



Survey of Legal Mechanisms Relating to Groundwater Along the Texas-Mexico Border

Jessica Foster



Texas A&M University School of Law, Program in Natural Resources Systems

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Abbreviations

American Abbreviations

ASR	Aquifer Storage and Recovery
CERLA	Comprehensive Environmental Response, Compensation, and Liability Act
CWA	Clean Water Act
DFC	Desired Future Condition
EPA	Environmental Protection Agency
ESA	Endangered Species Act
GCD	Groundwater Conservation Districts
GMA	Groundwater Management Area
MAG	Modeled Available Groundwater
MOU	Memorandum of Understanding
NMFS	National Marine Fisheries Service
NPL	National Priorities List
RCRA	Resources Conservation and Recovery Act
SDWA	Safe Drinking Water Act
SSA	Sole-Source Aquifers
TCEQ	Texas Commission on Environmental Quality
TRRC	Texas Railroad Commission
TSSWCB	Texas State Soil and Water Conservation Board
TWC	Texas Water Code
UIC	Underground Injection Control
USFWS	United States Fish & Wildlife Service
UWCD	United Water Conservation District
WOTUS	Waters of the United States
WSEP	Water Supply Enhancement Program

Mexican Abbreviations

ACU	Asociaciones Civiles de Usuarios (Water User Associations)
CEA	Comisión Estatal del Agua (State Water Commission)
CFE	Comisión Federal de Electricidad (National Electricity Commission)
CONAGUA	Comisión Nacional del Agua (National Water Commission)
COTAS	Comites Técnicos de Aguas Subterráneas (Basin Councils and Technical Committees on Groundwater)
LAN	La Ley de Aguas Nacionales (National Water Law)

LAN Reg	el Reglamento de la Ley de Aguas Nacionales (Regulation of the National Water Law)
LFRA	Ley Federal de la Responsabilidad Ambiental (Federal Law of Environmental Responsibility)
LGEEPA	Ley General del Equilibrio Ecológico y Ambiental (General Law of Ecological Balance and Environmental Protection)
NMX	Normas Mexicanas (Mexican Standards)
NOM	Normativa Oficial Mexicana (Official Mexican Normative)
PROFEPA	Procuraduría Federal de Protección al Ambiente (Attorney General for Environmental Protection)
SADM	Servicios de Agua y Drenaje de Monterrey (Monterrey Water and Drainage Services)
SAGARPA	Secretaría de Ganadería, Agricultura, Desarrolla Rural, Pesca y Alimentación (Secretary of Ranching, Agriculture, Rural Development, Fishing, and Nutrition)
SEMARNAT	Secretaría del Medio Ambiente y Recursos Naturales (National Resources and Environmental Ministry)
SLR	Sociedades de Responsabilidad Limitada (Limited Responsibility Societies)

I. INTRODUCTION

A. Introduction:

National boundaries traverse the surface of the Texas-Mexico border region, but underneath, aquifer boundaries follow a different path formed by a world of hydrogeological influences. A 2016 study identified the possibility of fifteen aquifers crossing the 1,250 mile border (see Table 1).¹ Five of these aquifers demonstrated transboundary characteristics with reasonable confidence; the data was less convincing but still suggestive of an additional four transboundary aquifers. For another six aquifers for which there was limited data, “some hydrological elements mentioned in technical studies, usually from only one side of the border, suggest[ed] the possibility of a transboundary aquifer.”²

Despite the deeply shared nature of these transboundary groundwater systems, the political entities that overlie border aquifers employ different governance mechanisms, creating points of possible conflict over groundwater usage. They also offer opportunities to cooperate, an endeavor of ever-increasing importance as population and drought increase the potential stress on the region’s shared water sources. For instance, several studies once estimated that the usable supply of the Hueco Bolsón aquifer—which provides water to the cities of El Paso, Texas, and Ciudad Juárez, Chihuahua—would be depleted by the year 2030, due largely to high rates of pumping from the aquifer.³ In response to these dire warnings, however, the El Paso Water Utility acted to reduce groundwater withdrawals by requiring conservation, raising the price of water, and building new water treatment infrastructure. As a result, projections have improved.⁴ Nevertheless, pumping practices are expected to continue to induce brackish water to

¹ Rosario Sanchez et al., *Identifying and Characterizing Transboundary Aquifers along the Mexico–US Border: An Initial Assessment*, 535 J. HYDROLOGY 101, 103 (2016); see also Rosario Sanchez & Gabriel Eckstein, *Aquifers Shared Between Mexico and the United States: Management Perspectives and Their Transboundary Nature*, GROUNDWATER 1 (2017), TEX. A&M UNIV. SCHOOL OF LAW LEGAL STUDIES RES. PAPER NO. 17-36.

² Sanchez et al. (2016), *supra* note 1, at 102.

³ Heavy pumping decreased water levels in ground water formations, which both reduced the overall quantity available in the aquifer and caused brackish ground water to intrude into the aquifer, diminishing the water quality and requiring more treatment. Daniel A. Muller & Robert D. Price, GROUNDWATER AVAILABILITY IN TEXAS: ESTIMATES AND PROJECTIONS THROUGH 2030, 27–29, REPORT 238, TEXAS DEP’T OF WATER RESOURCES (1979); see also EL PASO WATER UTILITIES, *Past and Present Water Supplies*, http://www.epwu.org/water/water_resources.html (last accessed January 14, 2018) (“EPWU”).

⁴ EPWU credits its conservation measures for pushing back ground water importation until the year 2040. “This is 10 years later than in the previous plan. The total amount of groundwater importation is 30,000 AF/year in 2060. This is 50% less than the importation amount included in the 2006” EPWU projections. *Id.*

infiltrate the aquifer, threatening the water's usable quality; thus, even in the improved scenario, current groundwater practices are unsustainable.⁵

TABLE 1. AQUIFERS TRAVERSING THE TEXAS–MEXICO BORDER⁶

On The Texas–Chihuahua–New Mexico border	Confidence Level
1. Conejos-Medanos/Mesilla-Bolson	Reasonable
2. Valle de Juarez/Hueco Bolson	Reasonable
On The Texas–Chihuahua border	
3. Valle del Peso/West Texas Bolsons	Limited
4. Bajo Rio Conchos/West Texas Bolsons	Limited
5. Alamo Chapo/Igneous	Limited
6. Manuel Benavides/Local aquifers	Limited
On The Texas–Coahuila border	
7. Presa La Amistad/Edwards	Reasonable
8. Allende-Piedras Negras, underlying the cities of Allende, Villa Union, Morelos, Zaragoza, and Nava-Guerrero on the Mexican side, and Brackettville and Spofford in Texas.	Reasonable
9. Serrania del Burro/Edwards	Some
10. Cerro Colorado-La Partida/Edwards	Some
11. Santa Fe del Pino/Local aquifers	Limited
12. Palestina/Local aquifers	Limited
<i>The following aquifers along the Coahuila, Nuevo Leon, & Tamaulipas' Border are linked with the Carrizo-Wilcox Aquifer in Texas:⁷</i>	
13. Hidalgo Aquifer (Coahuila and Nuevo León)	Some
14. Lampazos-Anahuac (Nuevo León)	Some
15. Bajo Rio Bravo Aquifer (Tamaulipas), which is hydraulically linked to two additional Texas aquifers, the Yegua Jackson and the Gulf Coast Aquifer.	Reasonable

⁵ See *id.*

⁶ Table 1 derives from the studies undertaken by Rosario Sanchez and Gabriel Eckstein, published in Sanchez & Eckstein (2017), *supra* note 1, at 5–7, and in Sanchez et al. (2016), *supra* note 1, at 103, 110–115.

⁷ 14,200 km² of the Carrizo-Wilcox is situated beneath Maverick, Dimmit, Uvalde, La Salle, Zavala, and Webb counties in Texas, and it further extends 3,300 km² into Coahuila, Nuevo. See Sanchez et al. (2016), *supra* note 1, at 114.

Conflict may emerge between users at the local level, just as it may rise to a level that brings state or international governments into the dispute. At the local level, El Paso has attempted to curb its groundwater withdrawals by increasing reliance on surface water and aquifer storage and recovery.⁸ The over-exploitation of the Hueco Bolson fostered an atmosphere of competition, which at times strained relations between the two cities that share the resource,⁹ but which also prompted the cross-border communities to cooperate with one another and each community independently to consider new groundwater governance approaches for itself. At the state and international level, in a current lawsuit between the states of Texas and New Mexico, Texas alleges that groundwater pumping from aquifers underlying the Rio Grande in New Mexico is reducing flows into the river and depriving Texas of the water due to the downstream state under the 1938 Rio Grande Compact.¹⁰ The compact, intended to allocate the waters of the Rio Grande between Colorado, New Mexico, and Texas, also aimed to uphold the United States obligation under a 1906 treaty to provide Mexico with 60,000 acre-feet of water annually.¹¹

Cooperation may likewise succeed between local stakeholders as much, if not more than, the broader states and nations¹²—but so far, there has been no such formal transboundary agreement. In 1999, the El Paso and Juárez communities officially recognized that increased population growth and water consumption would likely lead to “water supply and water quality problems within the next several years if corrective actions are not taken, which could create impacts on the available water supply for both communities.”¹³ In response, they initiated a cross-border Memorandum of Understanding (“MOU”), seeking to share such important information as historical and current groundwater pumpage, sources of water, and water quality data; technical support and information; and knowledge and experience in trying to obtain funding such as grants and loans.¹⁴ Importantly, in the MOU the two towns agreed to develop projects that could

⁸ María Rosa García-Acevedo & Helen Ingram, *Conflict in the Borderlands*, NACLA.ORG <https://nacla.org/article/conflict-borderlands> (last accessed Feb. 6, 2017).

⁹ *Id.*

¹⁰ Jim Malewitz, *Texas Gets Boost in New Mexico Water Fight*, TEXAS TRIBUNE (July 15, 2016, 12:01 A.M.), <https://www.texastribune.org/2016/07/15/texas-and-new-mexico-are-still-fighting-over-rio-g/>.

¹¹ CONVENTION BETWEEN THE UNITED STATES AND MEXICO: EQUITABLE DISTRIBUTION OF THE WATERS OF THE RIO GRANDE, signed May 21, 1906, ratified by the United States, Dec. 26, 1906, ratified by México, Jan. 5, 1907; *see also id.*

¹² Gabriel Eckstein, *Rethinking Transboundary Ground Water Resources Management: A Local Approach along the Mexico-U.S. Border*, 25 GEORGETOWN INT’L ENVTL. L. REV. 95, 112–13 (2013).

¹³ MEMORANDUM OF UNDERSTANDING/CONVENIO DE COLABORACIÓN BETWEEN THE JUNTA MUNICIPAL DE AGUA Y SANEAMIENTO DE JUAREZ, CHIHUAHUA (JMAS) (CITY OF JUAREZ UTILITIES) AND THE EL PASO WATER UTILITIES PUBLIC SERVICE BOARD (PSB), OF THE CITY OF EL PASO, TEXAS (“MOU”), signed Dec. 6, 1999.

¹⁴ *Id.* at 3–4.

have greater success given their combined economies of scale and further agreed to plan collaboratively how to secure water supplies in order to improve the Hueco Bolson Aquifer's connectivity.¹⁵ The MOU also encouraged cooperation over issues arising from the region's population growth and economy to inform a collaborative regional planning process, and to address long-term needs, such as new water resources, that both communities anticipated.¹⁶ Further, the MOU memorialized plans to restore aging infrastructure while improving wastewater treatment systems, and to prioritize water reuse, in part by creating a joint outreach program for the efficient use and re-use of water resources on both sides of the border.¹⁷

While this may reflect a momentum toward a binding agreement, under international law such an informal arrangement is not enforceable by either nation's local, state, or federal jurisdictions.¹⁸ It does, however, reflect the reality that local stakeholders are the first to feel the effects of threatened resources and more likely to attempt a solution when states and nations fail to.

B. Study Objective:

The purpose of this study is to present a factual picture of the multiple groundwater governance frameworks that cover the same transboundary aquifers on the Texas-Mexico border. The study can then serve as a foundation to support future research and as a reference for those sharing groundwater resources on the border to use in considering whether and how to coordinate management. Currently, Texas A&M School of Law, the Bush School of Government and Public Service at Texas A&M University, and the Texas Water Resources Institute are collaboratively pursuing a larger interdisciplinary project, and the study presented in this report is part of that concerted endeavor.

First, the project establishes a study area, then identifies who are the stakeholders in the area, and finally summarizes the various rules each entity applies to groundwater. The study area selected is based on the aquifers identified in the 2016 study noted above (see Figure 1).¹⁹ Although there is currently no formal agreement between governments

¹⁵ *Id.*

¹⁶ *Id.*

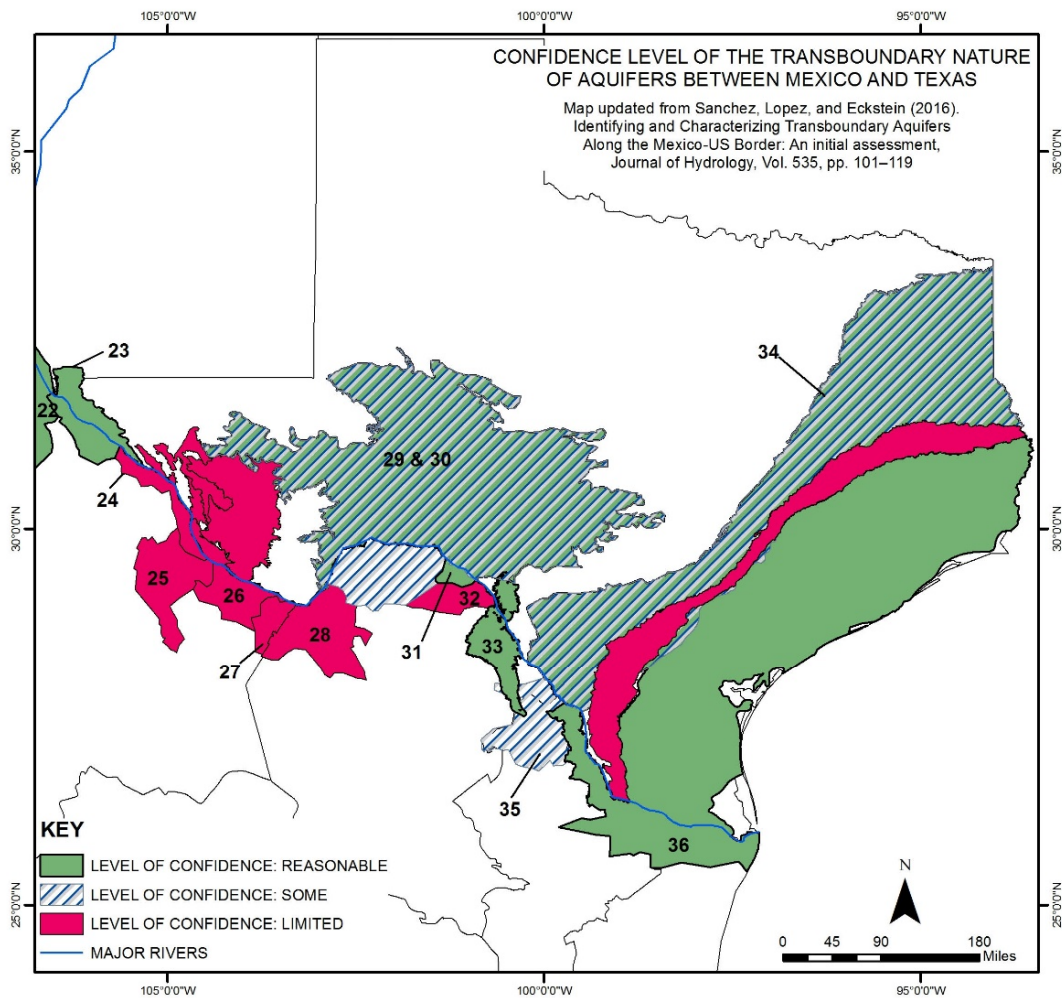
¹⁷ *Id.*

¹⁸ Eckstein (2013), *supra* note 12, at 120–21.

¹⁹ See Sanchez et al. (2016), *supra* note 1, at 103; see also Sanchez & Eckstein (2017), *supra* note 1.

or users in Mexico and Texas for managing the reservoirs that cross underneath the international border, this survey represents a preliminary step in addressing the larger problems that the absence of a cooperative groundwater management framework presents. All of the institutional approaches employed in the various jurisdictions surveyed here model features from which developing management approaches could draw. Equally, noting gaps in the institutional approaches themselves and the ad hoc groundwater withdrawals occurring outside the reach of those institutions illustrates potential value in engaging local users in Texas' and Mexico's respective groundwater governance arrangements.

FIGURE 1. AQUIFERS CROSSING THE TEXAS-MEXICO BORDER²⁰



Confidence Level: Reasonable

- (22) Conejos Medanos/Mesilla Bolson (TAAP3)
- (23) Valle de Juarez/Hueco Bolson (TAAP4)
- (31) Presa La Amistad/Edwards
- (33) Allende-Piedras Negras/Local aquifers
- (36) Bajo Rio Bravo/Carrizo Wilcox-Gulf Coast (Yegua Jackson no data)

Confidence Level: Some

- (29) Serrania del Burro/Edwards
- (30) Cerro Colorado-La Partida/Edwards
- (34) Hidalgo/Carrizo Wilcox
- (35) Lampazos/Anahuac-Carrizo Wilcox

Confidence Level: Limited

- (24) Valle del Peso/West Texas Bolsons
- (25) Bajo Rio Conchos/West Texas Bolsons
- (26) Alamo Chapo/Igneous
- (27) Manuel Benavides/Local Aquifers
- (28) Santa Fe del Pino/Local Aquifers
- (32) Palestina/Local Aquifers

²⁰ Sanchez et al. assigned these aquifers one of three levels confidence, according to data availability. See Sanchez et al. (2016), *supra* note 1, at 116.

C. **Methodology**

1. **Scope of Survey**

The focus of this project is on ascertaining what systems are in place to govern groundwater bounded by borders of various jurisdictions. Cooperation across national borders, if any exists, is not addressed in this report. While groundwater management naturally involves significant human social and political concerns, such investigation is beyond the scope of the present report, which is restricted to a factual survey and engages in only limited analysis. The initial boundary study area first extended to those communities within about a 20-mile range of the border, but then expanded to include communities that overlie and share management of the same transboundary aquifers. For instance, groundwater conservation districts on the Texas border apply their rules to communities situated farther than 20 miles from the border, so this study incorporates these areas into its scope.

2. **Process**

Research on this survey involved casting a very broad net in order to understand the overlapping jurisdictions and rules governing groundwater in the study area. To begin with, the author reviewed a variety of secondary sources, from United Nations documents to academic articles, to generate lists of primary governing documents in each country. Evaluating primary legal sources—including the constitution and water law of Mexico, and the constitutions, common law precedent, and legislation of the United States—and Texas, disclosed the primary institutions and legal framework governing various aspects of groundwater. Based on this assessment, two distinct views of groundwater ownership emerged: Texas' privately owned property view and Mexico's federally-managed public trust view of the resource. These varying frameworks propelled the project to follow two different approaches for discovering applicable governing systems. Over time, results from each country prompted comparisons and generated new points of research.

In researching Mexico, aspects of the national constitution and water law that gave control to various federal entities were identified to establish the overarching framework in the nation's top-down structure for groundwater quantity and quality. In Texas, the examination took a less linear approach, beginning with the state's constitution, legislation, and common law, to discern the limited extent that institutions can regulate a private landowner's right to groundwater quantity. Quality regulations for groundwater focused primarily on United States federal law. Based on this foundational research from

both sides of the border, new questions were generated regarding whether there were groundwater-related activities or concepts that did not fall under expressly written authority. This led the research to examine language used in Mexico's constitution and national water laws, as well as in Texas' constitution and legislation, revealing provisions that created political and regulatory space for other entities to develop groundwater rules; following up with research using secondary sources helped to broaden the search for those other entities. In addition to scholarly publications, this stage of the research cycle also looked at less formal commentary, such as newspaper articles and legal blogs, seeking reports of informal groundwater management, such as well-sharing cooperatives.

The approach to research evolved as these broadened searches revealed other concepts that might relate to groundwater, while refining two questions: (1) presuming the practice or rule implicates groundwater, is it superseded by the jurisdiction's dominant law, and (2) even if the rule exists apart from the dominant structure, are the users or institutions involved empowered to enforce it? Where research showed that the users or groups essentially had no power to enforce rules because the dominant jurisdiction's laws trumped the local rule—or, in some cases, where the institution perceived that it did—the research noted this as a gap in information or in management for the purposes of this report.

After identifying relevant stakeholders, contact information was collected online initially for members of institutions and user groups at several levels of authority within the study area. Some people responded, directing the study to additional contacts; the vast majority, however, did not respond to inquiries. Although research was conducted in both Spanish and English, as various terms or concepts became clearer through interpreting them in multiple contexts it was important to revisit and revise previous conclusions accordingly and to use this improved understanding to inform later research. The language barrier did not seem to be a barrier through email, which made it easier to explain research questions and to clarify the nuances of the information sought. Nevertheless, it is possible that fine distinctions in language, cultural and political unease, or general mistrust inhibited some respondents' level of engagement.

3. Challenges

In many cases, while the laws in Texas and Mexico appeared to allow local-level institutions to control certain aspects of groundwater resources, various local institutions in both Mexico and Texas disavowed having that authority and referred me to their primary institutional authority. For example, in Texas, irrigation districts claimed to have

no power to require users to restrict water usage where it could affect groundwater quality or recharge. But Texas laws give them the authority to take “necessary steps” where warranted for conservation and pollution prevention. Likewise, in Mexico, Chapter II of the National Water Law gives irrigation districts the power to prescribe some rules for users’ rights and duties, for conveying a concession, and to protect water source quality and quantity. Irrigation districts, however, claimed to have no rules, regulations, or procedures apart from what was stated in the federal laws. It is possible that these institutions that report having no rules applying to groundwater either have not exercised authority they do, in fact, possess or that they were uncomfortable disclosing governance mechanisms they used, perhaps out of concern for how the information would be used or interpreted.

As a result, the information gleaned from local institutions and users evidences gaps in knowledge of practices that users may actually be applying, and in the existence of actors at the local level authorized to carry out federal laws or to develop rules for doing so. In Texas, because groundwater is the landowner’s property, this report assumes that local users apply their own rules at will, leaving gaps in knowledge regarding what practices they follow. Texas groundwater conservation districts, where they have been formed, have limited ability to exercise control over groundwater, but in the majority of the border region not covered by such a district, landowners are largely operating under their own rules regarding water withdrawn from aquifers. In Mexico, federal groundwater law *does* apply, even in more remote areas where the federal authorities do not maintain offices, but the national laws afford little approval for local stakeholders to create or enforce water laws locally. With limited access to direct federal support, it is likely that local users are applying their own rules as well, perhaps in violation of federal law, resulting in gaps in groundwater governance.

D. Report Organization

To begin with, this report has presented a summary of the project’s results, its objectives, and the methodology used for research; from here, the report details the results for the jurisdictions in turn. Each section and subsection opens with an overview of the structure discussed immediately after. The surveys begin at the federal level, followed by the state level, and then proceeding to parse out the governance regime at the regional and local level. Within each level, the report identifies the institutions involved and then the laws that apply at that level.

Section II begins with the United States federal government's authority and related laws, then proceeds to Texas' state authority and landowner-centered laws, and finishes with a discussion of governance at the local level. Section III then explores the structure of Mexico's federal system and the bulk of the governance rules, thereafter surveying the states of Mexico and their related laws, as well as the municipalities' relevant laws and the various agricultural groups capable under the law of developing some level of groundwater management. Finally, the report concludes with an overview comparing the operative mechanisms in Mexico and Texas and honing in on gaps in information to provide a basis on which future work may build.

II. GROUNDWATER ON TEXAS' SIDE OF THE BORDER

A. Overview:

In the United States, jurisdiction over water is divided among multiple political, geographic, institutional, and economic jurisdictions. For example, water quality is generally regarded as a federal issue, leaving the states to determine water quantity. The United States government, however, does delegate authority over certain water quality programs to states that satisfy particular requirements. For instance, 46 of the 50 U.S. states—Texas among them—have qualified and been given authority to implement the Clean Water Act in accordance with federal guidelines, and though the Act only explicitly applies to surface water, where underground and surface water linkages exist, polluting groundwater could result in surface water pollution in violation of the Act. Most states have also developed a legal regime to implement federal hazardous waste standards under the Safe Drinking Water Act, the Resource Conservation and Recovery Act, and the Comprehensive Environmental Response, Compensation, and Liability Act. By contrast, the Endangered Species Act is exclusively under federal control (see Table 2).

TABLE 2. SUMMARY OVERVIEW OF TEXAS GROUNDWATER GOVERNANCE		
LEVEL OF GOVERNANCE	INSTITUTION OR ENTITY	RELEVANT LAW UNDER JURISDICTION
Federal (United States)	<ul style="list-style-type: none"> Environmental Protection Agency 	<ul style="list-style-type: none"> Exclusive authority for promulgating the Endangered Species Act Primary water quality authority via: <ul style="list-style-type: none"> Clean Water Act Safe Drinking Water Act Resource Conservation and Recovery Act Comprehensive Environmental Response, Compensation, and Liability Act
	<ul style="list-style-type: none"> United States Army Corps of Engineers 	<ul style="list-style-type: none"> Enforce certain permits under the Clean Water Act
	<ul style="list-style-type: none"> United States Fish & Wildlife Service National Marine Fisheries Service 	<ul style="list-style-type: none"> Jointly responsible for enforcing the rule of the Endangered Species Act
State (Texas)	<ul style="list-style-type: none"> Texas Commission on Environmental Quality 	<ul style="list-style-type: none"> Texas owns surface water and issues rights and permits Authority for federal programs delegated to it under: <ul style="list-style-type: none"> Clean Water Act Safe Drinking Water Act Resource Conservation and Recovery Act Comprehensive Environmental Response, Compensation, and Liability Act
	<ul style="list-style-type: none"> Texas Railroad Commission 	<ul style="list-style-type: none"> Regulates well drilling and injection in the hydrocarbon industry
	<ul style="list-style-type: none"> Texas' Judiciary 	<ul style="list-style-type: none"> Texas' appellate courts interpret constitutional, legislative, and administrative laws, setting common law that has affirmed the "Rule of Capture"
Local	<ul style="list-style-type: none"> Groundwater Conservation Districts 	<ul style="list-style-type: none"> Established by state or residents of an area and given limited authority to regulate groundwater within the area
	<ul style="list-style-type: none"> Counties 	<ul style="list-style-type: none"> Rule of capture and common law prevail
	<ul style="list-style-type: none"> Municipalities 	<ul style="list-style-type: none"> Limited ability to govern groundwater, such as through codes & ordinances, nuisance laws.
	<ul style="list-style-type: none"> Individuals 	<ul style="list-style-type: none"> Texas Constitution and judicial precedent give landowners private property right in groundwater beneath property.

Control of Texas groundwater quantity is further decentralized and belongs primarily to the owner of land situated above the water source. With state law declaring the water in aquifers to be private property—unlike state-owned surface water—state agencies, specially-authorized governance districts, and user groups have limited ability to regulate groundwater. Moreover, when governmental action restricts how owners of groundwater may use their property in excess of lawful authority, the U.S. and Texas constitutions may curb the government’s action.

B. Federal

1. Federal Institutions Involved

a. Environmental Protection Agency (“EPA”)

The EPA takes responsibility for setting and enforcing water quality standards. In certain cases, the EPA may delegate to states the primary enforcement authority for managing particular programs and implementing federal standards, so long as the states meet the EPA’s requirements.

b. United States Army Corps of Engineers (the “Corps”)

The Corps operates under the U.S. Department of the Interior, and although its jurisdiction over water generally extends only to wetlands,²¹ underground water may fall under its ambit in certain circumstances. The CWA tasks the Corps with enforcing regulations under Section 404 of the CWA related to permits for the discharge of dredge and fill material into “navigable waters.”²²

c. United States Fish & Wildlife Service (“USFWS”) & National Marine Fisheries Service (“NMFS”)

The USFWS, housed within the Department of the Interior, shares joint responsibility for implementing the Endangered Species Act (“ESA”) alongside the NMFS, housed within the National Oceanic and Atmospheric Commission. The ESA encompasses groundwater when conditions change in an aquifer or water from an

²¹ U.S. ARMY CORPS OF ENGINEERS, *Jurisdiction*, <http://www.nwp.usace.army.mil/Missions/Regulatory/Jurisdiction.aspx> (last accessed Feb. 6, 2017).

²² 33 U.S.C.A. § 1344.

underground source on which endangered species or their habitats rely, causing those species significant harm. When such a situation threatens one of ninety-four listed marine species, “from whales to sea turtles and salmon to Johnson’s sea grass,” the ESA triggers duties on the part of NMFS. Jurisdiction over the other more than 1,900 listed species falls to the USFWS.

2. Federal Laws

a. Clean Water Act (“CWA”)

(1) *Overview.*

Generally speaking, the CWA Section 404 prohibits anyone without a permit from discharging dredged or fill material into “navigable waters” of the United States²³—broadly, those that could be used in commerce or are susceptible to the ebb and flow of tides.²⁴ But the Corps of Engineers defines “navigable waters” to include wetlands “adjacent” to such waters and tributaries.²⁵ “[A]djacent” wetlands currently include those “bordering, contiguous [to], or neighboring” waters of the United States, even when they are “separated from [such] waters . . . by man-made dikes . . . and the like.”²⁶

(2) *Relationship to Groundwater.*

The CWA, though directed primarily at surface waters, indirectly regulates groundwater by restricting land development on wetlands where such actions may adversely impact groundwater recharge.²⁷ The definition of “Waters of the United States” (“WOTUS”) could possibly encompass and apply the CWA to aquifers with a very close relationship to surface water, but this definition is currently under scrutiny. Although the United States Supreme Court in *Rapanos v. United States* issued a plurality opinion²⁸ written by Justice Scalia, holding that to be considered an adjacent wetlands, there must be a “continuous surface connection” to a WOTUS. Justice Kennedy wrote a concurring opinion, relying on a different test for adjacency—the “significant nexus test.”²⁹ The

²³ *Id.*

²⁴ 33 U.S.C. §§ 1311(a), 1342(a). 33 U.S.C. 1362(7).

²⁵ 33 U.S.C. § 328.3(a)(7).

²⁶ 33 U.S.C. § 328.3(c).

²⁷ Sue Snyder & Brandon Tuck, *Conservation and Land Use Statutes: Water Related Programs—Wetlands*, 45 TEX. PRAC., ENVTL L. § 15:5 (2016).

²⁸ In American jurisprudence, a plurality opinion is not as strong as a majority opinion, meaning that the holding does not have the same precedential effect.

²⁹ *Rapanos v. United States*, 547 U.S. 715, 717 (2006).

“Clean Water Rule” that the EPA and the Corps of Engineers adopted on August 28, 2015 reflects Kennedy’s test. Under this Rule, waters at the head of a navigable water body, or those with a sufficient nexus to one, are also considered WOTUS or WOTUS-adjacent.³⁰ For instance, there is evidence that the “surface and groundwater conveyance and reservoir system used to comply with the US-Mexico 1944 treaty” may interconnect the Palestina Aquifer and the Presa La Amistad Aquifer.³¹ The result of the Rule is that underground water with a sufficient nexus to a wetlands or body of water that constitutes or is considered adjacent to a WOTUS potentially could be subject to EPA’s jurisdiction under the CWA.

In the months following the Rule’s adoption, however, it quickly became the subject of heavy litigation. Immediately following its issuance, the WOTUS Rule was thrown into jeopardy when thirteen states³² challenged the EPA’s expanded jurisdiction as beyond the scope of authority granted to it by Congress.³³ Meanwhile, the federal court for the Sixth Circuit agreed with eighteen states³⁴ that the sheer breadth of harm possible under the Rule’s expansive jurisdiction warranted a respite from implementation and issued a stay suspending the Clean Water Rule.³⁵ As a result, the EPA and Army reverted to regulations that employed the WOTUS definition as it existed prior to the Clean Water Rule’s implementation.³⁶

On February 28, 2017, the Trump Administration targeted the Clean Water Rule and its WOTUS definition when he signed the Executive Order entitled *Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the “Waters of the United States” Rule*,³⁷ which mandates that EPA and Corps review the Clean Water Rule and any “orders, rules, regulations, and policies” that implement the Rule.³⁸ The stated goal

³⁰ 33 U.S.C. § 328.3 (c);(a)(1),(a)(7); 80 Fed. Reg. 37054 (June 29, 2015).

³¹ Sanchez et al. (2016), *supra* note 1, at 113.

³² North Dakota, Alaska, Arizona, Arkansas, Colorado, Idaho, Missouri, Montana, Nebraska, Nevada, New Mexico, South Dakota, and Wyoming joined in *North Dakota, et al. v. United States Envtl. Protection Agency*, 2015 WL 7422349 (U.S. D. N.D. Nov. 10, 2015) (mem. op.).

³³ *Id.* at 9–11.

³⁴ The action consolidated cases involving Ohio, Michigan, Tennessee, Oklahoma, Texas, Louisiana, Mississippi, Georgia, West Virginia, Alabama, Florida, Indiana, Kansas, Kentucky, North Carolina, South Carolina, Utah, and Wisconsin, but the court applied its stay nationwide. *State of Ohio, et al. v. U.S. Army Corps of Eng’rs, et al.*, Case No. 15-3751, Document 49-2, Order of Stay, at 6.

³⁵ *Id.*

³⁶ *Clean Water Rule Litigation Statement*, EPA, <https://www.epa.gov/cleanwaterrule/clean-water-rule-litigation-statement>.

³⁷ Executive Order 13778, 82 FED. REG. 41 (2017) (signed Feb. 28, 2017), <https://www.gpo.gov/fdsys/pkg/FR-2017-03-03/pdf/2017-04353.pdf>.

³⁸ *Id.* at Section 2(a),(b).

of the mandate is to bring those rules into conformity with a newly expressed policy aimed at keeping navigable waters of the U.S. “free from pollution, while at the same time promoting economic growth, minimizing regulatory uncertainty, and showing due regard for the roles of the Congress and the States under the Constitution.”³⁹ In addition, Trump’s Order specifically directs the agencies to “consider interpreting” what are “navigable waters” in a manner that accords with Justice Scalia’s “continuous surface connection” test as stated in the *Rapanos* case.⁴⁰ Any proposed new rule that the agencies issue will still be subject to the notice and comment period.⁴¹ The Order further authorizes the Attorney General to act as needed related to litigation pending in federal courts that may relate to the Rule, while the EPA and Corps revise, replace, or rescind the Rule.⁴²

b. Safe Drinking Water Act (“SDWA”).

(1) *Overview.*

The goal of the federal Safe Drinking Water Act (“SDWA”) is to limit the amount of “physical, chemical, biological, or radiological substance[s] or matter” present in public drinking water supplies.⁴³ The SDWA authorizes EPA to set the maximum contaminant levels allowable for chemicals that it determines adversely affect human health.⁴⁴ While SDWA requires public water systems to meet these standards, it also imposes regulations on activities that could contaminate groundwater reservoirs. It does so in three primary ways: (1) providing safeguards for certain identified “sole-source aquifers,”⁴⁵ (2) enabling state-run wellhead protection programs to protect areas surrounding the public water supply,⁴⁶ and (3) through its Underground Injection Control (“UIC”) programs.⁴⁷ The EPA sets the standards and enforces them unless it delegates to qualifying states, territories, or tribal nation primary authority to oversee the UIC program.⁴⁸

³⁹ *Id.* at Section 1.

⁴⁰ *Id.* at Section 3.

⁴¹ *Id.* at Section 1(a),(b).

⁴² *Id.* at Section 2(c).

⁴³ 42 U.S.C. § 300f(1),(6).

⁴⁴ *Id.* § 300f(1).

⁴⁵ *Id.* § 300h-6.

⁴⁶ *Id.* § 300h-7.

⁴⁷ *Id.* § 300h-3.

⁴⁸ *Id.* § 300g-1(7); *see also* *Underground Injection Control (UIC): Primary Enforcement Authority for the Underground Injection Control Program*, EPA.GOV, <https://www.epa.gov/uic/primary-enforcement-authority-underground-injection-control-program> (emphasis added).

(2) *Sole-Source Aquifers.*

A “sole-source” aquifer meets two criteria: (1) it supplies at least 50% of the drinking water for a given area, and (2) should the aquifer become contaminated and pose “a significant hazard to public health,” there are no alternative drinking water sources reasonably available to the area.⁴⁹ Once the EPA designates an aquifer as an SSA, EPA must review the projected impacts on the area overlying the SSA, and sometimes even surface streams, if they contribute to the SSA’s recharge.⁵⁰ The SDWA prohibits federally-assisted projects from proceeding when they have potential to contaminate an SSA via its recharge zone—if the risk to public health would be significant.⁵¹ No SSAs have been designated on the Texas border, although if any border aquifers were discovered to be recharging and meet the SDWA’s other criteria, they would join the Edwards Aquifer on the state’s SSA list.⁵²

(3) *Underground Injection Control (“UIC”).*

The SDWA’s Underground Injection Control program is a permitting regime focusing specifically on injection wells that place fluids underground for storage or disposal. It establishes categories of injection wells, imposing varying levels of restrictions on the construction, operation, permitting, and closure of injection wells, to prevent any underground injection from endangering drinking water sources. Endangerment occurs when any contaminant’s presence in any groundwater that could “reasonably be expected to supply any public water system” may cause the water system to violate SDWA primary standards or adversely affect human health.⁵³

As applied in Texas,⁵⁴ the UIC employs a five-tiered well-classification scheme that determines what permit requirements and standards apply to wells based on the purpose and place of their use. In *Class I* wells, hazardous, industrial, and municipal

⁴⁹ *Overview of the Drinking Water Sole Source Aquifer Program*, EPA.GOV, <https://www.epa.gov/dwssa/overview-drinking-water-sole-source-aquifer-program> (last accessed July 5, 2017); 42 U.S.C. § 300h-6.

⁵⁰ EPA.GOV, *supra* note 47.

⁵¹ 42 U.S.C. § 300h-6.

⁵² *Sole Source Aquifer Recharge Area*, USDA RURAL DEV., at 1, https://www.rd.usda.gov/files/TX_21SoleSourceAquiferRechargeArea.pdf (last accessed Feb. 1, 2018).

⁵³ 42 U.S.C. § 300h(d)(2).

⁵⁴ See the discussion on federal and state classification schemes for this type of well in note 110, *infra*, and accompanying text.

wastes are injected below the deepest stratum containing protected groundwater.⁵⁵ Wells injecting fluids derived from oil or natural gas production are classified as *Class II*,⁵⁶ and those that inject in the process of solution mining of minerals comprise *Class III*.⁵⁷ Now forbidden, *Class IV* well permits allowed hazardous or radioactive waste to be injected into or above groundwater reservoirs.⁵⁸ Finally, the *Class V* catch-all category of injection wells encompasses drainage systems for stormwater and agriculture, as well as more “unsophisticated” shallow wastewater disposal wells.⁵⁹ These more informally constructed wells can include disposal pits for automotive wastes, cesspools, and large-capacity septic systems.⁶⁰ The EPA has approved UIC programs in the majority of the states, approving the states’ administration and enforcement of UIC programs within their jurisdictions, while in a few states, the EPA retains jurisdiction and shares it with yet other states.⁶¹ Because the EPA has determined that Texas’ programs qualify, its state agencies generally have jurisdiction over the UIC.

Notably, SDWA’s definition of “underground injection” specifically excludes injections of fluids and proppants used in hydraulic fracturing operations and of natural gas for storage.⁶² Instead, wastewater from oil and gas operations, particularly fluids used in enhanced and secondary recovery, are stored in Class II wells rather than more reinforced Class I hazardous waste wells. This is lawful because oil and gas waste is exempt from hazardous waste regulations that would require constructing Class I wells.

⁵⁵ *Underground Injection Control (UIC): Class I Industrial and Municipal Waste Disposal Wells*, EPA.GOV, <https://www.epa.gov/uic/class-i-industrial-and-municipal-waste-disposal-wells> (last accessed Feb. 1, 2018).

⁵⁶ *Underground Injection Control (UIC): Class II Oil and Gas Related Injection Wells*, EPA.GOV, <https://www.epa.gov/uic/class-ii-oil-and-gas-related-injection-wells> (last accessed Feb. 1, 2018).

⁵⁷ *Underground Injection Control (UIC): Class III Injection Wells for Solution Mining*, EPA.GOV, <https://www.epa.gov/uic/class-iii-injection-wells-solution-mining> (last accessed Feb. 1, 2018).

⁵⁸ *Underground Injection Control (UIC): Class IV Shallow Hazardous and Radioactive Injection Wells*, EPA.GOV, <https://www.epa.gov/uic/class-iv-shallow-hazardous-and-radioactive-injection-wells> (last accessed Feb. 1, 2018).

⁵⁹ *Underground Injection Control (UIC): More Information about Class V Well Types*, EPA.GOV, <https://www.epa.gov/uic/more-information-about-class-v-well-types> (last accessed Feb. 1, 2018).

⁶⁰ *Underground Injection Control (UIC): Class V Wells for Injection of Non-Hazardous Fluids into or Above Underground Sources of Drinking Water*, EPA.GOV, <https://www.epa.gov/uic/class-v-wells-injection-non-hazardous-fluids-or-above-underground-sources-drinking-water> (last accessed Feb. 3, 2017).

⁶¹ *Id.*

⁶² 42 U.S.C. § 300h(d)(1).

(4) *Wellhead Protection Programs.*

States are required to have a wellhead protection program that ensures health-damaging contamination does not enter wellhead protection areas: the “surface and subsurface area surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield.”⁶³ In determining the wellhead protection area, states must use “all reasonably available hydrogeologic information on groundwater flow, recharge and discharge.”⁶⁴ In addition to identifying man-made sources of contamination in the wellhead area, the state must designate backup water sources in the event of contamination and must also consider all possible sources of contamination when using a new water well to add to the public water supply.⁶⁵

c. Resources Conservation and Recovery Act (“RCRA”)

(1) *Overview.*

The EPA identifies “[s]alt storage piles, land application of biosolids, land disposal, landfills, and leaking underground storage tanks” as some of the major sources of “pollutants associated with water quality impairment.”⁶⁶ Accordingly, RCRA regulates how solid and hazardous waste is generated, transported, stored, treated, and disposed.⁶⁷ Violations of RCRA regulations involving hazardous waste, underground storage tanks, or landfills invite various administrative, civil, and criminal consequences.

(2) *Relationship to Groundwater.*

Groundwater is specifically protected by RCRA.⁶⁸ Rules applying to hazardous waste from “cradle to grave” (meaning that a permit is required for treatment, storage,

⁶³ *Id.* § 300h-7(e),(a).

⁶⁴ *Id.* § 300h-7(a)(2).

⁶⁵ *Id.* § 300(a)(1)–(6).

⁶⁶ EPA, NATIONAL WATER QUALITY INVENTORY: REPORT TO CONGRESS 21, EPA DOC. 841-R-16-011 (Aug. 2017), https://www.epa.gov/sites/production/files/2017-12/documents/305brtc_finalowow_08302017.pdf.

⁶⁷ *Hazardous Waste: Learn the Basics of Hazardous Waste*, EPA.Gov, <https://www.epa.gov/hw/learn-basics-hazardous-waste> (last accessed Feb. 2, 2018).

⁶⁸ EPA, RCRA ORIENTATION MANUAL, at III-1255 (2014), <https://www.epa.gov/hwgenerators/resource-conservation-and-recovery-act-rcra-orientation-manual>.

and disposal) include groundwater monitoring. And underground storage tank owners or operators are now subject to EPA enforcement for groundwater contamination, as one-half of all the releases confirmed from underground storage tanks have evidenced groundwater contamination.⁶⁹

d. Comprehensive Environmental Response, Compensation, and Liability Act (“CERCLA”)

(1) *Overview.*

Under CERCLA, past and present owners of a tract of land, those who generate waste there, and transporters who selected the site for disposal may be held strictly, jointly, and severally liable to clean hazardous waste sites, as statutory defenses are few and limited.⁷⁰ Initially, CERCLA’s enabling statute funded the effort with over one billion dollars to help pay for contaminated site cleanup, and this came to be known as the “Superfund.” “Superfund” sites are those where: (A) “any hazardous substance is released or there is a substantial threat of such a release into the environment, or (B) there is a release or substantial threat of release into the environment of any pollutant or contaminant which may present an imminent and substantial danger to the public health or welfare.”⁷¹

(2) *Relationship to Groundwater.*

As of 1997, over half of the Superfund sites prioritized for cleanup by the EPA under CERCLA involved groundwater contamination.⁷² However, of a total 1,345 Superfund sites on the National Priority List as of January 31, 2018, 66 indicate some type of groundwater contamination.⁷³

⁶⁹ EPA.GOV, *supra* note 65.

⁷⁰ See 42 U.S.C. § 9607(b).

⁷¹ *Id.* §§ 9604(a)(1)(A)-(B) (1994).

⁷² Christopher Gobert, *Groundwater Contamination A Look at the Federal Provisions*, AM. BAR ASS’N, GEN. PRAC., SOLO & SMALL FIRM DIV. MAG. (Spring 1997), https://www.americanbar.org/newsletter/publications/gp_solo_magazine_home/gp_solo_magazine_index/sp97gr.html (last accessed Feb. 1, 2018).

⁷³ *Superfund: National Priorities List (NPL) Sites*, EPA.GOV, <https://www.epa.gov/superfund/national-priorities-list-npl-sites-state> (last accessed Feb. 1, 2018).

e. Endangered Special Act (“ESA”).

(1) *Overview.*

The ESA protects endangered and threatened species by prohibiting the “take” of listed animals and the adverse effect or destruction of a listed plant’s habitat.⁷⁴ Section 7 of the ESA applies rules protecting listed species⁷⁵ to government agencies,⁷⁶ while Section 9 applies the scheme to individual actions.⁷⁷ A “take” occurs, for example, when an agency or individual causes harm to a species through “significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.”⁷⁸

(2) *Relationship to Groundwater.*

ESA protections impact groundwater governance when water quantity or quality related to an underground water source adversely affects or destroys the habitat of a listed species. Such was the case in *Sierra Club v. Lujan*.⁷⁹ There, a federal court adjudicated a citizen suit, joined by various other parties focused on water issues, alleging that the Fish and Wildlife Service contributed to the take of five species whose habitat relied on water from the Edwards Aquifer, specifically the Fountain Darter, whose only known habitat is the Edwards.⁸⁰ The court found that over-pumping of the aquifer caused reduced springflows, in particular by trapping the Fountain Darter in shallow pools, where they died from a lack of oxygen or predation.⁸¹ Coupled with harm to other animal and plant species, the court held that over-pumping triggered the FWS’s affirmative duty under ESA Section 7 to develop a recovery plan, in this case by establishing minimum springflows that would support restricting withdrawals of groundwater.⁸²

Notably, the court observed that the aquifer’s groundwater users and the region’s water-dependent entities were already aware of the strain that over-pumping placed on the aquifer. Users had been engaged in four decades of failed negotiations seeking to manage withdrawals, and the TWC had reported that “overdrafting of the Aquifer itself

⁷⁴ 16 U.S.C. § 1538(a)(1),(a)(2)(E); 50 C.F.R. § 17.94(a).

⁷⁵ *Id.* § 1533.

⁷⁶ *Id.* § 1536.

⁷⁷ *Id.* § 1538.

⁷⁸ 50 C.F.R. § 17.3.

⁷⁹ *Sierra Club v. Lujan*, Civ. No. MO–91–CA–069, 1993 WL 151353, at *1 (W.D. Tex. Feb. 1, 1993).

⁸⁰ *Id.* at *13.

⁸¹ *Id.* at *13.

⁸² *Id.* at *11.

may allow the intrusion of highly mineralized water from underground water adjacent to the [Edwards] otherwise held in check because of the hydrostatic pressure of the Aquifer.”⁸³ The intrusion of this “bad water” could contaminate the Edwards Aquifer permanently, meaning the users’ over-withdrawal poses both ESA problems and water quality threats to those who rely on the shared source. Moreover, the court signaled that the suit’s employment of the federal ESA authority could have been avoided if groundwater users had responded to the problems that they and the state knew were occurring.

Concurrently with the Texas-New Mexico compact dispute over the Rio Grande, which centers on groundwater withdrawals in New Mexico reducing river flows, an environmental group has filed a suit claiming ESA violations due to Rio Grande diversions causing the unlawful taking of several listed species. It is conceivable that future suits could target groundwater withdrawals for similarly causing listed species takes through reducing river flows.⁸⁴

C. State

1. **State Law: Rule of Capture**

a. Generally.

Texas uses two separate legal regimes for surface and groundwater. Surface water is owned by the state;⁸⁵ on the other hand, landowners, including their lessees, heirs, or assigns, have the exclusive, absolute right to drill for water underneath their property.⁸⁶ The groundwater estate is considered real property owned in place by the landowner,

⁸³ *Id.* at *29, *7.

⁸⁴ To illustrate, Wheat pointed out a recent suit alleging just this:

In July 2014, Wild Earth Guardians filed suit in federal district court against the Middle Grande Conservancy District, claiming Article 9 ESA violations for the District’s diversion of water from the Rio Grande at four separate dams along the river. Wild Earth Guardians claim this diversion has harmed the critical habitat and essential behavioral patterns of the endangered Rio Grande silvery minnow and the Southwestern willow flycatcher. Any resolution to water disputes of the Rio Grande will have to answer ESA situations such as these or face additional litigation.

Elizabeth Wheat, *Groundwater Challenges of the Lower Rio Grande: A Case Study of Legal Issues in Texas and New Mexico*, 4 RES. 172, 180 (2015).

⁸⁵ TEX. WATER CODE § 11.021.

⁸⁶ *Id.* § 36.002(b)(2); *Houston & T.C. Ry. Co. v. East*, 81 S.W. 279 (1904); *Edwards Aquifer Auth. v. Day*, 369 S.W.3d 814, 831–32 (Tex. 2012).

regardless of whether brought to the surface or not, and may be severed from the surface estate and sold, or reserved when the land is sold.⁸⁷

b. Exceptions:

(1) *Malicious Drainage or Pumping.*

Although Texas law does make it unlawful in some cases for users pumping from wells on their property to drain water from a neighbor's well, unless it is done for the sole purpose to injure the neighbor, there is no liability for depleting the neighbor's supply.⁸⁸ Their remedy? Pump faster. "Slant wells," however, are not lawful. Under historical common law principles, landowners generally have the right to exclude any person from crossing their property line, which runs from the surface, to the heavens above, and to the earth's center below.⁸⁹ Texas legal tradition upholds this principle through concepts like slant well drilling restrictions which prohibit crossing the plane of a landowner's property to drill for groundwater, even if the trespasser's water is in the same reservoir.⁹⁰

(2) *Subsidence.*

The Texas Supreme Court has declared that negligent drilling or pumping that proximately causes another person's land to subside is unlawful.⁹¹

(3) *Waste.*

No examples of waste have been recorded officially as having occurred in Texas case law. Statutory definitions of waste in the Texas Water Code include:

⁸⁷ *City of Del Rio v. Clayton Sam Colt Hamilton Tr.*, 269 S.W.3d 613, 617 (Tex. App.—San Antonio 2008, pet. denied).

⁸⁸ *Pecos County Water Control & Imp. Dist. No. 1 v. Williams*, 271 S.W.2d 503, 505 (Tex. Civ. App.—El Paso 1954, writ ref'd n.r.e).

⁸⁹ This concept, known as the *ad coelum* doctrine, has been limited by the United States Supreme Court, although Texas state law has not substantially done so. In *United States v. Causby*, the U.S. Supreme Court held that landowners hold title to the airspace above private property at the lower altitudes only, saying that private property ownership unto the heavens "has no place in the modern world." *United States v. Causby*, 328 U.S. 256 (1946).

⁹⁰ See, e.g. the Texas Supreme Court's overview of precedent from oil and gas law supporting a landowner's "right to exclude others from groundwater beneath his property," as discussed in *Day*, 369 S.W.3d at 829–30.

⁹¹ *Friendswood Dev. Co. v. Smith-Southwest Indus., Inc.*, 576 S.W.2d 21, 30 (Tex. 1978).

- (A) an amount or rate of groundwater withdrawal that causes saltwater to intrude into an aquifer that makes the groundwater within it unsuitable to use for agricultural, gardening, domestic uses, or for raising stock;
- (B) producing groundwater or allowing it to flow from an aquifer without using it for a beneficial purpose;
- (C) allowing groundwater to escape into any reservoir or geologic strata that does not hold groundwater;
- (D) saltwater or other harmful matter from the surface or from one stratum polluting groundwater in another;
- (E) negligently or willfully letting groundwater flow into any watercourse, depression, drainage, or land not owned by the well owner;
- (F) groundwater used in irrigation that flows off of the land where the well sits and onto another owners' land without permission; or
- (G) artesian well water is considered wasted if the user willfully or knowingly permits it to flow off of the land or to percolate through the land and into the stratum below.⁹²

However, even when substantial amounts of water are lost in transportation, courts have not considered this groundwater waste.⁹³

(4) *Underground water not Defined as "Groundwater".*

"Groundwater" in Texas includes percolating water and artesian springs but does not encompass underground streams in defined channels—these are considered surface water.⁹⁴ Underground watercourses must have a defined bed, banks, and stream.⁹⁵ No underground watercourse fitting this description has ever been identified in Texas.

c. Surface Use: Accommodation Doctrine.

Recently, the Texas Supreme Court in *City of Lubbock v. Coyote Lake Ranch* held that those who own groundwater rights that have been severed from the surface estate have an implied right to use the surface in order to access that groundwater.⁹⁶ But the

⁹² TEX. WATER CODE § 36.001(8).

⁹³ *City of Corpus Christi v. City of Pleasanton*, 276 S.W.2d 798, 802 (Tex. 1955).

⁹⁴ TEX. WATER CODE §§ 36.001(5), 11.205, 36.002(b)(2).

⁹⁵ *Denis v. Kickapoo Land Co.*, 771 S.W.2d 235 (Tex. App.—Austin 1989, writ denied).

⁹⁶ *Coyote Lake Ranch, LLC v. City of Lubbock*, 498 S.W.3d 53, 64 (Tex. 2016).

right came with recognition of a duty to give due regard to the surface estate owner's rights in the same manner as Texas requires oil and gas operators to accommodate owners of land situated above the mineral reservoirs they exploit.⁹⁷ In the oil and gas context, mineral rights holders and those with a surface estate right may agree to modify Texas' general accommodation rule—the same applies to interactions between separate owners of severed groundwater and surface estates.⁹⁸

The Court described the surface owner's burden in seeking to apply the Accommodation Doctrine: "[T]he surface owner must prove that (1) the groundwater owner's use of the surface completely precludes or substantially impairs the existing use, (2) the surface owner has no available, reasonable alternative to continue the existing use, and (3) given the particular circumstances, the groundwater owner has available reasonable, customary, and industry-accepted methods to access and produce the water and allow continuation of the surface owner's existing use."⁹⁹

d. Subsurface Trespass

In recent years, Texas courts have just breached the surface of a legal concept, known as "subsurface trespass," with the potential to hold liable as trespassers those who inject into wells fluids that migrate into adjacent groundwater. In a 2009 Texas court of appeals case, the plaintiff landowner argued that the same principle of subsurface trespass should apply when fluid from a neighboring injection well migrates across a landowner's property line into the groundwater there. In short, the *FPL Farming, Ltd. v. Environmental Processing Systems, L.C.* suit alleged that when wastewater that the lessor of an adjacent property injected into wells on the lease migrated into the landowner's groundwater property, the wastewater molecules constituted a trespass.¹⁰⁰ The Texas appellate court recognized that the state's case law on trespass could support a cause of action for the unauthorized entry of fluid into groundwater property; but the Texas Supreme Court's holding on a second appeal avoided declaring the right to sue for subsurface trespass of fluids from injection wells into surrounding groundwater.¹⁰¹ The issue is likely to persist, particularly because of the implications such a precedent could have on the oil and gas industry's use of injection wells.

⁹⁷ *Id.* at 64–65.

⁹⁸ *Id.* at 63–65.

⁹⁹ *Id.* at 64–65.

¹⁰⁰ *FPL Farming, Ltd. v. Envntl. Processing Sys., L.C.*, 305 S.W.3d 739, 741 (Tex. App.—Beaumont 2009), *rev'd*, 351 S.W.3d 306 (Tex. 2011).

¹⁰¹ *Envntl. Processing Sys., L.C. v. FPL Farming, Ltd.*, 457 S.W.3d 414 (Tex. 2015).

2. State Environmental Laws' Potential Application to Groundwater.

a. Environmental flow rules.

Environmental flow standards restrict surface water rights holders along the Rio Grande from diverting or storing water when the river is under certain flow conditions.¹⁰² The river must be flowing at or above the required baseflow or subsistence flow that is “adequate to support a sound ecological environment, to the maximum extent reasonable, considering other public interests and other relevant factors,” in order for rights holders to exercise their right to divert water lawfully.¹⁰³ These Rio Grande standards do not expressly discuss groundwater or aquifers as factors to be considered in determining this baseflow.¹⁰⁴ Yet just as an ecosystem supporting certain species may be fed by and rely on springs or other underground water, as the ESA recognizes,¹⁰⁵ ensuring that environmental flows on the Rio Grande adequately support a sound ecological environment may depend on groundwater. A situation could arise where the Texas Commission on Environmental Quality (“TCEQ”) prohibits a surface water rights holder from withdrawing his permitted amount because the required baseflow is not met, but

¹⁰² 30 TEX. ADMIN. CODE §§ 298.500, et seq.

¹⁰³ *Id.* at § 298.5. The “other factors” to which this section refers are found in Texas Water Code Section 11.1471(b), which requires the TCEQ when adopting an environmental flow standard to consider:

- (1) the definition of the geographical extent of the river basin and bay system adopted by the advisory group under Section 11.02362(a) and the definition and designation of the river basin by the board under Section 16.051(c);
- (2) the schedule established by the advisory group under Section 11.02362(d) or (e) for the adoption of environmental flow standards for the river basin and bay system, if applicable;
- (3) the environmental flow analyses and the recommended environmental flow regime developed by the applicable basin and bay expert science team under Section 11.02362(m);
- (4) the recommendations developed by the applicable basin and bay area stakeholders committee under Section 11.02362(o) regarding environmental flow standards and strategies to meet the flow standards;
- (5) any comments submitted by the advisory group to the commission under Section 11.02362(q);
- (6) the specific characteristics of the river basin and bay system;
- (7) economic factors;
- (8) the human and other competing water needs in the river basin and bay system;
- (9) all reasonably available scientific information, including any scientific information provided by the science advisory committee; and
- (10) any other appropriate information.

¹⁰⁴ *See generally id.* at §§ 298.500, et seq.

¹⁰⁵ *See Sierra Club*, 1993 WL 151353, at *13.

where the reduced flow conditions are actually being caused by groundwater usage pulling water away from the river.

b. Connection Between Ground and Surface Water Not Recognized.

Because Texas law has not yet recognized the connection between surface and groundwater, there is currently no legal mechanism for imposing responsibility on groundwater users for any environmental flow disruption they may cause. Nevertheless, the Expert Science Team for the Rio Grande Basin in its Environmental Flows Recommendations Report (on which the flow standards are based) noted that return flow and runoff estimates were assumed to include groundwater flow or interflow.¹⁰⁶ Their study did not measure groundwater flow rate or interflow, but evidence of this connective relationship could mean that existing groundwater use is affecting flows but not subject to the environmental flow standards that restrict surface water use.

3. Agencies in Texas and Groundwater

The TCEQ is the entity responsible for Texas' surface water permitting scheme; but it is also the state's environmental agency responsible for fulfilling federal environmental requirements, including certain water quality standards under the CWA and the SDWA. Although the primary function of the Texas Railroad Commission ("TRRC") relates to the state's energy industry regulations, the agency's role has expanded over the years, authorizing it to enforce certain groundwater well regulations. Like TCEQ, the federal government has also delegated to TRRC responsibilities for enforcing certain water quality standards under the state's UIC Program and under the Clean Water Act. Additional regulations the agency imposes on the hydrocarbon industry are aimed at promoting water recycling for oil and gas production.

a. Clean Water Act

Before the Corps can issue a Section 404 permit, Section 401 of the Clean Water Act looks to states to certify whether the applicant's proposed activity will comply with ~~state~~ "state water standards for protection of state waters."¹⁰⁷ Certifying permits on

¹⁰⁶ RIO GRANDE, RIO GRANDE ESTUARY, & LOWER LAGUNA MADRE BASIN & BAY EXPERT SCIENCE TEAM, ENVIRONMENTAL FLOWS RECOMMENDATIONS REPORT, at 2-23, 2-26 (submitted to TCEQ July 2012).

¹⁰⁷ 33 U.S.C.A. § 1341(a)(1).

wetlands is a job shared in Texas by the TCEQ and the TRRC. Permits associated with oil and gas exploration, development, and production fall under the ambit of the TRRC, while all other Section 404 permit certifications are the TCEQ's to review.

(1) *TCEQ's Responsibility for the CWA.*

The TCEQ reviews Section 401 certification requests to determine whether the activity proposed under a Section 404 permit will cause a discharge that violates effluent limitations or water quality standards or other requirements under Texas state law.”¹⁰⁸

(2) *CWA Oversight Vested with the TRRC*

When Section 404 permits relate to oil and gas activities, this triggers TRRC's jurisdiction to review whether activities would lead to a discharge into WOTUS within the boundaries of the state of Texas and then assess whether the permit applicant can satisfy water quality requirements.¹⁰⁹ Reviewing activities that will occur somewhere inside the Texas Coastal Management Program's boundary, the assessment must also consider the program's goals and policies.¹¹⁰

b. Underground Injection Control.

Texas bifurcates control over underground injections between two agencies—TCEQ and TRRC—depending on the purpose of the injection well. The Texas Injection Well Act, originally passed in 1961, and amended to give the state primacy over implementing the EPA's UIC program, is the state's authoritative statute on underground injections.¹¹¹ For either agency to lawfully issue a permit, it must first ensure that the underground injection will adequately protect groundwater and surface water from

¹⁰⁸ 30 TEX. ADMIN. CODE § 279.9(b). Either the TCEQ's Executive Director or a delegated commissioner decides whether to certify Section 401 requested, using specified criteria as follows:

- (1) “no discharge will be certified if there is a practicable alternative that would have less adverse impact on the aquatic ecosystem, and activities that are not water dependent are presumed to have practicable alternatives unless the permit applicant demonstrates otherwise;
- (2) no discharge will be certified unless steps have been taken to minimize potential adverse impacts to the aquatic ecosystem;
- (3) certification requires compensatory mitigation for unavoidable adverse impacts, and compensatory mitigation will provide for a replacement of impacted functions and values; and
- (4) instances may exist in which the adverse impacts of a proposal are so significant that certification may be denied even if no practicable alternative exists.”

¹⁰⁹ 16 TEX. ADMIN. CODE § 3.93(f).

¹¹⁰ *Id.* § 3.93(f).

¹¹¹ TEX. WATER CODE §§ 27.001 to 27.157.

pollution.¹¹² Rather than six classifications as under the federal regime, the state's UIC program identifies five types of wells.¹¹³

(1) *TRRC's Role.*

Energy-related injection activities are governed by the TRRC's UIC authority. Falling within the TRRC's ambit are Class I and III brine mining wells; Class II injection wells used in enhanced recovery of hydrocarbons¹¹⁴ or to store anthropogenic carbon dioxide;¹¹⁵ and Class V wells involving geothermal activities and coal mining.¹¹⁶ A person must have a TRRC permit in order to drill or convert an existing well into a disposal well to be used for oil and gas waste.¹¹⁷

(2) *TCEQ's Role.*

TCEQ is responsible for carrying out Texas's UIC program that satisfies federal SDWA criteria for Class I, III, IV, and V wells that are not otherwise subject to TRRC control.¹¹⁸ The TCEQ requires a permit to: (1) dispose of industrial and municipal waste, (2) extract minerals, or (3) inject a fluid.¹¹⁹ A "fluid" under Texas' UIC is a "[m]aterial or substance which flows or moves whether in a semisolid, liquid, sludge, gas, or any other form or state."¹²⁰ Accordingly, the TCEQ's share of the UIC program responsibility encompasses any "well into which fluids are being injected,"¹²¹ requiring permits for almost all injection wells except for TRRC-authorized wells used in enhanced recovery.¹²² Responsibility for administering the program for wells considered Class VI under the federal SDWA falls to the TCEQ for well classes not related to oil and gas,

¹¹² *Id.* § 27.051(a)(3), (b)(3).

¹¹³ *See* 30 TEX. ADMIN. CODE § 331.11 (TCEQ UIC rules); *see generally* 16 TEX. ADMIN. CODE Ch. 5 (TRRC UIC rules relating to the storage of anthropogenic carbon dioxide). Although the EPA classifies wells storing anthropogenic carbon dioxide under a sixth Class, the RRC regulates them as Class II wells. And because EPA has granted the state authority over this type of well, this report uses the state's terminology and discusses anthropogenic carbon dioxide injection wells as Class II for simplicity.

¹¹⁴ TEX. WATER CODE § 27.051.

¹¹⁵ *Id.* § 27.041.

¹¹⁶ *See generally* TEX. WATER CODE §§ 27.001 to 27.105 (the Injection Well Act); *see also* 69 FED. REG. 8824 (2004) (approving of TRRC's assumption of responsibility for brine mining wells and geothermal return and in situ coal combustion wells under Class V).

¹¹⁷ TEX. WATER CODE § 27.031.

¹¹⁸ TCEQ, UNDERGROUND INJECTION CONTROL PROGRAM, 2015 ANNUAL REPORT, Attachment 9 (2015).

¹¹⁹ TEX. WATER CODE § 27.011.

¹²⁰ TEX. ADMIN. CODE § 331.2(46).

¹²¹ *Id.* § 331.2(58).

¹²² *Id.* § 331.7(f).

specifically where a clean coal project produces carbon dioxide and uses injection wells to store it within geological formations.¹²³

Some aquifers are exempt from TCEQ's SDWA oversight. Aquifers or portions of aquifers may be considered "exempt" if they are not at the time being used to source drinking water for human consumption. Alternately, aquifers are exempt if they will not serve as a future drinking water source because they are capable of producing minerals, hydrocarbons, or geothermal energy. Furthermore, an aquifer is an improper source of drinking water if recovering water for drinking water purposes would be impractical economically or technologically as a result of the aquifer's location or contaminated groundwater, or if the reservoir is located above a Class III well mining area, making it susceptible to subsidence or catastrophic collapse.¹²⁴

c. TRRC'S Rules for Groundwater Produced from Oil and Gas Wells

Common hydraulic fracturing techniques conservatively use between two and five million gallons of fresh water to extract hydrocarbons from tight formations; but in 2013, the TRRC adopted regulations to encourage oil and gas operators to recycle water used in hydraulic fracturing processes.¹²⁵ Under certain conditions, Rule 8 allows drilling operators to conduct permitless recycling of flowback water produced from the formation drilled, or freshwater that, once used to fracture the well, contains chemicals and proppants used in the process.¹²⁶ Such water may be recycled and used on land the operator owns or leases, or it may be transferred to another operator's site for recycling.¹²⁷ In addition, operators may store fluids that are awaiting recycling, or treated fluids, on-site in recycling pits that meet certain criteria.¹²⁸ Recycled fluids may also be reused without a permit in oil and gas operations for any use authorized by a permit obtained from another state or the federal government.¹²⁹

¹²³ See 31 TEX. REG. 2690, 2691 (Mar. 24, 2006).

¹²⁴ TEX. ADMIN. CODE § 331.13(c).

¹²⁵ TRRC, *Railroad Commission Today Adopts New Recycling Rules to Help Enhance Water Conservation by Oil & Gas Operators* (March 26, 2013), <http://www/trc.state.tx.us/all-news/032613/> (last accessed Feb. 1, 2018).

¹²⁶ 16 TEX. ADMIN. CODE § 3.8(d)(7)(B).

¹²⁷ *Id.*

¹²⁸ *Id.* §§ 3.8(d)(3)(F), (d)(4)(G).

¹²⁹ *Id.* § 3.8(d)(7)(B)(ii).

D. Local

The Rule of Capture is not entirely boundless. Groundwater Conservation Districts (“GCD”s) are “local unit[s] of government authorized by the Texas Legislature and ratified at the local level to manage and protect groundwater.”¹³⁰ GCDs are authorized to create rules that limit the Rule of Capture to the extent permitted by the Texas Water Code and the Texas Constitution, provided that they do not go so far as to violate private property rights in groundwater. Various other state entities operating at a regional or local level have some authority over surface water, but none truly possess such power over groundwater.¹³¹ Although state programs do utilize these entities to carry out programs aimed at protecting groundwater, such as controlling surface vegetation to improve infiltration and aquifer recharge, the programs carry no enforcement authority and merely encourage landowner participation.¹³² Rules that Irrigation Districts, Water Conservation and Improvement Districts, Municipal Utility Districts, and others apply for surface waters may, however, affect groundwater management. Should the state’s legal structure officially recognize this connection between waters above and below the surface, these other state entities may extend their sphere of governance to include groundwater.

1. **Groundwater Conservation Districts**

a. Role and Authority under State Law

¹³⁰ Bruce Lesikar, et. al., *Questions about Texas Groundwater Conservation Districts*, 1 (2002).

¹³¹ *Irrigation Districts* have authority under Chapter 58 of the Texas Water Code to treat and deliver water for irrigation purposes only, and not for domestic uses. Texas Water Code Section 58.121 permits irrigation districts to adopt reasonable rules to prevent water from being wasted or used without authorization. *Water Control and Improvement Districts* under Chapter 51 §§ 52, 59 may use “any practical means” to ensure “the control, abatement, and change of any shortage or harmful excess of water” and “the protection, preservation, and restoration of the purity and sanitary condition of water within the state.” § 51.121(b)(2),(5),(6); § 51.121(c). *Municipal Utility Districts* have authority under Chapter 54 to act as necessary to preserve, reclaim, and use storm water, flood water, rivers, and streams.

¹³² The Texas State Soil and Water Conservation Board (“TSSWCB”) utilizes local soil and water conservation districts to deploy its Water Supply Enhancement Program (“WSEP”). In 2011 the Texas Legislature established the Program (WSEP) administered by the TSSWCB, targeting certain brush species (such as juniper and mesquite) that it declared threats to water conservation. The program declares that “brush control has the potential to enhance water yield, conserve water lost to evapotranspiration, recharge groundwater and aquifers, enhance spring and stream flows, improve soil health, restore native wildlife habitat by improving rangeland, improve livestock grazing distribution, protect water quality and reduce soil erosion, aid in wildfire suppression by reducing hazardous fuels, and manage invasive species.” The WSEP provides some cost-sharing funds to landowners seeking to implement the program on eligible acreage. WATER SUPPLY ENHANCEMENT PROGRAM, TEXAS STATE SOIL & WATER CONSERVATION BD., <http://www.tsswcb.texas.gov/en/brushcontrol> (last accessed Feb. 1, 2018).

(1) *Purpose.*

The stated purpose supporting the authority granted to GCDs is “provide for the conservation, preservation, protection, recharging, and prevention of waste of groundwater, and of groundwater reservoirs or their subdivisions, and to control subsidence caused by withdrawal.”¹³³ In aiming to respect private property rights, Texas law prefers GCDs as the method of managing groundwater to meet the state’s water needs by balancing the resource’s development with conservation.¹³⁴ To do so, the GCDs are to use the “best available science” in developing their rules.¹³⁵ In rulemaking, a GCD must consider groundwater ownership rights, while keeping in mind the public interest in promoting aquifer recharge and in conservation, waste prevention, and subsidence control, along with the goals the district established as part of its mandatory management plan.¹³⁶

(2) *Powers.*

GCDs must require permits to drill, operate, or complete a well¹³⁷—but they also must exempt certain wells from permitting, including eligible wells for domestic or livestock purposes,¹³⁸ water supply wells for qualifying drilling rigs;¹³⁹ and water required for surface coal mining.¹⁴⁰ They may also set well-spacing and production limits¹⁴¹ and restrict transfers of water to locations outside the district.¹⁴² Moreover, GCDs may set production limit amounts based on acreage, rate of withdrawal, or levels that “preserve[s] historic or existing use.”¹⁴³

(3) *Developing Plans for Aquifers in Texas*

The Texas Water Code requires GCDs to develop plans jointly with other GCDs that exist within the same groundwater management area.¹⁴⁴ A groundwater management

¹³³ TEX. WATER CODE § 36.0015(b).

¹³⁴ *Id.*; see also *Sipriano v. Great Spring Waters of Am., Inc.*, 1 S.W.3d 75, 80 (Tex. 1999).

¹³⁵ *Id.* § 36.0015(b).

¹³⁶ *Id.* § 36.101.

¹³⁷ *Id.* § 36.115.

¹³⁸ *Id.* § 36.117(b)(1).

¹³⁹ *Id.* § 36.117(b)(2).

¹⁴⁰ *Id.* § 36.117(b)(3).

¹⁴¹ *Id.* § 36.116.

¹⁴² *Id.* § 36.112.

¹⁴³ *Id.* § 36.116.

¹⁴⁴ *Id.* § 36.108.

area (“GMA”) is an area that the Texas Water Development Board designates and delineates “suitable for management of groundwater resources.”¹⁴⁵ Unlike GCDs’ political boundaries, the Texas Legislature requires the Texas Water Development Board to delineate GMA boundaries based on aquifer boundaries or boundaries of aquifer subdivisions.¹⁴⁶ The Board requires GCDs within the same GMA to “consider groundwater availability models and other data or information for the management area and shall propose for adoption desired future conditions for the relevant aquifers within the management area.”¹⁴⁷ A desired future condition (“DFC”) is a “quantitative description . . . of the desired condition of the groundwater resources in a management area at one or more specified future times.”¹⁴⁸ A DFC “must provide a balance between the highest practicable level of groundwater production and the conservation, preservation, protection, recharging, and prevention of waste of groundwater and control of subsidence in the management area.”¹⁴⁹

(4) *Drilling Rigs and Hydraulic Fracturing.*

GCDs may not require a permit for water wells being drilled to be used solely to provide water for drilling rigs while they are “actively engaged in drilling or exploration operations” for a Railroad Commission-permitted oil or gas well, provided that the operator is the permit holder and that the water well is on the same premises as the production.¹⁵⁰ GCDs disagree on how to interpret this language—specifically whether hydraulic fracturing operations are “drilling or exploration operations.”¹⁵¹ The Railroad Commission has clarified that it “interprets ‘exploration operations’ to include well completion and workover, including hydraulic fracturing operations.”¹⁵² But the confusion remains in practice, and currently different GCDs over the same hydrocarbon formation apply different rules. Nevertheless, the drilling rig exemption is strictly limited to this purpose. If water from a well is used for any purposes other than to supply water

¹⁴⁵ *Id.* § 36.001(13).

¹⁴⁶ Act of May 27, 2001, 77th Leg., Reg. Sess., ch. 966, § 2.22, 2001 Tex. Gen. Laws 1991, 2003 (amending TEX. WATER CODE § 35.004).

¹⁴⁷ *Id.* § 36.108(d)

¹⁴⁸ *Id.* § 36.001(30)

¹⁴⁹ *Id.* § 36.108(d-2).

¹⁵⁰ *Id.* § 36.117(b)(2).

¹⁵¹ See Kate Galbraith, *Fracking Groundwater Rules Reflect Legal Ambiguities*, TEX. TRIBUNE, Mar. 13, 2013, <http://www.texastribune.org/2013/03/13/fracking-groundwater-rules-reflect-legal-ambiguiti/>, archived at <http://perma.cc/YS9P-MFWK>.

¹⁵² *Water Use in Association with Oil and Gas Activities*, R.R. COMM’N OF TEX., <http://www.rrc.state.tx.us/about-us/resource-center/faqs/oil-gas-faqs/faq-water-use-in-association-with-oil-and-gas-activities/>, archived at <http://perma.cc/GF87-98F8>.

for oil and gas operations, or if the well is physically located outside the site where claimed hydraulic fracturing operation is being conducted, the exemption does not apply.

b. Limits on Authority

A GCD action may be subject to a takings claim if regulations too severely restrict the owner's groundwater use or extraction.¹⁵³ The United States Constitution's Fifth Amendment provides that government may not take property from individuals without justly compensating them. But even when the government does not physically take property, if it creates regulations that apply to property, frustrating owners' ability to use their land to such a degree that the property's value is destroyed, the action may be considered a "regulatory taking" and require just compensation. In the 2012 case *Edwards Aquifer Authority v. Day*, the Texas Supreme Court applied this regulatory takings concept to the groundwater estate, recognizing that groundwater is a property right that, like real property, requires the state to provide just compensation to owners of property taken by state action.¹⁵⁴ The following year, Texas' San Antonio Court of Appeals concluded that whether a regulation rises to the level of a taking depends, among other things, on: (1) the claimant's economic impact, (2) the investment-backed expectations, and (3) the nature of the regulation.¹⁵⁵ But if a GCD requires a permit (such as the Edwards Aquifer Authority GCD does), it may determine the amount based on historical beneficial use.¹⁵⁶

c. Rules of the Border GCDs

The rules of most of the GCDs include provisions for various types of permits, rules for transferring water outside of the district, production limits, and well-spacing rules. Most of the border GCDs use Modeled Available Groundwater ("MAG") to determine their production limits. A MAG calculates the amount of groundwater that could be withdrawn from an aquifer while maintaining the aquifer's DFC.

¹⁵³ *Day*, 369 S.W.3d at 843 (Tex. 2012); *Bragg v. Edwards Aquifer Authority*, 421 S.W.3d 118, 146 (Tex. App.—San Antonio 2013, pet. denied).

¹⁵⁴ See generally *Day*, 369 S.W.3d at 814; see also Dave Owen, *Taking Groundwater*, 91 WASH. U.L. REV. 253, 276–77 (2013) (noting that Texas' *Day* case is perhaps the seminal groundwater takings case in the nation).

¹⁵⁵ *Bragg*, 421 S.W.3d at 139.

¹⁵⁶ *Day*, 369 S.W.3d at 821.

Five GCDs physically touch Texas' border with Mexico, with an additional two GCDs (Culberson and Wintergarden) lying just miles from the border (see Figure 2).¹⁵⁷ Culberson, Jeff Davis, Presidio, Brewster, Terrell, Kinney, and Starr County GCDs and the counties within them that bear their names share the same boundaries, while Wintergarden GCD encompasses three counties, Zavala, Dimmit, and La Salle.¹⁵⁸ Because these boundaries follow political jurisdictions instead of aquifer boundaries, several aquifers along the border are overlain by multiple GCDs. However, a look at Figure 2 shows vast areas of white space representing land not covered by any GCD. Among these “white areas”—which include El Paso, Hudspeth, Val Verde, Maverick, Webb, Zapata, Hidalgo, and Cameron Counties—the state's default Rule of Capture governs groundwater withdrawal.

¹⁵⁷ See Figure 2, SECTION OF TEXAS' GCDS IN THE BORDER REGION.

¹⁵⁸ *Id.*

(1) *Culberson County GCD.*

The Culberson County GCD sits in close proximity to the border, so although it does not touch the national boundary, its rules apply to the same transboundary aquifers and lands within this report’s study area. This proximity supported including Culberson County GCD’s rules in this survey.

(a) Permit Types

Culberson County issues two types of groundwater permits. One type of “historic use” permit applies to users who established beneficial use of groundwater during 1994–2011.¹⁶⁰ Beneficial use is presumed attributed to the last known user if there was more than one user on same property.¹⁶¹ Owners who have several wells on the same aquifer may aggregate the amount authorized under their various historical use permits; the GCD does not restrict any single aggregated historic use well to a certain portion of the full permitted amount.¹⁶² For irrigation, *maximum historic use* gives an owner five acre-feet per acre historically used for irrigation in any one year of the period; other non-exempt uses give the maximum amount used beneficially in one year of that period. Permit holders may transfer a permit to another tract with Board approval.¹⁶³

If the Board determines there is groundwater available beyond the amount allocated for Historic Use Permits in that aquifer, it may allow applications for Non-Historic Use Permits, in which users are without the presumption of beneficial use and must demonstrate it.¹⁶⁴ Landowners may also aggregate withdrawal amounts for the same aquifer when they hold several non-historic permits.¹⁶⁵ Likewise, aggregating wells does not limit owners to a pro rata share of their total permitted quantity.¹⁶⁶ Permittees had 10 years from the time the GCD formed and created its regulations to put the water to beneficial use; any part of the water allotted not so used after reasonable diligence was subject to reduction.¹⁶⁷

¹⁶⁰ CULBERSON COUNTY GCD RULES § 1.001(26).

¹⁶¹ *Id.* § 5.204(1).

¹⁶² *Id.* § 5.205(e)(1),(2).

¹⁶³ *Id.* §§ 5.209–5.210.

¹⁶⁴ *Id.* at § 5.212.

¹⁶⁵ *Id.*

¹⁶⁶ *Id.* at § 5.214(b).

¹⁶⁷ *Id.* at § 5.217.

(b) Permit Exemptions.

Domestic or livestock wells are exempt from permitting if they are on a tract larger than 10 acres and incapable of producing more than 25,000 gallons of water a day.¹⁶⁸ As provided by state law, wells exempt by the TRRC, namely those that provide water for drilling rigs in oil and gas operations and those used for mining, are also exempt in Culberson County.¹⁶⁹ Wells that provide water for use in a subdivision approved by Chapter 232, Local Government Code are not exempt.¹⁷⁰

(c) Production Limits

Culberson GCD prioritizes its permit types in the following order: exempt wells have highest priority, historic use wells are second priority, and non-historic use wells rank lowest in priority.¹⁷¹ The amount of water available to Wild Horse Flat Aquifer, Michigan Flat Aquifer, and Lobo Flat Aquifer is determined by the MAG.¹⁷² Before the volume of water allotted to historical and non-historical use permits can be ascertained, the GCD subtracts the amount set aside for exempt permits, such as those exempt by the TRRC.¹⁷³ If the amount allocated under permits exceeds the MAG or threatens the DFCs, the amount available to non-historic users will be reduced proportionally, before reducing historic use amounts.¹⁷⁴

(d) Well Spacing.

All new wells must be 50 feet from a property line and 1,320 feet from any other well.¹⁷⁵ New wells must be 500 feet from a sewage plant and 300 feet from a sewage pump station or drainage ditch.¹⁷⁶ A variance may be granted if the petitioner can show good cause and that the proposed location will not substantially interfere with the wells in the spacing area.¹⁷⁷

¹⁶⁸ *Id.* at § 5.401(a)(1).

¹⁶⁹ *Id.* at § 5.401(a)(2).

¹⁷⁰ *Id.* at § 5.401(j).

¹⁷¹ *Id.* at §§ 5.101–5.104.

¹⁷² *Id.* at §§ 5.102(a), 5.103(a), 5.104(a).

¹⁷³ *Id.* at §§ 5.102(c), 5.103(c), 5.104(c).

¹⁷⁴ *Id.* at §§ 5.102(d)–(f), 5.103(d)–(f), 5.104(d)–(f).

¹⁷⁵ *Id.* at §§ 6.101(a),(b), 6.102(a).

¹⁷⁶ *Id.* at § 6.101(c).

¹⁷⁷ *Id.* at § 6.103.

(e) Water Transportation

Water from wells installed after 1994 are prohibited without a permit, except in a handful of circumstances; the GCD considers out-of-district exports “illegal, wasteful per se, and a nuisance.”¹⁷⁸ Wells used only on land that straddles GCD boundaries or that is delivered to end users based on a certificate of convenience and necessity do not require a permit.¹⁷⁹ The GCD Board may not deny an export request based solely on its out-of-district character, but it may restrict the exported amount and purpose of use to that in the original permit.¹⁸⁰

(f) Meters

Unless they qualify for an exemption, both existing and new wells are required to have a specific type of meter installed “to measure the instantaneous flow rate and cumulative amount of groundwater withdrawn from the well.”¹⁸¹ Each year, well users must submit to the GCD a report detailing the yearly and monthly amounts of groundwater withdrawn and the purpose for which it was used.¹⁸²

Conveying water farther than one-half mile from the wellhead requires a pipeline to avoid evaporation loss.¹⁸³

(2) *Jeff Davis UWCD*

(a) Permits Generally

Existing wells are not required to be registered or to have a permit, but any wells drilled since the district’s creation necessitate a permit before being drilled and must maintain a permit in order to operate.¹⁸⁴ The district may deny a permit if the proposed withdrawals would exceed the MAG for the Jeff Davis UWCD area.¹⁸⁵ Permits are generally issued for a one-year term, but may be extended up to a five-year period.¹⁸⁶ All

¹⁷⁸ *Id.* at § 5.301–5.302.

¹⁷⁹ *Id.* at § 5.301(4).

¹⁸⁰ *Id.* at § 5.302(d).

¹⁸¹ *Id.* at § 8.001.

¹⁸² *Id.* at § 8.004.

¹⁸³ *Id.* at § 5.003.

¹⁸⁴ JEFF DAVIS COUNTY UWCD RULES, at Rule 5.1.

¹⁸⁵ *Id.* at Rule 5.2.d–e.

¹⁸⁶ *Id.* at Rule 5.2.f.

permit holders must keep and make available accurate records of groundwater withdrawal amounts and purposes.¹⁸⁷

(b) Permit Types

The district additionally considers two special permit types: Aquifer Storage Recovery permits and Temporary Emergency Permits.¹⁸⁸ The district may grant a Temporary Emergency Permit to those who do not have right to well ownership when an emergency exists, there is no suitable alternative water supply available to them, the well cannot produce more than 25,000 gallons a day, and no other groundwater rights will be compromised.¹⁸⁹

In addition, the Jeff Davis UWCD allows for Aquifer Storage and Recovery (“ASR”). Water may be stored in a Jeff Davis aquifer, provided that it is the same quality as the aquifer’s water and will be put to beneficial use, and that its storage and withdrawal will not harm another user or cause waste.¹⁹⁰ The process requires two separate permits for storage and recovery.¹⁹¹

(c) Permit Exemptions

The standards prohibiting permit issuance when it would exceed the MAG do not apply to certain types of wells.¹⁹² In Jeff Davis UWCD, an exempt well includes “any artificial excavation constructed to produce or which produces less than 25,000 gallons of water per day (17.36 gallons per minute).”¹⁹³ Further, any well is exempt from permitting and metering requirements if it is used exclusively for “household” purposes, specifically: “[1] drinking, washing, or culinary purposes; [2] irrigation of lawns, a family garden or orchard; [or] [3] watering domestic animals[.]”¹⁹⁴ Selling exempt water renders its exemption void.¹⁹⁵

¹⁸⁷ *Id.* at Rule 5.3.d.

¹⁸⁸ *Id.* at Rule 5.5.

¹⁸⁹ *Id.* at Rule 5.5.a.

¹⁹⁰ *Id.* at Rule 6.2.c.

¹⁹¹ *Id.* at Rule 6.2.a.

¹⁹² *Id.* at Rule 5.6.

¹⁹³ *Id.* at Rule 1.1.10; Rule 5.6.b.

¹⁹⁴ *Id.* at Rule 5.6.a.

¹⁹⁵ *Id.* at Rule 5.6.c.

(d) Production Limits

Jeff Davis UWCD bases production limits on surface acreage, rather than historical use, and restricts three of its four aquifers—the Igneous, Edwards-Trinity, and Rustler DOWNDIP aquifers—to 651,851 gallons (2 acre foot) of groundwater production per year for each surface acre.¹⁹⁶ The West Texas Bolsons Aquifer is capped at 325,851 gallons (1 acre foot) per surface acre.¹⁹⁷ Permit holders may aggregate all of the contiguous surface acreage they own and draw their allotted amount from one well or divide it between various wells on the property.¹⁹⁸

(e) Well Spacing

Generally, all wells must be located 100 feet from any property line.¹⁹⁹ Wells producing 1,000 gallons per minute or less must be sited apart from any other well at a distance of one foot per gallon-a-minute production capacity; any amount produced in excess of 1,000 gallons per minute adds an additional one-half foot per gallon in excess.²⁰⁰

(f) Water Transportation

Transfers out of basin are allowed in Jeff Davis UWCD, but the permit holder must show that:

- there is insufficient water at the proposed destination;
- that the transported water will be put to beneficial use;
- and that the exportation will not harm the aquifer, the water it contains, or other users or permittees in the transferring district.²⁰¹

Permitting out-of-basin transfers requires that exported water be conveyed in the most efficient means feasible.²⁰² The exporter is strictly prohibited from conveying any groundwater via surface water course and from allowing groundwater to escape or seep to any surface water course, road, ditch, or depression.²⁰³ Transfer permits last for a minimum term of thirty years if a conveyance such as a pipeline has already been

¹⁹⁶ *Id.* at Rule 11.1.c.

¹⁹⁷ *Id.*

¹⁹⁸ *Id.*

¹⁹⁹ *Id.* at Rule 11.1.a

²⁰⁰ *Id.*

²⁰¹ *Id.* at Rule 10.2.a.

²⁰² *Id.* at Rule 10.5.

²⁰³ *Id.*

constructed when the permit is sought, but only three years if such a conveyance is not yet in place.²⁰⁴

(g) Meters

All non-exempt wells must be metered according to district specifications, and the district reserves the right to randomly test meters for accuracy.²⁰⁵

(3) *Presidio County UWCD*

(a) Permits, Generally

All wells in Presidio County UWCD's jurisdiction must be registered, whether exempt or non-exempt, existing or new.²⁰⁶ Likewise, a user must re-register an authorized well in order to vary the purpose of groundwater usage, raise the rate of withdrawal, or substantially change the well pump size.²⁰⁷ In addition to various pieces of evidence, the Board considers whether applications demonstrate beneficial use, conserve water, and protect groundwater quality.²⁰⁸ Terms are generally one year but may be approved for up to five.²⁰⁹ Permits vest no rights in their holder.²¹⁰ Accordingly, the district is empowered to modify existing permits in order to:

- avoid groundwater quality decay;
- prevent waste and conserve water;
- inhibit water table or artesian pressure declines;
- avoid interference between wells;
- counter subsidence; or
- preserve DFCs.²¹¹

The district retains the right to revoke permits altogether where justified.²¹²

²⁰⁴ Rule 10.3.a.

²⁰⁵ Rule 8.1.

²⁰⁶ PRESIDIO COUNTY UWCD RULES, Rule 5.1.

²⁰⁷ *Id.* at Rule 5.2.

²⁰⁸ *Id.* at Rule 5.2.c.

²⁰⁹ *Id.* at Rule 5.2.g.

²¹⁰ *Id.* at Rule 5.3.b.

²¹¹ *Id.* at Rule 5.2.d.

²¹² *Id.* at Rule 5.2.i.

Like the Jeff Davis UWCD, Presidio grants Temporary Emergency Permits. While the applicant waits for the district to rule on a general permit application, the district may grant a temporary permit when an emergency exists, the applicant has no suitable alternative water supply, and granting the permit will not impair other groundwater rights.²¹³

(b) Permit Exemptions

Permitting and metering rules do not apply to wells that are exempt as domestic, TRRC-exempt wells, or are exempt under Section 36.121 of the Texas Water Code.²¹⁴ Like Jeff Davis County, selling water from exempt wells voids the exemption; if the well no longer serves the purpose for which it was exempt, it also becomes subject to permitting and metering.²¹⁵

(c) Production Limits

Presidio County UWCD bases its allowable district-wide withdrawals on:

the best available hydrogeologic, geographic, and other relevant scientific data, including but not limited to noted changes in the water levels, water quality, groundwater withdrawals, annual recharge, or the loss of stored water in the aquifer, to avoid impairment of any Desired Future Condition or unreasonable effects on existing groundwater and surface water resources or existing permit holders.²¹⁶

(d) Well Spacing

In similar fashion to its neighboring district, the Presidio County UWCD prohibits wells from being sited within 100 feet from any property line.²¹⁷ Likewise, any well producing up to 1,000 gallons per minute must be spaced from any other well at a distance

²¹³ *Id.* at Rule 5.5.

²¹⁴ *Id.* at Rule 5.6.a. Section 31.121 exempts wells that are “located in a county that has a population of 14,000 or less if the water is to be used solely to supply a municipality that has a population of 121,000 or less and the rights to the water produced from the well are owned by a political subdivision that is not a municipality, or by a municipality that has a population of 115,000 or less, and that purchased, owned, or held rights to the water before the date on which the district was created, regardless of the date the well is drilled or the water is produced.” TEX. WATER CODE § 36.121.

²¹⁵ PRESIDIO COUNTY UWCD RULES, Rule 5.6.b–c.

²¹⁶ *Id.* at Rule 5.2.j.

²¹⁷ *Id.* at Rule 11.1.a.

measured by one foot per gallon-a-minute that the well is capable of producing; for each gallon of production capacity in excess of 1,000 gallons per minute, the minimum distance increases by one-half of a foot.²¹⁸ The Jeff Davis and Presidio UWCDs share two aquifers, and they enforce on each the same productions limits for groundwater per surface acre: 651,702 gallons (2 acre feet) for the Igneous Aquifer, and 325,851 gallons (1 acre foot) for the West Texas Bolsons Aquifer.²¹⁹ Additionally, the Presidio/Redford Bolson is capped at 977,553 gallons (3 acre feet) per surface acre of groundwater.

(e) Water Transportation

Transferring permits to use water outside the district is permissible where it is consistent with the district's Groundwater Management Plan and does not negatively impact "aquifer conditions, depletion, subsidence," or other district users.²²⁰

(f) Meters

The district's rules impose specific metering standards and enable the district to randomly test meters for accuracy.²²¹

(4) *Brewster County GCD*

(a) Permit Types

Drilling or deepening any water well in Brewster County necessitates a drilling permit.²²² Since January 1, 2006, all non-exempt wells capable of producing more than 17.36 gallons per minute (25,000 gallons per day) must have registration and operating permits before withdrawing from the well.²²³ In the event that the well's ownership or the purpose for which it is used changes.²²⁴

²¹⁸ *Id.*

²¹⁹ *Id.* at Rule 11.1.c.

²²⁰ *Id.* at Rule 5.2.b.14.

²²¹ *Id.* at Rule 8.1.

²²² *Id.* at Rule 4.1.

²²³ BREWSTER COUNTY GCD RULES, Rule 5.1, 5.2.

²²⁴ *Id.* at Rule 5.4.

(b) Permit Exemptions

Domestic or livestock wells are exempt from permitting if they are on a tract larger than 10 acres and incapable of producing more than 25,000 gallons of water a day.²²⁵

(c) Production Limits.

Brewster County GCD sets certain production limits based on rate of withdrawal. Domestic wells under four acres are limited to 163,000 gallons per minute.²²⁶ Domestic wells used in a non-commercial garden may pump up to 653,000 gallons per minute.²²⁷ Wells providing water for irrigation on one acre are limited to 1.3 million gallons per minute, but wells producing water for commercial use may pump 2.6 million acres per acre of land.²²⁸ Each year, a well may produce up to 10,000 gallons of water per animal.²²⁹

By petition, landowners over a common aquifer in Brewster County GCD may petition to limit production of a well they claim is causing drawdown, waste, subsidence, diminishing artesian pressure, interfering between wells, or degrading water quality—so long as the well is not for domestic or livestock use.²³⁰

Landowners whose contiguous land in aggregate exceeds 20,000 acres may limit production, impose limits stricter than the GCD's, or agree to share production limits between wells.²³¹ They may further agree to recognize correlative rights or to opt out of using the Rule of Capture as a defense against damages caused by overproduction.²³²

(d) Well Spacing.

Brewster County GCD requires 208 feet between any new well and an adjoining property line.²³³ Exceptions: the adjoining landowner agrees in writing; if topography or tract size make the compliant location infeasible; or if good cause is shown or the GCD

²²⁵ *Id.* at Rule 1.1.

²²⁶ *Id.* at Rule 7.1.

²²⁷ *Id.*

²²⁸ *Id.*

²²⁹ *Id.*

²³⁰ *Id.* at Rule 7.2.

²³¹ *Id.* at Rule 7.3.

²³² *Id.*

²³³ *Id.* at Rule 6.1

Board determines it necessary to protect property rights, prevent waste, or prevent a takings.²³⁴

(e) Water Transportation

Prohibited without a permit, which requires a hearing with notice given to all landowners within one-half mile of the proposed well.²³⁵ Likewise, the GCD requires a permit to transfer the water to another in-District location or to be used by a person who is not the well owner.²³⁶ Only the adjacent landowners must be notified.²³⁷

(f) Meters

When seeking an operating or production permit, applicants must certify that, unless exempt, all operating wells will be metered and that they will outfit new operating wells with equipment for well monitoring that measures static and pumping levels.²³⁸

(5) *Terrell County GCD*

(a) Permit Types

Wells or well systems that have been put to beneficial use at some point between January 1, 1995, and the effective date October 29, 2014, without having been abandoned, may be “grandfathered in”²³⁹ and, once established, exempt from permitting requirements. All those seeking such a designation had to apply by December 31, 2015,²⁴⁰ all those described in later-filed applications are presumed to be newer wells drilled after the deadline.²⁴¹ The amount recognized under the status is the largest volume of beneficially used water the applicant extracted from the aquifer during the relevant period.²⁴²

²³⁴ *Id.* at Rule 6.2.

²³⁵ *Id.* at Rule 8.1.

²³⁶ *Id.* at Rule 9.1.

²³⁷ *Id.*

²³⁸ *Id.* at Rule 5.2(9)(A),(C).

²³⁹ TERRELL COUNTY GCD RULES, Rule 1.1(bb),(cc) (as amended July 2015).

²⁴⁰ *Id.* at Rule 1.1(dd).

²⁴¹ *Id.* at Rule 3.1(c). People having wells that existed prior to October 29, 2014, may still file applications to grandfather the wells, but they must “provide additional evidence” of that fact in order to avoid well location and spacing rules applied to later-drilled wells. *Id.*

²⁴² *Id.* at Rule 1.1(oo).

The Terrell County GCD requires an operating permit in order to equip, complete, operate, or produce groundwater from a well that does not qualify for an exemption or for a Grandfathered Use Permit.²⁴³ Even when grandfathered in, a well needs an operating permit if it is to be substantially altered.²⁴⁴

(b) Permit Exemptions

Wells are exempt from permitting under several circumstances:

- *Domestic wells*: the water they pump is used exclusively for domestic purposes;
- *Livestock wells*: they sit on a land parcel larger than ten acres and pump 25,000 gallons or less in a day to water livestock or poultry;
- *Agricultural irrigation wells*: the wells are used in growing crops for human or animal food, for seed, or for fiber are exempt if they cannot produce more than 25,000 gallons a day;
- *Drilling rig supply wells*: water wells that a TRRC permit holder drills and operates to support drilling or exploration of oil and gas on the same land as the well site;
- *Mining wells*: those the TRRC authorizes under Chapter 134, Natural Resources Code, or for any mining activities, “regardless of any subsequent use of the water”;
- *Monitoring wells*: used to measure groundwater or aquifer characteristics, these wells produce no more than 5,000 gallons a year; and
- *Aquifer storage and recovery wells*, if compliant with the district’s rules for the project.²⁴⁵

(c) Production Limits

Wells with Grandfathered Use Permits are limited to their maximum grandfathered use, and those with operating permits are capped at their demonstrated beneficial use amount—but the GCD may limit either to bring about the DFCs set for the district.²⁴⁶ Likewise, the rules permit the GCD to limit production within designated

²⁴³ *Id.* at Rule 1.1(ww).

²⁴⁴ *Id.*

²⁴⁵ *Id.* at Rule 3.5(a); *see also* rules defining monitoring wells (Rule 1.1(rr)) and for Aquifer Storage and Recovery Projects (Rule 3.18).

²⁴⁶ *Id.* at Rules 7.1. 7.2.

Management Zones “based on geographically or hydrogeologically defined areas, aquifers, or aquifer subdivisions.”²⁴⁷

(d) Well Spacing

For wells drilled after October 29, 2014, Terrell County GCD bases its spacing requirements on the interior diameter of the particular well.²⁴⁸ Rules prescribe minimum distances between new wells and other well sites—where existing or approved well sites are located—and property lines bounding the tract of land where the well will sit.²⁴⁹ The spacing rules are as follows:

- *Wells 5 inches or less in diameter*—150 feet from well sites and 50 feet from property lines.
- *Between 5 and 8 inches*—1,200 feet from well sites and 100 feet from property lines.
- *Between 8 and 10 inches*—1,800 feet from well sites and 200 feet from property lines; and
- *10 inches or larger*—2,400 feet from well sites and 400 feet from property lines.²⁵⁰

If all those who own property or wells that would fall within the minimum distances of a proposed well agree in writing that they have no objection to a location that would otherwise violate spacing rules, the GCD staff may waive spacing requirements for the well.²⁵¹

(e) Water Transportation

Transporting water outside the Terrell County GCD requires the water-producing person to properly register and permit the well (or amend an existing permit) for either operational or grandfathered use; to submit a semiannual report detailing the total amount of water sent out-of-district; and to pay a transport fee.²⁵² In reviewing permits for proposed out-of-district transfers, the GCD board considers the water availability in both

²⁴⁷ *Id.* at Rule 12.1.

²⁴⁸ *Id.* at Rule 5.2. Under this rule, the diameter is “measured in inches, at the screened interval of the casing or well screen installed within the borehole of a well for the purpose of preventing collapse of the borehole, protecting water quality or for any other purpose.”

²⁴⁹ *Id.*

²⁵⁰ *Id.*

²⁵¹ *Id.* at Rule 5.3.

²⁵² *Id.* at Rule 11.1(a).

the transporting and receiving districts, whether the transfer complies with regional and district management plans, and any effect it would have on the aquifer or other permit holders or groundwater users.²⁵³ However, when a retail public utility that sits primarily within the GCD transports water outside the district but within the utility's service area, the district's production rules and fees do not apply, so long as the majority of the groundwater it produces is used within the GCD.²⁵⁴

(f) Meters

Only water wells engaged in transporting water out of district must have installed a meter or flow measurement device that complies with certain specifications.²⁵⁵

(6) *Kinney County GCD*

(a) Permit Types

Kinney County GCD's rule specifically enumerate prohibitions on groundwater waste and pollution: allowing harmful matter to enter groundwater through a water well, a different stratum of land, or the surface.²⁵⁶ The GCD recognizes five types of non-exempt permits.²⁵⁷

- *Existing Use permits* authorize wells that were completed by the effective date, January 7, 2003, so long as at some point between January 1, 1992, and January 7, 2003, the well yielded groundwater that was then put to use;²⁵⁸
- *Historic Use permits* govern wells that were in use as of December 31, 1991, producing and utilizing water at any time from January 1, 1960, through December 31, 1991;²⁵⁹
- *Testing permits* allow temporary production from new or existing wells that are in the process of being reviewed by the GCD board;²⁶⁰
- *Regular permits*, once approved by the Board, limit production to a specific amount in acre feet;²⁶¹ and

²⁵³ *Id.* at Rule 3.9(a)(14).

²⁵⁴ *Id.* at Rule 11.1(b).

²⁵⁵ *Id.* at Rule 6.1(a).

²⁵⁶ *Id.* at Rule 4.01.

²⁵⁷ KINNEY COUNTY GCD RULES (adopted Sept. 10, 2010, amended Mar. 12, 2015).

²⁵⁸ *Id.* at Rule 3.01(A).

²⁵⁹ *Id.* at Rule 3.01(B).

²⁶⁰ *Id.* at Rule 3.01(C).

²⁶¹ *Id.* at Rule 3.01(D); *see also* Rule 3.04.

- *Transport permits* are required to transfer groundwater outside the Kinney County GCD area.²⁶²

(b) Permit Amendments for Changes

Permit holders must first obtain an amendment to their permit if they aim to change the maximum amount of groundwater withdrawals allowed, the well's location, the purpose or location of groundwater usage, or to add additional wells, even if the total amount produced will not increase.²⁶³

(c) Permit Exemptions

Exemptions in Kinney County track the exemptions enumerated in the Texas Water Code Section 36.117, which prohibits GCDs from requiring permits for certain wells.²⁶⁴ Accordingly, groundwater used for solely domestic or livestock purposes and those wells used to supply water for active drilling rigs or surface coal mining operations are the only exemptions Kinney County GCD provides.²⁶⁵ A user forfeits a well's exempt status—subjecting it to permit requirements—by putting such groundwater to use for a non-exempt or illegal purpose.²⁶⁶

(d) Production Limits

Beyond the limits specified in a permit, the Kinney County GCD did not set specific aquifer-based production limitations for amounts allowed to be withdrawn from any aquifer within its boundaries.²⁶⁷ The rules do, however, enable the GCD to set limits district-wide or for a particular aquifer if hydrogeologic and geographic data supports it.²⁶⁸

(e) Well Spacing

The Kinney County GCD's rules outline several spacing mandates for both exempt and non-exempt wells. Exempt wells, though not subject to permits, are subject

²⁶² *Id.* at Rule 3.01(E).

²⁶³ *Id.* at Rule 5.02.

²⁶⁴ *Id.* at Rule 2.01(A).

²⁶⁵ TEX. WATER CODE § 36.117.

²⁶⁶ KINNEY COUNTY GCD RULES, Rule 2.01(D).

²⁶⁷ *Id.* at Rule 4.03(A).

²⁶⁸ *Id.* at Rule 4.03(B).

to well spacing rules in Kinney County: they must be 50 feet or more from an adjacent property boundary.²⁶⁹ Wells not qualifying for an exemption must have a 300-foot distance from any neighbor's property line,²⁷⁰ but the neighbor may waive objection to a non-exempt well's location in writing.²⁷¹ In relation to substances that could potentially contaminate groundwater in any well, all water wells in this GCD must be 500 feet from a facility that collects sewage, wastewater, or other liquid-waste; 100 feet from any concentrated contamination source, such as septic tanks or leach fields; and 500 feet from a cemetery.²⁷²

(f) Water Transportation

Groundwater transported and used out-of-district must have been withdrawn under both a regular permit and transport permit.²⁷³ Any person seeking such a transfer of groundwater must work with the GCD to determine what fees the district will require the user-purchaser to pay.²⁷⁴ Only a party to the water transfer contract may apply for a permit, and in doing so must conduct a pump test to prove the amount of water available and develop an approved mitigation plan specific to the management area where the well sits.²⁷⁵ Further, the applicant has to produce the contract covering the water transportation, which must show that the end user will put the water to beneficial use.²⁷⁶ Even users of exempt wells must have a permit to transport water.²⁷⁷ However, parties are exempt from obtaining a transport permit if the groundwater is:

- (1) a part of a manufactured product (such as bottled water or any other final product) that is manufactured in Kinney County and transported outside Kinney County as a final product; or
- (2) used on property that:
 - (a) straddles the District boundary line and
 - (b) is owned by the owner or operator of the well(s) that produce the groundwater.²⁷⁸

²⁶⁹ *Id.* at Rule 2.05(A).

²⁷⁰ *Id.* at Rule 2.01(B).

²⁷¹ *Id.* at Rule 2.01(C).

²⁷² *Id.* at Rule 2.06(B).

²⁷³ *Id.* at Rule 6.01(A).

²⁷⁴ *Id.*

²⁷⁵ *Id.* at Rule 6.01(E).

²⁷⁶ *Id.* at Rule 6.01(E)(2).

²⁷⁷ *Id.* at Rule 6.05.

²⁷⁸ *Id.* at Rule 6.01(B).

(g) Meters

Any well that is non-exempt in the Kinney County GCD must have a district-approved meter installed.²⁷⁹ The district's purpose in doing so is to "promptly and accurately measure the amount of groundwater being transported" out-of-district.²⁸⁰ In addition, to prevent damaging groundwater, all wells that use "chemical injection, chemigation or foreign substance" units in their delivery system are required to install specific pollution-preventing equipment.²⁸¹

(7) *Wintergarden GCD*

(a) Permit Types

Wintergarden, though like Culberson GCD does not direct about the Texas-Mexico border, is sufficiently close to fall within the scope of this study. All wells in Wintergarden GCD—even those that are exempt from permitting—must be registered.²⁸² Only new wells need a permit to be drilled, but wells that existed prior to February 23, 1999 require permits if they are to be replaced, reworked, re-drilled, or re-equipped.²⁸³ In lieu of permits, owners of existing "grandfathered use" water wells must register the well with the district.²⁸⁴ Permit applications must describe both the purpose and place of use;²⁸⁵ changing either after a permit is granted requires a well permit amendment.²⁸⁶

(b) Permit Exemptions

Wells are exempt from permitting if they are used solely for domestic or livestock purposes and are incapable of producing more than 25,000 gallons a day of groundwater.²⁸⁷ And, as provided by the Texas Water Code, wells used to supply water for drilling rigs continually engaged in oil and gas exploration or for surface coal mining operations do not need to undergo Wintergarden GCD's permitting process.²⁸⁸ To receive the exemption, wells for oil and gas drilling rigs must be located on the same lease or

²⁷⁹ *Id.* at Rule 4.02(B).

²⁸⁰ *Id.* at Rule 4.02(B).

²⁸¹ *Id.* at Rule 4.02(A).

²⁸² *Id.* at Rule 9.2.

²⁸³ *Id.* at Rule 1.1(58),(24), Rule 6.13.

²⁸⁴ *Id.* at Rule 8.1.

²⁸⁵ WINTERGARDEN GCD RULES (adopted March 29, 2007), Rule 10.2(f),(r).

²⁸⁶ *Id.* at Rule 10.1(b).

²⁸⁷ *Id.* at Rule 9.1(a).

²⁸⁸ *Id.* at Rule 9.1(b),(c).

field or in close proximity to the rig.²⁸⁹ If any of these conditions change, or if the groundwater withdrawn under a previously exempt permit is transported outside the district, the well loses its exempt status and must comply with the permit process.²⁹⁰

(c) Production Limits

Production limits in Wintergarden are based on how the extracted groundwater is used. Limits are as follows:

- *Historic* (“grandfathered”) *use wells* may produce an amount equal to the maximum volume produced and put to beneficial use within any one calendar year before February 23, 1999.²⁹¹
- *Agricultural wells*²⁹² may not pump more than 2.5 acre feet per year of groundwater on contiguous acreage used for agricultural purposes. To do so is considered waste by the Wintergarden GCD.²⁹³
- *Wells supplying surface reservoirs or tanks* may produce as much as “economically necessary, when [using] reasonable intelligence and reasonable diligence” in applying it for a beneficial purpose.²⁹⁴ The 2.5 acre foot cap applies to these wells also.
- *Public water system wells* may withdraw from Wintergarden GCD aquifers 350 gallons per day (per connection) or potentially more, if the system can establish that it does not have sufficient water from any alternate source to meet the needs of those within its service area.²⁹⁵
- *Other lawful uses* of water from wells in the district may warrant withdrawing whatever amount of groundwater the GCD determines is economically necessary for purposes, such as industrial or commercial uses, provided the user has used reasonable intelligence and diligence in the undertaking.²⁹⁶

²⁸⁹ *Id.*

²⁹⁰ *Id.* at Rule 9.6.

²⁹¹ *Id.* at Rule 7.2(a).

²⁹² Under Rule 1.1(4), wells are “agricultural” if the water they pump is used to grow crops for human or animal food, for seed, or for fiber, or is used by plant nurseries. Further, water utilized to raise, feed, or keep equine animals or animals that are used for breeding or to produce commercial products is “agricultural” usage. Finally, a well is “agricultural” if it is used to water fallow fields under a government program or is used in planting cover crops or to accomplish crop or livestock rotation.

²⁹³ *Id.* at Rule 1.1(53)(g); Rule 7.2(b).

²⁹⁴ *Id.* at Rule 7.2(c).

²⁹⁵ *Id.* at Rule 7.1(d).

²⁹⁶ *Id.* at Rule 7.2(e).

(d) Well Spacing

The Wintergarden GCD rules set a required distance of 100 feet between all water wells and the nearest property line.²⁹⁷ A replacement well must be located within 50 feet of the existing well, and the rules prohibit the new well from increasing the prior well's capacity.²⁹⁸ Moreover, the GCD mandates that any well, unless exempt, must be spaced from another producing water well at a distance of at least one foot for each gallon per minute that the two wells combined produce.²⁹⁹ Spacing rules may be increased at the GCD's discretion, in order to prevent waste and misappropriation of property.³⁰⁰

(e) Water Transportation

Groundwater produced within Wintergarden GCD may not be transported outside the district unless the owner or operator of the well has first received a permit to do so.³⁰¹ Likewise, one who already has a permit to transport groundwater out-of-district must apply for an amendment in order to increase the amount of water transported.³⁰²

(f) Meters and Required Devices

The district mandates certain devices be used on certain wells in order to conserve the GCD's underground resources. All non-exempt wells and wells that have not been grandfathered are required to have a meter installed.³⁰³ When groundwater is used more than one-half a mile from the well that produces it, the user must convey it through a pipeline or other covered container in order to prevent groundwater evaporation, seepage, and percolation.³⁰⁴

²⁹⁷ *Id.* at Rule 7.1(a).

²⁹⁸ *Id.* at Rule 6.13.

²⁹⁹ *Id.* at Rule 7.1.

³⁰⁰ *Id.* at Rule 7.1(c)-(d).

³⁰¹ *Id.* at Rule 11.1.

³⁰² *Id.* at Rule 11.2(a).

³⁰³ *Id.* at Rule 10.10.

³⁰⁴ *Id.* at Rule 10.6(c).

(8) *Starr County GCD*

(a) Permit Types

Starr County's groundwater wells may require either an operating permit or a historical grandfathered use permit, if the well is not exempt.³⁰⁵ Grandfathered wells are those that were proven to produce water within the GCD before January 1, 2014. All new wells first require a drilling permit, 30 days after which the well's owner or operator must apply for an operating permit.³⁰⁶ In addition to evaluating what effects a newly permitted well would have on the environment and other groundwater users in the GCD, Starr County requires applicants to agree to take specific board-mandated mitigation steps in the event that the new well causes various negative outcomes.³⁰⁷ For instance, if pumping causes nearby springs to stop flowing, the water table to drop severely, or drinking water to be contaminated, the GCD may prescribe the applicant to take certain actions and procedures or to place money in escrow to protect other groundwater users.³⁰⁸

(b) Permit Exemptions

In addition to grandfathered wells—those drilled before September 11, 2013³⁰⁹—water wells used for domestic purposes that cannot produce more than 25,000 gallons of water per day on at least 1.7 acres are exempt from permitting requirements, as are domestic wells on less than 1.7 acres if the well produces less than 10 gallons per minute.³¹⁰ Wells of that capacity used to water livestock or poultry on 10 acres or more, or wells on a tract of any size used to irrigate non-commercial gardens or orchards that provide produce solely for a household are also exempt.³¹¹ As in the Water Code, wells that provide water for drilling rigs actively used for oil and gas exploration or those used in surface coal mining also receive the exemption.³¹²

³⁰⁵ STARR COUNTY GCD RULES (effective Sept. 1, 2001), Rules 11, 12.

³⁰⁶ *Id.* at Rule 12.2(A),(B); Rule 12.3.

³⁰⁷ *Id.* at Rule 12.9.

³⁰⁸ *Id.* at Rule 12.9.

³⁰⁹ *Id.* at Rule 12.8(G).

³¹⁰ *Id.* at Rule 12.8(A),(C).

³¹¹ *Id.* at Rule 12.8 (B),(D).

³¹² *Id.* at Rule 12.8(E),(F).

(c) Production Limits

Annually, no well may pump more than one-half an acre foot of water for each acre on which the well sits.³¹³ Likewise, the GCD does not permit a well or well system to pump more than 10 gallons per minute for each contiguous acre.³¹⁴ The Starr County GCD further sets production-per-minute limits by dividing the district into three zones that prescribe minimum well depths and maximum pumping rates, regardless of acreage size.³¹⁵

(d) Well Spacing

The well-spacing rules for exempt wells are fairly straightforward. New exempt wells must be spaced “135 feet from the property line or water rights line of any adjoining landowner or the boundary line of a water rights owner.”³¹⁶ Existing exempt wells must be at least 50 feet from the property line.³¹⁷ Domestic wells must be 100 feet from a septic field or “spray area” and 150 feet from any sources of contamination, that may include places where livestock and poultry are kept and outhouses.³¹⁸

Permitted wells, however, have more complex spacing rules, because they involve a formula based on production limitations. All wells have to be sited more than 500 feet from a site where sewage is treated, solid waste is disposed, or sewage effluent is used in irrigation.³¹⁹ And 300 feet is required between any water well and a “sewage wet well, sewage pumping station, or a drainage ditch” conveying industrial or sewage treatment wastes.³²⁰

³¹³ *Id.* at Rule 12.6(C).

³¹⁴ *Id.* at Rule 12.6(D).

³¹⁵ *Id.* at Rule 12.6(E). The three zones’ prescriptions are as follows:

- North zone (Evangeline Aquifer)—Minimum well depth of 300 feet and pump limit of 400 gallons per minute.
- Central zone (Evangeline Aquifer)—Minimum well depth of 500 feet and pump limit of 600 gallons per minute.
- South zone—Minimum well depth of 700 feet and
 - (For the Evangeline Aquifer)—a pump limit of 800 gallons per minute; and
 - (For the Chicot Aquifer)—a pump limit of 400 gallons per minute.

³¹⁶ *Id.* at Rule 12.7(A).

³¹⁷ *Id.* at Rule 12.7(A).

³¹⁸ *Id.* at Rule 14.2(A),(B).

³¹⁹ *Id.* at Rule 14.2(D).

³²⁰ *Id.* at Rule 14.2(D).

(e) Water Transportation

A person may transport water outside the Starr County GCD without a permit if the place where the groundwater is to be used straddles the district's boundary.³²¹ Even if the water is to be used within the district, the use requires a permit.³²² Furthermore, utilities that use groundwater to supply customers in services areas that lie in part outside the district do not need a permit for such transportation if 95% of their service area is within Starr County GCD and water out-of-district usage makes up 5% or less of their demand.³²³

(f) Meters

Wells that produce groundwater that is sold, whether in or outside the district, require a meter.³²⁴

2. Counties

Fifteen Texas counties lie on the state's border with Mexico: El Paso, Hudspeth, Jeff Davis, Presidio, Brewster, Terrell, Val Verde, Kinney, Maverick, Dimmit, Webb, Zapata, Starr, Hidalgo, Cameron. Of those fifteen, eight "White Areas" are not encompassed by a GCD along the border, leaving them exclusively subject to the rule of capture and the common law.³²⁵ Those counties include: El Paso, Hudspeth (the county has a UWCD, but no GCD along the border), Val Verde, Maverick, Webb, Zapata, Hidalgo (Red Sands GCD is in Hidalgo, but it too has no border GCD), and Cameron counties. Although the research did not yield any state legislation giving counties authority to regulate groundwater, some of the same discussion regarding ordinance authority could apply to Texas counties.

³²¹ *Id.* at Rule 8.2.

³²² *Id.* at Rule 9.

³²³ *Id.* at Rule 8.2.

³²⁴ *Id.* at Rule 12.4.

³²⁵ Robert E. Mace et al., TEX. WATER DEV. BD., *A Streetcar Named Desired Future Conditions: The New Groundwater Availability for Texas* 5 (2006), <http://www.ccgcd.org/Reports/A%20Street%C20Car%C20Named%C20Desired%C20Future%Condition%20s.pdf>, archived at <http://perma.cc/CUH6-ZH4G>).

3. Municipalities

Municipalities may be able to regulate groundwater to a certain degree, relying on their police power³²⁶ and ordinances that regulate zoning³²⁷ and nuisance.³²⁸ Many cities have ordinances or codes restricting activities related to groundwater drilling, such as prescribing certain distances from a well and an animal pen, or declaring groundwater allowed to flow into storm drainage to be a nuisance actionable under common law. Police powers also make it possible for a city to ordain groundwater regulations when circumstances rise to the necessary level of threat to health, safety, and public welfare.

a. Police power.

A municipality could enact reasonable groundwater rules under its police power, which operates as “a grant of authority from the people to their governmental agents for the protection of the health, the safety, the comfort and the welfare of the public. In its nature it is broad and comprehensive.”³²⁹ But the Texas Supreme Court requires that using this power to make rules for health and safety purposes must be exercised on balance with private property rights—exceeding this scope could trigger state and federal due process requirements.³³⁰

b. Zoning and Nuisance Ordinances.

Under Local Government Code section 211.003, “[t]he governing body of a municipality may regulate: . . . the pumping, extraction, and use of groundwater by persons other than retail public utilities, as defined by Section 13.002, Water Code, for the purpose of preventing the use or contact with groundwater that presents an actual or potential threat to human health.”³³¹ For example, the Socorro City Nuisance Ordinance designates certain areas as a “neighborhood commercial district,” and a permit from the city is required if a person wants to drill a water well in that area.³³²

³²⁶ TEX. CONST. art. XI, § 5.

³²⁷ LOCAL GOV'T CODE, Ch. 211

³²⁸ *Id.* at Ch. 217; see generally Ross Crow, *Municipal Regulation of Groundwater and Takings*, 44 TEX. ENVTL. L.J. 1 (2014).

³²⁹ *Spann v. City of Dallas*, 235 S.W. 513, 515 (Tex. 1921).

³³⁰ *Lombardo v. City of Dallas*, 73 S.W.2d 475, 478 (Tex. 1934); see also *Falfurrias Creamery Co. v. City of Laredo*, 276 S.W.2d 351, 353 (Tex. Civ. App.—San Antonio 1955, writ ref'd n.r.e.).

³³¹ TEX. LOCAL GOVT. CODE § 211.003.

³³² CODE OF ORDINANCES, CITY OF SOCORRO, TEX. § 28-22(6), (9).

Because the El Paso area is in a “white area” that does not include a GCD, this section will focus on the groundwater-related ordinances that municipalities within the county have created. Compared to other municipalities, those in El Paso have passed a significantly greater number of ordinances on this subject, perhaps due to the lack of a GCD to otherwise regulate aquifer usage.

(1) *El Paso*

El Paso’s Conservation Ordinance addresses groundwater “that is pumped from the ground or diverted from the flows of the Rio Grande,” terming it *produced water*.³³³ El Paso declares produced water to be a nuisance, stating that its flow “into streets, alleys, gutters, and other public rights-of-way, ditches, or into a stormwater drainage system or facility is contrary to the public health, safety and welfare of the citizens of El Paso.”³³⁴ The Conservation Ordinance further makes it a misdemeanor to discharge water from any source—whether from the El Paso Water District or another source—into “to or upon any street, alley, gutter or ditch, or other public right-of-way, or into a stormwater drainage system or facility.”³³⁵ Additionally, doing so may incur a civil penalty of up to \$2,000.³³⁶

(2) *Horizon City*

Horizon City’s Subdivision Ordinance includes as one of its explicit purposes to “safeguard the water table, and to encourage the wise use and management of natural resources.”³³⁷ Subdivisions that use wells to provide water to homeowners, instead of relying on a public water system, must ensure that the water’s quality meets state drinking water standards and must provide proof of quality to prospective homeowners.³³⁸ Zoning Ordinance 408.5 applies a special restriction to mobile home subdivisions, prohibiting any device used to drill for water.³³⁹

(3) *San Elizario*

San Elizario’s Property Nuisance Ordinance declares it an unlawful public nuisance for “any waste products, offal, polluting material, spent chemicals, liquors,

³³³ EL PASO CODE OF ORDS. § 15.12.005.

³³⁴ *Id.* at § 15.13.040.

³³⁵ *Id.* at § 15.12.075.

³³⁶ *Id.* at § 15.12.120.

³³⁷ Horizon City Ordinance No. 0035 § 1.2.1.7.

³³⁸ *Id.* at § 2.2.2.

³³⁹ Horizon City Ordinance No. 0102 § 408.5.

brines, garbage, rubbish, refuse, sewage, used tires or other waste of any kind that is stored, deposited or disposed in a manner that may cause the pollution of the surrounding land, [or] the contamination of groundwater...” to exist on or emanate from any tract of land.³⁴⁰ Specifically, “the pollution of any public well or cistern . . . by sewage, dead animals, creamery, industrial wastes or other substances” is targeted under the Ordinance as a specific nuisance.³⁴¹ Anyone “maintaining, using, placing, depositing, leaving or permitting [such a condition] to be or remain on any public or private property” must promptly abate the condition out of public necessity.³⁴²

(4) *Socorro*

The Socorro City Nuisance Ordinance also includes water pollution as a public nuisance, specifically including abandoned wells and sewers that are not properly protected, in addition to polluted water in a public cistern or well.³⁴³ The city’s Zoning Ordinance prescribes a distance of no less than 100 feet between where a dog, cat, or other small animal is kept outdoors and any water well.³⁴⁴ And in an area zoned as a “neighborhood commercial district,” people wishing to drill a water well must get a permit from the city.³⁴⁵

(5) *Anthony*

In Anthony, several ordinances govern groundwater. The “water well ordinance of the town”³⁴⁶ makes it unlawful to construct or rework any water well without a specific permit from the town clerk.³⁴⁷ The city charges \$5,000 for a permit to drill such a well within city limits and sets construction standards.³⁴⁸ The code also specifies spacing required between water wells and property lines or “significant structures,” such as power lines, septic tanks, and animal pens.³⁴⁹ To protect groundwater from pollution, the code prohibits certain construction activities on land within 150 feet of a well.³⁵⁰ Livestock and certain operations—including “tile or concrete sanitary sewers, sewer appurtenances,

³⁴⁰ City of San Elizario Ordinance No. 1604.09 § 5.1.

³⁴¹ *Id.* at § 7.1(f).

³⁴² *Id.* at § 7.1.

³⁴³ CODE OF ORDINANCES, CITY OF SOCORRO, TEXAS § 28-22(6), (9).

³⁴⁴ *Id.* at § 46-640.

³⁴⁵ *Id.* at § 46-380.

³⁴⁶ ANTHONY CODE OF ORDINANCES § 13.16.010.

³⁴⁷ *Id.* at § 13.16.060.

³⁴⁸ *Id.* at §§ 13.16.160, 13.16.170.

³⁴⁹ *Id.* at § 13.16.080.

³⁵⁰ *Id.* at §§ 8.28.010, 8.28.030.

septic tanks, storm sewers, and cemeteries”—are expressly prohibited within fifty feet of water wells.³⁵¹

III. GROUNDWATER ON MEXICO’S SIDE OF THE BORDER

A. Overview:

Groundwater governance in Mexico has been vested with the federal government for over a century. In 1917, the government that arose after the 1910 Revolution rewrote the country’s Constitution to declare all water—both surface and groundwater—to be the public property of Mexico, centralizing jurisdiction over both quality and quantity within the national sphere. The Constitution divides the federal government’s water-related responsibilities into national and sub-national roles. At the national level, the Natural Resources and Environment Ministry called “SEMARNAT” (Secretaría del Medio Ambiente y Recursos Naturales), houses the National Water Commission (Comisión Nacional del Agua, or “CONAGUA”), which holds primary control over the nation’s waters. SEMARNAT also houses the Attorney General for Environmental Protection (Procuraduría Federal de Protección al Ambiente, or “PROFEPA”), an office that works jointly with SEMARNAT to enforce and create environmental laws and policy, which give them significant authority over water quality (see Table 3).

³⁵¹ *Id.* at § 8.28.030.

TABLE 3. SUMMARY OVERVIEW OF MEXICO'S GROUNDWATER GOVERNANCE

LEVEL OF GOVERNANCE	INSTITUTION OR ENTITY	RELEVANT LAW UNDER JURISDICTION
Federal (Mexico)	<ul style="list-style-type: none"> The United States of Mexico 	<ul style="list-style-type: none"> Constitution of Mexico places groundwater and surface water under federal control in trust for the people of Mexico Grants rights to water through concessions or assignments Requires permit to extract groundwater and discharge wastewater
	<ul style="list-style-type: none"> SEMARNAT 	<ul style="list-style-type: none"> Houses CONAGUA, which holds near-exclusive jurisdiction over water laws.
	<ul style="list-style-type: none"> CONAGUA 	<ul style="list-style-type: none"> Primary water authority and primary source of water-related laws. National Water Law National Water Law Regulation Federal Law of Environmental Responsibility Federal Law of Water Rights General Law of Ecological Balance and Environmental Protection Rural Energy Law Official Standards Related to Groundwater Conservation zones and protected areas
	<ul style="list-style-type: none"> Basin Agencies Basin Councils Technical Groundwater Committees 	<ul style="list-style-type: none"> Advise CONAGUA and function as liaisons between federal government and local stakeholders
	<ul style="list-style-type: none"> PROFEPA 	<ul style="list-style-type: none"> Works jointly with SEMARNAT to enforce the Federal Law of Environmental Responsibility
	<ul style="list-style-type: none"> CFE 	<ul style="list-style-type: none"> Rural Energy Law
	<ul style="list-style-type: none"> SAGARPA 	<ul style="list-style-type: none"> Subsidies for agricultural energy use

States	<ul style="list-style-type: none"> • State Administrative Commissions 	<ul style="list-style-type: none"> • Some authority over sustainable development and prevention groundwater contamination of its “state waters” (unclearly defined)
Local	<ul style="list-style-type: none"> • Municipalities • Rural 	<ul style="list-style-type: none"> • Obligated to provide water and sanitation
	<ul style="list-style-type: none"> • Irrigation Districts • Water User Associations • Ejidos 	<ul style="list-style-type: none"> • Collective use of concessions and assignments, under constitutionally granted authority
	<ul style="list-style-type: none"> • Individuals 	Groundwater freely withdrawn where entirely on one property and not subject to conservation or restrictive zone

CONAGUA's water primacy includes authority over establishing water policy, mediating conflicts between hydrological regions, and maintaining federal water infrastructure projects. Mexico's constitution also gives CONAGUA jurisdiction to administer rights via a permitting system and to monitor aquifers, which it does at through its sub-national arms. CONAGUA exercises its operative, executive, administrative, and judicial authority through auxiliary entities: Basin Agencies, advised by Basin Councils, further broken down into Basin Commissions, Basin Committees, and Technical Committees on Groundwater. These entities are organized at the broadest level within hydrologic-administrative regions that follow municipal political divisions in order to facilitate administration and enable them to consider socioeconomic factors.³⁵² Within these administrative regions are hydrologic regions that follow the major basin boundaries, further divided by basins that CONAGUA has identified as the basic units for developing hydraulic resources. Unlike in the U.S., Mexico's courts do not create law, and so case law does not add to the legislative, administrative, and customary laws that can apply to groundwater in Mexico.³⁵³

Recently, Mexico enacted constitutional reforms that take steps toward decentralizing water management by providing for the formation of various water authorities regionally and locally. The amended Constitution transferred to municipalities the responsibility—but not funding—for providing water services. Further, it provided for specialized management of water at the local level, carried out by collectives including ejidos,³⁵⁴ rural communities, Water User Associations, and Irrigation Districts. Finally, State Water Commissions find limited authority under the National Water Law to intervene when necessary to prevent damage to aquifers and ecosystems and to ensure water quality for potable water systems.

B. Federal

1. Federal Institutions

Groundwater management is accomplished at the federal level through organizations tasked with administering its water laws, in tandem with environmental,

³⁵² CONAGUA, ATLAS OF WATER IN MEXICO (2016), <http://files.conagua.gob.mx/conagua/publicaciones/Vertientes/AAM2016.pdf> (last accessed Feb. 1, 2018).

³⁵³ FRANCISCO A. AVALOS, THE MEXICAN LEGAL SYSTEM 16 (1992).

³⁵⁴ "Ejidos" are communities in which agriculture, ranching, and forestry workers possess the right to put the land to use, without having ownership rights to it.

energy, and taxation laws that target groundwater. CONAGUA serves functions as both a national actor and a regional actor, operating through sub-entities organized by river basin.³⁵⁵ The federal arm reaches into the Río Bravo hydrologic region as a Basin Agency, which is advised by Basin Councils, populated by stakeholders that sit on Basin Commissions, Basin Committees, and Technical Committees on Groundwater. SEMARNAT holds near exclusive authority over environmental regulations.

a. CONAGUA

(1) *National Level Roles.*

The executive branch of Mexico's federal government is responsible for administering the development and distribution of the nation's waters through its SEMARNAT ministry.³⁵⁶ To do so, SEMARNAT bestows CONAGUA with exclusive control over certain constitutionally-mandated duties, including:

- Developing water policy;
- Creating inter-basin and inter-regional programs aimed at cohesion;
- Constructing and maintaining federal water infrastructure projects (such as most of the nation's dams) and helping maintain those that are constructed jointly with states or municipalities;
- Encouraging the development of water treatment, stormwater drainage, irrigation, and flood control by states and municipalities, without taking responsibility for them;
- Taking actions to preserve water quality and quantity when it affects two or more hydrologic administration regions, international transboundary basins, or international agreements; and
- In times of emergency or over-exploitation, taking whatever measures necessary to ensure the availability of water to meet domestic and urban public needs.³⁵⁷

The national sphere also maintains a taxation structure that imposes certain fees for wastewater discharge and pollution. CONAGUA likewise possesses responsibility for enforcing those excise taxes.³⁵⁸

³⁵⁵ LA LEY DE AGUAS NACIONALES, ("LAN"), Arts. 4–5 (1992), last reformed Mar. 24, 2016.

³⁵⁶ *Id.*, at Art. 4, 5.

³⁵⁷ *Id.*, at Art. 9.

³⁵⁸ LEY FEDERAL DE DERECHOS: DISPOSICIONES EN MATERIA DE AGUAS NACIONALES (2016), Art. 3 (Federal Law of Rights Related to National Waters, hereinafter "Federal Water Rights Law").

(2) *Regional Basin Agencies and Councils.*

Unlike Texas' GCDs, whose boundaries are drawn along political lines, Mexico's sub-national governance structures are organized by hydrologic region, yet they are based on surface hydrology, and do not directly consider the hydrogeologic boundaries of aquifers. The governing arm of CONAGUA along the Rio Grande in Mexico is its Basin Agency ("Organismo de Cuenca") for Hydrologic Region 24, known as "Río Bravo."³⁵⁹ All of the aquifers underlying the Texas-Mexico border lie within this jurisdiction. It falls to the Basin Agencies to create and enforce groundwater rules and policies, relying on the Basin Councils and Technical Committees on Groundwater (Comites Técnicos de Aguas Subterráneas, or "COTAS") for guidance in keeping rules consistent with the most current scientific understanding, as well as in considering their impacts on stakeholders. Ultimately, although they manage water at the regional level, the laws and rules they apply are federally imposed.

(a) Basin Agencies (Organismos de Cuenca)

Within each hydrologic region, the federal arm of water management flexes its administrative jurisdiction through thirteen Basin Agencies—the governing body along the Texas-Mexico border is the Río Bravo Basin Agency.³⁶⁰ CONAGUA's Basin Agencies take on the federal government's operative, executive, administrative, and judicial authority in giving effect to the attributes, functions, and activities surrounding the management of national waters within the Agencies' jurisdictions.³⁶¹ This includes regulating the administration of water rights, educating the public on the hydrologic cycle and conservation, formulating regional policy and designing programs to implement them and evaluating, recommending, and collecting water user fees.³⁶² Further, the Agencies have authority to enforce sanctions or penalties for violating the National Water Law (La Ley de Aguas Nacionales, or "LAN").³⁶³

(b) Basin Councils (Consejos de Cuenca)

Basin Councils are made up of various experts and political entities, including executive representatives from each state in the region, which in turn advise the Basin

³⁵⁹ LAN, *supra* note 355, at Art. 12 Bis.

³⁶⁰ ATLAS DEL AGUA EN MÉXICO, *supra* note 352.

³⁶¹ LAN, *supra* note 355, at Art. 12 Bis. 6.

³⁶² *Id.*, at Art. 12 Bis. 6.

³⁶³ *Id.*, at Art. 12 Bis. 6

Agencies.³⁶⁴ The Councils generally include four sub-entities: The General Assembly of Users; The Directive Committee; The Operations and Council Oversight Committee; and the Operative Direction Group.³⁶⁵ The Council also includes sub-councils specific to certain aquifers or technical expertise.³⁶⁶ Each sector of significant water use in the region—including the urban and domestic, agriculture, agro-industrial, services, fisheries and aquaculture, and industrial sectors—elects a representative who is entitled to one vote on the Basin Council.³⁶⁷ Federal and state agencies, including CONAGUA, participate in basin council discussions alongside municipal councils, academics, and non-governmental organizations; however, none of these have a vote.³⁶⁸ Although one goal of the 2004 LAN reforms was to decentralize Mexico’s water administration by boosting the regional and local influence in Basin Councils, the decentralization process did not transfer authority to create or enforce laws.

(c) Technical Groundwater Committees
(Comités Técnicos de Aguas Subterráneas, or
“COTAS”)

Groundwater issues are specifically represented on the Basin Councils by COTAS. Though they have little to no legal authority, COTAS are independent and are not subordinate to CONAGUA or the Councils—they were created to be user-comprised advisory groups tasked with examining the hydraulic consequences and social impacts of aquifer extraction policies in their areas.³⁶⁹ The COTAS present their recommendations to the Basin Councils and Basin Agencies.³⁷⁰ There are twelve COTAS currently within the Río Bravo region—though none directly cover aquifers along the Texas-Mexico border.³⁷¹

- | | |
|-------------------------------------|-----------------------------------|
| 1. <i>Jiménez-Camargo Chihuahua</i> | 7. <i>Cuauhtemoc Chihuahua</i> |
| 2. <i>Ascención Chihuahua</i> | 8. <i>Casas Grandes Chihuahua</i> |
| 3. <i>Janos Chihuahua</i> | 9. <i>Cañon del Derramadero</i> |
| 4. <i>Buenaventura</i> | 10. <i>Baja Babícora</i> |

³⁶⁴ *Id.*, at Art. 13, 13 Bis.

³⁶⁵ *Id.*, at Art. 13 Bis. 1.

³⁶⁶ *Id.*, at Art. 12 Bis.

³⁶⁷ Margaret M. Wilder, *Water governance in Mexico: political and economic apertures and a shifting state-citizen relationship*, 15 *ECOLOGY & SOCIETY* 22, 9 (2010), <http://www.ecologyandsociety.org/vol15/iss2/art22/>.

³⁶⁸ *Id.*; see also LAN, *supra* note 355, at Art. 13 Bis. 3.

³⁶⁹ LAN, *supra* note 355, at Art. 13, Bis. 1(D).

³⁷⁰ *Id.*, at Art. 13, Bis. 1(D).

³⁷¹ ATLAS DEL AGUA EN MÉXICO 2016, *supra* note 352, at 112.

- | | |
|-------------------------------|---|
| 5. <i>Valle de Tarabillas</i> | 11. <i>Cuatrociénegas—Ocampo</i> |
| 6. <i>Cuatrociénegas</i> | 12. <i>Saltillo-Ramos Arizpe</i> ³⁷² |

In some areas, COTAS have gleaned a wealth of information about the state of the aquifers they cover and the users that apply groundwater within their boundaries, but unlike groundwater conservation districts, the COTAS have not yet obtained authority to take any legal action utilizing this information, such as limiting withdrawals, adjusting concessions, or enforcing policies.³⁷³

b. SEMARNAT and PROFEPA

Since SEMARNAT's creation in 2000, CONAGUA has been housed under the ministry, which holds near exclusive authority over Mexico's General Law of Ecological Balance and Environmental Protection (known as the "Waste Law"). SEMARNAT is charged with enforcing the cleanup of polluted land where groundwater contamination could result. The Attorney General for Environmental Protection (known as "PROFEPA") works jointly with SEMARNAT to execute the remediation requirements of the Federal Law of Environmental Responsibility. Compliance with both laws means obtaining permission from a federal agency, as permitting authority is non-delegable to the states.

c. National Electricity Commission (Comisión Federal de Electricidad, or "CFE")

Mexico's CFE has a unique role relating to aquifer withdrawals, by subsidizing in certain cases, and restricting in others, the energy used to pump groundwater for irrigation. This gives the CFE the power to prioritize agriculture's use of the underground resource over competing uses, but also to adjust the order of use preference.

d. Secretary of Ranching, Agriculture, Rural Development, Fishing, and Nutrition (Secretaría de Ganadería, Agricultura, Desarrollo Rural, Pesca y Alimentación, or "SAGARPA").

³⁷² SEMARNAT, CONSULTA TEMÁTICA, *Consejos de Cuenca y sus Órganos Auxiliares: Nombres y Fechas de Instalación*, http://dgeiawf.semarnat.gob.mx:8080/ibi_apps/WFServlet?IBIF_ex=D4_R_PSOCIAL01_08&IBIC_user=dgeia_mce&IBIC_pass=dgeia_mce (last accessed Feb. 1, 2018).

³⁷³ Wester, et al., *Assessment of the Development of Aquifer Management Councils (COTAS) for Sustainable Groundwater Management in Guanajuato, Mexico*, 19 HYDROGEOLOGY J. 889, 895 (2011).

SAGARPA coordinates with CONAGUA to approve the concessions of water necessary for the development of aquaculture and encourages user applications for development of federal hydraulic infrastructure.³⁷⁴ SAGARPA also implements programs that affect groundwater withdrawals by offering subsidies to offset the electricity that agricultural irrigators use to pump water for agriculture.³⁷⁵

2. Federal Laws Relating to Groundwater

With an understanding of water as a national resource under federal control, it follows that the majority of the body of law surrounding groundwater exists at the federal level. The Mexican Constitution itself discusses water resources in four of its articles: Article 27 (establishing that ground and surface water resources belong to the public), Article 25 (charging the federal government with sustainable water resource development), Article 115 (imposing on municipalities the responsibility for making clean water and sewage services available), and Article 4 (recognizing access to water as a human right).³⁷⁶ The LAN and sets out two types of water rights—one available to government entities, and the other to private entities—and the priority order guiding decisions to grant water rights. It further explains that a permit is generally required to discharge water onto land, into water bodies, or into aquifers, while also ascribing fees for water pollution. In addition to the primary national water law, an accompanying Regulation of the LAN and a taxation arrangement exist to fulfill the water law. Beyond these, environmental laws and rules centered on energy consumption involved in groundwater pumping create a foundational federal structure for groundwater governance that underlies state and local water management. Finally, federal agencies promulgate standards, or “norms,” to measure compliance with these laws and regulations.

a. The Constitution of the United States of Mexico.

Article 27 establishes that groundwater, equally with surface water, is a public good that private parties may access, generally requiring federally-granted

³⁷⁴ LAN, *supra* note 355, at Art. 82.

³⁷⁵ *Agreement that establishes the guidelines for applying for incentives to reduce electricity costs incurred in pumping water for agricultural irrigation* (June 21, 2007), http://dof.gob.mx/nota_detalle.php?codigo=2118071&fecha=23/03/2006 (last accessed Feb. 1, 2018).

³⁷⁶ CONSTITUCIÓN POLÍTICA DE LOS ESTADOS UNIDOS MEXICANOS, originally published in el DIARIO OFICIAL DE LA FEDERACIÓN el 5 de febrero de 1917 (Feb. 5, 1917), last reformed Feb. 4, 2017 (“CONSTITUTION OF MEXICO”).

concessions.³⁷⁷ With respect to underground water, the Article specifically permits landowners to freely withdraw water that lies exclusively beneath their property, provided that in consideration of the public interest, Mexico's president may on occasion establish certain limitations.³⁷⁸ Although only those born, naturalized, or incorporated in Mexico have the right to obtain assignments or concessions, entities or persons foreign to Mexico may obtain the same right only if they agree not to invoke their native governments' protection regarding the water right under penalty of forfeiture.³⁷⁹

Article 25 instructs the federal government to pursue sustainable, integrative national development plans, including exploiting the nation's water resources, seeking to achieve economic growth and a more equal distribution of wealth through competition.³⁸⁰ National economic development is to be accomplished cooperatively through the public, private, and social sectors, ensuring social responsibility is exercised.³⁸¹ The provision further states that public and private sector businesses will be supported based on criteria that include social equity, productivity, and sustainability.³⁸²

Article 115 requires municipalities, rather than federal or state governments, to make clean water and sewage services available to their citizens.³⁸³

Article 4, as amended on February 8, 2012, recognizes the right of every person to the access, distribution, and sanitation of water for personal and domestic consumption—under the Article's language, the Mexican State guarantees it.³⁸⁴ It mandates the promulgation of laws to define bases and modalities through which hydrologic resources may be accessed and used sustainably and equitably.³⁸⁵ With the

³⁷⁷ *Id.*, at Art. 27.

³⁷⁸ *Id.*; see also Alejandro Posadas & Regina M. Buono, *Looming Conflicts? Energy Reform Priorities and the Human Right of Access to Water in Mexico* 11, THE RULE OF LAW AND MÉXICO'S ENERGY REFORM, JAMES A. BAKER III INSTITUTE FOR PUBLIC POLICY (2016).

³⁷⁹ CONSTITUTION OF MEXICO, *supra* note 376, at Art. 27.

³⁸⁰ *Id.*, at Art. 25.

³⁸¹ *Id.* at Art. 25.

³⁸² *Id.*; see also Posadas & Buono for an interpretation which reads this to mean that CONAGUA's decisions related to any use of a water source "must consider the social, economic, and environmental impacts, as well as intergenerational needs." Posadas & Buono, *supra* note 378, at 10, (citing Rabasa, et al., MEXICAN CENTER FOR ENVIRONMENTAL RIGHTS & THE ENVIRONMENTAL LAW INSTITUTE, LA INSTRUMENTACIÓN DEL DERECHO HUMANO AL AGUA EN MÉXICO: RECOMENDACIONES PARA SU REGULACIÓN, 10 (2014), <http://derechohumanoalagua.org.mx/wpcontent/uploads/2015/03/Implementacion-Mexico.pdf> (last accessed Feb. 1, 2018)).

³⁸³ CONSTITUTION OF MÉXICO, *supra* note 376, at Art. 115.

³⁸⁴ *Id.* at Art. 4; see also Posadas & Buono, *supra* note 378, at 10.

³⁸⁵ CONSTITUTION OF MÉXICO, *supra* note 376, at Art. 4.

responsibility for providing water and sewer services lying with municipalities, the possibility exists that Article 4's right-to-water declaration could greatly increase pressure on municipalities to expand their services and thereby prompt the federal government to recalibrate the amount allotted to water rights holders in order to give municipalities sufficient water to fulfill their Article 115 duties.³⁸⁶ In addition, Article 4 affirms that its citizens have the right to a clean environment, which the government guarantees.³⁸⁷

Accompanying these significant declarations was a mandate for the Mexican Congress to pass a "General Water Law" that would supersede the LAN and enable implementation of the right-to-access paradigm.³⁸⁸ As of early 2017, the General Water Law had not been passed.³⁸⁹ Nevertheless, former General Director of CONAGUA David Korenfeld proposed a version of the General Water Law, known as the "Korenfeld Law,"³⁹⁰ which included as "one of its novelties" provision for transferring titles to concessions from one basin to another "with which there is no natural connection."³⁹¹ However, other propositions withing the Korenfeld Law drew sharp criticism, namely its requirement that anyone "interested in carrying out exploration, study, monitoring, re-injection and remediation in overlying and underlying aquifers" or other national water must first get permission from CONAGUA. In response, academics have proposed a specific Groundwater Law intended to encourage inclusion of groundwater in legislative, executive, and judicial discussions about the National Water Law.³⁹²

b. National Water Law and its Regulation

(1) *Generally.*

³⁸⁶ Posadas & Buono, *supra* note 378, at 12–13.

³⁸⁷ "All persons have the right to a healthy environment suitable for their development and well-being. The State will guarantee respect of this right. Environmental harm and deterioration will trigger responsibility for the person who causes it in terms set forth by the law." CONSTITUTION OF MÉXICO, *supra* note 376, at Art. 4 (direct translation).

³⁸⁸ Posadas & Buono, *supra* note 378, at 9–10.

³⁸⁹ *Id.*

³⁹⁰ *De las Comisiones Unidas de Agua Potable y Saneamiento, y de Recursos Hidráulicos, con proyecto de decreto por el que se expide la Ley General de Aguas* (March 5, 2015), published in the PARLIAMENTARY GAZETTE OF THE CHAMBER OF DEPUTIES (No. 4228-II).

³⁹¹ *Id.* at 3 (distinguishing out-of-basin "transfers" from the concession "transmissions" within the same basin, as already permitted under the current LAN).

³⁹² Carmen Carmona Lara et al., *Ley del Agua Subterránea: Una Propuesta* (2017).

The classification of water resources as federally-controlled public goods in Mexico's Constitution is given effect through the LAN. The LAN defines an "aquifer" as a geologic formation or series of hydrologically connected formations with vertical and lateral boundaries where water originates or circulates.³⁹³ It does not explicitly recognize the water rights of private individuals as such, but rather recognizes the right of individuals or collectives of users that qualify as legal persons to *use* water.³⁹⁴ Constitutional provisions regulating the extraction, exploitation, use, and improvement of underground waters look to basin or aquifer boundaries in setting limits. The LAN established the framework for institutions at the state and local, or regional, level that are intended to work with CONAGUA in implementing the national governance structure. A companion body of law, the Regulation of the National Water Law (el Reglamento de la Ley de Aguas Nacionales, referred to here as the "LAN Reg") sets forth instructions and regulations for applying the laws and policies of the LAN.

(2) *Water Rights Generally*

Assignments (*asignaciones*) are granted collectively to federal agencies, states, and municipalities; concessions (*concesiones*), on the other hand, are available to constitutionally-recognized individuals or entities. Concessions give the holder—whether a physical person or a public or private entity—title to use national water for any public benefit³⁹⁵ and are recorded in the Public Register of Water Rights ("REPDA"), but assignments are not recorded.³⁹⁶ Prospective users seek concessions and assignments through CONAGUA. At the same time as applicants request a concession or assignment, they must file application for a permit to construct any devices needed to withdraw the water, as well as for a permit to discharge the wastewater resulting from the concessioned or assigned water, unless the water is to be put to agricultural use.³⁹⁷ Article 78 of the LAN requires SEMARNAT to approve concessions for the Federal Electricity Commission to use in generating electricity and cooling plants when there is water available.³⁹⁸ It also directs that the Federal Electricity Commission should be involved in the nation's water plan to develop general plans for the nation's hydropower development.³⁹⁹

³⁹³ LAN, *supra* note 355, at Art. 3(II).

³⁹⁴ REGULATION OF THE NATIONAL WATER LAW ("LAN REG."), Art. 18 (1994), last reformed Aug. 25, 2014.

³⁹⁵ LAN, *supra* note 355, at Art. 3(VIII).

³⁹⁶ *Id.* at Arts. 30–32; LAN Reg., *supra* note 394, at Arts. 54–63.

³⁹⁷ LAN, *supra* note 355, at Arts. 21, 48.

³⁹⁸ *Id.* at Art. 78.

³⁹⁹ *Id.*

Parties receiving a concession or assignments receive corresponding rights and duties. *Concessions* give the holder the rights, among others, to: (1) withdraw and beneficially use the water granted; (2) construct infrastructure to carry out the extraction; (3) obtain a legal servitude to use the surface land for accessing and conveying the concessioned water; (4) seek administrative action to correct or extend titles; and (5) transfer rights.⁴⁰⁰ This includes the right to lease the water right. Meanwhile, concessionees are required to:

- (1) ensure infrastructure construction does not negatively impact third parties or hydrologic development and to verify plans for construction within 30 days of the grant;
- (2) to install meters within 40 days and keep them in good condition;
- (3) pay water excise taxes and other related fees;
- (4) comply with laws on water safety and environmental protection;
- (5) keep from using more water than the volume granted;
- (6) take any measures necessary to prevent contaminating the water granted for use, and to repair the quality of any such water contaminated by the user.⁴⁰¹

Concessionees who allow contamination to occur can be subject to sanctions varying in relation to the severity of the contamination, including taxes for wastewater discharges according to the water's quality and volume, and to possible suspension or revocation of the right.⁴⁰²

Assignments, unlike concessions, are not transferable,⁴⁰³ but assignees' have rights to (1) withdraw, beneficially use, and reuse the water; (2) construct infrastructure to carry out the extraction; (3) obtain a legal servitude to use the surface land for accessing and conveying the concessioned water; and (4) seek administrative action to correct or extend titles.⁴⁰⁴ Holding an assignment requires assignees to guarantee that the water's quality meets the Official Mexican Normative ("NOM") standards, as well as to follow NOM wastewater discharge standards while assuring that wastewater is reused and to take responsibility for any environmental harm, including economic and environmental costs, resulting from contamination caused by discharges.⁴⁰⁵

⁴⁰⁰ *Id.* at Art. 29.

⁴⁰¹ *Id.*

⁴⁰² *Id.*

⁴⁰³ *Id.* at Art. 20.

⁴⁰⁴ *Id.* at Art. 28 Bis. 1.

⁴⁰⁵ *Id.* at Art. 28 Bis.

Titles to assignments and concessions must specify the authorized volume of extraction and consumption of water.⁴⁰⁶ In no case may a water titleholder use volumes in excess of what CONAGUA has authorized without proceeding to modify the volume, flow, or specific use of the title.⁴⁰⁷ Though the usufructuary rights in Mexico's national waters last between five and thirty years,⁴⁰⁸ they are inheritable, and only a limited number of events extinguishes them, including when a titleholder renounces title to the right at death or fails to name a successor, when a title protest is successful, or when CONAGUA decides to void the title.⁴⁰⁹ In addition, when a portion of the water volume granted under a concession or assignment goes unused for two consecutive years without justification,⁴¹⁰ CONAGUA is empowered to cancel the title in whole or in part.⁴¹¹ For instance, irrigation districts that set rules that contradict the LAN or the LAN Reg. are subject to having their concession extinguished.⁴¹² Finally, judicial or administrative resolutions may extinguish a title.⁴¹³

Once concessioned or assigned, the volume granted under the concession may not generally be reduced, unless the federal government undertakes a *rescate* (rescue). A *rescate* is "an administrative procedure that enables the federal government to reduce the concessioned volumes, with due compensation."⁴¹⁴ In order to justify reductions, CONAGUA must first prove that the aquifer where it seeks to reduce withdrawals is overexploited and determine by how much. The Federal Water Law incorporates environmental flows into the standard for "ecological conservation uses" that are implicit in any exploitation of national waters.⁴¹⁵

⁴⁰⁶ *Id.* at Art. 23.

⁴⁰⁷ *Id.*

⁴⁰⁸ LAN, *supra* note 355, at Art. 24.

⁴⁰⁹ *Id.* at Art. 29, Bis. 3. Reasons for CONAGUA to cancel title include: the title holder used false information when applying for title; it was issued contrary to the law; a government employee approved it without authority, or the application process was otherwise tainted; or the purpose of the water's intended use has become frustrated. *Id.*

⁴¹⁰ Valid justifications include when: the reduction was due to forces beyond the user's control; states of emergency such as drought or overexploitation of water cause CONAGUA to temporarily permit reduced withdrawals; or before the two years pass, the titleholder pays CONAGUA a fee intended to prevent losing water rights. *Id.* at Bis. 3(VI)(1–6).

⁴¹¹ *Id.* at Art. 29, Bis. 3(VI).

⁴¹² *Id.* at Bis. 3(VIII).

⁴¹³ *Id.* at Bis. 3(IX).

⁴¹⁴ Wester, et al., *Assessment of the Development of Aquifer Management Councils (COTAS) for Sustainable Groundwater Management in Guanajuato, México*, 19 HYDROGEOLOGY J. 889, 892 (2011).

⁴¹⁵ LAN, *supra* note 355, at Art. 3 (XXV).

CONAGUA may revoke a concession, assignment, or discharge permit when:

- One-fifth more water is used than permitted when this is a repeated offense;
- Using the water without complying with NOMs;
- Permanently or intermittently discharging into water bodies or allowing to infiltrate onto lands that are national resources or others when it could contaminate the aquifer;
- Utilizing dilution to comply with NOMs related to ecology or discharge permit;
- Extracting groundwater in regulated zones, of protection or reserve, without CONAGUA's permission
- Failing to pay for the use of water or water service, when the water right has previously been suspended;
- Failure to employ required implements for reuse or quality control in accordance with terms of the concession, the National Water Law, or legislation, or using implements unauthorized by CONAGUA;
- Water use that harms ecosystems;
- Discharging dangerous materials that could harm health, natural resources, fauna, flora, or ecosystems;
- Transferring rights without permission of CONAGUA or against the National Water Law;
- Infringing on rights of others;
- Repeating any previous infraction, or failing to correct one;
- Using water for a different purpose than authorized; or
- Allowing third parties to use part of all of concessioned water without advising CONAGUA first.⁴¹⁶

Finally, under the National Water Law Article 29 Bis. 2, CONAGUA may suspend permits, concessions, or assignments until fees are paid for water rights or services, or charges assessed on those bases; if the user obstructs the inspection or verification of hydraulic infrastructure concessioned or assigned; when wastewater discharged affected or could affect sources of potable water or the public health (as determined by PROFEPA or CONAGUA); or for failure to comply with conditions or specifications of the concession or assignment.

⁴¹⁶ *Id.* at Art. 29, Bis. 4.

(3) *Rights to Groundwater.*

Groundwater brought to the surface by artificial means (as opposed to naturally discharging water, such as springs) was historically open for free, unlimited capture (*libre alumbramiento*), without a permit or concession, so long as the user advised CONAGUA of the withdrawal.⁴¹⁷ The LAN affirms that groundwater may freely be brought to the surface, unless the federal government establishes a regulated zone or temporarily suspends the *libre alumbramiento*.⁴¹⁸

Limitations apply when the groundwater is situated within a federally-established regulated zone of conservation or reserve, or a temporary restriction on withdrawals is imposed.⁴¹⁹ The President may establish *zonas de veda* (conservation zones) when surface or groundwater is being overexploited, in times of drought, or in certain emergent situations caused by water contamination or other damaging water extractions.⁴²⁰ Circumstances qualify a zone for regulation when either:

- (1) maintaining or increasing surface or groundwater withdrawals will affect the sustainability of the resource and risk inducing economic or environmental harm to the sources of water or users of those sources in the zone; or
- (2) protecting the quality of the water within the source or aquifer requires prohibiting or limiting withdrawals.⁴²¹

The decree establishing a *zona de veda* should explain the harm that the hydrological ecosystem has suffered within the zone and instruct CONAGUA to set conditions, forms, and limitations for water extraction or discharge within the zone, whether temporary or permanent.⁴²² Further, the decree sets forth an annual fixed volume of water that may be extracted in the zone without causing the identified harms.⁴²³ Protective zones may also be established when the federal executive deems it necessary to reserve part or all of the water in an area in order to secure water domestic or public urban use; generate electricity for public use; or to guarantee minimum flows for

⁴¹⁷ CONAGUA, *Suspensión Provisional del Libre Alumbramiento*, GOB.MX (June 9, 2015), <https://www.gob.mx/conagua/acciones-y-programas/suspension-provisional-del-libre-alumbramiento-66099>; see also LAN, *supra* note 355, at Art. 18; CONSTITUCIÓN DE MÉXICO, Art. 27.

⁴¹⁸ *Id.* at Art. 18.

⁴¹⁹ LAN REG., *supra* note 394, at Art. 18; see also Jose Ramon Diaz Cossio, *Constitutional Framework for Water Regulation in Mexico*, 35 NAT. RES. J. 489, 496 (1995).

⁴²⁰ LAN, *supra* note 355, at Art. 39 Bis.

⁴²¹ *Id.*

⁴²² *Id.* at Art. 40.

⁴²³ *Id.*

ecological conservation and restoration.⁴²⁴ Once a regulated zone is established, groundwater users must have in place a water right to withdraw within the zone, a management program to exploit the aquifer, and a CONAGUA-granted permit for any well the user perforates, repositions, or deepens after the date the zone was instituted.⁴²⁵

Under Article 81 of the LAN, the exploitation, use, and development of groundwater contained in geothermal formations requires a permit and concession from CONAGUA and an environmental impact authorization.⁴²⁶ Permit conditions are governed by Article 2 (XVI) of the Geothermic Energy Law.

(4) *Suspension of Free Exploitation*

On April 5, 2013, the Mexican government temporarily suspended the unlimited use of groundwater in aquifers where the practice was most prevalent; as of 2015, 333 aquifers underlying 45% of the nation's territory had their *libre alumbramiento* suspended.⁴²⁷ Of the five aquifers in the study area considered most likely to be transboundary with Texas, only one—the Valle de Juárez aquifer in Chihuahua—has been officially suspended.⁴²⁸ However, even where the suspension is in effect, it only applies to new wells, meaning that those wells that existed as of the moratorium are essentially grandfathered in to allow unrestricted water withdrawal from them.

(5) *Priority.*

Mexico's federal water law details thirteen priorities for water use purposes that CONAGUA measures in considering whether to approve a concession or assignment, as follows:

- (1) Domestic;
- (2) Urban Public;
- (3) Livestock;
- (4) Agricultural;

⁴²⁴ *Id.* at Art. 41.

⁴²⁵ *Id.* at Arts. 42, 43; *see also* Judith Domínguez & J. Joel Carrillo-Rivera, *El Agua Subterránea Como Elemento de Debate en la Historia de México*, at 17–18, in *MÉXICO EN TRES MOMENTOS: 1810-1910-2010*, UNAM (2007).

⁴²⁶ LAN, *supra* note 355, at Art. 81.

⁴²⁷ *Suspensión Provisional del Libre Alumbramiento*, CONAGUA: ACCIONES Y PROGRAMAS—AGUA SUBTERRÁNEA (June 9, 2015), <https://www.gob.mx/conagua/acciones-y-programas/suspension-provisional-del-libre-alumbramiento-66099> (last accessed Feb. 1, 2018).

⁴²⁸ *See* SEMARNAT, *General Agreement that temporarily suspends the “libre alumbramiento” of national underground waters in the indicated aquifers*, at Art. 3(I)(n) (Apr. 15, 2013).

- (5) Ecological conservation use or environmental use;
- (6) Generation of electricity for public service;
- (7) Industrial;
- (8) Aquaculture;
- (9) Generation of electricity for private service;
- (10) Wash and landfill;
- (11) Application for tourism, recreation and therapeutic purposes;
- (12) All-purpose; and
- (13) Other.⁴²⁹

This priority list is used in application approval and does not, as in some states in the U.S., function as a legal mechanism directing the order in which water should be allocated in times of scarcity.

(6) *Groundwater Rights Transferrable.*

Water rights under concession may be transmitted separately from the property where the right originates, and the use may also be changed. An additional rationale for allowing such transmissions is to encourage industrial development.⁴³⁰ However, the volumes of groundwater withdrawn under the transmitted right must still come from the same aquifer as the original water right.⁴³¹ And when a rights holder seeks to change only the use of the water—and not the volume extracted, the point of diversion, the point of discharge, or the volume or quality of wastewater discharged—they can do so freely, so long as they notify CONAGUA within ten days.⁴³² Unlike concessions, assignments are not transferable, meaning that a municipality may not assign its right to another municipality.

(7) *Discharge Permits*

Municipal and state governments in Mexico bear responsibility for contamination in wastewater discharges that enter drainage and sewage systems, but individuals and legal entities are responsible for wastewater discharges into a receiving body of the

⁴²⁹ LAN, *supra* note 355, at Transitory Art. 15.

⁴³⁰ *Estructura Institucional y Legal para la Administración del Agua en el Siglo XX*, CÁMARA DE DIPUTADOS (2003), <http://www.diputados.gob.mx/bibliot/publica/inveyana/polisoc/dps03/7estruc.htm> (last accessed Feb. 1, 2018).

⁴³¹ LAN, *supra* note 355, at Art. 34; LAN Reg., *supra* note 394, at Art. 64; *see also* CÁMARA DE DIPUTADOS (2003), *supra* note 430.

⁴³² LAN Reg., *supra* note 394, at Art. 43.

nation's waters.⁴³³ The LAN Reg. requires parties to obtain discharge permits for discharges that exceed pollutant limitations set by the Federal Law on Water Excise Taxes.⁴³⁴ When an entity that is legally obligated to treat water contracts with or uses services of a business to undertake treatment, the business must secure the discharge permit and comply with permit requirements.⁴³⁵ It is unclear whether wastewater discharge permits are transmissible with permission from CONAGUA, like concessions, or non-transmissible, like assignments.

As a base on which to fix the particular conditions of a discharge, CONAGUA determines for each body of water: (1) the parameters that discharges should adhere to; (2) the capacity of the receiving body to assimilate and dilute contaminants; and (3) the maximum limits of discharge for the analyzed contaminants.⁴³⁶ A discharge permit for wastewater that originates through the use or development of national water lasts at least as long as the concession or assignment of the corresponding water right and should satisfy the original water right's rules.⁴³⁷ However, CONAGUA will suspend wastewater discharge permits when:

- (1) a party does not comply with permit requirements;
- (2) wastewater quality does not follow corresponding Mexican Official Norms (standards called "NOM"s) or permit conditions;
- (3) A user fails to pay for the wastewater discharge for more than one fiscal year;
- (4) the person responsible for the discharge uses a process of dilution to treat wastewater discharge in order to comply with NOMs or permit conditions;
- or
- (5) when the user fails to present two years of information including the analysis and quality indicators of the water discharged.⁴³⁸

Causes for revoking the discharge permit include where: the discharge is done in a different location than authorized; certain acts or omissions occurred after activities were previously suspended for the same reason; or the concession or assignment

⁴³³ The definition of "national waters," for purposes of wastewater discharge, includes rivers, dams, lakes, marshes, wetlands, and oceans, as well as aquifers where wastewater may infiltrate. LAN, *supra* note 355, at Art. 47; *see also* CÁMARA DE DIPUTADOS (2003), *supra* note 430.

⁴³⁴ LAN, *supra* note 355, at Arts. 47, 1(XVII).

⁴³⁵ LAN Reg., *supra* note 394, at Art. 146.

⁴³⁶ LAN, *supra* note 355, at Art. 87.

⁴³⁷ *Id.* at Art. 90.

⁴³⁸ *Id.* at Art. 92.

underlying the discharge has been revoked.⁴³⁹ Failing to pay the concession or assignment underlying the discharge permit is also grounds for revoking the discharge permit.⁴⁴⁰

Several users are exempt, however. Agricultural users do not have to obtain a discharge permit;⁴⁴¹ even so, this does not dispense with their obligation to meet federal standards for water quality.⁴⁴² However, communities with populations less than 2,500 do not have to submit technical analyses demonstrating that the quality of the water they discharge falls within these federal norms.⁴⁴³ Also exempt are businesses that do not discharge water containing pollutants, if their daily water discharges are less than 300 cubic meters.

Reuse under the LAN Reg. is encouraged. The LAN Reg. enables holders of a water right or discharge permit to allow third parties to use their wastewater, provided that the water is used before the point of discharge specified under the associated concession, assignment, or discharge permit.⁴⁴⁴

c. Federal Water Rights Law.

(1) *Water Use Fees and Wastewater Discharge Fees.*

Even with the right to use or discharge water, those who do so must pay fees to do so. The rates demanded vary based on the user's identity, whether the user is a private concession holder or a public entity such as a municipality, the amount of water used, the intended purpose, and on the availability or scarcity of water of useable quality.⁴⁴⁵ CONAGUA computes the tax rate for groundwater by measuring the depth of water withdrawn from the aquifer during a three-month period, against the energy used in the withdrawal, to arrive at the volume in cubic meters of water extracted.⁴⁴⁶ The fee schedule assigns different rates per cubic meter, based on four "zones of availability" and considers the particular aquifer within the zone where the user extracts groundwater.⁴⁴⁷ Determining the level of availability used to classify a zone incorporates hydrogeologic

⁴³⁹ *Id.* at Art. 93.

⁴⁴⁰ *Id.* at Art. 93 Bis.

⁴⁴¹ LAN Reg., *supra* note 394, at Arts. 21, 48.

⁴⁴² *Id.* at Art. 30. Parameters for wastewater discharge are set forth in NOM-001-ECOL/96.

⁴⁴³ *Id.* at Arts. 192-D, 223 Bis.

⁴⁴⁴ *Id.* at Art. 33.

⁴⁴⁵ FEDERAL WATER RIGHTS LAW, *supra* note 358, at Art. 223.

⁴⁴⁶ *Id.* at Art. 226.

⁴⁴⁷ *Id.* at Art. 223-A.

considerations, as it compares the average groundwater available annually in a hydrologic region with the balance of water after total recharge and discharge attributed to the region.⁴⁴⁸ As of 2014, studies showed that the Chihuahuan Valle de Juárez aquifer crossing the Texas border has no availability.⁴⁴⁹

(2) *Pollution Discharge Fees.*

Discharging contaminants into water in quantities beyond effluent limits set under the Federal Law on Water Excise Taxes requires paying a fee for each kilogram of contamination that exceeds the threshold. Effluent limits measure such pollutants as fecal coliforms, total suspended solids, pH, total nitrogen and phosphorus, heavy metals, and cyanides.⁴⁵⁰ Like water usage and discharge taxes, small rural communities are exempt from pollution taxes. Additionally, those who submit a wastewater treatment proposal to CONAGUA do not have to pay the pollution fee.

(3) *Exemptions*

Indeed, the law exempts several categories of users, in part or in full. Rural communities with populations under 2,500 are exempt from these use and discharge fees for agricultural or domestic water usage.⁴⁵¹ Taxes make federal funds available to communities to cover capital costs. Communities operate entirely on state or federal funds; those above 2,500 and below 50,000 people receive some federal and state funding but must shoulder the remaining costs, and those greater than 50,000 in number either rely on loans or exchange concessions to private firms in order to finance the capital costs.⁴⁵² Transporting water out of a zone of availability subjects importing users to an additional premium based on the rates that apply to water withdrawal in the originating zone.⁴⁵³

⁴⁴⁸ *Id.* at Art. 231-II; see also Abdon Hernandez, *Water Law in the Republic of México*, 11 U.S.-MEX. L.J. 15, 26 (2003).

⁴⁴⁹ CONAGUA, ATLAS DEL AGUA EN MÉXICO (2015), at 48, <http://www.conagua.gob.mx/CONAGUA07/Publicaciones/Publicaciones/ATLAS2015.pdf> (last accessed Feb. 1, 2018).

⁴⁵⁰ Cecilia Tortajada, *Legal and Regulatory Regime for Water Management in Mexico and its Possible Use in Other Latin American Countries*, IWRA, 24 WATER INT'L. 316, 320 (1999).

⁴⁵¹ FEDERAL WATER RIGHTS LAW, *supra* note 358, at Art. 192-D.

⁴⁵² Tortajada, *supra* note 450, at 320.

⁴⁵³ FEDERAL WATER RIGHTS LAW, *supra* note 358, at Art. 223-Bis.

d. Federal Environmental Laws

In recent decades, Mexico has enacted significant environmental laws that form an arguably more modern framework than that of the United States. Title VII of the LAN makes any person or entity that uses the nation's waters responsible for preventing the water's contamination and, in the event contamination occurs, to return water to the state it was in before the user polluted it.⁴⁵⁴ As a way to carry out the LAN's declarations, the federal government has put in place two primary laws that incorporate protections for water to guard against pollution and preserve environmental flows and aquatic conditions of the nation's ecosystems. The General Ecology and Environmental Law imposes strict liability on those responsible for a contaminated site, while specifically featuring groundwater and aquifer protection as threshold criteria evaluated in whether to authorize the use of natural resources. The Federal Law of Environmental Responsibility provides causes of action by and against various parties to hold them responsible for environmental damage, including economic and criminal penalties.

Unlike the U.S. government's approach to environmental law that gives the standard-setting role to federal authorities and in some cases leaves primary enforcement to the states, Mexico sets environmental standards laws that it enforces, while states may enact their own, more stringent environmental regulations.

(1) General Law of Ecological Balance and Environmental Protection (“LGEEPA” and the “Waste Law”)

(a) Generally

LGEEPA (Ley General del Equilibrio Ecológico y Ambiental) sets forth guidelines for environmental protection policy;⁴⁵⁵ environmental standards related to water quality; environmental contingencies and civil protection; natural protected areas; and climate change mitigation and adaptation actions.⁴⁵⁶ It also guarantees to communities, including indigenous pueblos, the right to the protection, preservation, use, and sustainable development of natural resources and the safeguarding and use of biodiversity, in accordance with how the law determine it.⁴⁵⁷ Under the LGEEPA, the

⁴⁵⁴ LAN, *supra* note 355, at Art. 85.

⁴⁵⁵ *Id.*

⁴⁵⁶ LGEEPA, Art. 5 (1988), last reformed Sept. 1, 2015.

⁴⁵⁷ *Id.* at Art. 15.

federal government maintains enforcement responsibility for discharges made into national water bodies, leaving states responsible for discharges made from their states, and charging municipalities with responsibility for water discharged to the sewerage systems.⁴⁵⁸ Mexico's water laws do not specifically address "diffuse" or non-point sources of water contamination generally, but LGEEPA does make SEMARNAT responsible for wastewater from non-point sources discharged into marine waters.⁴⁵⁹

(b) The "Waste Law" under LGEEPA

The Waste Law, like CERCLA in the U.S., holds owners, possessors, and operators of a contaminated site strictly liable for its cleanup. Before the Waste Law, only those parties deemed to have caused the contamination were responsible for the site's cleanup. Now, SEMARNAT must expressly authorize the transfer of land contaminated by hazardous waste. Authorization is forbidden unless site cleanup has been completed or the parties to the land transaction have agreed to a cleanup plan. Further, transferors must disclose to potential third-party buyers or tenants any information that the transferor knows about hazardous materials or waste that may have contaminated the site.⁴⁶⁰ Even if they comply, strictly liable parties may still face criminal or administrative sanctions.⁴⁶¹

(c) Application to Groundwater

Mexico's LGEEPA goes beyond the United States' laws by directly including maintaining groundwater recharge as one of four criteria for sustainable water exploitation.⁴⁶² To be considered sustainable, water exploitation must consider:

- (1) the protection of the aquatic ecosystems and the equilibrium of the natural elements that intervene in the hydrologic cycle;
- (2) the sustainable development of natural resources that comprise aquatic ecosystems should be in a manner that does not affect its ecological balance;
- (3) that, in order to maintain the integrity and balance of the natural elements that intervene in the hydrologic cycle, it must protect forested and jungle surfaces

⁴⁵⁸ *Id.* at Art. 119 Bis.

⁴⁵⁹ *Id.* at Art. 130.

⁴⁶⁰ Anthony J. Maggio, *Mexico: Environmental Due Diligence and the Mexican Waste Law*, EHS JOURNAL (Nov. 13, 2010), <http://ehsjournal.org/anthony-j-maggio/mexico-environmental-due-diligence-and-the-mexican-waste-law/2010/>.

⁴⁶¹ LGEEPA, *supra* note 456, at Art. 3 (referring to sanctions available under the Federal Law on Environmental Responsibility); *see also* discussion in Section III(D)(2)(d)(2), *infra*.

⁴⁶² *Id.* at Art. 88.

and areas and basic flows of water currents, as well as the recharge capacity of the aquifers; and

- (4) that the preservation and sustainable development of water, just like the aquatic ecosystems, is the responsibility of users like those who create infrastructure or activities that affect such resources.⁴⁶³

CONAGUA must consider these criteria when reviewing concession applications, permits, and authorizations for using natural resources; establishing regulated zones; creating policies for establishing endangered aquatic species protections or protected fishing areas; and in developing the National Water Plan.⁴⁶⁴ Instances of groundwater contamination are considered public information and must be recorded in a database that should be available to the relevant authority to be considered in issuing permits and concessions, including states and municipalities where applicable.⁴⁶⁵

The LGEEPA expressly incorporates groundwater contamination prevention into its mandate, declaring that “the prevention and control of water contamination is fundamental to avoid the reduction of its availability and to protect the nation’s ecosystems.”⁴⁶⁶ The criteria expressed in this mandate guide the federal NOMs, establishment of regulated zones, and the process granting concessions, assignments, and permits.⁴⁶⁷ In order to prevent water contamination, the LGEEPA enables both federal and local regulation of infiltrations that affect strata containing aquifers.⁴⁶⁸ Further, it requires that all contaminated waters must be treated under a CONAGUA (or local) permit before being discharged into groundwater reservoirs.⁴⁶⁹ All wastewater from urban, industrial, or agricultural use that is discharged in any way that infiltrated into aquifers must be of a quality necessary to avoid contaminating the receiving body, interfering with water treatment processes, or altering correct exploitation or hydraulic system functioning, including those used to extract groundwater.⁴⁷⁰

In addition to these provisions and the Waste Law’s mechanism for holding those responsible who allow contamination on a site to infiltrate into groundwater, the

⁴⁶³ *Id.* at Art. 88.

⁴⁶⁴ *Id.* at Art. 89.

⁴⁶⁵ *Id.* at Art. 109 Bis.

⁴⁶⁶ *Id.* at Art. 117(I).

⁴⁶⁷ *Id.* at Art. 118.

⁴⁶⁸ *Id.* at Art. 120(VI).

⁴⁶⁹ *Id.* at Art. 121.

⁴⁷⁰ *Id.* at Art. 117(IV).

LGEEPA establishes express defenses for environmental flows in zones of natural protection.⁴⁷¹

(2) Federal Law of Environmental Responsibility
(“LFRA”)

(a) Generally.

The LFRA (Ley Federal de la Responsabilidad Ambiental) provides substantive requirements for holding individuals and companies responsible to restore the environment and compensate damaged parties.⁴⁷² When ecosystems, habitats, and natural resources are damaged, the responsible party must compensate for damage, seeking to return the environment to the state it was in prior to the damage.⁴⁷³ When restoration of the specific environment harmed is materially impossible, the reparation may be carried out instead on an ecologically and geographically linked site that will benefit the affected community.⁴⁷⁴ The LFRA also provides methods for calculating exemplary damages when warranted as economic sanctions, and claims are pursuable under LFRA through judicial procedures as well as alternative dispute resolution.⁴⁷⁵

Parties with standing to allege LFRA claims include:

1. Individuals who live in communities adjacent to the environmental damage;
2. Nonprofit Mexican legal entities engaged in environmental protection have standing to pursue claim on behalf of affected communities;
3. The federal government itself through the Federal Environmental Protection Agency ("PROFEPA"); and
4. The Environmental Protection Agencies or analogous institutions in the corresponding state or the Federal District.⁴⁷⁶

Potentially responsible parties may be individuals or legal entities, and those entities are responsible for harm caused by any representatives, administrators, managers,

⁴⁷¹ *Id.* at Art. 49.

⁴⁷² LFRA, Art. 3 (2013); *see also* Mauricio Llamas & Antonio González, *Enactment of the Federal Law on Environmental Liability in Mexico*, JONESDAY.COM (June 2013), <http://www.jonesday.com/enactment-of-the-federal-law-on-environmental-liability-in-mexico/>

⁴⁷³ LFRA, *supra* note 472, at Art. 3; *see also* Llamas & González (2013), *supra* note 472.

⁴⁷⁴ LFRA, *supra* note 472, at Art. 17 (2013).

⁴⁷⁵ *Id.* at Arts. 19–23.

⁴⁷⁶ *Id.* at Art. 28.

directors, employees, and anyone else exercising control over operations within the scope of their employment.⁴⁷⁷ Harm caused by a failure to avoid damage is attributable against a party when a law, contract, guaranty, or the party's prior conduct imposed an affirmative duty to avoid harm.⁴⁷⁸ Multiple responsible parties may be held jointly and severally liable.⁴⁷⁹ SEMARNAT and the Attorney General for Environmental Protection are charged with its enforcement.⁴⁸⁰

(b) Application to Groundwater.

Under the LFRA, “environmental damage” is defined as the measurable loss, change, deterioration, harm, effect, or modification of habitats, ecosystems, natural elements, and resources, including their chemical, physical, and biological conditions and the interaction between them, as well as the services they provide to the environment.⁴⁸¹ Thus, when the interrelationship between surface and groundwater resources or the ecosystems that include groundwater are measurably harmed, the resulting environmental damage would be actionable under the LFRA.

(c) Exceptions.

Exceptions exist to the concept of environmental “damage,” as understood by the LFRA. The law does not recognize “environmental damage” where the responsible party previously revealed and identified the deficiency or impairment and agreed to conditions SEMARNAT imposed after evaluating the threat posed.⁴⁸² This exception will not apply if the corresponding party does not comply with the mentioned conditions.⁴⁸³ Further, certain harms are criminally punishable under Mexico's federal penal code.⁴⁸⁴

Further, environmental compensation will not be demanded when total or partial reparation is materially or technically impossible, or when three elements are met:⁴⁸⁵

- (1) the harm was caused by an illegal activity or project that was required to undergo an environmental impact evaluation before being authorized;

⁴⁷⁷ LFRA, *supra* note 472, at Art. 24.

⁴⁷⁸ *Id.* at Art. 25.

⁴⁷⁹ *Id.* at Art. 26.

⁴⁸⁰ *Id.* at Art. 18.

⁴⁸¹ *Id.* at Art. 2(III).

⁴⁸² Llamas & González (2013), *supra* note 472.

⁴⁸³ *Id.*

⁴⁸⁴ LFRA, ART. 52.

⁴⁸⁵ *Id.* at Art. 14.

- (2) SEMARNAT has evaluated the harm caused and determined it is likely to continue in the future; and
- (3) where SEMARNAT has retroactively authorized the illegal project or activity as able to be cooperatively managed in a sustainable fashion that adheres to environmental laws and policies.⁴⁸⁶

In that case, automatic economic sanctions attach, without possibility of reduction.⁴⁸⁷

e. 2002 Rural Energy Law.

(1) *Generally.*

The 2002 Rural Energy Law calculates caps for the amount of energy in kilowatt hours (kWh) individual wells should use annually under a concession. Based on the depth of the water table under the well and a “fixed electro-mechanical efficiency,” the calculation determines a volume equivalent to the annual amount concessioned for that particular well.⁴⁸⁸ The purpose of the law was to reduce pumping costs for agricultural users, rather than to limit groundwater withdrawals.⁴⁸⁹

(2) *Tariffs.*

Under the energy law, users are assessed tariffs based on whether their annual energy usage falls under or over their limit; those under their limit are charged a \$0.30 (Mex.) fixed rate, and the rate for those exceeding it increases incrementally.⁴⁹⁰ The CFE’s tariff rates vary depending on the type of connection used, the time of day energy is consumed, and in what region the well sits.⁴⁹¹ One subsidized tariff (or “Tarifa 09”) applies to water pumped for use in agricultural irrigation,⁴⁹² “Tarifa 09-N,” however, is a “special night-time stimulus tariff” assessed for pumping that occurs between midnight

⁴⁸⁶ *Id.* at Art. 14(II).

⁴⁸⁷ *Id.*

⁴⁸⁸ Christopher A. Scott, & Tushaar Shah, *Groundwater Overdraft Reduction through Agricultural Energy Policy: Insights from India and Mexico*, 20 Water Resources Development (No. 2) 149, 151 (2004); *see also* COMISIÓN FEDERAL DE ELECTRICIDAD, *Tarifas para riego agrícola (2016–2017)*, http://app.cfe.gob.mx/Aplicaciones/CCFE/Tarifas/Tarifas/tarifas_negocio.asp?Tarifa=CMAA&Anio=2017.

⁴⁸⁹ Scott & Shah (2004), *supra* note 488, at 159.

⁴⁹⁰ *Id.* at 161.

⁴⁹¹ Christopher A. Scott, *Electricity for Groundwater Use: Constraints and Opportunities for Adaptive Response to Climate Change*, 8 ENVTL. RES. LETT. 4 (2013).

⁴⁹² *Id.*

and 8:00a.m. if the water it extracts is intended for use in agricultural irrigation.⁴⁹³ For comparison, while tariffs for low-tension general use are \$4.20 (Mex.),⁴⁹⁴ Tarifa 09 averages \$0.86 (Mex.) per kWh.⁴⁹⁵ and the average Tarifa 09-N rate is only \$.70 (Mex.) per kWh.—a subsidy that discounts daytime electricity used in agricultural groundwater pumping more than four times what general users pay, and overnight pumping an additional 25%.

f. SAGARPA Subsidies

In addition, Mexico's agriculture authority is the Department of Ranching, Agriculture, Rural Development, Fishing, and Food or Secretaría de Ganadería, Agricultura, Desarrollo Rural, Pesca y Alimentación ("SAGARPA"). SAGARPA offers applicants who qualify a subsidy of \$.04 (Mex.) per kWh toward electricity consumed in pumping groundwater for agricultural use.⁴⁹⁶ These subsidies are intended to promote agriculture, which in many areas relies on groundwater that is expensive to pump, because (in comparison with rates in Texas) the costs of electricity required to run water pumps is quite high in Mexico.⁴⁹⁷

g. Official Standards Related to Groundwater

Normativas Oficiales de Mexico ("NOM"s) are official standards that prescribe actions required to comply with underlying laws or regulations, creating measurable ways to enforce the nation's laws. In addition to NOMs, Normas Mexicanas ("NMX"s) are guidelines for how agencies should measure various standards.

(1) *Contaminant Limits*

Federal NOMs set limits for the maximum concentration of contaminants permissible in wastewater discharged to national waters⁴⁹⁸ and sewer systems,⁴⁹⁹ and

⁴⁹³ *Id.*

⁴⁹⁴ *Id.*

⁴⁹⁵ *Id.*; see also CFE (2016–2017), *supra* note 488.

⁴⁹⁶ SAGARPA, I DIARIO OFICIAL 1.3.1 (June 21, 2007).

⁴⁹⁷ See, e.g., Nicholas Casey, *Mexico Proposes Opening Up Electric Sector to Competition*, WSJ.COM (Aug. 3, 2013, 9:15 p.m.), <https://www.wsj.com/articles/mexico-proposes-opening-up-electric-sector-to-competition-1376442904> (last accessed Feb. 1, 2018).

⁴⁹⁸ NOM-001-SEMARNAT-1996; see also NOM-001-ECOL-1996 (establishing maximum permissible contaminant limits in wastewater discharges into national waters and assets).

⁴⁹⁹ NOM-002-SEMARNAT-1996.

reused in public services;⁵⁰⁰ they also set limits for heavy metals and other contaminants in soil.⁵⁰¹ When certain heavy metals⁵⁰² exceed the limits under NOM-147, the SEMARNAT considers the site to be contaminated and remediation is required. The NOM-147 process targets primary and secondary contamination sources to assess whether rigorous remediation will be required. First, Phase I characterizes the site and identifies primary sources of contamination—those at the surface of the soil. Naturally occurring metals can even pose a risk to human health, so Phase I seeks to distinguish contaminants arising from a human source that can be attributed to a responsible party from non-anthropogenic ones.⁵⁰³

After identifying primary sources of contamination, Phase I investigates possible contaminant transport pathways, examining infiltration and percolation toward groundwater.⁵⁰⁴ These are considered secondary contamination sources.⁵⁰⁵ NOM-147 also identifies processes whereby contaminants are dissolved into groundwater to be secondary mechanisms of contamination.⁵⁰⁶ Phase II determines the risk posed by the contamination to assess the level of remediation required. The only risk targeted for monitoring contamination in groundwater, however, is the risk to human health through drinking water withdrawn from wells.⁵⁰⁷ As a result, the standards reflect those levels calibrated to protect human health but do not aim to protect the broader environment.⁵⁰⁸

(2) *Preventing Contamination through Wells and Septic Tanks*

To address the potential threat of contamination posed when improperly constructed or maintained wells and septic tanks permit contaminated fluids to infiltrate into neighboring aquifers and the surrounding environment, CONAGUA establishes minimum construction standards for water wells.⁵⁰⁹ Those standards include requiring all those drilled to produce water for agriculture, agroindustry, domestic, aquaculture,

⁵⁰⁰ NOM-003-SEMARNAT-1997.

⁵⁰¹ NOM-147-SEMARNAT-2006.

⁵⁰² NOM-147-SEMARNAT-2006 lists arsenic, barium, beryllium, cadmium, chrome VI, mercury, nickel, silver, lead, selenium, thallium, and vanadium as heavy metal contaminants subject to the prescribed limitations.

⁵⁰³ NOM-147-SEMARNAT-2006, at App. A(II)(1),(2).

⁵⁰⁴ *Id.*

⁵⁰⁵ *Id.* at App. A(II)(6)(c).

⁵⁰⁶ *Id.* at App. A(II)(6)(d).

⁵⁰⁷ *Id.* at App. A(II)(6).

⁵⁰⁸ *Id.*

⁵⁰⁹ NOM-003-CNA-1996 § 0; NOM-004-CNA-1996 § 0; NOM-006-CNA-1996 § 0.

service, industrial, fishing, public purposes.⁵¹⁰ Specific additional requirements apply to maintenance, reworking, or closure processes undertaken on *all* exploration, production, or monitoring wells that partially or completely penetrate an aquifer.⁵¹¹ CONAGUA also sets installation and testing protocols for prefabricated domestic septic tanks, to avoid contaminating underground water sources.⁵¹²

Specific to the oil and gas industry, NOM-143-SEMARNAT-2003 establishes specifications for managing water associated with hydrocarbon formations.⁵¹³ The regulation incorporates reference to several other water-related regulations, including specifications and requirements for maximum permissible contaminant limits in wastewater discharges;⁵¹⁴ for protecting aquifers during maintenance and repair of water wells;⁵¹⁵ and for environmental protection that during well-drilling within agricultural zones outside of forests and protected natural areas.⁵¹⁶

(3) *Environmental Flows*

The LAN instructs that the national hydrology plan must respect “environmental uses,” which it defines as “the minimum flow or volume required in receiving water bodies, including streams or reservoirs, or the minimum flow of natural discharge from one aquifer that must be maintained to protect environmental conditions and the ecological balance.”⁵¹⁷ After 10 years in the works, CONAGUA published the Environmental Flow Standard (NMX-AA-159-SCFI-2012), which provides a way to calculate such minimum flows for use in designing consumptive-use infrastructure projects and in assessing groundwater availability for water resource management policies.

The Environmental Flow Standard defines “environmental flows” as “the quantity, quality, and flow variations or water levels required to preserve environmental services, components, functions, processes, and the resilience of aquatic and terrestrial eco-systems.”⁵¹⁸ This language is broad enough to encompass the independent

⁵¹⁰ NOM-003-CNA-1996 § 2.

⁵¹¹ NOM-004-CNA-1996 § 2.

⁵¹² NOM-006-CNA-1996 §§ 0–2.

⁵¹³ NOM-143-SEMARNAT-2003.

⁵¹⁴ NOM-001-ECOL-1996.

⁵¹⁵ NOM-003-CNA-1996.

⁵¹⁶ NOM-115-SEMARNAT-2003.

⁵¹⁷ María Antonieta Gómez-Balandra, et al., *The Mexican Environmental Flow Standard: Scope, Application and Implementation*, 5 J. ENVTL. PROTECTION 71–72 (2014).

⁵¹⁸ NMX-AA-159-SCFI-2012 § 4.6.

ecosystems of aquifers and their connectedness to surface ecosystems. Because this guidance emerged as a result of CONAGUA seeking ways to measure groundwater availability, the calculus can now account for things like an aquifer's natural discharge and recharge.⁵¹⁹

(4) *Artificial Aquifer Recharge Standards*

Mexico's federal water authority recognizes the value of human-driven aquifer renewal, providing NOM standards for artificial aquifer recharge⁵²⁰ and infiltration.⁵²¹ In the introduction to NOM-014, CONAGUA states that groundwater is a vital resource for the development of all of Mexico's sectors and that in many cases an aquifer's hydrogeology can make its recharge rate so slow that its groundwater may be considered a "fossil" resource.⁵²² As a result, CONAGUA values aquifer recharge as an essential part of an integrated strategy for groundwater administration.⁵²³ NOM-014 sets water quality standards for treated wastewater introduced artificially into underground reservoirs,⁵²⁴ whereas under NOM-015, systems designed to encourage surface runoff and stormwater to infiltrate aquifers must be monitored to ensure acceptable water quality at the point it enters the subsurface.⁵²⁵ Both NOMs also outline specifications for operating, maintaining, and monitoring the infrastructure used in the infiltration processes.

C. State

Where federal Mexican authority is not exclusive, there lies a narrow field of opportunity for states to govern groundwater within their jurisdictions. The LAN delineates certain instances that give Mexico's states flexibility to address concerns not undertaken by CONAGUA.

⁵¹⁹ Gómez-Balandra, et al., *supra* note 517, at 71–72.

⁵²⁰ NOM-014-CONAGUA-2003.

⁵²¹ NOM-015-CONAGUA-2005.

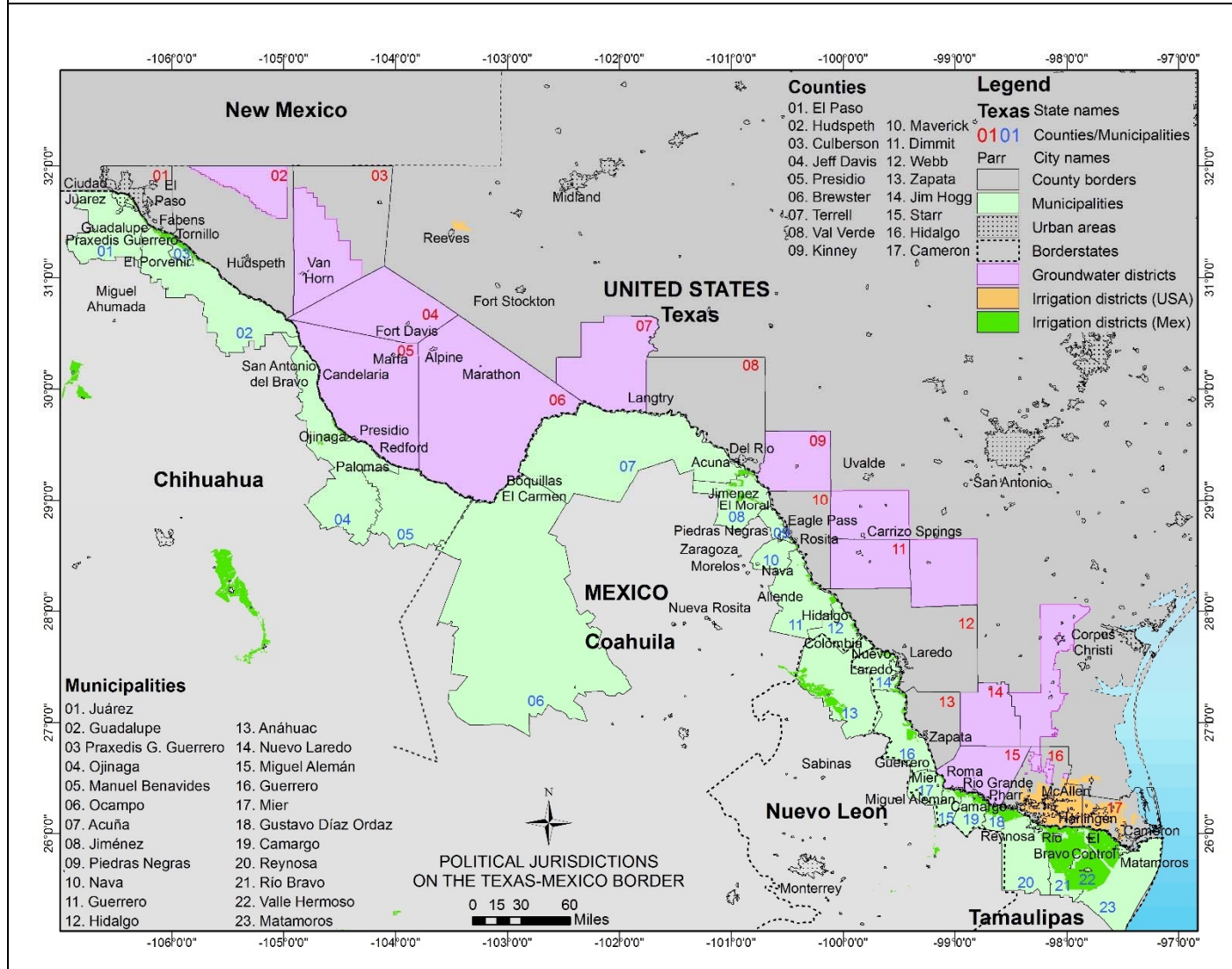
⁵²² NOM-014-CONAGUA-2003 § 0.

⁵²³ *Id.*

⁵²⁴ NOM-014-CONAGUA-2003 §§ 5, 6.3.1.

⁵²⁵ NOM-015-CONAGUA-2005 §§ 1.2, 2, 5.2.3.

**FIGURE 3. MAP SHOWING THE BOUNDARIES OF MEXICAN STATES
ALONG THE COUNTRY'S BORDER WITH TEXAS⁵²⁶**



⁵²⁶ Rosario Sanchez and Laura Rodriguez, Texas Water Resources Institute (2018).

1. State Water Commissions (“CEA”s)

a. Generally

Conceiving of what power the states may have under federal law to develop or regulate groundwater at the source is fraught with ambiguity. Although each state in the study area has some sort of state water law, the Mexican federation occupies the field of all water that could be considered “federal”—but many states have created water laws with provisions governing “waters of state jurisdiction.” The challenge is to identify water that is not deemed “federal.” The source of confusion is in Article 27 of Mexico’s constitution:

Whichever other waters not included in the prior enumeration are considered to be an integral part of the property of the lands through which they run or of those in which they are found deposited, but if they are located in two or more tracts, the development of this water will be considered of public utility and will remain subject to the regulations dictated by the States.⁵²⁷

Most of the states incorporating laws for waters of state jurisdiction mirror this language, without venturing any examples of what waters might be encompassed under this classification. Instead, the primary focus of most Mexican states’ water laws is on instructing their municipalities how to conduct water treatment, sanitation, and provision services; for this reason, few of the laws are within the scope of this survey.

The LGEEPA gives states some authority under Article 7 to regulate the sustainable development and to prevent contamination of waters of state jurisdiction.⁵²⁸ Given the firm federal legal framework concerning groundwater, the principal influence that states have over groundwater and the ecosystems reliant upon it is through establishing conservation zones and protected areas..⁵²⁹ The state may apply its law to concession or assignment-holders within the state’s boundaries, which may include municipalities, water utilities, or the private sector, such as industries. Each state’s water law sets out the authorities and duties of the central state authority and the municipal authorities, such as basic guidance for how municipalities or rural authorities should interact with any private utilities they use to provide water services.

⁵²⁷ CONSTITUTION OF MÉXICO, *supra* note 376, at Art. 27.

⁵²⁸ LGEEPA, *supra* note 456, at Art. 7.

⁵²⁹ José Luis Escobedo Sagaz, *Marco Institucional en la Cuenca del Río Bravo*, 4 EQUILIBRIO ECONÓMICO 41, 46 (2008).

b. CEAs and their Rules and Laws

(1) *Chihuahua (Junta Central de Agua y Saneamiento)*

(a) Generally Applicable Rules

Chihuahua directs its state water law at state and municipal users, as well as private sector users.⁵³⁰ For Chihuahua's "state waters,"⁵³¹ Chihuahua's water law includes state water regulations and policies declaring that water quality protection is in the public interest.⁵³² Under the state law, the executive power includes the right to regulate, prohibit, or reserve the use of state waters in certain situations declared to be in the public interest:

- (1) to prevent overexploitation,
- (2) to protect or restore ecosystems,
- (3) to protect state water from contamination, and
- (4) to restrict or prohibit their use in times of extraordinary drought.⁵³³

Water remains "state water" even while it is being treated or moved in infrastructure, or when it becomes waste water.⁵³⁴ Domestic use of state water takes priority in Chihuahua.⁵³⁵

The state's water law makes it obligatory for all those who own or possess urban buildings to use water and sanitation services.⁵³⁶ Industrial users are required to secure their own water right, and are permitted to install their own connecting infrastructure with permission of the related entity.⁵³⁷ Users with their own water right must make their water available for emergency purposes, and must connect to public utilities when required by the State to do so.⁵³⁸ All new subdivisions or residential developments are required to install the infrastructure needed to apply treated recycled water on greenspaces.⁵³⁹

⁵³⁰ LEY DEL AGUA DEL ESTADO DE CHIHUAHUA, Art. 1 (2012).

⁵³¹ *Id.* at Art. 3(I).

⁵³² *Id.* at Art. 78.

⁵³³ *Id.*

⁵³⁴ *Id.* at Art. 76.

⁵³⁵ *Id.* at Art. 79.

⁵³⁶ *Id.* at Art. 41.

⁵³⁷ *Id.* at Art. 42.

⁵³⁸ *Id.* at Art. 43.

⁵³⁹ *Id.* at Art. 48.

(b) Discharge Permits

Permits are available in Chihuahua to discharge wastewater that derives from nearly any use⁵⁴⁰ into sewer systems, but there is not a state law prohibiting users from discharging where there is not a sewer system, such as into aquifers or watercourses. Users may not generally discharge water containing substances classified as toxic or dangerous into sewer drains, but users discharging wastewater from industrial, commercial, or domestic processes that contains any of those substances may do so with a permit.⁵⁴¹ Such discharges are subject to the federal regulatory limits provided under the related NOMs, and those that exceed the NOM standards must be treated to comply.⁵⁴² Provisional permits last six months, and revocable permits last one year.⁵⁴³ Users must provide the operator of the sewage or drainage system with a plan for installing infrastructure to control water quality.⁵⁴⁴

(c) Use of Recycled Water

The state water law directs that treated wastewater may be used for certain named purposes, so long as the infrastructure for treated water is in place and the water's quality falls within the applicable norms.⁵⁴⁵ When water is treated for reuse in public distribution or agriculture, it must be treated to the highest quality level possible under the contaminant limitations.⁵⁴⁶

(d) Groundwater Specifics

The state water plan does consider how the actions and projects of the state and its municipalities interact, with the goal of developing basins and aquifers in an integrated manner, and of controlling and preserving the quality of groundwater.⁵⁴⁷ Likewise, the water plan must incorporate an assessment of its planning regions that considers the quantity and quality of groundwater within each basin, as well as its seasonal and locational variations.⁵⁴⁸

⁵⁴⁰ *Id.* at Art. 3 (IV).

⁵⁴¹ *Id.* at Arts. 55, 56.

⁵⁴² *Id.* at Arts. 56, 57.

⁵⁴³ *Id.* at Art. 51.

⁵⁴⁴ *Id.* at Art. 52.

⁵⁴⁵ *Id.* at Art. 60.

⁵⁴⁶ *Id.* at Art. 63.

⁵⁴⁷ *Id.* at Art. 74(VII).

⁵⁴⁸ *Id.* at Art. 75(I).

Chihuahua enacted a state Law of Ecological Equilibrium and Environmental Protection, which considers increasing aquifer recharge one of the facets of the ecological system requiring restoration in order to achieve balance.⁵⁴⁹ The state's environmental law assigns to municipalities the duty to promote forestation in areas of aquifer recharge.⁵⁵⁰

(2) *Coahuila (Comisión Estatal del Agua de Coahuila)*

The Coahuila state water law applies to municipalities when they engage in water administration.⁵⁵¹ Under the state law, end users of potable water, sewage, drainage, reuse, and wastewater discharge are obliged to pay tariffs set by the related providers of those services.⁵⁵² Exemptions or write-offs will not apply to these tariffs, which apply to individual users, federal, state, or municipal entities and governments, and institutions receiving public or private funding.⁵⁵³ Coahuila defines wastewater as water that, once used, has incorporated contaminants that have degraded its original quality.⁵⁵⁴ Wastewater that harms the environment's quality, whether from industrial, commercial, or any other use, must be treated before discharging it into the sewer system.

(3) *Nuevo León (Instituto del Agua del Estado de Nuevo León OPD)*

Nuevo León's water law, like Coahuila's, enables discharge permit processes to be developed, subject to NOM standards and LGEEPA compliance.⁵⁵⁵ These permit programs may grant and revoke permits (for a fee) to those who discharge wastewater into the drainage system from industrial, commercial, or service-derived uses and should require such discharges be treated first.⁵⁵⁶ Programs should also monitor and promote regulations aimed at keeping aquatic ecosystems contamination-free, to the same standards as potable water for domestic supply.⁵⁵⁷

⁵⁴⁹ LGEEPA, *supra* note 456, at Art. 84(III).

⁵⁵⁰ *Id.* at Art. 128.

⁵⁵¹ *Id.* at Article 1.

⁵⁵² LA LEY DE AGUAS PARA LOS MUNICIPIOS DEL ESTADO DE COAHUILA DE ZARAGOZA, Art. 11.

⁵⁵³ *Id.* at Art. 12.

⁵⁵⁴ *Id.* at Art. 1(V).

⁵⁵⁵ LEY DE AGUA POTABLE Y SANEAMIENTO PARA EL ESTADO DE NUEVO LEÓN, Art. 24 (2010).

⁵⁵⁶ *Id.*, at Art. 24 (I),(II), & (IV).

⁵⁵⁷ *Id.*, at Art. 24 (V).

(4) *Tamaulipas (Comisión Estatal del Agua de Tamaulipas)*

Article 154 of Tamaulipas' water law makes it unlawful to deposit, discharge, or allow to infiltrate into the subsurface any contaminated wastewater without first sending it through a treatment facility.⁵⁵⁸ In addition, it is illegal to waste potable water or toss wastewater into gutters, storm drains, sanitary discharge collectors, or wells used in the sanitation and drainage system.⁵⁵⁹ Tamaulipas's water law has several provisions that would apply to state water, if any were determined. For the present purposes, however, very few rules exist beyond those related to municipalities' utility services.

D. **Local**

1. **Overview:**

At the local level, extensions of the federal establishment commingle with community-centered entities. Articles 64 through 104 of the LAN enable the creation of agricultural water collectives and establishes the law that applies to the water rights held collectively by ejidos, rural communities, Water User Associations, and Irrigation Districts consisting of water users with aligned interests or reliant on the same physical resource.⁵⁶⁰ These smaller institutions often exist within larger municipalities and they may interact with one another on an informal or practical level. Still, federal responsibility exists at the local level—such as the obligation to maintain the main canals used by otherwise independent irrigation districts—though in practice, the nation's sheer size may make it difficult for CONAGUA to carry out the full extent of its authority at the local level.

2. **Municipalities**

In Mexico, “municipalities” are not merely towns and cities, such as the communities Texas uses the word to describe; they usually incorporate broad areas, more like Texas counties in scope. Many of those on the nation's border with Texas provide water and sanitation to users within their service areas. The municipalities have few or no mechanisms for governing groundwater beyond what federal laws, regulations, or

⁵⁵⁸ LEY DE AGUAS DEL ESTADO DE TAMAULIPAS, Art. 154 (2013).

⁵⁵⁹ *Id.*

⁵⁶⁰ *See generally* LAN, Arts. 64–104.

agency practices apply. The LGEEPA provides municipalities certain authority to control how they apply legal decisions related to the prevention and control of the contamination of waters discharged into drainage and sewage systems of population centers, to the extent state law permits.⁵⁶¹ Ensuring that their water supply sustains them through drought is a priority for most of these northern Mexican municipalities. For instance, Monterrey's Servicios de Agua y Drenaje de Monterrey ("SADM") considers repairing infrastructure to prevent water loss through old wells to be an important strategy for securing its underground water sources in the event that drought reduces available surface water.⁵⁶² Most municipalities, like the state governments that surround them, espouse policies of promoting legislation intended to protect their subterranean waters—and likewise, they are without authority under the federal regime to enact such legislation at a local level.

Twenty-one of the municipalities within the study area overlie aquifers that are, with reasonable confidence, identifiable as being transboundary with Texas.⁵⁶³ Despite the unlikelihood that these municipalities have rules in place beyond what the federal or state government allows, attempts were made to contact those municipal officials who could be identified, but none responded.

3. Rural

Rural water governance is generally subsumed by municipalities, states, or federal spheres but, at least in Chihuahua's case, the municipal authority empowered a rural branch to serve remote citizens. Las Juntas Rurales de Agua Potable are decentralized bodies of the Junta Central de Agua y Saneamiento, previously with distinct judicial and economic character and with their own development capacities, but now having only the structure and attributes granted to them by the Junta Central.⁵⁶⁴ The Rural Juntas are to coordinate community efforts to develop potable water, sanitation, and drainage.⁵⁶⁵ They have the authority to accept applications for new water connection projects, but they must

⁵⁶¹ LGEEPA, *supra* note 456, at rt. 8.

⁵⁶² ORGANISMO DE CUENCA RÍO BRAVO, PROGRAMA DE MEDIDAS PREVENTIVAS Y MITIGACIÓN CONTRA LA SEQUÍA, CIUDAD DE MONTERREY, NUEVO LEÓN 62 (2014).

⁵⁶³ See map in Sanchez et al. (2016), *supra* note 1, at 116. After looking to Sanchez' latest maps indicating the varying degrees of aquifer transboundariness, those with "reasonable confidence" were selected as a sample, and the boundaries for the municipalities were overlain to estimate which municipalities fell inside the boundaries of aquifers considered "reasonably confident" to be transboundary.

⁵⁶⁴ LEY DEL AGUA DEL ESTADO DE CHIHUAHUA, Art. 27 (2012); see also *id.* at 2nd Transitory Article (repealing the REGLAMENTO DE LAS JUNTAS RURALES DE AGUA POTABLE (1987)).

⁵⁶⁵ *Id.* at art. 4.

consult with the Central Junta before the Rural Juntas can approve projects.⁵⁶⁶ Once constructed, the Rural Juntas are responsible for maintaining them.⁵⁶⁷ They are also empowered to sanction any users for rule violations, and are authorized to act with those entities' authority.⁵⁶⁸ It is unclear, however, what rule violations exist other than those related to public water systems.

4. Ejidos, Irrigation Districts, and Water User Associations

Article 51 of the LAN lists requirements that apply to groups of users who wish to share the common use of national waters for purposes of irrigation, including ejidos and communities, irrigation districts, and irrigation units. The provision allows these groups to set rights and obligations for users;⁵⁶⁹ specify terms in which concessions may be transmitted;⁵⁷⁰ and declare proper methods to ensure water conservation and quality.⁵⁷¹

a. Ejidos

During the revolution of 1910, revolutionaries confiscated land that was later converted from centralized possession to distributed possession as part of the Agrarian Reform of 1915, abolishing the prior “*hacendado*” system, in which relatively few landowners controlled vast amounts of land under political or religious authority. These “*ejidos*” (land reform communities) conveyed possession to workers engaged in agriculture, ranching, and forestry, where workers organized under a democratic framework to put the land to use, without having ownership or rights to sell the land.⁵⁷²

However, with the 1992 reform of Article 27 of the Constitution and enactment of the Agrarian Law, the ejidos gained ownership of their lands and, accordingly, the right to convey title to their land and their water rights and along with it.⁵⁷³ The Agrarian Law permits ejidos to convey ownership of their land or to lease it to a company or any other

⁵⁶⁶ *Id.* at arts. 55–57.

⁵⁶⁷ *Id.* at art. 60.

⁵⁶⁸ *Id.* at art. 4.

⁵⁶⁹ LAN, *supra* note 355, at Art. 51(IV).

⁵⁷⁰ *Id.* at Art. 51(VI).

⁵⁷¹ *Id.* at Art. 51(XI),(XII).

⁵⁷² *Id.* at Art. 56 Bis.

⁵⁷³ Arturo Warman, *La reforma al Artículo 27 constitucional*, in PROCADURADURIA AGRARIA, 2 ESTUDIOS AGRARIOS 14–15 (Jan.–Mar. 1996), http://www.pa.gob.mx/publica/cd_estudios/pdf/2.pdf, *see also id.* at Art. 56.

legal entity, outlining a process for such conveyances to follow.⁵⁷⁴ Provided that the conveyance complies with this process, the entity receiving possession of the land also acquires any water rights attributed to the land, and CONAGUA will grant the entity the corresponding concession.⁵⁷⁵

Although none of the ejidos contacted have responded to engage in this project, the research yielded 190 ejidos within the Mexican states along the border with Texas. They are distributed across 26 municipalities, and 101 of these ejidos lie within municipalities that overlie aquifers that the most current research shows with reasonable confidence are transboundary with Texas.⁵⁷⁶

b. Irrigation Districts.

In a sense, irrigation districts jointly manage aquifers alongside CONAGUA. The irrigation districts are responsible for ensuring that users within their borders have infrastructure necessary for the districts' operation.⁵⁷⁷ Each district often houses a committee that works with CONAGUA, water user associations, and state and local officials to develop annual irrigation plans and rules for the district.⁵⁷⁸ However, the federal rules still govern. Under Article 75 of the LAN, Irrigation Districts may create rules, in accordance with Article 51, but representatives for irrigation districts who responded were certain that they did not have any rules that they applied to users. Users within an irrigation district are responsible for operation, conservation, and maintenance, and can acquire ownership of the infrastructure.⁵⁷⁹ Certain conditions are required in order to transmit rights to extract, use, or develop water within an irrigation district.⁵⁸⁰ And when, for reasons of force majeure, there is insufficient water to meet the irrigation district's demands, the Basin Agency circumscribing the irrigation district may control distribution.⁵⁸¹

Research for this project included reaching out to officials in each district within each state along the border. In Chihuahua, that was the Distrito Riego 90 Rio Conchos,

⁵⁷⁴ LA LEY AGRARIA, Art. 75 (1992), last reformed Mar. 27, 2017.

⁵⁷⁵ LAN, *supra* note 355, at Art. 57.

⁵⁷⁶ See Sanchez (2016), *supra* note 1, at 116. This number was calculated by determining which ejidos fell within the study area, and in what municipality boundaries they fell.

⁵⁷⁷ LAN, *supra* note 355, at Art. 64.

⁵⁷⁸ Wim H. Kloezen, *Water Markets between Mexican Water User Associations*, 1 WATER POL. 437, 441–42 (1998).

⁵⁷⁹ LAN, *supra* note 355, at Art. 65.

⁵⁸⁰ *Id.* at Art. 104.

⁵⁸¹ *Id.* at Art. 69.

and in Coahuila the Distrito Riego 06 Palestina and the Distrito Riego 04 Don Martín, shared with Nuevo León, which also has one district, Distrito Riego 31 Las Lajas. Tamaulipas includes three districts: Distrito Riego 50 Acuña-Falcón, Distrito Riego 26 Bajo Río San Juan, and Distrito Riego 25 Bajo Río Bravo. None of these irrigation districts expressed having any rules that were not subsumed by the federal laws and regulations.

c. Water User Associations (or Asociaciones Civiles de Usuarios (“ACU”s))

(1) *Generally.*

Whereas Irrigation Districts remain controlled by CONAGUA, many smaller areas under irrigation lie outside the districts, and although they are still ultimately subject to CONAGUA control, these “unidades de riego” (irrigations units) retain more autonomy. Some important distinctions between the two exist. Irrigation Units cover less than 500 hectares, while Irrigation Districts’ reach may exceed 2,000 hectares.⁵⁸² Infrastructure and land governed by Irrigation Units may be either private or belong to ejidos, and while Irrigation Districts include private and ejidal land, the infrastructure within a district is federal.

(2) *“Modules” and Limited Responsibility Societies (“SLR”s)*

The 1992 LAN made it mandatory for these irrigation units to organize as ACUs, many of which included ejidos and small farmers within the same association, in part in an attempt to reduce potential conflicts that might otherwise have arisen between.⁵⁸³ Although an ejido or user may have its own water concession, by banding together they may increase the users’ bargaining power with competing users and with CONAGUA. In the decentralization process post-1992, the federal government transferred some management authority to these associations, limited to management of infrastructure, rather than management of the water resource itself. Smaller WUAs are intended to form collective legal entities known as Limited Responsibility Societies (“SLR”s) that control

⁵⁸² EDMUNDO PEDROZO GONZÁLEZ & GUSTAVO A. HINOJOSA CUÉLLAR, INSTITUTO MEXICANO DE TECNOLOGÍA DEL AGUA, MANEJO Y DISTRIBUCIÓN DE AGUAS EN LOS DISTRITOS DE RIEGO: BREVE INTRODUCCIÓN DIDÁCTICA, 10 (2014), https://www.imta.gob.mx/biblioteca/libros_html/manejo-dadr/.

⁵⁸³ Robert R. Hearne, *Evolving Water Management Institutions in México*, 40 WATER RES. RESEARCH 5 (2004).

the primary canals, drainage, and roads in each district.⁵⁸⁴ CONAGUA remains responsible for ensuring that plans for development of water sources are in place and that the main irrigation canals are maintained.⁵⁸⁵

Modules are divisions within an irrigation unit or WUA that the government has acknowledged as legal civil associations with water concessions that give the modules the right to use water within the district and associated irrigation infrastructure.⁵⁸⁶ The physical boundaries of a module are based on hydraulic considerations such as efficient water delivery, economic concerns centering on what size is most efficient for collecting sufficient fees, and social aspects.⁵⁸⁷ For example, when groups of users have irreconcilable differences, the module's boundaries should be adjusted to reduce the chance for conflict while maintaining those hydraulic conditions.⁵⁸⁸

5. Other User Groups

This project's difficulty connecting with users at the very local level belies the self-governing or informally arranged collective user groups that most likely exist within this project's study area. As the research progressed, the goal shifted from ascertaining all of the rules that users might apply in cooperatively managing groundwater to finding just one example of its occurrence in along the Texas- Mexico border. An example from the central Mexican state of Guanajuato is the closest the research has come so far.

In a small community outside San Miguel de Allende, in the state of Guanajuato, irrigators joined to share a well with one concession.⁵⁸⁹ They established a "mayordomo" (water administrator) position authorizing the mayordomo to oversee schedules for pumping and distributing water and to receive regular dues from well users to fund maintenance on the well and distribution infrastructure.⁵⁹⁰ However, as predicted in the Methodology section at the beginning of this report,⁵⁹¹ some local users in this same state

⁵⁸⁴ OECD Environmental Performance Reviews OECD Environmental Performance Reviews: Mexico 2003, at 181–82 (2003).

⁵⁸⁵ LAN, *supra* note 355, at Art. 113.

⁵⁸⁶ Enrique Palacios, *Benefits and Second Generation Problems of Irrigation Management Transfer in Mexico*, 13, in CASE STUDIES IN PARTICIPATORY IRRIGATION MANAGEMENT, WORLD BANK (2000).

⁵⁸⁷ Sam H. Johnson III, *Irrigation Management Transfer in Mexico: A Strategy to Achieve Irrigation District Sustainability*, INT'L. IRRIGATION MGMT. INST., 16 RES. REP. 11 (1997).

⁵⁸⁸ *Id.* at 10.

⁵⁸⁹ Information gleaned from the Author's conversations with the cited user group's mayordomo in August 2015.

⁵⁹⁰ *Id.*

⁵⁹¹ See discussion in Section I(C)(3), *supra*.

of Guanajuato are operating in conflict with federal law: “An informal association of Guanajuato well drillers indicates that over 1000 wells were drilled in 2001, while only about one-quarter of these had official permission to reposition existing wells.”⁵⁹²

IV. CONCLUSION

Jurisdictions in Texas that border Mexico operate under a largely decentralized system of groundwater governance. Authority over water quality is generally federal with some responsibilities to states, while water rights and allocation powers belong to the states. Texas law sharply distinguishes how the law treats groundwater from surface water—Texas groundwater is private property, while the state claims surface water’s ownership in trust for its people; therefore, two distinct legal regimes apply. The ability to control groundwater quantity and rights in Texas lies primarily with the person who owns the groundwater estate, so state-authorized agencies and districts, and even local users, have little authority to limit how groundwater owners withdraw and use water from aquifers. Environmental and endangered species protection impacts water management as well, and courts and agencies in both Texas and the U.S. have created groundwater laws or regulations over which the state and federal government have some authority to enforce.

Along Mexico’s side of the border, the law considers both surface and groundwater to be the public property of Mexico, centralizing jurisdiction over both quality and quantity within the national sphere. The executive branch of the federal government holds most authority to create laws and rules, which it exercises through commissions and agencies who hold enforcement authority over water quantity and water quality. In Mexico, the judicial system does not create law, and so the legislative, administrative, and customary laws control groundwater. Groundwater rights permitting and enforcement are solely federal, and only entities that are an arm of the federal government have authority to carry out these functions. Mexico’s ministries and agencies create and enforce a robust environmental protection laws and policies, giving them significant authority over water quality. Local institutions that incorporate non-federal stakeholders are authorized to encourage and promote water policies specific to their area, but are generally unauthorized to create and enforce local groundwater rules. At the state and local level, most of these institutions’ water-related authority centers on water treatment, sanitation, and infrastructure projects.

⁵⁹² Scott & Shah (2004), *supra* note 488, at 158.

The jurisdictional picture on each side of the Texas- Mexico border reveals gaps in groundwater governance and some conflicting approaches to managing the resource within those jurisdictions—a resource that crosses the border, where users on each side apply distinct, sometimes unknown approaches in withdrawing groundwater from the same aquifers. The laws in Texas that create private property rights in groundwater enable the owner of the rights to freely withdraw from the aquifer with very few limitations permitted by state-authorized districts. And outside those districts, little is known about how groundwater owners may be withdrawing and using the resource. Likewise, much of how users in Mexico’s border region manage their groundwater is unknown, because the right to control it largely rests with the federal government, which often does not have local representation implementing the federal water laws. The primacy of private control of groundwater in Texas and federal authority in Mexico currently cause vast areas of lands along the Texas- Mexico border where users extract water from transboundary aquifers following widely varying, often unknown, practices.

