CHAPTER 24

Class VI Injection Wells and Facilities
Underground Injection Control Program

Section 1. Authority .

These regulations are promulgated pursuant to Wyoming Statutes (W.S.) §§ 35-11-101 through 2005, specifically § 313.

Section 2. Definitions. The following definitions supplement the definitions contained in Section § 35-11-103 of the Wyoming Environmental Quality Act.

(a) “Abandoned well” means a well whose use has been permanently discontinued or that is in a state of disrepair such that it cannot be used for its intended purpose or for observation purposes. Temporary or intermittent cessation of injection operations is not abandonment.

(b) "Aquifer" means a zone, stratum, or group of strata that can store and transmit water in sufficient quantities for a specific use.

(c) “Area of review” means the subsurface three-dimensional extent of the carbon dioxide plume, associated pressure front, and displaced fluids, as well as the overlying formations, and surface area above that delineated region.

(d) "Background" means the constituents or parameters and the concentrations or measurements that describe water quality and water quality variability prior to the underground injection.

(e) “Bore/casing annulus” means the space between the wellbore and the well casing.

(f) “Carbon dioxide plume” means the underground extent, in three dimensions, of an injected carbon dioxide stream.

(g) “Carbon dioxide stream” means carbon dioxide, plus associated substances derived from the source materials and any processing, and any substances added to the stream to enable or improve the injection process. Within this Chapter, the term “carbon dioxide stream” does not include any carbon dioxide stream that meets the definition of a hazardous waste under 40 C.F.R. § 261.3.

(h) “Casing” means a pipe or tubing of appropriate material, of varying diameter and weight, lowered into a borehole during or after drilling to support the sides of the hole to prevent the walls from caving, to prevent loss of drilling mud into porous ground, or to prevent water, gas, or other fluid from entering or leaving the hole.

(i) “Casing/tubing annulus” means the space between the well casing and the tubing.

(j) "Cementing" means sealing the annular space around the outside of a casing string using a specially formulated mixture to hold the casing in place and prevent any movement of fluid in this annular space. Cementing also includes operations to seal the well at the time of abandonment.

(k) "Class I well" means a well used to inject hazardous or non-hazardous industrial, commercial, or municipal waste beneath the lowermost formation containing, within one-quarter (1/4) mile of the well bore, an underground source of drinking water.

(l) "Class II well" means any commercial or non-commercial well used to dispose of water or fluids directly associated with the production of oil or gas, any well used to inject fluids or gas for enhanced oil recovery, or any well used for the storage of liquid hydrocarbons.

(m) "Class V facility" means any property that contains an injection well, drywell, or subsurface fluid distribution system that is not defined as a Class I, II, III, IV, or VI well in these Regulations. A Class V facility includes all systems of collection, treatment, and control that are associated with the underground injection.

(n) "Class VI well" means a well that is used for injecting a carbon dioxide stream for geologic sequestration that:

(i) Is not experimental in nature and injects a carbon dioxide stream for geologic sequestration, beneath the lowermost formation containing an underground source of drinking water;

(ii) Has been granted a waiver of the injection depth requirements pursuant to requirements of Section 15 of this Chapter; or

(iii) Has received an expansion to the areal extent of an existing Class II enhanced oil recovery or enhanced gas recovery aquifer exemption pursuant to Section 16 of this Chapter.

(o) "Confining zone" means a geological formation, group of formations, or part of a formation stratigraphically overlying the injection zone(s) that act(s) as a barrier to fluid movement. For Class VI 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(s) that acts as a barrier to fluid movement.

(p) "Contaminant" means any pollution; wastes; or physical, chemical, biological, or radiological substance or matter in water.

(q) "Corrective action" means the use of Administrator-approved methods to ensure that wells within the area of review do not serve as conduits for the movement of fluids into geologic formations other than those authorized under the permit.

(r) "Duly authorized representative" means a specific individual or a position having responsibility for the overall operation of the regulated facility or activity. The authorization shall be made in writing by a responsible corporate officer and shall be submitted to the Administrator.

(s) "Endanger" means to expose to actions or activities that could pollute an underground source of drinking water.

(t) "Exempted aquifer" means an aquifer or a portion thereof that meets the criteria in the definition of underground source of drinking water but that has been exempted according to the procedures in Section 16 of this Chapter.

(u) "Fact sheet" means a document briefly setting forth the principal facts and the significant factual, legal, methodological, and policy questions considered in preparing the draft permit.

(v) "Geologic sequestration project" means an injection well or wells used to emplace a carbon dioxide stream into an injection zone for geologic sequestration. It includes the subsurface three-dimensional extent of the carbon dioxide plume, associated pressure front, and displaced fluid, as well as the surface area above that delineated region.

(w) "Groundwater" means subsurface water that fills available openings in rock or soil materials such that they may be considered water saturated under hydrostatic pressure.

(x) "Groundwaters of the State" are all bodies of underground water that are wholly or partially within the boundaries of the State.

(y) "Hazardous waste" means a hazardous waste as defined in 40 C.F.R. § 261.3.

(z) "Indian lands" and "Indian country" means:

(i) All land within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent, and, including rights-of-way running through the reservation;

(ii) All dependent Indian communities within the borders of the United States whether within the original or subsequently acquired territory thereof, and whether within or without the limits of a state; and

(iii) All Indian allotments, the Indian titles to which have not been extinguished, including rights-of-way running through the same.

(aa) "Injectate" means the material injected through any underground injection facility.

(bb) "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.

(cc) "Log" means a written record progressively describing the strata and geologic and hydrologic character thereof to include electrical, radioactivity, radioactive tracer, temperature, cement bond and similar surveys, a lithologic description of all cores, and test data.

(dd) "Long string casing" means a casing that is continuous from at least the top of the injection interval to the surface and that is cemented in place.

(ee) "Packer" means a device lowered into a well to produce a fluid-tight seal.

(ff) "Plugging" means the act or process of stopping the flow of water, oil, or gas into or out of a formation through a borehole or well penetrating that formation.

(gg) "Plugging record" means a systematic listing of permanent or temporary abandonment of water, oil, gas, test, exploration, and waste injection wells. A plugging record may contain a well log, description of amounts and types of plugging material used, the method employed for plugging, a description of formations that are sealed, and a graphic log of the well showing formation location, formation thickness, and location of plugging structures.

(hh) "Plume stabilization" has been achieved when the carbon dioxide stream that has been injected subsurface essentially no longer expands vertically or horizontally and poses no threat to underground sources of drinking water, human health, safety, or the environment, as demonstrated by a minimum of three (3) consecutive years of monitoring data.

(ii) "Post-injection site care" means the monitoring, measurement, verification, and other actions (including corrective action) needed to ensure that underground sources of drinking water are not endangered following the cessation of injection, and plugging and abandonment of injection wells until plume stabilization has been achieved and certified by the Administrator, as required under Section 24 of this Chapter.

(jj) "Pressure front" means the zone of elevated pressure that is created by the injection of the carbon dioxide stream into the subsurface. The pressure front of a carbon dioxide plume refers to a zone where there is a pressure differential sufficient to cause movement of injected fluids or formation fluid if a migration pathway or conduit existed.

(kk) "Radioactive waste" means any waste that contains radioactive material in concentrations that exceed those listed in 10 C.F.R. Part 20, Appendix B, Table II, Column 2.

(ll) "Receiver" means any zone, interval, formation, or unit in the subsurface into which a carbon dioxide stream is injected.

(mm) "Responsible corporate officer" means a president, secretary, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation.

(i) For a corporation, "responsible corporate officer" means:

(A) A president, secretary, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation; or

(B) The manager of one (1) or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(ii) For a partnership, "responsible corporate officer" means a general partner.

(iii) For a sole proprietorship, "responsible corporate officer" means the proprietor.

(iv) For a municipality, state, federal or other public agency, "responsible corporate officer" means the principal executive officer or ranking elected official. For the purposes of this definition, a principal executive officer of a federal agency includes:

(A) The chief executive officer of the agency; or

(B) A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency, such as a Regional Administrator.

(nn) "Secondarily affected aquifer" means an aquifer affected by migration of fluids from an injection facility that does not directly discharge into the secondarily affected aquifer.

(oo) "Site closure" occurs when a geologic sequestration project is released from post-injection site care responsibilities and the Administrator certifies site closure pursuant to Section 24(b)(iii) of this Chapter.

(pp) "Surface casing" means the first string of well casing to be installed in the well.

(qq) "Underground injection" means a well injection, a subsurface discharge, a discharge into a receiver, or the subsurface emplacement of fluids through a well.

(rr) "Underground source of drinking water" or "USDW" means an aquifer or portions thereof that is not an exempted aquifer and:

(i) Supplies any public water system; or

(ii) Contains a sufficient quantity of groundwater to supply a public water system, and

(A) Currently supplies drinking water for human consumption; or

(B) Contains fewer than 10,000 mg/L total dissolved solids.

(ss) "Water quality management area" means the area delineated for the protection of water quality under a Department-approved plan developed under Sections 303, 208, or 201 of the Clean Water Act, 33 U.S.C. § 1251 *et seq.* as amended.

(tt) "Well" means :

(i) An opening, excavation, shaft, or hole in the ground allowing or used for underground injection or monitoring;

(ii) An improved sinkhole; or

(iii) A subsurface fluid distribution system.

(uu) "Well plug" means a watertight and gastight seal installed in a borehole or well to prevent movement of fluids.

(vv) "Well stimulation" means any process used to clean the wellbore, enlarge channels, or increase pore space in the interval to be injected and includes surging, jetting, blasting, acidizing, and hydraulic fracturing.

(ww) "Workover" means to pull the tubing, packer, or any downhole hardware from the well and inspect, replace, or refurbish it prior to placing that hardware back in service, or to enter the hole with any drilling tool.

(xx) "Wellhead protection area" means the area delineated for the protection of a public water supply utilizing a groundwater source under a Department-approved plan developed pursuant to Section 1428 of the Safe Drinking Water Act, 42 U.S.C. § 300h-7, or Section 1453 of the Safe Drinking Water Act, 42 U.S.C. § 300j-13.

Section 3. Applicability.

(a) Construction, installation, operation, monitoring, testing, plugging, post-injection site care, and modification of any Class VI well shall be allowed only in accordance with this Chapter.

(b) This chapter applies to all Class VI wells.

(i) This Chapter applies to owners, operators, and permittees of Class VI wells.

(ii) This Chapter applies to any Class I industrial, Class II, or Class V experimental or demonstration carbon dioxide injection project that is converted to a Class VI well. A permitted Class I, Class II, or Class V injection well may be converted to a Class VI well by obtaining a Class VI permit pursuant to this Chapter.

(A) To convert a permitted Class I, Class II, or Class V injection well to a Class VI well, the applicant shall:

(I) Apply for a Class VI permit;

(II) Demonstrate to the Administrator that the well was engineered and constructed to meet the requirements of Section 14(a) of this Chapter; and

(III) In lieu of meeting the requirements of Section 14(b) and Section 17(a) of this Chapter, demonstrate to the Administrator that the well will ensure protection of USDWs and will not endanger any USDW.

(B) After December 10, 2011, owners or operators of Class I wells previously permitted for the purpose of geologic sequestration and Class V experimental technology wells no longer being used for experimental purposes that will continue injection of carbon dioxide for the purpose of geologic sequestration shall obtain a Class VI permit.

(C) If the Administrator determines that a converted Class I, Class II, or Class V injection well will not endanger any USDWs, the Administrator may exempt the well from the requirements of Section 14(b)(i) - (vii) and Section 17(a)(i)-(v) of this Chapter.

(c) The injection of carbon dioxide for purposes of a project for enhanced recovery of oil or other minerals approved by the Wyoming Oil and Gas Conservation Commission is not subject to the provisions of this Chapter unless the operator converts to geologic sequestration upon the cessation of oil and gas recovery operations or as otherwise required by the Commission or Director.

(d) For owners or operators of Class II wells described in W.S. § 35-11-313(c):

(i) The Director's determination of primary purpose and increased risk to a USDW shall include, at a minimum, an evaluation of the following criteria:

(A) Increase in reservoir pressure within the injection zone(s).

(B) Increase in carbon dioxide injection rates.

(C) Decrease in reservoir production rates.

(D) Distance between the injection zone(s) and USDWs.

(E) Suitability of the Class II area of review delineation.

(F) Quality of abandoned well plugs within the area of review.

(G) The owner's and/or operator's plan for recovery of carbon dioxide at the cessation of injection.

(H) The source and properties of the injected carbon dioxide.

(I) Any additional site-specific factors as determined by the Administrator.

(ii) An owner or operator may apply for a Class VI permit upon recommendation by the Oil and Gas Conservation Commission supervisor, or by the Commission, that regulation of a Class II enhanced recovery operation be transferred to the Department.

(iii) An owner or operator of a Class II enhanced recovery operation shall apply for a Class VI permit within thirty (30) days of receipt of written notice from the Director that a Class VI permit is required.

(e) The requirements to maintain and implement approved plans, and maintain adequate financial responsibility, are directly enforceable regardless of whether the requirements are conditions of the permit.

Section 4. Processing Permits.

(a) The following permit processing procedures are applicable to all Class VI permits:

(i) The applicant shall submit the permit application to the Division in a format required by the Administrator.

(ii) Within sixty (60) days of submission of an application, the Administrator shall make an initial determination of completeness. An application shall be determined complete when the Administrator receives an application and any supplemental information necessary to determine compliance with this Chapter. The completeness of any application for a permit shall be judged independently of the status of any other permit application or permit for the same facility or activity.

(iii) Re-submittal of information by an applicant for an incomplete application will restart the process described in this Section.

(iv) At the end of any 60-day review period where an application is determined complete, the Administrator shall :

(A) Prepare a draft permit for issuance or denial;

(B) Prepare a fact sheet on the proposed operation;

(C) Provide public notice pursuant to Section 27 of this Chapter; and

(D) Notify in writing, the contacts, for any states or Tribes provided pursuant to Section 10(b)(xxxvi) of this Chapter.

(b) If the Director intends to modify, terminate, revoke, or reissue a permit, the Administrator shall prepare a draft permit incorporating the proposed changes and provide public notice pursuant to Section 27 of this Chapter.

(c) Prior to issuing a permit for a Class VI well, the Director shall consider :

(i) The final area of review based on modeling, using data obtained during logging and testing of the well and the formation as required by subparagraphs (b)(xviii), (b)(xix), (b)(xxvii), and (b)(xxviii) of Section 10 of this Chapter;

(ii) Any relevant updates, based on data obtained during logging and testing of the well and the formation as required by subparagraphs (b)(xviii), (b)(xix), (b)(xxvii), and (b)(xxviii) of Section 10 of this Chapter, to the information on the geologic structure and hydrogeologic properties of the proposed storage site and overlying formations, submitted to satisfy the requirements of subparagraph (b)(xi) of Section 10 of this Chapter;

(iii) The results of the formation testing program required by subparagraph (b)(xix) of Section 10 of this Chapter;

(iv) Final injection well construction procedures that meet the requirements of Section 14 of this Chapter;

(v) 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 site closure plan, or the emergency and remedial response plan submitted under Section 10(b) of this chapter that are necessary to address new information collected during logging and testing of the well and the formation as required by Section 10 of this Chapter.

(d) Permits may be modified, revoked and reissued, or terminated either in response to a petition from any interested person (including the permittee) or upon the Administrator's initiative.

(i) All petitions to modify, revoke and reissue, or terminate a permit shall be

in writing and shall contain facts or reasons supporting the request.

(ii) If the Administrator decides a petition to modify, revoke and reissue, or terminate a permit is not justified, the Administrator shall send the petitioner a brief written response giving the reason for the decision. A petition for modification, revocation and reissuance, or termination shall be considered denied if the Administrator takes no action within sixty (60) days after receiving the written request.

(iii) Denials of petitions for modification, revocation and reissuance, or termination are not subject to public notice and comment.

(e) The Administrator shall review each permit at least once every five (5) years to determine whether it should be modified, revoked and reissued, or terminated.

Section 5. Denying Permits.

(a) The Director may deny a permit for any of the following reasons:

(i) The application is incomplete;

(ii) The project, if constructed or operated, will violate applicable state surface or groundwater standards;

(iii) The application proposes the construction or operation of a project that does not meet the requirements of this Chapter;

(iv) The permitted facility would be in conflict with or is in conflict with a State-approved local wellhead protection plan, State-approved local source water protection plan, or State-approved water quality management plan; or

(v) Other justifiable reasons necessary to carry out the provisions of the Wyoming Environmental Quality Act.

Section 6. Modifying Permits.

(a) The Director may modify a permit when:

(i) Any material or substantial alterations or additions to the facility occur after permitting that justify the application of different permit conditions;

(ii) Any modification in the operation of the facility is capable of causing or increasing pollution in excess of applicable standards or permit conditions;

(iii) Information warranting modification is discovered after the operation has begun that would have justified the application of different permit conditions at the time of permit issuance;

(iv) Regulations or standards upon which the permit was based changed after the permit was issued;

(v) Cause exists for termination, as described in this Section, but the Department determines that modification is appropriate;

(vi) Modification is necessary to comply with applicable statutes, standards, or regulations;

(vii) The permit is transferred; or

(viii) The Administrator determines that permit changes are necessary based on:

(A) Area of review reevaluations under Section 13(c)(i) of this Chapter;

(B) Amendments to the testing and monitoring plan under Section 20(b)(xi) of this Chapter;

(C) Amendments to the injection well-plugging plan under Section 23(c) of this Chapter;

(D) Amendments to the post-injection site care and site closure plan under Section 24(a)(iv) of this Chapter;

(E) Amendments to the emergency and remedial response plan under Section 25(a) of this Chapter;

(F) A review of monitoring or testing results; or

(G) A determination that the injectate is a hazardous waste as defined in 40 CFR § 261.3.

(b) The Administrator may make minor modifications to permits with the consent of the permittee. The Administrator shall notify the permittee of minor modifications to its permit, and the modifications shall become final twenty (20) days from the date of receipt of such notice. Minor modifications may only:

(i) Correct typographical errors;

(ii) Require more frequent monitoring or reporting by the permittee;

(iii) Change an interim compliance date in a schedule of compliance, provided the new date is not more than 120 days after the date specified in the existing permit and does not interfere with attainment of the final compliance date requirement;

(iv) Allow for a permit transfer and change in ownership or operational control of a facility where the Administrator determines that no other change in the permit is necessary, provided that a written agreement containing a specific date for transfer of permit responsibility, coverage, and liability between the current and new permittees has been submitted to the Administrator;

(v) Change quantities or types of fluids injected that are within the capacity of the facility as permitted and, in the judgment of the Administrator, would not interfere with the operation of the facility or its ability to meet conditions described in the permit and would not change its classification;

(vi) Change construction requirements approved by the Administrator pursuant to Section 9(b)(xxix)(A)-(C) of this Chapter, provided that the alteration complies with the requirements of this Chapter;

(vii) Amend a well-plugging plan that has been updated under Section 23 of this Chapter; or

(ix) Amend a Class VI injection well testing and monitoring plan, well-plugging plan, post-injection site care and site closure plan, or emergency and remedial response plan where the modifications merely clarify or correct the plan.

(c) The Director may modify a permit to resolve issues that could lead to the revocation or termination of the permit under Section 7(a) of this Chapter.

(d) When the Director modifies a permit, only the conditions that are being modified shall be reopened when a new draft permit is prepared. All other aspects of the existing, unmodified permit shall remain in effect for the duration of the modified permit and the modified permit shall expire on the date when the original permit would have expired. Suitability of the facility location shall not be considered unless new information or standards indicate that a threat to human health, safety, or the environment exists that was unknown at the time of permit issuance.

(e) The Administrator may require the submission of a new application to modify a permit.

Section 7. Terminating, Revoking, and Reissuing Permits.

(a) The Director may terminate a permit or revoke and reissue a permit for any of the following reasons:

(i) Noncompliance with terms and conditions of the permit;

(ii) Failure in the application or during the issuance process to disclose fully all relevant facts, or misrepresentation of any relevant facts at any time; or

(iii) A determination that the activity threatens human health, safety, or the environment and can only be regulated to acceptable levels by a permit modification or termination.

(b) As part of any notice of intent to terminate a permit, the Director shall order the permittee to proceed with reclamation within a reasonable time period.

(c) A revoked permit may be reissued only if a new application is submitted.

(d) When a permit is revoked and reissued, the entire permit is reopened as if the permit has expired and is being reissued, except that suitability of the facility location shall not be considered unless new information or standards indicate that a threat to human health, safety, or the environment exists that was unknown at the time of permit issuance. During any revocation and reissuance proceeding, the permittee shall comply with all conditions of the existing permit until a new final permit is issued.

Section 8. Transferring Permits.

(a) To transfer a permit:

(i) The proposed permit transferee shall apply in writing as though that person were the original applicant for the permit; and

(ii) The proposed permit transferee shall agree to be bound by all of the terms and conditions of the permit.

(b) Transfer of a permit is allowed only upon approval by the Director.

(c) When a permit transfer occurs pursuant to this section, the permit rights of the previous permittee automatically terminate.

(d) Transfer shall not be allowed if the permittee is in noncompliance with any term and conditions of the permit unless the transferee agrees to bring the facility back into compliance with the permit.

(e) A permit may be transferred by modifying the permit or by revoking and reissuing the permit to identify the new permittee and incorporate the requirements of this Chapter and the Wyoming Environmental Quality Act, W.S. § 35-11-101 *et seq*.

Section 9. Permit Conditions.

(a) Permit conditions shall be incorporated either expressly or by reference. If incorporated by reference, a specific citation to the incorporated conditions shall be given in the permit.

(b) All permits issued under this Chapter shall contain the following conditions:

(i) A requirement that the permittee complies with all conditions of the permit, and a statement that any permit noncompliance constitutes a violation of these regulations and is grounds for enforcement action, permit termination, revocation and reissuance, or modification, or for denial of a permit renewal application;

(ii) A stipulation that it shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit;

(iii) A requirement that the permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit;

(iv) A requirement that the permittee properly operates and maintains all facilities and systems of treatment and control, and related appurtenances, that are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding and operator staffing and training, and adequate laboratory and process controls including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit;

(v) A stipulation that the filing of a request by the permittee, or at the instigation of the Administrator, for a permit modification, revocation, termination, or notification of planned changes or anticipated non-compliance, shall not stay any permit condition;

(vi) A stipulation that the permit does not convey any property rights of any sort, or any exclusive privilege;

(vii) A stipulation that the permittee shall furnish to the Administrator, within a specified time, any information that the Administrator requests to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit, or to determine compliance with the permit. The permittee shall also furnish to the Administrator, upon request, copies of records required to be kept by the permit;

(viii) A requirement that the permittee shall allow the Administrator, or an authorized representative of the Administrator, upon the presentation of credentials, during normal working hours, to enter the premises where a regulated facility is located, or where records are kept under the conditions of this permit, and:

(A) Inspect the discharge and related facilities, practices, or operations regulated or required under this permit;

(B) Review and copy reports and records required by the permit;

(C) Collect fluid samples for analysis for the purposes of ensuring permit compliance or as otherwise authorized by the Wyoming Environmental Quality Act of any substances or parameters at any location;

(D) Measure and record water levels;

(E) Collect resource data as defined by W.S. § 6-3-414; and

(F) Perform any other function authorized by law or regulation.

(ix) A requirement that:

(A) If the facility is located on property not owned by the permittee, the permittee shall also secure from the landowner upon whose property the facility is located permission for Department personnel and their invitees to enter the premises where the facility is located, or where records are kept under the conditions of this permit, and collect resource data as defined by W.S. § 6-3-414, inspect and photograph the facility, collect samples for analysis, review records, and perform any other function authorized by law or regulation. The permittee shall secure and maintain such access for the duration of the permit and the post-injection site care and site closure period; and

(B) If the facility cannot be directly accessed using public roads, the permittee shall also secure permission for Department personnel and their invitees to enter and cross all properties necessary to access the facility. The permittee shall secure and maintain such access for the duration of the permit and the post-injection site care and site closure period;

(x) A requirement that the permittee furnishes any information necessary to establish a testing and monitoring pursuant to Section 20 of this Chapter. Conditions shall specify:

(A) Required monitoring including type, intervals, and frequency sufficient to yield data that are representative of the monitored activity including when appropriate, continuous monitoring;

(B) Requirements concerning the proper use, maintenance, and installation, of monitoring equipment or methods, including biological monitoring methods; and

(C) Reporting and notice requirements based upon the impact of the regulated activity and as specified in Section 22 of this Chapter. Reporting shall be no less frequent than specified in Section 22 of this Chapter;

(xi) A requirement that all samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity and that records of all monitoring information be retained by the permittee;

(xii) A requirement that all applications, reports, and other information submitted to the Administrator contain the certifications required in Section 10(d) of this Chapter by a responsible corporate officer;

(A) A responsible corporate officer, as defined in Section 2(mm) of this Chapter, may authorize an individual or a position that does not meet the requirements of subparagraphs (i), (ii), (iii), or (iv) of Section 2(mm) to act as a "duly authorized representative." To authorize a duly authorized representative :

(I) A person who meets the requirements of subparagraph (i), (ii), (iii), or (iv) of Section 2(mm) shall authorize the duly authorized representative in writing;

(II) The authorization shall specify an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, or position of equivalent responsibility; and

(III) The responsible corporate officer shall submit the written authorization to the Administrator.

(B) If an authorization under subparagraph (A) of this subparagraph is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, the responsible corporate official shall notify the Administrator that the authorization is no longer accurate or shall submit to the Administrator a new authorization satisfying the requirements of subparagraph (A) of this subparagraph prior to or together with any reports, or information to be signed by a duly authorized representative.

(xiii) A requirement that the permittee give advance notice to the Administrator as soon as possible of any planned physical alteration or additions, other than authorized operation and maintenance, to the permitted facility and receive authorization from the Administrator prior to implementing the proposed alteration or addition;

(xiv) A requirement that any modification that may result in a violation of a permit condition shall be reported to the Administrator, and any modification that will result in a violation of a permit condition shall be reported to the Administrator through the submission of a new or amended permit application;

(xv) A requirement that any transfer of a permit shall first be approved by the Director, and that no transfer will be approved if the facility is not in compliance with the existing permit unless the proposed permittee agrees to bring the facility into compliance;

(xvi) A requirement that monitoring results shall be reported at the intervals specified in the permit;

(xvii) A requirement that reports of compliance or non compliance, or any progress reports on interim and final requirements contained in any compliance schedule (if one

is required by the Administrator) shall be submitted no later than thirty (30) days following each schedule date;

(xviii) The following reporting and mitigation requirements:

(A) If any monitoring or other information indicates that any contaminant, the injected carbon dioxide stream, displaced formation fluids, or associated pressure front may endanger a USDW or threaten human health, safety, or the environment, the permittee shall:

(I) Immediately cease injection;

(II) Take all steps reasonably necessary to identify and characterize any release;

(III) Orally notify the Administrator within twenty-four (24) hours of discovering the condition; and

(IV) Provide a written report to the Administrator within five (5) days of discovering the condition. The written report shall contain:

(1.) A description of the endangerment and its cause;

(2.) The period of endangerment, including exact dates and times, and, if the endangerment has not been controlled, the anticipated time it is expected to continue; and

(3.) The steps taken or planned to reduce, eliminate, and prevent reoccurrence of the endangerment;

(B) If the permittee discovers any noncompliance with a permit condition or a requirement of this Chapter that may cause fluid migration into or between USDWs, any malfunction of the injection system that may cause fluid migration into or between USDWs, or any excursion, the permittee shall:

(I) Orally notify the Administrator within twenty-four (24) hours of discovering the condition;

(II) Provide a written report to the Administrator within five (5) days of discovering the condition, which shall contain:

(1.) A description of the noncompliance, malfunction, or excursion and its cause;

(2.) The period of noncompliance, malfunction, or excursion, including exact dates and times, and, if the noncompliance, malfunction, or excursion has not been controlled, the anticipated time it is expected to continue; and

(3.) The steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance, malfunction, or excursion.

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(III) If an excursion is discovered, provide written notice to all surface owners, mineral claimants, mineral owners, lessees, and other owners of record of subsurface interests within thirty (30) days of discovering the excursion; and

(IV) Implement the emergency and remedial response plan approved by the Administrator;

(xix) A requirement that the permittee report all instances of noncompliance not already required to be reported under subparagraph (b)(xix)(B)of this Section, at the time monitoring reports are submitted. The reports shall contain the information listed in subparagraph (b)(xix)(B)(II) of this Section;

(xx) A requirement that if the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Administrator, the permittee shall promptly submit such facts or information;

(xxi) A requirement that the injection facility meet construction requirements outlined in Section 14 of this Chapter, that the permittee submit a notice of completion of construction to the Administrator, and that the permittee allows the Administrator to inspect the facility upon completion of construction and prior to commencing any underground injection activity;

(xxii) A requirement that the permittee notifies the Administrator before abandonment of the facility;

(xxiii) A requirement that injection shall not commence until construction is complete, and that construction is complete when:

(A) The permittee has submitted a notice of completion of construction to the Administrator; and

(B) The Administrator has inspected or reviewed the injection well and found it is in compliance with the conditions of the permit;

(I) Within thirteen (13) days of the date of the notice in subparagraph (xxii) of this paragraph, the Administrator shall provide notice to the permittee of the intent to inspect or review the injection well. The notice shall include a reasonable time period in which the Administrator shall inspect or review the well; but

(II) If the Administrator does not provide the notice required by subparagraph (I) of this subparagraph, the requirement for prior inspection or review is waived, and the permittee may commence injection;

(xxiv) A requirement that the permittee shall establish mechanical integrity prior to commencing injection or on a schedule determined by the Administrator and that thereafter, the permittee shall maintain mechanical integrity as defined in Section 19 of this Chapter;

(xxv) A requirement that if the Administrator determines that a Class VI well lacks mechanical integrity and gives written notice of the determination to the permittee, the permittee shall:

(A) Cease injection into the well within forty-eight (48) hours of receipt of the Administrator's determination unless the Administrator requires immediate cessation;

(B) Perform any construction, operation, monitoring, reporting, and corrective action that the Administrator requires to prevent the movement of fluid into or between USDWs caused by the lack of mechanical integrity, or plug the well pursuant to the requirements of Section 23 of this Chapter if allowed by the Administrator; and

(C) Not resume injection into the well until the Administrator provides written notice that the permittee has demonstrated mechanical integrity pursuant to Section 19 of this Chapter.

(xxvi) A requirement that, for any Class VI well that lacks mechanical integrity, injection operations are prohibited until the permittee shows to the satisfaction of the Administrator under Section 19 of this Chapter that the well has mechanical integrity;

(xxvii) A requirement that the permittee comply with a well-plugging plan that meets the requirements of Section 23 of this Chapter, which shall be incorporated into the permit; and

(xxviii) Conditions that implement the requirements of Section 14 of this Chapter. The conditions shall:

(A) Require all wells to achieve compliance with the requirements of Section 14 of this Chapter according to a compliance schedule established as a permit condition;

(B) Prohibit construction from commencing until a permit has been issued containing construction requirements;

(C) Require that all wells comply with the construction requirements of Section 14 of this Chapter prior to commencing injection operations. Changes in construction plans during construction may be approved by the Administrator as minor modifications. No such changes may be physically incorporated into construction of the well prior to approval of the modification by the Administrator.

(D) Include a corrective action plan as set forth in Section 13 of this Chapter;

(E) Require that all wells comply with the operational requirements of Section 14 of this Chapter;

(F) Establish any maximum injection volumes and pressures necessary to ensure that fractures are not initiated in the confining zone, to ensure that injected fluids do not migrate into any underground source of drinking water, to ensure that formation fluids are not displaced into any underground source of drinking water, and to ensure compliance with the operating requirements;

(G) Establish monitoring and reporting requirements set forth in Sections 20 and 22 of this Chapter. The permittee shall be required to identify types of tests and methods used to generate the monitoring data; and

(H) Require the permittee to comply with the financial responsibility requirements set forth in Section 26 of this Chapter.

(c) Permits for Class VI wells shall be issued for the operating life of the facility and extend through the post-injection site care period until the Administrator certifies site closure pursuant to Section 24(b)(iii) of this Chapter.

(d) Permits may be issued for individual Class VI wells and shall not be issued on an area basis for multiple points of discharge operated by the same person.

(e) Permits may specify a schedule of compliance leading to compliance with permit conditions, this Chapter, and the Wyoming Environmental Quality Act, W.S. § 35-11-101 *et seq*.

(i) Schedules of compliance shall require compliance as soon as possible, and in no case later than three (3) years after the effective date of the permit.

(ii) If a permit establishes a schedule of compliance that exceeds one (1) year from the date of permit issuance, the schedule shall set forth interim requirements and the dates for their achievement. The time between interim dates shall not exceed one (1) year unless, the time necessary for completion of any interim requirement is more than one (1) year and is not readily divisible into stages for completion, and in that case, the permit shall specify interim dates for the submission of reports of progress toward completion of the interim requirements and indicate a projected completion date.

(iii) The compliance schedule shall require the permittee to submit progress reports no later than thirty (30) days following each interim date and the final date of compliance.

(f) The Director shall include in permits, on a case-by-case basis:

(i) Conditions for monitoring, schedules of compliance, and any additional conditions necessary to prevent the migration of fluids into underground sources of drinking water. The Director shall evaluate what conditions are necessary and shall establish these conditions when issuing, modifying, or revoking and reissuing permits; and

(ii) Conditions to ensure compliance with all applicable requirements of this Chapter and the Wyoming Environmental Quality Act, W.S. § 35-11-101 *et seq*.

(g) To the extent possible under Section 9 of this Chapter, modified or revoked and reissued permits, shall incorporate all of the permit conditions required by this Section.

(h) When they meet the requirements of this Chapter and are approved by the Administrator, all plans shall be incorporated into the permit.

Section 10. Permit Application.

(a) It is the operator's responsibility to apply for and obtain a permit in accordance with these regulations. Each application shall be submitted with all supporting data.

(b) In addition to the requirements of W.S. § 35-11-313(f)(ii), a complete application for a Class VI well shall include:

(i) A brief description of the nature of the business and the activities to be conducted that require the applicant to obtain a permit under this Chapter;

(ii) The name, address, and telephone number of the operator, and the operator's ownership status and status as a federal, state, private, public, or other entity;

(iii) Up to four Standard Industrial Classification codes that best reflect the principal products or services provided by the facility;

(iv) The name, address, and telephone number of the facility;

(v) The location of the geologic sequestration project identified by section, township, range, and county, noting which sections (if any) include Indian lands;

(vi) Within the area of review, a listing and status of all permits or construction approvals associated with the geologic sequestration project received or applied for under any of the following programs or corresponding state programs:

(A) Hazardous Waste Management under the Resource Conservation and Recovery Act, 42 U.S.C. § 6901 *et seq.*;

(B) UIC Program under the Safe Drinking Water Act, 42 U.S.C. § 300f *et seq.*;

(C) National Pollutant Discharge Elimination System under the Clean Water Act, 33 U.S.C. § 1251 *et seq.*;

(D) Prevention of Significant Deterioration program under the Clean Air Act, 42 U.S.C. § 7401 *et seq.*;

(E) Nonattainment program under the Clean Air Act, 42 U.S.C. § 7401 *et seq.*;

(F) National Emissions Standards for Hazardous Air Pollutants pre-construction approval under the Clean Air Act, 42 U.S.C. § 7401 *et seq.*;

(G) Dredge and fill permitting program under section 404 of the Clean Water Act, 33 U.S.C. § 1251 *et seq.*;

(vii) Within the area of review, a list of other relevant permits associated with the geologic sequestration project that the applicant is required to obtain;

(viii) A statement of whether the geologic sequestration project is within a state-approved water quality management plan area, a state-approved wellhead protection area or a state-approved source water protection area;

(ix) A map showing the injection well(s) for which a permit is sought and the applicable area of review, consistent with Section 13 of this Chapter;

(A) Within the area of review, the map shall list the number, or name and location of:

(I) All injection wells, producing wells, abandoned wells, plugged wells, dry holes, or deep stratigraphic boreholes;

(II) All state- or EPA-approved subsurface cleanup sites;

(III) All water quality management plan areas, wellhead protection areas, and source water protection areas;

(IV) All surface bodies of water, springs, mines (surface and subsurface), quarries, and water wells;

(V) Other pertinent surface features, including structures intended for human occupancy;

(VI) Roads; and

(VII) State and Indian reservation boundaries;

(B) The applicant shall include on this map all relevant information of public record or known to the applicant; and

(C) The map shall also show known or suspected faults;

(x) A map delineating the area of review that:

(A) Meets the requirements of Section 13 of this Chapter;

(B) Is based upon modeling;

(C) Uses all available data, including data available from any logging and testing of wells within and adjacent to (within one (1) mile of) the area of review; and

(D) Describes the area of review by township, range, and section to the nearest ten (10) acres, as described under the general land survey system;

(xi) For the description required by W.S. 35-11-313(f)(ii)(A), sufficient information on the geologic structure and reservoir properties of the proposed storage site and overlying formations, including:

(A) Isopach maps of the proposed injection and confining zones, a structural contour map aligned with the top of the proposed injection zone, and at least two (2) geologic cross-sections of the area of review reasonably perpendicular to each other and showing the geologic formations from the surface to total depth;

(B) Location, orientation, and properties of known or suspected faults and fractures that may transect the confining zones in the area of review and a determination that they will not allow fluid movement;

(C) Information on seismic history that has affected the proposed area of review including knowledge of previous seismic events and history of these events, the presence and depth of seismic sources, and a determination that the seismicity will not allow fluid movement out of the injection zone;

(D) Data sufficient to demonstrate the effectiveness of the injection and confining zones, including:

(I) Data on the depth, areal extent, thickness, mineralogy,

porosity, vertical permeability, and capillary pressure of the injection and confining zones within the area of review; and

(II) A description of geologic changes based on field data that may include geologic cores, outcrop data, seismic surveys, well logs, and names and lithologic descriptions;

(E) Geomechanical information on fractures, stress, ductility, rock strength, and in situ fluid pressures within the confining zone; and

(F) Geologic and topographic maps and cross-sections illustrating regional geology, hydrogeology, and the geologic structure of the local area;

(xii) A list of all wells and other drill holes within and adjacent to (within one (1) mile) the area of review. The list shall include a description of each well and drill hole type, construction, date drilled, location, depth, record of plugging and completion, and any additional information the Administrator requires;

(xiii) A list of the identity and location of all known wells within and adjacent to (within one (1) mile) the area of review that penetrate the confining or injection zone;

(xiv) Maps and stratigraphic cross-sections indicating the general vertical and lateral limits of all USDWs in the area of review; the location of water wells and springs in the area of review; the positions relative to the injection zones of all USDWS, water wells, and springs in the area of review, and the direction of water movement (if known);

(xv) For the characterization required by W.S. 35-11-313(f)(ii)(B), information necessary for the Division to classify the receiver and any secondarily affected aquifers under Water Quality Rules and Regulations Chapter 8;

(xvi) Baseline geochemical data on subsurface formations, including all USDWs in the area of review;

(xvii) Proposed operating data, including:

(A) Average and maximum daily rate and volume and mass and total anticipated volume and mass of the carbon dioxide stream;

(B) Average and maximum surface injection pressure;

(C) The source of the carbon dioxide stream; and

(D) An analysis of the chemical and physical characteristics of the carbon dioxide stream and any other substances proposed for inclusion in the injectate stream; and

(E) Anticipated duration of the proposed injection periods;

(xviii) The compatibility of the carbon dioxide stream with fluids in the injection zone and minerals in both the injection and the confining zones, based on the results of the formation testing program, and with the materials used to construct the well;

(xix) Proposed formation testing program to obtain an analysis of the chemical and physical characteristics of the injection zone and confining zone and that meets the requirements of Section 16 of this Chapter;

(xx) Proposed stimulation program, a description of stimulation fluids to be used, and a determination that stimulation will not allow fluid movement out of the injection zone;

(xxi) Proposed procedure that outlines steps to conduct injection operations;

(xxii) A wellbore schematic of the subsurface construction details and surface wellhead construction of the injection and monitoring wells;

(xxiii) A demonstration, to the satisfaction of the Administrator, that the injection wells will be sited in areas with a suitable geologic system that meets the requirements of Section 12(a) of this Chapter, including:

(A) Identification and characterization of additional zones, if they exist, that will impede vertical fluid movement, allow for pressure dissipation, and provide additional opportunities for monitoring, mitigation, and remediation; and

(B) Identification of vertical faults and fractures that transect the zones identified in subparagraph (A) of this subparagraph;

(xxiv) Injection well design and construction procedures that meet the requirements of Section 14 of this Chapter, including the information listed in Section 14(c)(ii) of this Chapter;

(xxv) Proposed area of review and corrective action plan that meets the requirements under Section 13 of this Chapter;

(xxvi) The status of corrective action on wells in the area of review;

(xxvii) All available logging and testing program data on the wells required by Section 17 of this Chapter;

(xxviii)A demonstration of mechanical integrity required by Section 19 of this Chapter;

(xxix) A demonstration, satisfactory to the Administrator, that the applicant has met the financial responsibility requirements of Section 26 of this Chapter;

(xxx) A written financial assurance cost estimate required by Section 26(b) of this Chapter;

(xxxi) A public liability insurance certificate that, in addition to meeting the requirements of W.S. § 35-11-313(f)(ii)(O), demonstrates that the public liability insurance policy meets the requirements of Section 26(l)(i)(B) of this Chapter; identifies each facility by name, address, and EPA Identification Number; and identifies the amounts and types of coverage for each facility;

(xxxii) Proposed testing and monitoring plan required by Section 20 of this Chapter;

(xxxiii) Proposed injection and monitoring wells plugging plan required by Section 23 of this Chapter;

(xxxiv) Proposed post-injection site care and site closure plan required by Section 24(a) of this Chapter;

(xxxv) Proposed emergency and remedial response plan required by Section 25 of this Chapter;

(xxxvi) A list of contacts for states or Tribes on Indian lands identified pursuant to subparagraphs (b)(v) and (b)(ix)(A)(VII) of this Section; and

(xxxvii) Any other information requested by the Administrator.

(c) All applications for permits, reports, or information submitted to the Administrator shall be signed by a responsible corporate officer.

(d) The application shall contain the following certification by the responsible corporate officer signing the application:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

(e) Sections of permit applications that represent engineering work shall be sealed, signed, and dated by a licensed professional engineer as required by W.S. § 33-29-601.

(f) Sections of permit applications that represent geologic work shall be sealed, signed, and dated by a licensed professional geologist as required by W.S. § 33-41-115.

Section 11. Prohibitions.

(a) Pursuant to the provisions of W.S. § 35-11-301(a), no person shall:

(i) Discharge into, construct, operate, or modify any Class VI well unless permitted pursuant to this Chapter;

(ii) Discharge or inject to any zone except the authorized injection zone as described in the permit;

(iii) Conduct any injection activity in a manner that results in a violation of any permit condition or that conflicts with any representations made in a permit application;

(iv) Construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation contained in 40 C.F.R. Part 141, Subparts E, F, and G, or may otherwise adversely affect human health, safety, or the environment. The applicant for a permit shall have the burden of showing that the requirements of this paragraph are met.

(v) Inject any hazardous waste that has been banned from land disposal pursuant to Wyoming Hazardous Waste Rules, Chapter 1;

(vi) Construct a new, operate an existing, or maintain an existing Class V well for non-experimental geologic sequestration

(b) Class VI wells shall inject only to receivers classified by the Department pursuant to Water Quality Rules and Regulations, Chapter 8, as Class V (Hydrocarbon Commercial) or Class VI groundwaters. No Class VI well shall inject to any Class I, Class II, Class III, Class IV, or unclassified groundwaters.

(c) The Administrator shall designate and protect as underground sources of drinking water, all aquifers and parts of aquifers that meet the definition of "underground source of drinking water" in Section 2 of this Chapter, except to the extent there is expansion to the areal extent of an existing Class II enhanced oil recovery or enhanced gas recovery aquifer exemption for the exclusive purpose of Class VI injection for geologic sequestration under Section 16 of this Chapter.

(i) The Administrator may identify underground sources of drinking water by narrative description, illustrations, maps, or other means.

(ii) Other than EPA-approved aquifer exemption expansions that meet the requirements of Section 16 of this Chapter, new aquifer exemptions shall not be issued for Class

VI injection wells. Even if an aquifer has not been specifically identified by the Administrator, it is an underground source of drinking water if it meets the definition in Section 2 of this Chapter.

Section 12. Minimum Criteria for Siting Class VI Wells.

(a) All Class VI wells shall be sited in areas with a suitable geologic system. The geologic system shall be comprised of:

(i) An injection zone of sufficient areal extent, thickness, porosity, and permeability to receive the total anticipated volume of the carbon dioxide stream; and

(ii) Confining zones that are free of transmissive faults or fractures and of sufficient areal extent and integrity to contain the injected carbon dioxide stream and displaced formation fluids and allow injection at proposed maximum pressures and volumes without initiating or propagating fractures in the confining zones or causing non-transmissive faults to become transmissive.

(b) Owners or operators of Class VI wells shall identify and characterize additional zones, if they exist, that will impede vertical fluid movement, allow for pressure dissipation, and provide additional opportunities for monitoring, mitigation, and remediation. Faults and fractures that transect these zones shall be identified.

Section 13. Area of Review Delineation and Corrective Action.

(a) The owner or operator of a Class VI well shall prepare, maintain, and comply with a plan to delineate the area of review for a proposed geologic sequestration project, re-evaluate the delineation, and perform corrective action that meets the requirements of this Section and is approved by the Administrator. The area of review shall be based on computational modeling that accounts for the physical and chemical properties of all phases of the injected carbon dioxide stream. The area of review shall never be less than the area of potentially affected groundwater. An area of review and corrective action plan shall include the following information:

(i) The method for delineating the area of review that meets the requirements of paragraph (b) of this Section, including the name, version and availability of the model that will be used, assumptions that will be made, and the site characterization data on which the model will be based;

(ii) A description of:

(A) The monitoring and operational conditions that would warrant a re-evaluation of the area of review prior to the next scheduled re-evaluation as determined by the minimum fixed frequency established in paragraph (c) of this Section.

(B) How monitoring and operational data (e.g., injection rate and pressure) will be used to evaluate the area of review; and

(C) How corrective action will be conducted to meet the requirements of paragraph (b)(v) of this Section, including:

(I) What corrective action will be performed prior to injection;

(II) 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;

(III) How corrective action will be adjusted if there are changes in the area of review; and

(IV) How site access will be ensured for future corrective action.

(b) Owners or operators of Class VI wells shall perform the following actions to delineate the area of review, identify all wells that require corrective action, and perform corrective action on those wells:

(i) Predict, using existing site characterization, monitoring and operational data, and computational modeling:

(A) The projected lateral and vertical migration of the carbon dioxide plume and formation fluids in the subsurface from the commencement of injection activities until the plume movement ceases;

(B) The pressure differentials, demonstrating that pressure differentials sufficient to cause the movement of injected fluids or formation fluids into a USDW or to otherwise threaten human health, safety, or the environment will not be present, or until the end of a fixed time period determined by the Administrator;

(C) The potential need for brine removal; and

(D) The long-term effects of pressure buildup if brine is not removed.

(ii) Use modeling that:

(A) Is based on:

(I) Detailed geologic data available or collected to characterize the injection zone, confining zone, and any additional zones; and

(II) Anticipated operating data, including injection pressures, rates and total volumes over the proposed operational life of the facility;

(B) Takes into account any relevant geologic heterogeneities, other discontinuities, data quality, and their possible impact on model predictions; and

(C) Considers potential migration through faults, fractures, and artificial penetrations.

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

(iv) Determine which abandoned wells in the area of review have been plugged in a manner that prevents the movement of:

(A) Carbon dioxide that may endanger USDWs or otherwise threaten human health, safety, or the environment; or

(B) Displaced formation fluids, or other fluids, including the use of materials compatible with the carbon dioxide stream, that may endanger USDWs or otherwise threaten human health, safety, or the environment; and

(v) Owners or operators of Class VI wells shall perform corrective action on any 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 USDWs including use of materials compatible with the carbon dioxide stream, where appropriate.

(c) At a fixed frequency, not to exceed two (2) years during the operational life of the facility or five (5) years during the post-injection site care period (until site closure) as specified in the area of review and corrective action plan, or when monitoring and operational conditions warrant, owners or operators shall:

(i) Re-evaluate the area of review in the same manner specified in subparagraph (b)(i) of this Section;

(ii) Identify all wells in the re-evaluated area of review that require corrective action in the same manner specified in subparagraph (b)(iv) of this Section;

(iii) Perform corrective action on wells requiring corrective action in the reevaluated area of review in the same manner specified in subparagraph (b)(v) of this Section; and

(iv) Submit an amended area of review and corrective action plan, or demonstrate to the Administrator through monitoring data and modeling results that no change to the area of review and corrective action plan is needed.

(A) Amendments to the area of review and corrective action plan shall be subject to approval of the Administrator.

(B) Amendments to the area of review shall be incorporated into the permit.

(C) Amendments to the area of review are subject to the permit modification requirements of Section 6 of this Chapter.

Section 14. Construction and Operation Standards for Class VI Wells.

(a) The owner or operator shall design, construct, and complete all Class VI wells to meet the construction standards in this Section and to:

(i) Prevent the movement of fluids into or between USDWs or into any unauthorized zones;

(ii) Allow the use of appropriate testing devices and workover tools; and

(iii) Allow continuous monitoring of the annulus space between the injection tubing and long string casing.

(b) Casing and cement or other materials used in the construction of each Class VI well shall have sufficient structural strength and be designed for the life of the well.

(i) All well materials shall be compatible with fluids with which the materials may be expected to come into contact and shall meet or exceed the following standards:

(A) American Petroleum Institute Specification 5CT;

(B) American Petroleum Institute RP 5C1;

(C) American Petroleum Institute RP 10B-2;

(D) American Petroleum Institute Specification 10A;

(E) American Petroleum Institute RP 10D-2;

(F) American Petroleum Institute Specification 11D1;

(G) American Petroleum Institute RP 14B; and

(H) American Petroleum Institute RP 14C.

(ii) The casing and cementing program shall be designed to prevent the movement of fluids into or between USDWs.

(iii) To allow the Administrator to determine and specify casing and cementing requirements, the owner or operator shall provide the following information in a construction design plan:

(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), including whether the casing is new or used;

(E) Corrosiveness of the carbon dioxide stream and formation fluids;

(F) Down-hole temperatures and pressures;

(G) Lithology of injection and confining zones;

(H) Type or grade of cement and additives; and

(I) Quantity, chemical composition, and temperature of the carbon dioxide stream.

(iv) Casing shall extend through the base of the lowermost USDW above the injection zone and be cemented to the surface through the use of a single or multiple strings of casing and cement.

(v) At least one (1) long string casing, using a sufficient number of centralizers, shall be set to create a cement bond through the overlying and underlying confining zones.

(A) The long string casing shall:

(I) Extend to the injection zone;

(II) Be cemented by circulating cement to the surface in one (1) or more stages; and

(III) Be isolated by placing cement or other isolation techniques as necessary to provide adequate isolation of the injection zone and provide for protection of USDWs, human health, safety, and the environment.

(B) Circulation of cement may be accomplished by staging. The Administrator may approve an alternative method of cementing in cases where the cement cannot be recirculated to the surface if the owner or operator demonstrates by using logs that the cement does not allow fluid movement behind the wellbore.

(vi) Cement and cement additives shall be suitable for use with the carbon dioxide stream and formation fluids, and be of sufficient quality and quantity to maintain integrity over the operating life of the well.

(vii) The integrity and location of the cement shall be verified using technology capable of evaluating cement quality radially with sufficient resolution to identify the location of channels, voids, or other areas of missing cement to ensure that USDWs are not endangered and that human health, safety, and the environment are protected. The owner or operator shall provide a cement bond log (CBL) to the Administrator with an evaluation, certified by a licensed professional engineer or a licensed professional geologist, of the following:

(A) Quantitative estimations of the cement compressive strength;

(B) A bond index; and

(C) Qualitative interpretation of the cement-to-formation bond.

(c) All owners and operators of Class VI wells shall inject fluids through tubing with a packer set at a depth opposite a cemented interval at the location approved by the Administrator.

(i) Tubing and packer materials used in the construction of each Class VI well shall be compatible with fluids with which the materials may be expected to come into contact and shall meet or exceed the following standards:

(A) American Petroleum Institute Specification 5CT;

(B) American Petroleum Institute RP 5C1;

(C) American Petroleum Institute RP 10B-2;

(D) American Petroleum Institute Specification 10A;

(E) American Petroleum Institute RP 10D-2;

(F) American Petroleum Institute Specification 11D1;

(G) American Petroleum Institute RP 14B; and

(H) American Petroleum Institute RP 14C.

(ii) The Administrator shall determine and specify requirements for tubing and packer based on the following information:

(A) Depth of setting;

(B) Characteristics of the carbon dioxide stream (e.g., chemical content, corrosiveness, temperature, and density) and formation fluids;

(C) Maximum proposed injection pressure;

(D) Maximum proposed annular pressure;

(E) Maximum proposed injection rate (intermittent or continuous) and volume of the carbon dioxide stream;

(F) Size of tubing and casing; and

(G) Tubing tensile, burst, and collapse strengths.

Section 15. Class VI Injection Depth Waiver Requirements.

(a) An owner or operator seeking a waiver of the requirement to inject below the lowermost USDW shall submit a supplemental report concurrent with the permit application. The report shall contain the following:

(i) A demonstration that the injection zones are laterally continuous, are not USDWs, and are not hydraulically connected to USDWs; do not outcrop within the area of review; have adequate injectivity, volume, and sufficient porosity to safely contain the injected carbon dioxide and formation fluids; and have appropriate geochemistry;

(ii) A demonstration that the injection zones are bounded by laterally continuous, impermeable confining units above and below the injection zones adequate to prevent fluid movement and pressure buildup outside of the injection zones;

(iii) A demonstration that the confining units are free of transmissive faults and fractures;

(iv) A characterization of the regional fracture properties and a demonstration that the fractures will not interfere with injection, serve as conduits, or endanger USDWs;

(v) A computer model demonstrating that USDWs above and below the injection zone will not be endangered as a result of fluid movement. The modeling shall be done in conjunction with the area of review determination described in Section 13 of this Chapter, is subject to the requirements of Section 13(b) of this Chapter, and shall be periodically reevaluated as required by Section 13(c) of this Chapter;

(vi) A demonstration that well design and construction, in conjunction with the waiver, will ensure isolation of the injectate in lieu of the requirements of Section 14(a)(i) of this Chapter and will meet the well construction requirements of paragraph (f) of this Section;

(vii) A description of how the monitoring and testing and any additional plans will be tailored to this geologic sequestration project to ensure protection of USDWs above and below the injection zone;

(viii) Information on the location of all public water supplies affected, reasonably likely to be affected, or served by USDWs in the area of review; and

(ix) Any other information requested by the Administrator.

(b) To inform the US EPA Regional Administrator's decision on whether to grant a waiver of the injection depth requirements of 40 C.F.R. §§ 144.6, 146.5(f), and 146.86(a)(1), the Administrator shall submit to the US EPA Regional Administrator documentation of the following:

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

(A) The integrity of the upper and lower confining units;

(B) The suitability of the injection zone(s) (including lateral continuity, lack of transmissive faults and fractures, and knowledge of current or planned artificial penetrations into the injection zone(s) or formations below the injection zone);

(C) The potential capacity of the geologic formation(s) to sequester carbon dioxide, accounting for the availability of alternative injection sites;

(D) All other site characterization data, the proposed emergency and remedial response plan, and a demonstration of financial responsibility;

(E) Community needs, demands, and supply from drinking water resources;

(F) Planned needs and potential and future use of USDWs and non-USDW aquifers in the area;

(G) Planned or permitted water, hydrocarbon, or mineral resource exploitation potential of the proposed injection formation(s) 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(s) or formation(s);

(H) The proposed plan for securing alternative resources or treating USDW formation waters in the event of contamination related to the Class VI injection activity; and

(I) Any other applicable considerations or information requested by the Administrator;

(ii) Consultation with the public water system supervision directors of all states and Tribes having jurisdiction over lands within the area of review of a well for which a waiver is sought; and

(iii) Any written waiver-related information submitted by a public water system supervision director to the Department.

(c) Concurrent with the Class VI permit application public notice process pursuant to Section 27 of this Chapter, the Administrator shall give public notice that an injection depth waiver request has been submitted. The notice shall clearly state:

(i) The depth of the proposed injection zone(s);

(ii) The location of the injection wells;

(iii) The name and depth of all USDWs within the area of review;

(iv) A map of the area of review;

(v) The names of any public water supplies affected, reasonably likely to be affected, or served by the USDWs in the area of review; and

(vi) The results of any consultation between the UIC program and the Public Water System Supervision Directors within the area of review.

(d) Following the injection depth waiver application public notice, the Administrator of the Water Quality Division of the Department of Environmental Quality shall provide all the information received through the waiver application process to the US EPA Regional Administrator. Based on the information provided, the US EPA Regional Administrator shall provide written concurrence or non-concurrence regarding waiver issuance.

(i) If the US EPA Regional Administrator requires additional information to make a decision, the Administrator of the Water Quality Division of the Department of Environmental Quality shall provide the information. The US EPA Regional Administrator may require public notice of the new information.

(ii) The Administrator of the Water Quality Division of the Department of Environmental Quality shall not issue a depth injection waiver without receipt of written concurrence from the US EPA Regional Administrator.

(e) If an injection depth waiver is issued, within thirty (30) days of issuance, the EPA shall post the following information on the Office of Water's website:

(i) The depth of the proposed injection zone(s);

(ii) The location of the injection wells;

(iii) The name and depth of all USDWs within the area of review;

(iv) A map of the area of review;

(v) The names of any public water supplies affected, reasonably likely to be affected, or served by the USDWs in the area of review; and

(vi) The date of waiver issuance.

(f) Upon receipt of a waiver of the requirement to inject below the lowermost USDW for geologic sequestration, the owner or operator of a Class VI well shall comply with the following:

(i) All requirements of Sections 13, 17, 18, 19, 22, 23, 25, and 26 of this Chapter;

(ii) All the requirements of Section 14 of this Chapter with the following modified requirements:

(A) In lieu of meeting the requirements of Section 14(a)(i) of this Chapter, the Class VI well shall be constructed and completed to prevent the movement of fluids into any unauthorized zones, including USDWs;

(B) In lieu of meeting the requirements of Section 14(b) and 14(b)(i) of this Chapter, the casing and cementing program shall prevent the movement of fluids into any unauthorized zones including USDWs; and

(C) The casing shall extend through the base of the nearest USDW directly above the injection zone and shall be cemented to the surface or, at the Administrator's discretion, at another formation above the injection zone and below the nearest USDW above the injection zone;

(iii) All the requirements of Section 20 of this Chapter with the following modified requirements:

(A) The owner or operator shall monitor the groundwater quality, geochemical changes, and pressure in the first USDWs immediately above and below the injection zone(s) and in any other formation at the discretion of the Administrator; and

(B) The owner or operator shall conduct 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) in the injection zone(s) by using:

(I) Direct methods, and,

(II) Indirect methods (e.g., seismic, electrical, gravity, or electromagnetic surveys and/or down-hole carbon dioxide detection tools), unless the Administrator determines, based on site-specific geology, that such methods are not appropriate;

(iv) All requirements of Section 24 of this Chapter with the following modified requirements:

(A) The owner or operator shall monitor the groundwater quality, geochemical changes and pressure in the first USDWs immediately above and below the injection zone and in any other formations at the discretion of the Administrator; and

(B) Testing and monitoring in the injection zone(s) 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 and indirect methods (e.g., seismic, electrical, gravity, or electromagnetic surveys and down-hole carbon dioxide detection tools) unless the Administrator determines, based on site-specific geology, that such methods are not appropriate; and

(v) Any additional requirements imposed by the Administrator to ensure protection of USDWs above and below the injection zone(s).

Section 16. Expansion to the Areal Extent of Existing Class II Injection Well Aquifer Exemptions for Class VI Injection Wells.

(a) The owner or operator of a Class II enhanced oil recovery or enhanced gas recovery well that requests an expansion of the areal extent of an existing aquifer exemption for the exclusive purpose of Class VI injection for geologic sequestration shall define (by narrative description, illustrations, maps, or other means) and describe (in geographic and/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 using the criteria in subparagraphs (b)(i)(A)-(C) of this Section.

(b) The Administrator may consider a request from an owner or operator of permitted Class II injection well to convert its well to a Class VI well and expand the areal extent of the existing Class II enhanced oil recovery or enhanced gas recovery aquifer exemption for the exclusive purpose of Class VI injection for geologic sequestration.

(i) The Administrator may approve the request if the existing aquifer exemption and the well meet the following conditions:

(A) The groundwater does not currently serve as a source of drinking water;

(B) The total dissolved solids content of the groundwater is more than 3,000 mg/L and less than 10,000 mg/L; and

(C) The groundwater is not reasonably expected to supply a public water system.

(ii) The Administrator may evaluate a request to expand the areal extent of an aquifer exemption of a Class II enhanced oil recovery or enhanced gas recovery well for the purpose of Class VI injection if the Administrator:

(A) Determines that the request meets the criteria for exemptions in subparagraphs (b)(i)(A)-(C) of this Section;

(B) Determines that the proposed injection operation will not at any time endanger USDWs including non-exempted portions of the injection formation; and

(C) Considers, in making the determinations required by subparagraphs (b)(ii)(A)-(B) of this Section, the following:

(I) Current and potential future use of the USDWs to be exempted as drinking water resources;

(II) 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 Section 13(b)(i) of this Chapter;

(III) Whether the areal extent of the expanded aquifer exemption is of sufficient size to account for any possible revisions to the computational model during reevaluation of the area of review, pursuant to Section 13(c) of this Chapter; and

(IV) Any information submitted to support an injection depth waiver request pursuant to Section 15 of this Chapter.

(c) Approvals under this Section are not final until:

(i) The Administrator submits the request as a revision to the state-administered program under 40 C.F.R. Part 147 or as a substantial revision of a state program under 40 C.F.R. § 145.32; and

(ii) EPA approves the revision.

Section 17. Logging, Sampling, and Testing Prior to Injection Well Operation.

(a) During the drilling and construction of a Class VI injection well, the owner or 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 the well meets the construction requirements of Section 14 of this Chapter and to establish accurate baseline data against which future measurements may be compared. The owner or operator shall submit to the Administrator a descriptive report prepared by a knowledgeable log analyst that includes an interpretation of the results of the logs and tests. At a minimum, the logs and tests shall include:

(i) Deviation checks measured during drilling on all holes constructed by drilling a pilot hole that is subsequently enlarged by reaming or another method. Deviation checks shall 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;

(ii) Before and upon installation of the surface casing:

(A) Resistivity, spontaneous potential, and caliper logs before the casing is installed; and

(B) A cement bond and variable density log, or other approved device to evaluate cement quality radially with sufficient resolution to identify channels, voids, or other areas of missing cement and a temperature log after the casing is set and cemented;

(iii) Before and upon installation of the long string casing:

(A) Resistivity, spontaneous potential, porosity, caliper, gamma ray, fracture finder logs, and any other logs the Administrator requires for the given geology before the casing is installed; and

(B) A cement bond and variable density log, and a temperature log after the casing is set and cemented;

(iv) Tests designed to demonstrate the internal and external mechanical integrity of injection wells, which may include:

(A) A pressure test with liquid or gas;

(B) A tracer survey, such as oxygen-activation logging;

(C) A temperature or noise log; and

(D) A casing inspection log; and

(v) Any alternative methods that provide equivalent or better information and that are required or approved by the Administrator.

(b) The owner or operator shall take whole cores or sidewall cores of the injection zone and confining system as well as formation fluid samples from the injection zone(s).

(i) The owner or operator shall submit to the Administrator a detailed report prepared by a log analyst that includes:

(A) Well log analyses (including well logs);

(B) Core analyses; and

(C) Formation fluid sample information.

(ii) The Administrator may accept data from cores and fluid samples from nearby wells if the owner or operator can demonstrate that such data are representative of conditions in the wellbore.

(c) The owner or operator shall record the formation fluid temperature, formation fluid pH and conductivity, reservoir pressure, and static fluid level of the injection zone(s).

(d) The owner or operator shall determine fracture pressures of the injection and confining zones and verify hydrogeologic and geo-mechanical characteristics of the injection zone by conducting a pressure fall-off test, any other test requested by the Administrator, and:

(i) A pump test; or

(ii) Injectivity tests.

(e) The owner or operator shall provide the Administrator with the opportunity to witness all logging and testing by this section. The owner or operator shall submit a schedule of such activities to the Administrator prior to conducting the first test and shall notify the Administrator of any changes to the schedule thirty (30) days prior to the next scheduled test.

Section 18. Injection Well Operating Requirements.

(a) The owner or operator shall ensure that injection pressure does not exceed ninety percent (90%) of the fracture pressure of the injection zone(s) to ensure that the injection does not initiate new fractures or propagate existing fractures in the injection zone(s).

(i) In no case may injection pressure cause movement of injection or formation fluids in a manner that endangers a USDW, or otherwise threatens human health, safety, or the environment.

(ii) In no case may injection pressure initiate fractures in the confining zones or cause the movement of injectate or formation fluids that endangers a USDW or otherwise threatens human health, safety, or the environment.

(b) Injection of the carbon dioxide stream between the outermost casing protecting USDWs and the wellbore is prohibited.

(c) The owner or operator shall fill the annulus between the tubing and the long string casing with a non-corrosive fluid approved by the Administrator. The owner or operator shall maintain on the annulus a pressure that exceeds the operating injection pressure, unless the Administrator determines that such requirement might harm the integrity of the well or endanger USDWs.

(d) Other than during periods of well workover or maintenance approved by the Administrator in which the sealed tubing-casing annulus is, by necessity, disassembled for maintenance or corrective procedures, the owner or operator shall maintain mechanical integrity of the injection well at all times.

(e) The owner or operator shall install and use continuous recording devices to monitor:

(i) Injection pressure; and

(ii) Injection rate, volume, and temperature of the carbon dioxide stream.

(f) The owner or operator shall install and use continuous recording devices to monitor the pressure on the annulus between the tubing and the long string casing and annulus fluid volume.

(g) The owner or operator shall install, test, and use alarms and automatic surface shut-off systems or, at the discretion of the Administrator, use down-hole shut-off systems (e.g., automatic shut-off, check valves) or other mechanical devices that provide equivalent protection, designed to alert the operator and shut-in the well when operating parameters such as injection rate, injection pressure, or other parameters approved by the Administrator diverge beyond ranges or gradients specified in the permit.

(h) If an automatic shutdown is triggered or a loss of mechanical integrity is discovered, the owner or operator shall immediately investigate and identify as expeditiously as possible the cause. If, upon such investigation, the well appears to be lacking mechanical integrity, or if monitoring required under paragraphs (e), (f), and (g) of this Section otherwise indicates that the well may be lacking mechanical integrity, the owner or operator shall:

(i) Immediately cease injection;

(ii) 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;

(iii) Notify the Administrator within twenty-four (24) hours;

(iv) Restore and demonstrate mechanical integrity to the satisfaction of the Administrator as soon as practicable and prior to resuming injection; and

(v) Notify the Administrator when injection can be expected to resume.

Section 19. Mechanical Integrity.

(a) A Class VI well has mechanical integrity if:

(i) There is no significant leak in the casing, tubing, or packer; and

(ii) There is no significant fluid movement into a USDW through channels adjacent to the injection wellbore.

(b) To evaluate the absence of significant leaks under subparagraph (a)(i) of this Section, owners or operators shall, following an initial annulus pressure test, continuously monitor injection pressure, rate, injected volumes, and pressure on the annulus between tubing, long string casing, and annulus fluid volume as specified in Section 18(e)-(f) of this Chapter.

(c) At least once per year, the owner or operator shall use one (1) of the following methods to determine the absence of significant fluid movement under subparagraph (a)(ii) of this Section:

(i) An approved tracer survey such as an oxygen-activation log; or

(ii) A temperature or noise log.

(d) If required by the Administrator, at a frequency specified in the testing and monitoring plan required in Section 20 of this Chapter, the owner or operator shall run a casing inspection log to determine the presence or absence of corrosion in the long-string casing.

(e) The Administrator may require any other test to evaluate mechanical integrity under this Section. The Administrator may allow the use of a test to demonstrate mechanical integrity other than those listed in paragraph (c) of this Section with the written approval of the US EPA Administrator. To obtain approval, the Administrator shall submit a written request to the US EPA Administrator that shall set forth the proposed test and all technical data supporting its use.

(f) In conducting and evaluating the tests enumerated in this section or others to be allowed by the Administrator, the owner or operator and the Administrator shall apply methods and standards generally accepted in the industry.

(i) When the owner or operator reports the results of mechanical integrity tests to the Administrator, the owner or operator shall include a description of the tests and the methods used.

(ii) In making an evaluation, the Administrator shall review monitoring and other test data submitted since the previous evaluation.

(g) The Administrator may require additional or alternative tests if the results presented by the owner or operator under paragraph (e) of this Section are not satisfactory to the Administrator to demonstrate that there is no significant leak in the casing, tubing or packer and that there is no significant movement of fluid into or between USDWs resulting from the injection activity.

Section 20. Testing and Monitoring Requirements.

(a) The owner or operator of a Class VI well 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 USDWs. The testing and monitoring plan shall be submitted with the permit application, shall be subject to Administrator approval, and shall include a description of how the owner or operator will meet the requirements of this Section, including accessing sites for all necessary monitoring and testing during the life of the project.

(b) In addition to the requirements of W.S. § 35-11-313, testing and monitoring associated with geologic sequestration projects shall include:

(i) Analysis of the carbon dioxide stream with sufficient frequency to yield data representative of its chemical and physical characteristics;

(ii) Installation and use, except during well workovers, of continuous recording devices to monitor:

(A) Injection pressure;

(B) Injection rate and volume;

(C) Pressure on the annulus between the tubing and the long string casing;

(D) The annulus fluid volume added; and

(E) The pressure on the annulus between the tubing and the long string casing;

(iii) Corrosion monitoring of the well materials for loss of mass, loss of thickness, cracking, pitting, and other signs of corrosion, which shall be performed and recorded at least quarterly to ensure that the well components meet the minimum standards for material strength and performance set forth in Section 14(b) of this Chapter by:

(A) Analyzing coupons of the well construction materials placed in contact with the carbon dioxide stream;

(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 Administrator;

(iv) Periodic monitoring of the groundwater quality and geochemical changes above the confining zones that may be a result of carbon dioxide movement or displaced formation fluid movement through the confining zones or additional zones. The monitoring wells shall:

(A) Use specific information about the geologic sequestration project, including injection rate and volume, geology, the presence of artificial penetrations, and other relevant factors to establish the location and number of monitoring wells; and

(B) Use baseline geochemical data that have been collected under Section 10(b)(xvi) of this Chapter and any modeling results in the area of review evaluation required by Section 13(b) of this Chapter to establish the monitoring frequency and spatial distribution of monitoring wells;

(v) A demonstration of external mechanical integrity pursuant to Section 19(c) at least once per year until the well is plugged;

(vi) If required by the Administrator, a casing inspection log pursuant to requirements of Section 19(d) of this Chapter at a frequency established in the testing and monitoring plan;

(vii) A pressure fall-off test that identifies reservoir conditions with respect to flow dynamics at least once every five (5) years, unless more frequent testing is required by the Administrator based on site-specific information;

(viii) Testing and monitoring to track the extent of the carbon dioxide plume, the position of the pressure front, and surface displacement using:

(A) Direct methods in the injection zone(s); and

(B) Indirect methods in the injection zone (e.g., seismic, electrical, gravity, or electromagnetic surveys and/or down-hole carbon dioxide detection tools) unless the Administrator determines, based on site-specific geology, that such methods are not appropriate;

(ix) Based on site-specific conditions, surface air monitoring or soil gas monitoring to detect movement of carbon dioxide that could endanger a USDW or otherwise threaten human health, safety, or the environment;

(A) The surface air or soil gas monitoring plan shall:

(I) Be based on potential risks to USDWs, and modeling within the area of review;

(II) Use baseline data to establish the monitoring frequency and spatial distribution of surface air monitoring or soil gas monitoring; and

(III) Specify how the proposed monitoring will yield useful information for the area of review delineation and the potential movement of fluid:

(1.) Containing any contaminant into USDWs in exceedance of any primary drinking water regulation under 40 C.F.R. Part 141; or

(2.) Which may otherwise adversely affect human health, safety, or the environment;

(B) If an owner or operator demonstrates that monitoring employed under 40 C.F.R. §§ 98.440 to 98.449 accomplishes the goals of subparagraph (b)(ix)(A) of this Section, the Administrator shall approve the use of monitoring employed under 40 C.F.R. §§ 98.440 to 98.449. An owner or operator who uses monitoring employed under 40 C.F.R. §§ 98.440 to 98.449 to meet the requirements of this Section shall comply with 40 C.F.R. §§ 98.440 to 98.449;

(x) Any additional monitoring, as required by the Administrator, necessary to support, upgrade, and improve computational modeling of the area of review re-evaluation required under Section 13(c) of this Chapter and as necessary to demonstrate that there is no movement of fluid containing any contaminant into USDWs in exceedance of any primary drinking water regulation under 40 C.F.R. Part 141, Subparts E, F, and G, or which could otherwise adversely affect human health, safety, or the environment;

(xi) The owner or operator shall periodically review the testing and monitoring plan to incorporate monitoring data collected under this Section, operational data collected under Section 18 of this Chapter, and the most recent area of review reevaluation performed under Section 13 of this Chapter. The owner or operator shall review the testing and monitoring plan at least once every five (5) years. Based on this review, the owner or operator shall submit an amended testing and monitoring plan or demonstrate to the Administrator that no amendment to the testing and monitoring plan is needed. Any amendments to the testing and monitoring plan

are subject to approval by the Administrator, shall be incorporated into the permit, and are subject to the permit modification requirements of Section 6 of this Chapter. Amended plans or demonstrations shall be submitted to the Administrator as follows:

(A) Within one (1) 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; or

(C) When required by the Administrator; and

(xii) A quality assurance and surveillance plan for all testing and monitoring requirements.

(c) The owner or operator shall create and retain records of all monitoring information that include:

(i) The date, time, and exact place, of sampling or measurements;

(ii) The individuals who performed the sampling or measurements;

(iii) The dates analyses were performed;

(iv) The individuals who performed the analyses;

(v) The analytical techniques or methods used; and

(vi) The results of such analyses.

Section 21. Record Retention.

(a) An owner or operator of a Class VI well shall maintain records according to the following schedules:

(i) Calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three (3) years from the date of the sample, measurement, report, or application. This period may be extended by request of the Administrator at any time;

(ii) The nature and composition of all injected fluids until ten (10) years after the completion of any plugging and abandonment procedures under Section 23 of this Chapter;

(iii) All modeling inputs and data used to support area of review reevaluations under Section 13 of this Chapter shall be retained for ten (10) years;

(iv) The well-plugging report required by Section 23 of this Chapter, the site closure report required by Section 24 of this Chapter, and any post-injection site care data, (including data and information used to establish the post-injection site care time frame) shall be retained for ten (10) years following site closure;

(v) All data used to complete permit applications shall be retained for the life of the geologic sequestration project and for ten (10) years following site closure; and

(vi) All other monitoring records required by a permit shall be retained for a period of ten (10) years following site closure.

(b) The owner or operator must deliver the records to the Administrator at the conclusion of the retention period, and the records must thereafter be retained at a location designated by the Administrator for that purpose.

Section 22. Reporting and Notice Requirements.

(a) The owner or operator shall provide the following reports to the Administrator, for each Class VI well:

(i) Semi-annual reports. Semi-annual reports required by the permit shall be submitted to the Administrator within thirty (30) days following the end of the period covered in the report and shall contain:

(A) Any changes to the physical, chemical, and other relevant characteristics of the carbon dioxide stream from the proposed operating data;

(B) Monthly average, maximum, and minimum values for injection pressure, flow rate and volume, and annular pressure;

(C) A description of any event that exceeds operating parameters for annulus pressure or injection pressure as specified in the permit;

(D) A description of any event that triggers a shutdown device required pursuant to Section 18(g) of this Chapter, and the response taken;

(E) The monthly volume of the carbon dioxide stream injected over the reporting period and project cumulatively;

(F) Monthly annulus fluid volume added; and

(G) The results of monitoring required by Section 20 of this Chapter;

(ii) Reports, within thirty (30) days, the results of:

(A) Periodic tests of mechanical integrity;

(B) Any other test of the injection well conducted by the owner or operator if required by the Administrator; and

(C) Any well workover; and

(iii) Reports, within twenty-four (24) hours, of:

(A) Any evidence that the injected carbon dioxide stream or associated pressure front may cause an endangerment to a USDW;

(B) Any noncompliance with a permit condition, or malfunction of the injection system, which may cause fluid migration into or between USDWs;

(C) Any triggering of a shut-off system, either down-hole or at the surface;

(D) Any release of carbon dioxide to the atmosphere or biosphere indicated by the surface air or soil gas monitoring or other monitoring technologies required by Section 14(b)(ix) of this Chapter; and

(E) Any failure to maintain mechanical integrity.

(b) Owners or operators shall notify the Administrator in writing thirty (30) days in advance of:

(i) Any planned well workover;

(ii) Any planned stimulation activities, other than stimulation for formation testing conducted under Section 10 of this Chapter; and

(iii) Any other planned test of the injection well conducted by the owner or operator.

(c) Owners or operators shall submit all required reports, submittals, and notifications to both the Administrator and to EPA (in an electronic format acceptable to EPA).

(d) Owners or operators shall submit a written report to the Administrator of all remedial work concerning the failure of equipment or operational procedures that resulted in a violation of a permit condition at the completion of the remedial work.

(e) For any aborted or curtailed operation, the owner or operator shall submit to the Administrator a complete report within thirty (30) days of complete termination of the discharge or associated activity.

Section 23. Injection Well-plugging.

(a) Prior to well-plugging, the owner or operator shall flush each Class VI injection well with a buffer fluid, determine bottom hole reservoir pressure, and perform a final external mechanical integrity test in accordance with Section 19 of this Chapter.

(b) The owner or operator of a Class VI well shall prepare, maintain, update on the same schedule as the update to the area of review delineation, and comply with a well-plugging plan that is approved by the Administrator. The well-plugging plan shall include the following information:

(i) Appropriate test or measure to determine bottom hole reservoir pressure;

(ii) Appropriate testing methods to ensure final external mechanical integrity as specified in Section 19 of this Chapter;

(iii) The type and number of plugs to be used;

(iv) The placement of each plug including the elevation of the top and bottom of each plug;

(v) The type and grade and quantity of material, suitable for use with the carbon dioxide stream, to be used in plugging; and

(vi) A description of the method of placement of the plugs.

(c) Any amendments to the injection well-plugging plan are subject to approval by the Administrator, shall be incorporated into the permit if approved, and are subject to the permit modification requirements of Section 6 of this Chapter.

(d) The owner or operator shall notify the Administrator, in writing, at least sixty (60) days before plugging a well.

(i) If any changes have been made to the original well-plugging plan, the owner or operator shall also provide the revised well-plugging plan with notice of its intent to plug the well.

(ii) The Administrator may allow a shorter notice period.

(e) Within sixty (60) days after completion of plugging and abandonment of a well or well field, the owner or operator shall submit to the Administrator a final report that includes:

(i) Certification of completion in accordance with approved plans and specifications by a licensed professional engineer or a licensed professional geologist; and

(ii) Certification of accuracy by the owner or operator and by the person who performed the plugging operation (if other than the owner or operator).

Section 24. Post-injection Site Care and Site Closure.

(a) The owner or operator of a Class VI well shall prepare, maintain, update on the same schedule as the update to the area of review delineation, and comply with a plan for post-injection site care and site closure that meets the requirements of subparagraph (a)(ii) of this Section and is approved by the Administrator.

(i) The post-injection site care and site closure plan is subject to approval by the Administrator in consultation with EPA.

(ii) The post-injection site care and site closure plan shall include the following information:

(A) A demonstration containing substantial evidence that the geologic sequestration project will no longer pose a risk of endangerment to USDWs and will not harm or present a risk to human health, safety, or the environment at the end of the post-injection site care timeframe. The demonstration shall be based on significant, site-specific data and information, including all data and information collected pursuant to Sections 10 and 12 of this Chapter;

(B) The site closure plan shall address all reclamation, monitoring, and remediation sufficient to show that the carbon dioxide stream injected into the geologic sequestration site will not harm human health, safety, the environment, or drinking water supplies;

(C) Detailed plans for post-injection monitoring, verification, maintenance, and mitigation;

(D) The pressure differential between pre-injection and predicted post-injection pressures in the injection zone;

(E) The predicted position of the carbon dioxide plume and associated pressure front at the time when plume movement has ceased and pressure differentials sufficient to cause the movement of injected fluids or formation fluids into a USDW are no longer present, as demonstrated in the area of review evaluation required under Section 13(b)(i) of this Chapter;

(F) A description of post-injection monitoring locations, methods, and proposed frequency;

(G) A proposed schedule for submitting post-injection site care monitoring results pursuant to Section 22(c) of this Chapter;

(H) The duration of the post-injection site care timeframe that ensures compliance with subparagraph (A) of this paragraph;

(I) The results of computational modeling performed pursuant to delineation of the area of review under Section 13 of this Chapter;

(J) The predicted timeframe for pressure decline:

(I) Within the injection zone and any other zones such that formation fluids may not be forced into any USDWs; or

(II) To pre-injection pressures;

(K) The predicted rate of carbon dioxide plume migration within the injection zone, and the predicted timeframe for the cessation of migration;

(L) 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;

(M) The predicted rate of carbon dioxide trapping in the immobile capillary phase, dissolved phase, and mineral phase;

(N) The results of laboratory analyses, research studies, and field or site-specific studies to verify the information required in subparagraphs (J) and (K) of this paragraph;

(O) A characterization of the confining zones including a demonstration that they are free of transmissive faults, fractures, and micro-fractures and of appropriate thickness, permeability, and integrity to impede fluid (including carbon dioxide and formation fluids) movement;

(P) The presence of potential conduits for fluid movement, including planned injection wells and project monitoring wells associated with the proposed geologic sequestration project or any other projects in proximity to the predicted or modeled final extent of the carbon dioxide plume and area of elevated pressure;

(Q) A description of the well construction and an assessment of the quality of plugs of all abandoned wells within the area of review;

(R) The distance between the injection zone and the nearest USDWs above and below the injection zone; and

(S) Any additional site-specific factors required by the Administrator.

(iii) Information submitted to support the demonstration in subparagraph (a)(ii) of this Section shall meet the following criteria:

(A) All analyses and tests performed shall be accurate, reproducible, and performed in accordance with industry standards;

(B) Estimation techniques shall be appropriate;

(C) EPA-certified test protocols shall be used where available;

(D) Predictive models shall 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;

(E) Predictive models shall be calibrated using existing information (which may be obtained from Class I, Class II, Class V experimental technology, or Class VI well sites) where sufficient data are available;

(F) Reasonably conservative values and modeling assumptions shall be used and disclosed to the Administrator whenever values are estimated on the basis of known, historical information instead of site-specific measurements;

(G) An analysis shall be performed to identify and assess aspects of the post-injection site care timeframe demonstration that contribute significantly to uncertainty. The owner or operator shall conduct sensitivity analyses to determine the effect that significant uncertainty may contribute to the modeling demonstration;

(H) An approved quality assurance and quality control plan shall address all aspects of the demonstration; and

(I) Any additional criteria required by the Administrator shall be met.

(iv) Upon cessation of injection, owners or operators of Class VI wells shall either submit an amended post-injection site care and site closure plan or demonstrate to the Administrator through monitoring data and modeling results that no amendment to the plan is needed. Any amendments to the post-injection site care and site closure plan shall be:

(A) Subject to approval by the Administrator;

(B) Incorporated into the permit; and

(C) Subject to the permit modification requirements of Section 6 of this Chapter.

(v) The owner or operator may amend the post-injection site care and site closure plan. The owner or operator shall re-submit the post-injection site care and closure plan for the Administrator's approval within thirty (30) days of amending the plan.

(vi) Upon receipt of the Administrator's approval of the post-injection site care and site closure plan, the owner or operator shall submit the proposed cost estimate for measurement, monitoring, and verification of plume stabilization required by Section 26(i) of this Chapter.

(b) The owner or operator shall monitor the site following the cessation of injection to ascertain the position of the carbon dioxide plume and pressure front and demonstrate that USDWs are not being endangered.

(i) The owner or operator shall continue to conduct monitoring as specified in the Administrator-approved post-injection site care and site closure plan until the Administrator certifies site closure pursuant to Section 24(b)(iii) of this Chapter.

(ii) The owner or operator may request that the post-injection site care and site closure plan be revised to reduce the frequency of monitoring, and the Administrator may approve the request if the owner or operator demonstrates that the plan should be revised.

(iii) Prior to certification of site closure, the owner or operator shall demonstrate to the Administrator, based on monitoring, other site-specific data, and modeling that is reasonably consistent with site performance, that no additional monitoring is needed to ensure that the geologic sequestration project does not, and is not expected to endanger a USDW or otherwise threaten human health, safety, or the environment. In addition, the owner or operator shall demonstrate, based on the best available understanding of the site including monitoring data and modeling, that all other site closure standards and requirements have been met.

(iv) If the owner or operator does not demonstrate that the requirements of subparagraph (b)(iii) of this Section have been met, the owner or operator shall continue post-injection site care.

(v) The owner or operator shall notify the Administrator, in writing, at least 120 days before filing a request for site closure. At this time, if any changes have been made to the original post-injection site care and site closure plan, the owner or operator shall also provide the revised plan. The Administrator may allow a shorter notice period.

(vi) Post-injection site care shall continue for a period that meets the criteria of W.S. § 35-11-313(f)(vi)(F).

(c) After the Administrator has certified site closure, the owner or operator shall plug monitoring wells in a manner approved by the Administrator that will not allow movement of injection or formation fluids.

(d) The owner or operator shall submit a site closure report within ninety (90) days after completion of all closure operations. The report shall include:

(i) Documentation of injection and monitoring well-plugging that meets the requirements of Section 23 of this Chapter and paragraph (c) of this Section;

(ii) A copy of a survey plat that has been submitted to the local zoning authority designated by the Administrator, and:

(A) The plat shall indicate the location of the injection well(s) and monitoring wells relative to permanently surveyed benchmarks; and

(B) The owner or operator shall also submit a copy of the plat to the US EPA Regional Administrator;

(iii) Documentation of appropriate notification and information to the State, local and tribal authorities that have authority over drilling activities to enable them to impose appropriate conditions on subsequent drilling activities that may penetrate the injection and confining zones;

(iv) Proof that the owner or operator has:

(A) Published notice of the application for site closure, including a mechanism to request a public hearing, in a newspaper of general circulation in each county of the proposed operation at weekly intervals for four (4) consecutive weeks; and

(B) Mailed notice of the application for site closure to all surface owners, mineral claimants, mineral owners, lessees, and other owners of record of subsurface interests that are located within one (1) mile of the proposed boundary of the geologic sequestration site; and

(v) Records of the nature, composition, and volume of the carbon dioxide stream.

(e) Each owner or operator of a Class VI injection well shall record a notation on the deed to the facility property or any other document that is normally examined during title search that will in perpetuity provide notice to any potential purchaser of the property, and shall file an affidavit in accordance with W.S. § 35-11-313(f)(vi)(G), that includes the following information:

(i) The fact that land has been used to sequester carbon dioxide;

(ii) The name of the State agency, local authority, or Tribe with which the survey plat was filed, as well as the address of the EPA regional office to which it was submitted; and

(iii) The volume of fluid injected, the injection zone or zones into which it was injected, and the period over which injection occurred.

Section 25. Emergency and Remedial Response.

(a) All owners or operators of a Class VI well shall develop, maintain, and comply with an emergency and remedial response plan that describes actions to be taken to address movement of the injectate or formation fluids that endangers a USDW or threatens human health, safety, or the environment during construction, operation, closure, and post-closure periods.

(i) The emergency and remedial response plan shall be reviewed and updated, as necessary, on the same schedule as the update to the area of review delineation.

(ii) Any amendments to the emergency and remedial response plan shall be subject to approval by the Administrator, shall be incorporated into the permit, and are subject to the permit modification requirements of Section 6 of this Chapter. Amendments to the emergency and remedial response plan shall be submitted to the Administrator as follows:

(A) Within one (1) year of an area of review reevaluation;

(B) Following any significant changes to the facility, such as addition of injection or monitoring wells; or

(C) When required by the Administrator.

(iii) The emergency and remedial response plan shall account for the entire area of review delineated pursuant to Section 13 of this Chapter, regardless of whether corrective action in the area of review is phased.

(b) If any monitoring data or other information indicate that any contaminant, the injected carbon dioxide stream, displaced formation fluids, or associated pressure front may endanger a USDW or threaten human health, safety, or the environment, the owner or operator shall:

(i) Immediately cease injection;

(ii) Take all steps reasonably necessary to identify and characterize any release;

(iii) Orally notify the Administrator within twenty-four (24) hours of discovering the condition; and

(iv) Provide a written report to the Administrator within five (5) days of discovering the condition. The written report shall contain:

(A) A description of the noncompliance and its cause;

(B) The period of noncompliance, including exact dates and times, and, if the noncompliance has not been controlled, the anticipated time it is expected to continue; and

(C) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

(c) If an owner or operator discovers any noncompliance with a permit condition or a requirement of this Chapter that may cause fluid migration into or between USDWs, any malfunction of the injection system that may cause fluid migration into or between USDWs, or any excursion, the owner or operator shall:

(i) Orally notify the Administrator within twenty-four (24) hours of discovering the condition;

(ii) Provide a written report to the Administrator within five (5) days of discovering the condition, which shall contain:

(A) A description of the noncompliance, malfunction, or excursion and its cause;

(B) The period of noncompliance, malfunction, or excursion, including exact dates and times, and, if the noncompliance, malfunction, or excursion has not been controlled, the anticipated time it is expected to continue;

(C) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance, malfunction, or excursion.

(iii) If an excursion is discovered, provide written notice to all surface owners, mineral claimants, mineral owners, lessees, and other owners of record of subsurface interests within thirty (30) days of discovering the excursion; and

(iv) Implement the emergency and remedial response plan approved by the Administrator.

(d) The Administrator may allow the owner or operator to resume injection prior to implementing the emergency and remedial response plan if the owner or operator demonstrates that the injection operation will not endanger USDWs or otherwise threaten human health, safety, or the environment.

(e) If any water quality monitoring of a USDW indicates the movement of any contaminant into the USDW, except as authorized under this Chapter, the Administrator shall prescribe any additional requirements for construction, corrective action, operation, monitoring, reporting, or closure of the injection well that are necessary to prevent further movement, and:

(i) If the well responsible for the movement is authorized by permit, these additional requirements shall be imposed by modifying the permit; or

(ii) The Director may terminate or revoke and reissue the permit pursuant to Section 7 of this Chapter.

Section 26. Financial Responsibility.

(a) Owners or operators of Class VI wells shall establish, demonstrate, and maintain financial responsibility for all applicable phases of the geologic sequestration project, including complete site reclamation in the event of default. The phases of a geologic sequestration project are :

(i) Permitting/characterization;

(ii) Testing and monitoring, pursuant to Section 20 of this Chapter;

(iii) Operations, including injection and well-plugging, pursuant to Sections 18 and 23 of this Chapter;

(iv) Post-injection site care, including plume stabilization, monitoring, measurement, verification, corrective action, and other actions needed to ensure that underground sources of drinking water are not endangered from the time of well-plugging until site closure is certified by the Administrator and above ground-reclamation is completed, pursuant to Section 24 of this Chapter; and

(v) Emergency and remedial response pursuant to Section 25 of this Chapter.

(b) The owner or operator shall develop and annually update in accordance with paragraph (f) of this Section, a written financial assurance cost estimate.

(i) The financial assurance cost estimate shall include the cost in current dollars of:

(A) Performing corrective action on other wells in the area of review that require corrective action under Section 13 of this Chapter;

(B) Plugging the injection wells under Section 23 of this Chapter;

(C) Post-injection site care and site closure under Section 24 of this Chapter;

(D) Testing and monitoring under Section 20 of this Chapter; and

(E) Emergency and remedial response under Section 25 of this Chapter.

(ii) The financial assurance cost estimate shall consider the following events:

(A) Contamination of underground sources of water including, drinking water supplies;

(B) Mineral rights infringement;

(C) Single large-volume release of carbon dioxide that impacts human health and safety or that causes ecological damage;

(D) Low-level leakage of carbon dioxide to the surface that impacts human health and safety or that causes ecological damage;

(E) Storage rights infringement;

(F) Property and infrastructure damage, including changes to surface topography and structures;

(G) Entrained contaminant releases of contaminants other than carbon dioxide;

(H) Accidents and unplanned events;

(I) Well capping and permitted abandonment; and

(J) Removal of above-ground facilities and site reclamation.

(iii) The owner or operator shall consider the Risk Activity Matrix in Appendix A of this Chapter to develop the financial assurance cost estimate.

(iv) The financial assurance cost estimate shall be based upon a multi-disciplinary analytical framework such as Monte Carlo or other commonly accepted stochastic modeling tools.

(A) Cost curves shall combine risk probabilities, event outcomes, and damages assessment to calculate expected losses under a series of events.

(B) For all cases of potential damages, the probability distributions should be identified for 50 percent, 95 percent, and 99 percent probabilities of occurrence.

(v) The owner or operator shall perform the financial assurance cost estimate for each phase separately.

(vi) The owner or operator shall base the financial assurance cost estimate on the costs to the regulatory agency of hiring a third party (that is not within the corporate structure

of the owner or operator) to perform the required activities.

(vii) The financial assurance cost estimate shall account for the entire area of review delineated pursuant to Section 13 of this Chapter.

(viii) The owner or operator shall submit an updated financial assurance cost estimate to the Administrator annually within thirty (30) days of the anniversary date when the original financial assurance cost estimate was submitted.

(c) The financial responsibility instruments used shall be from the following list of qualifying instruments and shall be submitted on a Wyoming Department of Environmental Quality form:

(i) Irrevocable Trust Funds with government-backed securities;

(ii) Surety Bonds;

(iii) Irrevocable Letter of Credit;

(iv) Cash; or

(v) Federally Insured Certificates of Deposit.

(d) The qualifying instruments shall be sufficient to cover the cost of the financial assurance cost estimate required in paragraph (b) of this Section.

(e) The qualifying financial responsibility instruments shall comprise protective conditions of coverage that include at a minimum cancellation, renewal, continuation provisions, specifications on when the provider becomes liable following a notice of cancellation, and requirements for the provider to meet a minimum rating, minimum capitalization, and the ability to pass the bond rating test when applicable.

(i) An owner or operator shall provide that their financial mechanism may not cancel, terminate or fail to renew except for failure to pay such financial instrument.

(A) 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 owner or operator and the Director;

(B) The cancellation shall not be final for 120 days after receipt of cancellation notice;

(C) Within sixty (60) days of notice of cancellation, the owner or operator shall provide to the Director an alternate financial responsibility demonstration that meets the requirements of paragraphs (c), (d), (e), (f), and (g) of this Section; and

(D) If an alternate financial responsibility demonstration is not acceptable (or possible), any funds from the instrument being cancelled shall be released within sixty (60) days of notification by the Director.

(ii) Owners or operators shall renew all financial instruments, if an instrument expires, for the entire term of the geologic sequestration project. The instrument may be automatically renewed as long as, at a minimum, the owner or operator has the option of renewal at the face amount of the expiring instrument.

(iii) Cancellation, termination, or failure to renew may not occur and the financial instrument shall remain in full force and effect in the event that on or before the date of expiration:

(A) The Administrator deems the facility abandoned.

(B) The permit is terminated, revoked, or a new permit is denied.

(C) Closure is ordered by the Director, a U.S. district court, or other court of competent jurisdiction.

(D) The owner or operator is named as debtor in a voluntary or involuntary proceeding under Title 11 (Bankruptcy), U.S. Code.

(E) The amount due is paid.

(f) The qualifying financial responsibility instruments are subject to approval by the Director. The use and length of pay-in-periods for trust funds and escrow accounts are also subject to approval by the Director.

(i) No Class VI permit shall be issued until and unless the Director has considered and approved the financial responsibility demonstration for all phases of the geologic sequestration project.

(ii) The Director may negotiate a satisfactory financial responsibility demonstration or deny a demonstration.

(iii) The owner or operator shall provide any updated information related to financial responsibility instruments on an annual basis, and if there are any changes, the Director shall evaluate the financial responsibility demonstration and determine whether the instruments used are adequate. The owner or operator shall maintain financial responsibility requirements regardless of the status of the Director's review of the financial responsibility demonstration.

(iv) The owner or operator shall provide an adjustment of the financial assurance cost estimate to the Administrator within sixty (60) days of receiving notice that the Administrator has determined that a demonstration of financial assurance is not adequate to cover the cost of corrective action, injection well-plugging, post-injection site care and site

closure, and emergency and remedial response.

(v) During all phases of the geologic sequestration project, the owner or operator shall adjust the financial assurance cost estimate for inflation within sixty (60) days prior to the anniversary date of the establishment of the financial instruments used to comply with this Section and provide this adjustment to the Administrator. The owner or operator shall also provide to the Administrator written updates of adjustments to the cost estimate within sixty (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 site closure plan, the emergency and remedial response plan, and mitigation or reclamation costs that the State may incur as a result of any default by the permit holder.

(vi) Any decrease or increase to the financial assurance cost estimate shall be subject to approval by the Administrator. During all phases of the geologic sequestration project, the owner or operator shall revise the cost estimate no later than sixty (60) days after the Administrator has approved a request to modify the area of review and corrective action plan, the injection well-plugging plan, the post-injection site care and site closure plan, or the emergency and response plan, if the change in the plan increases the cost. If the change to the plan decreases the cost, any withdrawal of funds is subject to approval by the Administrator. Any decrease to the value of the financial assurance instrument is subject to approval by the Administrator.

(vii) Whenever the current financial assurance cost estimate increases to an amount greater than the face amount of a financial instrument currently in use, the owner or operator, within sixty (60) days after the increase, shall either cause the face amount to be increased to an amount at least equal to the current financial assurance cost estimate and submit evidence of such increase to the Administrator, or the owner or operator shall obtain other financial responsibility instruments to cover the increase. Whenever the current financial assurance cost estimate decreases, the face amount of the financial assurance instrument may be reduced to the amount of the current financial assurance cost estimate only after the owner or operator has received written approval from the Administrator.

(g) The owner or operator may demonstrate financial responsibility by using one (1) or multiple qualifying financial instruments subject to the following requirements:

(i) Owners or operators that propose to demonstrate financial assurance with surety bonds shall meet the following requirements:

(A) A corporate surety shall not be considered good and sufficient unless:

(I) It is licensed to do business in the State;

(II) The estimated bond amount does not exceed the limit of risk as provided for in W.S. § 26-5-110, nor raise the total of all bonds held by the applicant under that surety above three (3) times the limit of risk; and

(III) The surety agrees:

(1.) Not to cancel bond unless the Department gives prior written approval of a good and sufficient replacement surety with transfer of the liability that has accrued against the operator on the permit area, site, or facility;

(2.) To be jointly and severally liable with the permittee, owner, or operator.

(3.) To provide immediate written notice to the Department and operator once it becomes unable or may become unable due to any action filed against it to fulfill its obligations under the bond.

(B) If for any reason the surety becomes unable to fulfill its obligations under the bond, the operator shall provide the required notice. Failure to comply with this provision shall result in suspension of the permit.

(C) The surety bond shall be submitted on a Wyoming Department of Environmental Quality form.

(ii) Owners or operators that propose to demonstrate financial assurance with cash, or government securities, or a combination of both, shall meet the following requirements:

(A) Securities that are unencumbered shall only include those that are United States government securities or state government securities that are acceptable to the Director. Government securities shall be endorsed to the order of the Department and placed in possession of the Department. Possession shall be in the form of the cash value of the irrevocable trust for the full amount of the reclamation obligation and payable to the Department and federally insured.

(B) An owner or operator shall satisfy the requirements of this subsection by establishing an irrevocable trust that conforms to the requirements below and submitting an originally signed duplicate of the trust agreement to the Director for consideration.

(I) The irrevocable trust shall be submitted to the Director on the Wyoming Department of Environmental Quality Irrevocable Trust Form and be signed by the owner, operator, or guarantor as principal and the financial institution as Trustee, and made payable to the Department;

(II) The Trustee shall be a bank organized to do business in the United States that has the authority to act as a trustee and whose trust operations is regulated and examined by a federal agency;

(III) The irrevocable trust shall be cash funded for the full amount of the financial assurance obligation to be provided in the irrevocable trust before it may be approved to satisfy the requirements of financial assurance in lieu of a bond. For purposes of

this subsection, "the full amount of the financial assurance obligation to be provided" means the amount of coverage required to be provided by paragraphs (b) and (i) of this Section, less the amount of financial assurance obligation that is being provided by other financial assurance mechanisms being used to demonstrate financial assurance by the owner, operator, or guarantor;

(IV) Any bond may be canceled by the surety only after ninety (90) days written notice to the Director, and upon receipt of the Director's written consent, which may be granted only when the requirements of the irrevocable trust have been fulfilled; and

(V) Irrevocable trust forfeiture proceedings shall occur only after the Department provides notice to the owner or operator and trustee pursuant to W.S. 35-11-701 that a violation exists and the Environmental Quality Council has approved the request of the Director to begin forfeiture proceedings.

(iii) Owners or operators that propose to demonstrate financial assurance with irrevocable letters of credit shall meet the following conditions:

(A) The irrevocable letter of credit shall be payable to the Department in part or in full upon demand and receipt from the Director of a notice of forfeiture issued in accordance with paragraph (t) of this Section;

(B) The irrevocable letter of credit shall not be in excess of ten percent of the issuing or supporting bank's capital surplus account as shown on a balance sheet liabilities certified by a certified public accountant;

(C) The Director shall not accept standby letters of credit;

(D) The Director shall not accept letters of credit from a bank for any person, on all permits held by that person, in excess of the limitations imposed by W.S. §13-3-402; and

(E) The irrevocable letter of credit shall provide that:

(I) The bank will give prompt notice to the owner or operator and the Director of any notice received or action filed alleging the insolvency or bankruptcy of the bank or alleging any violations of regulatory requirements that could result in suspension or revocation of the bank's charter or license to do business;

(II) In the event the bank becomes unable to fulfill its obligations under the letter of credit for any reason, notice shall be given immediately to the owner or operator and the Director; and

(III) Upon the incapacity of a bank by reason of bankruptcy, insolvency, or suspension or revocation of its charter or license, the owner or operator shall be deemed to be without performance bond coverage in violation of the Act. The Director shall issue a notice of violation against any owner or operator who is without bond coverage,

specifying a reasonable period to replace bond coverage, not to exceed ninety (90) days. During this period the Director or the Director's designated representative shall conduct weekly inspections to ensure continuing compliance with other permit requirements, the regulations and the Act. If the notice is not abated in accordance with the schedule, a cessation order shall be issued.

(IV) The irrevocable letter of credit may be cancelled by the surety only after ninety (90) days notice to the Director, and upon receipt of the Director's written consent, which may be granted only when the requirements of the bond have been fulfilled.

(F) The irrevocable letter may only be issued by a bank organized to do business in the U.S. that identifies by name, address, and telephone number an agent upon whom any process, notice or demand required or permitted by law to be served upon the bank may be served.

(I) If the bank fails to appoint or maintain an agent in this State, or whenever any such agent cannot be reasonably found, then the Director shall be an agent for such bank upon whom any process, notice or demand may be served for the purpose of this Chapter. In the event of any such process, the Director shall immediately cause one copy of such process, notice or demand to be forwarded by registered mail to the bank at its principal place of business. The Director shall keep a record of all processes, notices, or demands served upon him under this paragraph, and shall record therein the time of such service and his action with reference thereto.

(II) Nothing herein contained shall limit or affect the right to serve any process, notice or demand required or permitted by law to be served upon the bank in any other manner now or hereafter permitted by law.

(h) The owner or operator shall maintain financial responsibility and resources until:

(i) The Administrator receives the site closure report and certifies site closure.

(A) When the conditions of W.S. § 35-11-313(f)(vi)(F) have been met, the owner or operator may submit a written request to the Administrator to release the retained financial assurance instruments; and

(B) The Administrator shall evaluate the request within sixty (60) days of the receipt of the financial assurance release request.

(I) If the Administrator finds the owner or operator has demonstrated the requirements of W.S. § 35-11-313(f)(vi)(F) have been met, the Administrator shall prepare a draft recommendation to the Director to approve the request and provide public notice pursuant to Section 27 of this Chapter.

(II) Re-submittal of information by an operator for an incomplete demonstration of the requirements of W.S. § 35-11-313(f)(vi)(F) will restart the process described in this subsection.

(III) If the Administrator finds the owner or operator has not demonstrated the requirements of W.S. § 35-11-313(f)(vi)(F) have been met, the Administrator shall prepare a draft recommendation to the Director to deny the request.

(C) After receiving public comment and holding a hearing (if a hearing is held) pursuant to Section 27 of this Chapter, the Director shall determine whether the operator has demonstrated the requirements of W.S. § 35-11-313(f)(vi)(F) have been met.

(I) If the Director finds the owner or operator has demonstrated the requirements of W.S. § 35-11-313(f)(vi)(F) have been met, the Director shall notify the owner or operator and request the State Treasurer to release that portion of the final financial assurance instruments. The State Treasurer shall then return the financial assurance instruments constituting that portion of the financial assurance so retained.

(II) If the Director finds the owner or operator has not demonstrated the requirements of W.S. § 35-11-313(f)(vi)(F) have been met, the Director shall notify the owner or operator by registered mail within a reasonable time after the request is filed. The notice shall state the reasons for denial and shall recommend corrective actions.

(ii) The owner or operator meets the requirements for release from a financial instrument in the following circumstances:

(A) The owner or 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 Director, including obtaining financial responsibility for the next phase of the geologic sequestration project, if required;

(B) The owner or operator has submitted a replacement financial instrument and received written approval from the Director accepting the new financial instrument and releasing the owner or operator from the previous financial instrument; or

(C) The owner or operator has submitted a revised financial assurance cost estimate for the remaining phases of the geologic sequestration project. The revised financial assurance cost estimate may demonstrate that a partial release of the financial instrument is warranted and will still provide adequate financial assurance for the remainder of the geologic sequestration project. Partial release of the financial instrument is at the discretion of the Director.

(i) Within a reasonable time following certification of site closure by the Administrator, plume stabilization, the completion of all remediation work, and release of all other financial assurance instruments, the owner or operator shall submit a proposed cost estimate for measurement, monitoring, and verification of plume stabilization. The Administrator

shall evaluate and determine whether the proposed cost estimate is adequate.

(j) The owner or operator shall notify the Director by certified mail of adverse financial conditions, such as bankruptcy, that may affect its ability to complete injection well-plugging and post-injection site care and site closure.

(i) The owner or operator shall notify the Director by certified mail of the commencement of a voluntary or involuntary proceeding under Title 11 (Bankruptcy), U.S. Code, naming the owner or operator or the third-party provider of a financial responsibility instrument as debtor, within ten (10) days after commencement of the proceeding.

(ii) An owner or operator who fulfills the requirements of this Section by obtaining an irrevocable trust fund, surety bond, or irrevocable letter of credit shall be deemed to be without the required financial assurance in the event of:

(A) Bankruptcy of the trustee or issuing institution;

(B) A suspension or revocation of the authority of the trustee institution to act as trustee of the institution issuing the irrevocable trust fund, surety bond, or irrevocable letter of credit; or

(C) If the license to do business in Wyoming of the surety issuing financial assurance is suspended or revoked.

(iii) Within sixty (60) days after such an event the owner or operator shall establish other financial assurance that meets the requirements of paragraphs (c), (d), (e), (f), and (g) of this Section.

(k) The Department shall conduct bond forfeiture proceedings pursuant to W.S. § 35-11-421. If the forfeited financial assurance instrument is inadequate to cover the costs of the closure, mitigation, reclamation, measurement, monitoring, verification, and pollution control, the Department may request that the Attorney General bring suit to recover costs against the owner, operator, or permittee.

(l) The owner or operator shall obtain and maintain public liability insurance for a geologic sequestration project.

(i) The public liability insurance policy shall:

(A) Include coverage for the major risks identified in Appendix A to this Chapter;

(B) Provide minimum coverage that:

(I) Accounts for site-specific risk factor and bond adjustment factor calculations, based on the previous year’s information; and

(II) Is at least $15 million per occurrence with an annual aggregate of at least $45 million, exclusive of legal defense costs; and

(C) Include a rider that requires the insurer to notify the Administrator whenever substantive changes are made to the policy, including any termination or failure to renew.

(ii) The owner or operator shall recalculate the minimum coverage amount of the public liability insurance policy annually and at the same time that the owner or operator updates the financial assurance cost estimate pursuant to paragraph (b) of this Section. The owner or operator shall submit a copy of the current public liability insurance policy annually and at the same time that the owner or operator submits an updated financial assurance cost estimate pursuant to subparagraph (b)(viii) of this Section.

(iii) The owner or operator shall maintain the public liability insurance policy until the Administrator certifies that plume stabilization has been achieved.

Section 27. Public Participation, Public Notice and Public Hearing Requirements.

(a) The Administrator shall give public notice if a draft permit has been prepared, after receiving a financial assurance release request pursuant to Section 26(h)(i)(A) of this Chapter and finding the operator has met the requirements of W.S. 35-11-313(f)(vi)(F), or if a hearing has been scheduled.

(i) Public notice of the preparation of a draft permit shall allow at least sixty (60) days for public comment.

(ii) Public notice of a hearing or recommendation to release financial assurance after certifying site closure shall be given at least thirty (30) days before the hearing.

(iii) Public notice of a hearing may be given at the same time as public notice of the draft permit or of a draft recommendation to release financial assurance after certifying site closure, and the two notices may be combined.

(b) Public notice shall be given by:

(i) Providing a copy of the notice, a copy of the fact sheet, the permit application (if any), and the draft permit (if any) to the following persons:

(A) The applicant, by certified or registered mail;

(B) The U.S. Environmental Protection Agency, Region 8 Drinking Water Program, by mail;

(C) The U.S. Environmental Protection Agency, Underground Injection Control Program, by mail;

(D) Wyoming Game and Fish Department;

(E) Wyoming State Engineer;

(F) State Historical Preservation Officer;

(G) Wyoming Oil and Gas Conservation Commission;

(H) Wyoming Department of Environmental Quality, Land Quality Division;

(I) Wyoming State Geological Survey;

(J) Wyoming Water Development Office;

(K) Wyoming Department of Environmental Quality, Air Quality Division;

(L) Wyoming Department of Environmental Quality, Solid and Hazardous Waste Division; and

(M) U.S. Army Corps of Engineers;

(N) Federal agencies with jurisdiction over fish, shellfish, and wildlife resources and over coastal zone management plans;

(O) The Advisory Council on Historic Preservation;

(P) Any Tribes with Indian reservations and Indian lands identified pursuant to Sections 10(b)(v) and 10(b)(ix)(A)(VII) of this Chapter;

(Q) Persons on the mailing list developed by the Department, including those who request in writing to be on the list and participants in hearings in that area who request to be on "area" mailing lists; and

(R) Any unit of state or local government having jurisdiction over the area where the facility is proposed to be located.

(ii) Publishing the notice in a newspaper of general circulation in the location of the facility or operation; and

(iii) At the discretion of the Administrator, any other method reasonably expected to give actual notice of the proposed action to the persons potentially affected by it, including press releases or any other forum or medium to elicit public participation.

(c) All public notices issued under this chapter shall contain the following minimum information:

(i) Name and address of the Department;

(ii) Name and address of the owner, operator, permittee, or permit applicant, and, if different, of the facility or activity regulated by the permit;

(iii) A brief description of the business conducted at the facility or activity described in the permit application, described in the draft permit, or subject to regulation under this Chapter;

(iv) The type and quantity of wastes, fluids, or pollutants that are proposed to be or are being treated, stored, disposed of, injected, emitted, or discharged;

(v) A brief summary of the basis for the draft permit conditions, including references to applicable statutory or regulatory provisions;

(vi) Reasons why any requested variances or alternatives to required standards do or do not appear justified;

(vii) Name, address and telephone number of a person from whom interested persons may obtain further information, including copies of the draft permit, statement of basis, fact sheet, and the application; and

(viii) A brief description of comment procedures, including:

(A) Procedures to request a hearing;

(B) The beginning and ending dates of the comment period;

(C) The address where comments may be submitted; and

(D) Other procedures that the public may use to participate in the final permit decision.

(d) In addition to the information required in paragraph (c) of this Section, any notice for a hearing shall contain the following:

(i) Reference to the date of previous public notices relating to the permit;

(ii) Date, time, and place of hearing; and

(iii) A brief description of the nature and purpose of the hearing, including applicable rules and procedures.

(e) The Department shall provide an opportunity for the applicant, permittee, owner, operator, or any interested person to submit written comments regarding any aspect of a permit or to request a hearing.

(i) During the public comment period, any interested person may submit written comments on the draft permit and may request a hearing. Requests for hearings shall be made in writing to the Administrator and shall state the reasons for the request.

(ii) The Administrator shall hold a hearing whenever the Administrator finds, on the basis of requests, a significant degree of public interest in a draft permit.

(iii) The Administrator may hold a hearing whenever a hearing may clarify issues involved in a permit decision.

(iv) The public comment period shall automatically extend to the close of any hearing. The Administrator may also extend the comment period by so stating at the hearing.

(f) The Director shall render a decision on the draft permit within sixty (60) days after completion of the public comment period if no hearing is held. If a hearing is held, the Director shall make a decision on any Department hearing as soon as practicable after receipt of the transcript or after the expiration of the time set to receive written comments.

(g) At the time a final decision is issued, the Administrator shall respond in writing to comments received during the public comment period or during the hearing held by the Department. This response shall:

(i) Specify any changes that have been made to the permit and the reasons for the changes; and

(ii) Briefly describe and respond to all comments stating a technical or regulatory concern that is within the authority of the Department to regulate.

Section 28. Incorporation by Reference.

(a) These rules incorporate by reference the following statutes, rules, and regulations in effect as of July 1, 2020:

(i) 10 C.F.R. Part 20, Appendix B, Table II, Column 2, available at http://www.ecfr.gov;

(ii) 40 C.F.R. §§ 98.440 to 98.449,, available at http://www.ecfr.gov;

(iii) 40 C.F.R. § 141, Subparts E, F, and G, available at: http://www.ecfr.gov;

(iv) 40 C.F.R. § 261.3 available at: http://www.ecfr.gov;

(v) American Petroleum Institute Recommended Practice, API RP 14C, Recommended Practice for Analysis, Design, Installation and Testing of Safety Systems for Offshore Production Facilities, Recommended Practice 14C, (2018), referred to as "API RP 14C", available at https://www.apiwebstore.org/publications/item.cgi?af9eaacd-f8b0-4d7c-bfa7-2c39a409f892;

(vi) American Petroleum Institute Specification, API Spec 10A, Specification for Cements and Materials for Well Cementing. 25th Edition, (2019), referred to as "API Specification 10A", available at https://www.apiwebstore.org/publications/item.cgi?82493435-f281-45d8-af82-07ad8131cb56;

(vii) American Petroleum Institute Recommended Practice, API RP 10D-2, Centralizer Placement and Stop-collar Testing, (2020), referred to as "API RP 10D-2", available at https://www.apiwebstore.org/publications/item.cgi?7ad6705a-954e-476c-b520-47cbbdce9f06;

(viii) American Petroleum Institute Recommended Practice, API RP 10B-2, Recommended Practice for Testing Well Cements, (2019), referred to as "API RP 10B-2", available at https://www.apiwebstore.org/publications/item.cgi?3c1808c7-6312-4b8d-b3de-291ef79704c5;

(ix) American Petroleum Institute Recommended Practice, API RP 14B, Design, Installation, Repair, and Operation of Subsurface Safety Valve Systems, (2012), referred to as "API RP 14 B", available at https://www.apiwebstore.org/publications/item.cgi?a1711f10-0121-4c12-936c-471c97a19f93;

(x) American Petroleum Institute Specification, API Spec 5CT, Specification for Casing and Tubing, (2019), referred to as "API Specification 5CT", available at https://www.apiwebstore.org/publications/item.cgi?5b345884-5a3a-4889-8066-60f93e467f29;

(xi) American Petroleum Institute Recommended Practice, API RP 5C1, Recommended Practices for Care and Use of Casing and Tubing, (2020), referred to as "API RP 5C1", available at https://www.apiwebstore.org/publications/item.cgi?010058af-29b1-412c-b892-ec3e5583c534; and

(xii) American Petroleum Institute Specification, API Spec 11D1, Packers and Bridge Plugs, (2015), referred to as "API Specification 11D1", available at https://www.apiwebstore.org/publications/item.cgi?4828a454-0fea-451b-a61b-18304836ea91.

(b) For these rules incorporated by reference:

(i) The Environmental Quality Council has determined that incorporation of the full text in these rules would be cumbersome or inefficient given the length or nature of the

rules;

(ii) This Chapter does not incorporate later amendments or editions of incorporated codes, standards, rules, and regulations; and

(iii) All incorporated codes, standards, rules, and regulations are available for public inspection at the Department's Cheyenne office. Contact information for the Cheyenne office may be obtained at http://deq.wyoming.gov or from (307) 777-7937.

Appendix A. Risk Activity Table

	Major Risk (Feature, Event, or Process)
1	**Mineral Rights Infringement (Trespass)**
1.1	Leakage migrates into mineral zone or hydraulic front impacts recoverable mineral zone; causes may include plume migration different than modeled.
1.2	Post injection discovery of recoverable minerals.
1.3	New technology (or economic conditions) enables recovery of previously un-economically recoverable minerals.
1.4	Act of God (e.g. seismic event).
1.5	Formation fluid impact due to CO_2 injection.
1.6	Address also contributing causes 3.1, 3.2, 3.3, 3.5, 4.3, and 4.4
2	**Water Quality Contamination**
2.1	Leakage of CO_2 outside permitted area.
2.2	Leakage of drilling fluid contaminates potable water aquifer.
2.3	Rock/acid water (i.e. geochemistry) interaction contaminates potable water by carryover of dissolved contaminants.
2.4	Act of God (e.g. seismic event).
2.5	Formation fluid impact due to CO_2 injection.
2.6	See also contributing causes 3.1, 3.2, 3.3, 3.5, 4.3, and 4.4
3	**Single Large Volume CO_2 Release to the Surface – Asphyxiation/Health/Ecological**
3.1	Overpressurization (i.e. induced).
3.2	Caprock/reservoir failure.
3.3	Well blowout (e.g. at surface or bore failure below ground), includes monitoring wells – Causes could include seal failure (e.g. well, drilling or injection equipment).
3.4	Major mechanical failure of distribution system or storage facilities above ground or below ground (i.e. near the surface).
3.5	Orphan well failure (e.g. well not identified prior to injection).
3.6	Sabotage/Terrorist attack (e.g. on surface infrastructure).
3.7	Act of God (e.g. major seismic event)
4	**Low Level CO_2 Release to Surface – Ecological damage due to low-level releases; potential asphyxiation of human or ecological receptors**
4.1	Overpressurization (i.e. induced).
4.2	Caprock/reservoir failure (e.g. Plume migrates along fault line/fissure to surface).
4.3	Incomplete geological seal (e.g. inaccurate characterization of sub-surface geology).
4.4	Well seal failure (e.g. well, drilling or injection equipment) including monitor wells
4.5	Mechanical failure of distribution system or storage facilities above or below ground (e.g. near surface).
4.6	Orphan wells (e.g. well not identified prior to injection).
4.7	Induced seismicity leading to leakage.
4.8	Act of God (e.g. seismic event).

Risk Activity Table (continued)

	Major Risk (Feature, Event, or Process)
5	**Storage Rights Infringement (CO_2 or other entrained contaminant gases) – Form of Mineral Rights Infringement**
5.1	Leakage migrates into adjacent pore space; causes may include plume migrates faster than modeled.
5.2	Post injection decision (e.g. due to new technology or changed economic conditions) to store gas in adjacent pore space.
5.3	Acts of God affecting storage capacity of pore space.
5.4	Formation fluid impact due to CO_2 injection.
5.5	Will also require primary contributing causes 3.1, 3.2, 3.3, 3.5, 4.3, and 4.4
6	**Modified Surface Topography (subsidence or uplift) Resulting in Property/Infrastructure Damage**
6.1	Induced Seismicity – Pressure from geochemistry induced reactivation of historic fault or dissolution of material caused by subsidence.
6.2	Formation fluid impact due to CO_2 injection.
7	**Entrained Contaminant (Non-CO_2) Releases**
7.1	Change in CO_2 composition/properties (e.g. concentration of contaminate in CO_2 supply increases).
7.2	Microbial activity initiated by injection process or composition.
	Will also require primary contributing causes 3.1, 3.2, 3.3, 3.5, 4.3, and 4.4
8	**Accidents/Unplanned Events (Typical Insurable Events)**
8.1	Surface infrastructure damage
8.2	Saline water releases from surface storage impoundment.