Post Oak Savannah GCD Management Strategies Report

A Review of District Management Strategies to Accomplish District Goals

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Presented at the Milam and Burleson Counties Groundwater Summit

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Introduction

- **Established and Historical Management Strategies**
- Provide protection for existing users and landowners' property rights.
- Divide District into management zones based on aquifer properties and characteristics.
- Maintain protection of water levels in shallow management zones of each aquifer.
- Set predetermined threshold levels of aquifer impact based on existing user's wells.
- Evaluate aquifer impacts through District Monitoring Well Program.
- Take appropriate action, outlined in Section 16 of Rules, to protect and maintain appropriate aquifer water levels to protect both current and future producers.
- Work within GMA process to develop DFCs and management strategies beneficial to all stakeholders.
- Equitable treatment of all property owners at any given time.
- Curtail equitably at appropriate times to achieve protective goals.

Report Objectives

- Describe and formalize the District Management Structure
- Identify factors that could impact the District's ability to implement Management Strategies to accomplish District Goals
- Identify actions that could improve the District's ability to implement Management Strategies to accomplish District Goals

Management Structure

Hydrogeology

ERA	Period	Age (million years)	Hydrostratigraphic Unit	Declared as a Relevant Aquifer	Hydrogeologic Unit
Cenozoic	Tertiary	33.9	Jackson	yes	Yegua-Jackson Aquifer
			Yegua	yes	
			Sparta	yes	Sparta Aquifer
			Weches	no	Aquitard
			Queen City	yes	Queen City Aquifer
			Reklaw	no	Aquitard
		55.8	Carrizo	yes	Carrizo-Wilcox Aquifer
			Upper Wilcox/Calvert Bluff	yes	
			Middle Wilcox/Simsboro	yes	
			Lower Wilcox/Hooper	yes	
		65.5	Midway	no	Aquitard
Mesozoic	Cretaceous		Trinity	yes	Trinity Aquifer

The table above lists the formations/aquifers that are relevant within the District boundaries, not including the Brazos River Alluvium. Each of these formations are Major or Minor Aquifers as declared by the State.

The District establishes each of these entire aquifers as a management zone for two (2) reasons:

- Different characteristics of each aquifer
- Anticipated future development of each aquifer

Management Structure

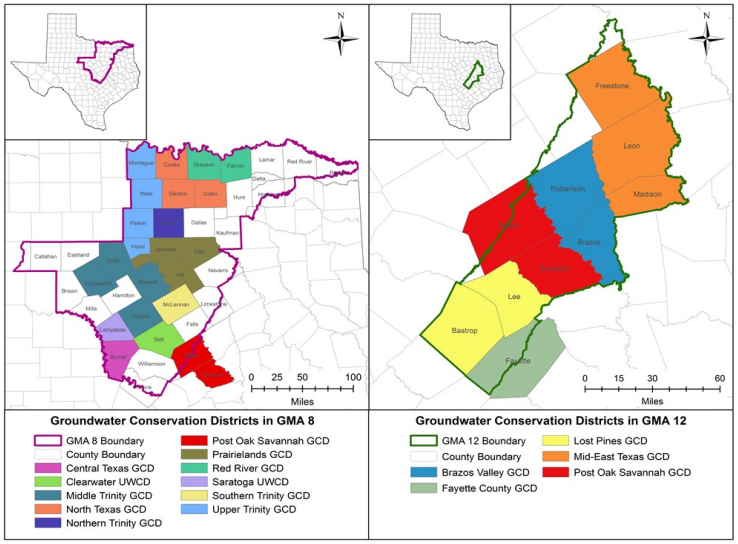
Joint Planning

For each of the management zones associated with a relevant aquifer, the District has adopted DFCs as part of the joint planning process.

- GMA 8 (left) – Trinity aquifer
- GMA 12 (right) – Carrizo-Wilcox, Queen City, Sparta, Yegua-Jackson & Brazos River Alluvium

DFCs = Desired Future Conditions, are aquifer water level scenarios adopted by each GMA and GCD that balance highest practicable use with conservation.

In addition to DFCs, the District has also adopted Protective Drawdown Limits (PDLs) within the shallow (<400 ft) portion of the aquifer. PDLs were established to protect production capacity of existing wells in the shallow, unconfined portions of the aquifer.



Management Structure

Management Goals

Chapter 36 – Texas Water Code

TWC § 36.0015 states the GCDs are the State's preferred method of Groundwater management in order to:

- Protect property rights
- Balance the conservation and development of groundwater to meet the needs of the state, and
- Use the best available science in the conservation and development of groundwater through rules developed, adopted, and promulgated by a district in accordance with the provisions of this chapter.

Enabling Legislation

POSGCD was created by HB1784, 77th Legislature, 2001, and a local confirmation election in November 2002 for the purpose to provide a locally controlled groundwater district to:

- Protect and recharge groundwater
- Prevent pollution or waste of groundwater in the central Carrizo-Wilcox area
- Control subsidence caused by withdrawal of water from the groundwater reservoirs in that area
- Regulate the transport of water out of the boundaries of the District.

Management Structure

Management Goals

Management Plan

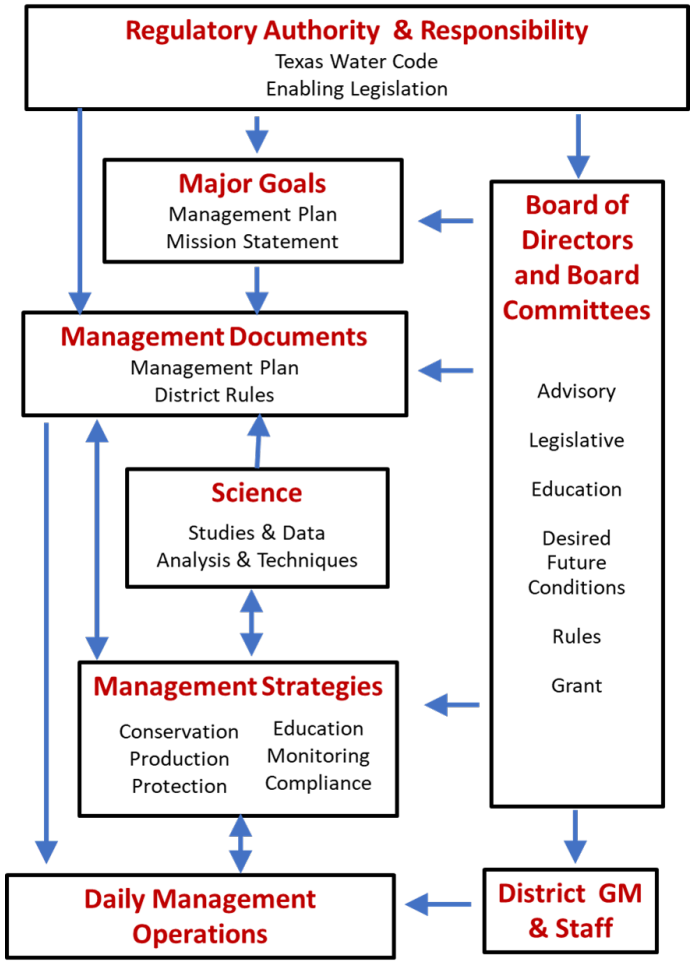
TWC § 36.1071 requires that a GCD develop a management plan that addresses the following management goals, as applicable:

- Providing the most efficient use of groundwater
- Controlling and preventing waste of groundwater
- Controlling and preventing subsidence
- Addressing conjunctive surface water management issues
- Addressing natural resource issues
- Addressing drought conditions
- Addressing conservation, recharge enhancement, rainwater harvesting, precipitation enhancement, or brush control, where appropriate and cost-effective
- Addressing the desired future conditions adopted by the District under TWC § 36.108

POSGCD Mission Statement

The Post Oak Savannah Conservation District mission is to adopt and enforce Rules consistent with State law and based on best available science, which provide for the conservation, preservation, recharging, and prevention of waste of groundwater, while supporting the ownership of groundwater and the owner's right to assign or produce that property.

Components of Groundwater Management



Regulatory Authority & Responsibility

This component includes the governing documents that provide the foundation and purpose for the District.

Board of Directors

The primary decision makers regarding the development and implementation of groundwater management. The Board has an active group of committees that have direct involvement with the development of documents, policies, budgets, and priorities before they are presented to the full Board for approval. The Board has either direct or indirect control over all aspects of groundwater management with the exception of science. However, the Board has the ability to impact the role of science in the District's approach to groundwater management.

Major Goals

This component frames the District's vision and approach for how it will manage groundwater resources

Management Documents

This component includes the District regulations regarding groundwater production and how the regulations will be administered and enforced.

Management Strategies

This component includes the District strategies associated with the development and implementation of conservation, production, protection, education, monitoring, and compliance.

Science

This component includes all studies, analyses, data, information, techniques, and models related to the aquifers, groundwater systems, wells, and recharge areas within the district boundaries.

District GM & Staff

This component includes the District's General Manager, Water Resources Management Specialist, and staff

Daily Management Operations

This component includes all daily activity associated with managing the District's groundwater resources.

Defensibility of Groundwater Management Strategies

An important and necessary attribute of any management strategy is that it helps achieve district goals in a manner that is both "legally" and "scientifically" defensible

Legally defensible = the management strategy is aligned and supported by legislative statues and administrative codes, especially those responsible for the creation of the District.

Scientifically defensible = the management strategy is aligned and supported by the science

Chapter 36 states that GCDs were created in order to use best available science for developing rules associated with the conservation and production of groundwater. TWC § 36.0015 defines "best available science" as follows:

"best available science" means conclusions that are logically and reasonably derived using statistical or quantitative data, techniques, analyses, and studies that are publicly available to reviewing scientists and can be employed to address a specific scientific question.

Management Strategies

Role of Science

TWC §36.0015 makes quite clear that, if a District desires to create a solid set of enforceable rules, **the District needs to use best available science in developing and implementing its Management Strategies and rules**.

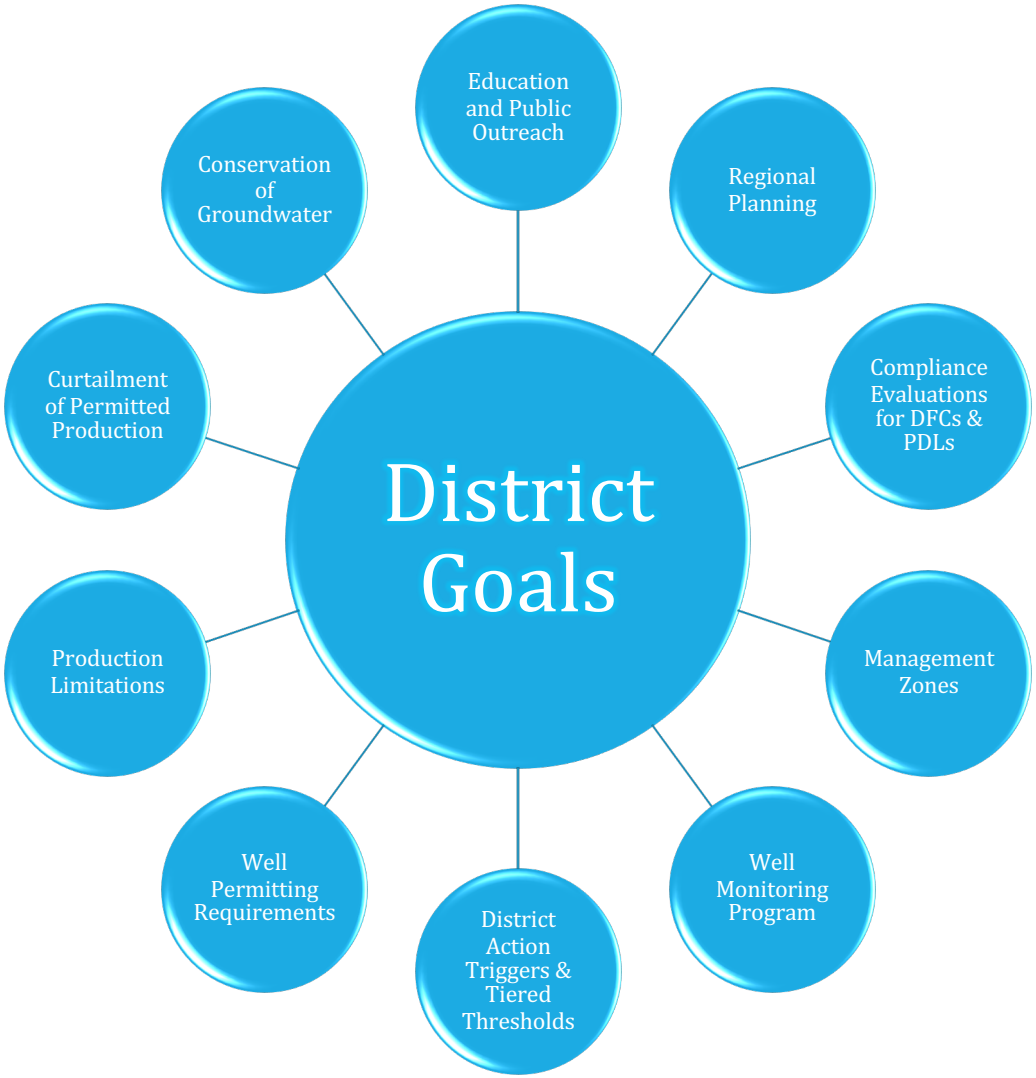
Except for the requirement that it be based on information that is publicly available and be derived in a logically and reasonable manner, **the definition of best available science allows considerable leeway for criteria for evaluating if a GCD has properly satisfied the requirements set forth in TWC §36.0015 in their rule making**. Moreover, the definition does not provide clear criteria for courts to use for determining what is best available science when opposing parties present their own set of science, which achieves the standard set forth in TWC §36.0015, but support different conclusions.

A concern associated with TWC §36.0015 is that science is continually evolving and changing with the advent of new data. Among the consequences to the District of changes in science is that predictions of drawdown for specific future scenarios vary among different versions of groundwater availability models.

The avenues for the District to improve the technical defensibility of its Management Strategies is threefold:

- **Ensure that the requirements in TWC §36.0015 are satisfied.**
- **Fill data gaps in science in order to reduce uncertainty associated with changes in science over time**
- **Strengthen the connection between science and Management Strategies as much as practicable**

Management Strategies



Management Strategies

Education and Public Outreach

To better promote water conservation, community support for groundwater management, and education of groundwater-related issues, the District participates in and supports programs focused on public education and communication.

Regional Planning

To promote and improve management of groundwater with nearby GCDs, river authorities and the state, the District is actively engaged with GMA 8, GMA 12, Region G, and the Brazos River Authority.

Compliance Evaluations for DFCs & PDLs

To provide for the conserving, preserving, and protecting of groundwater, the District has established criteria for evaluating the allowable average amount of drawdown of water or the reduction of artesian pressure for management zones.

Management Zones

For better management of groundwater resources, the District has created management zones based on different conditions in the subsurface associated with aquifer properties, aquifer use, or geographic area.

Well Monitoring Program

To monitor changes in aquifer conditions and the impact of production on groundwater levels, the District operates a well monitoring program that measures water levels and groundwater production on a regular basis.

Management Strategies

District Action Triggers & Tiered Thresholds

To provide for the conserving, preserving, and protecting of groundwater, the District has established a tiered system of thresholds, which are based on aquifer conditions. Exceedances of those thresholds trigger a District response that is commensurate to the magnitude of the violation.

Well Permitting Requirement

To minimize as far as practicable the interference between wells, the district has established permitting requirements for well spacing, aquifer testing, hydrogeology study, and monitoring.

Production Limitations

To minimize as far as practicable the drawdown of water or the reduction of artesian pressure, and to prevent interference between wells, or to prevent degradation of water quality, the District has limited the amount of water that can be produced based on acreage on the basis of acre-feet per acre.

Curtailment of Permitted Production

To provide for the conserving, preserving, and protecting of groundwater, the District will use curtailment of groundwater production in management zone(s) to accomplish one of the two following objective. One objective is to prevent pumping from causing unreasonable impacts or exceeding regulatory limits on drawdown. The other objective is to restore aquifer water levels to acceptable levels if groundwater production was responsible for creating unacceptable drawdowns levels.

Conservation of Groundwater

To reduce the demand for groundwater production, the District has developed programs to assist individuals and municipalities to conserve groundwater. These programs include rainfall harvesting for landowners, grant programs to municipalities, and the aquifer conservancy program.

Connection Between Science & Management Strategies

Quantitative Data	Example Hydrogeological Application	Management Strategy with Possible Overlap with Example Applications
Measured Water Level and Water Quality Data	• Maps of water level contours and elevations • Estimates of vertical hydraulic gradients • Measure change in water levels over time • Determine an average water for DFC zones • Maps of water quality including brackish zones	1. Education and Public Outreach 2. Regional Planning 3. Compliance Evaluations for DFC and PDLs 5. Well Monitoring Program 6. District Action Triggered by Exceedances of Tiered Thresholds 9. Curtailment of Permitted Productions
Reported Pumping Rates	• Track compliance with individual operating permits • Track compliance with modeled available groundwater • Provide pumping rates for GAM update • Establish water budgets for management zones	2. Regional Planning 5. Well Monitoring Program 6. District Action Triggered by Exceedances of Tiered Thresholds 7. Well Permitting Requirements 9. Curtailment of Permitted Productions
Aquifer Pumping Tests	• Estimate Transmissivity at District well locations • Use to help identify fault locations • Validate and test groundwater models	2. Regional Planning 3. Compliance Evaluations for DFC and PDLs 7. Well Permitting Requirements 9. Curtailment of Permitted Productions
Driller Logs & Geophysical Logs	• Identify total depth and screen intervals for wells to support aquifer assignment • Identify pump settings • Identify boundaries between aquifers • Locate faults and fault zones • Identify and quantify clay and sand interval	2. Regional Planning 3. Compliance Evaluations for DFC and PDLs 5. Well Monitoring Program 6. District Action Triggered by Exceedances of Tiered Thresholds 7. Well Permitting Requirements

Connection Between Science & Management Strategies

Analysis & Techniques	Example Hydrogeological Application	Management Strategy with Possible Overlap
Groundwater Availability Models	• Evaluate operation permits • Evaluate Possible DFC for GMA • Evaluate Possible DFCs & PDLs for District • Develop water budgets for Management Plans • Provide aquifer properties for local-scale analysis • Provide aquifer tops and bottom to assign wells to aquifers	1. Education and Public Outreach 2. Regional Planning 3. Compliance Evaluations for DFC and PDLs 4. Management Zones 5. Well Monitoring Program 6. District Action Triggered by Exceedances of Tiered Thresholds 7. Well Permitting Requirements 8. Production Limitations 9. Curtailment of Permitted Productions
Modified Groundwater Availability Models	• Site specific analysis of pumping impacts when GAM is improved by updating or extending pumping rates and by updating aquifer properties	3. Compliance Evaluations for DFC and PDLs 7. Well Permitting Requirements 9. Curtailment of Permitted Productions
Analytical Models for Groundwater Flow (examples Theis Equations, TTIM	• Calculate transmissivity values from district pumping tests • Predict drawdown from pumping scenarios to support the development of well spacing rules	7. Well Permitting Requirements
Software to Interpolate Monitoring Data	• Perform analysis on measured water levels to evaluate compliance with DFCs and PDLs	3. Compliance Evaluations for DFC and PDLs 5. Well Monitoring Program 6. District Action Triggered by Exceedances of Tiered Thresholds 9. Curtailment of Permitted Productions

External Factors on Management Strategies

Regulatory Authority	If the regulatory authority vested in POSGCD through Chapter 36 TWC or the Enabling Legislation were to be modified regarding the responsibilities and authority of POSGCD, the District Rules and Management Plan would require review and potential modification.
Science	Because of the evolving nature of science, the District should be continually reviewing their Management Strategies to made them as resilient to these changes as possible. In addition, it would be advantageous for the District to be in a strong position to anticipate the changes in science as much as possible
Joint Planning	TWC Chapter 36, Section §36.108 requires joint planning among the GCDs in a GMA. One of the objectives of joint planning is to develop DCFs that represent an agreed upon goal for the future condition of aquifers. TWC §36.108(8) requires that the GMA consider the feasibility of achieving each DFC. Although the meaning of feasible is in the eye of the beholder, until determined by additional legislation or a court decision, the meaning of feasible has thus far been interpreted by GMA 12 to mean that DFCs should be compatible with all other DFCs.
Adjacent District Policies and Pumping	GCDs are created along political boundaries instead of hydrogeological boundaries. This can cause differences in rules and management structures in neighboring counties that can have impacts on aquifer conditions within POSGCD counties. Investigations using Groundwater Availability Models (GAMs) have shown that for some aquifers, more than half of the drawdown that has occurred in the District the last few decades can be attributed to pumping that occurs outside of the District.
State Water Needs	The Carrizo-Wilcox Aquifer is one of the most prolific aquifers in the state. However, because much of it underlies rural areas of Texas, it has not been heavily pumped in the past and has tremendous potential for providing water to the high-growth areas of central Texas. Several major water suppliers have already or will soon be targeting the transmission of Carrizo-Wilcox water to meet the state's increasing demand for water. As this demand increases, the District's task of balancing the conservation and development of groundwater to meet the needs of the state, per TWC § 36.0015, will become increasingly difficult.
Interests of Landowners and Well Owners	The District was created to serve the citizens of Milam and Burleson counties. TWC Chapter 36 identifies several responsibilities that the District has to its landowners and well owners. TWC § 36.0015 states that one of the considerations for the creation of GCDs is to protect property rights. Groundwater is a property right of landowners in Milam and Burleson counties. During the last decade, the public has been actively engaged and vocal during Board meetings and public hearings concerning several large well operating permits, the groundwater well assistance program, transport permits, DFCs, and compliance monitoring.
Environmental Impacts	Groundwater pumping can cause environmental impacts by reducing spring flow or reducing stream baseflow. Because of concerns that groundwater pumping can cause environmental impacts, the last two Texas legislative sessions have conducted hearing and introduced bills to promote improved conjugate management of groundwater and surface water resources. Two the obstacles for developing DFCs in GMA 12 based on environmental impacts is the difficulties associated with both modeling them and measuring them. As the science and measuring techniques improve, there is a possibility that POSGCD may be required to constrain groundwater pumping so that it does not create undesirable environmental impacts.
Court Findings	There are many issues relevant to groundwater management under Chapter 36 which are being litigated. Most issues go through the State Office of Administrative Hearings (SOAH). After the hearing process, the SOAH judge issues a Proposal for Decision (PFD), which provides a summary of arguments and establishes the court's rulings. In the PFD, the judge also makes Conclusions of Law on legal issues contested. Decisions under the SOAH hearing process as well as rulings from the Texas Supreme Court are directly relevant to the powers and authority of districts. As the groundwater law in Texas evolves, district Management Strategies will have to undergo review and possible revision to ensure that the districts activities will stand up in legal proceedings.

Achievement of Management Goals

Rule 16.4 and Threshold Levels

To help manage and monitor the change in aquifer conditions, District Rule 16.4 establishes three threshold levels, which are based on measured drawdown and production.

Criteria	Threshold Level		
	1	2	3
Total annual groundwater production (AFY)	> 60% of MAG in Management Plan	>70% of MAG in Management Plan	NA
Average drawdown in a Management Plan	> 50% of PDLs	> 60% of DFCs	> 75% of PDLs
	> 50% of DFCs	> 60% of DFCs	> 75% of DFCs
Projected Average drawdowns calculated with a District	> PDLs in 15 years	NA	NA
	> DFC in 15 years	NA	NA

Note: DFC = Desired Future Condition
PDL = Protective Drawdown Limit
MAG = Modeled Available Groundwater

Achievement of Management Goals

Rule 16.4 and Threshold Levels

If the District determines that a threshold level has been exceeded, Rule 16.4 specifies the type of actions that the District should perform in order to help preserve and protect groundwater resources.

Threshold Level	District Actions if Threshold is Exceeded
1	• Perform studies to improve quantification of pumping effects, characterization of aquifer, and prediction of changes in future water levels. The studies will suggest possible schedules for reducing groundwater production in the affected management zones. • Conduct public meetings to discuss the Level 1 exceedance(s). •
2	• Re-evaluate the Management Plan and rules regarding management zones, collection and analysis of monitoring data, and DFCs. • Notify well owners of possible plans for curtailing groundwater production. • Will conduct public meetings to discuss the Level 2 exceedance(s).
3	• Conduct public hearing to discuss aquifer conditions. Develop a Response Action Work Plan to achieve DFCs and PDLs. • Reduce the maximum water production permitted per acre for the Management Zone and the water authorized to be produced under any permit issued by the District , if the data analysis supports that action

Note: DFC = Desired Future Condition
PDL = Protective Drawdown Limit

Achievement of Management Goals

Key Issues

Six management issues that are central to several of POSGCD Management Strategies that are key to POSGCD achieving its goals:

- Maximum Production Volumes Based on Permitted Acreage
- Operating & Transport Permit Fees
- Boundaries for Management Zones Associated with DFCs
- Time Intervals Associated with DFCs
- Compatibility Between DFCs and PDLs
- Enforcement of DFCs and PDLs by Curtailment of Production
- Unreasonable Impacts to Groundwater and Surface Water

Key Issues

Maximum Production Volumes Based on Permitted Acreage

The District currently uses an allocation of 2 ac-ft/year per acre to determine the maximum production volumes that can be allocated for the acreage associated with a permit.

- Was established during the first several years after creation of the District
- During the last 15 years, the District has periodically weighed the merit of 2 AFY/acre allotment in response to the following:
  - The District's improved understanding of its groundwater resources
  - The significant improvements in the GAMs
  - The increased demand for water in the District and the State
  - The significant changes in TWC statues and administrative code

In March 2017, INTERA discussed options with the District DFC committee for amending the current allocation rule. The discussion explained that a weakness with the current allocation approach is it does not account for the large differences in the amount of groundwater in-place and the large differences in the production capacity of the individual aquifers in the District.

Key Issues

Maximum Production Volumes Based on Permitted Acreage

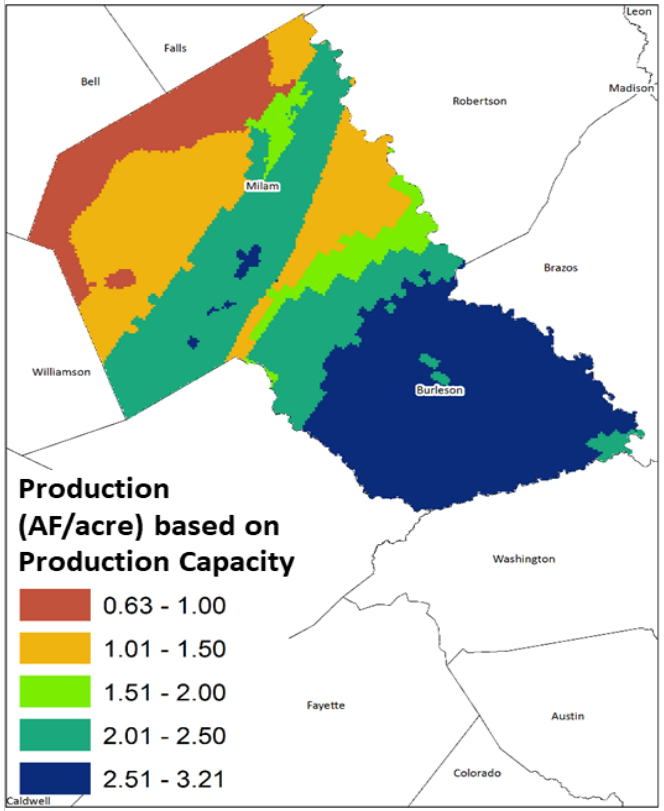
The presentation, "Investigation into Methods for Developing Fair Share", provided a process for developing correlative rights that recognizes and accounts for significant differences in the availability of groundwater across the District. The process involved the following steps:

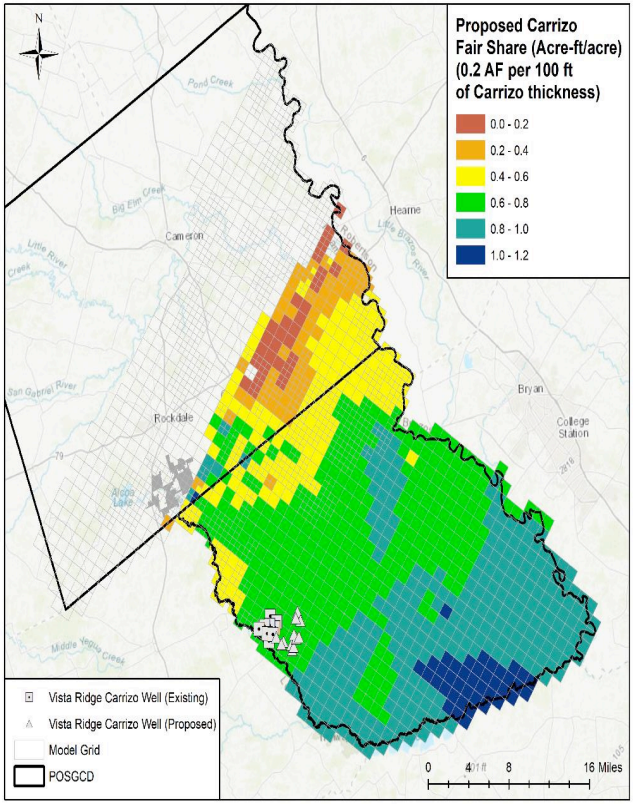
- Identify the aquifers or management zones that will be used for determining the correlative right
- Identify the range of maximum production rates that will be allowed for each management zone
- Identify the properties of each management zone that will be used to calculate the maximum production allocation
- Develop maps for individual management zones that show the spatial variability in maximum production allocation
- Develop maps that show the spatial variability for the maximum production allocation that includes all management zones

Key Issues

Maximum Production Volumes Based on Permitted Acreage

The maps below are an example of the maximum pumping allocation associated with aquifer properties. The figure on the left, accounts for the cumulative total of all aquifers (avg = 2 AFY/acre). Whereas the figure on the right, illustrates the correlative allocation for a single aquifer (Carrizo).





Key Issues

Maximum Production Volumes Based on Permitted Acreage

From this exercise, the Board learned that if it intends to adopt a correlative policy that considers the differences among aquifers to produce groundwater availability, then the District should consider the following:

- Differences in water quality
- Aquifer cumulative thickness
- Aquifer information derived from the GAM and/or aquifer pumping tests
- Total Estimated Recoverable Storage
- DFCs and PDLs
- Impacts on current permits and production

Key Issues

Operating & Transport Permit Fees

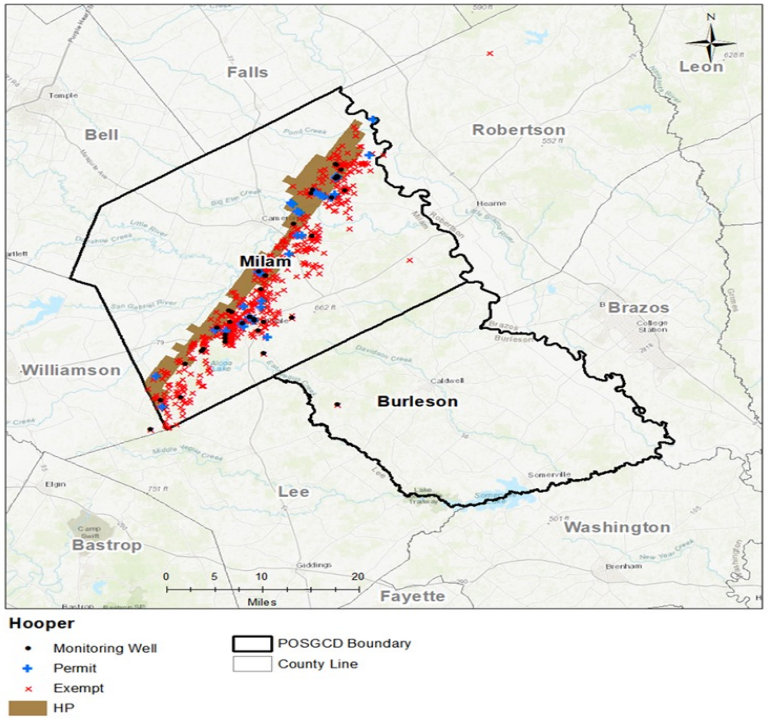
The District currently uses the same schedule of fees for water use, production, transport, and permits for all groundwater regardless of aquifer. The decision of whether or not to vary the fee based on the aquifer pumped is an option that could be used by the District as a management to incentivize the pumping of one aquifer over another.

- Aquifer-based fee structure could be implemented District wide or within designated management zones
- A benefit of this fee structure is to help avoid the need for curtailment of pumping in a specific aquifer by charging a higher fee for pumping one specific aquifer over another
- The purpose for the fee structure would be to provide sufficient financial incentive for current well owners to reduce their pumpage from one or more specific aquifer(s) and to increase pumpage from other aquifers and for new well owners to minimize pumpage from the onset.

Key Issues

Boundaries for Management Zones Associated with DFCs

The District has previously set DFCs to represent the average drawdown for Total Management Areas. From the perspective of water resource planning, the Total Management Area may be an appropriate size because so that all of the available groundwater in a GCD is properly reported. However, the use of the Total Management area can be problematic from a regulatory perspective because of the lack of wells that can be used to evaluate compliance in the down dip portion of all of the District aquifers.



Key Issues

Boundaries for Management Zones Associated with DFCs

If the District is interested in using DFCs as a regulatory driver to justify curtailment in production in management zones, then the District should partition Total Management Zones into multiple management zones, whose areas are based on the following considerations:

- The location of available wells for monitoring the water levels in the management zone
- The wells in the District monitoring network that are located in the management zones
- Whether the DFC will be used to regulate production and permitting
- The District's responsibility to set DFCs where there are no permitted wells
- The District's responsibility to set DFCs where there are no exempt wells

Key Issues

Time Intervals Associated with DFCs

For the last two joint planning session, POSGCD has adopted DFC values for only a single time, which has been at least 50 years into the future. Currently, GMA 12 has adopted DFCs only for only the year 2070 and for the third round to joint planning, the GMA 12 has proposed DFCs only for the year 2070.

From the perspective of planning, a DFC set 50 years into the future provides a useful endpoint for investigating the different future pumping scenario that can occur to achieve the DFC. Such an investigation would provide valuable information related to the amounts of groundwater production that are possible for the DFC. From the perspective of regulatory enforcement, however, a DFC set 50 years into the future may not be a useful endpoint because the data are beyond the renewal date for all of POSGCD permits, which are issued with 40-year terms.

- **Among important regulatory questions associated with the using a 2070 DFC as a regulatory driver is whether or not the DFC can be exceeded prior to 2070 if the DFC will still be achieved 2070.**

If POSGCD desires to use DFCs as a regulatory driver to justify curtailment, the District should consider the benefit of selecting a DFC for multiple times and not just for the time corresponding to the end of the 50-year planning cycle.

Key Issues

Compatibility of DFCs & PDLs

The District has assigned a Shallow Management Zone and a Total Management Zone to each aquifer. The Shallow Management Zone for each aquifer includes only the portion of the aquifer that extends to depth of 400 feet, whereas the entire aquifer is contained within a Total Management Zone. A concern with setting a PDL and a DFC for the same aquifer is that the two may not be compatible. If DFCs and a PDL are not compatible in an aquifer, the PDL may prevent the DFC from being achieved, which means that the DFC is not feasible. This situation would be in violation of TWC §36.108(8), which requires that groundwater management areas shall consider the feasibility of achieving the DFC.

One of the obstacles with checking the compatibility between the District's PDLs and DFCs is developing a credible method for evaluating whether or not they are compatible. Whereas the GAMs simulated water levels can be used to directly calculate a DFC, these same water levels cannot also be used to directly calculate a PDL.

In order to improve the technical and legal defensibility of adopting and enforcing DFCs and PDLs , then the District should consider the following:

- Review the definition of PDLs
- Adjust PDLs to represent drawdown in the unconfined portion of an aquifer
- Develop a process for evaluating compatibility
- Change the definition of the management zones associated with DFCs and PDLs to demonstrate that PDLs do not impact the feasibility of achieving DFCs
- Adjust model layers in GAM to better calculate average drawdown in shallow zones
- Adjust the definition of PDLs so that current GAM can be used to simulate average drawdown in shallow management zones

Key Issues

Enforcement of DFCs & PDLs by Curtailment of Production

In preparation for determining how and when to enforce DFCs, PDLs, or similar limits on groundwater depletion, the District should consider performing a comprehensive review its entire set of management strategies and rules related to enforcement of production and drawdown thresholds because the aquifer conditions and best science available is continually evolving. Among the objectives of such review would be to identify rules that: (1) may not be adequately supported by best available science and thus need to be updated; (2) may not be sufficiently articulated to serve their intended purpose; (3) may contain words that are not sufficiently defined; (4) are in conflict with other rules or management strategies.

Management Strategy	Regulation/Guidance	Dependence on Science	Overlap with Other MS
1. Education and Public Outreach	MP Sec 16,	T-1 D-1	All
2. Regional Planning	TWC Chapter 36,	T-1 D-1, D-2, D-3, D-4	4, 5
3. Compliance Evaluations for DFC and PDLs	Rules Sec 16/ MP Sec 7,	T-1, T-2, T-4 D-1, D-3, D-4	4, 5
4. Management Zones	Rules Sec 16/ MP Sec 5	T-1, T-4 D-4	2
5. Well Monitoring Program	Rules Sec 4, 11 / MP Sec-10/ Compliance Monitoring Document	T-1, T-4 D-1, D-2, D-4	2, 3, 4, 5, 7, 8, 9
6. District Action Triggered by Exceeding Threshold Levels	Rules Sec 16 /MP 11	T-1, T-4 D-1, D-2, D-4	2, 3, 4, 5
7. Well Permitting Requirements	Rules Sec 5, 12	T-1, T-2, T-3 D-2, D-3, D-4	4, 5, 8, 9
8. Production Limitations	Rules Sec 5	T-1	2, 3, 4, 5, 7, 9
9. Curtailment of Permitted Production	Rules Sec 16 /MP 11	T-1, T-2, T-4 D-1, D-2, D-3	2, 3, 4, 5, 6, 7
10. Conservation Programs	Rules Sec 8, 13; MP Sec 16,		3, 4, 8
Science: Analysis & Techniques		Science: Quantitative Data	
T-1. Groundwater Availability Models		D-1. Monitored WL Data	
T-2 Modified Groundwater Availability Models		D-2. Reported Pumping Rates	
T-3. Analytical Models for Groundwater Flow		D-3. Aquifer Pumping Tests	
T-4 Software to Interpolate Monitoring Data		D-4. Driller and Geophysical Logs	

Key Issues

Unreasonable Impacts to Groundwater & Surface Water

Before granting or denying a permit, or a permit amendment issued in accordance TWC § 36.1146, requires that the district shall consider whether the proposed use of water unreasonably affects existing groundwater and surface water resources or existing permit holders. The District rules do not explicitly define what represents an unreasonable impact to groundwater or surface water.

In order have the rules address the issue of unreasonable impact, the District should consider defining unreasonable impacts of groundwater and surface water as part of their rules.

Additional Management Issues

In addition to the six issues discussed, the Board has identified three additional issues it would like to integrate into Management Strategies:

Incentivize Conjunctive Use of Groundwater and Surface Water

Conjunctive use in water resources is generally defined as the use of groundwater and surface water resources in a conjunctive, or integrated method, to increase the overall reliability and availability of water in the long-term.

Incentivize Aquifer Storage & Recovery

ASR is a proven technology and is used as a water supply strategy to increase the availability of either groundwater or surface water. ASR uses the aquifer to store excess water during times of plenty and recovers that water from the aquifer when it is needed.

Promote Water Conservation

The District currently has a management objective in the Management Plan for Conservation of groundwater through several means within the District. Some of these methods include rainwater harvesting, brush control, conjunctive management and recharge enhancement projects (which could include ASR). A key premise of conservation of groundwater in the District is that the more efficiently all the water resources are used within the District, the more groundwater will be conserved.

QUESTIONS?