

The Texas Natural Resource Conservation Commission (TNRCC or commission) proposes amendments to §331.121, Class I Wells; §331.161, Applicability; and §331.163, Well Construction Standards.

BACKGROUND AND SUMMARY OF THE FACTUAL BASIS FOR THE PROPOSED RULES

On June 5, 1992 the Texas Water Commission (a predecessor agency of the TNRCC) adopted new rules regulating the permitting of Class I salt cavern disposal wells. This action was taken in response to legislative changes enacted by the 72nd Texas Legislature in 1991.

Solution-mined salt caverns have been permitted by other agencies for the storage of petroleum products, but none have ever been permitted in the United States for the purpose of disposing of hazardous waste. The commission was cautious but deliberate in developing regulations for these activities and wanted to ensure that any proposed site would be geologically suitable, that any proposed salt cavern disposal well would meet stringent construction standards, and that the design and operation of any project would preclude the escape of hazardous constituents from the salt cavern injection zone.

A total of five applications for salt cavern waste disposal projects have been evaluated by the commission, four of which were received before Class I Salt Cavern Disposal Well rules were adopted in 1992. Of the four, two applications were received from United Resource Recovery (URR), one from Texstor, and one from Hunter Industrial Facilities, Inc. (HIFI). All were ultimately denied. The fifth application, from Secured Environmental Management, Inc. (SEM), is currently under technical review by commission staff.

On June 5, 2000, Baker Botts, L.L.P., on behalf of SEM, filed a petition for rulemaking requesting revision of 30 TAC §331.121(d)(1) to clarify and amend the requirements for information necessary to establish the geologic suitability of a proposed site for a salt cavern Class I injection well. The petitioner requested that the requirement to submit three-dimensional (3-D) seismic survey data sufficient to delineate the edge of the salt stock and image underneath all suspected overhangs be deleted from the rule and that it be replaced with a requirement to conduct a 3-D seismic survey over the cavern location. SEM, in its petition, interpreted the current language as requiring a 3-D seismic survey of the salt dome in its entirety. SEM argued that such a requirement would thwart applicants from proposing Class I salt cavern injection wells in large salt domes due to the expense of the 3-D seismic survey requirement, and noted the difficulty in obtaining surface access to neighboring properties to conduct the survey.

By order dated September 11, 2000, the commission directed the executive director to examine the issues in the petition and initiate rulemaking. As a result of the examination, the executive director determined that the current requirements for the 3-D seismic survey are ambiguous and subject to various interpretations. The existing 3-D seismic survey rule, stated in §331.121(d)(1)(A), requires an applicant to submit seismic reflection data “sufficient to image underneath all suspected overhangs and to delineate the edge of the stock.” Although this language has been interpreted by some as requiring delineation of the entire edge of the salt stock, the executive director believes that the rule only requires delineation of that portion of the edge of the salt stock that is technically relevant to the application.

The commission today proposes amendments and clarifications of §331.121(d)(1)(A) concerning establishing geologic suitability of proposed salt cavern locations. These changes include the following:

1) deletion of the requirement for a 3-D seismic survey to image underneath all suspected overhangs and to delineate the edge of the stock; 2) addition of new language to clarify that mapping the overall geometry of the salt dome includes mapping all edges of the salt stock and any suspected overhangs of the salt stock; 3) addition of a requirement, stated in §331.164(b)(1), to demonstrate the existence of a minimum distance of 500 feet between the boundaries of the proposed salt cavern injection zone and the boundaries of the salt stock; 4) addition of a requirement to define the composition and map the top and thickness of the sedimentary rock units between the caprock and surface; 5) addition of a requirement to map the top of salt stock; and 6) addition of a provision which specifies that the executive director may require any other information necessary to demonstrate the geologic suitability of the location. The commission also proposes to reformat §331.121(d)(1)(A) to improve readability.

The commission proposes new §331.121(d)(1)(B) that would require, if determined necessary by the executive director, a surface-recorded three-dimensional seismic survey, which, in conjunction with §331.121(d)(1)(A), will support demonstration of the geologic suitability of the site.

While evaluating the petition, staff discovered an administrative error in the original rules the commission submitted to the *Texas Register* of the Office of the Secretary of State in 1992. At that time, the commission adopted changes to the original proposal in response to public comments, including a new requirement for a vertical seismic profile (VSP), and clarification of other provisions in the rules. Except for the VSP requirement, all of the previously adopted provisions are included in this

proposed rule without changes. The original objective of the VSP, which would be required after drilling the cavern pilot hole, was to depict the three-dimensional nature of the salt-sediment interface. In today's proposal, VSP may be required at the discretion of the executive director to correlate seismic data with geophysical logs, or to support the 500-foot construction standard in §331.164(b)(1), as needed.

SECTION BY SECTION DISCUSSION

Section 331.121, Class I Wells, is proposed to be amended to clarify information which must be submitted as part of the technical report of the application to perform a thorough characterization of the salt dome to establish the geologic suitability of the location. This information is required as part of the demonstration required by §331.162 (relating to Performance Standard). In §331.121(d)(1)(A), the proposed amendments specify that data and interpretation from all appropriate geophysical methods (such as well logs, seismic surveys, and gravity surveys), subject to approval by the executive director, must be provided. The information required for a thorough geologic characterization of a salt dome is specified in proposed §331.121(d)(1)(A)(i) - (viii), which requires an applicant to: 1) map the overall geometry of the salt dome, including all edges and any suspected overhangs of the salt stock; 2) demonstrate the existence of a minimum distance of 500 feet between the boundaries of the proposed salt cavern injection zone and the boundaries of the salt stock; 3) define the composition and map the top and thickness of the sedimentary rock units between the caprock and surface, including the flanks of the salt stock; 4) define the composition and map the top and thickness of the caprock overlying the salt stock; 5) map the top of the salt stock; 6) calculate the movement and the salt loss rate of the salt stock; 7) define any other caverns and other uses of the salt dome, and address any conditions that may result

in potential adverse impact on the salt dome; 8) and satisfy any other criteria required by the executive director to demonstrate the geologic suitability of the location. The requirements in §331.121(d)(1)(A)(ii) restate the cavern construction standard in §331.164(b)(1) (relating to Cavern Construction Standards) to emphasize that the requirement of 500 feet between the boundaries of the salt cavern injection zone and the boundaries of the salt stock is crucial in determining the geologic suitability of a proposed site. Section 331.121(d)(1)(A)(iv) and (v), is proposed to provide clarification of certain data which is needed to characterize the salt dome, by adding the requirement to define the composition and map the top and thickness of the caprock as well as to map the top of the salt stock. The specific requirement in existing §331.121(d)(1)(A) to submit seismic reflection data, including a 3-D seismic grid survey to image underneath all suspected overhangs and delineate the edge of the stock, is proposed to be deleted.

New §331.121(d)(1)(B) is proposed to require a surface-recorded 3-D seismic survey in support of subparagraph (A) if determined to be necessary by the executive director to establish the geologic suitability of the location to show compliance with the performance standard in §331.162. Depending on the information submitted with the application and the geology of the location, the executive director may require that the applicant provide information from a 3-D seismic survey to support the demonstration of geologic suitability. The information must be provided before completion of technical review and before a draft permit may be issued.

The commission proposes a correction in §331.121(d)(1)(C) by adding the words “identification of” at the beginning of the paragraph for proper grammatical formatting of the subparagraph.

The amendments to §331.161 and §331.163 described in the following sections propose amendments which were inadvertently omitted, through an administrative error, when the agency originally submitted these rules to the Office of the Secretary of State in 1992. All of these changes were adopted as a result of comments during the 1992 public comment period. The proposed amendments under §331.161 and §331.163 are the same as they were originally adopted, except 1) a VSP is no longer always required, and 2) a change in the purpose and use of a VSP, if one is required.

Section 331.161 is proposed to be amended to make clear that the rules contained in Subchapter J, Standards for Class I Salt Cavern Solid Waste Disposal Wells, apply only to salt caverns located in the salt stocks of salt domes. The term “horizontally bedded salt formation” was not specifically defined previously, and the prohibition on salt cavern disposal wells and associated caverns was not specified for “geologic structures or formations other than salt stocks of salt domes.” The commission proposes this clarification to provide consistency with existing requirements in §331.14 of this title (relating to Prohibition of Class I Salt Cavern Solid Waste Disposal Wells and Associated Caverns in Geologic Structures or Formations Other Than Salt Stocks of Salt Domes).

Section 331.163(b)(1) is proposed to be amended to add the words “and waste” to the phrase “to prevent the movement of fluids” to clarify that all fluids and waste must be prevented from moving into underground sources of drinking water or freshwater aquifers and to prevent potential leaks of fluid and waste from the well. This additional clarification is necessary because any waste disposed of in the salt caverns must be stabilized. The word “period” is also added to modify the term “post-closure care.”

Section 331.163(c) is proposed to be amended to substitute the word “tubings” for “tubing” and to clarify the requirement that two concentric and removable injection tubings are to be utilized for injection activities. Paragraph (1) is also proposed to be amended to replace the term “corrosion inhibiting” with the word “non-corrosive.” This proposed change allows greater flexibility in the type of annulus fluid used. Paragraph (2) is proposed to be amended to replace the phrase “removable injection tubing” with the phrase “the inner tubing.”

Section 331.163(d)(2) is proposed to be amended to add the words “and waste” to clarify that the requirements for a tubing and packer system must consider both the fluid and the waste in stabilized form.

Although the rules originally adopted by the commission require a three-component offset VSP to depict the three-dimensional nature of the salt-sediment interface, new §331.163(e)(1)(F) is proposed to require a VSP of the salt dome site, if deemed necessary by the executive director. This less prescriptive language will allow the executive director, as needed, to require the type of VSP most appropriate to supplement or confirm information submitted to demonstrate compliance with the performance standard under §331.162, gain approval of the well construction stage under §331.163(i), or to gain approval of the completion of the cavern construction stage under §331.164(f)(2).

Section 331.163(e)(2)(A) is proposed to be amended to modify the pressure testing requirements for the surface casing to specify a more commonly accepted engineering practice. Section 331.163(e)(3)(D), which would allow the executive director to waive or modify future coring projects, is proposed to be

deleted. Such a requirement would allow the permittee to construct new caverns without performing confirming cores for each subsequent cavern. Numerous commenters in 1992 pointed out the danger of making assumptions from the original cavern due to foreign matter which may be present within the salt and which could compromise the integrity of waste containment. The commission continues to agree with this concern.

FISCAL NOTE: COSTS TO STATE AND LOCAL GOVERNMENT

John Davis, Technical Specialist with Strategic Planning and Appropriations, has determined that for each year of the first five-year period the proposed amendments are in effect there will be no anticipated fiscal implications for units of state and local government as a result of administration or enforcement of the proposed amendments.

The proposed amendments will remove prescriptive language relating to which methodologies must be employed to make specific demonstrations of geologic suitability, clarify the information to be submitted in the technical report to support an application for a Class I salt cavern injection well, add requirements and clarifications inadvertently left out when the adopted rules were published in 1992, and add at the discretion of the executive director, a requirement for a VSP.

If authorized by the commission, salt cavern Class I waste disposal wells can be used to dispose of industrial hazardous and nonhazardous solid wastes, including organic and inorganic solids, liquids, and slurries and sludge (which have been stabilized) such as from manufacturing, waste management, petrochemical industries, metal refineries, mining, transportation, and other industries.

Units of state and local government are generally not anticipated to be users of Class I disposal wells. Also, these amendments will not substantially affect the commission's current practices relative to review of such applications. Therefore, the commission does not anticipate any fiscal implications to units of state and local government as a result of implementing the proposed amendments.

PUBLIC BENEFIT AND COSTS

Mr. Davis has also determined for each of the first five years the proposed amendments are in effect, the public benefit anticipated as a result of implementing the proposed amendments will be the incorporation of more clearly defined geological requirements for any proposed salt cavern Class I injection wells.

The proposed amendments will remove prescriptive language relating to which methodologies must be employed to make specific demonstrations of geologic suitability, clarify the information to be submitted in the technical report to support an application for a Class I salt cavern injection well, add requirements and clarifications inadvertently left out when the adopted rules were published in 1992, and add at the discretion of the executive director, a requirement for a VSP.

If authorized by the commission, salt cavern Class I waste disposal wells can be used to dispose of industrial hazardous and nonhazardous solid wastes, including organic and inorganic solids, liquids, and

slurries and sludge (which have been stabilized) such as from manufacturing, waste management, petrochemical industries, metal refineries, mining, transportation, and other industries.

There is currently one company with an application pending before the commission. The only potential additional cost associated with the amendments, is the VSP requirement, if required by the executive director. Based on an estimate provided by a geophysical service company, the commission expects that a VSP would cost approximately \$23,000.

SMALL BUSINESS AND MICRO BUSINESS ASSESSMENT

There will be adverse economic effects, which are not anticipated to be significant, to small or micro-businesses as a result of the implementation of the proposed amendments. The proposed amendments will remove prescriptive language relating to which methodologies must be employed to make specific demonstrations of geologic suitability, clarify the information to be submitted in the technical report to support an application for a Class I salt cavern injection well, add requirements and clarifications inadvertently left out when the adopted rules were published in 1992, and add at the discretion of the executive director, a requirement for a VSP.

The only potential additional cost associated with the amendments, is the VSP requirement, if required by the executive director. Based on an estimate provided by a geophysical service company, the commission expects that a VSP would cost approximately \$23,000.

The commission is aware of only one company, a micro-business, which might be affected by these proposed rule amendments. At the present time that company consists of eight employees, although that number may rise to approximately 75 employees if a salt cavern injection well permit is issued to the company and authorized activities are initiated.

The cost to comply with the proposal could be approximately \$23,000. The commission believes that the potential one-time cost to small or micro-businesses would range from as low as \$230 per employee for a small business with 100 employees, \$1,150 per employee for a micro business with 20 employees, to \$2,875 per employee for the one known small business currently expected to be affected by the proposed amendments.

The potential cost for a large business, assuming a labor force of 200 employees, would comparatively be \$115 per employee.

DRAFT REGULATORY IMPACT ANALYSIS DETERMINATION

The commission has reviewed the proposed rulemaking in light of the regulatory analysis requirements of Texas Government Code, §2001.0225, and has determined that the rulemaking is not subject to that section because it does not meet the definition of a “major environmental rule.” A “major environmental rule” is a rule the specific intent of which is to protect the environment or reduce risks to human health from environmental exposure and that may adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, or the public health and safety of the state or a sector of the state.

The primary purpose of this rulemaking is to clarify the information to be submitted in the technical report under §331.121(d)(1), to remove prescriptive language that may not be applicable to all proposed sites, to emphasize the purpose and use of the data as they relate to the performance standard of no release of hazardous material from the salt cavern and to the geologic suitability of a proposed site. There is, however, a potential new technical requirement for persons granted permits for salt dome cavern waste disposal wells. Proposed new §331.163(e)(1)(F) requires that permittees perform a VSP, if required by the executive director.

The commission believes the amendments are as protective as those which currently exist in the agency's rules. The goal under either set of rules is to maximize protection of human health and the environment by establishing the geologic suitability of a proposed site for a salt cavern Class I injection well. By clarifying what information is required in the application, and by tying the information to current construction and performance standards, the commission believes the amendments provide appropriate flexibility while maintaining the level and degree of protectiveness of the permitting process.

The proposed rulemaking is not a "major environmental rule" because it is not expected to adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, or the public health and safety of the state. The proposed amendments should not have a materially adverse effect on any of the listed categories. The amendments are intended primarily to clarify requirements which already exist in the commission's regulations, eliminate prescriptive language relating to the requirement for a 3-D seismic survey, and relate the demonstrations required in

a permit application to the geologic suitability of a specific site, in order to ensure there will be no release of hazardous constituents from the proposed salt cavern injection zone. Because the proposed rulemaking does not constitute a “major environmental rule,” a full regulatory impact analysis under Texas Government Code, §2001.0225 is not required.

TAKINGS IMPACT ASSESSMENT

The commission evaluated these proposed amendments and performed a preliminary assessment of whether they constitute a takings under Texas Government Code, Chapter 2007. The following is a summary of that evaluation and preliminary assessment. The purpose of this rulemaking is to remove prescriptive language relating to which methodologies must be employed to make specific demonstrations of geologic suitability, clarify the information to be submitted in the technical report to support an application for a Class I salt cavern injection well, add requirements inadvertently left out of the agency’s transmission to the Secretary of State in 1992, and add a requirement for a VSP if requested by the executive director. The commission believes that the level and degree of protectiveness under these amendments is equivalent to that which currently exists in the agency’s rules. The purpose under either set of rules is to maximize protection of human health and the environment by establishing the geologic suitability of a proposed site for a salt cavern Class I injection well. The commission believes the proposed amendments would substantially advance this purpose by more specifically describing which geologic features of a salt dome are to be analyzed and authorizing the executive director to require 3-D seismic or VSP, as needed, to ensure that a proposed cavern location and any subsequently constructed caverns meet the performance standard “of no escape of hazardous constituents from the salt cavern injection zone” in §331.162.

Promulgation and enforcement of these amendments would constitute neither a statutory nor a constitutional taking of private real property. There are no burdens imposed on private real property under this rulemaking as the proposed amendments neither relate to, nor have any impact on, the use or enjoyment of private real property, other than to require certain characterization of property owned or controlled by an applicant seeking a permit for a salt cavern Class I injection well. Because there is no new limitation on the property owner's right to the property, there is also no reduction in value of the property as a result of this rulemaking.

CONSISTENCY WITH THE COASTAL MANAGEMENT PROGRAM

The executive director has reviewed the proposed rulemaking and found that the rule is neither identified in Coastal Coordination Act Implementation Rules, 31 TAC §505.11, Actions and Rules Subject to the Texas Coastal Management Program (CMP), nor will it affect any action or authorization identified in Coastal Coordination Act Implementation Rules, 31 TAC §505.11. Therefore, the proposed rules are not subject to the CMP.

ANNOUNCEMENT OF HEARINGS

Public hearings on this proposal will be held in Tyler, on April 3, 2001, at 7:00 p.m. at the commission's regional office located at 2916 Teague Drive; in Mont Belvieu, on April 5, 2001, at 7:00 p.m. at the Barbers Hill High School, in the CTJ Conference Center, located at 9600 Eagle Drive; in Wharton, on April 10, 2001, at 7:00 p.m. at the Wharton Community Civic Center, in the Main Hall, located at 1924 North Fulton; and in Austin on April 12, 2001, at 2:00 p.m. in Building E, Room 201S at the commission's central office located at 12100 Park 35 Circle. The hearings will be structured for

the receipt of oral or written comments by interested persons. Individuals may present oral statements when called upon in order of registration. Open discussions will not occur during the hearings; however, an agency staff member will be available to discuss the proposal 30 minutes prior to the hearing and will answer questions before and after the hearings.

Persons with disabilities who have special communication or other accommodation needs who are planning to attend the hearings should contact the agency at (512) 239-4900. Requests should be made as far in advance as possible.

SUBMITTAL OF COMMENTS

Comments may be submitted to Joyce Spencer, Office of Environmental Policy, Analysis, and Assessment, MC 205, P.O. Box 13087, Austin, Texas 78711-3087, or faxed to (512) 239-4808. All comments should reference Rule Log Number 2000-053-331-WT. Comments must be received by 5:00 p.m., April 16, 2001. For further information contact Kathy Vail at (512) 239-6637.

STATUTORY AUTHORITY

The amended section is proposed under Texas Water Code (TWC), §5.103, which provides the commission authority to adopt any rules necessary to carry out its powers and duties under this code and other laws of this state and to adopt rules when adopting, repealing, or amending any agency statement of general applicability that interprets or prescribes law or policy, or describes the procedure or practice requirements of an agency; §5.105 which authorizes the commission to establish and

approve all general policy of the commission by rule; and §27.019, which requires the commission to adopt rules reasonably required for the regulation of injection wells.

The proposed amended section implements TWC, Chapter 27, Injection Wells.

SUBCHAPTER G: CONSIDERATION PRIOR TO PERMIT ISSUANCE

§331.121

§331.121. Class I Wells.

(a) - (c) (No change.)

(d) The commission shall also consider the following additional information [criteria], which must be submitted to support the performance standard in §331.162 (relating to Performance Standard) as part of [addressed in] the technical report of the application, before issuing a salt cavern Class I injection well permit:

(1) a thorough characterization of the salt dome to establish the geologic suitability of the location, including [geologic suitability of the location]:

(A) data and interpretation from all appropriate geophysical methods (such as well logs, seismic surveys, and gravity surveys), subject to the approval of the executive director, necessary to: [a thorough geologic characterization of the salt dome, including the geometry of the salt stock and its calculated movement and calculated salt loss rate. Data submitted must be sufficient to image underneath all overhangs, to delineate the edge of the salt stock, to define any other caverns or co-uses of the salt stock, and to address any conditions that may result in potential adverse impact on the salt stock. Well logs, seismic reflection surveys, gravity surveys, and any other appropriate

geophysical methods necessary to characterize the salt dome are to be utilized. Seismic reflection data submitted must include a surface recorded three-dimensional seismic grid survey sufficient to image underneath all suspected overhangs and to delineate the edge of the stock;]

(i) map the overall geometry of the salt dome, including all edges and any suspected overhangs of the salt stock;

(ii) demonstrate the existence of a minimum distance of 500 feet between the boundaries of the proposed salt cavern injection zone and the boundaries of the salt stock;

(iii) define the composition and map the top and thickness of the sedimentary rock units between the caprock and surface, including the flanks of the salt stock;

(iv) define the composition and map the top and thickness of the caprock overlying the salt stock;

(v) map the top of the salt stock;

(vi) calculate the movement and the salt loss rate of the salt stock;

(vii) define any other caverns and other uses of the salt dome, and address any conditions that may result in potential adverse impact on the salt dome; and

(viii) satisfy any other requirement of the executive director necessary to demonstrate the geologic suitability of the location;

(B) a surface-recorded three-dimensional seismic survey, as determined by the executive director to be required to establish the geologic suitability of the location to show compliance with the performance standard in §331.162 of this title, considering the data presented by the applicant under subparagraph (A) of this paragraph;

(C) [(B)] identification of any unusual features, such as depressions or lineations observable at the land surface or within or detectable within the subsurface, which may be indicative of underlying anomalies in the caprock or salt stock, which might affect construction, operation, or closure of the cavern;

(D) [(C)] the petrology of the caprock, salt stock, and deformed strata; and

(E) [(D)] for strata surrounding the salt stock, information on their nature, structure, hydrodynamic properties, and relationships to USDWs, including a demonstration that the proposed salt cavern injection zone will not be in or above a formation which within 1/4 mile of the salt cavern injection zone contains a USDW;

(2) - (5) (No change.)

(e) - (g) (No change.)

SUBCHAPTER J: STANDARDS FOR CLASS I SALT CAVERN SOLID WASTE

DISPOSAL WELLS

§331.161, §331.163

STATUTORY AUTHORITY

The amended sections are proposed under Texas Water Code (TWC), §5.103, which provides the commission authority to adopt any rules necessary to carry out its powers and duties under this code and other laws of this state and to adopt rules when adopting, repealing, or amending any agency statement of general applicability that interprets or prescribes law or policy, or describes the procedure or practice requirements of an agency; §5.105 which authorizes the commission to establish and approve all general policy of the commission by rule; and §27.019, which requires the commission to adopt rules reasonably required for the regulation of injection wells.

The proposed amended sections implement TWC, Chapter 27, Injection Wells.

§331.161. Applicability.

The sections of this subchapter apply to all Class I salt cavern solid waste disposal wells and their associated salt caverns located in the salt stocks of salt domes, and not to such facilities in horizontally bedded or non-domal salt. As provided by §331.14 of this title (relating to Prohibition of Class I Salt Cavern Solid Waste Disposal Wells and Associated Caverns in Geologic Structures or Formations Other Than Salt Stocks of Salt Domes), salt cavern solid waste disposal wells and associated caverns in geologic structures or formations other than salt stocks of salt domes [horizontally

bedded or non-domal salt] are prohibited until such time at which §331.14 of this title and this subchapter are amended to allow the subject facilities, and any necessary specific rules for such facilities [in horizontally bedded or non-domal salt] are added by amendment to this subchapter or promulgated as a new subchapter.

§331.163. Well Construction Standards.

(a) (No change.)

(b) Casing and cementing.

(1) All Class I salt cavern disposal wells shall be cased and all casings which extend to the surface shall be cemented to the surface to prevent the movement of fluids and waste into or between underground sources of drinking water (USDWs) or freshwater aquifers, and to prevent potential leaks of fluids and waste from the well. Cementing shall be by the pump and plug or other method approved by the commission, and cement circulated shall be of a volume equivalent to at least 120% of the calculated volume needed to fill the annular space between the hole and casing and between casing strings to the surface of the ground. Circulation of cement may be accomplished by staging. The executive director may approve an alternative method of cementing in cases where the cement cannot be recirculated to the surface, provided the owner or operator can demonstrate by using logs that the cement is continuous or does not allow any fluid and waste movement behind the well

casings. Casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well, including the post-closure care period.

(A) - (C) (No change.)

(2) (No change.)

(c) Injection tubings [tubing]. Except for circulation of drilling fluids during well construction, all injection activities for salt cavern construction and waste disposal in a salt cavern shall be performed using two concentric and removable injection tubings suspended from the wellhead [through removable injection tubing installed inside of the cemented long string casing and extending from the wellhead at ground surface to the salt borehole or salt cavern below the long string casing seat].

(1) All injection activities during cavern construction shall be performed with the annulus between the tubing and long string casing filled with a non-corrosive [corrosion inhibiting] fluid sufficient to protect the bond between salt, cement, and the long string casing seat.

(2) All injection of waste into a salt cavern shall be performed through the inner tubing [removable injection tubing] with a packer to seal the annulus between the tubing and long string casing near the bottom of the long string casing.

(d) Well annulus system factors for consideration. All elements of the design of the well's tubing-long string casing annulus system, including the outer tubing and packer, shall be approved by permit or by the executive director's approval that any proposed modifications to the plans and specifications in the permit application will provide protection equivalent to or greater than the original plans and specifications. In determining and specifying requirements for a tubing and packer system, the following factors shall be considered:

(1) (No change.)

(2) characteristics of injection fluid and waste;

(3) - (7) (No change.)

(e) Logs and tests.

(1) Geophysical logging [Logging]. Appropriate logs and other tests shall be conducted during the drilling and construction phases of the well including drilling into the salt. All logs and tests shall be interpreted by the service company which processed the logs or conducted the test; or by other qualified persons. A minimum of the following logs and tests shall be conducted:

(A) - (D) (No change.)

(E) fracture detector log from the base of the surface casing to the total investigated depth including all core hole or pilot hole; and [.]

(F) a vertical seismic profile, if required by the executive director.

(2) Pressure tests.

(A) After installation and cementing of casings, and prior to drilling out the cemented casing shoe, surface casing shall be pressure tested at mill test pressure or 80% of the calculated internal pressure at minimum yield strength [to 1,000 psi for 30 minutes], and the intermediate and long string casing shall be tested to 1,500 psi for 30 minutes, unless otherwise specified by the executive director.

(B) - (C) (No change.)

(3) Coring.

(A) - (C) (No change.)

[(D) Upon satisfactory completion of all coring requirements of this subsection and all reports and certification requirements of subsection (i) of this section, for at least one salt cavern

disposal well in a multi-cavern waste disposal project, the executive director may modify or waive provisions in subparagraphs (A), (B), and (C) of this paragraph.]

(4) (No change.)

(f) - (i) (No change.)