Frac Water - Regulation of Quantity and Quality, and Reporting by Texas Groundwater Conservation Districts

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CHAPTER 8
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I. Introduction

This paper addresses the regulation by groundwater conservation districts ("GCD") of water wells and groundwater associated with hydraulic fracturing ("HF") operations in the oil and gas industry. The target audience is an individual who is generally familiar with GCDs and groundwater law and is generally familiar with the process of HF. A bibliography of resources about GCDs and groundwater law and about the HF process associated with oil and gas activities is provided as Appendix A.

Reservoirs with low permeability require stimulation to optimize production of oil and gas. Fresh water1 is used in the HF stimulation process. The water is mixed with proppant (often sand), and other additives and injected into the formation to hydraulically induce cracks in the target formation through which oil or natural gas can flow to the wellbore.2 This viscous gelled fluid is called "frac fluid."3 After doing its job below ground, some of the frac fluid, which may contain additional constituents at this point, returns to the surface. This fluid is called "flowback" and consists primarily of water.4

Water is delivered to the well site in tanker trucks or via dedicated waterlines. The water may arrive over a period of days or weeks and may be stored on site in tanks or lined pits. Generally, there is no lengthy on-site storage of pre-mixed frac fluid because blending of the frac fluid occurs as pumping of the fracture fluid is underway. Upon completion of the fracturing operation, recovered frac fluid in the flowback water must be managed. Sometimes this requires storage on site until it can be separated, contained, treated, disposed of, and/or reused.5

Hydraulic fracturing to produce hydrocarbons in the Barnett, Eagle Ford, and Haynesville shale formations is much in the news, and most of the GCD Case Studies presented in this paper address this situation. Hydraulic fracturing also allows for extended production in older oil and natural gas fields, which is the primary activity in the Panola County GCD, as discussed below.

A GCD takes interest in HF operations because of its statutory duty to protect the quantity and quality of groundwater within its jurisdictional boundaries.7 Groundwater conservation districts are interested in (1) the source and quantity of the water that is being used to drill the well and being used to create frac fluid for the fracturing process ("frac water"). (2) Districts are interested in whether the HF process itself is adversely impacting the quality of surrounding groundwater. (3) Of additional interest to GCDs is whether during these operations, groundwater is being wasted. (4) Districts are also interested in whether the handling of flowback is impacting groundwater: whether it is injected into a saltwater disposal well, being disposed of in reserve pits or landfarming, or being recycled.

This paper discusses the authority of a GCD to regulate these activities and provides Case Studies of a limited number of the numerous GCDs currently being impacted by HF operations.

II. Authority of a GCD to Regulate Frac Water

The underlying issues when determining the interplay8 between GCDs and HF operations are generally the same. These are the issues addressed in this paper and explored in the Case Studies presented later in the discussion.

• Does the GCD want to know about all wells producing water for HF?

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1 What comprises "fresh water" depends upon who is using the term. See discussion below at Section III.A.
4 FracFocus, Fracturing Fluid Management. Available at http://fracfocus.org/hydraulic-fracturing-how-it-works/drilling-risks-safeguards. (Last visited Jan. 24, 2012). ("FracFocus Fluid Management") "FracFocus is the national hydraulic fracturing chemical registry. It is managed by the Ground Water Protection Council and Interstate Oil and Gas Compact Commission, two organizations whose missions both revolve around conservation and environmental protection. The site was created to provide the public access to reported chemicals used for hydraulic fracturing within their area. To help users put this information into perspective, the site also provides objective information on hydraulic fracturing, the chemicals used, the purposes they serve and the means by which groundwater is protected." FracFocus, About Us: FracFocus Chemical Disclosure Registry. Available at http://fracfocus.org/welcome. (Last visited Jan. 24, 2012).
5 API Water Management at p. 9
8 Borrowing from McPherson, Mark, Interplay Between Groundwater Districts and Oil and Gas Production Areas, presented at the 11th Annual Changing Face of Water Rights Course (April 8, 2010) at p. 1. ("Interplay") This paper uses the term "interplay" . . . "to describe the broader relationship between energy producers and Districts."
The RRC literature related to HF states that "fresh water" is used in HF.\textsuperscript{12} There seems, however, to be no consistent definition of "fresh water." The various sources either do not define "fresh water,"\textsuperscript{13} the definition is vague,\textsuperscript{14} or the definition in terms of total dissolved solids ("TDS") is contradictory.\textsuperscript{15}

For example, the American Petroleum Institute ("API") Guidance Document HF2 states that lower-quality groundwater sources, such as water with 10,000


\textsuperscript{13} See Appendix B: Railroad Commission of Texas: Barnett Shale at pp. 14-15.

\textsuperscript{14} Fresh water is defined by the Texas Water Code §27.002(8) and in Railroad Commission regulations as "[w]ater having bacteriological, physical, and chemical properties that make it suitable and feasible for beneficial use for any lawful purpose." See, e.g., Tex. Admin. Code 16 § 3.81(7).

\textsuperscript{15} Under the Safe Drinking Water Act's ("SDWA") Underground Injection Control ("UIC") Program, which has been delegated to the State (Texas Commission on Environmental Quality ("TCEQ") and RRC), an underground source of drinking water ("USDW") is defined at 40 CFR 144.3 as "an aquifer or its portion: (a)(1) Which supplies any public water system; or (2) Which contains a sufficient quantity of ground water to supply a public water system; and (i) Currently supplies drinking water for human consumption; or (ii) Contains fewer than 10,000 mg/l total dissolved solids; and (b) Which is not an exempted aquifer." The United States Geological Survey ("USGS") and the Water Quality Association ("WQA"), a not-for-profit international trade association representing the residential, commercial and industrial water treatment industry, define fresh water as containing fewer than 1,000 mg/l total dissolved solids. See USGS, Glossary of Hydrologic Terms. Available at http://or.water.usgs.gov/projs_dir/willgw/glossary.html#B (Last visited Jan. 27, 2012) and Water Quality Association, The WQA Glossary of Terms: Saltwater. Available at http://www.wqa.org/glossary.cfm?gl=1874. (Last visited Jan. 27, 2012), respectively. Compare to API Water Management at p. 16. Compare also, Tex. Admin. Code 16 § 331.2(25) and (26), [the RRC definitions of "cone of influence" and "confining zone," which appear to equate USDW with fresh water aquifer] with the standard used to determine the base of "usable-quality water" (groundwater with 3,000 milligrams per liter ("mg/L") or less TDS), previously used by the TCEQ during the injection well permitting process and now used by the RRC staff for the same purpose. Texas Groundwater Protection Committee, What are the Permitting Processes for a Class II Oil and Gas Disposal Well? (October 2011). Available at: http://www.lgpc.state.tx.us/FAQs.htm.


116 Tex. Admin. Code §§ 3.5, 3.13, and 3.14, respectively. See also, Interplay at p. 3.
ppm TDS\textsuperscript{16} can be used, which would avoid competing with fresh water users. They note that in some cases, producers are using saline waters with up to 30,000 ppm TDS but this may require the drilling of source water wells that are deeper than publicly used potable water aquifers and may contain additional constituents that could require treating.\textsuperscript{17} As discussed below in Section VIII, Case Studies, some GCDs are actively engaged in communicating with the producers in the preferred selection of groundwater sources.

B. Texas Water Code Section 36.117 "Oil and Gas Exemption"

Many sections of Texas Water Code chapter 36 may apply to all water wells and groundwater use within a GCD, other than underground reservoirs that are below the base of usable quality water. In the context of regulation of frac water, a GCD looks at its enabling legislation\textsuperscript{18} and then to Texas Water Code section 36.117(b)(2) to determine the extent of its regulatory powers. Section 36.117(b)(2) is generally referred to as the "oil and gas exemption." Until fairly recently, a majority of GCDs read this provision as a "hands-off" for regulating any water well associated with oil and gas operations.\textsuperscript{19} This provision should not be read in a vacuum, however. In addition to the obvious need to review the legislation or order creating a GCD,\textsuperscript{20} other provisions in Chapter 36 must be considered.

Following is an excerpt of Section 36.117 that includes provisions applicable to understanding the meaning of the "oil and gas exemption."

Sec. 36.117. EXEMPTIONS; EXCEPTION; LIMITATIONS. (a) A district by rule may provide an exemption from the district's requirement to obtain a drilling permit, an operating permit, or any other permit required by this chapter or the district's rules.

(b) Except as provided by this section, a district shall provide an exemption from the district requirement to obtain a permit for:
   (1) . . .
   (2) drilling a water well used solely to supply water for a rig that is actively engaged in drilling or exploration operations for an oil or gas well permitted by the Railroad commission of Texas provided that the person holding the permit is responsible for drilling and operating the water well and the water well is located on the same lease or field associated with the drilling rig;
   (3) . . .

(c) . . .

(d) A district may cancel a previously granted exemption, and may require an operating permit for or restrict production from a well if:
   (1) . . .
   (2) the groundwater withdrawals that were exempted under Subsection (b)(2) are no longer used solely to supply water for a rig that is actively engaged in drilling or exploration operations for an oil or gas well permitted by the Railroad Commission of Texas; or
   (3) . . .

(e) . . .

(f) A district may require compliance with the district's well spacing rules for the drilling of any well except a well exempted under Subsection (b)(3). [The oil and gas exemption is (b)(2).]

(g) A district may not deny an application for a permit to drill and produce water for hydrocarbon production activities if the application meets all applicable rules as promulgated by the district.

(h) A district shall require the owner of a water well to:
   (1) register the well in accordance with rules promulgated by the district; and
   (2) equip and maintain the well to conform to the district's rules requiring installation of casing, pipe, and fittings to prevent the escape of groundwater from a groundwater reservoir to any reservoir not containing groundwater and to prevent the pollution or
harmful alteration of the character of the water in any groundwater reservoir.

(i) The driller of a well shall file with the district the well log required by Section 1901.251, Occupations Code, [commonly known as the driller's log] and, if available, the geophysical log.

(j) An exemption provided under Subsection (b) does not apply to a well if the groundwater withdrawn is used to supply water for a subdivision of land for which a plat approval is required by Chapter 232, Local Government Code.21

(k) Groundwater withdrawn under an exemption provided in accordance with this section and subsequently transported outside the boundaries of the district is subject to any applicable production and export fees under Sections 36.122 and 36.205.

(l) This chapter applies to water wells, including water wells used to supply water for activities related to the exploration or production of hydrocarbons or minerals. This chapter does not apply to production or injection wells drilled for oil, gas, sulphur, uranium, or brine, or for core tests, or for injection of gas, saltwater, or other fluids, under permits issued by the Railroad Commission of Texas.

[Emphasis added.] It is difficult to understand the "hands-off" approach of GCDs when the provisions in this excerpt of Section 36.117 are considered.

Possibly the reluctance to regulate water wells used to supply water for activities related to the exploration or production of hydrocarbons arises, in part, from the RRC's stated interpretation of "water for a rig that is actively engaged in drilling or exploration operations." [Phrase from 36.117(b)(2).] On a webpage entitled, "Barnett Shale: Water Use in Association with Oil and Gas Activities Regulated by the Railroad Commission of Texas," the Railroad Commission quotes this statutory language, and in a footnote states that the agency interprets "exploration operations" to include HF operations. See Appendix B, at page 17. A limited search of the RRC Rules at Title 16 of the Texas Administrative Code did not reveal the source of this interpretation. Additionally, other sections of the "Barnett Shale" webpage seem to contradict this interpretation. Finally, 16 Texas Administrative Code section 3.29(a)(15) defines "hydraulic fracturing treatment" as being used "to enhance production of oil and/or natural gas." This definition in the RRC’s newly adopted “Hydraulic Fracturing Chemical Disclosure Requirements” rules is inconsistent with equating water supply for HF with water supply for exploration.

So if HF is not "exploration" as the RRC interprets it, is it "drilling"? FracFocus confirms that HF is not a "drilling process."

Contrary to many media reports, hydraulic fracturing is not a “drilling process.” Hydraulic Fracturing is used after the drilled hole is completed. Put simply, hydraulic fracturing is the use of fluid and material to create or restore small fractures in a formation in order to stimulate production from new and existing oil and gas wells. This creates paths that increase the rate at which fluids can be produced from the reservoir formations, in some cases by many hundreds of percent.23

Even if the Railroad Commission has correctly interpreted section 36.117(b)(2) to mean that the exemption applies to groundwater supply for HF, what exactly does that mean with respect to a GCD's authority to regulate those water wells and that supply? While not specifically addressing whether frac water falls within the exemption, the oldest and largest trade association representing the Texas oil and gas industry believes a GCD has broad authority over 36.117(b)(2) exempt wells. At a House Natural Resources Committee meeting on House Bill 2311 (82nd Leg.), Mr. Ben Sebree testified on behalf of the Texas Oil and Gas Association25 that Texas Water Code chapter 36

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21 After the "clarification" of this subsection provided by S.B. 691 and 692, 82nd Leg. (2011), it seems to say the subsection is only meaningful as to exemptions under Subsection (b)(1). It is included here in case someone has a persuasive argument that it could logically still apply to wells exempt under Subsection (b)(2).


23 FracFocus HF Process

24 H.B. 2311 sought to address the concern that the law did not adequately address permit exemptions by clarifying the applicability of certain permits.

25 “Texas Oil & Gas Association (TXOGA) is a general, multipurpose trade association representing the Texas oil and gas industry. It is the oldest and largest organization in the state representing petroleum interests and continues to serve as the only organization in the state which embraces all segments of this industry. Membership in Texas Oil & Gas Association is open to anyone with a vested interest in continued prosperity of the oil & gas industry in Texas.” See, Texas Oil & Gas Association, About Us. Available at http://www.txoga.org/categories/about-us/. (Last visited Jan. 25, 2012).
provides an exemption from permitting by groundwater conservation districts but it does not provide an exemption from regulation of [water wells associated with oil and gas activities]. . . . they do have to comply with all the rules of the district, whether it's spacing, production, whatever, . . .

Mr. Sebree continued by emphasizing that GCDs have the right to regulate production, spacing, and reporting requirements. See Appendix C, transcript of the Texas House of Representatives, 82nd Session, Natural Resources Committee, April 5th, 2011, First Meeting; *Hearing Segment - 30 minutes to 1 hour, at pp. 4 - 5.*

In summary, a GCD has broad authority for the actual regulation of certain aspects of frac water use. As discussed below, even when a GCD does not have specific authority to address an activity associated with HF that could potentially impact groundwater, a GCD's broad duties to protect and manage groundwater empower it to actively participate in decisions made by other regulatory agencies in this regard.

**C. GCD Regulatory Language**

Each GCD is created by its unique special legislation or TCEQ order. Texas Water Code chapter 36 is designed to "fill in the gaps." Each GCD is empowered and required to implement those statutes by adopting rules. These regulations differ for each GCD and every GCD interprets its statutory duties and powers differently. This makes it essential to establish the meaning attributed to various regulatory terms to avoid misunderstandings by "comparing apples and oranges." Additionally, a GCD's rules do not necessarily reflect actual practice in the GCD. Finally, GCDs and other stakeholders may interpret commonly used terms differently.

Groundwater conservation districts may impose different regulations on water that is being produced from a well already in existence and owned by the producer; water that is being produced from a well already in existence and owned by someone other than the producer; or water from a well drilled specifically to supply frac water. See Section VIII, below.

In the context of GCD regulations, a GCD may regulate water wells, regardless of the purpose of use of the produced water, differently based on classifications such as the following:

One classification is based on when the subject water well was constructed. Thus wells are often denoted with the terms "existing," "new," and "grandfathered." Further, certain dates may determine whether a well is an "existing," "new," or "grandfathered" well. Thus, a well that physically exists today may not be considered to be an "existing" well under GCD rules.

Another classification has evolved due to the Texas Water Code section 36.117 exemptions. These wells are often denoted with the terms "exempt" and "non-exempt." Considerable variability exists among GCDs about (1) which wells are "exempt" and which are "non-exempt"; (2) what those wells are exempt from; and (3) the practical difference of being classified as "exempt" or "non-exempt.

A final classification germane to this discussion is whether a well must be "registered"; must obtain a "drilling permit"; and/or must obtain an operation or production permit. As with the classifications of "exempt" and "non-exempt," the essential question is: what practical difference does it make?

As mentioned, because of the distinctive nature of GCD regulation, these terms encompass completely different concepts in different GCDs. Thus it is essential to establish from the outset what these terms mean in any given situation to avoid confusion. The Case Studies show how different GCDs use or do not use these classifications to accomplish their own unique goals.

**IV. The Source and Quantity of Groundwater Supply**

Although water for HF may be obtained from many sources other than groundwater, such as surface water, municipal water suppliers, treated wastewater from municipal and industrial treatment facilities, power plant cooling water, and/or recycled produced water and/or flowback water, this presentation addresses only groundwater sources. In that context, the producer considers volume, required pressure, water quality requirements for mixing frac fluid, regulatory and physical availability, competing uses, and water characteristics compatible with the formation to be fractured.

Groundwater conservation districts are interested in the source and quantity of the water that is being used for the HF operations. They are interested in the source so that they can determine which of their regulations apply and whether the source will be competing with other existing and future uses of the groundwater supply within the District. They are

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26 This testimony illustrates the importance of defining terms when discussing such issues. See discussion above at "GCD Regulatory Language." If a GCD has the authority to regulate even wells exempt under section 36.117(b)(2), what exactly does the oil and gas industry contend that exemption from permitting means?

27 Or predecessor agency.

28 See discussion above regarding Mr. Ben Sebree's testimony before the House Natural Resources Committee. See also, above, discussion of the meaning of fresh water.

29 *API Water Management* at p. 13
interested in the quantity for the same reason and to fulfill their duty to properly manage groundwater resources as required by their enabling legislation or order and by Texas Water Code chapter 36.51

According to the API, "A significant part of a hydraulic fracturing operation involves securing access to reliable sources of water, the timing associated with this accessibility, and the requirements for obtaining permission to secure these supplies." A producer should be aware of competing water needs, water management issues, and regulatory requirements when investigating options for water supply. Even though the water needed for these operations may be only a small volume relative to other water requirements in the area, water use associated with large-scale developments, conducted over multiple years, may have a cumulative adverse impact to groundwater supplies in the area.32

GCDs address concerns about the quantity of water being used by HF operations by requiring the installation of meters on frac water source wells or otherwise recording water usage; periodic water usage reporting; and imposition of production limits. These requirements are generally based on how the well is classified under the GCD's rules.

Another consideration is the location of source wells for oil and gas operations in relation to existing municipal, public, private water supply wells, and fresh water springs. Various GCDs address the concern about the location of frac water source wells being located close to existing municipal, public, private water supply wells, and fresh water springs by imposing spacing limits. Once again, such limits generally depend on how the source well is classified under a GCD's rules.

A producer may make arrangements to obtain water from a well that is already in existence. In some areas of the State, some wells have sufficient capacity to allow a producer to obtain the water directly from the well either by laying down a frac water dedicated pipeline from the water well to the HF operation or by filling tanker trucks at the well head and transporting the water to the oil and gas well site. If the existing water well does not have sufficient capacity, it may still serve as a water source for the HF operations. The water can be pumped from a pond at the well location. Such a pond may be lined or unlined. A producer may own a water well on or near the site to use for frac water. Finally, a well may be drilled specifically for frac water supply, either by the producer, or by another individual selling water to the producer. Each of these scenarios can elicit different regulatory responses by different GCDs.

V. Concerns about Groundwater Quality from the HF Process

Districts are interested in whether the fracturing process itself is adversely impacting the quality of surrounding groundwater. These concerns are not unique to Texas and in fact, have led to Congressional studies. The issue is: Are the created fractures contained within the target formation so that they do not contact underground sources of drinking water?35

A brief summary of the HF process will provide context to that question. During HF, fluid is pumped into the production casing, through the perforations (or open hole), and into the targeted formation at pressures high enough to cause the rock within the targeted formation to fracture. The fracture can continue to grow as high-pressure fluid injection continues. This allows fluids to then flow more readily through this higher permeability fracture. During the fracturing process, some of the frac fluid may leave the fracture and enter the targeted formation adjacent to the created fracture. This happens if the fluid flows into the micropore or pore spaces of the formation or into existing natural fractures in the formation or into small fractures opened and propagated into the formation by the pressure in the induced fracture. These fractures can be horizontal or vertical. In general, horizontal fractures are parallel to the bedding plane of the formation. The upper confining zone or formation controls the extent that a vertical fracture will propagate in the vertical direction toward a USDW.36

This zone should stop the vertical growth of a fracture because it should be strong enough or elastic enough to contain the pressure of the injected fluids.37

A number of studies have considered the issue of whether the fracturing process itself may contaminate fresh water formations. Recommendations of the SEAB Subcommittee 90 Day Report focus on protecting water quality. Many of the

30 With regard to water demands for HF and estimated use of groundwater for this purpose, a number of studies have been performed, with varying conclusions. A concise summary and list of these studies is provided in McPherson, Mark, Water Use and Water Law in Texas From an Oil and Gas Perspective presented at State Bar of Texas’ Environmental Impacts of Oil and Gas seminar (January 13, 2012) at pp. 9 - 11. (“McPherson Water Use Paper”)
32 API Water Management at pp. 12-13, 16.
33 Id. at 16.
34 Id. at 16.
35 FracFocus HF Process citing Keven Fisher, American Oil and Gas Reporter.
36 See footnote 15, explanation of USDW.
recommendations focus on construction of the well, but some are designed to address possible adverse effects on fresh water from the fracturing itself. These include using best practices and conducting micro seismic surveys to ensure vertical fracture growth is confined to the gas producing formations; and field studies regarding possible migration of methane leakage from the wells to water reservoirs.  

Because the frac water in horizontal drilling and production is under enormous pressure, the integrity of the well itself is also of concern. A GCD clearly has no authority over the well construction. As discussed in the Case Studies below, some GCDs encourage landowners to monitor nearby water well static water levels and water quality and some develop a monitoring well program to do the same.

VI. Waste of Groundwater Associated with Hydraulic Fracturing Activities

Of additional interest to GCDs is whether during activities and operations associated with HF, groundwater is being wasted. Groundwater may be wasted, or not put to beneficial use, in several situations. For example, because trucking costs can be the biggest part of the water management expense, producers often use temporary surface pipelines, particularly to transport fresh water to impoundments and to well sites. Pipelines may be used to transport water from wells or groundwater-filled ponds. Pipelines may also be used for the transmittal of flowback and produced water associated with HF operations. While the polyethylene pipelines seem less likely to leak, the aluminum pipelines, when depressurized, leak at the joints. Some groundwater districts are considering such leaks of fresh water as being prohibited waste. Another situation that may give rise to the waste of groundwater is the use of unlined or earthen fresh water storage pits or ponds. In general, few of the Districts interviewed for the Case Studies are addressing this issue.

VII. Recycling or Disposal of Flowback

Districts are also interested in whether the handling of flowback is impacting groundwater. Flowback in the GCDs in the Case Studies is usually managed and disposed of in one of three ways (1) injected in disposal wells permitted by the RRC under its UIC regulatory program; (2) disposed of in reserve pits (surface impoundments) and/or landfarmed; and (3) reused/recycled.

A. Disposal of Flowback by Injection into the Subsurface.

Proper disposal of flowback fluids is critically important to groundwater protection. Most flowback fluids are disposed of in underground injection wells. Such injection is conducted in a Class II injection well regulated by the Railroad Commission, which has primary UIC enforcement authority for the EPA’s UIC program related to saltwater disposal wells associated with oil and gas activities. The RRC program follows national guidelines under the federal Safe Drinking Water Act for surface and groundwater protection.

The purpose of the Safe Drinking Water Act and thus the RRC UIC program is to protect groundwater. Under the program, the disposal well construction rules require multiple layers of cement and steel to ensure that shallow, usable quality water is not impacted. Properly permitted disposal wells inject saltwater (which includes frac fluid and flowback) into underground formations that are already full of naturally occurring saltwater. These are beneath the USDW.

The public has an opportunity to participate in these permitting decisions. After staff review of area geology and required areas of review near the proposed wells to determine if there are other wells penetrating the same geologic horizon proposed for disposal, the permit may be administratively approved. While protests may be submitted any time during the staff review, public notice is not provided until the administrative approval. At that point, every
application has a minimum 15-day holding period before a permit can be issued. This allows a brief window of opportunity for protests to be received by the RRC. 44

In the case of commercial disposal wells, all surface owners adjoining the legal tract of the well’s location, offset oil and gas well producers, and cities, if the well is to be located within city limits, must be directly notified and are considered to have the right to request a contested case hearing. Although GCDs have the right to protest, apparently there is no requirement to directly notify local water conservation districts. Notice must be published in the newspaper, however. 45

B. Reserve Pits and Landfarming.

Traditionally pits have been used to temporarily hold or to dispose of drilling fluids and wastes. GCDs are most concerned about pits that are excavated holes in the ground, although they can be above ground containment systems such as steel tanks. 46 According to the RRC, pit disposal practices vary geographically throughout the State. For example, in West Texas, where net evaporation rates are high, reserve pit fluids are usually allowed to evaporate before closing the pit. Where annual rainfall commonly exceeds evaporation, such as in East Texas, reserve pits often do not dry out. In such instances, pits are generally dewatered, and the water disposed of in an authorized saltwater disposal well. 47

A pit lining may be necessary in pits constructed from ground excavation in order to prevent infiltration of fluids into the subsurface of the ground. Pit liners are typically constructed of compacted clay or synthetic materials like polyethylene or treated fabric that can be joined using special equipment. 48

Another surface disposal method used in Texas is landfarming. Water-based drilling fluids with a chloride concentration of 3,000 mg/l or less; drill cuttings, sands and silts obtained while using water-based drilling fluids with a chloride concentration of 3,000 mg/l or less; and wash water used for cleaning drill pipe and other equipment at the well site can be disposed of without a permit from the RRC under certain circumstances. The wastes must be disposed of on the same lease where they are generated, and written consent of the surface owner of the tract where the landfarming will occur must be obtained. Other landfarming operations require a permit. 49

In landfarming, low toxicity wastes are spread and mixed into the soils to promote reduction of organic constituents and dilution and attenuation of metals. The Railroad Commission grants permits by letter of request for this method of disposal of water-based drilling fluid and cuttings; oil and gas wastes; and produced water. This method uses the physical, chemical and biological capabilities of the soil-plant system to control waste migration and under the right circumstances, to provide a safe means of disposal without impairing the potential of the land for future use. The cited RRC publication describes various methods of landfarming. 50

C. Recycling Flowback.

Another method for management of flowback water is to treat and reuse it for HF, depending on the quality of the water. Several efforts are underway to examine the conditions where the use of reservoir water and recycled flowback water for fracturing operations may be economically viable. 51 This technology is being used by companies like Devon Energy in the Barnett Shale area around Fort Worth, Texas. 52 Processes that can be utilized for water treatment include filtration, aeration and sedimentation, biological treatment, demineralization, thermal distillation, condensation, reverse osmosis, ionization, natural evaporation, freeze/thaw, crystallization, and ozonation. 53

VIII. Case Studies

The following Case Studies focus on GCDs located in the Barnett, Eagle Ford, and Haynesville shale gas plays, although hydraulic fracturing in not limited to those situations. The author attempted to interview two GCDs in each area with disparate conditions, legislation, or practices. 54 See Appendix

44 Id.
45 RRC Saltwater Injection FAQs. For greater detail, see Texas Groundwater Protection Committee, FAQ: What are the Permitting Processes for a Class II Oil and Gas Disposal Well? (October 2011). Available at: http://www.tgpc.state.tx.us/FAQs.htm.
46 FracFocus Fluid Management.
48 FracFocus Fluid Management.
50 Id.
51 API Water Management at p. 17.
52 FracFocus Fluid Management.
53 API Water Management at p. 22.
54 Special thanks to Lonnie Stewart, General Manager of Bee Groundwater Conservation District, Live Oak Underground Water Conservation District, and McMullen Groundwater Conservation District for taking the time for an interview. Because the legislation, rules, and practices of these GCDs
D, a map that illustrates the currently recognized shale plays in Texas and their location in reference to GCDs. While GCDs in most of rural Texas have a history of regulating or not regulating water wells and groundwater usage associated with oil and gas activities, the recent natural gas production from gas-bearing shales has increased significantly, with hydraulic fracturing playing a key role. Many of the GCD general managers interviewed for these Case Studies, when discussing their interplay with the producers indicated that they feel like the GCDs are "playing catch-up."

A. Evergreen Underground Water Conservation District

Water wells that are used to supply water for HF operations (1) must register so the District knows they exist; and (2) do not require a drilling permit to begin drilling. There are no production fees, but the production must be metered and reported. The District believes it does not have the authority to regulate spacing on wells that are exempt under Chapter 36.117(b)(2). Nevertheless, the District accomplishes compliance with spacing because when registering a new HF water well, the District makes the well owner or producer aware that when such wells change use, for example, if they are conveyed to the landowner, they will have to meet spacing requirements or they are subject to plugging.

If the owner of an existing domestic and livestock water well wants to convert the use of the water produced from that well so it can be sold to a producer for HF, the classification of the well becomes commercial and the owner must obtain a production permit. Such wells must report production monthly and meet the 2 acre-foot/acre production limit based on the property under lease, if applicable. The production authorized when an existing well is converted from some other use to use for hydraulic fracturing is based on the property the well owner owns. Generally, in such a case, instead of authorizing 2 acre-feet/acre production, the District authorizes 75% of well capacity (based on running the well 24/7).

Within the Evergreen UWCD jurisdiction, no reserve pits or land farming are being used for disposal of flowback. Most disposal is to existing saltwater disposal wells. If the district becomes aware of applications to the RRC for new saltwater disposal wells, they review them and are generally satisfied. The only way they know about such applications is by periodically checking the RRC website or they may become aware through a notice published in a local newspaper.

The district also monitors the RRC website for applications to convert old oil and gas wells into disposal injection wells. These warrant much closer scrutiny.

B. Gonzales County Underground Water Conservation District

Gonzales District is unique to this set of Case Studies because its jurisdiction is confined to the Wilcox, Carrizo, Queen City, and Sparta aquifers and has no jurisdiction over the Gulf Coast Aquifers within the District's territory. The Gulf Coast Aquifers are shallower formations. This presents unique challenges. The aquifers over which the District has jurisdiction are generally not being used for frac water, because of their depths and the expense of drilling water wells to those depths. Thus the frac wells are competing directly for groundwater with most landowners, whose wells are completed in the shallower formations.

The District is in the process of gathering information about all wells producing frac water. Its primary goal is to identify where those wells are located; how much water they are using; and in which aquifer they are completed. The water well drillers are required to submit a driller's log for every well they drill in the District. The District then registers those wells, which includes obtaining GPS co-ordinates. The District also reviewed its existing files and registered all water wells for which they had a driller's log. Although the driller's log does not identify the purpose of use of water from the wells, the District determines in which aquifer they are completed.

The District has asked producers doing business in the District to report production from every water well that they are using. If a landowner is selling frac water to be transported by truck, the landowner should report usage. The District has requested monthly production records. It prefers that production be metered, but it can be estimated.

If an existing domestic and livestock well (these wells are considered exempt) is selling water for frac water, it has no production limit (it can pump 17.5 gallons per minute 24/7). If an existing irrigation well (these wells are considered non-exempt), however, is selling water for frac purposes, the preferred process

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would be to amend the irrigation permit to allow this new use. Currently this requirement is not in District Rules.

The District is working with the producers to urge them to use aquifers where there will not be direct competition for the groundwater. For example, EOG will use water with 3,000 to 5,000 ppm TDS, rather than the fresher water with 1,000 ppm TDS.

The District is tax-based, so no production fees are required of any water producers except those subject to a transportation fee under Texas Water Code § 36.122 and District Rules.

Most flowback is being disposed of in saltwater injection wells. The District periodically checks the RRC website for pending applications and monitors the local newspaper. The District has protested two of the permits on technical grounds. Both are pending at the RRC.

The District Rules follow the Chapter 36 definition of waste and the District is not focused on that issue related to HF, unless groundwater waste is brought to its attention.

C. Upper Trinity Groundwater Conservation District

The special legislation creating the Upper Trinity GCD (and several others in the Barnett Shale area) allows the GCD to assess and collect production fees for all groundwater used for oil and gas drilling and production. Therefore, all frac water wells must be registered, water production must be metered and reported, and production fees are assessed. The only person who can give authority to drill a new well, and thus be responsible for registering the well, is the surface landowner unless there is a mineral lease that specifically gives the lessee that right and duty.

In the Upper Trinity District, it is rare that an existing water well has enough capacity for the producer to draw directly from the well. If an existing well is used to supply HF water, its classification changes to commercial, because the well owner is selling the water to the producer.

The District requires HF water to be metered at the source water well and metered at the oil and gas well head. This allows the GCD to determine whether the line transporting the water from the well/pond to the oil and gas operations is losing water. These "frac water lines" are sometimes laid as far as 25 miles. The GCD has found little problem with the polyethylene lines, but lines that rely on pressure to seal the joints, such as those using aluminum piping, leak at the joints.

The Upper Trinity GCD has contracted with owners to monitor 108 wells for static water levels. It is adding between 80 - 110 wells to the system in February. All wells in the system will be monitored quarterly. The District does not believe it has the authority to test for water quality. It is cooperating with the Montague County Property Owners Association, an advocacy group, to perform water quality testing for individual well owners.

The District actively monitors related activities under RRC jurisdiction. The District actively participates in monitoring disposal of flowback, as well as permits for injection water source wells. The RRC requires a permit for an injection water well source that penetrates the base of usable quality water. This type of water is generally being used for water flooding, which is a form of secondary recovery of oil and gas. Upper Trinity GCD tracks these permits at the RRC and if the well is too close to drinkable quality water, the GCD protests at the RRC. The District also opposes all applications to the RRC for saltwater disposal wells and requests a contested case hearing. In nearly 100% of the cases, they settle and no hearing takes place.

Especially in Montague County, the flowback from HF or drilling is disposed of in surface pits known as reserve pits or by "land farming." Through the District's efforts, the producers held public hearings and meetings and the GCD invited the TCEQ to send representatives, which they did. Because of all of the negative publicity about this practice, the major producers agreed to a closed system recovery for all flowback in that area.

The District's definition of waste matches that of Chapter 36. In one situation, a producer had an HF water retention pond above ground. Someone forgot to turn the well off and the water ran over the sides of the pond. It dumped 400,000 barrels of fresh water. The operator agreed to pay production fees on that amount of water and a $250 penalty, but would not agree that this was "waste" of water under District Rules.

D. Middle Trinity Groundwater Conservation District


E. Panola County Groundwater Conservation District

Being created recently (2007), the District has only had permanent rules since 2010. The economy of the County has always relied on oil and gas production, so cordial relationships and open communication are important to the District. Some Haynesville Shale is located in the District; however, the primary HF activity in the District is associated with re-fracturing old wells in the Carthage field, which is a shallower formation than the Haynesville Shale.

The District considers all water wells associated with oil and gas activities to be exempt, including those drilled as water supply for HF because they are all in the Carthage field. The producer must register the water wells when they drill a new well, when they create a pond, or when they buy water from a landowner's well. Water supply wells for HF must report water production to the District on a quarterly basis. They ask the companies to meter production from new wells. The major companies do; the independents may not. There are no production limits; generally the use of water for these purposes only lasts 3 - 6 months. If a landowner sells water for HF from a water well already in existence, regardless of the well's original status, it becomes non-exempt commercial and must comply with all non-exempt well requirements.

The general practice in the District is for producers to buy property, construct a permanent frac pond and multiple water wells to feed the pond. They then use the pond for HF within a 10 mile radius. Spacing is enforced at registration for all wells including oil and gas water wells.

The District has monitoring wells in the area. They have determined that the frac water wells create an approximate 1700 foot cone of influence as long as they are filling the frac ponds. Once that use ceases, the water levels recover within 2 months. When an oil and gas use ceases, the water well must be plugged or transferred to the landowner. The District then re-evaluates and inspects the well to see if it can be re-classified as exempt.

The District has encountered situations where in order to produce the greatest volume of water, contrary to Texas Department of Licensing and Regulation rules, a producer will gravel pack multiple sands and screen the entire well.

The District has experienced natural gas in groundwater, have isolated the contamination, and have worked with the producer to remediate.

The District is not actively monitoring any flowback disposal. Its current three goals are to (1) map the subsurface of the County, including brackish layers; (2) establish a monitoring well project where their current system is updated based on the new geologic mapping; and (3) institute periodic water quality monitoring.

F. Pineywoods Groundwater Conservation District

Mr. Alford estimates that approximately 2% of the total groundwater use in the GCD is for HF activities. The District Rules allow the drilling of one rig supply well for each project. It is considered exploratory and is exempt. It must be registered and must report production monthly or quarterly. Production must be metered. Subsequent wells are considered to be hydraulic fracturing supply wells. They are considered to be non-exempt industrial or commercial production wells. They must obtain drilling and operating permits for a nominal fee. The District, which is fee-based, charges $0.02 per 1,000 gallons for such a permitted well. If the original exploratory rig supply well is used to supply water for fracturing, the District must be notified; the well must obtain a permit and pay production fees thereafter. Newly drilled water wells must comply with District spacing rules.

The District limits production on a "reasonable use" and requested amount basis, and are flexible on these. Mr. Alford estimates that water for two wells to be fractured would be 14 million gallons. Because the jobs need a large volume of water quickly, the companies generally build a frac pond and complete 2 - 3 water wells around it to fill it.

District permits require renewal every 5 years and the District expects that as these permits come up for renewal, with the District's additional experience, they will be in a better position to judge reasonable production limits. They currently have a nine year history.

If a well already in existence sells water for hydraulic fracturing, they re-classify the well as a non-exempt commercial well, which must obtain a permit and pay production fees.

Many saltwater disposal wells are located within the District and these are being used for disposal of the flowback. They do not attempt to monitor the Railroad Commission's handling of these wells.

They have the same definition of waste as Chapter 36. They monitor the frac ponds pretty closely. Generally, producers use a polyethylene lining, while individuals usually use a good clay base.

Although most operations follow the model described above of constructing water wells around a


central pond, some do use dedicated pipelines to transport water from off-site. The District monitors those, particularly the aluminum ones, and reports leaks to the producer.

The District has had favorable responses and interplay with the major producers. It does have difficulty, however, keeping current contact information on smaller companies.
Appendix A

Groundwater Conservation District Bibliography


Hydraulic Fracturing Bibliography


Appendix B

Barnett Shale

WATER USE IN ASSOCIATION WITH OIL AND GAS ACTIVITIES REGULATED BY THE RAILROAD COMMISSION OF TEXAS

1. RAILROAD COMMISSION OF TEXAS JURISDICTION

Generally, under Texas Natural Resources Code, Title 3, and Texas Water Code, Chapters 26 and 27, the Railroad Commission of Texas (Commission) has jurisdiction activities associated with the exploration, development, or production of oil or gas or geothermal resources, including transportation of crude oil or natural gas by pipeline. The Commission also has jurisdiction over surface mining for coal, uranium, and iron ore gravel.

2. USE OF FRESH WATER IN ASSOCIATION WITH OIL AND GAS ACTIVITIES

Water is used in association with many oil and gas activities, including use (in general order of relative volume) as a supplemental fluid in enhanced recovery of petroleum resources; during drilling and completion of an oil or gas well; during workover of an oil or gas well; during solution of underground salt in brine mining or hydrocarbon storage cavern creation; as gas plant cooling and boiler water; as hydrostatic test water for pipelines and tanks; as rig wash water; as coolant for internal combustion engines for rigs, compressors, and other equipment; for sanitary purposes; and for laboratory purposes.

The largest volume of water is used in enhanced recovery. The following table indicates injected volumes of total fluids (produced water, fresh makeup water, and other fluids) relative to estimates of total injected volumes of fresh water. Note that the trend for using fresh injection makeup water is declining. Most fresh water is injected for enhanced recovery in Commission Districts 8 and 9A in West Texas. The 1996 estimate for fresh water injected for those two districts was 252 million barrels.

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimate of fresh/brackish water (in million barrels)</th>
<th>Estimate of produced water (in million barrels)</th>
<th>TOTAL Estimated Volume of Fluids injected (in million barrels)</th>
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<tbody>
<tr>
<td>CY 1998</td>
<td>316</td>
<td>6,000</td>
<td>6,316</td>
</tr>
<tr>
<td>CY 1999</td>
<td>276</td>
<td>5,600</td>
<td>5,876</td>
</tr>
<tr>
<td>CY 2000</td>
<td>254</td>
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<tr>
<td>CY 2001</td>
<td>212</td>
<td>5,900</td>
<td>6,112</td>
</tr>
</tbody>
</table>

The next largest volume of water is used during the drilling and completion of oil and gas wells. Water is used during drilling for drilling fluid preparation and make-up water, for completion fluids, including cementing, in well stimulation, as rig wash water, as coolant for internal combustion engines; and for sanitary purposes.

Fresh water is used in oil and gas well stimulation. Stimulation methods include acidizing and/or fracturing. In order to be able to produce gas at volumes and rates that are economical, reservoirs with low permeability must be treated. One method of treatment to increase permeability is fracture treatment or “fracing.” Conventional fracture technology increases permeability as a result of pumping frac fluid, which generally consists of a viscous gelled fluid, and which creates an increase in the available surface area by creating fractures that are “propped up” or held open by the propping agents in the frac fluid.

Hydraulic fracturing consists of pumping into the formation large volumes of fresh water that generally has been treated with a friction reducer, surfactant and clay stabilizer, and that contains sand. Hydraulic fracturing maximizes the horizontal length of the fracture while minimizing the vertical fracture height. The fractures, which are held open by the sand, result in increased surface area, which further results in increases in the desorption of the gas from the shale and increases in the mobility of the gas. The result is lower completion costs and faster recovery of a larger

http://www.trc.state.tx.us/barnetts shale/wateruse.php

1/27/12
volume of the gas-in-place. The volumes injected during hydraulic fracturing treatment can range from 70,000 barrels in a vertical well to over 90,000 barrels in a horizontal well. Fracking, where necessary, generally takes place immediately after drilling and periodically during the life of the well.

3. REGULATION OF SURFACE WATER IN TEXAS

The industries regulated by the Commission use both surface water and ground water for their activities. In Texas, water flowing in Texas creeks, rivers, and bays is owned and managed by the State. Anyone who diverts such surface water must have authorization – or a water right – from the State of Texas through the Texas Commission on Environmental Quality (TCEQ) (Texas Water Code, Chapter 11, relating to Water Rights). Therefore, a person who withdraws surface waters for mining, construction, and oil or gas activities must obtain a water rights permit from TCEQ.

An applicant may apply for a Temporary Water Right permit for short-term use of surface water. Temporary Water Rights permits authorizing use of 10 acre-feet or less and for one year or less may be issued by a TCEQ Regional Office. In times of drought, the TCEQ may suspend all temporary water rights permits.

Applicants who seek to use more than 10 acre-feet of water or who seek a term of more than one year (up to a maximum of three years) must apply through the TCEQ Water Rights Permitting Team in Austin. TCEQ forms, fees, contacts, and other water rights information may be found on the TCEQ website (www.tceq.state.tx.us).

4. REGULATION OF GROUND WATER IN TEXAS

A. Regulations of the Railroad Commission of Texas.

Much of the water used in association with oil and gas activities, particularly the water used in enhanced recovery, is saline or brackish water. With regards to enhanced recovery more than 90 percent of the water used is actually highly saline to brackish water produced from the same formations where the oil fields are located. A very small percentage of the water used for enhanced recovery is fresh water or slightly saline water produced from outside sources as needed to replace the volume of oil removed. Saline or brackish water is drawn from underground reservoirs that are below the base of usable quality water. The Railroad Commission requires a permit for wells associated with oil and gas activities that draw such water from formations below the base of usable quality water.

The Commission’s Statewide Rule 5 (16 TAC §3.5) requires a Commission drilling permit to drill an injection water supply well that penetrates the base of usable quality water. Statewide Rule 13 (16 TAC §3.13) requires that an injection supply water well that penetrates the base of usable quality water be completed in accordance with the criteria in the rule, and the injection supply water well must be plugged in accordance with Statewide Rule 14 (16 TAC §3.14).

When a fresh water well, whether the well is a rig supply well or an injection water supply well, is drilled above the base of usable quality water and fresh water is used, regulations other than those of the Commission apply.

B. Regulations of the Texas Department of Licensing and Regulation.

Effective September 1, 2003, the Texas Department of Licensing and Regulation (TDLR) regulates Water Well Drillers under the Texas Occupations Code, Chapter 1901. Rig supply wells must be drilled by a licensed Water Well Driller; however, Chapter 1901 excludes from the definition of “water well” “an injection water source well regulated under §91.101 of the Natural Resources Code.” The Water Well Driller must submit drilling logs and other required information to the TDLR and the Texas Water Development Board. The completion and plugging of such wells must comply with TDLR regulations. The GWCDs have the authority to enforce the plugging regulations for abandoned or deteriorated water wells within their boundaries.

C. Regulations of Groundwater Conservation Districts.

In Texas, groundwater ownership rights are subject to regulation and control by the courts and the State Legislature. Groundwater may be managed individually by landowners under the rule of capture, or collectively by landowners and groundwater conservation districts (GCDs). Under the “Rule of Capture,” landowners may pump as much water

http://www.rrc.state.tx.us/barnettshale/wateruse.php
as they choose, without liability to surrounding landowners who might claim that the pumping is depleting their wells. There are very few restrictions to the rule of capture.

The Texas Legislature authorized the creation of GCDs as the State’s preferred method of groundwater management (Texas Water Code, Chapter 36). These districts are empowered and charged to conserve, preserve, protect, recharge, and prevent waste of groundwater resources within their boundaries. GCDs may be created through a special legislative act, a landowner petition process to the Texas Commission on Environmental Quality (TCEQ), a landowner petition process to join an existing GCD, or TCEQ initiative in a priority groundwater management area (PGMA). Additional information regarding groundwater management can be located at the following: http://www.tasc.state.tx.us/GWManagement.htm

Chapter 36 specifically does not apply to production or injection wells drilled for oil, gas, sulphur, uranium, or brine, or for core tests, or for injection of gas, saltwater, or other fluids, under permits issued by the Railroad Commission. However, it does apply to water wells, including injection water source wells ("water wells used to supply water for activities related to the exploration or production of hydrocarbons or minerals" (§36.117(i))).

Under Texas Water Code §36.117, there are certain exemptions, exceptions, and limitations to Chapter 36. In addition to exemptions for small volume livestock and poultry and domestic water wells, there are certain exceptions for temporary rig supply wells and limitations on injection water supply wells used in association with oil and gas activity, as well as water wells associated with surface mining activity.

Section 36.117 includes a permit exception for temporary rig supply wells. A GCD may not require a permit for the drilling of a temporary rig supply well ("drilling of a water well used solely to supply water for a rig that is actively engaged in drilling or exploration operations for an oil or gas well permitted by the Railroad Commission of Texas provided that the person holding the permit is responsible for drilling and operating the water well and the well is located on the same lease or field associated with the drilling rig" (§36.117(b)(1))). However, a rig supply water well must be registered in accordance with GCD rules and must be equipped and maintained to conform to the GCD’s rules requiring installation of casing, pipe, and fittings to prevent the escape of ground water from a groundwater reservoir to any reservoir not containing ground water and to prevent the pollution or harmful alteration of the character of the water in any groundwater reservoir (§36.117(h)). The driller of a rig supply well must file the drilling log with the GCD (§36.117(i)). In addition, the GCD may require a water well originally drilled for the purpose of rig supply to be permitted by the GCD and to comply with all GCD rules if the purpose of the well no longer is solely to supply water for a rig that is actively engaged in drilling or exploration operations for an oil or gas well permitted by the Railroad Commission (§36.117(d)). And finally, the well must be plugged in accordance with GCD regulations.

Section 36.117 also includes a limitation on injection water supply wells. Although Chapter 36 applies to injection water source wells, Section 36.117 prohibits a GCD from denying an application for a permit to drill and produce water for hydrocarbon production activities (an injection supply water well) if the application meets all applicable rules as promulgated by the GCD (§36.117(g)).

The following tables outline the regulations relating to water wells drilled for water to be used in oil and gas activities in Texas.

Section 36.117 also includes a permit exemption for water wells drilled in association with surface mining. A GCD may not require a permit issued by the GCD for the drilling of a water well authorized under a permit issued by the Railroad Commission under Chapter 134, Natural Resources Code, or for production from such a well to the extent the withdrawals are required for mining activities regardless of any subsequent use of the water. However, such a well must be registered in accordance with GCD rules and must be equipped and maintained so as to conform to the GCD’s rules requiring installation of casing, pipe, and fittings to prevent the escape of groundwater from a groundwater reservoir to any reservoir not containing groundwater and to prevent the pollution or harmful alteration of the character of the water in any groundwater reservoir, and the driller of such a well must file with the GCD a copy of the drilling log. Furthermore, a GCD may require such a well to be permitted by the GCD and to comply with all GCD rules if the withdrawals from such a well are no longer necessary for mining activities or are greater than the amount necessary for mining activities specified in the permit issued by the Railroad Commission.

REQUIREMENTS FOR WATER WELLS ASSOCIATED WITH OIL AND GAS ACTIVITIES IN TEXAS

http://www.rrc.state.tx.us/barnettshale/watuse.php

1/27/12
<table>
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<tr>
<th>Agency</th>
<th>Requirement</th>
<th>Cite</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDLR</td>
<td>Rig supply water well must be drilled by Licensed Water Well Driller.</td>
<td>§1901.151 Texas Occupations Code</td>
</tr>
<tr>
<td></td>
<td>Driller must make and keep a well log in accordance with TDLR rules and forms and must send a copy of the log to TDLR and TCEQ. Log must include: 1. the depth, thickness, and character of strata penetrated; 2. the location of water-bearing strata; 3. the depth, size, and character of casing; and 4. any other information required by TDLR.</td>
<td>§1901.251, Texas Occupations Code</td>
</tr>
<tr>
<td></td>
<td>Driller must complete the rig supply water well in accordance with TDLR standards and procedures.</td>
<td>§1901.253, Texas Occupations Code</td>
</tr>
<tr>
<td></td>
<td>Landowner or operator of abandoned or deteriorated water well must plug or cap the well within 180 days. (NOTE: A GCD has the authority to enforce this section.)</td>
<td>§§1901.254, 1901.255, and 1901.256, Texas Occupations Code</td>
</tr>
<tr>
<td></td>
<td>Driller, pump installer, or owner who plugs a rig supply water well must submit plugging report to GCD and TDLR.</td>
<td></td>
</tr>
<tr>
<td>GCD</td>
<td>Rig supply water wells are exempt from GCD permitting requirements provided: 1. the rig supply water well is to be used solely to supply water for a rig that is actively engaged in drilling or exploration operations for an oil or gas well permitted by the RRC*; and 2. the person holding the permit is responsible for drilling and operating the water well and the well is located on the same lease or field associated with the drilling rig.</td>
<td>§36.117(b)(2), Texas Water Code</td>
</tr>
<tr>
<td></td>
<td>Rig supply well must be: 1. registered in accordance with GCD rules and 2. be equipped and maintained so as to conform to</td>
<td>§36.117(h), Texas Water Code</td>
</tr>
</tbody>
</table>
the GCD’s rules requiring installation of casing, pipe, and fittings to prevent the escape of groundwater from a groundwater reservoir to any reservoir not containing groundwater and to prevent the pollution or harmful alteration of the character of the water in any groundwater reservoir.

<table>
<thead>
<tr>
<th>Driller must submit the drilling log for the rig supply water well to the GCD.</th>
<th>§36.117(j), Texas Water Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>The GCD may require a permit and compliance with all GCD rules if the exempted rig supply well no longer supplies water solely to a rig that is actively engaged in drilling or exploration operations for an oil or gas well permitted by the RRC.</td>
<td>§36.117(d)(1), Texas Water Code</td>
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<tr>
<td>Groundwater withdrawn from an exempt rig supply water well that is subsequently transported outside the boundaries of the GCD is subject to any applicable production and export fees.</td>
<td>§§36.117(k), 36.122 and 36.205, Texas Water Code</td>
</tr>
</tbody>
</table>

* The RRC interprets the phrase “a rig that is actively engaged in drilling or exploration operations for an oil or gas well permitted by the commission” to mean a drilling rig or a workover rig and interprets “exploration operations” to include well completion and workover, including hydraulic fracturing operations.

### Rig Supply Wells that Penetrate the Base of Usable Quality Water

<table>
<thead>
<tr>
<th>Agency</th>
<th>Regulation</th>
<th>Cite</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDLR</td>
<td>A driller must notify TDLR and the landowner or person having a well drilled on encountering water injurious to vegetation, land, or other water and determining that the well must be plugged, repaired, or properly completed in order to avoid injury or pollution. The driller must ensure that the well is plugged, repaired, or properly completed under standards and procedures adopted by TDLR.</td>
<td>Chapter 28 Texas Water Code §1901.254</td>
</tr>
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### Injection Water Supply Wells that Do Not Penetrate the Base of Usable Quality Water

<table>
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<tbody>
<tr>
<td>TDLR</td>
<td>Injection water supply well must be drilled by licensed water well driller.</td>
<td>§1901.151 Texas Occupations Code</td>
</tr>
<tr>
<td></td>
<td>Driller must make and keep a well log in accordance with TCEQ rules and forms and must send a copy to the well owner, TDLR and TCEQ.</td>
<td>§1901.251, Texas Occupations Code</td>
</tr>
</tbody>
</table>

http://www.rrc.state.tx.us/barnettshale/wateruse.php 1/27/12
The well log must include:
1. the depth, thickness, and character of strata penetrated;
2. the location of water-bearing strata;
3. the depth, size, and character of casing; and
4. any other information required by TDLR.

Driller must complete the well under TDLR standards and procedures. §1901.253, Texas Occupations Code

Landowner or operator of abandoned or deteriorated water well must plug or cap the well within 180 days. (NOTE: GCD has authority to enforce this section.) §§1901.254, 1901.255, and 1901.256, Texas Occupations Code

Driller, pump installer, or owner who plugs injection water supply well must submit plugging report to GCD and TDLR.

GCD

Jurisdiction of GCD applies to water wells, including water wells used to supply water for activities related to the exploration or production of hydrocarbons or minerals. Jurisdiction does not extend to production or injection wells drilled for oil and gas, or for core tests, or for injection of gas, saltwater, or other fluids, under permits issued by the RRC.

GCD permit required for injection water supply wells drilled for hydrocarbon activities associated with an oil or gas well drilled after September 1, 1985. §36.117, Texas Water Code, enacted effective 09-01-1985.

A GCD cannot deny an application for a permit to drill and produce water for hydrocarbon production activities (injection water supply well) if the application meets all applicable GCD rules. §36.117(g), Texas Water Code

A GCD permit may regulate:
1. Spacing of wells from property lines or adjoining wells
2. Density
3. Production
4. Completion; and
5. Plugging

A GCD permit may also require submission of certain information and assess production fees. §§36.1131 and 36.116, §36.120, §36.205 and 36.206, Texas Water Code
Water well must be completed and plugged in accordance with TDLR rules. §§1901.253, 1901.254, and 1901.255, Texas Occupations Code

Report of well plugging must be submitted to the GCD and TDLR. §1901.255, Texas Occupations Code

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<tr>
<th>Agency</th>
<th>Regulation</th>
<th>Cite</th>
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<tr>
<td>RRC</td>
<td>A RRC drilling permit is required to drill an injection water source well that penetrates the base of usable quality water.</td>
<td>§91.101, Texas Natural Resources Code 16 TAC §3.5</td>
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<td></td>
<td>Well must cased and plugged in accordance with RRC regulations.</td>
<td>16 TAC §§3.13 and 3.14.</td>
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Appendix C

Texas House of Representatives, 82nd Session
Natural Resources Committee
April 5th, 2011, First Meeting
Hearing Segment – 30 minutes to 1 hour
Texas House of Representatives, 82nd Session
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Chairman Ritter: Chair lays out House Bill 2311 and recognizes Representative Miller to explain.

Rep. Miller: Thank you Mr. Chairman, members, this is a bill that was worked on over the interim by the TWCA and a number of groundwater representatives work together to try to improve some legislation and try to bring up some provisions that would help them and their work and I know we have several, I believe we have several folks that might be here to testify on this and with that Mr. Chairman, I'd be happy to answer any questions.

Chairman Ritter: Members, are there any questions of the author? None?

Rep. Miller: I reserve the right to close.

Chairman Ritter: Well we might just give it to you. Chair calls Gregory Ellis, an attorney representing I guess himself, House Bill, testifying for House Bill 2311. Welcome sir.

Greg Ellis: Thank you Mr. Chairman, I'm Greg Ellis, I'm here on my, my own behalf, I did participate in the Texas Water Conservation Association's Groundwater Committee over the last year and this is one of the bills that was approved by that group. The purpose of this bill is to try and clarify that the exemptions under Chapter 36 apply to the use of the water and not directly to the well, and the reason that becomes a problem is because when someone buys a piece of property they, they try to have an exempt well, then they change the purpose of use, they put a machine shop on their property or they open up a business and they think they have a exempt well and they don't get a permit and we find them, three, four, five years down the road, now they've got five years of violations behind them and they're in trouble. By changing the language I'm hoping to put people on notice that it's the use of the water that determines whether or not the exemption applies and not the ownership of the well. With that I'd be happy to answer any questions.

Chairman Ritter: Mr. Larson.

Rep. Larson: This the, the provision on, Provision 2 on Page 1, the drilling water well used solely to supply water for a rig that is actively engaged in drilling or exploration or op, operations, are you familiar with that?

Greg Ellis: Yes sir.

Next Speaker: Yeah just could you explain that to me a little bit more?

Greg Ellis: Right now the drilling of a, of an oil and gas exploration well if you're, if you need to drill a water well to get drilling mud to be able to drill your oil and gas well, that if you do not have to have a drilling permit from the district to be able to do that.
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They, they do have to follow the spacing limitations of the district but they don't have to get the district's permission, so they can drill, they can take as much water as they need to for that drilling operation. Typically as soon as the oil and gas well is drilled they either plug the well or they turn it over to the land owner, the land owner at that time, again, depending on what use they're going to put it to, may or may not have to get a permit for that well to operate.

Rep. Larson: So in the Eagle Ford, they're using a 150,000 barrels for fracking each of those wells so they can drill a well adjacent to their drilling operations and take as much water as, like you just indicated?

Greg Ellis: They, they do not have to get a drilling permit for that, that, that's correct Your Honor--Representative.

Rep. Larson: So they can take it, let, let's go over that again, they can drill a well and they can pull as much water as they want to complete that particular well and in, in one field there's 800 wells that are contemplated so they can drill these wells and, and they're exempt, each, each of the wells without the, the Groundwater Conservation District weighing in on it?

Greg Ellis: That, that's exactly right, now they do have to get permission from the Railroad Commission.


Greg Ellis: And the Railroad Commission governs all of the oil and gas exploration activities. But the Groundwater Conservation District would not have authority to require a drilling permit for that well.

Rep. Larson: Okay, so that's the oversight, is the Railroad Commission on there?

Greg Ellis: Yes sir.

Rep. Larson: And they would work with the Groundwater District in making that determination.

Greg Ellis: We do our best to get them to work with the Groundwater Conservation Districts, yes sir.


Chairman Ritter: Members, any other questions?

Rep. Price: Mr. Chairman?

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Chairman Ritter: Mr. Price.

Rep. Price: Greg, the, the section or I guess the provision on Page 2, Subsection B that, that talks about canceling a previously granted exemption is directed uniquely to Hill County, or Hill County Priority Groundwater Management area, and I just wanted to know why that is singled out in the bill.

Greg Ellis: Well that bill passed it was either 2005 or 2003 and there were specific problems dealing with the Hill Country that they wanted to address through this amendment. Honestly I think districts had that authority beforehand but if I remember, if I remember correctly they did have a specific problem that they wanted to address and there was a, an issue as to whether or not the district could do that so they added that provision to the water code to make sure that that district could take care of that particular problem.

Rep. Price: So that district, that, that PGMA is unique, it's got unique problems, or had?

Greg Ellis: Well all, all PGMAs are unique, I mean a priority groundwater management area by definition has problems and it is at or, or beyond their limits, their capacity to be able to sustainably produce groundwater. The Hill County PGMA was the first one declared in the State back in, I think it was 1992, and there are a couple of provisions that only deal with the Hill Country PGMA as a result of that.


Greg Ellis: Yes sir.

Chairman Ritter: Members, are there any other questions? None?

Greg Ellis: Thank you Mr. Chairman.

Chairman Ritter: Does anyone else wish to testify for, on or against House Bill 2311?

Next Speaker: Ben Sebree.

Chairman Ritter: Are you wanting to do 2311?

Next Speaker: Yes, Mr. Chairman.

Chairman Ritter: You sure are late.
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Chairman Ritter: We're, we're gonna fine you $10,000.00. Hang on, let me get you ****.

Rep. Miller: You're not going to testify against my bill are you?

Chairman Ritter: Hang on, let me ****.

Ben Sebree: I'm glad I stepped up.

Chairman Ritter: You're an honorable **** okay, Chair calls Ben Sebree representing Texas Oil and Gas Association testifying neutral on House Bill 2311. Go ahead brother.

Ben Sebree: I had, I had to please the court, Mr. Chairman, members of the committee, I just, I'd like to try to clarify the testimony of Mr. Ellis regarding how oil and gas is treated by the law and the Groundwater Conservation Districts. I differ a little bit with Mr. Ellis' interpretation. The law as we understand it provides an exemption from permitting by Groundwater Conservation Districts but it does not provide an exemption from regulation of our wells. We went through the legislature, the industry and the districts went through a whole scale change of water law primarily during Senate Bills 1 and 2 that Bob Bullock pushed through in the late 90s. The agreement that was made, quite frankly, water districts didn't want to have to permit water wells for oil and gas rigs because we come in and like you said we use them quickly and we generally turn them over to the land owner at which time they become permanent. They didn't want to have to deal with that paperwork and quite frankly we didn't either, as you all are probably aware we have, we have to move in fast and we got to get them going, but our water wells are not exempt from the rules of the districts. We don't have to get a permit for them, and I know that sounds kind of odd, but they do have to comply with all the rules of the district, whether it's spacing, production, whatever, our rules, our, our water wells have to comply with those rules. I just felt compelled to get up and, and point that out.

Chairman Ritter: Mr. Larson.

Rep. Larson: Yeah Ben, you and I had a discussion about Eagle Ford on a couple of different occasions about the volume of water that's being used down there and a lot of people's concerns, and so go, go through the process you just indicated that they're exempt because if they go to whatever that Groundwater Conservation District is and they apply for a certain volume of water for each of the individual wells that they drill, is that the process?

Ben Sebree: It depends on individual groundwater districts, the districts have the right to regulate production from all wells and if the district has chosen to do that then our
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water wells have to comply with those rules, so it's up to the district. Basically, whatever
rules are in place apply to wells for the oil and gas industry, there's just no discrimination.
The only thing that we don't have to have is a permit but if there is a production limit, if
there is a spacing regulation our wells must comply with those rules. And it, and if there's
a reporting requirement for everyone we have to comply with those rules, and I think that
might be the subject of the bill coming up later.

Rep. Larson: Okay, well thank you.

Ben Sebree: Thank you.

Next Speaker: Okay Ben.

Next Speaker: Members –

Chairman Ritter: Members, other – Mr. Miller?

Rep. Miller: Yeah, let me just clarify with, with Ben here, Ben, do you, but you don't
see anything in this bill that's impacting your industry or you're just basic clarification to
Mr. Ellis’ . . . .

Ben Sebree: That's correct, we're perfectly fine with your legislation.


Next Speaker: Thank you.

Chairman Ritter: Thank you Ben, appreciate it. Is that it? Is there anyone else
wishing to testify for, on or against House Bill 2311? We did 2311. Chair recognizes
Mr. Miller to close. I forgot whose it was.


Chairman Ritter: Okay.

Rep. Miller: Thank you, Mr. Chairman.

Chairman Ritter: Chair will leave pending House Bill 2311.
Shale overlay is based on map from the Energy Information Administration dated May 9, 2011.