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

Environmental Stewardship

Comments on Needs & Strategies,

Property Rights Presentation, and

Supplemental comments on Hydrological Conditions

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Proposed Desired Future Condition(s)

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

Aquifer	Proposed DFC and Measuring/Calculating Method

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 1 – "Aquifer uses or conditions within the management area, including conditions that differ substantially from one geographic area to another:" _____

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Consideration 2 – "The water supply needs and water management strategies included in the state water plan:"

Environmental Stewardship applauds the Consultant Team for gathering into one set of slides the primary data available and needed to understand how the supply, demand and water management strategies of the Districts will impact the aquifers relative to the adopted desired future conditions. Having this information in one place in a consistent tabular format is a major first step in accomplishing Consideration 2.

EXPORT & ENVIRONMENTAL FLOWS

Environmental Stewardship asserts that, first and foremost, the presentation by the Consultant Team titled GMA-12 Needs and Strategies on June 25, 2015 presents an incomplete view of the needs and strategies that impinge on the aquifers because 1) exports of water outside the GMA-12 districts are not included in the analysis, and 2) environmental flow needs and requirements within the GMA-12 districts are not included in the analysis. The fact that environmental flows are not currently considered in the State Water Plan is not, however, a shortcoming of the GMA-12 DFC process. Lacking analysis of these needs in Consideration 2 does, however, hinder evaluation of the impact of pumping of the aquifers on the surface water and spring flows within the GMA and must be included in Consideration 4.

To fully comprehend the needs and strategies that will impact the aquifers it is necessary to 1) ensure that all exports out of the district that are included in the State Water Plan are included, and 2) ensure that all major water projects that require groundwater to be produced, supplied and delivered to meet demands outside the Districts that may not be included in the state water plan are, none-the-less, quantified and evaluated along with the other data in Consideration 2. .

ES notes that slide 29 provides export information for Lost Pines GCD. ES requests that a similar slide be added for Post Oak Savannah GCD and any other district that has significant exports. To provide a more complete picture of what export might look like for Lost Pines GCD, slide 29 should include contested applications that are yet pending. (Contested information for Post Oak and other Districts should be provided to the extent applicable). As such the following information should be added to the Lost Pines Export slide:

Total permitted export not including demands: 15,300 ac-ft/yr.

Contested exports: Forestar: 33,000 ac-ft/yr.

End Op: 56,000 ac-ft/yr.

Total permitted and contested export: 104,300 ac-ft/yr.

Post Oak Savannah GCD currently has two Transport Permits – Blue Water Systems with 70,993 AF/Yr, and Southwest Milam WSC with somewhere near 490 AF/Yr, a total of 71,423 AF/Yr (personal communication with Gary Westbrook, August 5, 2015).

ES notes that if the above export permit volumes were added to Lost Pines GCD slide 28 and Post Oak Savannah GCD slide 46, total permits would greatly exceed 2010 Availability indicating a very significant gap may exist in future supply availability. The export factor will become increasingly important and significant as the impact of total production (within districts and exports) is evaluated relative to the adopted desired future conditions.

ES REQUEST 1: It is unclear to what extent the current and future exports from GMA-12 are included in the State Water Plan. To fully comply with Consideration 2, this uncertainty needs to be investigated and the tables reported in this presentation updated to include such exports. To the extent these exports *are not* in the State Water Plan, the consultant team should prepare a supplemental report to bring this factor in focus under Consideration 8.

ES REQUEST 2: To the extent practicable, the consultants should be requested to tabulate environmental flow needs for the Colorado and Brazos rivers as adopted by TCEQ which can be found at https://www.tceq.texas.gov/permitting/water_rights/wr_technical-resources/eflows/rulemaking . By documenting and considering environmental flow needs now, the GMA-12 and Districts will be prepared when the next round of Regional Water Planning is required to include these standards and requisite supply/demand needs.

ENERGY – WATER NEXUS

In reviewing at the demand, need and strategy tables (slides 7, 9, 10, 14, 16-17, 21, 23-26, 31, 33-36, 40, 42-44, 48, 50-53) it is clear that the greatest growth in water demand for the GMA-12 other than *export* is in *steam electric power*, yet very little or no strategies are focused on this gap. Perhaps, as I have heard some say, the demand is going to go away, OR, as unsuccessfully argued in the recent legislative session, the industry believes they will draw a "get out of jail free" card and be exempted from any curtailment that may come as a result of over-pumping of groundwater.

The data also makes clear that steam electric is highly dependent upon the Highland Lakes Lake/Reservoir System for for surface water supply (Lost Pines and Fayette County GCDs) yet there is no increase in the amount of water the surface water system in predicted to supply. In fact, we have seen a great deal of pressure on the Highland Lakes System during the drought, and FIRM water supply has, in fact, been reduced by 100,000 ac-ft/yr as a result of declining inflows. None-the-less, these data reinforce the key link between the production of electricity and the amount of water required to produce electricity from our aging coal fired electrical generating infrastructure (the Energy – Water Nexus). In

the GMA-12 region, this is likely the single greatest opportunity for water demand reduction, even before conservation.

ES REQUEST 3: To address the energy – water nexus in a way that reduces overall demand for water for steam electric power production, GMA-12 and District representatives on regional water planning groups are requested to confront this imbalance between high growth in demand and low priority for strategies. It is essential in planning that the best estimates possible be made available for the RWPGs and the GMAs.

CARRIZO-WILCOX AQUIFER OVER-PUMPING INDICATED

In reviewing the groundwater and surface water supply and strategy tables (slides 8-9, 15-16, 22-23, 32-33, 34-35, and 49-50) it is apparent that the Carrizo-Wilcox Aquifer is the only groundwater aquifer that consistently is forecast to have a declining trend in all Districts (all others are essentially flat). The consistent declining trend in groundwater production from existing permits and associated infrastructure in the Carrizo-Wilcox Aquifers should be seen as an indicator that the aquifers are forecast to be pumped at an unsustainable rate. Only additional drilling and pumping, which will exacerbate the current situation and will be further exacerbated by development for export, will provide even a flat production rate in this aquifer group. To allow ongoing and unsustainable over-pumping will ultimately lead to irreparable damage to the aquifer system.

As expected, both Lost Pines and Post Oak Savannah GCDs show substantial increases in supply as a result of existing strategies within the Districts, but do not appear to show the extent of increase in production that is expected due to production strategies for export of water outside the region.

ES REQUEST 4: The consultant team should be tasked with determining if the steady decline in the Carrizo-Wilcox Aquifer under the conditions of the existing production infrastructure is an indicator of *unsustainable over-production* of the aquifer group. The team should further be tasked to evaluate the impact of export development and production on the sustainability of the aquifer group.

CONSERVATION

In reviewing the strategies for reducing demand (summarized in slide 53) it is pathetic that only Lost Pines GCD indicates any degree of strategic planning for conservation. And then only Smithville, in Bastrop County, lists 25 acre feet of targeted conservation in 2010.

ES REQUEST 5: All groundwater conservation districts (GCDs) in GMA-12 should be tasked to request and require, within the extent of their legal ability, that all water suppliers submit conservation plans which set quantified conservation targets during each decade of the planning period.

Consideration 3 – "Hydrological conditions, including for each aquifer in the management area the total estimated recoverable storage as provided by the executive administrator, and the average annual recharge, inflows, and discharge:"

The following comments in ***bold italics*** are supplemental to those made by Environmental Stewardship in its June 18, 2015 submission and are based on the GMA Consultant Team's slide set presented at the May 28 meeting. Environmental Stewardship appreciates that the discussion at the May meeting was presented for the PS-4 scenario in the context of a full water budget for the current planning period through 2070 and included the 1975-1999 calibration period.

ES Comment #2. As noted in slide 21, the Carrizo formation is hydrologically connected to the Wilcox formation, and in slide 25, the Simsboro is defined as a separate unit in most of the GMA. These two statements are significant "assumptions" that echo throughout the evaluation and decision process and, in many cases, conflict with the GAM out-puts data ***and the historical literature.*** Environmental Stewardship contends that the assumption for the Simsboro aquifer needs to be tempered to recognize that, over the long-term 50+ year planning horizon of the DFC process, it is likely that the Simsboro aquifer communicates with the other associated aquifers (Calvert Bluff, Hooper, and Carrizo). To the extent that the hydrological dynamics of heavy pumping of the Simsboro Aquifer will cause inflows to the aquifer from these other formations, the likely impact over time will be to lower the levels of the Carrizo, Calvert Bluff and Hooper aquifers which will have impacts on both exempt and non-exempt wells in those formations. These impacts seem to be indicated in Consideration 2 and need to be examined in considerations 4, 6 and 7.

ES bases its concern about the degree to which the GMA considers that these aquifers do, or do not, communicate on both the GMA-12 GAM and historical literature. The faults in the GAM are problematic in that they appear to limit communication while the empirical evidence indicates that there is greater communication across the faults than anticipated. If such is the case, and if the faults impact on communications between aquifers, the amount of water predicted to flow both vertically and horizontally would likely increase, and perhaps increase substantially.

Further, ES provides the following references from its slide presentation to GMA-12 on June 27, 2014 as evidence from the historical literature. (Slide numbers are from the referenced presentation).

Slides 9 & 10: The Rice study provided to GMA-12 predicts that the effects of pumping on other aquifers will be to induce leakage from the Hooper Calvert, Bluff, and Carrizo aquifers into the Simsboro aquifer.

Slides 19-30: Impacts of pumping on other aquifers have significant implications for shallow surface wells, streams, springs and surface features that depend on shallow groundwater to survive and thrive. The literature indicates the sand aquifers of the Carrizo-Wilcox Group communicate and are not isolated as follows:

TWDB and LCRA developed a digital model of the Carrizo-Wilcox Aquifer within the Colorado River basin (primarily Bastrop and Fayette counties) published in 1989. (Exhibit N2 : A Digital Model of the Carrizo-Wilcox Aquifer within the Colorado River Basin of Texas: TWDB Report LP-208, January 1989).

Key Findings:

> *"The sand units yield most of the water and are interconnected, at least regionally, causing the entire system to act as a leaky artesian system."*
>
> *"The aquifer is essentially full and currently loses water through interformational flow to the overlying Younger Rocks, flow to the Colorado River where it crosses the outcrop, and rejected recharge in lower-lying portions of the outcrop area."*
>
> *"The aquifer model which was constructed ... works well to predict regional trends within the aquifer, and can be used for regional planning."*
>
> *"... study of water level maps indicates that the Colorado River and its major tributaries appear to be receiving a major portion of the natural discharge from the Carrizo-Wilcox aquifer."*
>
> *"... a significant component of ground-water flow in the Carrizo-Wilcox within the study area is toward the Colorado River."*
>
> *Using 1985 pumping, "... about 65,000 acre-feet is rejected through natural discharge in the outcrop area through seeps and springs, and about 45,000 acre-feet flows to the Colorado River in the outcrop."*
>
> *"... in these simulations, discharge to the Colorado River correspondingly decreased incrementally with each increase in pumpage."*

Other Reference to communicating sands:

- *"In this report, the Carrizo Sand and the Wilcox Group are considered as a unit because they are hydrologically connected." (Exhibit N3 : Ground-water Resources of Bastrop County, Texas. TWDB Report 109, Third printing, November 1981)*
- *"Because the sands of the Wilcox Group are hyraulically connected with the Carrizo Sand, the term "Carrizo-Wilcox aquifer" is often used." (Exhibit N4: : Phase I Evaluation Carrizo-Wilcox Aquifer West-Central Study Area Trans-Texas Water Program Draft. LBG-Guyton Associates. January 1994, Published in Volume 2, May 1994)*
- *The aquifer consists of hydrologically connected interbedded sands, clays, slits and discontinuous lignite beds of the Wilcox Group and overlaying the massive sands of the Carrizo." (Exhibit N4)*
- *"Vertical leakage to and from the more important Carrizo and Simsboro sands of the Carrizo-Wilcox aquifer is through confining beds (aquitards)" (Exhibit N4)*

- *"The expectation that there will be drawdown in the outcrop raises the issue as to what the magnitude of the hydrologic and environmental impact will be." (Exhibit N4)*
- *"... analysis indicate that significant quantities of water could enter the Carrizo (and Simsboro in Bastrop County only) as leakage from the hydraulically connected sands and clays of the Wilcox because of the pumpage-imposed vertical hydraulic gradients" (Exhibit N4)*
- *"Because of the presence of relatively poor quality water in a least some portions of the Wilcox, this interformational leakage may not have a desirable effect on the Carrizo and Simsboro Sands." (Exhibit N4)*
- *"Three data sets on hydraulic properties were used [in the model]. One data set included interpreted results of field tests conducted near the Sandow Mine in Milam County according to standard hydrological techniques." (Attachment S: Groundwater Availability in the Carrizo-Wilcox Aquifer in Central Texas – Numerical Simulations of 2000 through 2050 Withdrawal Projections. Alan R. Dutton. Bureau of Economic Geology Report of Investigations No. 256.)*
- *"A second set of filed-tested results was compiled from literature and the TWDB Internet site." (Attachment S)*
- *The third data set, provided by Mr. David Thorkildsen, was used in his previous model of the Carrizo-Wilcox Aquifer." (Attachment S)*
- *Accordingly, all data on hydraulic conductivity were pooled together, (Attachment S).*

Based on sound science and the data used to build the GAM used by GMA-12 it is reasonable to conclude that:

- ▲ *Water does move between the aquifers of the Carrizo-Wilcox formation on a regional basis.*
- ▲ *The GAM reasonably estimates the water movement vertically between aquifers.*
- ▲ *Pumping in the Simsboro Aquifer will induce leakage from the Carrizo, Calvert Bluff and Hooper formations into the Simsboro.*

ES Comment #4: Annual Recharge, Inflows, and Discharges (Slide 46): What is the modeling periods used for each of the TWDB GAM Run's? Taken out of the context of a water budget, the values for recharge, inflows, and discharges can be very misleading. To be meaningful, these data need to be considered in the context of the pumping and other factors. At a minimum, this information should be presented as a sequence of GAM runs progressing from the earliest done for each district, through to the most current, so that

changes in these values can be viewed and trends detected. The water budget information that follows is much more informative.

The concern is that these data points, when taken out of the context of a water budget, lead a reader to believe (or perhaps assume) that these quantities of water are constant from year-to-year and from decade-to-decade. ES realizes that, to a certain extent, these data are being provided as prescribed by the Legislature in the Water Code. However, we believe it would be appropriate for some general statement as to the context of these data and the associated values be included in GCD management plans.

Consideration 4 – "Other environmental impacts, including impacts on spring flow and other interactions between groundwater and surface water:" _____

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Consideration 5 – "The impact on subsidence:" _____

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Consideration 6 – "Socioeconomic impacts reasonably expected to occur:" _____

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Consideration 7 – "The impact on the interests and rights in private property, including ownership and the rights of management area landowners and their lessees and assigns in groundwater:"

Environmental Stewardship contends that the Conservation Amendment to the Texas Constitution is an important instructional document in considering the balancing of groundwater production versus conservation. ES contends that the Conservation Amendment requires that the natural water resources (both surface water and groundwater) be managed in such a way as to preserve, protect and conserve both water resources for the citizens and state *in perpetuity* while allowing development of these resources for human use to the extent that the conservation objective is not compromised (Attachment 1).

The following comments are based on the June 26, 2015 Power Point presentation by Monique Norman titled: GROUNDWATER MANAGEMENT AREA 12: CONSIDERATION OF THE IMPACT ON THE INTERESTS AND RIGHTS IN PRIVATE PROPERTY IN THE ADOPTION OF DESIRED FUTURE CONDITION OF AQUIFERS

ES strongly agrees with the continuum of interests (slide 12 titled Major GMA12 Interests in Groundwater Rights) where interests and rights range from those benefitted by present use of groundwater, to those that are benefitted by leaving a significant amount of groundwater in place. ES contends that the Conservation Amendment requires a balancing of these interests in such as way as to provide for the long-term availability of groundwater for use *in perpetuity*.

The statutory mandate to achieve a balance between the "highest practicable level of groundwater production versus the conservation, preservation, protection, recharging and prevention of waste of groundwater" must be considered in the DFC review process in order to protect the property rights of landowners (slides 3 & 4). The word "practicable" may be defined as "feasible." For example, granting 100% of an applicants' requested amounts is not feasible, and thus does not achieve the "highest practicable level of groundwater production," if the combined effect is to make the DFCs unachievable and has an unintended impact on the groundwater owned by other landowners. In the face of potential legislative developments, over-permitting is an imprudent practice, sets a dangerous precedent, and potentially injures landowners.

ES contends that, in balancing the use of groundwater at the *highest practicable* level of production, the GMA and districts must also consider the impacts of groundwater withdrawal on surface water interests and rights. Two statutes have been in the Texas Water Code for a number of years that reflect the Legislatures' acknowledgement of the duty of the State and GCDs in managing these resources in a manner described in the Conservation Amendment. However, it is noted that these statutes have not been fully implemented by the State by developing the science that is needed to implement the decision-making considerations required by Section 36.108(d) (3) and (4)[1] and Section 36.113(d)(2)[2].

Section 36.108 (d)(4) has been in the Texas Water Code since 2011 and has direct application in this review process, yet groundwater districts and Groundwater

Management Area 12 have fail to date to adequately consider the impacts of adopted DFCs on spring flow, river and stream flow, and other interactions between groundwater and surface water. Rather the GMA and GCD's have claimed that there is not adequate science available; a conundrum created by the State. In assisting the GMA and districts with implementation of this statue, the Texas Water Development Board has not identified and applied the science available and has not developed sound science and guidelines for Districts to use in their decisions on these matters. Not withstanding the fact that subsections (3) and (4) were added to the code in the same Act, the TWDB has, on the other hand, provided such information and guidance for (3), total estimated recoverable storage.

Section 36.113 (d)(2) has been in the Texas Water Code since 1997 (18 years), yet groundwater districts have fail to adequately consider whether the permit decisions unreasonably affects existing groundwater and surface water resources, again claiming there is not adequate science available. For eighteen years the State has not identified and applied the science available and has not developed sound science and guidelines for districts to use in their decisions on these matters.

ES further contends that the aforementioned Sections 36.108(d)(4) and 36.113(d)(2) have a direct impact on interests and rights in private property and the rights of management area landowners, *and* have a direct impact on the rights of those who have been granted *surface water rights* that are impacted when water withdrawn from under the ground has a consequential impact on the amount of groundwater that outflows from the aquifers into surface waters that are owned by the State and have previously been allocated for private use. As such, it is proper that the impact on *surface water rights* be considered under Section 36.108(c)(7).

To illustrate the impact of planned groundwater withdrawal on surface water rights that would result from the GMA-12 Adopted DFCs, Environmental Stewardship retained a licensed geoscientist with the Texas Board of Professional Geoscientists. The naturalized flows of the Colorado and Brazos rivers were modified by removing a volume of water equivalent to the historic outflows from the aquifers to the river. A volume of withdrawal was selected to represent historical inflows from the Colorado River and Brazos Rivers. The contractor provided Environmental Stewardship with information on each water right and how it was affected by the adjustment in flow. Attachment 2 provides evidence of the estimated impact of groundwater withdrawals on surface water rights.

ES REQEST 6: The consultant team should be requested to prepare a report that quantitatively considers the impact of the pumping anticipated under the adopted desired future conditions on the property and surface water rights of landowners as described above. The report should estimate the number and percent of landowners that are beneficially and un-beneficially impacted by the pumping to determine whether or not there is balance in the current and anticipated District practices.

Consideration 8 – "The feasibility of achieving the desired future condition:" _____

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Consideration 9 – "Any other information relevant to the specific desired future conditions:"

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REFERENCES

[1] 36.108(d)(3)-(4) was added by Acts 2011, 82nd Leg., R.S., Ch. 1233 (S.B. 660), Sec. 17, Effective September 1, 2011.

SB 660, Section 17, Acts 2011 SECTION 17. Subchapter D, Chapter 36, Water Code, is amended by amending Section 36.108 and adding Sections 36.1081 through 36.1086 to read as follows:

Sec. 36.108. JOINT PLANNING IN MANAGEMENT AREA. (a) In this section:

(d) Not later than September 1, 2010, and every five years thereafter, the districts shall consider groundwater availability models and other data or information for the management area and shall propose for adoption [~~establish~~] desired future conditions for the relevant aquifers within the management area. Before voting on the proposed [~~In establishing the~~] desired future conditions of the aquifers under Subsection (d-2) [~~this section~~], the districts shall consider:

(3) hydrological conditions, including for each aquifer in the management area the total estimated recoverable storage as provided by the executive administrator, and the average annual recharge, inflows, and discharge;

(4) other environmental impacts, including impacts on spring flow and other interactions between groundwater and surface water;

[2] 36.113 (d)(2) has been in the Texas Water Code since 1997 (18 years), yet Groundwater Districts and fail to adequately consider whether the permit decisions unreasonably affects existing groundwater and surface water resources, claiming there is not adequate science available. For eighteen years The Texas Water Development Board has not identified and applied the science available and has not developed sound science and guidelines for Districts to use in their decisions on these matters.

Amended by Acts 1997, 75th Leg., ch. 1010, Sec. 4.30, Effective Sept. 1, 1997 Senate Bill 1.
SECTION 4.30. Section 36.113, Water Code, is amended to read as follows:

(d) Before granting or denying a permit, the district shall consider whether:

(1) the application conforms to the requirements prescribed by this chapter and is accompanied by the prescribed fees;

(2) the proposed use of water unreasonably affects existing groundwater and surface water resources;

(3) the proposed use of water is dedicated to any beneficial use;

(4) the proposed use of water is consistent with the district's certified water management plan;

(5) the applicant has agreed to avoid waste and achieve water conservation; and

(6) the applicant has agreed that reasonable diligence will be used to protect groundwater quality and that the applicant will follow well plugging guidelines at the time of well closure.

Attachment 1.

Conservation Amendment of the Texas Constitution

Balancing Preservation and Development of Natural Resources in Perpetuity

Section 59, CONSERVATION AND DEVELOPMENT OF NATURAL RESOURCES AND PARKS AND RECREATIONAL FACILITIES; CONSERVATION AND RECLAMATION DISTRICTS. (a) The conservation and development of all of the natural resources of this State,... and the preservation and conservation of all such natural resources of the State are each and all hereby declared public rights and duties; and the Legislature shall pass all such laws as may be appropriate thereto.

We assert that the Conservation Amendment, in combination with the Texas Water Code as passed by the Texas Legislature, requires that, in developing the groundwater resources of the State, a *balance* must be struck between "preservation and conservation" of the resource (supply side conservation) and development of the resource (demand side). Because each side of this equation amounts to a public right and duty under the Conservation Amendment, it is logical to conclude that *achieving balance* is itself a public right and duty.

Stated another way, the Conservation Amendment infers a direction to *achieve balance* between what would otherwise be two diametrically opposed concepts: conserve and develop, using and saving a natural resource --- for what purpose other than to make sure a resource necessary for survival lasts forever. The Amendment also uses the terms "preserve and protect". We do not take any of these references as purposeless.

The Conservation Amendment infers that the purpose is to make sure a resource necessary for survival lasts forever, or *in perpetuity.* The Amendment does not state a "planned obsolescence" date since it says conserve and develop rather than develop. . Planning and adopting a desired future condition is, by statute, a 50 year rolling process. Again, the Legislature infers that the purpose is to make the resource last forever, or *in perpetuity*. Again, there is no obsolescence date.

It is the duty of the Legislature to preserve and protect the natural resources of the state by passing laws that *achieve balance* between preservation and development of those resources *in perpetuity.*

A practical example from the Texas Water Code is Section 36.1132 (a) and (b), that also requires a *balancing*, though the statute does not use the word. It is only through *balancing* that a District can (a) "to the extent possible ... up to the point that the total volume of ... production will achieve ... an applicable desired future conditions", (b) "manage total groundwater production on a long-term basis to achieve an applicable desired future condition".

The "applicable desired future condition" is, and should be, a condition that purposefully "preserves and conserves" the groundwater natural resource. For groundwater, the balancing

is between "total volume of production" and "preservation and conservation" of the natural resource.

In fact, §36.1132 compels that a groundwater conservation district permit *up to the point* that total volume of permitted and exempt water will achieve the adopted desired future condition. The statutory mandate of §36.108 (d-2) is to achieve a *balance* between the "highest practicable level of groundwater production and the conservation, preservation, protection, recharging and prevention of waste of groundwater".

TEXAS WATER CODE:

Sec. 36.1132. PERMITS BASED ON MODELED AVAILABLE GROUNDWATER. (a) A district, to the extent possible, shall issue permits up to the point that the total volume of exempt and permitted groundwater production will achieve an applicable desired future condition under Section 36.108.

(b) In issuing permits, the district shall manage total groundwater production on a long-term basis to achieve an applicable desired future condition and consider: a set of five stated conditions.

Attachment 2.

IMPACT OF GROUNDWATER WITHDRAWAL ON SURFACE WATER PERMITS

To investigate the impact that would result from the planned withdrawals from the GMA-12 Adopted DFCs, Environmental Stewardship retained a licensed geoscientist with the Texas Board of Professional Geoscientists. The naturalized flows of the Colorado River at Bastrop were modified by removing a volume of water equivalent to the historic outflows from the aquifers to the river. A volume of 25,000 acre-feet per year was selected to represent historical inflows from the Colorado River. The contractor provided Environmental Stewardship with information on each water right and how it was affected by the adjustment in flow (Kennedy, 2012 - see endnote). Tables 1 & 2 illustrate this information.

Two scenarios were run for the Colorado River. In the first scenario (Table 1) 25,000 acre-feet per year of water was removed to simulate the withdrawal of historic groundwater outflows. Over 1,100 water rights were impacted up and down the Colorado River, involving over 7,300 acre-feet per year of water (that's about 2.4 billion gallons of water per year). Freshwater inflows to Matagorda Bay were reduced by about 16,000 acre-feet per year.

Table 1. Impact of groundwater withdrawal of 25,000 acre-feet per year on Colorado River Water Rights

Colorado River Water Rights

Water Rights Negatively Impacted with 25,000 ac-ft/yr removed						
Ac-Ft/Yr Range of Impact:	>500	100-500	10-100	1-10	<1	TOTAL
No. Water Rights Impacted:	4	11	25	228	890	1,158
Average Ac-Ft/Yr Impacted:	3,271	2,421	889	544	231	7,356

Average % Reduced:	>= 4%	3.0-3.9%	2.0-2.9%	1.0-1.99%	<1.0%	TOTAL
No. Reduced:	2	8	25	237	879	1,151

- TCEQ WAM Run 3 for Colorado River with 1401 Water Records (1940-1998)
- Flow Adjustment Record was used to reduce naturalized flow at Bastrop by 25,000 ac-ft/yr
- Comparing Volume Reliability Indexes
- **No changes were made to any water rights records**
- **Freshwater inflows to Matagorda Bay are reduced 16,196 ac-ft/yr.**

In the second scenario (Table 2) 40,000 acre-feet per year was removed to simulate loss of the historical gain to the Colorado River (25,000 acre-feet per year) and an additional volume to model predicted inflow to the aquifers as the river becomes a "losing" stream (15,000 acre-feet per year). In this scenario, about the same number of water rights were impacted, involving about 10,800 acre-feet per year of surface water (about 3.5 billion gallons). In addition, and significantly, the uncommitted Highland Lakes water right had to be adjusted by 6,500 acre-feet per year to keep the modeled lakes from going dry. And freshwater inflows to Matagorda Bay were reduced by about 21,500 acre-feet per year.

Table 2. Impact of groundwater withdrawal of 40,000 acre-feet per year on Colorado River Water Rights

Colorado River Water Rights

Water Rights Negatively Impacted with 40,000 ac-ft/yr removed						
Ac-Ft/Yr Range of Impact:	>500	100-500	10-100	1-10	<1	TOTAL
No. impacted:	5	14	34	303	798	1,154
Average Ac-Ft/Yr Impacted:	5,383	3,161	1,245	800	237	10,826

Average % Reduced:	>= 4%	3.0-3.9%	2.0-2.9%	1.0-1.99%	<1.0%	TOTAL
No. Reduced:	16	10	116	473	547	1,162

- TCEQ WAM Run 3 for Colorado River with 1401 Water Rights (1940-1998)
- Flow Adjustment Record was used to reduce naturalized flow at Bastrop by 40,000 ac-ft/yr
- Comparing Volume Reliability Indexes

*** Uncommitted Highland Lakes Water Right was adjusted -6,500 ac-ft/yr to avoid taking lakes to zero**

*** Freshwater inflows to Matagorda Bay are reduced 21,522 ac-ft/yr.**

In the Brazos River scenario (Table 3) 265,700,000 acre-feet per year was removed to simulate loss of the historical gain to the Brazos River In this scenario, about 884 water rights were impacted, involving about 29,168 acre-feet per year of surface water.

Table 3. Impact of groundwater withdrawal of 40,000 acre-feet per year on Brazos River Water Rights

Brazos River Water Rights

Number of Water Rights Negatively Impacted with 265,700 ac-ft/yr removed						
Ac-Ft/Yr Range:	>1000	100-999	10-99	1-9.9	<1	TOTAL
No. impacted:	7	27	126	273	451	884
Average Ac-Ft/Yr Impacted:	17,044	7,151	3,910	916	147	29,168

Average % Reduced:	>= 10 %	5.0-9.9%	2.0-4.9%	1.0-1.9%	<1.0%	TOTAL
No. Reduced:	6	159	191	182	355	893

- TCEQ WAM Run 3 for Brazos River with 1307 Water Rights (1940-1997)
- Flow Adjustment Record was used to reduce naturalized flow at Hearn by 265,700 ac-ft/yr
- Comparing Volume Reliability Indexes

- No changes were made to any water rights records

USING ONLY WRID WITH 0 TARGET CHANGE (UNCOMPLICATED WATER RIGHTS)
DOES NOT CONSIDER WATER RIGHT RECORDS THAT HAD NO CHANGE OR POSITIVE CHANGE

The data shows that the water that GMA-12 intends to withdraw from the river to satisfy pumping is, for the most part, already allocated in surface water right permits. There is, for all practical purposes, no unallocated water available in the Bastrop segment of the Colorado River. That withdrawal of the historic groundwater inflows will impact the water rights of over 1,000 permit holders and involve over 10,000 acre-feet per year of surface water in the Colorado River basin and over 800 permit holders and involve over 29,000 acre-feet per year of surface water in the Brazos River basin. The water to implement the GMA-12 DFCs simply is not available without damaging surface water

property rights and threatening river flows and freshwater inflows to the Bay, especially during extreme drought.

In reality, we know that the impact of a call on surface water rights does not spread the impact evenly among surface water right owners. To the contrary, since calls are made on a priority date basis, most of the impact is distributed among those water right permit holders that have a priority date later than that of the right being called.

Endnote:

Kennedy, Kirk, 2012. DETAIL RELIABILITY-25KAF BASTROP REDUCTION-pasted results-02202012.SWB.xls, DETAIL RELIABILITY-40KAF BASTROP REDUCTION-pasted results-02202012.SWB.xls. These are unpublished Excel files that will be provided to GMA-12 and/or Districts upon request.