

2012 RULE CHANGES

RULES AND REGULATIONS NORTH DAKOTA ADMINISTRATIVE CODE

CHAPTER 43-05-01 GEOLOGIC STORAGE OF CARBON DIOXIDE

43-05-01-01. DEFINITIONS. ~~Terms~~ The terms used in throughout this chapter have the same meaning as in chapter 43-02-03 and North Dakota Century Code chapter 38-08 except:-
~~Further, in this chapter:~~

- ~~1. "Carbon dioxide" means carbon dioxide produced by anthropogenic sources which is of such purity and quality that it will not compromise the safety of geologic storage and will not compromise those properties of a storage reservoir which allow the reservoir to effectively enclose and contain a stored gas.~~
1. "Area of Review" means the region surrounding the geologic sequestration project where underground sources of drinking water may be endangered by the injection activity.
2. "Bond rating" means a rating assigned to any long-term senior secured indebtedness issued by or on behalf of the storage operator (including any indebtedness issued by any governmental authority with respect to which the storage operator is obligor).
3. "Carbon dioxide plume" means the extent underground, in three dimensions, of an injected carbon dioxide stream.
4. "Carbon dioxide stream" means carbon dioxide that has been captured from an emission source (e.g., a coal burning power plant), plus incidental associated substances derived from the source materials and the capture process, and any substances added to the stream to enable or improve the injection process. This does not apply to any carbon dioxide stream that meets the definition of a hazardous waste.
- 2.5. "Closure period" means that period from permanent cessation of carbon dioxide injection until the commission issues a certificate of project completion.
- ~~3. "Commission" means industrial commission.~~

6. “Confining zone” means a geologic formation, group of formations, or part of a formation stratigraphically overlying the injection zone that acts as a barrier to fluid movement. For injection wells operating under an injection depth waiver, confining zone means a geologic formation, group of formations, or part of a formation stratigraphically overlying and underlying the injection zone.
7. “Corrective action” means the use of commission-approved methods to ensure that wells within the area of review do not serve as conduits for the movement of fluids into underground sources of drinking water.
8. “Facility area” means the areal extent of the storage reservoir.
- 4.9. “Flow lines” means pipelines transporting carbon dioxide from the carbon dioxide facility injection facilities to the wellhead.
- 5.10. “Formation fracture pressure” means the pressure, measured in pounds per square inch, which, if applied to a subsurface formation, will cause that formation to fracture.
- ~~6. “Freshwater” means an underground source of drinking water unless otherwise defined by the commission.~~
11. “Geologic sequestration” means the geologic storage of a gaseous, liquid, or supercritical carbon dioxide stream in a storage reservoir. This term does not apply to carbon dioxide capture or transport.
12. “Geologic sequestration project” means an injection well or wells used to emplace a carbon dioxide stream beneath the lowermost formation containing underground sources of drinking water; or, wells used for geologic sequestration that have been granted a waiver of the injection depth requirements; or, wells used for geologic sequestration that have received an expansion to the areal extent of an existing enhanced oil or gas recovery aquifer exemption. It includes the subsurface three-dimensional extent of the carbon dioxide plume, as well as the associated pressure front.

~~7. "Geologic storage" means the permanent or short term underground storage of carbon dioxide in a storage reservoir.~~

~~8-13.~~ "Injection well" means a non-experimental well used to inject carbon dioxide into or withdraw carbon dioxide from a reservoir.

14. "Injection zone" means a geologic formation, group of formations, or part of a formation that is of sufficient areal extent, thickness, porosity, and permeability to receive carbon dioxide through a well or wells associated with a geologic sequestration project.

15. "Mechanical integrity" means the absence of significant leakage within an injection well's tubing, casing, or packer (internal mechanical integrity), or outside of the casing (external mechanical integrity).

~~9-16.~~ "Minerals" means coal, oil, and natural gas.

17. "Model" means a representation or simulation of a phenomenon or process that is difficult to observe directly or that occurs over long time frames. Models that support geologic sequestration can predict the flow of carbon dioxide within the subsurface, accounting for the properties and fluid content of the subsurface formations and the effects of injection parameters.

~~10-18.~~ "Operational period" means the period during which injection occurs.

~~11.~~ "Permit" means a permit issued by the commission allowing a person to operate a storage facility.

- ~~12.19.~~ "Postclosure period" means that period after the commission has issued a certificate of project completion.
20. "Post-injection site care" means appropriate monitoring and other actions (including corrective action) needed following cessation of injection to ensure that underground sources of drinking water are not endangered. Post-injection site care may occur in the closure or postclosure periods.
21. "Pressure front" means the zone of elevated pressure and displaced fluids created by the injection of carbon dioxide into the subsurface. The pressure front of a carbon dioxide plume refers to a zone where there is a pressure differential sufficient to cause the movement of injected fluids or formation fluids into underground sources of drinking water.
22. "Project completion" means the point in time, as determined by the commission at which the certificate of project completion is issued and the storage operator is released from all regulatory requirements associated with the storage facility.
- ~~13. "Reservoir" means a subsurface sedimentary stratum, formation, aquifer, cavity, or void, whether natural or artificially created, including oil and gas reservoirs, saline formations, and coal seams suitable for or capable of being made suitable for injecting and storing carbon dioxide.~~
- ~~14. "Storage facility" means the reservoir, underground equipment, and surface facilities and equipment used or proposed to be used in a geologic storage operation. It does not include pipelines used to transport carbon dioxide to the storage facility.~~
- ~~15. "Storage operator" means a person holding or applying for a permit.~~
- ~~16. "Storage reservoir" means a reservoir proposed, authorized, or used for storing carbon dioxide.~~

~~17-23.~~ "Subsurface observation well" means a well used to observe subsurface phenomena, including the presence of carbon dioxide, pressure fluctuations, fluid levels and flow, temperature, and in situ water chemistry.

24. "Transmissive fault or fracture" means a fault or fracture that has sufficient permeability and vertical extent to allow fluids to move between formations.

25. "Trapping" means the physical and geochemical processes by which injected carbon dioxide is sequestered in the subsurface. Physical trapping occurs when buoyant carbon dioxide rises in the formation until it reaches impermeable strata that inhibits further upward and lateral migration or is immobilized in pore spaces due to capillary forces. Geochemical trapping occurs when chemical reactions between the injected carbon dioxide and natural occurring minerals in the formation lead to the precipitation of solid carbonate minerals or dissolution in formation fluids.

~~18-26.~~ "Underground source of drinking water" means an aquifer or any portion of an aquifer that supplies drinking water for human consumption, or in which the ground water contains fewer than ten thousand milligrams per liter total dissolved solids and is not an exempted aquifer as determined by the commission under section 43-02-05-03.

History: Effective April 1, 2010.

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

Section 43-05-01-02.1 is created as follows:

43-05-01-02.1. APPLICATION OF RULES FOR GEOLOGIC STORAGE OF CARBON DIOXIDE. In addition to the provisions in this chapter, injection wells utilized for geologic storage are subject to the provisions of chapters 43-02-03 and 43-02-05 where applicable.

History:

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

Section 43-05-01-02.2 is created as follows:

43-05-01-02.2. INJECTION INTO UNDERGROUND SOURCE OF DRINKING WATER PROHIBITED. Underground injection of carbon dioxide for geologic storage that causes or allows movement of fluid into an underground source of drinking water is prohibited, unless the underground source of drinking water is an exempted aquifer under section 43-02-05-03.

History:

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

Section 43-05-01-02.3 is created as follows:

43-05-01-02.3. TRANSITIONING FROM ENHANCED OIL OR GAS RECOVERY TO GEOLOGIC SEQUESTRATION. A storage operator injecting carbon dioxide for the primary purpose of geologic sequestration into an oil and gas reservoir shall apply for and obtain storage facility and injection well permits when there is an increased risk to underground sources of drinking water compared to enhanced oil or gas recovery operations. In determining if there is an increased risk to underground sources of drinking water, the commission shall consider the following factors:

1. Increase in reservoir pressure within the injection zone;
2. Increase in carbon dioxide injection rates;
3. Decrease in reservoir production rates;
4. Distance between the injection zone and underground sources of drinking water;
5. Suitability of the enhanced oil or gas recovery area of review delineation;
6. Quality of abandoned well plugs within the area of review;
7. The storage operator's plan for recovery of carbon dioxide at the cessation of injection;
8. The source and properties of injected carbon dioxide; and
9. Any additional site-specific factors as determined by the commission.

History:

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

Section 43-05-01-02.4 is created as follows:

43-05-01-02.4. EXEMPTED AQUIFERS AND EXPANSIONS OF AREAL EXTENT OF EXISTING AQUIFER EXEMPTIONS.

1. The commission may identify (by narrative description, illustrations, maps, or other means) and shall implement these rules to protect as underground sources of drinking water, all aquifers and parts of aquifers that meet the definition of “underground source of drinking water.” Even if an aquifer has not been specifically identified by the commission, it is an underground source of drinking water if it meets the definition of “underground source of drinking water.” Other than Environmental Protection Agency approved aquifer exemption expansions, new aquifer exemptions shall not be issued for injection wells.
2. The commission shall identify (by narrative description, illustrations, maps, or other means) and describe in geographic and geometric terms (such as vertical and lateral limits and gradient) that are clear and definite, all aquifers or parts of aquifers that the commission proposes to designate as exempted aquifers using the criteria in section 43-02-05-03. No designation of an exempted aquifer submitted as part of the underground injection control program is final until approved by the United States Environmental Protection Agency Administrator as part of the underground injection control program.
3. A storage operator of enhanced oil or gas recovery wells may apply to the commission for approval to expand the areal extent of an aquifer exemption already in place for an enhanced oil or gas recovery well for the exclusive purpose of carbon dioxide injection for geologic sequestration. Such applications are considered a revision to the applicable federal underground injection control program or a substantial program revision to an approved state underground injection control program and are not final until approved by the United States Environmental Protection Agency.
 - a. A storage operator’s application must define (by narrative description, illustrations, maps, or other means) and describe in geographic or geometric terms (such as vertical and lateral limits and gradient) that are clear and definite, all aquifers or parts thereof that are requested to be designated as exempted under section 43-02-05-03.
 - b. In evaluating an application the commission shall determine that it meets the criteria for exemptions in section 43-02-05-03. In making the determination, the commission shall consider:

- (1) Current and potential future use of the underground sources of drinking water to be exempted as drinking water resources;
- (2) The predicted extent of the injected carbon dioxide plume, and any mobilized fluids that may result in degradation of water quality, over the lifetime of the geologic sequestration project, as informed by computational modeling performed pursuant to subdivision a of subsection 2 of section 43-05-01-05.1, in order to ensure that the proposed injection operation will not at any time endanger underground sources of drinking water including non-exempted portions of the injection formation;
- (3) Whether the areal extent of the expanded aquifer exemption is sufficient to account for any possible revisions to the computational model during reevaluation of the area of review; and
- (4) Information submitted to support a waiver request made by the applicant under section 43-05-01-11.6, if appropriate.

History:

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

43-05-01-03. BOOKS AND RECORDS TO BE KEPT TO SUBSTANTIATE REPORTS. All owners, operators, drilling contractors, drillers, service companies, or other persons engaged in drilling, completing, operating, or servicing storage facilities shall make and keep appropriate books and records ~~for a period of not less than six years~~ until project completion, covering their operations in North Dakota from which they may be able to make and substantiate the reports required by this chapter.

History: Effective April 1, 2010.

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

43-05-01-05. STORAGE FACILITY PERMIT.

1. An application for a permit must include the following:
 - a. A site map showing the boundaries of the storage reservoir and the location of all proposed wells, proposed cathodic protection boreholes, and surface facilities within the carbon dioxide storage facility area;
 - b. A technical evaluation of the proposed storage facility, including the following:

- (1) The name, description, and average depth of the storage reservoirs;
- (2) A geologic and hydrogeologic evaluation of the facility area, including an evaluation of all existing information on all geologic strata overlying the storage reservoir, including the immediate caprock containment characteristics and all subsurface zones to be used for monitoring. The evaluation must include any available geophysical data and assessments of any regional tectonic activity, local seismicity and regional or local fault zones, and a comprehensive description of local and regional structural or stratigraphic features. The evaluation must describe the storage reservoir's mechanisms of geologic confinement, including rock properties, regional pressure gradients, structural features, and adsorption characteristics with regard to the ability of that confinement to prevent migration of carbon dioxide beyond the proposed storage reservoir. The evaluation must also identify any productive existing or potential mineral zones occurring within the facility area and any ~~freshwater~~ underground sources of drinking water in the facility area and within one mile [1.61 kilometers] of its outside boundary. The evaluation must include exhibits and plan view maps showing the following:
 - (a) All wells, including water, oil, and natural gas exploration and development wells, and other manmade subsurface structures and activities, including coal mines, within the facility area and within one mile [1.61 kilometers] of its outside boundary;
 - (b) All manmade surface structures that are intended for temporary or permanent human occupancy within the facility area and within one mile [1.61 kilometers] of its outside boundary;
 - (c) Any regional or local faulting;
 - (d) An isopach map of the storage reservoirs;
 - (e) An isopach map of the primary and any secondary containment barrier for the storage reservoir;
 - (f) A structure map of the top and base of the storage reservoirs;
 - (g) Identification of all structural spill points or stratigraphic discontinuities controlling the isolation of stored carbon dioxide and associated fluids within the storage reservoir;
 - (h) Evaluation of the ~~potential displacement of in situ water pressure front~~ and the potential impact on ~~ground water resources~~ underground sources of drinking water, if any; ~~and~~

- (i) Structural and stratigraphic cross sections that describe the geologic conditions at the storage reservoir ~~or reservoirs~~;
 - (j) The location, orientation, and properties of known or suspected faults and fractures that may transect the confining zone in the area of review, and a determination that they would not interfere with containment;
 - (k) Data on the depth, areal extent, thickness, mineralogy, porosity, permeability, and capillary pressure of the injection and confining zone; including facies changes based on field data, which may include geologic cores, outcrop data, seismic surveys, well logs, and names and lithologic descriptions;
 - (l) Geomechanical information on fractures, stress, ductility, rock strength, and in situ fluid pressures within the confining zone. The confining zone must be free of transmissive faults or fractures and of sufficient areal extent and integrity to contain the injected carbon dioxide stream;
 - (m) Information on the seismic history including the presence and depth of seismic sources and a determination that the seismicity would not interfere with containment.
 - (n) Geologic and topographic maps and cross sections illustrating regional geology, hydrogeology, and the geologic structure of the facility area; and
 - (o) Identify and characterize additional strata overlying the storage reservoir that will prevent vertical fluid movement, are free of transmissive faults or fractures, allow for pressure dissipation, and provide additional opportunities for monitoring, mitigation, and remediation.
- (3) A review of the data of public record, conducted by a geologist or engineer, for all wells within the facility area, which penetrate the storage reservoir or primary or secondary seals overlying the reservoir, and all wells within the facility area and within one mile [1.61 kilometers], or any other distance as deemed necessary by the commission, of the facility area boundary. ~~This review must determine if all abandoned wells have been plugged in a manner that prevents the carbon dioxide or associated fluids from escaping from the storage reservoir. The review required under this paragraph shall be conducted by a geologist or engineer; The review must include the following:~~

- a. A determination that all abandoned wells have been plugged, and operating wells have been constructed in a manner that prevents the carbon dioxide or associated fluids from escaping from the storage reservoir;
 - b. A description of each well's type, construction, date drilled, location, depth, record of plugging, and completion;
 - c. Maps and stratigraphic cross sections indicating the general vertical and lateral limits of all underground sources of drinking water, water wells and springs within the area of review; their positions relative to the injection zone; and the direction of water movement, where known;
 - d. Maps and cross sections of the area of review.
 - e. A map of the area of review showing the number or name and location of all injection wells, producing wells, abandoned wells, plugged wells or dry holes, deep stratigraphic boreholes, state or United States Environmental Protection Agency approved subsurface cleanup sites, surface bodies of water, springs, mines (surface and subsurface), quarries, water wells, other pertinent surface features including structures intended for human occupancy, State, County, or Indian Country boundary lines, and roads.
 - f. A list of contacts, submitted to the commission, when the area of review extends across state jurisdiction boundary lines.
 - g. Baseline geochemical data on subsurface formations, including all underground sources of drinking water in the area of review; and
 - h. Any additional information the commission may require.
- (4) The proposed calculated average and maximum daily injection rates, daily volume, and areal extent for the storage reservoir the total anticipated volume of the carbon dioxide stream using a method acceptable to and filed with the commission; ~~and~~
- (5) The proposed average and maximum bottom hole injection pressure to be utilized at the reservoir. The maximum allowed injection pressure, measured in pounds per square inch gauge, shall be approved by the commission and specified in the permit. In approving a maximum injection pressure limit, the commission shall consider the results of well tests and other studies that assess the risks of tensile failure and shear failure. The commission shall approve limits that, with a reasonable degree of certainty, will avoid initiating a new fracture or propagating an

existing fracture in the confining zone or cause the movement of injection or formation fluids into an underground source of drinking water;

- (6) The proposed pre-operational formation testing program to obtain an analysis of the chemical and physical characteristics of the injection zone and confining zone pursuant to section 43-05-01-11.2; and
 - (7) The proposed stimulation program, a description of stimulation fluids to be used and a determination that stimulation will not interfere with containment.
 - (8) The proposed procedure to outline steps necessary to conduct injection operation.
- c. The extent of the pore space that will be occupied by carbon dioxide as determined by utilizing all appropriate geologic and reservoir engineering information and reservoir analysis, which ~~may~~ must include various computational models ~~if appropriate~~ for reservoir characterization, and the projected response of the carbon dioxide plume and storage capacity of the geologic storage unit reservoir; The computational model must be based on detailed geologic data collected to characterize the injection zones, confining zones, and any additional zones;
 - d. ~~A detailed description of the storage facility's public safety and emergency and~~ remedial response plan pursuant to section 43-05-01-13. The plan must detail the safety procedures concerning the facility and residential, commercial, and public land use within one mile [1.61 kilometers], or any other distance set by the commission, of the outside boundary of the area of review. ~~The public safety and emergency and~~ remedial response procedures must include contingency plans for carbon dioxide leakage from any well, flow lines, or other facility and identify specific contractors and equipment vendors capable of providing necessary services and equipment to respond to such leaks or loss of containment from the storage reservoir. These emergency response procedures must be reviewed and updated annually;
 - e. A detailed worker safety plan that addresses carbon dioxide safety training and safe working procedures at the storage facility pursuant to section 43-05-01-13;
 - f. A corrosion monitoring and prevention plan for all wells and surface facilities pursuant to section 43-05-01-15;
 - g. A leak detection and monitoring plan for all wells and surface facilities pursuant to section 43-05-01-14. The plan must:
 - (1) Identify the potential for release to the atmosphere;

- (2) Identify potential degradation of ground water resources with particular emphasis on underground sources of drinking water; and
 - (3) Identify potential migration of carbon dioxide into any mineral zone in the facility area;
- h. A leak detection and monitoring plan ~~utilizing subsurface observation wells to~~ monitor any movement of the carbon dioxide outside of the storage reservoir. This may include the collection of baseline information of carbon dioxide background concentrations in ground water, surface soils, and chemical composition of in situ waters within the facility area and the storage reservoir and within one mile [1.61 kilometers] of the facility area outside boundary. Provisions in the plan will be dictated by the site characteristics as documented by materials submitted in support of the permit application but must:
- (1) Identify the potential for release to the atmosphere;
 - (2) Identify potential degradation of ground water resources with particular emphasis on underground sources of drinking water; and
 - (3) Identify potential migration of carbon dioxide into any mineral zone in the facility area;
- i. The proposed well casing and cementing program detailing compliance with section 43-05-01-09;
- j. ~~A performance bond in an amount and under terms set by the commission to provide it with funds sufficient to satisfy any regulatory obligation that the storage operator fails to fulfill. If the commission uses a part of the bond, the storage operator shall immediately replenish the bond or secure a new bond to ensure that the full bond amount set by the commission is maintained; An area of review and corrective action plan that meets the requirements pursuant to section 43-05-01-05.1;~~
- k. ~~Any other information that the commission requires; and~~ The storage operator shall comply with the financial responsibility requirements in section 43-05-01-09.1;
- l. ~~A closure plan.~~ A testing and monitoring plan pursuant to section 43-05-01-11.4
- m. A plugging plan that meets requirements pursuant to section 43-05-01-11.5
- n. A post-injection site care and facility closure plan pursuant to section 43-05-01-19; and

- o. Any other information that the commission requires.
- 2. Any person filing a permit application or an application to amend an existing permit shall pay a processing fee. The fee will be based on actual processing costs, including computer data processing costs, incurred by the commission.
 - a. A record of all application processing costs incurred must be maintained by the commission.
 - b. Promptly after receiving an application, the commission shall prepare and submit to the applicant an estimate of the processing fee and a payment billing schedule.
 - c. After the commission's work on the application has concluded, a final statement will be sent to the applicant. The full processing fee must be paid before the commission issues its final decision on an application.
 - d. The applicant must pay the processing fee regardless of whether a permit is issued or denied, or the application withdrawn.
- 3. The commission has one year from the date an application is deemed complete to issue a final decision regarding the application.

History: Effective April 1, 2010.

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

Section 43-05-01-05.1 is created as follows:

43-05-01-05.1. AREA OF REVIEW AND CORRECTIVE ACTION.

- 1. The storage operator shall prepare, maintain, and comply with a plan to delineate the area of review for a proposed geologic sequestration project, periodically reevaluate the delineation, and perform corrective action that meets the requirements of this section and is acceptable to the commission. The requirement to maintain and implement a commission approved plan is directly enforceable regardless of whether the requirement is a condition of the permit. As a part of the storage facility permit application, the storage operator shall submit an area of review and corrective action plan that includes the following:
 - a. The method for delineating the area of review including the model to be used, assumptions that will be made, and the site characterization data on which the model will be based;
 - b. A description of:

- (1) The reevaluation date, not to exceed five years, at which the storage operator shall reevaluate the area of review;
- (2) The monitoring and operational conditions that would warrant a reevaluation of the area of review prior to the next scheduled reevaluation date.
- (3) How monitoring and operational data (e.g., injection rate and pressure) will be used to inform an area of review reevaluation; and
- (4) How corrective action will be conducted to meet the requirements of this section, including what corrective action will be performed prior to injection and what, if any, portions of the area of review will have corrective action addressed on a phased basis and how the phasing will be determined; how corrective action will be adjusted if there are changes in the area of review; and how site access will be guaranteed for future corrective action.

2. The storage operator shall perform the following actions to delineate the area of review and identify all wells that require corrective action:

a. Predict, using existing site characterization, monitoring and operational data, and computational modeling, the projected lateral and vertical migration of the carbon dioxide plume and its associated pressure front in the subsurface from the commencement of injection activities until the plume movement ceases, or until the end of a fixed time period as determined by the commission. The model must:

- (1) Be based on detailed geologic data collected to characterize the injection zone, confining zone and any additional zones; and anticipated operating data, including injection pressures, rates, and total volumes over the proposed life of the geologic sequestration project;
- (2) Take into account any geologic heterogeneities, other discontinuities, data quality, and their possible impact on model predictions; and
- (3) Consider potential migration through faults, fractures, and artificial penetrations.

b. Using methods approved by the commission, identify all penetrations, including active and abandoned wells and underground mines, in the area of review that may penetrate the confining zone. Provide a description of each well's type, construction, date drilled, location, depth, record of plugging and completion, and any additional information the commission may require; and

- c. Determine which abandoned wells have been plugged, or operating wells have been constructed in the area of review in a manner that prevents the movement of the injected carbon dioxide or other fluids that may endanger underground sources of drinking water, including use of materials compatible with the carbon dioxide stream.
3. The storage operator shall perform corrective action on all wells in the area of review that are determined to need corrective action, using methods designed to prevent the movement of fluid into or between underground sources of drinking water, including use of materials compatible with the carbon dioxide stream, where appropriate.
4. At the reevaluation date, not to exceed five years, as specified in the area of review and corrective action plan, or when monitoring and operational conditions warrant, the storage operator shall:
 - a. Reevaluate the area of review in same manner specified in subdivision a of subsection 2;
 - b. Identify all wells in the reevaluated area of review that require corrective action in the same manner specified in subsection 2;
 - c. Perform corrective action on wells requiring corrective action in the reevaluated area of review in the same manner specified in subsection 3; and
 - d. Submit an amended area of review and corrective action plan or demonstrate to the commission through monitoring data and modeling results that no amendment to the plan is needed. Any amendments to the plan are subject to the commission's approval, must be incorporated into the permit, and are subject to the permit modification requirements.
5. The emergency and remedial response plan and the demonstration of financial responsibility must account for the area of review, regardless of whether or not corrective action in the area of review is phased.
6. All modeling inputs and data used to support area of review delineations and reevaluations must be retained until project completion. Upon project completion the storage operator shall deliver the records to the commission.

History:

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

43-05-01-06. STORAGE FACILITY PERMIT TRANSFER.

1. Notification. The storage operator and proposed transferee shall notify the commission in writing of any proposed permit transfer. The notice must contain the following:
 - a. The name and address of the person to whom the permit is to be transferred.
 - b. The name of the permit subject to transfer and location of the storage facility and a description of the land ~~upon which the storage facility is situated~~ within the facility area.
 - c. The date that the storage operator desires the proposed transfer to occur.
 - d. ~~Performance bonds~~ A demonstration of financial assurance as required by section 43-05-01-05 43-05-01-09.1.
2. Commission review. The commission shall review the proposed transfer to ensure that the purposes of North Dakota Century Code chapter 38-22 are not compromised but are promoted. For good cause, the commission may deny a transfer request, delay acting on it, and place conditions on its approval.
3. Commission approval required. A permit transfer can occur only upon the commission's written order.

History: Effective April 1, 2010.

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

~~43-05-01-07. AMENDING STORAGE FACILITY PERMIT.~~

- ~~1. The following changes to a permit require compliance with all the provisions of section 43-05-01-05:

 - a. Any change in the areal extent of the storage facility;
 - b. Using a reservoir not specified in the permit;
 - c. Any increase in the carbon dioxide storage volume; and
 - d. Any change in the chemical composition of the injected carbon dioxide.~~
- ~~2. Significant changes to operational methods and procedures contained in the permit or upon which the permit was based will require compliance with subsection 2 of section 43-05-01-05.~~

History: Effective April 1, 2010.

43-05-01-08. AMALGAMATION OF SUBSURFACE RIGHTS TO OPERATE GEOLOGICAL STORAGE UNIT. STORAGE FACILITY PERMIT HEARING.

1. ~~On or before the date a permit application is filed with the commission, The commission shall hold a public hearing before issuing a storage facility permit. At least forty-five days prior to the hearing, the applicant shall give notice of the hearing to the following: notice that it has filed the application:~~
 - a. Each operator of mineral extraction activities within the facility area and within one-half mile [.80 kilometer] ~~outside of the facility area~~ its outside boundary;
 - b. Each mineral lessee of record within the facility area and within one-half mile [.80 kilometer] of its outside boundary;
 - c. Each owner of record of the surface within the facility area and one-half mile [.80 kilometer] of its outside boundary;
 - d. Each owner of record of minerals within the ~~project~~ facility area and within one-half mile [.80 kilometer] of its outside boundary;
 - e. Each owner and each lessee of record of the pore space within the storage reservoir and within one-half mile [.80 kilometer] of the reservoir's boundary; and
 - f. Any other persons as required by the commission.
2. The notice must contain:
 - a. A legal description of the land ~~overlying the storage reservoir~~ within the facility area.
 - b. The date, time, and place that the commission will hold a hearing on the permit application.
 - c. A statement that a copy of the permit application may be obtained from the commission.
 - d. ~~A notice of the right to file comments.~~ A statement that all comments regarding the storage facility permit application must in writing and submitted to the commission prior to the hearing, or presented at the hearing.

- e. A statement that amalgamation of the storage reservoirs pore space is required to operate the storage facility, that the commission may require that the pore space owned by nonconsenting owners be included in the storage facility and subject to geologic storage, and the amalgamation of pore space will be considered at the hearing.
3. The commission shall give at least ~~fifteen~~ thirty days' notice, except in an emergency, of the time and place of hearing thereon by one publication of such notice in a newspaper of general circulation in Bismarck, North Dakota, and in a newspaper of general circulation in the county where the land affected or some part thereof is situated, unless in some particular proceeding a longer period of time or a different method of publication is required by law, in which event such period of time and method of publication shall prevail. The notice shall issue in the name of the commission and shall conform to the other requirements provided by law. The public notice must state that an application has been filed with the commission for permission to store carbon dioxide and describe the location of the proposed facility area and the date, time, and place of the hearing before the commission at which time the merits of the application will be considered
 - ~~4. Objections received by the commission shall be in writing and specify the nature of the objection.~~

History: Effective April 1, 2010.

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

43-05-01-09. WELL PERMIT APPLICATION REQUIREMENTS.

1. Following receipt of a storage facility permit, the storage operator shall ~~submit applications~~ obtain a permit to drill, deepen, convert, operate, or, upon demonstration of mechanical integrity, reenter a previously plugged and abandoned well for storage purposes.
2. Application for permits to drill, deepen, convert, operate, or reenter a well must be submitted on ~~a Form 25 prescribed~~ provided by the commission and must include at a minimum:
 - a. ~~A plat prepared by a licensed land~~ An accurate plat certified by a registered surveyor showing the location of the proposed injection or subsurface observation well. The plat must be drawn to the scale of one inch [25.4 millimeters] equals one thousand feet [304.8 meters], unless otherwise directed by the commission, and must show distances from the proposed well to the nearest ~~storage reservoir~~ facility area boundary. The plat must show the latitude and longitude of the proposed well ~~in decimal degrees to five~~

~~significant digits.~~ location to the nearest tenth of a second. The plat must also show the location and status of all other wells that have been drilled within one-fourth mile [402.34 meters], or any other distance deemed necessary by the commission, of the proposed injection or subsurface observation well;

- b. The drilling, completion, or conversion procedures for the proposed injection or subsurface observation well;
 - c. A well bore schematic showing the name, description, and depth of the storage reservoirs and the depth of the deepest underground source of drinking water; a description of the casing in the injection or subsurface observation well, or the proposed casing program, including a full description of cement already in place or as proposed; and the proposed method of testing casing before use of the injection well;
 - d. A geophysical log, if available, through the storage reservoir to be penetrated by the proposed injection well or if an injection or subsurface observation well is to be drilled, a complete log through the reservoir from a nearby well is permissible. Such log must be annotated to identify the estimated location of the base of the deepest underground source of drinking water, showing the stratigraphic position and thickness of all confining strata above the reservoirs and the stratigraphic position and thickness of the reservoir; and
 - e. The proposed pad layout including cut and fill diagrams.
3. ~~No later than~~ Within 30 days after the conclusion of well drilling and completion activities, a permit application shall be submitted to operate an injection well and must include at a minimum:
- a. A schematic diagram of the surface injection system and its appurtenances;
 - b. A final well bore diagram showing the name, description, and depths of the storage reservoir and the base of the deepest underground source of drinking water and a diagram of the well depicting the casing, cementing, perforation, tubing, and plug and packer records associated with the construction of the well;
 - c. The well's complete dual induction or equivalent log through the storage reservoir. Such a log shall be run prior to setting casing through the storage reservoir. Logs must be annotated to identify the estimated location of the base of the deepest underground source of drinking water, showing the stratigraphic position and thickness of all confining strata above the storage reservoir and the reservoir's stratigraphic position and thickness unless that information has been previously submitted. When approved in advance by the commission, this

information can be demonstrated with a dual induction or equivalent log run in a nearby well or by such other method acceptable to the commission;

- d. An affidavit specifying the chemical constituents, their relative proportions and the physical properties of the ~~injection~~ carbon dioxide stream; other than carbon dioxide and their relative proportions; and the source of the carbon dioxide stream;
- e. Proof that the long string of casing of the well is cemented adequately so that the carbon dioxide is confined to the storage reservoirs. Such proof must be provided in the form of a cement bond log or the results of a fluid movement study or such other method specified by the commission; ~~and~~
- f. The results of a mechanical-integrity test, if applicable to well type, of the casing in accordance with the pressure test requirements of this section if a test was run within one calendar year preceding the request for a conversion permit for a previously drilled well-;
- g. The final area of review based on modeling, using data obtained during logging and testing of the well and the formation, including any relevant updates on the geologic structure and hydrogeologic properties of the proposed storage reservoir and overlying formations;
- h. Information on the compatibility of the carbon dioxide stream with fluids in the injection zone and minerals in both the injection and the confining zone, based on the results of the formation testing program, and with the materials used to construct the well;
- i. The results of the formation testing program;
- j. The status of corrective action on wells in the area of review;
- k. All available logging and testing program data on the well;
- l. Any updates to the proposed area of review and corrective action plan, testing and monitoring plan, injection well plugging plan, post-injection site care and facility closure plan, and the emergency and remedial response plan, which are necessary to address new information collected during logging and testing of the well; and
- m. Any other information that the commission requires.

History: Effective April 1, 2010.

Section 43-05-01-09.1 is created as follows:

43-05-01-09.1. FINANCIAL RESPONSIBILITY.

1. The storage operator shall demonstrate and maintain financial responsibility as determined by the commission that meets the following conditions:
 - a. The qualifying financial responsibility instrument used must be from the following list of qualifying instruments:
 - (1) Trust funds;
 - (2) Surety or cash bonds;
 - (3) Letter of credit;
 - (4) Insurance;
 - (5) Self insurance (i.e., financial test and corporate guarantee);
 - (6) Escrow account; or
 - (7) Any other instrument the commission finds satisfactory.
 - b. The qualifying financial responsibility instrument must be sufficient to cover the cost of:
 - (1) Corrective action that meets the requirements of section 43-05-01-05.1;
 - (2) Injection well plugging that meets the requirements of section 43-05-01-11.5;
 - (3) Post injection site care and facility closure that meets the requirements of section 43-05-01-19; and
 - (4) Emergency and remedial response that meets the requirements of section 43-05-01-13.
 - c. The qualifying financial responsibility instrument must be sufficient to address endangerment of underground sources of drinking water.

d. The qualifying financial responsibility instrument must comprise protective conditions of coverage.

(1) Protective conditions of coverage must include at a minimum cancellation, renewal, and continuation provisions; specifications on when the provider becomes liable following a notice of cancellation if there is a failure to renew with a new qualifying financial responsibility instrument; and requirements for the provider to meet a minimum rating, minimum capitalization, and ability to pass the bond rating when applicable.

(2) Cancellation. The storage operator shall provide that its financial mechanism may not cancel, terminate, or fail to renew except for failure to pay such financial instrument. If there is a failure to pay the financial instrument, the financial institution may elect to cancel, terminate, or fail to renew the instrument by sending notice by certified mail to the storage operator and the commission. The cancellation must not be final for 120 days after receipt of cancellation notice. The storage operator shall provide an alternate qualifying financial responsibility demonstration within 60 days of notice of cancellation, and if it is not acceptable (or possible), any funds from the instrument being cancelled must be released to the commission within 60 days of notification by the commission.

(3) Renewal. The storage operator shall renew all qualifying financial responsibility instruments, if an instrument expires, for the entire term of the geologic sequestration project. The instrument must be automatically renewed as long as the storage operator has the option of renewal at the face amount of the expiring instrument. The automatic renewal must, at a minimum, provide the storage operator with the option of renewal at the face amount of the expiring financial instrument.

(4) Cancellation, termination, or failure to renew may not occur and the financial instrument will remain in full force and effect in the event that on or before the date of expiration: the commission deems the facility abandoned; or the permit is terminated or revoked or a new permit is denied; or closure is ordered by the commission or a United States district court or other court of competent jurisdiction; or the storage operator is named as debtor in a voluntary or involuntary proceeding under Title 11 (Bankruptcy), United States Code; or the amount due is paid.

e. The qualifying financial responsibility instrument is subject to the commission's approval.

(1) The commission shall consider and approve the qualifying financial responsibility demonstration for all the phases of the geologic sequestration project prior to issuing a storage facility permit.

(2) The storage operator shall provide any updated information related to its qualifying financial responsibility instrument on an annual basis and, if there are any changes, the commission must evaluate, within a reasonable time, the qualifying financial responsibility demonstration to confirm that the instrument used remains adequate. The storage operator shall maintain financial responsibility requirements regardless of the status of the commission's review of the financial responsibility demonstration.

(3) The commission may disapprove the use of a financial instrument if it determines that it is not sufficient to meet the requirements of this section.

f. Upon the commission's approval, the storage operator may demonstrate financial responsibility by using one or multiple qualifying financial responsibility instruments for specific phases of the geologic sequestration project.

If the storage operator combines more than one instrument for a specific geologic sequestration phase (e.g., well plugging), such combination must be limited to instruments that are not based on financial strength or performance (i.e., self insurance or performance bond), for example trust funds, surety bonds guaranteeing payment into a trust fund, letters of credit, escrow account, and insurance. In this case, it is the combination of mechanisms, rather than the single mechanism, which must provide financial responsibility for an amount at least equal to the current cost estimate.

g. When using a third-party instrument to demonstrate financial responsibility, the storage operator shall provide a proof that the third-party providers either have passed financial strength requirements based on credit ratings; or has met a minimum rating, minimum capitalization, and ability to pass the bond rating when applicable.

h. The storage operator using certain types of third party instruments shall establish a standby trust to enable the commission to be party to the financial responsibility agreement without the commission being the beneficiary of any funds. The standby trust fund must be used along with other qualifying financial responsibility instruments (e.g., surety bonds, letters of credit, or escrow accounts) to provide a location to place funds if needed.

i. If the storage operator uses a surety bond or cash bond to satisfy its financial responsibility requirements, the storage operator shall be the principal on the bond and each surety bond must be executed by a responsible surety company authorized to transact business in North Dakota.

j. If the storage operator uses an escrow account to satisfy its financial responsibility requirements, the account must segregate funds sufficient to cover estimated costs for geologic sequestration financial responsibility from other accounts and uses.

- k. If the storage operator or its guarantor uses self insurance to satisfy its financial responsibility requirements, the storage operator shall meet a tangible net worth of an amount approved by the commission; have a net working capital and tangible net worth each at least six times the sum of the current well plugging, post injection site care and facility closure cost; have assets located in the United States amounting to at least 90 percent of total assets or at least six times the sum of the current well plugging, post injection site care and facility closure cost; and must submit a report of its bond rating and financial information annually. In addition the storage operator shall either: have a bond rating test of AAA, AA, A, or BBB as issued by Standard & Poor's, or Aaa, Aa, A, or Baa as issued by Moody's; or meet all of the following five financial ratio thresholds: a ratio of total liabilities to net worth less than 2.0; a ratio of current assets to current liabilities greater than 1.5; a ratio of the sum of net income plus depreciation, depletion, and amortization to total liabilities greater than 0.1; a ratio of current assets minus current liabilities to total assets greater than -0.1; and a net profit (revenues minus expenses) greater than 0.
- l. The storage operator who is not able to meet corporate financial test criteria in the preceding provision, may arrange a corporate guarantee by demonstrating that its corporate parent meets the financial test requirements on its behalf. The parent's demonstration that it meets the financial test requirement is insufficient if it has not also guaranteed to fulfill the obligations for the storage operator.
- m. If the storage operator uses an insurance policy to satisfy its financial responsibility requirements, the insurance policy must be obtained from a third party provider.
- 2. The requirement to maintain commission approved qualifying financial responsibility and resources is directly enforceable regardless of whether the requirement is a condition of the permit.

 - a. The storage operator shall maintain qualifying financial responsibility and resources until the commission approves project completion.
 - b. The storage operator may be released from a financial instrument in the following circumstances:

 - (1) The storage operator has completed the phase of the geologic sequestration project for which the financial instrument was required and has fulfilled all its financial obligations as determined by the commission, including obtaining financial responsibility for the next phase of the geologic sequestration project, if required;
 - (2) The storage operator has submitted a replacement financial instrument and received written approval from the commission accepting the new financial

instrument and releasing the storage operator from the previous financial instrument; or

(3) The commission approves project completion.

3. The storage operator shall have a detailed written estimate, in current dollars, of the cost of performing corrective action on wells in the area of review, plugging the injection well, post-injection site care and facility closure, and emergency and remedial response.
 - a. The cost estimate must be performed for each phase separately and must be based on the costs to the commission of hiring a third party to perform the required activities. A third party is a party who is not within the corporate structure of the storage operator;
 - b. During the active life of the geologic sequestration project, the storage operator shall adjust the cost estimate for inflation within 60 days prior to the anniversary date of the establishment of the financial instrument used to comply with this section and provide this adjustment to the commission. The storage operator shall also provide to the commission written updates of adjustments to the cost estimate within 60 days of any amendments to the area of review and corrective action plan, the injection well plugging plan, the post-injection site care and facility closure plan, and the emergency and remedial response plan;
 - c. Any decrease or increase to the initial cost estimate is subject to the commission's approval. During the active life of the geologic sequestration project, the storage operator shall revise the cost estimate no later than 60 days after the commission has approved the request to modify the area of review and corrective action plan, the injection well plugging plan, the post-injection site care and facility closure plan, and the emergency and response plan, if the change in the plan increases the cost. If the change to the plans decreases the cost, any withdrawal of funds is subject to the commission's approval. Any decrease to the value of the financial responsibility instrument must first be approved by the commission. The revised cost estimate must be adjusted for inflation; and
 - d. Whenever the current cost estimate increases to an amount greater than the face amount of a financial instrument currently in use, the storage operator, within 60 days after the increase, shall either cause the face amount to be increased to an amount at least equal to the current cost estimate and submit evidence of such increase to the commission, or obtain other qualifying financial responsibility instruments to cover the increase. Whenever the current cost estimate decreases, the face amount of the financial assurance instrument may be reduced to the amount of the current cost estimate only after the storage operator has received written approval from the commission.

4. The storage operator shall notify the commission by certified mail of adverse financial conditions that may affect the operator's ability to carry out its obligations under state and federal law.
 - a. If the storage operator or the third party provider of a qualifying financial responsibility instrument is named as the debtor in a bankruptcy proceeding, the notice to the commission must be made within 10 days after commencement of the proceeding;
 - b. A guarantor of a corporate guarantee shall make the notification required in subdivision a of this subsection if the guarantor is named as debtor, as required under the terms of the corporate guarantee; and
 - c. The storage operator who fulfills its financial responsibility requirements by obtaining a trust fund, surety bond, letter of credit, escrow account, or insurance policy, will be deemed to be without the required financial assurance in the event of bankruptcy of the trustee or issuing institution, or a suspension or revocation of the authority of the trustee institution to act as trustee of the institution issuing the trust fund, surety bond, letter of credit, escrow account, or insurance policy. The storage operator shall establish other financial assurance within 60 days after such an event.
5. The storage operator shall provide an adjustment of the cost estimate to the commission within 60 days of notification by the commission, if the commission determines during the annual evaluation of the qualifying financial responsibility instrument that the most recent demonstration is no longer adequate to cover the operator's obligations under state and federal law.
6. The use and length of pay-in-periods for trust funds or escrow accounts are subject to the commission's approval. The storage operator may make periodic deposits into a trust fund or escrow account throughout the operational period in order to ensure sufficient funds are available to carry out the required activities on the date on which they may occur. The commission shall take into account project-specific risk assessments, projected timing of activities (e.g., post-injection site care), and interest accumulation in determining whether sufficient funds are available to carry out the required activities.

History:

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

43-05-01-10. INJECTION WELL PERMIT.

1. Upon review and approval of the application to drill, deepen, convert, reenter, or operate an injection well, submitted in accordance with section 43-05-01-09, the commission shall issue permits to drill and operate.
2. A permit shall expire twelve months from the date of issue if the permitted well has not been drilled, deepened, reentered, operated, or converted.
3. Injection well permits must be issued for the operating life of the storage facility and the closure period.
4. The commission shall review each issued injection well permit at least once every five years to determine whether it should be modified, revoked, or a minor modification made.
5. On a case-by-case basis when required by the commission, the storage operator shall submit a schedule of compliance leading to full compliance with all provisions this chapter and North Dakota Century Code chapter 38-22.

History: Effective April 1, 2010.

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

43-05-01-11. INJECTION WELL OPERATIONAL CONSTRUCTION AND COMPLETION STANDARDS.

1. The storage operator shall ensure that all injection wells are constructed and completed to prevent movement of the carbon dioxide stream or fluids into underground sources of drinking water or outside the storage reservoir. The injection wells must be constructed and completed in a way that allows the use of appropriate testing devices and workover tools. The casing and cement or other materials used in the construction of each new injection well must be designed for the well's life expectancy. In determining and specifying casing and cementing requirements, all of the following factors must be considered:
 - a. Depth to the injection zone;
 - b. Injection pressure, external pressure, internal pressure, and axial loading;
 - c. Hole size;
 - d. Size and grade of all casing strings (wall thickness, external diameter, nominal weight, length, joint specification, and construction material);
 - e. Corrosiveness of the carbon dioxide stream and formation fluids;

- f. Down-hole temperatures;
 - g. Lithology of injection and confining zone;
 - h. Type or grade of cement and cement additives; and
 - i. Quantity, chemical composition, and temperature of the carbon dioxide stream.
- 1-2. Surface casing in all newly drilled carbon dioxide injection and subsurface observation wells drilled below the underground source of drinking water must be set fifty feet [15.24 meters] below the base of the ~~Fox Hills formation~~ lowermost underground source of drinking water and cemented pursuant to section 43-02-03-21.
- 2-3. The long string casing in all injection and subsurface observation wells must be cemented pursuant to section 43-02-03-21. Sufficient cement must be used on the long string casing to fill the annular space behind the casing to the surface of the ground and a sufficient number of centralizers shall be used to assure a good cement job. The long string casing must extend to the injection zone.
- 3-4. Any liner set in the well bore must be cemented with a sufficient volume of cement to fill the annular space.
- 4-5. All cements used in the cementing of casings in injection and subsurface observation wells must be of sufficient quality to maintain well integrity in the carbon dioxide injection environment. Circulation of cement may be accomplished by staging. The commission may approve an alternative method of cementing in cases where the cement cannot be recirculated to the surface, provided the storage operator can demonstrate by using logs that the cement does not allow fluid movement behind the well bore.
- 5-6. All casings must meet the standards specified in either of the following documents, which are hereby adopted by reference:
- a. The most recent American petroleum institute bulletin on performance properties of casing, tubing, and drill pipe;
 - b. Specification for casing and tubing (United States customary units), American petroleum institute specification 5CT, as published by the American petroleum institute ~~in October 1998;~~
 - c. North Dakota Administrative Code Section 43-02-03-21; or
 - d. Other equivalent casing as approved by the commission.

- ~~6.7.~~ All casings used in new wells must be new casing or reconditioned casing of a quality equivalent to new casing and that has been pressure-tested in accordance with the requirements of subsection ~~56~~. For new casings, the pressure test conducted at the manufacturing mill or fabrication plant may be used to fulfill the requirements of subsection ~~56~~.
- ~~7.8.~~ The location and amount of cement behind casings must be verified by ~~a cement bond log, cement evaluation log, or any other~~ an evaluation method approved by the commission. The evaluation method must be capable of evaluating cement quality radially and identifying the location of channels to ensure that underground sources of drinking water are not endangered.
- ~~8.9.~~ All injection wells must be completed with and injection must be through tubing and packer. In order for the commission to determine and specify requirements for tubing and packer, the storage operator shall submit the following information:
- a. Depth of setting;
 - b. Characteristics of the carbon dioxide stream (chemical content, corrosiveness, temperature, and density) and formation fluids;
 - c. Maximum proposed injection pressure;
 - d. Maximum proposed annular pressure;
 - e. Proposed injection rate (intermittent or continuous) and volume and mass of the carbon dioxide stream;
 - f. Size of tubing and casing; and
 - g. Tubing tensile, burst, and collapse strengths.
- ~~9.10.~~ All tubing strings must meet the standards contained in subsection ~~56~~. All tubing must be new tubing or reconditioned tubing of a quality equivalent to new tubing and that has been pressure-tested. For new tubing, the pressure test conducted at the manufacturing mill or fabrication plant may be used to fulfill this requirement.
- ~~10.11.~~ All wellhead components, including the casinghead and tubing head, valves, and fittings, must be made of steel having operating pressure ratings sufficient to exceed the maximum injection pressures computed at the wellhead and to withstand the corrosive nature of carbon dioxide. Each flow line connected to the wellhead must be equipped with a manually operated positive shutoff valve located on or near the wellhead.
- ~~11.12.~~ All packers, packer elements, or similar equipment critical to the containment of carbon dioxide must be of a quality to withstand exposure to carbon dioxide.

- ~~12.~~13. All injection wells must have at all times an accurate, operating pressure gauge or pressure recording device. Gauges must be calibrated as required by the commission and evidence of such calibration must be available to the commission upon request.
- ~~13.~~14. All newly drilled wells must establish internal and external mechanical integrity as specified by the commission and demonstrate continued mechanical integrity through periodic testing as determined by the commission. All other wells to be used as injection wells must demonstrate mechanical integrity as specified by the commission prior to use for injection and be tested on an ongoing basis as determined by the commission using these methods:
- a. Pressure tests. Injection wells, equipped with tubing and packer as required, must be pressure-tested as required by the commission. A testing plan must be submitted to the commission for prior approval. At a minimum, the pressure must be applied to the tubing casing annulus at the surface for a period of thirty minutes and must have no decrease in pressure greater than ten percent of the required minimum test pressure. The packer must be set at a depth at which the packer will be opposite a cemented interval of the long string casing and must be set no more than fifty feet [15.24 meters] above the uppermost perforation or open hole for the storage reservoirs; and
 - b. The commission may require additional testing, such as a bottom hole temperature and pressure measurements, tracer survey, temperature survey, gamma ray log, neutron log, noise log, casing inspection log, or a combination of two or more of these surveys and logs, to demonstrate mechanical integrity.
- ~~14.~~15. The commission has the authority to witness all mechanical integrity tests conducted by the storage operator.
- ~~15.~~16. If an injection well fails to demonstrate mechanical integrity by an approved method, the storage operator shall immediately shut in the well, report the failure to the commission, and commence isolation and repair of the leak. The operator shall, within ninety days or as otherwise directed by the commission, perform one of the following:
- a. Repair and retest the well to demonstrate mechanical integrity;
 - b. Properly plug the well;~~or~~
 - ~~c. Comply with an alternative plan approved by the commission.~~
- ~~16.~~17. All injection wells must be equipped with shutoff systems designed to alert the operator and shut in wells when necessary.
- ~~17.~~18. Additional requirements may be required by the commission to address specific circumstances and types of projects.

History: Effective April 1, 2010.

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

Section 43-05-01-11.1 is created as follows:

43-05-01-11.1 MECHANICAL INTEGRITY- INJECTION WELLS.

1. An injection well has mechanical integrity if:
 - a. There is no significant leak in the casing, tubing, or packer; and
 - b. There is no significant fluid movement into an underground source of drinking water through channels adjacent to the well bore.
2. To evaluate the absence of significant leaks the storage operator shall, following an initial annulus pressure test, continuously monitor injection pressure, rate, injected volumes, pressure on the annulus between tubing and long-string casing, and annulus fluid volume.
2. At least annually, the storage operator shall use one of the following methods to determine the absence of significant fluid movement.
 - a. An approved tracer survey; or
 - b. A temperature or noise log.
3. If required by the commission, at a frequency specified in the testing and monitoring plan, the storage operator shall run a casing inspection log to determine the presence or absence of corrosion in the long-string casing.
4. The commission may require alternative and additional United States Environmental Protection Agency approved methods to evaluate mechanical integrity.
6. To conduct and evaluate mechanical integrity, the storage operator shall apply methods and standards generally accepted in the industry. When the storage operator reports the results of mechanical integrity tests to the commission, the storage operator shall include a description of the test and the method used.
7. The commission may require additional or alternative tests if the results presented by the storage operator are not satisfactory to the commission to demonstrate mechanical integrity.

History:

Section 43-05-01-11.2 is created as follows:

43-05-01-11.2 LOGGING, SAMPLING, AND TESTING PRIOR TO INJECTION WELL OPERATION.

1. During the drilling and construction of an injection well, the storage operator shall run appropriate logs, surveys and tests to determine or verify the depth, thickness, porosity, permeability, lithology, and salinity of any formation fluids in all relevant geologic formations to ensure conformance with the injection well construction requirements under section 43-05-01-11.3, and to establish accurate baseline data against which future measurements may be compared. The storage operator shall submit to the commission a descriptive report prepared by a log analyst that includes an interpretation of the results of such logs and tests. At a minimum, such logs and tests must include:
 - a. Deviation checks during drilling on all holes constructed by drilling a pilot hole which is enlarged by reaming or another method. Such checks must be at sufficiently frequent intervals to determine the location of the borehole and to ensure that vertical avenues for fluid movement in the form of diverging holes are not created during drilling;
 - b. Before and upon installing the surface casing:
 - (1) Resistivity, spontaneous potential, and caliper logs before the casing is installed; and
 - (2) A cement bond and variable density log to evaluate cement quality radially, and a temperature log after the casing is set and cemented.
 - c. Before and upon installation of the long string casing:
 - (1) Resistivity, spontaneous potential, porosity, caliper, gamma ray, fracture finder logs, and any other logs the commission requires for the given geology before the casing is installed; and
 - (2) A cement bond and variable density log, and a temperature log after the casing is set and cemented.
 - d. A series of tests designed to demonstrate the internal and external mechanical integrity of injection wells, which may include:

- (1) A pressure test with liquid or gas;
 - (2) A tracer survey;
 - (3) A temperature or noise log;
 - (4) A casing inspection log; and
 - e. Any alternative methods that provide equivalent or better information and that the commission requires or approves.
2. The storage operator shall take whole cores or sidewall cores of the injection zone and confining zone and formation fluid samples from the injection zone, and shall submit to the commission a detailed report prepared by a log analyst that includes: well log analyses (including well logs), core analyses, and formation fluid sample information. The commission may accept information on cores from nearby wells if the storage operator can demonstrate that core retrieval is not possible and that such cores are representative of conditions at the well. The commission may require the storage operator to core other formations in the borehole.
 3. The storage operator shall record the fluid temperature, pH, conductivity, reservoir pressure, and static fluid level of the injection zone.
 4. At a minimum, the storage operator shall determine or calculate the following information concerning the injection and confining zone:
 - a. Fracture pressure;
 - b. Other physical and chemical characteristics of the injection and confining zone; and
 - c. Physical and chemical characteristics of the formation fluids in the injection zone.
 5. Upon completion, but prior to operation, the storage operator shall conduct the following tests to verify hydrogeologic characteristics of the injection zone:
 - a. A pressure fall-off test; and,
 - b. A pump test; or
 - c. Injectivity test.
 6. The storage operator shall provide the commission with the opportunity to witness all logging and testing carried out under this section. The storage operator shall submit a schedule of such activities to the commission 30 days prior to conducting the first test and submit any changes to the schedule 30 days prior to the next scheduled test.

History:

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

Section 43-05-01-11.3 is created as follows:

43-05-01-11.3 INJECTION WELL OPERATING REQUIREMENTS.

1. Except during stimulation, the storage operator shall ensure that injection pressure does not exceed 90 percent of the fracture pressure of the injection zone so as to ensure that the injection does not initiate new fractures or propagate existing fractures in the injection zone. Injection pressure must never initiate fractures in the confining zone or cause the movement of injection or formation fluids that endangers an underground source of drinking water. All stimulation programs are subject to the commission's approval as part of the storage facility permit application and incorporated into the permit.
2. Injection between the outermost casing protecting underground sources of drinking water and the well bore is prohibited.
3. The storage operator shall fill the annulus between the tubing and the long string casing with a non-corrosive fluid approved by the commission. The storage operator shall maintain on the annulus a pressure that exceeds the operating injection pressure, unless the commission determines that such requirement might harm the integrity of the well or endanger underground sources of drinking water.
4. Other than during periods approved by the commission in which the sealed tubing-casing annulus is disassembled for maintenance or corrective procedures, the storage operator shall maintain mechanical integrity of the injection well at all times.
5. The storage operator shall install and use:
 - a. Continuous recording devices to monitor the injection pressure; the rate, volume or mass, and temperature of the carbon dioxide stream; and the pressure on the annulus between the tubing and the long string casing and annulus fluid volume; and
 - b. Alarms and automatic surface shut-off systems or, at the discretion of the commission, down-hole shut-off systems (e.g., automatic shut-off, check valves) or, other mechanical devices that provide equivalent protection that are designed to alert the operator and shut-in the well when operating parameters diverge beyond permitted ranges or gradients specified in the permit.

6. If a shutdown (down-hole or at the surface) is triggered or a loss of mechanical integrity is discovered, the storage operator shall immediately investigate and identify the cause as expeditiously as possible. If, upon such investigation, the well appears to be lacking mechanical integrity, or if monitoring required under subsection 5 indicates that the well may lack mechanical integrity, the storage operator shall:
 - a. Immediately cease injection;
 - b. Take all steps reasonably necessary to determine whether there may have been a release of the injected carbon dioxide stream or formation fluids into any unauthorized zone;
 - c. Notify the commission within 24 hours;
 - d. Restore and demonstrate mechanical integrity to the satisfaction of the commission prior to resuming injection; and
 - e. Notify the commission when injection can be expected to resume.
7. If any monitoring indicates the movement of injection or formation fluids into underground sources of drinking water, the commission shall prescribe such additional requirements for construction, corrective action, operation, monitoring, or reporting as are necessary to prevent such movement.

History:

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

Section 43-05-01-11.4 is created as follows:

43-05-01-11.4 TESTING AND MONITORING REQUIREMENTS. The storage operator shall prepare, maintain, and comply with a testing and monitoring plan to verify that the geologic sequestration project is operating as permitted and is not endangering underground sources of drinking water. The requirement to maintain and implement a commission approved plan is directly enforceable regardless of whether the requirement is a condition of the permit. The plan must be submitted with the storage facility permit application, for commission approval, and must include a description of how the storage operator will meet the requirements of this section, including accessing sites for all necessary monitoring and testing during the life of the project. The plan must, at a minimum, include:

1. Analysis of the carbon dioxide stream with sufficient frequency to yield data representative of its chemical and physical characteristics;

2. Installation and use, except during well workovers, of continuous recording devices to monitor injection pressure, rate, and volume; the pressure on the annulus between the tubing and the long string casing; and the annulus fluid volume added;
3. Corrosion monitoring of the well materials for loss of mass, thickness, cracking, pitting, and other signs of corrosion, which must be performed on a quarterly basis to ensure that the well components meet the minimum standards for material strength and performance by:
 - a. Analyzing coupons of the well construction materials placed in contact with the carbon dioxide stream; or
 - b. Routing the carbon dioxide stream through a loop constructed with the material used in the well and inspecting the materials in the loop; or
 - c. Using an alternative method approved by the commission;
4. Periodic monitoring of the ground water quality and geochemical changes above the confining zone that may be a result of carbon dioxide movement through the confining zone or additional identified zones including:
 - a. The location and number of monitoring wells based on specific information about the geologic sequestration project, including injection rate and volume, geology, the presence of artificial penetrations, and other factors; and
 - b. The monitoring frequency and spatial distribution of monitoring wells based on baseline geochemical data and on any modeling results in the area of review evaluation.
5. A demonstration of external mechanical integrity at least once per year until the injection well is plugged; and, if required by the commission, a casing inspection log at a frequency established in the testing and monitoring plan;
6. A pressure fall-off test at least once every five years unless more frequent testing is required by the commission based on site-specific information;
7. Testing and monitoring to track the extent of the carbon dioxide plume and the presence or absence of elevated pressure (e.g., the pressure front) by using:
 - a. Direct methods in the injection zone; and,
 - b. Indirect methods (e.g., seismic, electrical, gravity, interferometric synthetic aperture radar or electromagnetic surveys and down-hole carbon dioxide detection tools), unless the commission determines, based on site-specific geology, that such methods are not appropriate;

8. The commission may require surface air monitoring and soil gas monitoring to detect movement of carbon dioxide that could endanger an underground source of drinking water. Regarding these requirements:
 - a. Design of surface air and soil gas monitoring must be based on potential risks to underground sources of drinking water within the area of review;
 - b. The monitoring frequency and spatial distribution of surface air monitoring and soil gas monitoring must be based on using baseline data, and the monitoring plan must describe how the proposed monitoring will yield useful information on the area of review; and
 - c. Surface air monitoring and soil gas monitoring methods are subject to the commission's approval.
9. Any additional monitoring, as required by the commission, necessary to support, upgrade, and improve computational modeling of the area of review evaluation;
10. Periodic reviews of the testing and monitoring plan by the storage operator to incorporate monitoring data collected, operational data collected, and the most recent area of review reevaluation performed. The storage operator shall review the testing and monitoring plan at least once every five years. Based on this review, the storage operator shall submit an amended testing and monitoring plan or demonstrate to the commission that no amendment to the testing and monitoring plan is needed. Any amendments to the testing and monitoring plan are subject to the commission's approval, must be incorporated into the permit, and are subject to the permit modification requirements. Amended plans or demonstrations must be submitted to the commission as follows:
 - a. Within one year of an area of review reevaluation;
 - b. Following any significant changes to the facility, such as addition of monitoring wells or newly permitted injection wells within the area of review, on a schedule determined by the commission; or
 - c. When required by the commission.
11. A quality assurance and surveillance plan for all testing and monitoring requirements.

History:

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

Section 43-05-01-11.5 is created as follows:

43-05-01-11.5. INJECTION WELL PLUGGING.

1. Prior to the well plugging, the storage operator shall flush each injection well with a buffer fluid, determine bottom hole reservoir pressure, and perform a final external mechanical integrity test.
2. The storage operator shall prepare, maintain, and comply with a plugging plan that is acceptable to the commission. The requirement to maintain and implement a commission approved plan is directly enforceable regardless of whether the requirement is a condition of the permit. The plan must be submitted as part of the storage facility permit application and must include the following:
 - a. Appropriate tests or measures for determining bottom hole reservoir pressure;
 - b. Appropriate testing methods to ensure external mechanical integrity;
 - c. The type and number of plugs to be used;
 - d. The placement of each plug, including the elevation of the top and bottom of each plug;
 - e. The type, grade, and quantity of material to be used in plugging. The material must be compatible with the carbon dioxide stream; and
 - f. The method of placement of the plugs.
3. The storage operator shall notify the commission in writing, at least 60 days before plugging a well, although the commission may allow a shorter period. At this time, if any changes have been made to the original well plugging plan, the storage operator shall also provide the revised well plugging plan. Any amendments to the plan are subject to the commission's approval and must be incorporated into the storage facility permit and are subject to the permit modification requirements.
4. Within 60 days after plugging, the storage operator shall submit, a plugging report to the commission. The report must be certified as accurate by the storage operator and by the person who performed the plugging operation (if other than the storage operator). The storage operator shall retain the well plugging report until project completion. Upon project completion the storage operator shall deliver the records to the commission.

History:

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

Section 43-05-01-11.6 is created as follows:

43-05-01-11.6. INJECTION DEPTH WAIVER REQUIREMENTS.

1. In seeking a waiver of the requirement to inject below the lowermost underground sources of drinking water, the storage operator shall submit a supplemental report concurrent with the storage facility permit application. The supplemental report must:
 - a. Demonstrate that the injection zone is laterally continuous, is not an underground source of drinking water, and is not hydraulically connected to underground sources of drinking water; does not outcrop; has adequate injectivity, volume, and sufficient porosity to safely contain the injected carbon dioxide and formation fluids; and has appropriate geochemistry;
 - b. Demonstrate that the injection zone is bounded by laterally continuous, impermeable confining units above and below the injection zone adequate to prevent fluid movement and pressure buildup outside of the injection zone; and that the confining unit is free of transmissive faults and fractures. The report shall further characterize the regional fracture properties and demonstrate that such fractures will not interfere with injection, serve as conduits, or endanger underground sources of drinking water;
 - c. Demonstrate, using computational modeling, that underground sources of drinking water above and below the injection zone will not be endangered as a result of fluid movement. This modeling must be conducted in conjunction with the area of review determination, and is subject to requirements and periodic reevaluation.
 - d. Demonstrate that well design and construction, in conjunction with the waiver, will ensure isolation of the injectate in lieu of requirements and will meet well construction requirements;
 - e. Describe how the monitoring and testing and any additional plans will be tailored to the geologic sequestration project to ensure protection of underground sources of drinking water above and below the injection zone, if a waiver is granted;
 - f. Provide information on the location of all the public water supplies affected, reasonably likely to be affected, or served by underground sources of drinking water in the area of review; and
 - g. Provide any other information requested by the commission that the United States Environmental Protection Agency Regional Administrator might find useful in making the decision whether or not to issue a waiver.
2. To assist the United States Environmental Protection Agency Regional Administrator in making the decision whether to grant a waiver of the injection depth requirements,

the commission shall submit, to the Regional Administrator, documentation of the following:

a. An evaluation of the following information as it relates to siting, construction, and operation of a geologic sequestration project with a waiver:

- (1) The integrity of the upper and lower confining units;
- (2) The suitability of the injection zone (e.g., lateral continuity; lack of transmissive faults and fractures; knowledge of current or planned artificial penetrations into the injection zone or formations below the injection zone);
- (3) The potential capacity of the geologic formation to sequester carbon dioxide, accounting for the availability of alternative injection sites;
- (4) All other site characterization data, the proposed emergency and remedial response plan, and a demonstration of financial responsibility;
- (5) Community needs, demands, and supply from drinking water resources;
- (6) Planned needs, potential and future use of underground sources of drinking water and non- underground sources of drinking water in the area;
- (7) Planned or permitted water, hydrocarbon, or mineral resource exploitation potential of the proposed injection formation and other formations both above and below the injection zone to determine if there are any plans to drill through the formation to access resources in or beneath the proposed injection zone;
- (8) The proposed plan for securing alternative resources or treating underground sources of drinking water in the event of contamination related to the carbon dioxide injection well activity; and,
- (9) Any other applicable considerations or information requested by the commission.

b. A review of the commission's consultation with the state department of health and federally recognized Indian tribes having jurisdiction over lands within the area of review for the injection well for which a waiver is sought.

c. Any written waiver-related information submitted by the state department of health to the commission.

3. The commission shall give public notice that a waiver application has been submitted. The notice must include a map of the area of review and state:

a. The depth of the proposed injection zone;

- b. The location of the injection well;
 - c. The name and depth of all underground sources of drinking water within the area of review;
 - d. The names of any public water supplies affected, reasonably likely to be affected, or served by underground sources of drinking water in the area of review; and
 - e. The results of the consultation with the department of health.
4. Following public notice, the commission shall provide all information received through the waiver application process to the United States Environmental Protection Agency Regional Administrator.
- a. If the Regional Administrator determines that additional information is required to support a decision, the commission shall request that the applicant for the waiver provide the information.
 - b. The commission may not issue a waiver without written concurrence from the Regional Administrator.
5. Upon receipt of a waiver, the storage operator shall comply with:
- a. All requirements in sections 43-05-01-9.1, 43-05-01-9.2, 43-05-01-11.1, 43-05-01-11.2, 43-05-01-11.3, 43-05-01-11.5, 43-05-01-13, and 43-05-01-18
 - b. All requirements in section 43-05-01-11 with the following modifications:
 - (1) Injection wells must be constructed and completed to prevent movement of fluids into any unauthorized zones including underground sources of drinking water.
 - (2) The casing and cementing program must be designed to prevent the movement of fluids into any unauthorized zones including underground sources of drinking water in lieu of requirements in section 43-05-01-11.
 - (3) The surface casing must extend through the base of the nearest underground source of drinking water directly above the injection zone and be cemented to the surface; or, at the commission's discretion, another formation above the injection zone and below the nearest underground source of drinking water above the injection zone.
 - c. All requirements in section 43-05-01-11.4 with the following modifications:

(1) Groundwater quality, geochemical changes, and pressure in the first underground source of drinking water immediately above and below the injection zone, and in any other formations at the discretion of the commission, must be monitored.

(2) Test and monitor to track the extent of the carbon dioxide plume and the presence or absence of elevated pressure (e.g., the pressure front) by using direct methods to monitor for pressure changes in the injection zone, and indirect methods (e.g., seismic, electrical, gravity, or electromagnetic surveys or down-hole carbon dioxide detection tools), unless the commission determines based on site-specific geology that such methods are not appropriate.

d. All requirements in section 43-05-01-19 with the following modifications for post-injection site care monitoring requirements:

(1) Groundwater quality, geochemical changes and pressure in the first underground source of drinking water immediately above and below the injection zone, and in any other formations at the discretion of the commission, must be monitored.

(2) Test and monitor to track the extent of the carbon dioxide plume and the presence or absence of elevated pressure (e.g., the pressure front) by using direct methods in the injection zone, and indirect methods (e.g., seismic, electrical, gravity, or electromagnetic surveys or down-hole carbon dioxide detection tools), unless the commission determines based on site-specific geology that such methods are not appropriate;

e. Any additional requirements requested by the commission to ensure protection of underground sources of drinking water above and below the injection zone.

History:

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

~~**43-05-01-12. AMENDMENT TO CARBON DIOXIDE STORAGE FACILITY WELL PERMITS.**~~

~~1. An amendment to a well permit for a change in injection formation, or modifying the maximum allowable injection rate and pressure, must comply with the provisions of section 43-05-01-05.~~

~~2. Modifying well construction must comply with section 43-05-01-09.~~

43-05-01-12 MODIFICATION OR REVOCATION OF PERMITS. Permits are subject to review by the commission. After review, the commission may modify or revoke a permit. Permits are also subject to review when the following events occur:

1. Changes to the facility area;
2. Injecting into a reservoir not specified in the permit;
3. Any increase greater than the permitted carbon dioxide storage volume;
4. Changes in the chemical composition of the carbon dioxide stream;
5. Area of review reevaluations under subdivision a of subsection 4 of section 43-05-01-05.1;
6. Amendment to the testing and monitoring plan under subsection 10 of section 43-05-01-11.4;
7. Amendment to the injection well plugging plan under subsection 3 of section 43-05-01-11.5;
8. Amendment to the post-injection site care and facility closure plan under subsection 3 of section 43-05-01-19;
9. Amendment to the emergency and remedial response plan under subsection 4 of section 43-05-01-13; or
10. Review of monitoring and testing results conducted in accordance with injection well permit requirements.

History: Effective April 1, 2010.

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

Section 43-05-01-12.1 is created as follows:

43-05-02-12.1. MINOR MODIFICATIONS OF PERMITS. Upon agreement between the storage operator and the commission, the commission may modify a permit to make the corrections or allowances without the storage operator filing an application to amend a permit. Any permit modification not processed as a minor modification under this section must be filed as an application to amend an existing permit under section 43-05-01-12. Minor modifications may include: changes to the testing and monitoring plan, plugging plan, post-injection site care and facility closure plan, or emergency and remedial response plan where the modifications merely clarify or correct the plan, as determined by the commission.

History:

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

43-05-01-13. STORAGE FACILITY OPERATIONAL SAFETY EMERGENCY AND REMEDIAL RESPONSE PLANS. EachThe storage operator shall implement the commission-approved ~~storage facility public safety and emergency and remedial~~ response plan and the worker safety plan proposed in section 43-05-01-05. This plan must include emergency response and security procedures. The plan, including revision of the list of contractors and equipment vendors, must be updated as necessary or as the commission requires. Copies of the plans must be available at the storage facility and at the storage operator's nearest operational office.

1. The emergency and remedial response plan requires a description of the actions the storage operator shall take to address movement of the injection or formation fluids that may endanger an underground source of drinking water during construction, operation, and post-injection site care periods. The requirement to maintain and implement a commission approved plan is directly enforceable regardless of whether the requirement is a condition of the permit. The plan must also detail:
 - a. The safety procedures concerning the facility and residential, commercial, and public land use within one mile [1.61 kilometers], or any other distance set by the commission, of the outside boundary of the facility area; and
 - b. Contingency plans for addressing carbon dioxide leaks from any well, flow lines, or other facility, and loss of containment from the storage reservoir, and identify specific contractors and equipment vendors capable of providing necessary services and equipment to respond to such leaks or loss of containment.
2. If the storage operator obtains evidence that the injected carbon dioxide stream and associated pressure front may endanger an underground source of drinking water, the storage operator shall:
 - a. Immediately cease injection;
 - b. Take all steps reasonably necessary to identify and characterize any release;
 - c. Notify the commission within 24 hours; and
 - d. Implement the emergency and remedial response plan approved by the commission.

3. The commission may allow the operator to resume injection prior to remediation if the storage operator demonstrates that the injection operation will not endanger underground sources of drinking water.
4. The storage operator shall review annually the emergency and remedial response plan developed under subsection 1. Based on this review, the storage operator shall submit to the commission an amended plan or demonstrate to the commission that no amendment to the plan is needed. Any amendments to the plan are subject to the commission's approval, must be incorporated into the storage facility permit, and are subject to the permit modification requirements. Amended plans or demonstrations that amendments are not needed shall be submitted to the commission as follows:
 - a. Within one year of an area of review reevaluation;
 - b. Following any significant changes to the facility, such as addition of injection or monitoring wells, on a schedule determined by the commission; or
 - c. When required by the commission.

History: Effective April 1, 2010.

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

43-05-01-14. LEAK DETECTION AND REPORTING.

1. Leak detectors or other approved leak detection methodologies must be placed at the wellhead of all injection and subsurface observation wells. Leak detectors must be integrated, where applicable, with automated warning systems and must be inspected and tested on a semiannual basis and, if defective, shall be repaired or replaced within ten days. Each repaired or replaced detector must be retested if required by the commission. An extension of time for repair or replacement of a leak detector may be granted upon a showing of good cause by the storage operator. A record of each inspection must include the inspection results, must be maintained by the operator for at least ~~six~~ ten years, and must be made available to the commission upon request.
2. The storage operator ~~must~~ shall immediately report to the commission any leak detected at any well or surface facility.
3. The storage operator ~~must~~ shall immediately report to the commission any pressure changes or other monitoring data from subsurface observation wells that indicate the presence of leaks in the storage reservoir.
4. The storage operator ~~must~~ shall immediately report to the commission any other indication that the storage facility is not containing carbon dioxide, whether the lack

of containment concerns the storage reservoir, surface equipment, or any other aspect of the storage facility.

History: Effective April 1, 2010.

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

43-05-01-15. STORAGE FACILITY CORROSION MONITORING AND PREVENTION REQUIREMENTS. ~~Each~~The storage operator must shall conduct a corrosion monitoring and prevention program approved by the commission.

History: Effective April 1, 2010.

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

43-05-01-17. STORAGE FACILITY FEES.

1. ~~Each~~The storage operator shall pay the commission a fee of one cent on each ton of carbon dioxide injected for storage. The fee must be deposited in the carbon dioxide storage facility administrative fund.
2. ~~Each~~The storage operator shall pay the commission a fee of seven cents on each ton of carbon dioxide injected for storage. The fee must be deposited in the carbon dioxide storage facility trust fund.
3. Monies from the carbon dioxide storage facility trust fund, including accumulated interest, may be relied upon to satisfy the financial assurance requirements pursuant to 43-05-01-09.1 for the postclosure period. If sufficient monies are not available in the carbon dioxide storage facility trust fund at the end of the closure period, the storage operator shall make additional payments into the trust fund to ensure that sufficient funds are available to carry out the required activities on the date at which they may occur. The commission shall take into account project-specific risk assessments, projected timing of activities (e.g., post-injection site care), and interest accumulation in determining whether sufficient funds are available to carry out the required activities.

History: Effective April 1, 2010.

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

43-05-01-18. ~~QUARTERLY AND ANNUAL REPORTING REQUIREMENTS.~~

1. The storage operator shall file with the commission all reports, submittals, notifications, and any other information that the commission requires.
- ~~1-2.~~ 2. The storage operator shall file with the commission quarterly, or more frequently if the commission requires, a report on the volume of carbon dioxide injected into or withdrawn since the last report, the average injection rate, average composition of the carbon dioxide stream, wellhead and down-hole temperature and pressure data or calculations, or other pertinent operational parameters as required by the commission.
3. The storage operator shall submit all required reports, submittals, and notifications under chapter 43-05-01 to the United States Environmental Protection Agency in an electronic format approved by that agency.
- ~~2-4.~~ 4. The quarterly report is due thirty days after the end of the quarter. The report must:
 - a. Describe any changes to the physical, chemical, and other relevant characteristics of the carbon dioxide stream from the proposed operating data;
 - b. State the monthly average, maximum, and minimum values for injection pressure, flow rate and volume, and annular pressure;
 - c. Describe any event that exceeds operating parameters for annulus pressure or injection pressure specified in the permit;
 - d. Describe any event which triggers a shut-off device required pursuant to subsection 5 of section 43-05-01-11.3 and the response taken;
 - e. State the monthly volume and mass of the carbon dioxide stream injected over the reporting period and the volume injected cumulatively over the life of the project to date;
 - f. State the monthly annulus fluid volume added; and
 - g. State the results of monitoring prescribed under section 43-05-01-11.4.
- ~~3-5.~~ 5. The storage operator shall file with the commission an annual report that summarizes the quarterly reports and that provides updated projections of the response and storage capacity of the storage reservoir. The projections must be based on actual reservoir operational experience, including all new geologic data and information. All anomalies in predicted behavior as indicated in permit conditions or in the

assumptions upon which the permit was issued must be explained and, if necessary, the permit conditions amended in accordance with section 43-05-01-07. The annual report is due forty-five days after the end of the year.

6. The storage operator shall report, within 30 days, the results of:
 - a. Periodic tests of mechanical integrity;
 - b. Any well workover; and,
 - c. Any other test of the injection well conducted by the storage operator if required by the commission.

7. The storage operator shall report, within 24 hours:
 - a. Any evidence that the injected carbon dioxide stream or associated pressure front may cause an endangerment to an underground source of drinking water;
 - b. Any noncompliance with a permit condition, or malfunction of the injection system, which may cause fluid migration into or between underground sources of drinking water;
 - c. Any triggering of a shut-off system (i.e., down-hole or at the surface);
 - d. Any failure to maintain mechanical integrity; or,
 - e. Any release of carbon dioxide to the atmosphere or biosphere in compliance with the requirement under subsection 8 of section 43-05-01-11.4 for surface air and soil gas monitoring, or other monitoring technologies required by the commission.

8. The storage operator shall notify the commission in writing 30 days in advance of:
 - a. Any planned well workover;
 - b. Any planned stimulation activities, other than stimulation for formation testing conducted; and
 - c. Any other planned test of the injection well conducted by the storage operator.

9. The storage operator shall retain records until project completion. Upon project completion the storage operator shall deliver any records required in this section to the commission. The following records shall be retained:
 - a. All data collected for the applications of the storage facility permit, injection well permit, and operation of injection well permit;

- b. Data on the nature and composition of all injected fluids collected pursuant to subsection 1 of section 43-05-01-11.4;
- c. Monitoring data collected pursuant to subsections 2 through 9 of section 43-05-01-11.4; and
- d. All records from the closure period including well plugging reports, post-injection site care data, and the final assessment;

History: Effective April 1, 2010.

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

43-05-01-19. POST-INJECTION SITE CARE AND FACILITY CLOSURE. The storage operator shall submit and maintain the post-injection site care and facility closure plan as a part of the storage facility permit application to be approved by the commission. The requirement to maintain and implement a commission approved plan is directly enforceable regardless of whether the requirement is a condition of the permit.

- ~~1. Prior to the conclusion of the operational period, and at a time set by the commission, the storage operator must provide an assessment of the operations conducted during the operational period, including the volumes injected, volumes extracted, all chemical analyses conducted, and a summary of all monitoring efforts. The report must also document the stored carbon dioxide's location and characteristics and predict how it might move during the closure period.~~
- 1. The post-injection site care and facility closure plan must include the following information:
 - a. The pressure differential between pre-injection and predicted post-injection pressures in the injection zone;
 - b. The predicted position of the carbon dioxide plume and associated pressure front at cessation of injection as demonstrated in the area of review evaluation;
 - c. A description of post-injection monitoring location, methods, and proposed frequency;
 - d. A schedule for submitting post-injection site care monitoring results to the commission; and,

- e. The duration of the post-injection site care monitoring timeframe that ensures non-endangerment of underground sources of drinking water.
2. The storage operator shall ~~submit a~~ specify in the post-injection site care and facility closure monitoring plan for the closure period for approval by the commission, including a proposal specifying which wells will be plugged and which will remain unplugged to be used as subsurface observation wells. Subsurface observation and ground water monitoring wells as approved in the plan must remain in place for continued monitoring during the closure and postclosure periods.
3. Upon cessation of injection, the storage operator shall either submit an amended post-injection site care and facility closure plan or demonstrate to the commission through monitoring data and modeling results that no amendment to the plan is needed. Any amendments to the post-injection site care and facility closure plan are subject to the commission's approval and must be incorporated into the storage facility permit.
4. At any time during the life of the geologic sequestration project, the storage operator may modify and resubmit the post-injection site care and facility closure plan for the commission's approval within 30 days of such change.
- 3-5. Upon cessation of injection, all wells not associated with monitoring must be properly plugged and abandoned in a manner which will not allow movement of injection or formation fluids that endangers underground sources of drinking water in accordance with section 43-05-01-11.5; all storage facility equipment, appurtenances, and structures not associated with monitoring must be removed. Following well plugging and removal of all surface equipment, the surface must be reclaimed to the commission's specifications that will, in general, return the land as closely as practicable to original condition.
- 4-6. The well casing must be cut off at a depth of five feet [1.52 meters] below the surface and a steel plate welded on top identifying the well name and that it was used for carbon dioxide ~~injection~~ storage.
- 5-7. The commission shall develop in conjunction with the storage operator a continuing monitoring plan for the postclosure period, including a review and final approval of wells to be plugged.
6. Upon project closure, all wells designated by the commission must be properly plugged and abandoned; all storage facility equipment, appurtenances, and structures removed; and the project area reclaimed to the commission's specifications that will, in general, return the land as closely as practicable to original condition.
7. All subsurface observation and ground water monitoring wells as approved in the closure plan must remain in place for continued monitoring during the closure period.

8. The storage operator shall continue to conduct monitoring during the closure period as specified in the commission approved post-injection site care and facility closure plan. The storage operator may apply for project completion with an alternative post-injection site care monitoring timeframe pursuant to North Dakota Century Code section 38-22-17. Once it is demonstrated that underground sources of drinking water are no longer endangered, the final assessment under subsection 9 is complete, and upon full compliance with North Dakota Century Code 38-22-17 the storage operator may apply to the commission for a certificate of project completion. If the storage operator is unable meet the requirements of North Dakota Century Code section 38-22-17 and is unable to demonstrate that underground sources of drinking water are no longer being endangered the storage operator shall continue monitoring the storage facility for fifty years or until full compliance is met and such demonstration can be made.

8.9. Before the closure period ends and at a time set by the commission, project completion, the storage operator shall provide a final assessment of the stored carbon dioxide's location, characteristics, and its future movement and location within the storage reservoir. The storage operator shall submit the final assessment to the commission within ninety days of completing all post-injection site care and facility closure requirements.

a. The final assessment must include:

- (1) The results of computational modeling performed pursuant to delineation of the area of review under section 43-05-01-05.1;
- (2) The predicted timeframe for pressure decline within the injection zone, and any other zones, such that formation fluids may not be forced into any underground sources of drinking water; or the timeframe for pressure decline to pre-injection pressures;
- (3) The predicted rate of carbon dioxide plume migration within the injection zone, and the predicted timeframe for the cessation of migration;
- (4) A description of the site-specific processes that will result in carbon dioxide trapping, including immobilization by capillary trapping, dissolution, and mineralization at the site;
- (5) The predicted rate of carbon dioxide trapping in the immobile capillary phase, dissolved phase, or mineral phase;
- (6) The results of laboratory analyses, research studies, or field or site-specific studies to verify the information required in paragraphs (4) and (5);

- (7) A characterization of the confining zone including a demonstration that it is free of transmissive faults, fractures, and micro-fractures, and an evaluation of thickness, permeability, and integrity to impede fluid (e.g., carbon dioxide, formation fluids) movement;
 - (8) Any other projects in proximity to the predictive modeling of the final extent of the carbon dioxide plume and area of elevated pressures. The presence of potential conduits for fluid movement including planned injection wells and project monitoring wells associated with the proposed geologic sequestration project.
 - (9) A description of the well construction and an assessment of the quality of plugs of all abandoned wells within the area of review;
 - (10) The distance between the injection zone and the nearest underground source of drinking water above and below the injection zone;
 - (11) An assessment of the operations conducted during the operational period, including the volumes injected, volumes extracted, all chemical analyses conducted, and a summary of all monitoring efforts. The report must also document the stored carbon dioxide's location and characteristics and predict how it might move during the postclosure period;
 - (12) An assessment of the funds in the carbon dioxide storage facility trust fund to ensure that sufficient funds are available to carry out the required activities on the date on which they may occur, taking into account project-specific risk assessments, projected timing of activities (e.g., post-injection site care), and interest accumulation in the trust fund; and
 - (13) Any additional site-specific factors required by the commission.
- b. Information submitted to support the demonstration in subdivision a of subsection 9 must meet the following criteria:
- (1) All analyses and tests for the final assessment must be accurate, reproducible, and performed in accordance with the established quality assurance standards. An approved quality assurance and quality control plan must address all aspects of the final assessment;
 - (2) Estimation techniques must be appropriate and test protocols certified by the Environmental Protection Agency must be used where available;
 - (3) Predictive models must be appropriate and tailored to the site conditions, composition of the carbon dioxide stream and injection and site conditions over the life of the geologic sequestration project;

- (4) Predictive models must be calibrated using existing information where sufficient data are available;
 - (5) Reasonably conservative values and modeling assumptions must be used and disclosed to the commission whenever values are estimated on the basis of known, historical information instead of site-specific measurements;
 - (6) An analysis must be performed to identify and assess aspects of the post-injection monitoring timeframe demonstration that contribute significantly to uncertainty. The storage operator shall conduct sensitivity analyses to determine the effect that significant uncertainty may contribute to the modeling demonstration; and
 - (7) Any additional criteria required by the commission.
9. ~~Wells other than those deemed as subsurface observation wells per subsection 2 shall be plugged by the storage operator in accordance with section 43-02-03-34.~~
10. The storage operator shall provide a copy of an accurate plat certified by a registered surveyor which has been submitted to the county recorder's office designated by the commission. The plat must indicate the location of the injection well relative to permanently surveyed benchmarks. The storage operator must also submit a copy of the plat to the United States Environmental Protection Agency Regional Administrator Office;
11. The storage operator shall record a notation on the deed to the property on which the injection well was located, or any other document that is normally examined during title search, that will in perpetuity provide any potential purchaser of the property the following information:
- a. The fact that land has been used to sequester carbon dioxide;
 - b. The name of the State agency, local authority, or Tribe with which the survey plat was filed, as well as the address of the Environmental Protection Agency Regional Office to which it was submitted; and
 - c. The volume of fluid injected, the injection zone or zones into which it was injected, and the period over which injection occurred.

History: Effective April 1, 2010.

General Authority
NDCC 28-32-02

Law Implemented
NDCC 38-22

43-05-01-20. DETERMINING STORAGE AMOUNTS.

1. Upon application by an enhanced oil or gas recovery unit operator or a storage operator ~~the~~ the commission, after notice and hearing, shall issue an order determining the amount of injected carbon dioxide stored in a reservoir that has been or is being used for an enhanced oil or gas recovery project or in a storage reservoir that has been or is being used for storage under a permit issued pursuant to North Dakota Century Code chapter 38-22.
2. ~~Any person applying for a storage amount determination~~ The applicant shall pay a processing fee for a storage amount determination.

~~Processing fee.~~ The applicant shall pay a processing fee based on the commission's actual processing costs, including computer data processing costs, as determined by the commission. The following procedures and criteria will be utilized in establishing the fee:

- a. A record of all application processing costs incurred must be maintained by the commission.
- b. Promptly after receiving an application, the commission shall prepare and submit to the applicant an estimate of the processing fee ~~and a payment billing schedule~~.
- c. After the commission's work on the application has concluded, a final statement will be sent to the applicant. The full processing fee must be paid before the commission issues its decision on the application.
- d. The applicant must pay the processing fee even if the application is denied or withdrawn.

History: Effective April 1, 2010.

General Authority
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