HEMPHILL COUNTY
Underground Water Conservation District

High Plains Underground Water Conservation District

PANHANDLE GROUNDWATER DISTRICT
"Conserving Water for Future Generations"

NORTH PLAINS GROUNDWATER
Conservation District

Groundwater Management Area #1 – GMA#1

MEMORANDUM

To: Honorable Chairman and Members

From: Kyle G. Ingham, Local Government Services Director

Date: August 19, 2014

Re: Agenda Item #10

RECEIVE AND DISCUSS – UPDATED AND SUMMARIZED INFORMATION REGARDING BACKGROUND INFORMATION RELATED TO HYDROLOGIC CONDITIONS, INCLUDING FOR EACH AQUIFER IN THE GMA#1 PLANNING AREA, THE CURRENT TOTAL ESTIMATED RECOVERABLE STORAGE AS PROVIDED BY THE TEXAS WATER DEVELOPMENT BOARD EXECUTIVE ADMINISTRATOR. {TEXAS WATER CODE §36.108(D)(3)]

SUMMARY

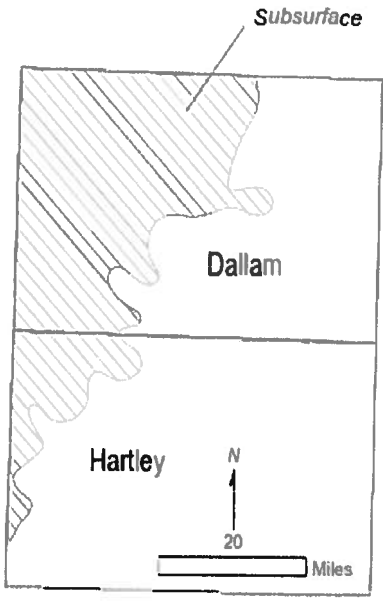
The GMA-1 Joint Planning Committee initially received a presentation and on background information related to hydrologic condition within GMA-1 on May 30, 2014. As part of the presentation, the committee received a presentation on "Total Estimated Recoverable Storage" from Intera and discussed this concept with the Texas Water Development Board staff. Currently, the High Plains Aquifer Model is under development is not scheduled to be completed until later in the joint planning cycle. The presentations from that meeting will be included in the appendices of the draft explanatory report for further reference.

Texas Water Code §36.108 (d)(3) requires that before voting on the proposed desired future conditions of the aquifers, the districts shall consider 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.

GMA-1 portions of the Rita Blanca, Ogallala, Dockum, Blaine and Seymour Aquifers.

Rita Blanca Aquifer

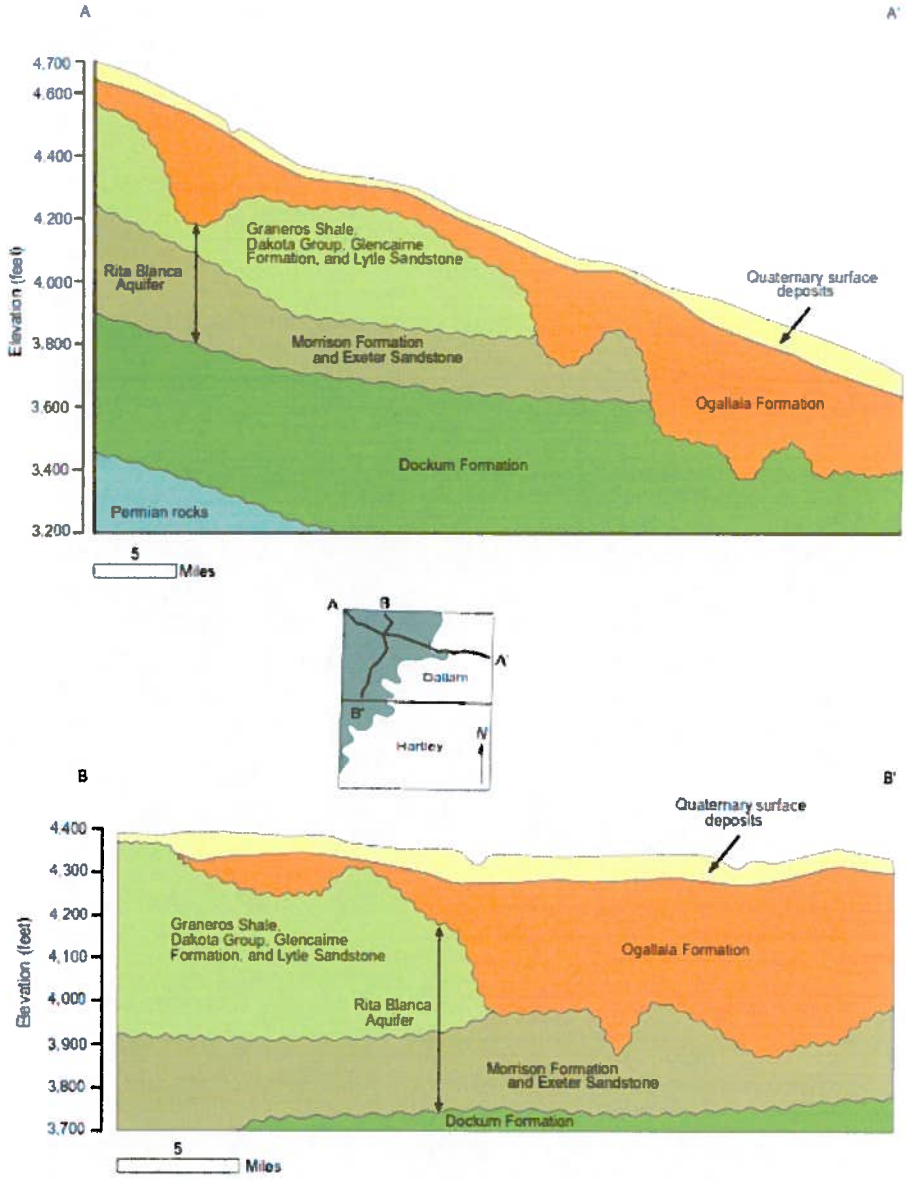
According to Texas Water Development Board Report 380, the Rita Blanca aquifer is located in northwest Dallam and Hartley Counties and subcrops below the Ogallala Aquifer and overlies the Dockum Aquifer. The map below shows the location of the Rita Blanca Aquifer in GMA-1



The Rita Blanca is hydraulically connected to Ogallala & Dockum Aquifers. Groundwater availability modeling combines Rita Blanca with the Ogallala Aquifer. The strata in the Rita Blanca Aquifer range in Jurassic to Cretaceous in ages and described as including:

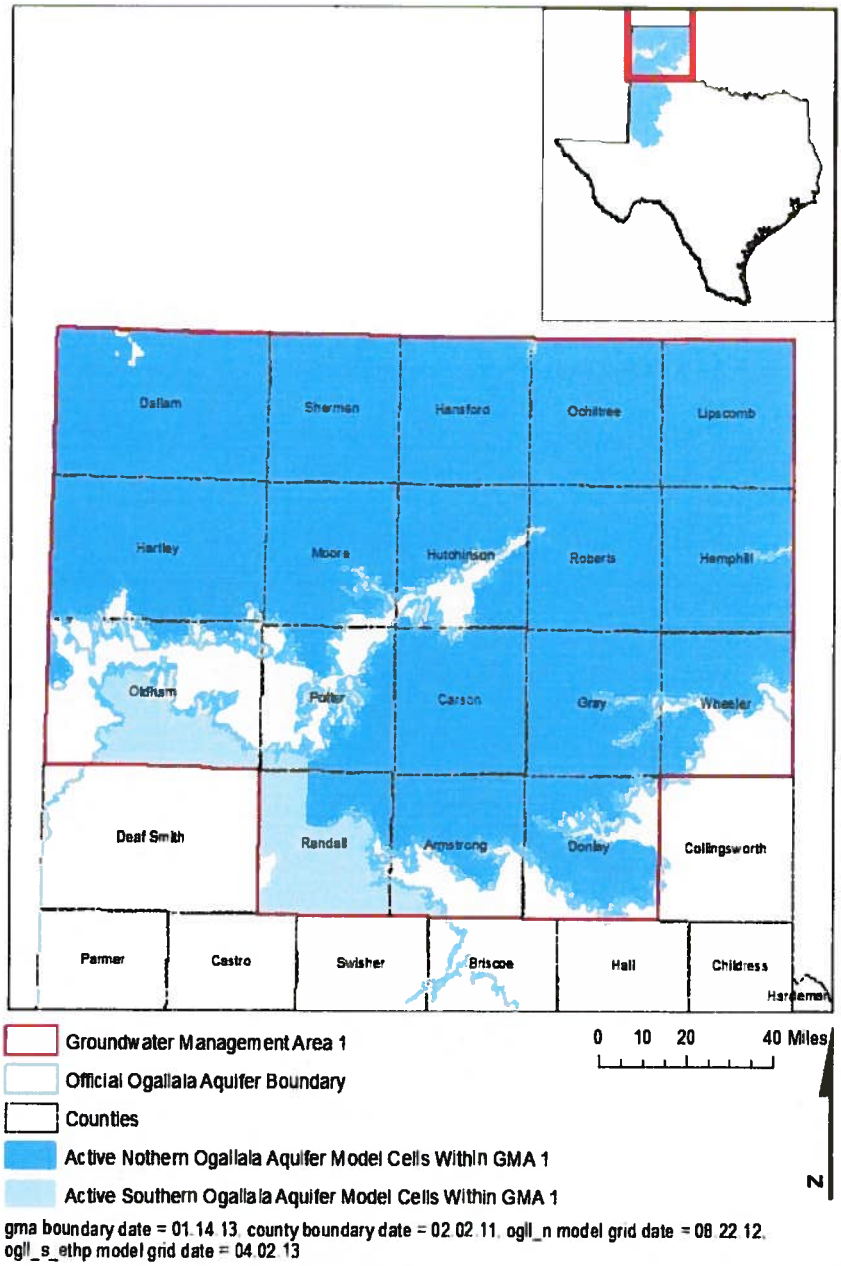
- Graneros Shale: Marine shale with fine grained mixed clastic sediment and limestone. (Cretaceous);
- Dakota Group: (Undifferentiated, Glencairn Formation & Lytle Sandstone) fine- to coarse-grained sandstone, variegated clay, and pebbly beds. (Cretaceous);
- Morrison Formation: mudstone, sandstone, siltstone and limestone (Jurassic); and
- Exeter Sandstone: Coarse, evenly laminated, sandstone. (Jurassic) .

Groundwater is produced from undifferentiated sands & Lytle Sandstone of the Dakota Group, and the Exeter Sandstone. Below are cross-sections of the geologic strata that comprise the Rita Blanca Aquifer.



Ogallala Aquifer

The Ogallala Aquifer was deposited as sediments on a massive alluvial fan that ranged from South Dakota to Big Spring, Texas. The sediments were carried by braided streams from the ancestral Rocky Mountains eastward terminating in central Nebraska, Kansas and western Oklahoma. The Ogallala Aquifer is an unconfined water table aquifer extending through 48 counties in the Texas High Plains and Panhandle area. The aquifer extends throughout all 18 counties in GMA-1. The following map is from TWDB GAM Task 13-025 (August 2013) and shows the extent of the Ogallala Aquifer in GMA-1.



The Texas Water Development Board executive director must provide an estimated recoverable storage for each aquifer within the groundwater management area. Though the current aquifer model is under revision, executive director provides total estimated recoverable groundwater as part of TWDB GAM Task 13-025 (August 2013). Texas Administrative Code §356.10 defines "Total Estimated Recoverable Storage" as the estimated amount of groundwater within an aquifer that accounts for recovery scenarios that range between 25% and 75% of the porosity-adjusted aquifer volume. Though estimated recoverable storage is defined by rule, the actual ability to "recover" from certain aquifers may often be less than 25% and rarely above 75%. The executive director's total estimated recoverable storage for the combined Ogallala and Rita Blanca Aquifers are shown below.

Table - Ogallala and Rita Blanca Aquifers Total Estimated Recoverable Storage by County

(Acre-feet)

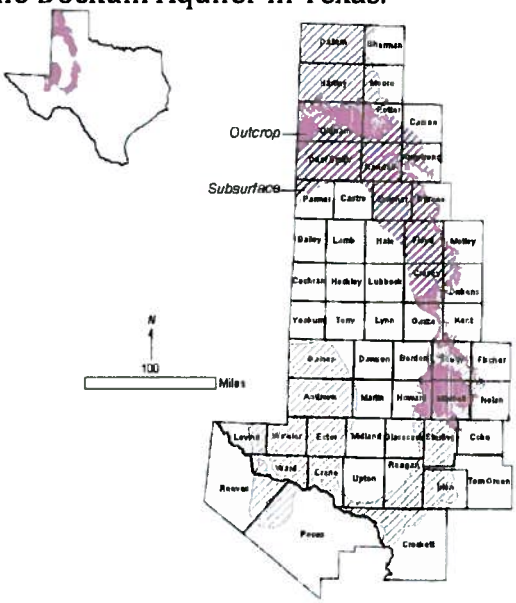
County	*Total Storage*	*25% Total Storage*	*75% Total Storage*
Armstrong	3,300,000	825,000	2,475,000
Carson	16,000,000	4,000,000	12,000,000
Dallam	22,000,000	5,500,000	16,500,000
Donley	5,000,000	1,250,000	3,750,000
Gray	13,000,000	3,250,000	9,750,000
Hansford	22,000,000	5,500,000	16,500,000
Hartley	27,000,000	6,750,000	20,250,000
Hemphill	15,000,000	3,750,000	11,250,000
Hutchinson	11,000,000	2,750,000	8,250,000
Lipscomb	21,000,000	5,250,000	15,750,000
Moore	12,000,000	3,000,000	9,000,000
Ochiltree	21,000,000	5,250,000	15,750,000
Oldham	2,600,000	650,000	1,950,000
Potter	2,400,000	600,000	1,800,000
Randall	6,100,000	1,525,000	4,575,000
Roberts	32,000,000	8,000,000	24,000,000
Sherman	20,000,000	5,000,000	15,000,000
Wheeler	7,700,000	1,925,000	5,775,000
Total	**259,100,000**	**64,775,000**	**194,325,000**

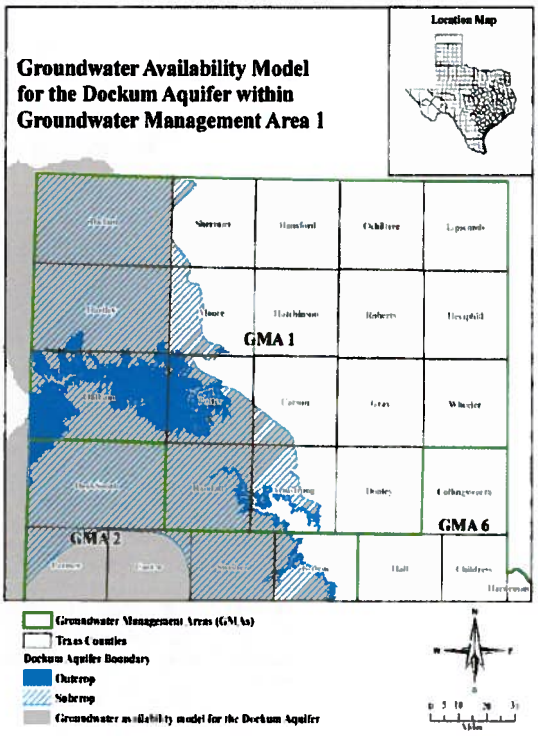
Table - Ogallala and Rita Blanca Aquifers Total Estimated Recoverable Storage by Groundwater Conservation District (Acre-feet)

Groundwater Conservation District	*Total Storage*	*25% Total Storage*	*75% Total Storage*
Hemphill County UWCD	15,000,000	3,750,000	11,250,000
High Plains UWCD No. 1	4,600,000	1,150,000	3,345,000
North Plains GCD	150,000,000	37,500,000	112,500,000
Panhandle GCD	79,000,000	19,750,000	59,250,000
No District	13,000,000	3,250,000	9,750,000
Total	**261,600,000**	**65,400,000**	**196,200,000**

Dockum Aquifer

The Dockum Aquifer is a minor aquifer within Texas but, according to Groundwater Availability Modeling this aquifer has more groundwater within storage (319,000,000 acre-feet in GMA-1 than the Ogallala Aquifer. However, the confining conditions of the Dockum Aquifer greatly reduce its probable recoverable groundwater. The Dockum Aquifer has an outcrop area of 3,519 square miles and a subsurface area of 21,992 square miles. The map below shows the extent of the Dockum Aquifer in Texas.





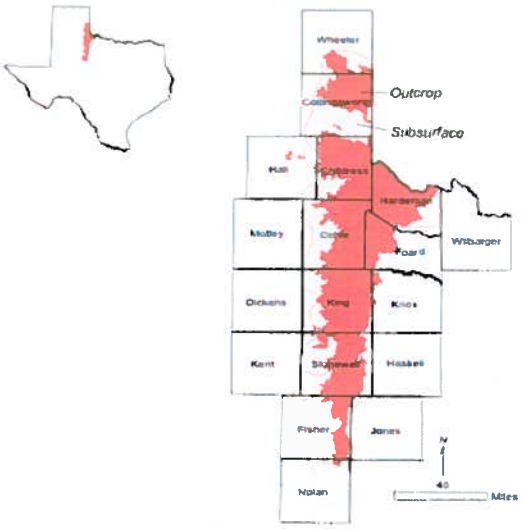
Because the Dockum Aquifer is confined, a desired future condition based on water level drawdown is more appropriate for that hydrologic condition. The Dockum Aquifer total estimated recoverable storage (acre-feet) by county and by groundwater conservation district are shown below.

County	*Total Storage*	*25% Total Storage*	*75% Total Storage*
Armstrong	10,000,000	2,500,000	7,500,000
Carson	1,800,000	450,000	1,350,000
Dallam	81,000,000	20,250,000	60,750,000
Hartley	93,000,000	23,250,000	69,750,000
Moore	11,000,000	2,750,000	8,250,000
Oldham	60,000,000	15,000,000	45,000,000
Potter	14,000,000	3,500,000	10,500,000
Randall	50,000,000	12,500,000	37,500,000
Sherman	1,200,000	300,000	900,000
Total	**322,000,000**	**80,500,000**	**241,500,000**

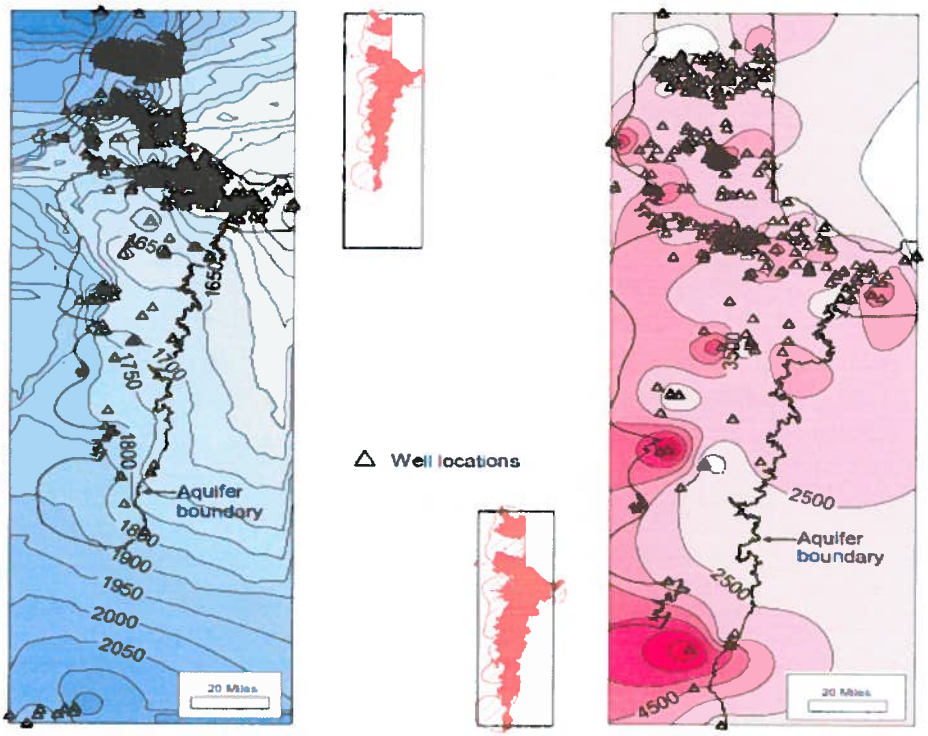
Groundwater Conservation District	*Total Storage*	*25% Total Storage*	*75% Total Storage*
High Plains UWD No.1	31,000,000	7,750,000	23,250,000
North Plains GCD	170,000,000	42,500,000	127,500,000
Panhandle GCD	20,000,000	5,000,000	15,000,000
No District	98,000,000	24,500,000	73,500,000
Total	**319,000,000**	**79,750,000**	**239,250,000**

Blaine Aquifer

The Blaine Aquifer strata consist of the Blaine Formation (Peace River Group) - red silty shale, gypsum, anhydrite, salt, and dolomite. The sediments of the aquifer originated as part of Permian marine and nonmarine sedimentary cycles deposited in a broad, shallow sea. Groundwater in the Blaine Aquifer occurs primarily in solution channels and caverns within anhydrite and gypsum. The Blaine's maximum saturated thickness is 300 feet with its average saturated thickness approximately 137 feet. The extent of the Blaine Aquifer is shown in the map below.

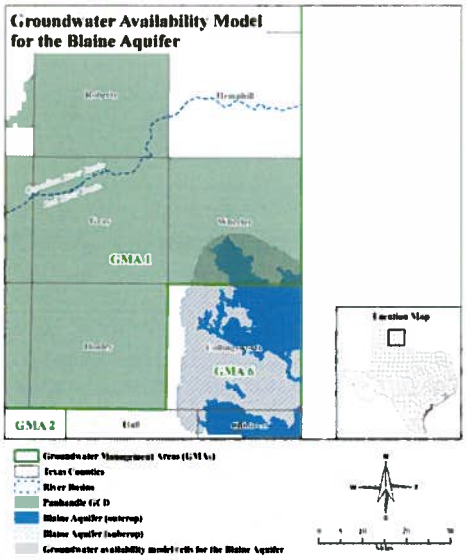


The Blain Aquifer's water quality ranges from slightly saline (1000-3000 mg-l) to moderately saline (3,000-10,000 mg-l). Contour maps of groundwater elevations (feet, left) and total dissolved solids (milligrams per liter, right) are shown below.



The Blaine Aquifer is a confined aquifer located, in part, in southern Wheeler County in the Panhandle Groundwater Conservation District. GMA-1 Joint Planning Committee previously set the Blaine Aquifer's desired future condition as 50 percent of the volume in storage remaining in 50 years. Modeled available groundwater based on this DFC is 98,997 acre-feet per year. Panhandle Groundwater Conservation District is currently

investigating whether it should recommend a different DFC. A map of the Blaine Aquifer in GMa-1 is shown below.



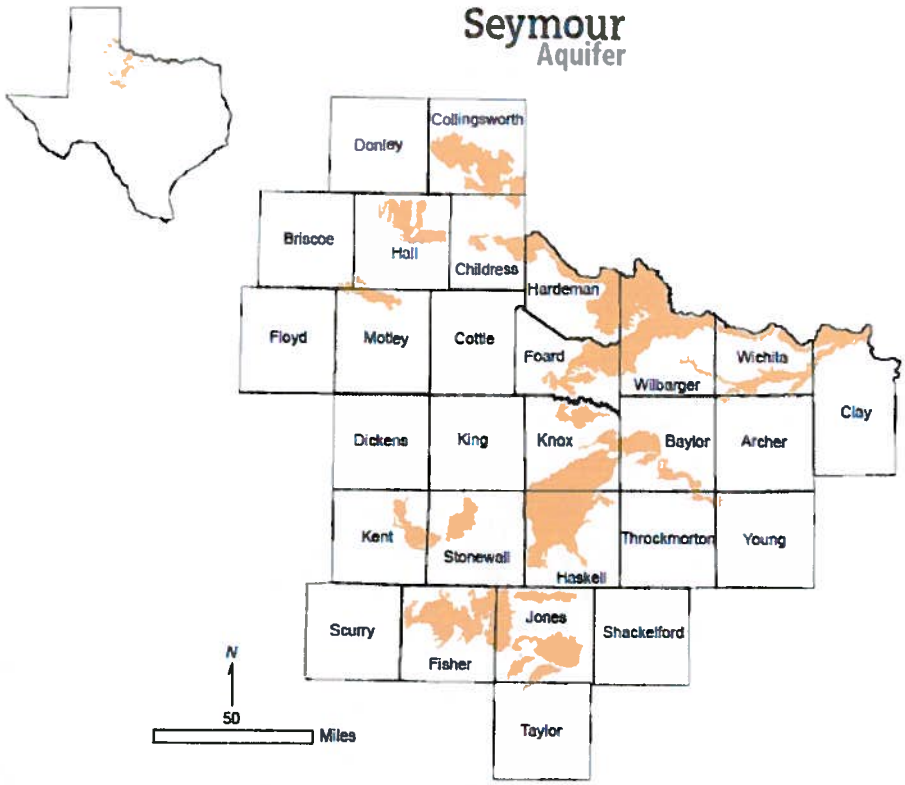
The Blaine Aquifer's total estimated recoverable storage (acre-feet) of groundwater by county and by groundwater conservation district is shown below.

County	*Total Storage*	*25% Total Storage*	*75% Total Storage*
Wheeler	6,700,000	1,675,000	5,025,000
Total	**6,700,000**	**1,675,000**	**5,025,000**

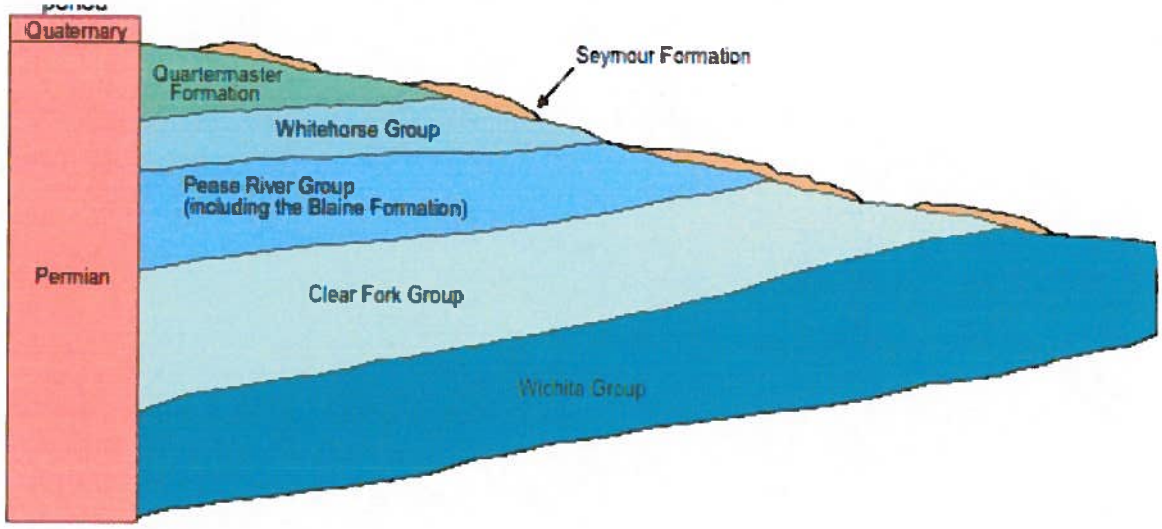
Groundwater Conservation District	*Total Storage*	*25% Total Storage*	*75% Total Storage*
Panhandle GCD	6,700,000	1,675,000	5,025,000
Total	**6,700,000**	**1,675,000**	**5,025,000**

Seymour Aquifer

The Seymour Aquifer is a major unconfined (water table) aquifer in Texas but has a very limited extent in GMA-1. A very small segment of the Seymour Aquifer is located in eastern Donley County and has an estimated total storage in the county of 760 acre-feet. The aquifer is part of the Seymour Formation containing discontinuous beds of poorly sorted gravel, conglomerate, sand, and silty clay. The Seymour originated as Quaternary Alluvial sediments overlying Permian-age rocks. A map of the Seymour aquifer is shown below.



A generalized cross-section of the Blaine and Seymour Aquifers is shown below.



The total estimated recoverable groundwater for the Seymour Aquifer is shown below.

County	Total Storage	25% Total Storage	75% Total Storage
Donley	760	190	570
Total	**760**	**190**	**570**

Groundwater Conservation District	Total Storage	25% Total Storage	75% Total Storage
Panhandle GCD	760	190	570
Total	**760**	**190**	**570**

The GMA-1 Joint Planning Committee previously determined that the Seymour Aquifer was not of sufficient relevance to joint plan and set a desired future condition.

Additional documentation used in this item is found in the reference folder under AQUIFER CONDITIONS.

Discussion

1. In review of the information contained within this summary, what other information does the Joint Planning Committee wish to consider?
2. Are there any similarities from county to county in the GMA#1 planning area related to hydrological conditions?

Notes:

1. This memo/summary is intended to help educate and facilitate discussion & joint planning among GMA#1 members at this time. It is not anticipated that this memo/summary will be acted upon in relationship to the Explanatory Report at this time.
2. Supporting documents related to this Factor will be included in a folder entitled with the Factor Number under the GMA#1 Shared Dropbox folder. These folders shall contain all factor related documents going forward.