



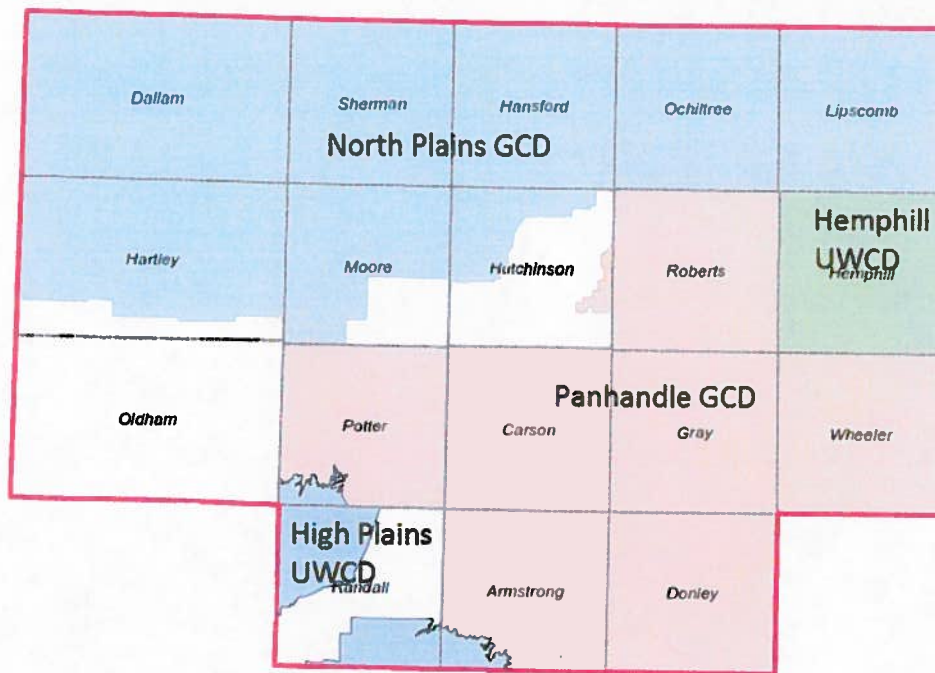
Groundwater Management Area #1 – GMA#1

Appendix B Explanation of Proposed DFCs Proposed Desired Future Conditions

Texas Water Code, Title 2, Chapter 36 ("Chapter 36") requires groundwater conservation districts located entirely or partially within a groundwater management area designated by the Texas Water Development Board ("TWDB") to propose for adoption desired future conditions for the relevant aquifers within each groundwater management area by May 1, 2016, and every five years thereafter. A desired future condition ("DFC") is a quantitative description, adopted in accordance with Section 36.108, of the desired condition of the groundwater resources in a management area at one or more specified future times. Eighteen counties in the Texas Panhandle, comprise Groundwater Management Area 1 ("GMA 1") including: Dallam, Sherman, Hansford, Ochilree, Lipscomb, Hartley, Moore, Hutchinson, Roberts, Hemphill, Oldham, Potter, Carson, Gray, Wheeler, Randall, Armstrong, and Donley Counties.

All or part of seventeen counties in GMA 1 are served by four groundwater conservation districts – the Hemphill County Underground Water Conservation District ("Hemphill District") serving Hemphill County, portions of the High Plains Underground Water Conservation District ("High Plains District") serving portions of Potter, Randall, & Armstrong Counties, the North Plains Groundwater Conservation District ("North Plains District") serving all or part of Dallam, Hansford, Hartley, Hutchison, Lipscomb, Moore, Ochilree, and Sherman Counties, and the Panhandle Groundwater Conservation District ("Panhandle District") serving all or part of Armstrong, Carson, Donley, Gray, Hutchinson, Potter, Roberts, and Wheeler Counties. These districts are collectively referenced in this draft consideration report as "GMA 1 Districts" and a map of GMA 1 is shown below.

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On April 20, 2016, GMA 1 Joint Planning Committee (GMA 1 JPC) passed by resolution to propose to adopt DFCs for relevant aquifers in GMA 1.

The proposed DFCs are based on consideration of distinct aquifer uses and conditions that exist across the management area to achieve a balance between the highest practicable level of groundwater production and the conservation, preservation, protection, recharging, and prevention of waste of groundwater. GMA 1 JPC proposes different DFCs for the Dockum and Ogallala Aquifers because aquifer uses or conditions within the management area differ, including conditions that differ substantially from one geographic area to another.

GMA 1 JPC proposes DFCs to provide a balance between the highest practicable level of groundwater production and the conservation, preservation, protection, recharging, and prevention of waste of groundwater in the management area. The water code does not prohibit the establishment of Desired Future Conditions that provide for the reasonable long-term management of groundwater resources consistent with the goals reflected in the GMA 1 Districts' management plans.

The GMA 1 Districts are local political subdivisions of the state pursuant to Chapter 36 and their specific enabling statutes. Each GMA 1 District desires to fulfill the requirements of Section 36.108 through mutual cooperation and joint planning efforts. Oldham County is not within the jurisdiction of a groundwater conservation district but is served for joint planning purposes by the GMA 1 Districts. The GMA 1 Districts last adopted DFCs within GMA 1 for the Ogallala Aquifer in 2009, and for the Dockum Aquifer in 2010.

GMA 1 JPC held meetings on November 8, 2011; August 9, 2012; July 23, 2013; November 7, 2013; February 21, 2014; April 11, 2014; May 30, 2014; August 19, 2014; November 6, 2014; February 18, 2015; August 23, 2015; February 25, 2016; March 17, 2016; and April

20, 2016 to comply with its statutory duty and to publically consider all nine factors listed in § 36.108(d). Through these meetings, GMA 1 JPC determined that the Rita Blanca Aquifer, Ogallala Aquifer, and the Dockum Aquifer are relevant for joint planning. The GMA 1 JPC proposes to combine the Rita Blanca Aquifer and Ogallala Aquifer. Any references to the "Ogallala Aquifer" in this report shall also include and apply to any groundwater in the Rita Blanca Aquifer. The Minutes from the meetings are located under Meeting Documentation > "Meeting Date" > Minutes on www.panhandlewater.org tab 2016 GMA#1 DFC.

High Plains Aquifer System Groundwater Availability Model

GMA 1 JPC reviewed previous GAMs and adopted the High Plains Aquifer System Groundwater Availability Model ("HPAS GAM") that the TWDB Executive Administrator approved in November 2015. GMA 1 JPC considered six HPAS GAM predictive runs from Intera Incorporated for all of GMA 1 and supplemental predictive runs from William R Hutchison, PhD, regarding the High Plains District portion of the management area. These predictive runs were used by The GMA 1 JPC to consider various pumping and aquifer conditions. The HPAS GAM reports and memos from Intera and Hutchison describing the predictive runs are found under Models > Balance Test > HPAS GAM on www.panhandlewater.org tab 2016 GMA#1 DFC.

Current Desired Future Conditions and Non Relevant Aquifers

GMA 1 JPC reviewed current DFCs that were adopted in 2009, and 2010; and voted to include the current DFCs as options for this round of joint planning. Panhandle District proposed that the Blaine Aquifer and Seymour Aquifer are not relevant for management area joint planning. These aquifers generally are not hydraulically connected to any other aquifer within the management area, and relatively small portions of these aquifers are located in two separate counties within Panhandle District. GMA 1 JPC considered the proposal and declared the Blaine Aquifer and Seymour Aquifer not relevant for joint planning in the management area.

GMA 1 JPC Consider Factors

Chapter 36 requires GMA 1 Districts to consider groundwater availability models (GAM) and other data or information for the management area when proposing for adoption DFCs for the relevant aquifers within the management area every five years. GMA 1 JPC proposes for adoption DFCs for the relevant aquifers within GMA 1 before May 1, 2016, as provided by Subsection 36.108 (d-5). Consistent with subsection 36.108(d), before proposing DFCs as required under Subsection 36.108(d-2), the GMA 1 JPC considered nine factors as follows:

- (1) aquifer uses or conditions within the management area, including conditions that differ substantially from one geographic area to another;
- (2) the water supply needs and water management strategies included in the state water plan;

- (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;
- (5) the impact on subsidence;
- (6) socioeconomic impacts reasonably expected to occur;
- (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 as recognized. The legislature recognizes that a landowner owns the groundwater below the surface of the landowner's land as real property;
- (8) the feasibility of achieving the desired future condition; and
- (9) any other information relevant to the specific desired future conditions.

After considering and documenting each of the factors described above and other relevant scientific and hydrogeological data at multiple meetings respectively, the districts are statutorily allowed to establish different desired future conditions for:

- (1) each aquifer, subdivision of an aquifer, or geologic strata located in whole or in part within the boundaries of the management area; or
- (2) each geographic area overlying an aquifer in whole or in part or subdivision of an aquifer within the boundaries of the management area.

An overview of the GMA 1 JPC consideration of each of the nine factors is as follows:

Factor 1 - Aquifer uses or conditions within the management area, including conditions that differ substantially from one geographic area to another

GMA 1 JPC considered aquifer uses or conditions within the management area, including conditions that differ substantially from one geographic area to another. GMA 1 JPC considered aquifer uses by water user groups (WUGs) for which water demands and water supplies have been identified and analyzed as well as considered plans developed to meet water needs through regional and state water planning. Collectively, WUGs include: irrigation, municipal and domestic water use, manufacturing, steam electric power generation, mining, and livestock watering.

The GMA 1 JPC considered aquifer uses and conditions for the aquifers with the management area as denoted in the attached Factor Consideration Matrix.

The GMA 1 JPC proposes different DFCs for the Dockum Aquifer because substantially different aquifer uses or conditions exist across the management area, including conditions that differ substantially from one geographic area to another. The GMA 1 JPC proposes to use aquifer water level drawdown as the DFC measure because water level drawdown best addresses substantially different confined and unconfined aquifer conditions; and aquifer

pumping volumes, historically, are not well documented compared to the Ogallala Aquifer. The Dockum Aquifer is located only in Carson, Dallam, Hartley, Moore, Oldham, Potter, Randall, and Sherman Counties.

The GMA 1 JPC proposes different DFCs within the Ogallala Aquifer because substantially different aquifer uses or conditions exist across the management area, including conditions that differ substantially from one geographic area to another. Some of those different aquifer uses and conditions by county are as follows:

For Dallam, Hartley, Sherman, and Moore Counties;

- High agriculture usage of the aquifer,
- Above average rate of decline,
- Very limited stream flow, and
- High agriculture economic impact.

For Armstrong, Donley, Carson, Gray, Hansford, Hutchinson, Lipscomb, Ochiltree, Oldham, Potter, Randall, Roberts, and Wheeler, Counties;

- Moderate agriculture usage of the aquifer,
- Significant municipal well fields in the area,
- Average rate of decline,
- Minimal stream flow, and
- Moderate agriculture and municipal economic impact.

For Hemphill County;

- Minimal agriculture usage of the aquifer,
- Minimal rate of decline,
- Extensive stream flow for the planning area, and
- Water related ecotourism economic impact.

The GMA 1 JPC proposes using “percent of volume in storage remaining in 50 years” as the measure for the Ogallala Aquifer DFC because over 80 percent of all non-exempt aquifer withdrawals are documented with flow meters or alternative measuring devices since 2006. Furthermore procedures for monitoring and tracking the proposed DFCs have already been incorporated into the Districts. However, GMA 1 JPC proposes to use aquifer drawdown for those portions of High Plains District and Randall County in the management area because drawdown has been and still is the primary measurement method for groundwater management in High Plains District as well as GMA 2 to the south of GMA 1.

Pumping locations in the management area may not necessarily be the same as the location of use because groundwater can be pumped from a well or well field and transported by pipeline to another geographic location within or outside the management area. Accordingly, GMA 1 JPC reviewed and considered aquifer uses as described in the regional planning process and considered both the places of use and points of withdrawal since the availability of groundwater supply is highly dependent on the points of withdrawal (a well or well field).

2016 Regional Water Planning Group projections indicate that total water use in the management area will decline over 50 years, primarily due to an expected reduction in agricultural irrigation water requirements as a result of more efficient agricultural practices. Irrigation water use is expected to decline because of declining water levels (primarily in Dallam, Hartley, Moore and Sherman Counties), implementation of conservation practices, implementation of new crop types, and the use of more efficient irrigation technology.

HPAS GAM predictive runs based on the proposed DFCs show more water available for future WUG uses than has been currently developed except in Dallam, Hartley, Moore and Sherman Counties where aquifer water level decline will approximate modeled available groundwater (MAG) for that management zone.

Supporting documentation regarding Factor 1 is found in the reference folder under Factor Analysis > Aquifer Uses & Conditions on www.panhandlewater.org tab 2016 GMA#1 DFC.

Factor 2 - The water supply needs and water management strategies included in the state water plan

The GMA 1 JPC considered water supply needs and water management strategies within GMA 1 as denoted in the attached Factor Consideration Matrix. The GMA 1 JPC considered information from the 2011 Panhandle Regional Water Plan adopted by reference in the 2012 Texas State Water Plan.

HPAS GAM predictive runs based on the proposed DFC shows more water available for future WUG needs than has been currently developed except in Dallam, Hartley, Moore and Sherman Counties where aquifer water level decline will approximate the MAG for that area.

Additional documentation regarding Factor 2 is found in the reference folder under Factor Analysis > Water Needs & Strategies on www.panhandlewater.org tab 2016 GMA#1 DFC.

Factor 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 GMA 1 JPC considered hydrological conditions, including for each aquifer in the management area the total estimated recoverable storage (TERS) as provided by the TWDB executive administrator, and the average annual recharge, inflows, and discharge as denoted in the attached Factor Consideration Matrix. TERS does not account for a variety of important conditions and aquifer characteristics that limit groundwater production such as well withdrawal rate, well density, hydraulic conductivity, withdrawal costs, aquifer petrology, permeability, and potential water quality degradation, etc. The TERS calculation represents the approximate percentage of total storage in the water-producing zones of an aquifer; however, not all of the water in those zones is "practicably recoverable". Recovery of all water from TERS would take longer than the fifty year planning horizon and at a cost impractical for regional uses. Therefore, TERS accounts for water that cannot be

practicably produced for beneficial use at any level. Unlike TERS, the highest practicable level of groundwater production is defined as a rate.

Due to both limited volume and accessibility, the GMA 1 JPC has determined that the Blaine Aquifer and the Seymour Aquifer within the GMA 1 are not of sufficient relevance to joint plan and set a DFC.

Additional documentation regarding Factor 3 is found in the reference folder under Factor Analysis > Hydrological Conditions on www.panhandlewater.org tab 2016 GMA#1 DFC.

Factor 4 - Environmental impacts, including impacts on spring flow and other interactions between groundwater and surface water

The GMA 1 JPC considered environmental impacts, including impacts on spring flow and other interactions between groundwater and surface water within GMA 1 on as denoted in the attached Factor Consideration Matrix.

Based on HPAS GAM water balance calculations, annual recharge to the Dockum Aquifer remained between 8,572 acre-feet and 8,706 acre-feet from before to after groundwater pumping developed (1930-2012). Annual Dockum Aquifer discharge to springs, rivers, and draws was between 19,709 acre-feet and 18,952 acre-feet from before to after aquifer pumping developed,

Based on HPAS GAM water balance calculations, annual recharge to the Ogallala Aquifer remained between 324,889 acre-feet and 327,567 acre-feet from before to after aquifer pumping developed (1930-2012). Annual Ogallala Aquifer discharge to springs, rivers, and draws declined from 209,566 acre-feet to 85,914 acre-feet from before to after aquifer pumping developed.

The 2011 Panhandle Regional Water Plan says that reservoir development, groundwater development, and invasion by brush have altered natural stream flow patterns in the area. Spring flows in the area have generally declined over the past several decades. Much of the impact to springs is because of groundwater development, the spread of high water use plant species such as mesquite and salt cedar, or the loss of native grasses and other plant cover. High water use plant species have reduced reliable flows for many tributary streams. Reservoir development also changes natural hydrology by diminishing flood flows and capturing low flows.

The GMA 1 JPC anticipates that groundwater pumping in the Ogallala Aquifer and portions of the Dockum Aquifer will continue to diminish groundwater discharge to springs, rivers, draws and escarpments.

Supporting documentation regarding Factor 4 is found under Factor Analysis > Environmental on www.panhandlewater.org tab 2016 GMA#1 DFC.

Factor 5 - The impact on subsidence

GMA 1 JPC considered impacts of the proposed DFCs on land subsidence on August 19, 2014 and April 20, 2016. Largely based on the 2011 and 2016 Panhandle Regional Water Plans and individual district records, the GMA 1 JPC proposes that there are no significant

impacts on subsidence caused by groundwater withdrawals from the relevant aquifers in the management area and therefore the proposed DFCs should not impact subsidence.

Supporting documentation regarding Factor 5 is found under Factor Analysis > Subsidence on www.panhandlewater.org tab 2016 GMA#1 DFC.

Factor 6 - Socioeconomic impacts reasonably expected to occur from the adoption of proposed DFCs

The GMA 1 JPC considered socioeconomic impact studies prepared by the TWDB for regional water planning purposes, as well as studies that target areas in GMA 1 provided by the GMA 1 Districts that may experience socioeconomic impacts base on the DFCs options as denoted in the attached Factor Consideration Matrix.

GMA 1 JPC has identified that the proposed DFCs will not have any socio-economic impact that exceeds the socio-economic impacts identified in the adopted 2016 Panhandle Regional Water Plan associated with currently projected regional pumping demands.

Additional documentation regarding Factor 6 is found in the reference folder under Factor Analysis > Socioeconomic on www.panhandlewater.org tab 2016 GMA#1 DFC.

Factor 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 as recognized. The legislature recognizes that a landowner owns the groundwater below the surface of the landowner's land as real property

GMA 1 JPC considered 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 as denoted in the attached Factor Consideration Matrix.

The GMA 1 JPC proposes DFCs that are consistent with protecting rights in private property, including ownership and the rights of landowners and their lessees and assigns in groundwater are recognized under Section 36.002.

Supporting documentation regarding Factor 7 is found in the reference folder under Factor Analysis > Private Property Rights on www.panhandlewater.org tab 2016 GMA#1 DFC.

Factor 8 The feasibility of achieving the desired future condition

GMA 1 JPC considered the feasibility of achieving the proposed DFCs as denoted in the attached Factor Consideration Matrix. During the last round of joint planning, the TWDB was required by statute to determine if DFCs were "reasonable". The TWDB determination was based primarily on whether or not achieving the proposed DFCs was possible. The GMA 1 JPC used the HPAS GAM, other groundwater models, and the TERS provided by the TWDB to analyze feasibility of the proposed DFCs. The most recent GAM predictive run (Task Run 15-006) from the TWDB indicates that the proposed DFCs are physically possible even within the constraints of recoverable storage. The available information shows that the proposed DFCs are achievable and therefore, feasible.

The GMA 1 JPC proposes DFCs that can be individually and as a group feasibly achieved based on the predictive runs from the HPAS GAM.

Supporting documentation regarding Factor 8 is found in the reference folder under Factor Analysis > Feasibility on www.panhandlewater.org tab 2016 GMA#1 DFC.

Factor 9 Any other information relevant to the specific desired future conditions

Texas Water Code 36.108 (d) (9) requires the districts to consider any other information relevant to the specific desired future conditions. GMA 1 JCP discussed other information relevant to the specific desired future conditions as denoted in the attached Factor Consideration Matrix.

To this point, all material information related to the adoption of a proposed Desired Future Condition has been tied to one or more of the previously discussed factors. These presentations were considered in relationship to multiple factors discussed above. As such, no additional information has been designated as "other" at this time by the voting membership of the GMA 1.

Supporting documentation regarding Factor 9, if identified, will be found in the reference folder under Factor Analysis > Other Information on www.panhandlewater.org tab 2016 GMA#1 DFC.

Public Comment:

The proposed DFCs must be approved by a two-thirds vote of all of the district representatives of GMA 1 JPC for distribution to the GMA 1 Districts. A period of not less than 90 days for public comments begins on the day the proposed DFCs are mailed to the GMA 1 Districts. During the public comment period and after posting notice as required by Section 36.063, each GMA 1 District shall hold a public hearing on any proposed DFCs relevant to that district. During the public comment period, the district shall make available in its office a copy of the proposed DFCs and any supporting materials, such as the documentation of factors considered under Subsection 36.108(d) and GAM run results. After the public hearing, the district shall compile for consideration at the next joint planning meeting a summary of relevant comments received, any suggested revisions to the proposed desired future conditions, and the basis for the revisions.

After the earlier of the date on which all the districts have submitted their district summaries or the expiration of the public comment period under Subsection 36.108(d-2), the GMA 1 JPC will reconvene to review the reports, consider any district's suggested revisions to the proposed DFCs, and finally adopt the proposed DFCs for GMA 1.

The public comment period regarding the proposed DFCs for the GMA 1 will be referenced within the Panhandle Regional Planning Commission (PRPC) cover letter on the day the proposed DFCs are mailed to the GMA 1 Districts. Comments may be submitted to any or each of the participating GMA 1 Districts.

