Legal & Regulatory Framework for Brackish Groundwater Desalination and Water Recycling in Texas

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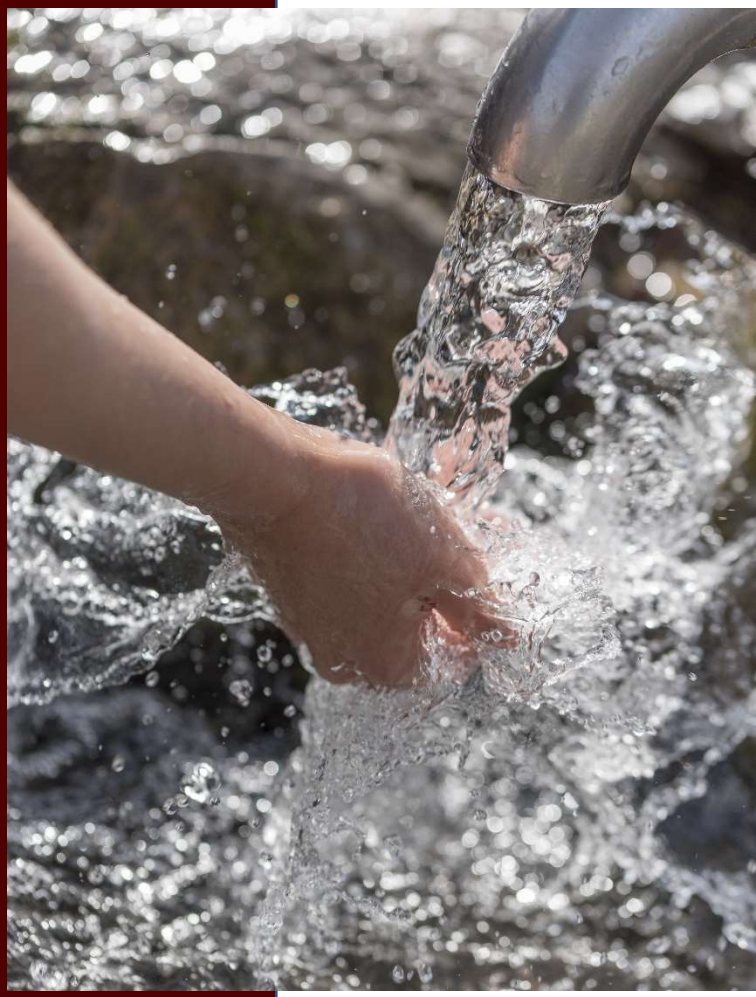
Part 1: Brackish Groundwater Desalination Technical Report



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May 1, 2020

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Part 1: Brackish Groundwater Desalination Technical Report

Part 2: Water Recycling Technical Report for Direct Non-Potable Use

Part 3: Case Study Appendices to the Technical Reports

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DISCLAIMER: This Technical Report and its student authors do not in any way purport to opine, advise (legally or non-legally), or otherwise direct any person or entity to come to a certain conclusion. **This is not legal advice** and should not be construed that way. This Technical Report and the corresponding summary materials are merely **educational resources** that may **inform** municipal leaders and interested members of the public of legal and regulatory considerations in Texas.

I. Introduction

This Brackish Groundwater Desalination Technical Report examines the legal frameworks that affect desalination in Texas. The goal of this report is to provide insight into the legal and regulatory barriers, challenges, and opportunities for these technologies to go online. Each desalination implementation site has to find ways of complying with various laws and regulations. The information in this Report comes from the study of brackish groundwater desalination facilities currently operating in Texas, as well as extensive research into available literature and documents from various agencies. While there is no updated "one-stop-shop" resource that provides detailed information on all the necessary permits to build, operate, and maintain such facilities, this Technical Report aims to compile the existing, available information in an organized and accessible fashion.

The Brackish Groundwater Desalination Technical Report is the first of three reports that make up the work product of a project undertaken by students at Texas A&M University School of Law in a select capstone seminar. These reports examine regulations surrounding desalination and water recycling. The companion report entitled Water Recycling Technical Report highlights building, operating, and monitoring requirements for water recycling facilities in Texas. Finally, the Case Study Report expands on regulations in San Antonio and El Paso where these water alternatives are in place.

II. Background and Methodology

There are a number of considerations that must be taken into account when producing a toolkit or education guide of this nature. This section is intended as a brief overview of why this Technical Report and the corresponding summary materials focused on the areas that it did.

Generally, desalination is "the process of removing dissolved solids and other minerals from saline water sources, including brackish groundwater and seawater."[1] Most often, this means using membranes "to physically

[1] *The Future of Desalination in Texas*, TEX. WATER DEVELOPMENT BD. at 12 (Dec. 1, 2018),

separate the dissolved solids from water."[2] "The most widely used commercial membrane technology is reverse osmosis, which uses high pressure to push water through the membranes."[3]

Notably, desalination can be used for both seawater and brackish groundwater. This Technical Report focuses exclusively on brackish groundwater desalination. Producing desalinated seawater is an expensive process and is primarily reserved for potable water production.[4] Brackish groundwater desalination poses distinct advantages because it yields a higher percentage of freshwater and is available to inland regions.

Brackish groundwater desalination typically yields 75% to 80% of its volume in freshwater and has the potential to reach a 90% recovery rate.[5] Comparatively, seawater desalination only yields about 50% of its volume in freshwater.[6] With brackish groundwater desalination's high recovery rate, there is also less brine leftover at the end of the process.[7]

While pilot projects are exploring seawater desalination, as of February 2020, Texas does not have a facility that desalinates seawater.[8] Therefore, desalination of brackish groundwater is the only type of desalination operation currently in use in Texas.[9] These brackish groundwater desalination facilities account for nine (9) percent of the total brackish groundwater plants in the United States.[10] As of 2016, Texas had thirty-five (35) brackish groundwater desalination plants with a capacity to produce of 85 million gallons of freshwater per day.[11]

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https://www.twdb.texas.gov/innovativewater/desal/doc/2018_TheFutureofDesalinationinTexas.pdf?d=1546638725773.

[2] *Id.*

[3] *Id.*

[4] *See* Jorge Arroyo and Saquib Shirazi, *Cost of Brackish Groundwater Desalination in Texas*, TEX. WATER DEVELOPMENT BD. (Sep. 2012), http://www.twdb.texas.gov/innovativewater/desal/doc/Cost_of_Desalination_in_Texas.pdf.

[5] David L. Chandler, *Study Finds Potential in Brackish Groundwater Desalination*, MIT NEWS (July 4, 2018), http://news.mit.edu/2018/study-finds-potential-brackish-groundwater-desalination-0705.

[6] Chandler, *supra* note 4.

[7] *Id.*

[8] *The Future of Desalination in Texas*, *supra* note 1, at 7; *IWT Project - Brownsville Seawater Desalination Pilot Plant Study*, TEXAS WATER DEVELOPMENT BOARD, http://www.twdb.texas.gov/innovativewater/desal/projects/brownsville/index.asp (last visited Apr 2, 2020).

[9] *The Future of Desalination in Texas*, *supra* note 1, at 7;

[10] *Id.*

[11] *Id.*

The Texas Water Development Board (TWDB) provides a technical definition for the composition of water that qualifies as brackish groundwater as: "groundwater that contains dissolved salts with total dissolved solid concentration ranging from 1,000 to 10,000 milligrams per liter."[12] Conveniently, "Texas is estimated to have more than 2.7 billion acre-feet (880 trillion gallons) of brackish groundwater available in 26 of its major and minor aquifers."[13]

As such, this Technical Report focuses exclusively on brackish groundwater desalination and does not include seawater desalination.

III. Stakeholders

In order to have a comprehensive understanding of the legal and regulatory regime governing brackish groundwater desalination and water recycling in Texas, it is necessary to identify the key stakeholders involved in these water issues.

A. Texas Water Development Board (TWDB)

The Texas Water Development Board was created by legislation and supported by a Constitutional Amendment in 1957.[14] "TWDB is to provide leadership, information, education, and support for planning, financial assistance, and outreach for the conservation and responsible development of water in Texas."[15] Importantly, the TWDB provides loans to develop water supply projects, studies the availability of ground and surface water, and manages the state's water plan.[16] As such, various municipalities rely on TWDB for both financial assistance and resource information for developing water supply diversity like desalination and water recycling.

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[12] *Id.*
[13] *Id.*
[14] *About the Texas Water Development Board*, Tex. Water Development Bd., https://www.twdb.texas.gov/about/.
[15] *Id*.
[16] *Id*.

B. Texas Commission on Environmental Quality (TCEQ)

TCEQ is the head environmental agency in the state of Texas.[17] TCEQ is tasked with monitoring the quality of surface water, defining standards for water quality, permitting discharges to Texas water, and restoring water quality when necessary.[18] TCEQ is often the permitting authority with respect to projects that will affect water quality or supply.[19] Municipal entities need to work with TCEQ to secure the necessary permits for building and operating desalination and water recycling plants.

IV. Legal and Regulatory Landscape

A. Building Permits

1. Federal

Under federal law, desalination projects must obtain source water permits, potable water permits, and waste permits as outlined below.[20]

[17] *About Us*, Tex. Comm'n on Environmental Quality, https://www.tceq.texas.gov/agency/about-the-tceq.
[18] *Water Quality Program Successes*, Tex. Comm'n on Environmental Quality, https://www.tceq.texas.gov/waterquality/watersuccess/waterqualitysuccess.
[19] *Id*.
[20] Daniel Cochran, *Government is Giving Desalination a Salty Reception*, American Legislative Exchange Council (July 6, 2016), https://www.alec.org/article/government-is-giving-desalination-a-salty-reception-why-every-state-should-care/.

Permit Name	Federal Agency	Description
Clean Water Act (CWA) § 404 Permit	United States Army Corps of Engineers (USACE)	Activities that might discharge dredged or fill material into waters of the United States are required to get a § 404 permit.[21] USACE performs Jurisdictional Determinations to determine if water on a property is a water of the United States and therefore subject to the § 404 permit process.[22]
Endangered Species Act Take Permit	U.S. Fish and Wildlife Service (USFWS)	If the Environmental Assessment reveals that there are endangered species or endangered species habitat on the project site, then a permit is required to proceed with construction on the site.[23]
Conditional Letter of Map Revision/Letter of Map Revision	Federal Emergency Management Agency (FEMA)	If a proposed construction project is in the floodplain or requires changing the floodplain it requires permission from FEMA first.[24]
Antenna Permit	Federal Aviation Administration (FAA), a branch of the U.S. Department of Transportation	If the antenna is higher than the average height of the terrain, then the antenna needs height authorization from the FAA.

[21] *Permit Program Under CWA Section 404*, U.S. Envt'l. Prot. Agency, https://www.epa.gov/cwa-404/permit-program-under-cwa-section-404 (last visited Dec. 4, 2019).
[22] *How Wetlands are Defined and Identified Under CWA Section 404*, U.S. Envt'l. Prot. Agency, https://www.epa.gov/cwa-404/how-wetlands-are-defined-and-identified-under-cwa-section-404 (last visited Dec. 4, 2019).
[23] *Endangered Species Permits*, U.S. Fish and Wildlife Serv., https://www.fws.gov/endangered/permits/index.html. (last updated April 16, 2019).
[24] *Conditional Letter of Map Revision*, Fed. Emergency Mgmt. Agency, https://www.fema.gov/conditional-letter-map-revision (last updated July 24, 2019).

2. State

It is worth noting that many federal statutes delegate implementation at the state level to state agencies. As a result, some of the permits and compliance requirements that are required at the state level are actually state derivatives of federal requirements. These permits and compliance requirements are identified below.

Permit / Regulation Name	State Agency	Description
Clean Water Act § 401 Water Quality Certification	Texas Commission on Environmental Quality (TCEQ)	If the pipeline crossed waterways or wetlands, a §401 permit is needed.
Public Water System Plan Review, Membrane Pilot Study	Texas Commission on Environmental Quality (TCEQ)	The membranes in the reverse osmosis plant have to undergo a pilot study for approval.
Public Water System Plan Reviews	Texas Commission on Environmental Quality (TWDB)	Site Access Road, Ground Storage Tank, Well Build Out, Injection Well Electrical Instrumentation and Controls, Engineering report (serving as the basis of design memos).
Public Water System Plan Reviews	Texas Commission on Environmental Quality (TCEQ)	Well Build out, Reverse osmosis plant, Production wells.
Utility Installation Permit to cross roads within the Texas Department of Transportation (TxDOT) right-of-way (ROW)[25]	Texas Department of Transportation (TxDOT)	If the utilities have to cross roads in TxDOT's ROW TxDOT has to provide its approval.

[25] *See generally Occupational Licenses: Water System Operators*, Tex. Comm'n on Envt'l. Quality, https://www.tceq.texas.gov/licensing/licenses/waterlic#acceptD (last updated Aug. 29, 2019).

Permit / Regulation Name	State Agency	Description
Permit to construct access driveway facilities on Highway Right-of-Way (Form 1058)	Texas Department of Transportation (TxDOT)	If the utilities have to cross roads in TxDOT's ROW TxDOT has to provide its approval.
Texas Antiquities Permit for Investigation	Texas Historical Commission (THC)	State agencies and political subdivisions of the state including cities, counties, river authorities, municipal utility districts, and school districts must notify THC of ground-disturbing activity on public land.
Texas Antiquities Permit	Texas Historical Commission (THC)	If an environmental assessment cultural resource report reveals that the project will disturb the ground on public land, THC has to issue a permit.
National Historic Preservation Act	THC	Federal agencies must take into account the effects of their undertakings on historic properties.
TPDES General Stormwater Construction Permit (TXR150000)	TCEQ	If a construction site will discharge stormwater associated with the construction activity and that disturbs more than one acre of land, the project will need a stormwater discharge permit.[26]

[26] *General Permit to Discharge Under the Texas Pollutant Discharge Elimination System*, Tex. Comm'n on Envt'l. Quality at 1, 5 (Mar. 5, 2018), https://www.tceq.texas.gov/assets/public/permitting/stormwater/txr150000-cgp.pdf.

Permit / Regulation Name	State Agency	Description
Phase II, Small MS4[27] permit (TXR040000)	TCEQ	Stormwater permits regulate the "requirements related to water quality permitting for stormwater runoff from construction sites, industrial facilities, and publicly owned and operated storm sewers."[28] Specifically, the Phase II permit covers "small MS4[s]" in urbanized areas.[29]
Public Water System Plan Review, Interim Public Well Completion Approval (for each production well)	TCEQ	Prior to drilling the wells, TCEQ has to approve them.
Register Above Ground Storage Tanks	TCEQ	Above ground storage tanks over a certain capacity, including those with petroleum products, have to be registered.
Elimination of Architectural Barriers Law (EABL)	Texas Department of Licensing and Regulation (TDLR)	The EABL is a law that "ensure[s] that each building and facility subject to this chapter is accessible to and functional for persons with disabilities without causing the loss of function, space, or facilities."[30]

[27] "An MS4 is a conveyance or system of conveyances that is: *owned by a state, city, town, village, or other public entity that discharges to waters of the U.S., *designed or used to collect or convey stormwater (e.g. storm drains, pipes, ditches), *not a combined sewer, and *not part of a sewage treatment plant, or publicly owned treatment works (POTW)." *Stormwater Discharges from Municipal Sources*, U.S. Envt'l Prot. Agency, https://www.epa.gov/npdes/stormwater-discharges-municipal-sources (last visited Dec. 5. 2019).

[28] *Stormwater Permit*, Tex. Comm'n on Envt'l. Quality, https://www.tceq.texas.gov/permitting/stormwater (last visited Dec. 4, 2019).

[29] *Municipal Separate Storm Sewer System (MS4) Discharges: Am I Regulated?*, Tex. Comm'n on Envt'l. Quality, https://www.tceq.texas.gov/permitting/stormwater/ms4/WQ_ms4_AIR.html (last visited Dec. 5, 2019).

[30] 4 Tex. Gov. Code § 469.001.

Permit / Regulation Name	State Agency	Description
Environmental Assessment pursuant to 31 Tex. Admin. Code § 363.14	TWDB	This is a state regulation that mandates coordinated regulatory effort across several federal and state environmental laws if the project receives TWDB funding.
Marl, Sand, Gravel, Shell or Mudshell Permit	Texas Parks and Wildlife Department (TPWD)	A permit is required to dig in a stream bed.[31]

3. Local

Similar to other public utility construction projects, cities and counties will have additional permitting requirements unique to the locality. Local considerations specific to the construction of a desalination facility are discussed in the in the operational permit section of this report. Municipalities should consult with the local building and construction experts to better understand what is required to construct the facility.

B. Operational Permits

1. Federal

There are few federal regulations that directly govern brackish groundwater desalination in specific states. Practically none of which discuss the specifics of operating a brackish groundwater desalination facility. However, it is important to note that the Safe Drinking Water Act (SDWA)authorizes the delegation of federal standards to state agencies upon a showing that the state has the capacity to undertake the implementation and enforcement of federal regulations as well as any additional more stringent state regulations. Texas is one such state that has federal authorization to implement the federal scheme and as such, these regulations will be discussed in the context of the state agency's responsibilities.

[31] *Land & Water Frequently Asked Questions*, Tex. Parks and Wildlife Dep't, https://tpwd.texas.gov/faq/landwater/sand_gravel/#dig (last visited Dec. 5, 2019).

2. State

Permit/ Regulation Name	State Agency	Description
Water Well Registration	TDLR	Approval for existing wells. Drillers have to submit well registration after it is constructed
Permit to Produce Water	Local Groundwater Districts (where applicable)	Approval to produce water from existing wells.
Application for High-Impact Production Permit	Local Groundwater Districts (where applicable)	Approval to own and operate wells crossing a high production threshold.
Water Well Construction and Alteration Permit & Plan's Approval Prior to Construction	Local Groundwater Districts (where applicable) & TCEQ	Approval for new wells or modifications to existing wells.
Well and Test Hole Permits & Plan's Approval Prior to Conversion to Public Drinking Water Well[32]	Local Groundwater Districts (where applicable) & TCEQ	Approval for wells and test hole installation.
Groundwater Protection Recommendation Letter & Class II Underground Injection Control Permit (UIC)[33]	TCEQ & Railroad Commission of Texas	Beneficial reuse via Class II wells

[32] *Submit Public Water System Plans for Review,* TEX. COMM'N ON ENVT'L. QUALITY, https://www.tceq.texas.gov/drinkingwater/planrev.html (last visited Apr 2, 2020).
[33] Underground Injection Control Permits and Registrations, TEX. COMM'N ON ENVT'L. QUALITY, https://www.tceq.texas.gov/permitting/waste_permits/uic_permits/uic.html (last visited Apr 2, 2020).

Permit/ Regulation Name	State Agency	Description
Class I Underground Injection Control (UIC) Permit (for each injection well)[34]	TCEQ	In order to inject the concentrate brine from reverse osmosis back into the ground below the underground source of drinking water, TCEQ has to issue a UIC permit. Additionally, SAWS had to file a Notice of Completion (NOC) when the well began operating.
Certification of Operators for Public Water Supply System[35]	TCEQ	The persons hired to operate the reverse osmosis plant have to be certified and trained at the Class D level, which after one year needs to be upgraded to Class C.[36]
Public Water System Plan Review, Final Public Well Completion Approval (for each production well)[37]	TCEQ	After the wells are completed, TCEQ has to approve them.
Air Permit by Rule 30 Tex. Admin. Code § 106.511	TCEQ	Electric generators are subject to permitting by TCEQ.
Air Permit by Rule [38]30 Tex. Admin. Code § 106.532	TCEQ	Water treatment units are subject to permitting by TCEQ.

[34] Class I Injection Wells Regulated by the TCEQ, TEX. COMM'N ON ENVT'L. QUALITY, https://www.tceq.texas.gov/permitting/waste_permits/uic_permits/UIC_Guidance_Class_1.html (last visited Apr 2, 2020).
[35] *See generally Occupational Licenses: Water System Operators*, Tex. Comm'n on Envt'l. Quality, https://www.tceq.texas.gov/licensing/licenses/waterlic#acceptD (last updated Aug. 29, 2019)..
[36] *Id*.
[37] *Submit Public Water System Plans for Review, supra* note 32.
[38] "A permit by rule is the state air authorization for activities that produce more than a de minimis level of emissions but too little for other permitting options." *Indexes to Air Permits by Rule*, Tex. Comm'n on Envt'l. Quality, https://www.tceq.texas.gov/permitting/air/permitbyrule (last updated May 5, 2019).

Permit/ Regulation Name	State Agency	Description
Texas Pollution Elimination Discharge Permit (TPDES)	TCEQ	If water is discharged to waters of the state, a TPDES permit is required.
Texas Land Application Permit (TLAP)	TCEQ	If water is discharged to the waters adjacent to waters of the state, a TLAP is required.
Commercial Industrial Non-hazardous Waste Permit[39]	TCEQ	Storage and treatment of non-hazardous waste.
Sludge Disposal Registration[40]	TCEQ	Sand/multi-media filtration sludge disposal.
Air-Permit - Title V Operating Permit [41]	TCEQ	Degasification and other ancillary equipment that emit air pollutants.
House Bill 722 "an act relating to the development of brackish groundwater."[42]	Natural Resources and Economic Development Committee and Water and Rural Affairs Committee	This bill could have a great effect on the processes that govern obtaining brackish groundwater in Texas.[43]

3. Local Considerations

Municipalities and counties have additional permitting requirements. Permit names, requirements, and issuing departments may vary among cities. While local permits are not uniform, there are some universal considerations,

[39] *Domestic Wastewater Permits,* TEX. COMM'N ON ENVT'L. QUALITY, https://www.tceq.texas.gov/permitting/wastewater/municipal/WQ_Domestic_Wastewater_Permits.html (last visited Apr 2, 2020).
[40] *Registering to Apply Water Treatment Sludge to Land*, TEX. COMM'N ON ENVT'L. QUALITY, https://www.tceq.texas.gov/permitting/wastewater/sludge/WTP_sludge_forms.html (last visited Apr 2, 2020).
[41] *Air Operating Permits (Title V)*, TEX. COMM'N ON ENVT'L. QUALITY, https://www.tceq.texas.gov/permitting/air/nav/air_oppermits_v.html (last visited Apr 2, 2020).
[42] Tex. House Bill 722 (2019 Legislative Session).
[43] *See* The Legal and Regulatory Framework for Brackish Groundwater Desalination and Water Recycling in Texas - The Case Study Appendices to the Technical Report 57 (2020).

and most local governments have permits to address them. Below is a table outlining some of these local considerations.

Topic	Description
Electric and Gas	Coordination with the local energy company if electric and gas lines are present.
County right-of-way permits	A permit for a right-of-way is often required when an activity, like construction, blocks or impairs a roadway, sidewalk, or other public access way. This permit is likely administered at the county level.
Floodplain	County floodplain development permits (if within 100-year flood plain).
Sewage/ Septic	County septic permit for on-site sewage at the facility, or permit for sewage connection. On-site sewage also requires TCEQ approval.
Water Quality	County Water Quality Site Development Permit for distribution of a Certain acreage of Land.
Construction	County building permit (including fire marshal approval).
Trees	City ordinance to preserve trees on site.
Construction	Construction trailers on site during development need to be permitted by the county.
Platting Consideration	In certain cities the developers can vest a property's regulatory rights at the time of plating. This can prevent later laws with more stringent regulations applying to the property.
Tank Permit	Projects using generations or trucks with tank greater than 100 gallons may need a permit from the fire marshal.

C. Ongoing Monitoring Standards

1. Federal

Permit/ Regulation Name	Federal Agency	Description
Safe Drinking Water Act Total Dissolved Solid (TDS) Requirement	Environmental Protection Agency (EPA)	The EPA sets National Primary Drinking Water Regulations, and states can be more stringent and enact secondary regulations regarding the TDS present in drinking water.[44]

2. State

Permit/ Regulation Name	State Agency	Description
Secondary Standard for Total Dissolved Solids (TDS) [45]	TCEQ	States can enact secondary regulations regarding the TDS present in drinking water.[46] TCEQ's standard is 1,000 mg/L.[47]

[44] *Drinking Water Regulations and Contaminants*, U.S. Envt'l. Prot. Agency, https://www.epa.gov/dwregdev/drinking-water-regulations-and-contaminants#Primary (last visited Dec. 18, 2019).
[45] Email Interview with Andrea Beymer, San Antonio Water System (Nov. 14, 2019).
[46] *See Drinking Water Regulations and Contaminants*, U.S. Envt'l. Prot. Agency, https://www.epa.gov/dwregdev/drinking-water-regulations-and-contaminants#Primary (last visited Dec. 18, 2019).
[47] Email Interview with Andrea Beymer, San Antonio Water System (Nov. 14, 2019).

3. Local Consideration

Topic	Description
Water Quality	There can be a tertiary level of Total Dissolved Solids that exceeds federal and state requirements at the local level.
Storm Water	The City or County may institute a fee-in-lieu-of, which if a fee that developers pay to mitigate any increases in stormwater runoff from the development.

V. Conclusion

As currently implemented and monitored, brackish groundwater desalination and use is largely regulated at the state and local levels in Texas. As such, it is imperative for city leaders, municipal entities, and potential operators of brackish groundwater desalination plants to understand the state and local regulations by which they must abide. The ability to make a decision regarding whether desalination is appropriate for a particular community may depend on its location, its budget, and the feasibility of following all applicable Texas regulations.


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