

Proposed Desired Future Condition(s) for Aquifer(s) in GMA 12

Environmental Stewardship Supplemental to Consideration 4

Submitted March 18, 2021

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Executive Summary

Environmental Stewardship proposes that GMA-12 Districts adopt a DFC that includes a surface water parameter, such as the maintenance of flows in the Colorado River at the Bastrop Gage, or the maintenance of overall inflows into the Colorado River consistent with a sustainable water budget. The consideration and protection of surface water resources is a required element of the DFC planning process, and these methods of planning are supported by the best available science.

Environmental Stewardship also proposes that GMA-12 Districts implement a field data collection program, as described herein, to assess the interaction of the Colorado River with area groundwater resources. The implementation of such a project would enable refinement of a surface water DFC, if adopted. If the GMA-12 does not adopt a surface water DFC component in this DFC planning cycle, then the implementation of such a project would provide valuable information that would inform the development of a surface water DFC in the next planning cycle.

Environmental Stewardship further requests that Lost Pines and Fayette County GCDs develop and include in its 2023 management plan a surface water management plan for the Colorado Alluvium Aquifer that includes such details as required in Sec. 36.1071(e), uses the models and information required in Section 36.1071(h), and provides for a desired future condition to be adopted as described herein. That each GCD adopt rules to implement the management plan as required by Sec. 36.1071(f).

Standard for Desired Future Condition(s): Environmental Stewardship's primary interest in this GMA-12 DFC review process is to protect the integrity and functioning of the ecological systems that form the basis of the Colorado and Brazos river basins and the Carrizo-Wilcox and associated aquifers for current and future generations.

In conformance with the Conservation Amendment of the Texas Constitution, it is the duty of Groundwater Conservation Districts to conserve and preserve the natural resources of the state -- our groundwater, our rivers, our springs, and our bays ... our ecosystems -- by passing laws, rules, and for the purposes of this effort, adopting desired future conditions, that achieve a resilient balance between conservation and development of those resources *in perpetuity*. To protect our aquifers as we found them while respecting the ownership rights of landowners.

Though the ability to preserve an aquifer for future generations is not totally in our control -- its rate of replenishment, and its hydrologic characteristics, are largely a function of Mother Nature and must be accepted and respected -- development of an aquifer, and ultimate depletion of an aquifer and/or the surface water and ecosystems which depend on groundwater, *is the voluntary human action in which we are currently engaged*.

The essence of conservation and preservation of an aquifer resource is that the rate at which we deplete our aquifers must be in balance with the protection of the aquifer. That the depletion not be driven only by the desire for development, against which we simply wait for damage to the aquifer's sustainability before attempting to bring it back "in balance".

Only when a definite "conservation standard" describing a resilient and sustainable aquifer is established -- an aquifer that is capable of recovering from unanticipated events and preserved in perpetuity -- can we then determine how much of that aquifer we can develop in balance with the conservation standard. Conservation and protection of an existing aquifer for the *common good of future generations* must be the priority, not the *development* of an aquifer to satisfy every current and speculated human demand on it. Civilizations that have disappeared have failed to realize this distinction when they exploited natural resources.

Proposed AQUIFER DFCs and Measuring/Calculating Method

Please be as detailed as possible in describing your proposed DFC. Include the quantifiable value and a description of the method for measuring or calculating the value. Attach additional pages as needed.

Aquifer	Proposed DFC and Measuring/Calculating Method
Carrizo Aquifer	ES requests that the Districts re-adopt the current DFCs based on DFC Run 3 (New GAM)
Calvert Bluff Aquifer	ES requests that the Districts re-adopt the current DFCs based on DFC Run 3 (New GAM)
Simsboro Aquifer	ES requests that the Districts re-adopt the current DFCs based on DFC Run 3 (New GAM)
Hooper Aquifer	ES requests that the Districts re-adopt the current DFCs based on DFC Run 3 (New GAM)
Queen City Aquifer	
Sparta Aquifer	
Yegua-Jackson Aquifer	
Brazos Alluvium Aquifer	
Colorado Alluvium Aquifer	ES requests that the Districts initiate the development of DFCs, as described in Section 36.1071, for this aquifer in anticipation of adopting quantitative DFCs during the next planning cycle based on the field data collected.

Consideration of Proposed Desired Future Condition(s)

The Texas Water Code requires that the GMA develop DFCs that “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.” In the space below, or on additional attached pages, please provide your considerations with regard to the nine items that must be considered, per the Texas Water Code, for the proposed DFC(s).

CONSIDERATION 4 – “Other environmental impacts, including impacts on spring flow and other interactions between groundwater and surface water.”

Environmental Stewardship (ES) provides the following comments to supplement its October 28th and December 28th, 2021 comments to GMA-12 that provide the background and scientific basis for this consideration by the GMA-12 Districts before adopting desired future conditions (DFCs) for the Carrizo-Wilcox Aquifer Group (Carrizo, Calvert Bluff, Simsboro and Hooper formations).

OBJECTIVES AND EXPECTATIONS

The surface water monitoring project described herein consists of designing, installing, initial data collection, and development of monitoring protocols. Once established, the project should continue in order to provide the ongoing monitoring of the surface water-groundwater (SW-GW) interactions between the Texas Colorado River, its tributaries, the Colorado Alluvial Aquifer, and the Carrizo-Wilcox Aquifer Group. Such monitoring is needed to conjunctively manage these resources.

Information and data from the project will enable further improvements to the GMA-12's 2020 Groundwater Availability Model (GAM). Such improvements are necessary to enable reliable predictions regarding the current and future impacts of groundwater pumping on the surface waters associated with the Colorado Alluvial Aquifer and the Carrizo-Wilcox Aquifer Group in Bastrop and Fayette Counties, Texas.

Environmental Stewardship's interest is to have a monitoring network designed and installed in order to ensure that the surface water and groundwater interests of the residents and the environment of Bastrop, Lee and Fayette counties, within Lost Pines and Fayette Groundwater Conservation Districts, are protected. The GAM improvements should enable confident predictions regarding the impacts of groundwater pumping on surface waters such that quantitative desired future conditions can be adopted and enforced for surface waters by the Districts in GMA-12.

DESIRED FUTURE CONDITION (DFC)

Texas Water Code Chapter 36

Sec. 36.108 JOINT PLANNING. (d-2): This subsection does not prohibit the establishment of desired future conditions that provide for the reasonable long-term management of groundwater resources consistent with the management goals under Section [36.1071\(a\)](#)

Sec. 36.1071. MANAGEMENT PLAN. (a) Following notice and hearing, the district shall, in coordination with surface water management entities on a regional basis, develop a management plan that addresses the following management goals, as applicable:

- (1) providing the most efficient use of groundwater;
- (2) controlling and preventing waste of groundwater;
- (3) controlling and preventing subsidence;
- (4) **addressing conjunctive surface water management issues;**
- (5) **addressing natural resource issues;**
- (6) **addressing drought conditions;**
- (7) **addressing conservation**, recharge enhancement, rainwater harvesting, precipitation enhancement, or brush control, where appropriate and cost-effective; and
- (8) addressing the desired future conditions adopted by the district under Section [36.108](#).

Example of Proposed Surface Water DFC

Desired Future Condition: To provide long-term conjunctive management of the Colorado Alluvial Aquifer in Bastrop and Fayette counties in order to protect groundwater baseflow contributions to the state-adopted environmental flows in the Colorado River and equivalent flows in its tributaries, during normal, dry and drought conditions, in perpetuity.

Performance Standards:

Long-Term (in perpetuity)

- A. Maintain a desired amount of flow of groundwater from the alluvial aquifer to the Colorado River and its tributaries throughout each succeeding management period based on:
 - a. Water levels in the alluvial aquifer, and
 - b. Desired outflows to the river and its tributaries.

Near-Term (Present through ~2027)

- B. Quantify the desired amount of flow of groundwater from the alluvial aquifer during the fourth DFC review cycle from field data collected in the interim.
 - a. Install monitoring and maintain stations (similar to Vista site) to quantify flows between aquifers, and between the aquifers and the streams.
 - b. Install and maintain monitoring wells or piezometers in the alluvium throughout Bastrop and Fayette counties in order to measure and quantify water levels in the alluvium, establish baselines, and detect trends.

GCD MANAGEMENT PLANS

Management plans are required to address the eight management goals, as applicable, including conjunctive surface water management issues, natural resource issues, drought conditions, conservation, and desired future conditions.

Management plans are required to be updated and re-adopted following each joint-planning cycle. Lost Pines GCD's 2023 plan is due to be submitted to the Texas Water Development

Board by January 24, 2023. Fayette County GCD's plan is due by November 16, 2023.

Environmental Stewardship requests that Lost Pines and Fayette County GCDs develop and include in its 2023 management plan a surface water management plan for the Colorado Alluvium Aquifer that includes such details as required in Sec. 36.1071(e), uses the models and information required in Section 36.1071(h), and provides for a desired future condition to be adopted as described herein. That each GCD adopt rules to implement the management plan as required by Sec. 36.1071(f).

FIELD DATA COLLECTION

A Proposal to Collect Information Required to Establish a DFC to Protect Groundwater Discharges to the Colorado River and its Tributaries

This is a proposal to begin gathering the data needed to establish a realistic and quantifiable DFC to protect groundwater discharges to the Colorado River and its tributaries.

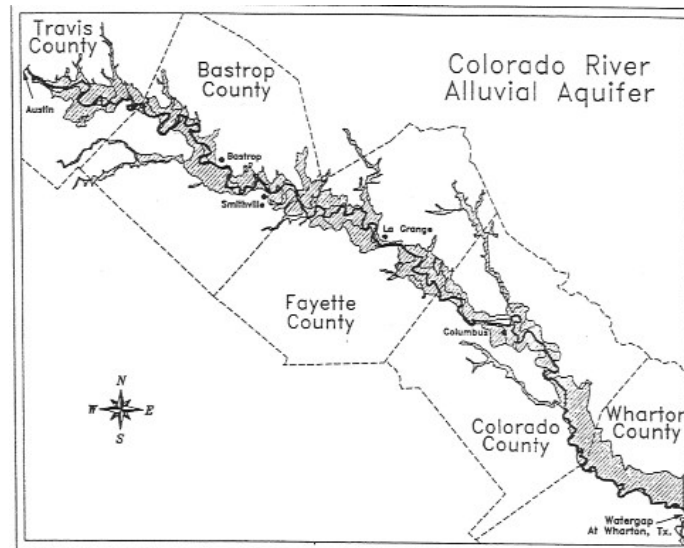


Figure 1. Extent of the Colorado River Alluvium, south-central Texas (after Barnes, 1974).

Figure 1. Extent of the Colorado River Alluvium, south-central Texas (after Barnes, 1974)

Groundwater discharges cannot be directly observed. However, the discharges are directly related to water levels in the alluvium along the streams. Therefore, Environmental Stewardship (ES) proposes establishing a DFC for the alluvium.

A realistic DFC requires a better understanding of the relationship between the alluvium and the streams. Some of the data needed is already being gathered¹. However, ES believes that more will be required. Therefore, ES asks that GMA 12 direct its consultants to develop and implement a monitoring plan, and/or issue a request for proposals to collect the required

¹ Fenstemaker, Batchelder, September 2020, E.g., the Surface Water/Groundwater Interaction Study at the Vista site.

information and monitor long-term trends. The general categories of information are outlined below.

1) Establish Baseline for Alluvium

Establish a network of wells to monitor water levels in the alluvium.

- Determine long-term water level trends.
- Measure hydraulic conductivity.
- Use existing wells to extent possible.
- Evaluate the use of piezometers VS monitor wells.
- Refine mapping of alluvium.
- Other.

2) Monitor Interactions

Monitor interactions between streams, alluvium, and underlying aquifers.

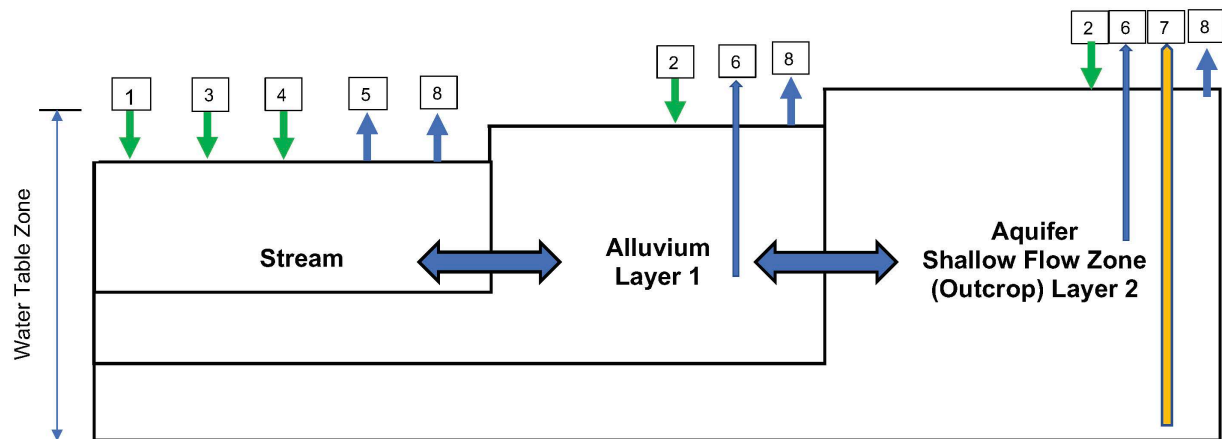
- Construction of stations similar that at the Vista site.
- Perform pumped aquifer tests.
- Monitor water levels and water quality parameters (e.g., temperature, conductivity).
- Include, where practical, a monitor well in Carrizo-Wilcox below the alluvium.
- Estimate the local rate of discharge from alluvium and aquifer to stream (or vice versa).
- Estimate amount and duration of bank storage following high stream flows.
- Determine origin of water in alluvium (stream, underlying aquifer, precipitation).
- Other.

3) Improve GAM

The GAM will, most likely, continue to be used to predict the effects of pumping on water levels in the alluvium, and the discharge of groundwater to the Colorado and its tributaries. The data gathered above may be used to improve the GAM's estimates of groundwater discharge. Improvements may include the incorporation of more realistic properties of alluvium and aquifers near streams, and calibration to measured flow rates between alluvium and streams.

CONCEPTUAL GRAPHICS

The following graphics provide a summary of the inflows, outflows, and monitoring tools that will be needed to develop and implement a monitoring plan.



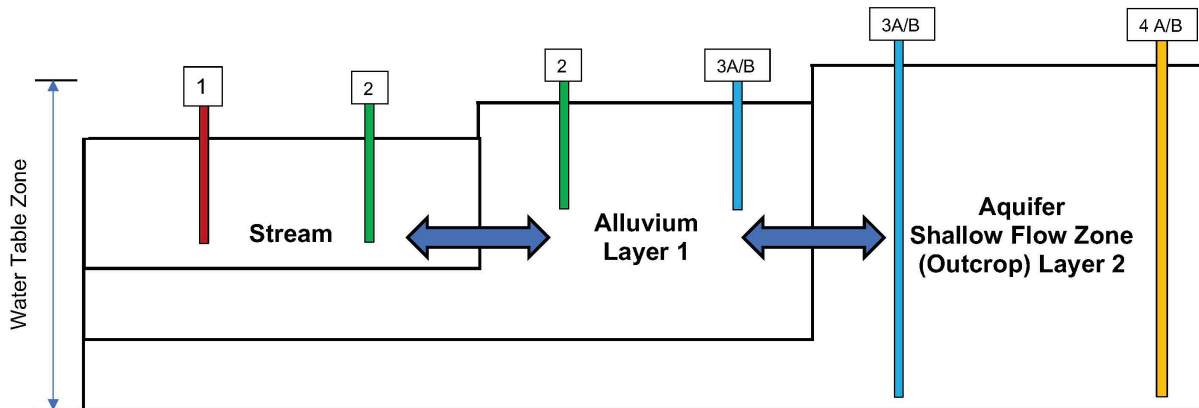
Inflows

1. Precipitation (Storm Water)
2. Precipitation (Recharge)
3. Municipals (Return Flows)
4. LCRA (Highland Lake Releases as directed by Water Management Plan)

Outflows

5. Surface Water Rights (diversions)
6. Exempt wells (withdrawals)
7. Commercial Non-exempt wells (withdrawals)

Figure 2. Inflows and outflows relative to stream, alluvium, and aquifer layers



- | | |
|--------------------------------|---|
| 1. USGS Stream Gage | Measures water level, flow rate, and discharge |
| 2. Piezometer | Measures water level, temperature, dissolved solids |
| 3. Monitoring Well | |
| Type A - Drilled and spaced | Measures depth and water quality |
| Type B - Existing | Measures depth and possibly water quality |
| 4. Production Well | No monitoring measurements |
| Type A - Exempt Domestic | |
| Type B - Non-Exempt Commercial | |

Figure 3. Conceptual layout of monitoring measurement tools in relationship to stream, alluvium and aquifer layers.