

1 The Railroad Commission of Texas (Commission) adopts amendments to §3.9 and §3.46, relating
2 to Disposal Wells, and Fluid Injection into Productive Reservoirs, with changes from the proposed text
3 published in the August 29, 2014, issue of the *Texas Register* (39 TexReg 6775). The adopted
4 amendments incorporate requirements related to seismic events in connection with disposal well permits,
5 monitoring and reporting.

6 SUMMARY OF CHANGES FROM THE PROPOSAL LANGUAGE

7 As proposed, the Commission would have required that applicants for disposal well permits
8 provide with the application the results of a calculation of the estimated five pounds per square inch (psi),
9 10 year pressure front boundary and use that area to determine whether or not there has been historic
10 seismic activity. In response to comments, the Commission agrees that, in many instances, the
11 assumptions and approximations used by applicants in such calculations would be highly interpretive and
12 difficult for many operators to obtain, particularly for applicants proposing to dispose into non-productive
13 formations. As a result, the results from such calculations could be non-uniform and misleading.
14 Therefore, the Commission is adopting a simpler and more consistent method of determining the area to
15 be surveyed. The Commission is now requiring that an applicant for a disposal well permit include with
16 the permit application a printed copy or screenshot showing the results of a survey review of information
17 from the United States Geological Survey (USGS) regarding the locations of any historical seismic events
18 within a circular area of 100 square miles (a circle with a radius of 9.08 kilometers) centered around the
19 proposed disposal well location. The language regarding calculation of a pressure front boundary around
20 a proposed disposal well location has been moved to §3.9(3)(C) and §3.46(b)(1)(D) and such calculation
21 will be required only in certain limited circumstances where additional information is necessary to
22 demonstrate that fluids will be confined if the well is to be located in an area where conditions exist that
23 may increase the risk that fluids will not be confined to the injection interval.

1 Also in response to comments, the Commission has revised the proposed language in
2 §3.9(6)(A)(vi) and §3.46(d)(1)(F) relating to modification, suspension, and termination of a permit to
3 replace the phrase "if injection is suspected of or shown to be causing seismic activity" with the phrase "if
4 injection is likely to be or determined to be causing seismic activity."

5 The Commission adopts a minor clarifying change in §3.9(11)(A) and (B), and §3.46(i).

6 COMMENTS

7 The Commission received 36 comments on the proposed amendments. The Commission
8 appreciates the interest shown by the public in this rulemaking effort. The Commission received timely-
9 filed comments from 20 entities, 10 of which were from groups or associations: Environmental Defense
10 Fund ("EDF"); Neighborhoods of East Fort Worth; Sierra Club, Lone Star Chapter ("Sierra Club"); Texas
11 Alliance of Energy Producers (the "Alliance"); Texas Energy Services Coalition; and a workgroup
12 comprised of the following associations: Texas Oil and Gas Association, the Texas Independent
13 Producers & Royalty Owners Association; the Texas Alliance of Energy Producers, the Permian Basin
14 Petroleum Association, and the Association of Energy Service Companies (the "Workgroup"). The
15 Commission received comments from four groundwater conservation districts (collectively, the "GCDs"):
16 Lone Star Groundwater Conservation District ("Lone Star GCD"); North Texas Groundwater
17 Conservation District ("North Texas GCD"); Prairielands Groundwater Conservation District
18 ("Prairielands GCD"); and Upper Trinity Groundwater Conservation District ("Upper Trinity GCD").
19 The Commission received timely-filed comments from three other governmental entities: United States
20 Environmental Protection Agency ("EPA"); the City of Southlake; and the United States Geological
21 Survey ("USGS"). The Commission received timely-filed comments from three companies: Chevron
22 USA Inc. ("Chevron"); CrownQuest Operating, LLC ("CrownQuest"); and Pioneer Natural Resources
23 ("Pioneer"). The Commission received 23 comments from individuals. After the September 29, 2014,
24 comment deadline, the Commission received late-filed comments from two companies (Apache

1 Corporation and Newfield Exploration Company ("Apache/Newfield")) and one governmental entity
2 (Frio County Commissioners Court).

3 Four commenters expressed support for the proposed rule amendments. Neighborhoods of East
4 Fort Worth provided a resolution in support of the proposed amendments. One commenter expressed
5 support for the provisions for §3.9(6) to permit the Commission to respond to an appearance of seismic
6 activity without conclusive evidence that the activity is triggered or induced by a particular well. This
7 commenter also expressed support for the proposed amendments in §3.9(11) to allow the Commission to
8 require closer monitoring and reporting of injection pressure and rate. The Commission appreciates these
9 comments. The Commission made no change in response to these comments.

10 Three commenters expressed opposition to hydraulic fracturing in Texas. One expressed
11 opposition to fossil fuels. Another commenter expressed support for limiting hydraulic fracturing. These
12 comments are beyond the scope of this rulemaking. The Commission made no change in response to
13 these comments.

14 One commenter stated that the proposed amendments lack a methodology to catalogue quakes
15 and relate them in proximity to existing wells, and that the proposal does not require operators to report
16 quake events in proximity to their wells.

17 The Commission notes that seismic activity is reported by the USGS and that Commission staff is
18 monitoring seismic activity in the state in relation to proximity to existing wells. The Commission made
19 no change in response to this comment.

20 Two commenters expressed concern with individual property rights, seismic activity associated
21 with hydraulic fracturing, and decreased property values. These commenters recommended that the
22 Commission amend the rules to provide further protection for property owners in areas in which drilling
23 is to occur. One commenter stated that the commenter's home has been damaged by the earthquakes in
24 the Azle/Reno area and recommended stronger laws and rules and permits governing the gas industry.

1 One commenter recommended that the Commission require operators to buy earthquake insurance.

2 A review of the numerous studies of seismic activity in areas with oil and/or gas exploration and
3 production indicates that seismic activity induced by hydraulic fracturing is not very likely. In addition,
4 the Commission has no statutory authority to require an operator to purchase insurance. The Commission
5 made no change in response to these comments.

6 USGS commented that the Commission was incorrect in stating that the USGS has the ability to
7 detect and locate all seismic events larger than magnitude 2.0 throughout the continental United States.
8 USGS went on to state that it is currently capable of detecting and locating all Texas earthquakes with
9 magnitudes of about 3.0 and larger and can detect smaller earthquakes in regions with better seismic
10 station coverage. The Commission acknowledges the correction, but no change to the rules is necessary.

11 Two commenters noted that USGS earthquake locations in Texas are not sufficiently accurate to
12 retrieve data regarding the locations of historical seismic events within an the estimated 10-year, five psi
13 pressure front boundary.

14 The Commission agrees with the statement concerning USGS earthquake location accuracy; the
15 Commission is simply using the reported earthquake locations as a screening tool for disposal well
16 applications. However, the Commission finds that it is appropriate to require permit applicants to access
17 the USGS database and adopts a change to require a circular survey area of 100 square miles centered on
18 the proposed disposal well location.

19 Five seismologists (Brian Stump, Heather DeShon, Matthew J. Hornbach, Maria Beatrice
20 Magnini, and Christopher T. Hayward) (Stump et al.) jointly filed comments concerning the proposed
21 fluid calculations, concluding that pressure front predictions will likely be subject to large uncertainties in
22 predicting where the pressure front is located as a function of time.

23 The Commission agrees with the comments concerning the proposed fluid calculations,
24 concluding that pressure front predictions will likely be subject to large uncertainties in predicting where

1 the pressure front is located as a function of time. The Commission adopts a change to require that
2 applicants for a disposal well permit review a defined survey area, and has moved the language regarding
3 pressure front boundaries to the list of additional information that may be required of an applicant
4 subsequent to a determination of the existence of complex geology, proximity of the basement rock to the
5 injection interval, transmissive faults, and/or a history of seismic events in the survey area.

6 Stump et al. questioned the motivation for choosing a five psi pressure front over 10 years, as the
7 critical pressure number or time and recommended that the Commission require that an applicant for a
8 disposal well permit avoid any pressure development near a major fault system that is active or appears
9 critically stressed.

10 The Commission proposed five psi as a pressure differential on the lower side of the 1.4 to 14 psi
11 range mentioned by the commenters as a conservative number. The Commission chose to compute the
12 pressure front boundary after 10 years of operation at the proposed maximum daily disposal volume to
13 represent an operational maximum value for fluid injected, because few operators operate disposal wells
14 at the maximum daily allowed volume over extended periods of time, and large volume disposal wells
15 are considered to have a lifespan of approximately 10 years. The Commission made no change in
16 response to this comment.

17 Stump et al. recommended that the Commission consider situations where the reported pressures
18 downhole are significantly in excess of five psi due to overpressure as industry studies already suggest
19 that overpressures sometimes exist in some of the injection formations, and may exceed tens of psi.

20 The Commission agrees with the comment; however, no change is necessary for calculating the
21 pressure front boundary as described because of the adopted changes. The Commission made no change
22 in response to this comment.

23 Stump et al. noted that the "injected fluids may well stay confined in the injection interval but the
24 pressure perturbation induced by the injections fluids can have farther reaching effects." These

1 commenters further stated that the perturbation may be more important in locally changing stress in a
2 manner sufficient to allow earthquakes along pre-existing fault structures. These commenters noted that
3 there are a number of other critical data sets related to the fluids and the rock properties that control fluid
4 migration, including, but not limited to downhole pressures in the injector, static pressures at injection
5 depth, permeability and fault locations including their connection to layers above and below the injection
6 interval. These commenters recommended that the Commission consider requiring annual measurement
7 and reporting of bottom hole shut-in pressures to determine if injected fluids are having far-reaching
8 effects on subsurface stress.

9 The Commission agrees with the comments, but disagrees that requiring industry to measure and
10 report annually bottom hole shut-in pressures at all disposal wells is warranted. The language of the
11 proposed rule would allow the Commission to add such a condition in reservoirs for which such
12 monitoring and reporting might be warranted. The Commission made no change in response to this
13 comment.

14 Stump et al. noted that many of the earthquake sequences in Texas, such as those in Azle, DFW
15 and Cleburne, only began after the injectors began operating in the area, and that searching for
16 earthquakes before the injection process begins may not be sufficient. These commenters further stated
17 that any information on the locations of subsurface faults and their orientation relative to the in-situ stress
18 field might provide more effective permitting criteria based on some of the historical earthquake data.
19 These commenters pointed out that imaging and location of subsurface faults may be problematic. Even
20 small offset faults at the limit of high-quality 3D seismic data may generate small magnitude earthquakes
21 based on data analysis in Azle.

22 The Commission disagrees that these changes are necessary. Because the recurrence rate for
23 these types of sequences is unknown, one cannot with any confidence correlate the onset of an earthquake
24 sequence with any measureable impact of injection well operation. The Commission made no change in

1 response to this comment.

2 Stump et al. noted that a characteristic radius for the search might be a better approach rather than
3 one estimated from a model run because: (1) the earthquake locations based on regional observations
4 have a characteristic error in latitude and longitude of approximately 10 kilometers which may be larger
5 than estimated radius; (2) few details are described in models and an assessment of the errors in the
6 calculation may necessitate a larger radius (e.g., the bottom hole pressures and permeability used can
7 greatly influence the estimate radius); and (3) model runs can be influenced by inclusion of faults.

8 The Commission agrees that a characteristic radius will provide a more straightforward review of
9 historical earthquake occurrence and adopts a circular survey area of 100 square miles centered on the
10 proposed disposal well location in §3.9(3)(B) and §3.46(b)(1)(C).

11 Stump et al. noted that the "magnitude threshold for the USGS catalog should be checked with
12 the USGS." Chevron pointed to the preamble reference to magnitude 2.0 events as the USGS framework
13 of reference and stated that magnitude 2.5 is a more appropriate threshold for references to USGS given
14 the current seismic monitoring network in Texas. Chevron commented that it is important that seismic
15 monitoring be consistent in both space and time such that a threshold magnitude event can be detected no
16 matter where it occurs in Texas and that an increase in detected threshold events over time as the
17 monitoring network improves is not misinterpreted as an increase in seismic events. Chevron
18 recommended that the Commission lower the threshold once an expanded seismic network is in place.
19 Similarly, Pioneer recommended that the Commission revise the proposed rule language to include the
20 following: "the results of a review of information from the USGS threshold of 2.5 magnitude on the
21 Richter Scale." Pioneer stated that such language would provide clarity and certainty should specific
22 seismic monitoring of a particular area use technology that would allow measurements to a lower
23 threshold. One commenter stated that the preamble reference to magnitude 2.0 events as the USGS frame
24 of reference is incorrect and suggested that magnitude 2.5 is more appropriate given the current

1 monitoring capability. One commenter stated that defining a numerical seismic magnitude threshold
2 would provide precise clarity in the rule and prevent the need to readdress this issue in the future as
3 technology changes in Texas or in other parts of the country.

4 Based on these comments submitted by the USGS, Stump et al., Chevron, Pioneer and two others,
5 the Commission agrees with comments regarding the capability of the USGS monitoring in Texas.
6 Nonetheless, the Commission retains the option to consider any earthquake reported on the USGS
7 database. The suggested numerical seismic magnitude threshold would preclude including smaller
8 earthquakes that might be reported in the future where denser monitoring could detect smaller
9 earthquakes. Further, earthquakes with magnitudes well below magnitude 2.0 are being used to delineate
10 basement seated faults in the Reno, Texas, area. The Commission made no change in response to these
11 comments.

12 One commenter recommended that the Commission defer action on the requirements proposed
13 for §3.9(3)(C) and §3.46(b)(1)(D) to require submission of additional information with permit
14 applications because, given the current state of the science, the information proposed to be requested of an
15 applicant would not allow the Commission to predict seismic activity and "science is not yet ready to
16 inform the correct rules." This commenter recommended that the Commission determine whether the
17 changes in the proposed amendments can be applied to past situations to gather proposed information,
18 and determine that it would have been of some predictive value and applied to a variety of likely
19 situations to verify that reliable and consistent collection and reporting is feasible and practical. This
20 commenter also recommended that the Commission measure the actual cost of compliance.

21 Apache/Newfield also expressed concern that the apparent simplicity of a statewide, one-size-fits-all
22 regulation may not be in the best interest of the state or the public, because the natural geologic and
23 land-use variability that occurs across Texas results in different risk profiles. Consequently,

24 Apache/Newfield recommended that the Commission consider requiring different actions in different

1 areas of the state based on seismic risk. Chevron echoed that comment by stating that, because seismicity
2 that appears to be associated with disposal wells in Texas is concentrated in a limited number of localities,
3 seismicity would be better addressed through field rules. Chevron stated that addressing seismicity in
4 statewide rules that need only apply in a few areas would be detrimental to resource development.

5 The Commission agrees with the commenters that the science is not exact and more study of
6 natural and induced seismic events is needed. However, the Commission has amended the rules based on
7 the best information from current science. These rule amendments address disposal wells located in new
8 areas, or more or higher volume disposal wells located in areas with existing oil and gas activity. In
9 addition, the rule language is sufficiently broad to allow the Commission to require information based on
10 advancing science. The Commission made no change in response to this comment.

11 The Alliance recommended that the Commission consider the basic roles of injection pressure,
12 depth of injection, and volume of injected fluid, which play a significant role in injection permitting.
13 Lower injection pressure generally results in lower volumes of fluids being disposed. These lower
14 volume, lower pressure wells will consistently have a smaller zone of influence on subsurface pore
15 pressure over time. This smaller zone of influence means less risk of induced seismicity. Therefore, the
16 Alliance recommended that the Commission revise the rule to exempt disposal wells with an injection
17 volume of 5,000 barrels per day or less, unless the well falls within 20 circular square miles (2.5 mile
18 radius) of the radius survey area of an historic seismic event of a magnitude of 2.5 or higher. The
19 Alliance recommended for higher volume wells (greater than 5,000 barrels per day) a survey area of 40
20 circular square miles (approximate 4 mile radius).

21 The Commission agrees that injection pressure, depth of injection, and volume of injected fluid
22 play a significant role in injection permitting. However, the survey area addressed in this rulemaking is
23 intended to address increased pressure that could trigger movement of existing stressed faults. No one
24 knows where all faults are, whether they are under stress, or how much of an increased reservoir pressure

1 would trigger movement of an existing stressed fault. In addition, the increased impact of several "small
2 volume" disposal wells in one area could have the same impact as one "large volume" disposal well.
3 However, as previously discussed, the Commission adopts a more appropriate method for surveying the
4 area surrounding the location of a proposed disposal well, requiring the applicant to survey a reasonably
5 conservative area around the proposed disposal well location for historic seismic activity as indicated by
6 USGS. The Commission has determined that a reasonably conservative area for such a survey is a
7 circular area of 100 square miles (a circle with a radius of 9.08 kilometers) centered around the proposed
8 disposal well location. Such review places minimal burden on an applicant. The Commission made no
9 change in response to the request for a survey area based on volume.

10 One commenter recommended that the Commission combine the proposed changes in §3.9(3)(C)
11 and (D) and §3.46(b)(1)(C) and (D) so that all requirements are included in one amendment. This
12 commenter expressed concern that earthquakes can occur in areas without historic seismic activity. Just
13 because an area has had no prior earthquake activity does not mean that it will not occur when a well is
14 put into operation. This commenter also recommended that the Commission revise the proposed language
15 in §3.9(3)(C) and (D) and §3.46(b)(1)(C) and (D) to substitute the word "will" for the word "may."

16 The Commission selected the word "may" to indicate that the Commission may require the
17 applicant to provide some or all of the additional information. Commission staff will review the
18 particular well and well location to determine what additional information may be needed. The
19 Commission disagrees that it must require all of the information in every case. The Commission made no
20 change in response to this comment.

21 One commenter expressed concern about the potential cost to applicants and stated that
22 earthquakes from salt water disposal ("SWD") injection wells are not common to all areas and injection
23 intervals. This commenter recommended that the Commission form a new unit (similar to the
24 Commission's Groundwater Advisory Unit) to advise on the potential for historic earthquakes at the

1 proposed disposal well location. This commenter stated that the cost of seismic lines for each new
2 location is prohibitive and will increase the cost of disposal considerably, as well as result in time delays.
3 The presence of nearby faults at the disposal well location also could be part of the Commission
4 responsibility by subscribing to the GeoMap mapping service on a statewide basis.

5 The Commission disagrees with this comment. The Commission's Underground Injection
6 Control regulations appropriately place the burden on the applicant to provide the Commission with the
7 information to justify issuance of a permit. In addition, the rule amendments do not require the
8 placement of seismic lines at every proposed disposal well location. The Commission made no change in
9 response to this comment.

10 Apache/Newfield recommended that the Commission and the industry focus in the short-term on
11 better understanding seismicity issues. This commenter recommended that the Commission undertake a
12 thorough analysis of known cases where disposal by injection is believed to be coincident with seismicity.
13 Rather than place the complete burden on one operator to perform the necessary technical work and
14 possibly collect confidential business information from other operators, the commenter recommended that
15 the Commission identify specific areas of interest across the state and request funding from the State
16 Legislature for comprehensive integrated subsurface geological, geophysical, and fluid modeling studies
17 by Texas institutions of higher learning, with input from industry, for the purpose of creating maps. This
18 commenter recommended that the Commission consider rule amendments after these studies.

19 Although the Commission agrees that additional study is warranted, the Commission does not
20 agree that this rulemaking effort should be postponed. The recommended studies would require vast
21 amounts of funding and time. Meanwhile, Texas has experienced seismic activity over the past few
22 years. The Commission made no change in response to this comment.

23 The Workgroup commended the Commission for being proactive in responding to seismic
24 activity, including the hiring of a seismologist and proposing reasoned requirements to address the risk of

1 seismic activity related to disposal well operations. The Workgroup found the following provisions
2 acceptable: (1) using the USGS database as the source for historic seismic activity; (2) amending
3 §3.9(6)(A)(vi) and §3.46(d)(1)(F) to include disposal that is shown to be causing seismic activity to the
4 list of reasons for which the Commission may modify, suspend, or terminate a disposal well permit for
5 just cause and after opportunity for hearing; (3) requiring operators to collect disposal volumes and
6 pressures as requested by the Commission for submittal; and (4) requiring additional technical data such
7 as logs and geologic cross-sections where conditions exist that may increase the risk that fluids will not be
8 confined to the injection interval or being possibly connected to seismic events nearby. Chevron,
9 Pioneer, and Apache/Newfield expressed support for the Workgroup comments. The Commission
10 appreciates these comments.

11 The Workgroup commented, however, that, while pressure front calculations can be an
12 appropriate part of a robust technical review and risk assessment where there have been seismic events in
13 close proximity to a proposed new disposal well, the Workgroup questioned using five psi pressure front
14 calculations as a tool simply to delineate an area for assessing historic seismic activity. The Workgroup
15 expressed concern that the number of poorly constrained variables that go into such a calculation may
16 lead to underestimating or overestimating the location of the pressure front boundary, thereby rendering a
17 common and consistent review of historic seismic events in a given area unlikely. Further, the
18 Workgroup stated that the methodology and results would not be transparent to all stakeholders, and
19 would also place a substantial burden on small operators by requiring them to retain additional technical
20 resources to perform calculations solely to obtain information on historic seismicity. The Workgroup and
21 Chevron stated that a more transparent, repeatable and risk-appropriate approach would be to require a
22 review of USGS historic seismic activity within a circular area of 40 square miles centered around the
23 proposed location for large disposal wells. The Workgroup recommended that shallow, low volume
24 disposal wells be exempted from this requirement or that the Commission require the use of a smaller area

1 for referencing historic seismic events. The Texas Energy Services Coalition echoed these concerns, but
2 recommended survey of a circular area of 20 square miles centered around the proposed disposal well
3 location.

4 Chevron commented that the proposed rule does not state any guidelines for the input data or
5 parameters, or calculation method(s) for determining the pressure front, making the rule somewhat
6 ambiguous and problematic in its application. Without specific guidance regarding verification of the
7 input parameters (some of which are rarely measured and can vary by orders of magnitude) and
8 calculation method, the confidence level in the calculation would be low and the uncertainty high. This
9 commenter stated that the actual pressure front that would be induced in the subsurface would be
10 complicated by the actual injection history, faults, injection horizon parameters, and interaction with other
11 wells.

12 The Commission agrees that, in many instances, the assumptions and approximations used by
13 applicants in such calculations would be highly interpretive and difficult for many operators to obtain,
14 particularly for applicants proposing to dispose into non-productive formations. As a result, the results
15 from such calculations could be non-uniform and misleading. Therefore, the Commission adopts a
16 simpler and more consistent method of determining the area to be surveyed. The Commission will
17 require that an applicant for a disposal well permit include with the permit application a printed copy or
18 screenshot showing the results of a survey review of information from the United States Geological
19 Survey (USGS) regarding the locations of any historical seismic events within a circular area of 100
20 square miles (a circle with a radius of 9.08 kilometers) centered around the proposed disposal well
21 location.

22 The Workgroup recommended that the Commission move the language regarding pressure front
23 calculations to §3.9(3)(C) and §3.46(b)(1)(D) as part of the additional information that may be required
24 by the Commission. Chevron commented that, if pressure front calculation requirement is retained, it

1 should be placed in §3.9(3)(C) and §3.46(b)(1)(D), as data that may be required on a case-by-case basis.

2 The Commission agrees with these comments and has made the recommended change.

3 One commenter stated that he had trouble using the USGS Earthquake Archive Search & URL
4 Builder site. The Commission contacted this person to assist with navigating the USGS website. The
5 Commission made no change in response to this comment.

6 The GCDs commended the Commission on proposal of the rule and, in general, expressed
7 support for the proposed changes to the rules and the Commission's efforts to ensure fluids from disposal
8 wells are confined to the injection interval and not at risk of migrating to freshwater resources. The
9 Commission appreciates these comments.

10 The GCDs recommended that the Commission require disposal well applicants to include their
11 calculations for determining pressure front boundary and area of influence for fluid migration in the
12 disposal well application, so that the values they use as parameters for the equations and their calculations
13 can be reviewed by Commission staff and third parties.

14 The Commission agrees in part with this comment. In cases where the Commission requires the
15 performance of pressure front boundary calculations, the actual input parameters and calculations also
16 would be required. The Commission made no change in response to this comment.

17 Upper Trinity GCD also suggests that the Commission amend the proposed language to require
18 that all disposal well permit applicants provide the Commission with the additional information, such as
19 logs, geologic cross-sections, and/or structural maps, to demonstrate fluid confinement to the injection
20 interval, rather than leaving this as a permissive option for the Commission staff to review on a
21 case-by-case basis. The GCD recommended that §3.9(3)(C) be changed so that the Commission will
22 require each applicant to submit the information, rather than leaving it as optional. The GCD also noted
23 that the term "baserock" should be "basement rock."

24 The Commission disagrees with the first recommended change. The existing requirements for

1 disposal well permit applications are adequate to make such a determination in most instances. The
2 Commission will require the additional information in §3.9(3)(C) to address instances in which additional
3 information is necessary to make such a determination. The Commission agrees that the term "basement
4 rock" is more correct than the term "baserock" originally proposed, and adopts the recommended change.

5 Pioneer requested clarification that the additional data that could be requested by the Commission
6 under §3.9(3)(C) or §3.46(b)(1)(D) would be existing data.

7 Although existing data will be adequate in most cases, the possibility exists where sufficient
8 information would not allow the Commission to adequately assess seismic threat. Therefore, if the
9 applicant wishes to pursue a disposal well permit application in such circumstances, new data may be
10 necessary. The Commission made no change in response to this comment.

11 Pioneer also requested clarification that in order to comply with the rule amendments, operators
12 will not be responsible for purchasing and/or installing seismographs, geophones or other monitors
13 designed to detect seismic activity.

14 The Commission did not propose the requirement for an operator to purchase and/or install
15 seismographs, geophones, or other monitors designed to detect seismic activity. However, there could be
16 an unusual case where an operator would elect to use this equipment. The Commission made no changes
17 in response to this comment.

18 The GCDs recommended that the Commission consider providing additional definitional
19 guidance through the proposed rules on what it will consider to constitute "complex geology" for the
20 purposes of requiring additional information from permit applicants to demonstrate confinement of fluids.

21 The Commission declines to define "complex geology" in the rule because an all-inclusive
22 definition is not possible. However, some examples might include heterogeneity, varying permeability
23 and porosity, faulting and folding, high stress, unconformities, tilted or rotated fault blocks, and
24 cross-stratification. The Commission made no change in response to this comment.

1 The GCDs requested that the Commission continue to take the necessary steps to protect not only
2 freshwater resources, but brackish water as well, in the regulation of disposal wells and potential sources
3 of contamination.

4 This comment is beyond the scope of this rulemaking. Texas Natural Resources Code, §91.101,
5 relating to rules and orders, requires the Railroad Commission to adopt and enforce rules and orders and
6 issue permits relating to "the production of oil and gas, including...activities associated with the drilling
7 of injection water source wells which penetrate the base of useable quality water." The Commission
8 provides letters of recommendation concerning groundwater protection. For recommendations related to
9 normal drilling operations, shot holes for seismic surveys, and cathodic protection wells, the Commission
10 provides geologic interpretation identifying the base of usable-quality water (generally less than 3,000
11 milligrams per liter (mg/L) total dissolved solids (TDS), but may include higher levels of TDS if
12 identified as currently being used or identified by the Texas Water Development Board (TWDB) as a
13 source of water for desalination). The geological interpretation may include groundwater protection based
14 on potential hydrological connectivity to usable quality water. For recommendations related to injection
15 into a non-producing zone, the Commission provides geologic interpretation of the base of the
16 underground sources of drinking water (USDW). USDW is defined as an aquifer or its portions which
17 supplies drinking water for human consumption; or in which the groundwater contains fewer than 10,000
18 milligrams per liter TDS; and which is not an exempted aquifer. The Commission's UIC program
19 prohibits injection into (unless the EPA has approved an aquifer exemption) or contamination of USDWs.
20 The Commission's Groundwater Advisory Unit coordinates with the TWDB with respect to desalination
21 projects and water use. The Commission also is a member of the Texas Groundwater Protection
22 Committee. The Commission made no change in response to this comment.

23 The Lone Star GCD stated that §3.9 and §3.46 currently require an applicant for an injection well
24 permit to review an area of a fixed radius of 1/4 mile for abandoned, unplugged, or improperly plugged

1 wells that could serve as a conduit for migration of injectate to freshwater (area of review). The Lone
2 Star GCD recommended that the Commission amend the rules to require that an applicant calculate a
3 site-specific area of review for all injection wells.

4 The commenter appears to be confusing the "area of review" requirement in the rules and the area
5 to be surveyed for historic seismicity. When the federal Underground Injection Control (UIC) regulations
6 were promulgated in 1980 under the Safe Drinking Water Act (SDWA), they required that a review of
7 wells within a 1/4 mile radius of the proposed injection well be conducted to ensure that surrounding
8 wells would not serve as a conduit for injected fluids to enter USDWs. This requirement is known as the
9 area-of-review or AOR requirement. Sections 3.9 and 3.46, adopted in 1981, require a 1/4 mile AOR
10 unless an applicant shows by computation that a lesser area will be affected by pressure increases. The
11 "area of review" with respect to the underground injection program is the area surrounding an injection
12 well that is reviewed during the permitting process to determine if flow between aquifers will be induced
13 by the injection operation. The area of review defines the area where the injection reservoir pressure
14 under the influence of injection activity could cause fluid to move into a USDW. The area of review is
15 determined based on the location at which fluids from the injection zone would rise in a hypothetical well
16 at a given location. The Commission's UIC program was approved with a fixed radius of 1/4 mile. The
17 information is used to determine whether corrective action is necessary.

18 In most cases, the Commission's AOR review involves a review of the map of wells within a 1/4
19 mile radius of the proposed injection or disposal well and the corresponding "Table of Wells" indicating
20 the status of all wells within the 1/4 mile radius to verify that the operator has indicated that the wells are
21 active, have an exception to §3.14 of this title (relating to Plugging), or are properly plugged. For
22 applications in selected problem areas, the Commission's UIC staff performs the more detailed review.
23 The more detailed AOR reviews are performed for applications for wells located in areas of highly
24 pressured formations, highly corrosive formation waters, public concern over injection wells, or where

1 unplugged abandoned wells are a real or perceived problem. The more detailed review involves pulling
2 and reviewing all completion and plugging reports for all wells within the 1/4 mile radius to verify that
3 the wells are properly completed and/or plugged. In addition, in certain areas, such as areas in which the
4 reservoir pressure is elevated, the Commission has determined that a larger area of review is warranted.

5 The survey area in this rulemaking is intended to address increased pressure that could trigger
6 movement of existing stressed faults. In any event, this comment is beyond the scope of the proposed
7 rulemaking, which is limited to seismicity associated with disposal wells. The Commission made no
8 change in response to this comment.

9 The EDF and the Sierra Club expressed general support for the proposed amendments. The
10 Commission appreciates these comments. The Commission made no change in response to these
11 comments.

12 The Sierra Club also recommended more research efforts and appropriate regulation to encourage
13 operators to move away from underground injection to prevent contamination, and to provide a potential,
14 available water resource for Texas.

15 The Commission agrees that produced fluids are a potential source of available water for Texas,
16 but finds that this comment is beyond the scope of this rulemaking. The Commission encourages the
17 re-use of these produced fluids when possible, particularly through the Commission's current rules
18 relating to recycling of these fluids (in §3.8 of this title, relating to Water Protection, and in Chapter 4,
19 Subchapter B, of this title, relating to Commercial Recycling.) However, current technology, as well as
20 the storage and transportation costs, with respect to use of these fluids as a potential fresh water source is
21 not yet economical in all instances. In addition, EPA estimates that there are 144,000 Class II injection
22 wells in the United States, and the Commission has permitted over 50,000 Class II injection wells in
23 Texas since the 1930s, with relatively few problems. The Commission made no changes in response to
24 this comment.

1 The EDF encouraged the Commission to continue to study the issue and develop protocols for
2 responding to future seismic events. The Sierra Club recommended that the Commission include in the
3 rule: (1) a discussion of the types of information needed, including but not limited to a discussion of
4 radioactive tracer or spinner surveys, well logs, and geological investigation of potential faulting; (2) a
5 requirement for a seismic monitoring plan, such as pre- and post-monitoring of the region for
6 earthquakes; (3) a requirement for monitoring before injection and testing and recording of original
7 bottomhole injection interval pressure; and (4) a requirement for a shut-off device on the injection pump
8 set to allow the maximum allowable injection pressure so that the Commission and operators can assure
9 safe disposal. The Sierra Club also recommended that the Commission develop a seismic monitoring plan
10 for assessing induced seismicity that may be or could be associated with existing permits.

11 Commission efforts to study issues related to seismic events are ongoing. Commission staff,
12 including the Commission's seismologist, are participating in the Induced Seismicity by Injection Work
13 Group of the State Oil and Gas Regulatory Exchange established by the Interstate Oil & Gas Compact
14 Commission and the national Ground Water Protection Council, which includes representatives from state
15 regulatory agencies and geological surveys across the country. State agencies participating in this work
16 group are collaborating and sharing science, research, and practical experience to equip the states with the
17 best decision making tools to evaluate the possible connections between seismic events and injection
18 wells, minimize risk, and enhance appropriate readiness when seismic events occur. The State Oil and
19 Gas Regulatory Exchange initiative is part of a larger state-led effort called States First, through which
20 state oil and gas regulatory agencies are collaborating and communicating with one another in an ongoing
21 effort to keep current with rapidly changing technology, as well as to share the very best and innovative
22 practices, procedures, and protocols from state to state. The Commission made no changes in response to
23 these comments.

24 The Sierra Club expressed support for the ability of the Commission to modify, suspend or

1 terminate a permit, but recommended that the Commission include additional details in the rule, such as
2 the right of the Commission to implement graduated maximum allowable injection pressure.

3 Language regarding the Commission's ability to modify, suspend or terminate an injection well
4 permit has been included in §3.9 and §3.46 since their initial adoption. The procedure is basically the
5 same no matter the cause. In addition, the Commission did not enumerate the details with regard to how
6 the Commission might modify a permit because such modifications would be based on site-specific
7 conditions. The Commission made no changes in response to this comment.

8 The Sierra Club recommended that the Commission include certain draft amendments considered
9 by the Commission in 2013 regarding various issues such as public notice, integrity testing, and casing
10 and cementing.

11 The Commission did circulate for informal comment in 2013 certain draft amendments to both
12 §3.9 and §3.46 relating to issues such as public notice, integrity testing, and casing and cementing.
13 However, the Commission has suspended work on those proposed amendments in order to address the
14 issue of seismic activity. The Commission may revisit the issues raised in those earlier draft amendments
15 at a later date. The Commission made no change in response to this comment.

16 The Sierra Club recommended that the Commission revise the rule to increase the disposal well
17 permit application fee to cover the additional work required of Commission staff.

18 The Commission disagrees with this recommendation, as its application fees are established by
19 the Texas Legislature in the statutes. The Commission made no change in response to this comment.

20 The EPA stated that the proposed regulations were reviewed by multiple Ground
21 Water/Underground Injection Control program engineers and scientists, all of which applauded the
22 Commission's efforts to ensure it has sufficient regulatory authority to respond to any event of this type
23 where concerns may arise. The Commission appreciates this comment.

24 The EPA further commented that the proposed regulations require the permit applicant to

1 calculate the estimated location of a five psi pressure front boundary after 10 years of injection, which
2 would be used to define the area to be reviewed for information on seismic events on the USGS website
3 as part of the application process. While the proposal preamble indicated this estimation is to be
4 calculated using injection at the maximum requested permit injection volume, this is not stated in the
5 proposed regulations. The EPA recommended that the Commission consider adding that requirement in
6 §3.9(3)(B) and §3.46(b)(1)(C). As previously discussed, the Commission adopts wording changes that
7 render this comment moot. The Commission made no change in response to this comment.

8 The EPA also expressed concern that the type of information necessary to conduct the pressure
9 front boundary calculation may not be readily available, because it is difficult to reliably estimate the
10 pressure front without an in situ measurement of transmissibility (generally a falloff test), and a static
11 pressure measurement. EPA commented that, in areas where new oil and gas activity creates the need for
12 new disposal wells, this type of information may not be well documented. If the pressure front is not
13 realistically estimated, the search area for seismic events might be very small and, given the uncertainties
14 in the USGS event locations (i.e., +/- 10 miles) this approach would be of limited utility. EPA
15 recommended that the Commission consider whether more detail needs to be provided on how to conduct
16 this estimation, or consider establishing a minimum distance to be reviewed (e.g., 10 miles) which the
17 applicant could opt to use if the formation information is not readily available.

18 The Sierra Club expressed agreement that the actual available information may not be sufficient
19 and the distance assumed in the analysis may be too small.

20 One commenter expressed appreciation for the proposed rule amendments as a first step but was
21 not convinced of their efficacy. Specifically, the commenter was concerned with calculation of the
22 "10-year five pounds per square inch pressure front boundary," stating that assumptions and
23 approximations used by permit applicants can be highly interpretative in nature and difficult for some
24 operators to obtain and therefore would yield non-uniform and possibly misleading results. The

1 commenter supports the requirement for reporting historical earthquake activity, the authority to request
2 timely, detailed pressure and volume information for specific injection wells, and clarification of the
3 ability of the Commission to modify injection permits. This commenter proposed changes to the
4 proposed rules that would provide detailed methodology of calculation of the "10-year five pounds per
5 square inch pressure front boundary" or require a simple, fixed distance search criteria for historical
6 earthquakes, and detail how the Commission will use specified "additional data" in determination of
7 earthquake risk.

8 The Commission appreciates these comments. As previously discussed, the Commission adopts
9 changes to the rules that address some of the commenters' concerns. Specifically, the Commission agrees
10 that the 10-year, five pounds per square inch pressure front boundary calculation may be onerous for
11 some disposal well permit applicants and further agrees that a simpler, fixed-size circular survey centered
12 on the proposed injection well location will be adequate for the purpose of performing a survey for
13 historical earthquake occurrence. The Commission adopts changes to require applicants to conduct a
14 survey of the USGS historical earthquake database in a circular area of 100 square miles centered on the
15 location of the proposed injection well.

16 One commenter recommended that the Commission revise the rule to require monthly reporting
17 of injection volumes and pressures along with maintaining daily injection volumes and pressures that may
18 be requested at any time; clarify that the Commission may, as the result of an emergency hearing, require
19 an operator to suspend operations pending further study; and indicate the Commission's commitment to
20 continue to engage in, support, and review further scientific and engineering studies.

21 The Commission's rules already require that a permitted disposal well operator monitor the
22 injection pressure and injection rate of each disposal well on at least a monthly basis and report the results
23 of the monitoring to the Commission annually. However, the disposal well operator must typically
24 monitor injection pressure and volume on a daily basis to ensure compliance with the limits on injection

1 pressure and volume in the operator's permit. In addition, the Commission has the authority to require an
2 operator to provide the records for injection pressure and volume to the Commission upon request. With
3 respect to the recommendation that the Commission clarify that, as the result of an emergency hearing,
4 the Commission may require an operator to suspend operations pending further study, the language
5 regarding modification, suspension, and termination of a disposal well permit after notice and opportunity
6 for hearing is sufficiently clear. With respect to the last recommendation of this commenter, the
7 Commission presently plans to engage in, support, and review further scientific and engineering studies;
8 however, such a statement is unnecessary in the rule language. The Commission made no change in
9 response to these comments.

10 The City of Southlake recommended that the Commission revise the rule to provide for: (1)
11 adequate public notice to elicit public comment and to engage public involvement through the permitting
12 process; (2) accompanying hearing procedures; (3) and earnest appeals procedures for property owners
13 who do not agree with or who are otherwise impacted by the Commission's permit determination in any
14 case.

15 The Commission finds these comments are beyond the scope of this rulemaking and made no
16 change in response to this comment.

17 With respect to the amendments in §3.9(6)(A)(vi) and §3.46(d)(1)(F), relating to modification,
18 suspension or termination of a permit based on increased seismic activity, Chevron recommended that the
19 Commission establish an appeals provision to allow an operator to present evidence to the Commission.

20 The Commission's regulations in Chapter 1 of this title (relating to Practice and Procedure), allow
21 for "appeals" using the Commission's current hearing process and Commission decision, as well as the
22 existing avenues through the court system. The Commission made no change in response to this
23 comment.

24 CrownQuest and an individual expressed concerns with the proposed rule amendments with the

1 calculation of the "10-year five pounds per square inch pressure front boundary", stating that assumptions
2 and approximations used by permit applicants can be highly interpretative in nature and difficult for some
3 operators to obtain and therefore would yield non-uniform and possibly misleading results. The
4 commenters find the parameters used by the Commission to be arbitrary and not founded in sound science
5 and engineering.

6 The Commission disagrees with the comment that the "10-year five pounds per square inch
7 pressure front boundary" is arbitrary and not founded in sound science and engineering practice.
8 Published research indicates that inducing earthquakes on preferentially oriented faults requires positive
9 pressure differentials of as little as one pound per square inch to as much as 75 pounds per square inch.
10 The Commission proposed five pounds per square inch as a conservative number. Further, calculation of
11 the pressure front boundary after 10 years of injection at the maximum permitted injection rate was
12 considered to be a reasonable measure of the lifetime amount of volume injected for a typical disposal
13 well. Also, while understanding the wide range of possible values for real reservoir characteristics, the
14 Commission expected operators would enter realistic values in the calculation to yield a first-order
15 scientific and engineering calculation. Nonetheless, as previously discussed, the Commission adopts
16 other changes to this wording; the language regarding calculation of a pressure front boundary around a
17 proposed disposal well location has been moved to §3.9(3)(C) and §3.46(b)(1)(D) and will be required
18 only in certain limited circumstances where additional information is necessary to demonstrate that fluids
19 will be confined if the well is to be located in an area where conditions exist that may increase the risk
20 that fluids will not be confined to the injection interval.

21 CrownQuest suggested that in §3.9(3)(C) and §3.46(b)(1)(D) the word "may" be deleted and
22 replaced with the words "will significantly" in the phrase "... may increase the risk that fluids will be
23 confined to the injection interval."

24 EPA commented that the transmission of pressure in the subsurface due to the injection of fluids

1 affects a much greater area than the actual migration of the injected fluids, and expressed concern that not
2 including language recognizing this pressure influence (which is the primary concern in induced
3 seismicity events) may inadvertently limit the applicability of these changes.

4 The Commission agrees with the statement that transmission of pressure in the subsurface due to
5 the injection of fluids affects a much greater area than the actual migration of the injected fluids, which is
6 why the Commission originally proposed a pressure front calculation. However, due to other changes
7 previously discussed, the Commission made no change with regard to these comments.

8 CrownQuest and Pioneer recommended that the Commission delete the phrase "suspected of or
9 shown to be" in §3.9(6)(A)(vi) and §3.46(d)(1)(F) and replace it with "demonstrated by reliable scientific
10 and engineering data" in the phrase "... injection is suspected of or shown to be causing seismic activity."

11 The Commission disagrees with the suggested wording change for §3.9(6)(A)(vi) and
12 §3.46(d)(1)(F); however, the Commission adopts language to clarify that the trigger for the Commission
13 to consider modification, suspension, or termination of a permit will be based on injection "likely to be or
14 determined to be contributing to seismic activity."

15 CrownQuest commented that generally, disposal wells should be treated differently based on their
16 proximity to population centers or the number of homes within the pressure front boundary.

17 The Commission disagrees with this comment; the Commission is concerned with the safety of
18 all Texans, including those who live in low population areas. The Commission made no changes in
19 response to this comment.

20 In a letter signed by the Honorable Judge Carlos Garcia, the Frio County Commissioners Court
21 commented that the capacity of disposal into disposal wells is "exceeding environmental boundaries" and
22 expressed concern that in the future, such disposal will result in well overflows or leaks. The
23 Commissioners Court requested that the Commission review the Frio County area, in which the
24 Commissioners Court stated are located wells permitted to dispose into shallow oil and gas producing

1 formations which contain brackish water. The Commissioners Court also expressed concern with public
2 safety and spills on roads in the county as well as pipelines, fractionation facilities, and other ancillary
3 facilities, and referenced Chapter 361 of the Texas Health and Safety Code, regarding development of
4 solid waste plans to protect and promote water, health, and public safety.

5 The Commission finds that these comments are beyond the scope of this rulemaking or outside
6 the Commission's statutory authority. In determining whether to permit a disposal well, the Commission
7 considers disposal capacity of an area, including the need for such disposal capacity and the existing
8 pressure status of the interval into which the injection is proposed. The Commission also considers the
9 presence of abandoned, unplugged or improperly plugged wells within the area of a proposed disposal
10 well. The Commission does not permit injection into an underground source of drinking water as defined
11 by the EPA and §3.30 of this title (relating to Memorandum of Understanding between the Railroad
12 Commission of Texas (RRC) and the Texas Commission on Environmental Quality (TCEQ)). Section
13 3.30 defines an underground source of drinking water as "an aquifer or its portions which supplies
14 drinking water for human consumption; or in which the groundwater contains fewer than 10,000
15 milligrams per liter total dissolved solids; and which is not an exempted aquifer." Such definition
16 includes water defined as brackish. No disposal well in Frio County is permitted to inject into a USDW.
17 The Commission made no changes in response to these comments.

18
19 DESCRIPTION OF RULE AS ADOPTED

20 As stated in the proposal preamble, the EPA estimates that there are 144,000 Class II injection
21 wells in the United States. The Commission has permitted over 50,000 Class II injection wells in Texas
22 since the 1930s. While few earthquakes have been documented over the past several decades relative to
23 the large number of disposal wells in operation, seismic events have infrequently occurred in areas where
24 there is coincident oil and gas activity. Therefore, the Commission adopts these rule amendments in order

1 to require additional information in support of a permit application regarding historical seismic events in
2 the vicinity of a proposed disposal well's location, as well as certain other information in the event the
3 well is to be located in an area where conditions exist that may increase the risk that fluids will not be
4 confined to the injection interval. The USGS maintains an online, accessible data base of seismic events
5 in the United States from 1973 to the present. Applicants for a disposal well permit under §3.9 or §3.46 as
6 amended will be required to access the USGS earthquake search tool at
7 <http://earthquake.usgs.gov/earthquakes/search/> in order to retrieve data regarding the locations of
8 historical seismic events within a specified area around the proposed disposal well location. The
9 Commission also adopts these amendments to clarify that it has the authority to modify, suspend, or
10 terminate a permit for just cause after notice and opportunity for hearing if injection is likely to be or
11 determined to be contributing to seismic activity. Finally, the Commission adopts these rule amendments
12 to authorize more frequent monitoring and reporting by operators of disposal well injection pressures and
13 injection rates in the event certain conditions are present that may increase the risk that fluids will not be
14 confined to the injection interval.

15 The Commission adopts amendments to §3.9(3) to add new subparagraph (B), with changes
16 previously discussed, to state that the applicant shall include with the application for a disposal well
17 permit under this section a printed copy or screenshot showing the results of a survey of information from
18 the USGS indicating the locations of any historical seismic events within a circular area of 100 square
19 miles (a circle with a radius of 9.08 kilometers) centered around the proposed disposal well location.

20 The Commission adopts new §3.9(3)(C), with changes previously discussed, to state that the
21 Commission may require an applicant for a disposal well permit to provide the Commission with
22 additional information, such as logs, geologic cross-sections, pressure front boundary calculations, and/or
23 structure maps, to demonstrate that fluids will be confined if the well is to be located in an area where
24 conditions exist that may increase the risk that fluids will not be confined to the injection interval.

1 Conditions that may increase the risk that fluids will not be confined to the injection interval may include,
2 but are not limited to, complex geology, proximity of the basement rock to the injection interval,
3 transmissive faults, and/or a history of seismic events in the area as demonstrated by information
4 available from the USGS required in §3.9(3)(B).

5 The Commission amends §3.9(6)(A)(vi), with changes previously discussed, to include injection
6 that is likely to be or determined to be contributing to seismic activity to the list of reasons for which the
7 Commission may modify, suspend, or terminate a permit for saltwater or other oil and gas waste disposal
8 for just cause after notice and opportunity for hearing.

9 The Commission amends §3.9(11)(A) and §3.9(11)(B) to state that the Commission may require
10 more frequent monitoring and monitoring reporting to the Commission of the injection pressure and
11 injection rate in the event that conditions described in §3.9(3)(C) and §3.46(b)(1)(D) exist which may
12 increase the risk that fluids will not be confined to the injection interval. The Commission also amends
13 §3.9(11)(B) to correct a typographical error in the existing rule.

14 The Commission amends §3.46 to incorporate similar language for disposal wells that are
15 permitted under §3.46. Under §3.46, the Commission regulates injection into productive formations for
16 either enhanced recovery or for disposal. The new language relating to seismic activity would apply only
17 to those wells permitted under §3.46 for disposal purposes.

18 The Commission amends §3.46(b)(1) to add new subparagraphs (C) and (D). New subparagraph
19 (C), adopted with changes previously discussed, requires the applicant to include with the permit
20 application for injection for the purpose of disposal under this section a printed copy or screenshot
21 showing the results of a survey of information from the USGS indicating the locations of any historical
22 seismic events within a circular area of 100 square miles (a circle with a radius of 9.08 kilometers)
23 centered around the proposed disposal well location.

24 New §3.46(b)(1)(D), adopted with changes previously discussed, states that the Commission may

1 require an applicant for a disposal well permit under this section to provide the Commission with
2 additional information such as logs, geologic cross-sections, pressure front boundary calculations, and/or
3 structure maps, to demonstrate that fluids will be confined if the well is to be located in an area where
4 conditions exist that may increase the risk that fluids will not be confined to the injection interval. Such
5 conditions may include, but are not limited to, complex geology, proximity of the basement rock to the
6 injection interval, transmissive faults, and/or a history of seismic events in the area as demonstrated by
7 information available from the USGS required in §3.46(b)(1)(C).

8 The Commission amends §3.46(d)(1)(F), with changes previously discussed, to include injection
9 that is likely to be or determined to be contributing to seismic activity to the list of reasons for which the
10 Commission may modify, suspend, or terminate a permit for just cause after notice and opportunity for
11 hearing.

12 The Commission amends §3.46(i)(1) and (2) to state that the Commission may require more
13 frequent monitoring and monitoring reporting to the Commission of the injection pressure and injection
14 rate.

15 RESTATEMENT OF STATUTORY AUTHORITY

16 The Commission adopts amendments to §3.9 and §3.46, pursuant to Texas Water Code, §26.131,
17 which gives the Commission jurisdiction over pollution of surface or subsurface waters from oil and gas
18 exploration, development, and production activities; Texas Water Code, Chapter 27, which authorizes the
19 Commission to adopt and enforce rules relating to injection wells; Texas Natural Resources Code,
20 §81.052, which authorizes the Commission to adopt all necessary rules for governing and regulating
21 persons and their operations under the jurisdiction of the Commission under Texas Natural Resources
22 Code, §81.051; Texas Natural Resources Code, §85.042(b), which provides the Commission with the
23 authority to, when necessary, make and enforce rules either general in their nature or applicable to
24 particular fields for the prevention of actual waste of oil or operations in the field dangerous to life or

1 property; Texas Natural Resources Code, §85.201, which authorizes the Commission to make and enforce
2 rules for the conservation of oil and gas and prevention of waste of oil and gas; Texas Natural Resources
3 Code, §85.202, which authorizes the Commission to adopt rules to prevent waste of oil and gas in drilling
4 and producing operations; Texas Natural Resources Code, §91.101, which authorizes the Commission, in
5 order to prevent pollution of surface water or subsurface water in the state, to adopt rules relating to the
6 various oilfield operations, including activities associated with the drilling of injection water source wells
7 which penetrate the base of usable quality water, and the discharge, storage, handling, transportation,
8 reclamation, or disposal of oil and gas waste; and Texas Natural Resources Code, §91.602, which
9 authorizes the Commission, in order to protect human health and the environment, to adopt and enforce
10 rules relating to the generation, transportation, treatment, storage, and disposal of oil and gas hazardous
11 waste.

12 Texas Water Code, §26.131, and Chapter 27; and Texas Natural Resources Code, §§81.052,
13 85.042(b), 85.201, 85.202, 91.101, and 91.602 are affected by the adopted amendments.

14 Statutory authority: Texas Water Code, §26.131, and Chapter 27; and Texas Natural Resources
15 Code, §§81.052, 85.042(b), 85.201, 85.202, 91.101, and 91.602.

16 Cross-reference to statute: Texas Water Code, §26.131, and Chapter 27; and Texas Natural
17 Resources Code, §§81.052, 85.042(b), 85.201, 85.202, 91.101, and 91.602.

18 ADOPTED RULE LANGUAGE

19 **[Note: Changes made to the published rule language are shown in bold type.]**

20 §3.9. Disposal Wells.

21 Any person who disposes of saltwater or other oil and gas waste by injection into a porous
22 formation not productive of oil, gas, or geothermal resources shall be responsible for complying with this
23 section, Texas Water Code, Chapter 27, and Title 3 of the Natural Resources Code.

24 (1) - (2) (No change.)

1 (3) Application.

2 (A) The application to dispose of saltwater or other oil and gas waste by injection
3 into a porous formation not productive of oil, gas, or geothermal resources shall be filed with the
4 commission in Austin accompanied by the prescribed fee. On the same date, one copy shall be filed with
5 the appropriate district office.

6 (B) The applicant for a disposal well permit under this section shall include with
7 the permit application a printed copy or screenshot showing the results of a survey ~~review~~ of
8 information from the United States Geological Survey (USGS) regarding the locations of any historical
9 seismic events within a circular area of 100 square miles (a circle with a radius of 9.08 kilometers)
10 centered around ~~the estimated radius of the 10-year, five pounds per square inch (psi) pressure~~
11 front boundary of the proposed disposal well location. ~~The pressure front is the zone of elevated~~
12 pressure that is created by the injection of fluids into the subsurface.

13 (C) The commission may require an applicant for a disposal well permit under
14 this section to provide the commission with additional information such as logs, geologic cross-sections,
15 pressure front boundary calculations, and/or structure maps, to demonstrate that fluids will be confined
16 if the well is to be located in an area where conditions exist that may increase the risk that fluids will not
17 be confined to the injection interval. Such conditions may include, but are not limited to, complex
18 geology, proximity of the basement rock ~~baserock~~ to the injection interval, transmissive faults, and/or
19 a history of seismic events in the area as demonstrated by information available from the USGS.

20 (4) - (5) (No change.)

21 (6) Subsequent commission action.

22 (A) A permit for saltwater or other oil and gas waste disposal may be modified,
23 suspended, or terminated by the commission for just cause after notice and opportunity for hearing, if:

24 (i) a material change of conditions occurs in the operation or completion

1 of the disposal well, or there are material changes in the information originally furnished;

2 (ii) freshwater is likely to be polluted as a result of continued operation
3 of the well;

4 (iii) there are substantial violations of the terms and provisions of the
5 permit or of commission rules;

6 (iv) the applicant has misrepresented any material facts during the permit
7 issuance process;

8 (v) injected fluids are escaping from the permitted disposal zone; ~~[or]~~

9 (vi) injection is likely to be or ~~[suspected of or shown]~~ determined to
10 be contributing to ~~causing~~ seismic activity; or

11 (vii) ~~[(vi)]~~ waste of oil, gas, or geothermal resources is occurring or is
12 likely to occur as a result of the permitted operations.

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

14 (7) - (10) (No change.)

15 (11) Monitoring and reporting.

16 (A) The operator shall monitor the injection pressure and injection rate of each
17 disposal well on at least a monthly basis, or on a more frequent basis as required by the commission under
18 conditions described in paragraph (3)(C) of this section.

19 (B) The results of the monitoring shall be reported annually to the commission on
20 the prescribed form, or on a more frequent basis as required by the commission under conditions
21 described in paragraph (3)(C) of this section [from].

22 (C) All monitoring records shall be retained by the operator for at least five
23 years.

24 (D) The operator shall report to the appropriate District Office within 24 hours

1 any significant pressure changes or other monitoring data indicating the presence of leaks in the well.

2 (12) - (14) (No change.)

3
4 §3.46. Fluid Injection into Productive Reservoirs.

5 (a) (No change.)

6 (b) Filing of application.

7 (1) Application.

8 (A) An application to conduct fluid injection operations in a reservoir productive
9 of oil, gas, or geothermal resources shall be filed in Austin on the form prescribed by the commission
10 accompanied by the prescribed fee. On the same date, one copy shall be filed with the appropriate district
11 office. The form shall be executed by a party having knowledge of the facts entered on the form.

12 (B) The applicant shall file the freshwater injection data form if fresh water is to
13 be injected.

14 (C) The applicant for a disposal well permit under this section shall include with
15 the permit application a printed copy or screenshot showing the results of a survey [review] of
16 information from the United States Geological Survey (USGS) regarding the locations of any historical
17 seismic events within a circular area of 100 square miles (a circle with a radius of 9.08 kilometers)
18 centered around [the estimated radius of the 10-year, five pounds per square inch (psi) pressure
19 front boundary of] the proposed disposal well location. [The pressure front is the zone of elevated
20 pressure that is created by the injection of fluids into the subsurface.]

21 (D) The commission may require an applicant for a disposal well permit under
22 this section to provide the commission with additional information such as logs, geologic cross-sections,
23 pressure front boundary calculations, and/or structure maps, to demonstrate that fluids will be confined
24 if the well is to be located in an area where conditions exist that may increase the risk that fluids will not

1 be confined to the injection interval. Such conditions may include, but are not limited to, complex
2 geology, proximity of the **basement rock [baserock]** to the injection interval, transmissive faults, and/or
3 a history of seismic events in the area as demonstrated by information available from the USGS.

4 (2) (No change.)

5 (c) (No change.)

6 (d) Subsequent commission action.

7 (1) An injection well permit may be modified, suspended, or terminated by the
8 commission for just cause after notice and opportunity for hearing, if:

9 (A) a material change of conditions occurs in the operation or completion of the
10 injection well, or there are material changes in the information originally furnished;

11 (B) fresh water is likely to be polluted as a result of continued operation of the
12 well;

13 (C) there are substantial violations of the terms and provisions of the permit or of
14 commission rules;

15 (D) the applicant has misrepresented any material facts during the permit
16 issuance process;

17 (E) injected fluids are escaping from the permitted injection zone; ~~or~~

18 (F) for a disposal well permit under this section, injection is likely to be or
19 ~~[suspected of or shown]~~ determined to be contributing to ~~[causing]~~ seismic activity; or

20 (G) ~~[(F)]~~ waste of oil, gas, or geothermal resources is occurring or is likely to
21 occur as a result of the permitted operations.

22 (2) - (3) (No change.)

23 (e) - (h) (No change.)

24 (i) Monitoring and reporting.

1 (1) The operator shall monitor the injection pressure and injection rate of each injection
2 well on at least a monthly basis, or on a more frequent basis for a disposal well permitted under this
3 section as required by the commission under **conditions described in** subsection (b)(1)(D) of this section.

4 (2) The results of the monitoring shall be reported annually, or on a more frequent basis
5 for a disposal well permitted under this section as required by the commission under **conditions**
6 **described in** subsection (b)(1)(D) of this section, to the commission on the prescribed form.

7 (3) All monitoring records shall be retained by the operator for at least five years.
8

1 (4) The operator shall report to the appropriate District Office within 24 hours any
2 significant pressure changes or other monitoring data indicating the presence of leaks in the well.

3 (j) - (n) (No change.)

4 This agency hereby certifies that the rules as adopted have been reviewed by legal counsel and
5 found to be a valid exercise of the agency's legal authority.

6 Issued in Austin, Texas, on _____, 2014.

7 Filed with the Office of the Secretary of State on _____, 2014.

Christi Craddick, Chairman

David Porter, Commissioner

Barry T. Smitherman, Commissioner

ATTEST:

Secretary of the Commission

Cristina Martinez Self
Rules Attorney
Office of General Counsel
Railroad Commission of Texas