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

Environmental Stewardship

Request regarding Feasibility of Achieving the DFC Presentation

Please see Consideration 8.

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Contact Information

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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

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:" _____

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

See ES comments dated August 6, 2015

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:"

See ES Comments dated May 15, June 18, and August 6, 2015.

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

See ES comments dated September 21, 2015

Consideration 5 – "The impact on subsidence:" _____

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

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:"

SEE ES Comments date August 6, 2015.

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

Environmental Stewardship (ES) respectfully requests that the presentation on the feasibility of achieving the desired future conditions include a detailed discussion regarding the adequacy or appropriateness of the current GMA-12 GAM in providing accurate predictions regarding each of the below listed uses of the model. That the presentation include a quantitative estimate of the error (predictive uncertainty) that is associated with each use of the model listed, and uses the water budgets from run PS4 to quantitatively illustrate the accuracy of each use of the model.

1. **At its most fundamental level, how accurate is the GMA-12 GAM in converting a quantitative demand in ac-ft/yr into a prediction of drawdown in feet in each aquifer in each District, in each decade through 2070? And vis-versa, converting a desired future condition stated in drawdown into quantitative predictions of the amount of pumping in ac-ft/yr that will achieve, in each aquifer, the adopted desired future conditions? What quantitative measures of**

error can be applied in describe the range in which each of these predictions might fall.

2. **Based on the answers to #1 above, how does the model perform in predicting the more specific parameters for which it is used and what is the range of error for each as follows:**
3. **Predicting the amount of drawdown in feet that will result from a given amount of pumping as described predictive scenarios (PS) in relationship to achieving the adopted DFCs for each aquifer in each District in each decade through 2070.**
4. **Predicting the modeled available groundwater (MAG) that is estimated to be available in each aquifer in each District, in each decade through 2070 as provided by the TWDB from the current adopted DFCs. Given that the MAG concept was not in law at the time the model was developed, is the model adequately designed and appropriate for estimating the MAG? How does the USGS ZONEBUDGET model fit into the methodology for estimating the MAG for this objective? And what error does this model introduce?**
5. **Predicting modeled available groundwater (MAG) that is estimated to be available from future predictive scenarios and/or adopted DFCs for each District in each aquifer, in each decade through 2070. Will the model get better at predicting MAG over time as pumping and drawdown data are measured and used in the GAM? How long will it take for the model to be accurate within 10%, 20%, etc. of actual?**
6. **Predicting the amount of pumping that can be permitted in each aquifer, in each district, for each decade through 2070 in order to achieve the DFCs.**
7. **Predicting the amount of vertical leakage between each aquifer, in each district, for each decade through 2070.**
8. **Predicting the amount of lateral flow between each aquifer between districts for each decade through 2070.**
9. **Predicting the amount of change in storage for each aquifer for each district for each decade through 2070.**
10. **Predicting the amount of net stream leakage for each aquifer for each district for each decade through 2070.**
11. **Predicting the amount of drains (spring leakage) for each aquifer for each district for each decade through 2070.**
12. **Predicting the amount of recharge for each aquifer for each district for each decade through 2070.**
13. **Predicting the amount of evapotranspiration for each aquifer for each district for each decade through 2070.**

Provide an understanding of how the above can, or will, be used to evaluate consideration 8 regarding the feasibility of achieving the desired future conditions and provide answers to the following questions:

a. **Is the objective of assessing the feasibility of achieving the adopted or proposed DFCs an appropriate use of the GMA-12 GAM?**
b. **Is the mathematical method used in the GMA-12 GAM appropriate to address the problem of predicting the feasibility of achieving the DFC?**

c. Does the numerical or analytical model simulate the important physical processes, including the groundwater-surface water interactions required by law, needed to adequately represent the GMA-12 aquifers?
d. If not, what available tools are appropriate to achieve the objective?

As a point of reference for the discussion ES cites the publication "Guidelines for Evaluating Ground-Water Flow Models[1]". If another publication is used for purposes of the discussion, ES requests that the publication be provided at least one week in advance of the presentation.

ES further requests that the discussions regarding calibration, error measurements, sensitivity analysis, etc. from the model documentation publications be discussed in the context of the above. Specifically, GMA-12 groundwater availability model (GAM) for the central part of the Carrizo-Wilcox Aquifer[2] major aquifer, and the Queen City and Sparta Aquifers[3] and Yegau-Jackson[4] minor aquifers.

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

SEE ES comments dated May 15, 2015 as follows:

Environmental Stewardship respectfully requests that other documents provided to GMA-12 prior to this "form" be included in the record and be considered in your deliberations regarding the current review of the desired future conditions.

Specifically citing:

ES presentation on June 27, 2014 which included a PowerPoint presentation, list of references, and copies of selected documents, all of which were provided to GMA-12.

ES letter and attachments dated March 27, 2015.

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[1] Thomas E. Reilly, Thomas E. and Arlen W.Harbaugh. 2004. Guidelines for Evaluating Ground-Water Flow Models. pubs.usgs.gov/sir/2004/5038/PDF/SIR20045038part2.pdf.
[2] Dutton, Alan R., Bob Harden, Jean-Philippe Nicot, and David O'Rourke. February 2003. Groundwater Availability Model for the Central Part of the Carrizo-Wilcox Aquifer in Texas. Final Technical Report.
[3] Kelly, Van A., Neil E. Deeds, Dennis G. Fryar, and Jean-Philippe Nicot. October 2004. Groundwater Availability Model for the Queen City and Sparta Aquifers. Final Report.
[4] Deeds, Neil E., Tingting Yan, Abhishek Singh, Toya L. Jones, Van A. Kelley, Paul R. Knox, and Steven C. Young. March 2010. Groundwater Availability Model for the Yegua-Jackson Aquifer. Final Report