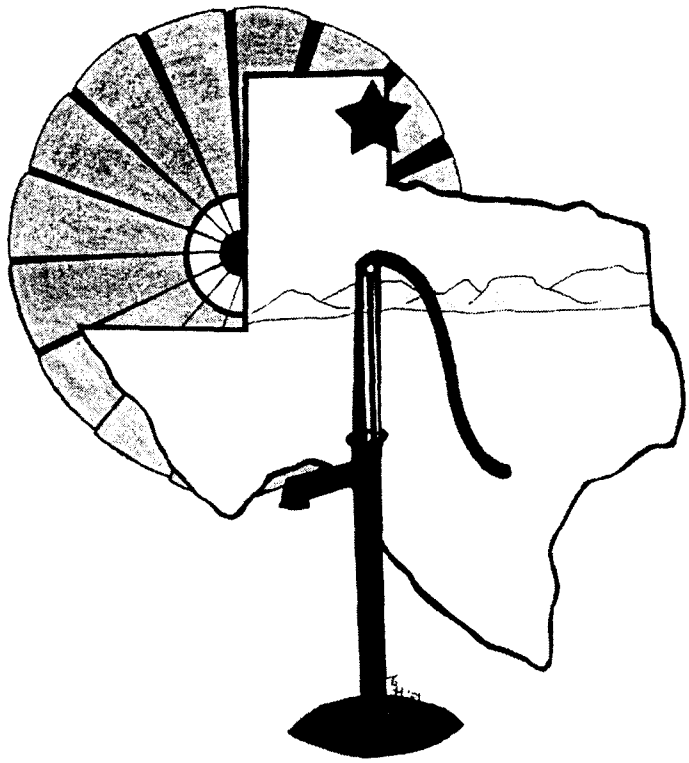

HEMPHILL COUNTY UNDERGROUND WATER CONSERVATION DISTRICT ACT

Act of May 19, 1995, 74th Leg., R.S., ch. 157, 1995 Tex. Gen. Laws 1007.

HEMPHILL COUNTY UNDERGROUND WATER CONSERVATION DISTRICT ACT

TABLE OF CONTENTS

CHAPTER 157

H.B. No. 1493

AN ACT

relating to the creation, administration, powers, duties, operation, and financing of the Hemphill County Underground Water Conservation District.

Be it enacted by the Legislature of the State of Texas:

SECTION 1. CREATION. (a) An underground water conservation district, to be known as the Hemphill County Underground Water Conservation District, is created in Hemphill County, subject to approval at a confirmation election under Section 8 of this Act. The district is a governmental agency and a body politic and corporate.

(b) The district is created under and is essential to accomplish the purposes of Section 59, Article XVI, Texas Constitution.

Act of May 19, 1995, 74th Leg., R.S., ch. 157, 1995 Tex. Gen. Law 1007.

SECTION 2. DEFINITION. In this Act, "district" means the Hemphill County Underground Water Conservation District.

Act of May 19, 1995, 74th Leg., R.S., ch. 157, 1995 Tex. Gen. Law 1007.

SECTION 3. BOUNDARIES. The boundaries of the district are coextensive with the boundaries of Hemphill County.

Act of May 19, 1995, 74th Leg., R.S., ch. 157, 1995 Tex. Gen. Law 1007.

SECTION 4. FINDING OF BENEFIT. All of the land and other property included within the boundaries of the district will be benefited by the works and projects that are to be accomplished by the district under powers conferred by Section 59, Article XVI, Texas Constitution. The district is created to serve a public use and benefit.

Act of May 19, 1995, 74th Leg., R.S., ch. 157, 1995 Tex. Gen. Law 1007.

SECTION 5. POWERS. (a) The district has all of the rights, powers, privileges, authority, functions, and duties provided by the general law of this state, including Chapters 50 and 52, Water Code, applicable to underground water conservation districts created under Section 59, Article XVI, Texas Constitution, except the district may not exercise the power of eminent domain for any purpose. This Act prevails over any provision of general law that is in conflict or inconsistent with this Act.

(b) The rights, powers, privileges, authority, functions, and duties of the district are subject to the continuing right of supervision of the state to be exercised by and through the Texas Natural Resource Conservation Commission.

Act of May 19, 1995, 74th Leg., R.S., ch. 157, 1995 Tex. Gen. Law 1007.

SECTION 6. BOARD OF DIRECTORS. (a) The district is governed by a board of five directors.

(b) Temporary directors serve until initial permanent directors are elected under Section 8 of this Act.

(c) Initial permanent directors serve until permanent directors are elected under Section 9 of this Act.

(d) Permanent directors other than initial permanent directors serve staggered four-year terms.

(e) Each director must qualify to serve as director in the manner provided by Sections 51.078 and 51.079, Water Code.

(f) A director serves until the director's successor has qualified.

Act of May 19, 1995, 74th Leg., R.S., ch. 157, 1995 Tex. Gen. Law 1007.

SECTION 7. TEMPORARY DIRECTORS. (a) The Commissioners Court of Hemphill County shall appoint five temporary directors.

(b) If a temporary director fails to qualify for office, the temporary directors who have qualified shall appoint a person to fill the vacancy. If at any time there are fewer than three qualified temporary directors, the Commissioners Court of Hemphill County shall appoint the necessary number of persons to fill all vacancies on the board.

Act of May 19, 1995, 74th Leg., R.S., ch. 157, 1995 Tex. Gen. Law 1007.

SECTION 8. CONFIRMATION AND INITIAL DIRECTORS' ELECTION. (a) The temporary board of directors shall call and hold an election to confirm establishment of the district and to elect five initial directors.

(b) A person who desires to be a candidate for the office of initial director may file an application with the temporary board to have the candidate's name printed on the ballot as provided by Section 52.107, Water Code.

(c) At the confirmation and initial directors' election, the temporary board of directors shall have the names of the five persons serving as temporary directors placed on the ballot together with the name of any candidate filing for the office of director as provided by

Subsection (b) of this section and blank spaces to write in the names of other persons. If the district is created at the election, the temporary board of directors, at the time the vote is canvassed, shall declare the five persons who receive the most votes to be elected as the initial directors and shall include the results of the directors' election in its election report to the Texas Natural Resource Conservation Commission.

(d) Section 41.001(a), Election Code, does not apply to a confirmation and initial directors' election held as provided by this section.

(e) Except as provided by this section, a confirmation and initial directors' election must be conducted as provided by Sections 52.059(b)-(g), Water Code, and the Election Code.

Act of May 19, 1995, 74th Leg., R.S., ch. 157, 1995 Tex. Gen. Law 1007.

SECTION 9. ELECTION OF DIRECTORS. (a) On the first Saturday in May of the second year after the year in which the district is authorized to be created at a confirmation election, an election shall be held in the district for the election of two directors, each of whom shall serve a two-year term, and three directors, each of whom shall serve a four-year term.

(b) On the first Saturday in May of each subsequent second year following the election, the appropriate number of directors shall be elected to the board.

Act of May 19, 1995, 74th Leg., R.S., ch. 157, 1995 Tex. Gen. Law 1007.

SECTION 10. FINDINGS RELATED TO PROCEDURAL REQUIREMENTS. (a) The proper and legal notice of the intention to introduce this Act, setting forth the general substance of this Act, has been published as provided by law, and the notice and a copy of this Act have been furnished to all persons, agencies, officials, or entities to which they are required to be furnished by the constitution and other laws of this state, including the governor, who has submitted the notice and Act to the Texas Natural Resource Conservation Commission.

(b) The Texas Natural Resource Conservation Commission has filed its recommendations relating to this Act with the governor, lieutenant governor, and speaker of the house of representatives within the required time.

(c) All requirements of the constitution and laws of this state and the rules and procedures of the legislature with respect to the notice, introduction, and passage of this Act are fulfilled and accomplished.

Act of May 19, 1995, 74th Leg., R.S., ch. 157, 1995 Tex. Gen. Law 1007.

SECTION 11. EMERGENCY. The importance of this legislation and the crowded condition of the calendars in both houses create an emergency and an imperative public necessity that the constitutional rule requiring bills to be read on three several days in each house

be suspended, and this rule is hereby suspended, and that this Act take effect and be in force from and after its passage, and it is so enacted.

Act of May 19, 1995, 74th Leg., R.S., ch. 157, 1995 Tex. Gen. Law 1007.

TEXAS WATER DEVELOPMENT BOARD

P.O. Box 13231
Austin, Texas 78711-3231

1700 North Congress Avenue
Austin, Texas 78701

Phone: (512) 463-7847 fax: (512) 936-0889

WATER RESOUCES PLANNING DIVISION
Fax Cover Sheet

Date: 6/13/2007

To: Curtis

Company: City of Canadian

Phone Number:

Fax Number: 806-323-5358

From: Thelma Dufort

Phone Number 512-463-7952

Fax Number:

NUMBER OF PAGES (including cover sheet): 3

COMMENTS: Copy of 2005 Water Use Survey

D. WATER SYSTEM INFORMATION:

D1.	TCEQ PWS #	1060001	
D2.	Res. Population	2350	
D3.	Service Conn.	1202	
D4.	S-F Conn.	932	
D5.	M-F Units	9	
D6.	Comm./Inst. Conn.	200	
D7.	Industrial Conn.		
D8.	Other Conn.	61	
D9.	% Comm. Metered	100	%

		City 1	City 2	City 3	City 4
D10.	City				
D11.	Connections				

		County 1	County 2	County 3	County 4
D12.	County				
D13.	Connections				

D14. - D17.	D14. Single-Family Residential	D15. Multi-Family Residential	D16. Commercial/ Institutional	D17. Industrial
Jan	gal.	gal.	gal.	gal.
Feb	gal.	gal.	gal.	gal.
Mar	gal.	gal.	gal.	gal.
Apr	gal.	gal.	gal.	gal.
May	gal.	gal.	gal.	gal.
June	gal.	gal.	gal.	gal.
July	gal.	gal.	gal.	gal.
Aug	gal.	gal.	gal.	gal.
Sep	gal.	gal.	gal.	gal.
Oct	gal.	gal.	gal.	gal.
Nov	gal.	gal.	gal.	gal.
Dec	gal.	gal.	gal.	gal.
Total	gal.	gal.	gal.	gal.

D18.	Total Metered		gallons
D19.	Total Unmetered		gallons
D20.	Total Water Loss		gallons
D21.	Water Restrictions		days
D22.	Primary Use		

E. REUSE (DIRECT & INDIRECT) / SALINE WATER USE

E1.	Direct Reuse	N/A	Y or N
E2.	Total Direct Reuse		gallons
E3.	% Industrial		%
E4.	% Landscape		%
E5.	% Agricultural		%
E6.	% Other		%
E7.	Indirect Reuse		Y or N
E8.	Total Indirect Reuse		gallons
E9.	Saline Water		Y or N
E10.	Total Saline Water		gallons
E11.	Saline Water TDS		TDS (ppm)

F. COMMENTS AND CONTACT INFORMATION

F1.	Comments	
F2.	Name	Craig A. Klaw
F3.	Title	Public Works Dir.
F4.	Phone	806-323-6173
F5.	Email Address	
F6.	General Email	
F7.	Date	June 23, 2006

TEXAS WATER . .VELOPMENT BOARD

Municipal Water Use Survey For The Calender Year Ending December 31, 2005
Answer Sheet

TWDB Code: 132200 EIN: 454497 (105)

CITY OF CANADIAN
C/O JOHN D. DESHA, W & WW SUPT
6 MAIN STREET
CANADIAN, TEXAS 79014

Please correct your address information.

A. GROUNDWATER INTAKE

A1.	Active Wells	6
A2.	Inactive/Operable	2
A3.	Counties/Wells	Hemphill
A4.	Aquifer(s)	Ogallala

		Source 1 SG or PG	Source 2 SG or PG	Source 3 SG or PG	Source 4 SG or PG
A5.	Source Type				
A6.	Supplier				
A7.	Jan	8.944 gal.	gal.	gal.	gal.
	Feb	9.371 gal.	gal.	gal.	gal.
	Mar	12.747 gal.	gal.	gal.	gal.
	Apr	13.065 gal.	gal.	gal.	gal.
	May	15.598 gal.	gal.	gal.	gal.
	June	19.524 gal.	gal.	gal.	gal.
	July	22.485 gal.	gal.	gal.	gal.
	Aug	20.521 gal.	gal.	gal.	gal.
	Sep	18.583 gal.	gal.	gal.	gal.
	Oct	13.807 gal.	gal.	gal.	gal.
	Nov	11.338 gal.	gal.	gal.	gal.
	Dec	9.810 gal.	gal.	gal.	gal.
	Total	175.693 gal.	gal.	gal.	gal.
A8.	% Treated	100 %	%	%	%
A9.	Metered/Estimated	M or E	M or E	M or E	M or E

A10.	SG Total	175.693	gallons
A11.	PG Total		gallons

B. SURFACE WATER INTAKE

		Source 1 SS or PS	Source 2 SS or PS	Source 3 SS or PS	Source 4 SS or PS
B1.	Source Type				
B2.	Supplier/Source				
B3.	WR #				
B4.	Conveyed				
B5.	County(ies)				
B6.	Jan	gal.	gal.	gal.	gal.
	Feb	gal.	gal.	gal.	gal.
	Mar	gal.	gal.	gal.	gal.
	Apr	gal.	gal.	gal.	gal.
	May	gal.	gal.	gal.	gal.
	Jun	gal.	gal.	gal.	gal.
	Jul	gal.	gal.	gal.	gal.
	Aug	gal.	gal.	gal.	gal.
	Sep	gal.	gal.	gal.	gal.
	Oct	gal.	gal.	gal.	gal.
	Nov	gal.	gal.	gal.	gal.
	Dec	gal.	gal.	gal.	gal.
	Total	gal.	gal.	gal.	gal.
B7.	% Treated	%	%	%	%
B8.	Metered/Estimated	M or E	M or E	M or E	M or E

TEXAS WATER DEVELOPMENT BOARD
Water Resources Planning Division
Fax Cover Sheet

P.O. Box 13231
Austin, Texas 78711-3231
Phone: (512) 463-7847

1700 North Congress Avenue
Austin, Texas 78701
fax: (512) 936-0889

Date: 6/15/2007

To: Janet Guthrie

Company: Hemphill County UWCD

Phone Number: 806-323-8350

Fax Number: 806-323-9574

From: Craig Caldwell / Water Uses Section

Phone Number: 512-936-0885

Fax Number: 512-936-0889

NUMBER OF PAGES (including cover sheet): 1

COMMENTS:

Janet,

Staff at the TWDB estimate that approximately 6,824 acre-feet* of groundwater was used for irrigation purposes in Hemphill County in 2005. Please let me know if you have any questions or need more information.

Craig

* 1 acre-foot = 325,851 gallons

March 26, 2007

Ms. Rima Petrossian
Texas Water Development Board
Austin, Texas

Re: Estimation of Ogallala Aquifer water used in oil and gas drilling and hydro-fracturing activities

Dear Rima and TWDB staff:

DBS&A was hired by the Hemphill UWCD to estimate the Ogallala Aquifer water used during drilling and hydro-fracturing operations within the Granite Wash (and other formations) in southern Hemphill County. Oil and gas activity water use has not been previously included in regional planning for Hemphill County and would be included under the "Mining" water user group. The following sections are to support our estimates of water used during oil and gas exploration activities.

Estimation of the number of oil and gas wells drilled per year;

The DBS&A staff went to the following web page ate the Texas Railroad Commission (RRC),

http://webapps.rrc.state.tx.us/DP/initializePublicQueryAction.do

Query database by 1) County = Hemphill, 2) Well Type = Oil or Gas Well, 3) Status = all statuses, 4) Approved Date = 01/01/2000 and 12/31/2000 for the year 2000 to acquire what oil and gas wells that were permitted during that year. The following are the results of the queries from 1996 to 2006

1996 = 57 wells, 1997 = 63 wells, 1998 = 62 wells, 1999 = 77 wells, 2000 = 82 wells, 2001 = 92 wells, 2002 = 143 wells, 2003 = 185 wells, 2004 = 270 wells, 2005 = 181 wells and 2006 = 264 wells.

The average number of wells drilled per year is 148 wells per year

Estimation of the quantity of Ogallala Aquifer water used fro drilling and hydro-fracturing activities;

During 2006, Janet Guthrie, the Hemphill UWCD manager, observed drilling and hydro-fracturing activities at a number of oil and gas (predominately gas) wells in Hemphill County. In addition to her observations, she also had conversations concerning water use with the local pump installers, land owners and oil and gas producers Dominion Oil and Gas Company).

Daniel B. Stephens & Associates, Inc.
4030 W. Braker Lane, Suite 325 512-821-2765
Austin, TX 78759 FAX 512-821-2724

According to her observations and information she obtained from her conversations, the following is the estimate of water use per well.

Drilling (Field observations, pump installers, landowners)

1) The drilling of an oil/gas well takes an average of 16 days

2) The average Ogallala water well produces x 65 gpm (24 hrs/day, 7 days/week)

1,497,600 gals or **4.6 acre-feet per well**

Hydro-fracturing (Field observations, Dominion Oil & Gas Co.)

1) Between three to five zones are hydro-fractured

in the Granite Wash or an average of four 4 zones

2) Approximately 25,000 barrels (3.2 acre-feet) of

water (Dominion Oil & Gas Co.) is needed per zone x 3.2 acre-feet

12.8 acre-feet per well

Total estimated water used (drilling and hydro-fracturing) per well is **17.4 acre-feet per well.**

During periods of low oil and gas activities (1996 = 57 wells) a total of 992 acre-feet of Ogallala groundwater is used during a year.

During periods of high oil and gas activities (2004 = 270 wells) a total of 4,698 acre-feet of Ogallala groundwater is used during a year.

During an average year of oil and gas activities (148 wells) a total of 2,575 acre-feet Ogallala groundwater is used during a year.

Well spacing is presently down to 20 acres and there is talk about reducing spacing down to 10 acres. The life expectancy of these wells is 20 years and additional hydro-fracturing on existing

wells is not expected at the present. Therefore, the water demand for these oil and gas activities appears to be only during drilling and hydro-fracturing activities.

According to Region A's 2006 SB II regional planning document (Appendix A) for 2010;

Municipal Water Demand = (475, Canadian), (110, Red) (48, other) or	633 acre-feet/year
Irrigation Water Demand = (790, Canadian), (2.847, Red) or	3,637 acre-feet/year
Livestock Water Demand = (964, Canadian), (671, Red) or	1,635 acre-feet/year
Manufacturing Water Demand = (1, Canadian)	1 acre-feet/year

The average year of oil and gas (mining) activities of 2,575 acre-feet per year exceeds all other user group demands except for irrigation.

The Hemphill UWCD respectfully requests the approval from the TWDB to include oil and gas (mining) activities water demand for the average year of 2,575 acre-feet/year in its management plan for future planning and management activities.

Sincerely,

DANIEL B. STEPHENS & ASSOCIATES, INC.

Allan R. Standen, P.G.
Texas Water Resources Director

TEXAS WATER DEVELOPMENT BOARD
Water Resources Planning Division
Fax Cover Sheet

P.O. Box 13231
Austin, Texas 78711-3231
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From: Craig Caldwell / Water Uses Section

Phone Number: 512-936-0885

Fax Number: 512-936-0889

NUMBER OF PAGES (including cover sheet): 1

COMMENTS:

Janet,

Staff at the TWDB estimate that approximately 314 acre-feet* of groundwater and 1,206 acre-feet of surface water was used for livestock purposes in Hemphill County in 2004. Please let me know if you have any questions or need more information.

Craig

* 1 acre-foot = 325,851 gallons

GAM run 05-26

By Richard M. Smith, P.G.
Texas Water Development Board
Groundwater Availability Modeling Section
(512) 936-0877
September 1, 2005

REQUESTOR:

Ms. Janet Guthrie, on behalf of the Hemphill County Underground Water Conservation District

DESCRIPTION OF REQUEST:

Ms. Guthrie requested that we run the Groundwater Availability Model (GAM) of the northern part of the Ogallala aquifer (Dutton and others, 2001; Dutton, 2004), based on present conditions and modeling parameters, to determine the following information:

1. The annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams and rivers.
2. The annual flow out of the District (i.e., Hemphill County) into Oklahoma.
3. The average aquifer thickness for the District north of the Canadian River and south of the Canadian River and the number of acres encompassed by each area.
4. The average specific yield for the area north and south of the Canadian River in addition to a contour map of the specific yield for those areas.
5. The recharge for those areas north and south of the Canadian River.
6. The recharge and the lateral inflows to those areas of the District north and south of the Canadian River.
7. Determine the decline in feet of the water table which corresponds to the volume determined in part 6 above and the percentage decline in the overall volume that corresponds to part 6 above.
8. Provide a GIS compatible map file showing the center line of the Canadian River.

METHODS:

After running the model, we extracted from the water budget of Hemphill County the annual volume of water that discharges from the aquifer to springs and other surface water bodies. We estimated flow volumes leaving the county to the east into Oklahoma by zoning the eastern cells of Hemphill County and extracting the horizontal flow from the water budget. We calculated the average aquifer thickness using the saturated thickness at the beginning of the predictive period. We then subtracted the base of the aquifer from the hydraulic heads in each cell to obtain the thickness and then averaged the results for the areas north and south of the Canadian River. The number of acres encompassed in each area was determined using ArcGIS. The specific yield was obtained from the model on a cell-by-cell basis and then contoured in PMWIN to form a map.

Recharge and lateral inflows were extracted from the water budget at the beginning of the predictive period for each zoned area. The total volume of groundwater north and south of the Canadian River was calculated by zoning each of those areas within Hemphill County in ArcGIS. We obtained the cell-by-cell specific yield values and multiplied those by the corresponding cell-by-cell saturated thickness and by the aerial extent of the zoned area in acres to arrive at the total volume for each area in acre-feet. The decline in head which corresponds to the combined volume of recharge and lateral inflows was calculated using a proportional analysis; that is, the total volume is proportional to the average thickness which is equal to the reduced total volume's proportionality to the reduced thickness. Percentage decline was calculated by dividing the change in head by the total average head.

A GIS file of the major rivers of Texas in decimal degrees was reprojected for the northern part of the Ogallala aquifer GAM. The metadata file is included in Appendix A.

PARAMETERS AND ASSUMPTIONS:

- See Dutton and others (2001) and Dutton (2004) for assumptions and limitations of the GAM. The overall root mean squared error was up to 53 feet at the end of the transient calibration in 1998. This error will have more of an effect on model results where the aquifer is thin.
- The recharge in the model represents average climatic conditions for the entire model run of 2001 to 2060.
- We assumed conditions in 1998 (the last year of the calibration period) represented present conditions.
- To represent the demand numbers that the Panhandle Regional Water Planning Group plans to include in their 2006 regional water plan, we proportionally adjusted the pumping distribution in the predictive run from Dutton and others (2001). To extend this run from 2050 to 2060, we assumed the same distribution applied through 2060.

RESULTS:

.The volume of water that discharges from the aquifer in Hemphill County to springs and any surface water body, including lakes, streams, and rivers is about 45,000 acre-feet per year. The annual flow out of Hemphill County into Oklahoma via horizontal flow is about 3,000 acre-feet per year. The average aquifer thickness for Hemphill County north of the Canadian River is 148.6 feet at the beginning of the predictive period in 2000. The average aquifer thickness south of the Canadian River in Hemphill County is 159.7 feet at the beginning of the predictive period in 2000. The total number of acres north of the river is approximately 211,200 and the total number south of the river is approximately 364,800. The average specific yield north of the Canadian River in Hemphill County is 0.1809 and south of the Canadian River is 0.1672. A contour map of the specific yields used in the model for Hemphill County is shown in Figure 1. The average recharge for the area north of the Canadian River in Hemphill County is 9,400 acre-feet per year and 22,200 acre-feet per year south of the river. The combined total of lateral inflows and

recharge north of the river is 14,900 acre-feet per year and 31,600 acre-feet per year south of the river. The decline in the water table north of the river corresponding to the 9,400 acre-foot volume is 0.4 feet. The decline in the water table south of the river corresponding to the 31,600 acre-foot volume is 0.5 feet. The percent of decline in the volume north of the Canadian River is 0.26 percent and 0.32 percent south of the Canadian River. A GIS compatible map file accompanies this report. The projection is:

1. Albers Equal-Area Conic
2. Spheriod: GRS 80
3. Central Meridian: -101.5
4. Reference Latitude: 36
5. Standard Parallel 1: 35
6. Standard Parallel 2: 37
7. False Easting: 820210
8. False Northing: 820210

REFERENCES:

Dutton, A., 2004, Adjustments of parameters to improve the calibration of the Og-N model of the Ogallala aquifer, Panhandle Water Planning Area: prepared for Freese and Nichols, Inc. and the Panhandle Regional Water Planning Group by the Bureau of Economic Geology, The University of Texas at Austin, 9 p.

Dutton, A., Reedy, R., and Mace, R., 2001, Saturated thickness of the Ogallala aquifer in the Panhandle Water Planning Area–Simulation of 2000 through 2050 withdrawal projections: prepared for the Panhandle Water Planning Group by the Bureau of Economic Geology, The University of Texas at Austin, 54 p.

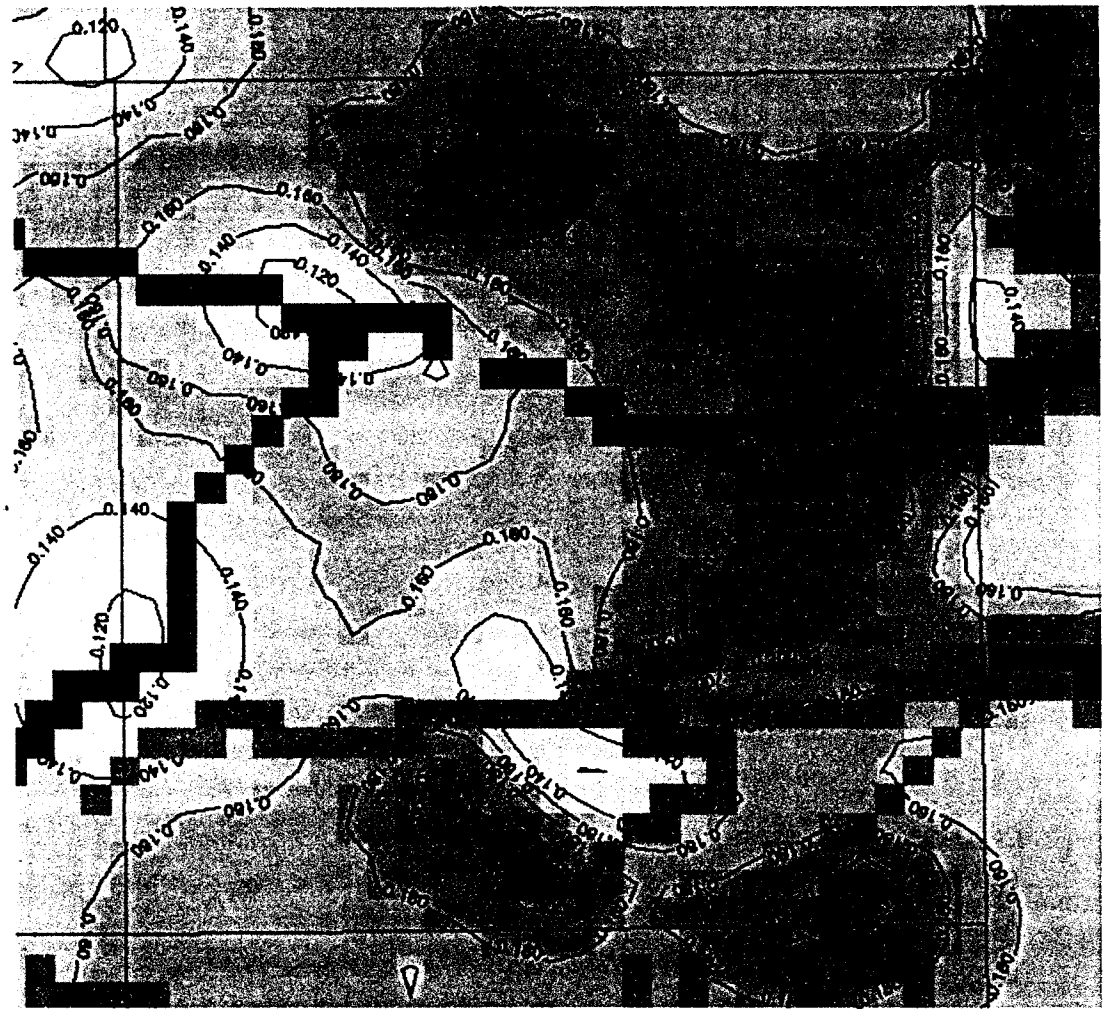


Figure 1: Specific yield map of Hemphill County. North is at the top of the map and the contour interval is 0.02. Streams and rivers are in dark blue, while drains are in cyan. The black cells are inactive.

Appendix A – Metadata for the GIS Texas Rivers Shapefile

U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency ESRI 20040301 2004 vector digital data ESRI® Data & Maps 2004 Redlands, California, USA ESRI Location: \usa\hydro U.S. Rivers and Streams represents detailed rivers and streams in the United States. U.S. Rivers and Streams provides a database of linear water features that interconnects and identifies the stream segments or reaches that comprise the surface water drainage system of United States. Largest scale when displaying the data: 1:24,000. 1999 publication date Complete Matches software update releases -160.186636 -66.988391 49.358327 18.922745 None line rivers streams hydrography inlandWaters None United States None 1999 Access granted to Licensee only. The data are provided by multiple, third party data vendors under license to ESRI for inclusion on ESRI Data & Maps for use with ESRI® software. Each data vendor has its own data licensing policies and may grant varying redistribution rights to end users. Please consult the redistribution rights below for this data set provided on ESRI Data & Maps. As used herein, "Geodata" shall mean any digital data set consisting of geographic data coordinates and associated attributes. The redistribution rights for this data set: Redistribution rights are granted by the data vendor for hard-copy renditions or static, electronic map images (e.g. .gif, .jpeg, etc.) that are plotted, printed, or publicly displayed with proper metadata and source/copyright attribution to the respective data vendor(s). Geodata is redistributable with a Value-Added Software Application developed by ESRI Business Partners on a royalty-free basis with proper metadata and source/copyright attribution to the respective data vendor(s). Geodata is redistributable without a Value-Added Software Application (i.e., adding the sample data to an existing, [non]commercial data set for redistribution) with proper metadata and source/copyright attribution to the respective data vendor(s). The terms and conditions below apply to all the data sets provided on ESRI Data & Maps. Proprietary Rights and Copyright: Licensee acknowledges that the Data and Related Materials contain proprietary and confidential property of ESRI and its licensor(s). The Data and Related Materials are owned by ESRI and its licensor(s) and are protected by United States copyright laws and applicable international copyright treaties and/or conventions. Limited Warranty and Disclaimer: ESRI warrants that the media upon which the Data and Related Materials are provided will be free from defects in materials and workmanship under normal use and service for a period of ninety (90) days from the date of receipt. THE DATA AND RELATED MATERIALS ARE EXCLUDED FROM THE LIMITED WARRANTY, AND THE LICENSEE EXPRESSLY ACKNOWLEDGES THAT THE DATA CONTAINS SOME NONCONFORMITIES, DEFECTS, OR ERRORS. ESRI DOES NOT WARRANT THAT THE DATA WILL MEET LICENSEE'S NEEDS OR EXPECTATIONS; THAT THE USE OF THE DATA WILL BE UNINTERRUPTED; OR THAT ALL NONCONFORMITIES, DEFECTS, OR ERRORS CAN OR WILL BE CORRECTED. ESRI IS NOT INVITING RELIANCE ON THIS DATA, AND THE LICENSEE SHOULD ALWAYS VERIFY ACTUAL DATA. EXCEPT FOR THE LIMITED WARRANTY SET FORTH ABOVE, THE DATA AND RELATED MATERIALS CONTAINED THEREIN ARE PROVIDED "AS-IS," WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR

the National Hydrography Dataset, most often are U.S. Geological Survey topographic maps. Features found on the ground may have been eliminated or generalized on the source graphic because of scale and legibility constraints. In general, streams longer than one mile (approximately 1.6 kilometers) were collected. Most streams that flow from a lake were collected regardless of length. Only definite channels were collected so not all swamp/marsh features have stream/rivers delineated through them. Lake/ponds having an area greater than 6 acres (approximately 2.4 hectares) were collected. Note, however, that these general rules were applied unevenly among maps during compilation. Some map quadrangles have a much sparser pattern of hydrography than do adjoining maps and these differences continue in the digital rendition of these features. Transport reaches are defined on nearly all features of type stream/river, canal/ditch, artificial path, pipeline, and connector. Waterbody reaches are defined on the subset of lake/pond features that were identified as waterbodies during the development of Reach File Version 3. Most attention in applying geographic names was given to transport reaches that follow stream/rivers and waterbody reaches. Near the international boundaries with Canada and Mexico, only the parts of features within the United States are delineated. Detailed capture conditions are provided for every feature type in the Standards for National Hydrography Dataset (USGS, 1999), available online through http://mapping.usgs.gov/standards/.] The data set originally comes from several sources. Most of the data is from U.S. Geological Survey topographic quadrangle maps or sources that exceed its horizontal accuracy. These maps were compiled to meet National Map Accuracy Standards. For horizontal accuracy, this standard is met if at least 90 percent of points tested are within 0.02 inch (at map scale) of their true position. At 1:100,000 scale, 0.02 inch is approximately 167 feet (50.8 meters). U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency 1999 vector digital data Reston, Virginia, USA U.S. Geological Survey National Hydrography Dataset is an ongoing project with Alaska being worked on currently. http://nhd.usgs.gov/ 100000 CD–ROM 1999 publication date NHD Attribute and geospatial data Convert DLG [Digital Line Graph] data to features: This process converted DLG data to features and associated characteristics and converted the coordinate system to geographic (longitude-latitude) coordinates in NAD83 in five steps: 1. The USGS's [U.S. Geological Survey] "Batch DLG-3 to DLG-F Conversion System" converted DLG-3 nodes, lines, areas, and associated attribute codes to temporary features and associated characteristics. Known conditions for which conversions could not be reliably made were flagged for later inspection. Only known conversion problems were flagged, and no additional steps were taken to detect or repair discrepancies in the original DLG-3 or the converted NHD [National Hydrography Dataset]. 2. A default value of a characteristic was added in cases where the description was incomplete. 3. All instances in which data were flagged were inspected and resolved interactively. 4. Feature delineation rules were applied to the temporary features in a batch process to create the final version of features. 5. Coordinate values were converted to geographic coordinates and to the NAD83 using the NADCON software version 2.1 (National Geodetic Survey, n.d.). This process generated the "features" data. Build reaches: The basic steps for building reaches are as follows: 1. Convert RF3 [Reach File Version 3] to RF3" (RF3 double prime). This batch operation processed Reach File Version 3 to delete duplicate reaches, reassign reaches to the correct cataloging unit, validate geographic names assigned to reaches against data from

the Geographic Names Information System (December 1996 extract), apply updates supplied by the States of California and Arizona, redelineate reaches on the basis of standards used for the NHD, and identify inflow/outflow points where transport reaches entered and exited waterbodies. 2. Create artificial paths. Using waterbodies from the feature data and inflow/outflow points extracted from RF3", this process automatically generated the centerlines used to delineate artificial paths within waterbodies by using subroutines within the ARC/INFO® GRID module. 3. Blind pass. This batch step conflated features and RF3" reaches and transferred reach information (reach code, reach date, name, stream level, and flow relationships) to the features. It also integrated the artificial paths generated in the previous step with the other features, built reaches on the artificial paths, and assigned geographic names (February 1995 extract) to waterbodies. 4. Quadrangle-based visual pass. During this interactive step, analysts ensured that the data developed in the previous batch processes conformed to reach delineation rules and that reaches were assigned to the appropriate cataloging unit. Batch procedures identified and developed a list of possible errors. (Errors not detected by the software may continue in the data.) Using the list, software presented each case to analysts to make appropriate edits to the data. Analysts recorded notes about repairs that could not be made and about other errors in the data. (These notes are encoded in the cataloging unit digital update units.) 5. Build superquads. After the quadrangle-based visual pass was complete, all quadrangles that cover all or part of each cataloging unit were paneled into a superquad. In this batch process, reaches that cross quad boundaries were corrected to conform to reach delineation rules. 6. Cataloging unit-based visual pass. As they did with the quadrangle-based visual pass, analysts ensured that reaches conformed to reach delineation rules. Batch procedures identified and developed a list of possible errors. (Errors not detected by the software may continue in the data.) Analysts examined each error and corrected the data. Analysts recorded notes about repairs that could not be made and about other errors in the data. (These notes are encoded in the cataloging unit digital update units.) 7. Central quality assurance/quality control. This step (1) confirmed that integrity checks were performed successfully during the visual pass activity, and (2) assessed statistics gathered during the earlier processes to determine if additional review of data was needed. A check of data from the cataloging unit-based visual pass was run in batch; any data that did not pass the procedure were reviewed interactively. If substantive changes were required, the data were reprocessed using procedures (as required) described in previous steps. The edited data then were rechecked using the central quality assurance/quality control process. 8. Data preparation and database load. This batch procedure performed final processing to the data emerging from the quality assurance/quality control step. Some of the activities included assigning the final reach codes, building waterbody reaches, adding final artificial paths in waterbodies, and implementing any recent changes in standards for the NHD. The spelling of geographic names was replaced using the March 1999 data extract from the Geographic Names Information System. After this, reaches, features, characteristics, geographic names, and relations were loaded into the database that holds the NHD. 9. Flow relation correction and validation. The flow relations were checked for consistency through a batch procedure, which generated a list of possible errors. Software presented possible errors to analysts, who corrected flow relations and, occasionally, the delineation of reaches. Changes were posted to the database. 10. Extract distribution copies of data. Data for a

cataloging unit were extracted from the database and converted into an ARC/INFO® workspace containing coverages and other files. Data available in the Spatial Data Transfer Standard format were developed from the workspaces. The workspaces and the Spatial Data Transfer Standard-formatted files were made available to the public. 1999 NHD The following steps were performed by ESRI: Extracted NHD Route DRAIN from National Hydrography Dataset (NHD). Added STRM_LEVEL and NAME attributes from NHD Route RCH. Removed unneeded attributes. Split the data set by U.S. states (for easier processing). Unsplit features based on combining NAME, FTYPE, FCODE, and STRM_LEVEL attributes. Merged the data sets into one. Recalculated the lengths for the METERS attribute. Formatted the attributes. Created ArcGIS® layer file (.lyr), projection file (.prj), and spatial indices. Converted the data set to SDC. NHD 20021113 Vector String 1899923 0.000009 0.000009 Decimal degrees North American Datum of 1983 Geodetic Reference System 80 6378137.000000 298.257222 dtl_riv The lines represent the detailed rivers and streams in the United States. ESRI ObjectID Internal feature number. ESRI Sequential unique whole numbers that are automatically generated. NAME The name of the river or stream. ESRI Names for the features. FTYPE The feature type of river or stream. ESRI ARTIFICIAL PATH The linear water feature allows connectivity through areal features (for example, lake/ponds and stream/rivers). U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency CANAL/DITCH The linear water feature is a canal (1-dimensional) or ditch (1-dimensional). U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency CONNECTOR The linear water feature is a connector (fill gaps in the delineation of features through which water flows). U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency PIPELINE The linear water feature is a pipeline. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency STREAM/RIVER The linear water feature is a stream (1-dimensional) or river (1-dimensional). U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency FCODE The feature code (five-digit) for the river or stream. The first three digits encode the feature type; the last two digits encode values for a set of characteristics associated with the feature. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency 0 unknown ESRI 33400, 33600, 42800, 46000, 55800 Feature type only: no attributes. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency 33601 Canal/Ditch Type|aqueduct. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency 33602 Canal/Ditch Type|unspecified. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency 42801 Product|water; Pipeline Type|aqueduct; Relationship to Surface|at or near. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency 42802 Product|water; Pipeline Type|aqueduct; Relationship to Surface|elevated. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency 42803 Product|water; Pipeline Type|aqueduct; Relationship to Surface|underground. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency 42804 Product|water; Pipeline Type|aqueduct; Relationship to Surface|underwater. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency 42807 Product|water; Pipeline Type|general case; Relationship to Surface|underground. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency 42809 Product|water; Pipeline Type|penstock;

Relationship to Surface|at or near. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency 42811 Product|water; Pipeline Type|penstock; Relationship to Surface|underground. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency 42813 Product|water; Pipeline Type|siphon; Relationship to Surface|unspecified. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency 46001 Hydrographic Category|intermittent; Positional Accuracy|definite. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency 46002 Hydrographic Category|intermittent; Positional Accuracy|indefinite. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency 46004 Hydrographic Category|perennial; Positional Accuracy|definite. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency 46005 Hydrographic Category|perennial; Positional Accuracy|indefinite. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency FCODE_DESC The description of the feature code for the river or stream. ESRI Descriptions for the features. STRM_LEVEL The numeric code that identifies the path level of water flow through a drainage network for the river or stream. The lowest value ["1" for rivers or streams that terminate at the Atlantic, Pacific, or Arctic Oceans, the Gulf of Mexico, or the Caribbean Sea; "2" for rivers or streams that terminate at the Great Lakes or the Great Salt Lake; "3" for rivers or streams that terminate at the boundary of the United States with Canada or Mexico; "4" for rivers or streams that terminate at any other place (isolated drainage).] for stream level is assigned to a river or stream at the end of a flow and to upstream rivers and streams that trace the main path of flow back to the head. The stream level value is incremented by one and is assigned to all rivers and streams that terminate at this path (that is, all tributaries to the path) and to all rivers and streams that trace the main path of the flow along each tributary back to its head. The stream level value is incremented again and is assigned to rivers and streams that trace the main path of the tributaries to their heads. This process is continued until all rivers and streams for which flow is encoded are assigned a stream level. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency 1 99 -9998 The linear water feature is unspecified. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency METERS The length of the river or stream in meters. U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency Calculated lengths for the features. shape Feature geometry. ESRI Coordinates defining the features. ESRI; ESRI International Distributors mailing and physical address
380 New York Street
Redlands California 92373-8100 USA 800-447-9778 In the United States, contact the ESRI Telesales staff at 800-447-9778 for more information about our software and data. Outside the United States, please direct all inquiries to your local ESRI International Distributor. This information can be found at http://gis.esri.com/intldist/contactint.cfm. Offline Data See use constraints. SDC The SDC file contains the geospatial and attribute data. The SDI file contains the spatial and attribute indexes. The PRJ file contains the coordinate system information (optional). The XML file (*.sdc.xml) contains the metadata describing the data set (optional). ArcGIS® software 98.377 DVD–ROM 4.38 GB (gigabytes) ISO 9660 CD–ROM 650 MB (megabytes) ISO 9660 Software purchase price ESRI Data & Maps is available only as part of ESRI® software. To use this data

requires software that supports SDC files. 20040115 ESRI Data Team mailing and physical address
380 New York Street
Redlands California 92373-8100 USA 909-793-2853 909-793-5953 info@esri.com 8:00 a.m.–5:30 p.m. Pacific time, Monday–Friday FGDC Content Standards for Digital Geospatial Metadata FGDC-STD-001-1998 local time
http://www.esri.com/metadata/esriprof80.html ESRI Metadata Profile

GAM run 04-16

By Richard M. Smith
Texas Water Development Board
Groundwater Availability Modeling Section
(512) 936-0877
March 21, 2005

REQUESTOR:

Mr. Ray Brady, on behalf of the Hemphill County Groundwater Conservation District

DESCRIPTION OF REQUEST:

Mr. Brady requested that we run the Groundwater Availability Model (GAM) of the northern part of the Ogallala aquifer (Dutton and others, 2001; Dutton, 2004), based on present conditions and modeling parameters, to:

1. estimate the amount of groundwater that annually crosses the Hemphill County line from the north (from Lipscomb County), from the west (Roberts County), and from the south (Wheeler County);
2. estimate the amount of groundwater that annually crosses the Hemphill County line from Roberts County for the area north and the area south of the Canadian River; and
3. estimate the net change in water elevation and volume of water in storage in Hemphill County in 2055 compared to the present.

METHODS:

After running the model through 2060 using projected demand numbers that the Panhandle Regional Water Planning Group plans to include in their 2006 regional water plan, we generated a water-level map to determine the flow direction at the county boundaries both north and south of the Canadian River in addition to the county boundary of Hemphill with Lipscomb and Wheeler counties. We estimated flow volumes by zoning the counties and summing the horizontal flow numbers for those model cells on the county boundaries. We estimated water volumes by multiplying the saturated thickness of the county by the specific yield and the appropriate area.

PARAMETERS AND ASSUMPTIONS:

- See Dutton and others (2001) and Dutton (2004) for assumptions and limitations of the GAM. Root mean squared error for this model is 32 ft. This error will have more of an effect on model results where the aquifer is thin.
- The recharge in the model represents average climatic conditions for the entire model run of 2001 to 2060.
- Conditions in 1998 (the last year of the calibration period) represent present conditions.

- We assumed a specific yield of 0.15.
- To represent the demand numbers that the Panhandle Regional Water Planning Group plans to include in their 2006 regional water plan, we proportionally adjusted the pumping distribution in the predictive run from Dutton and others (2001). To extend this run from 2050 to 2060, we assumed the same distribution applied through 2060.

RESULTS:

Groundwater flows from Lipscomb, Roberts, and Wheeler counties into Hemphill County (Figure 1). Given present conditions, about 4,800 acre-feet per year flows south into Hemphill County from Lipscomb County. About 500 acre-feet per year flows from Roberts County into Hemphill County north of the Canadian River, and 5,500 acre-feet per year flows from Roberts County into Hemphill County south of the river. About 4,100 acre-feet per year flows north into Hemphill County from Wheeler County.

According to the GAM, the volume of water in Hemphill county at the present time is 13,400,000 acre-feet and the volume of water for 2055 is 13,200,000, a difference of 200,000 acre-feet. The change in water levels is barely discernable (compare Figures 1 and 2).

REFERENCES:

Dutton, A., 2004, Adjustments of parameters to improve the calibration of the Og-N model of the Ogallala aquifer, Panhandle Water Planning Area: prepared for Freese and Nichols, Inc. and the Panhandle Regional Water Planning Group by the Bureau of Economic Geology, The University of Texas at Austin, 9 p.

Dutton, A., Reedy, R., and Mace, R., 2001, Saturated thickness of the Ogallala aquifer in the Panhandle Water Planning Area–Simulation of 2000 through 2050 withdrawal projections: prepared for the Panhandle Water Planning Group by the Bureau of Economic Geology, The University of Texas at Austin, 54 p.

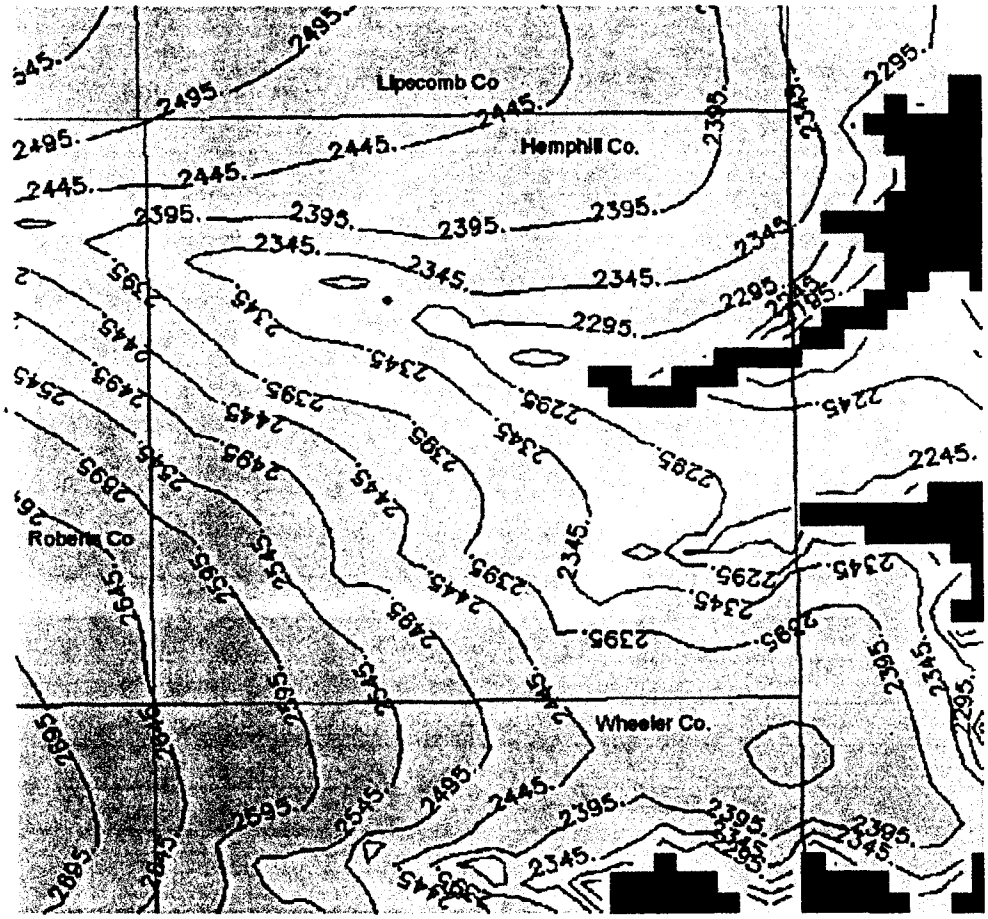


Figure 1: Water-level elevation at the end of the transient period in 1998. North is towards the top of the graph, the contour interval is 50 feet, and the dark gray cells are inactive cells in the model.

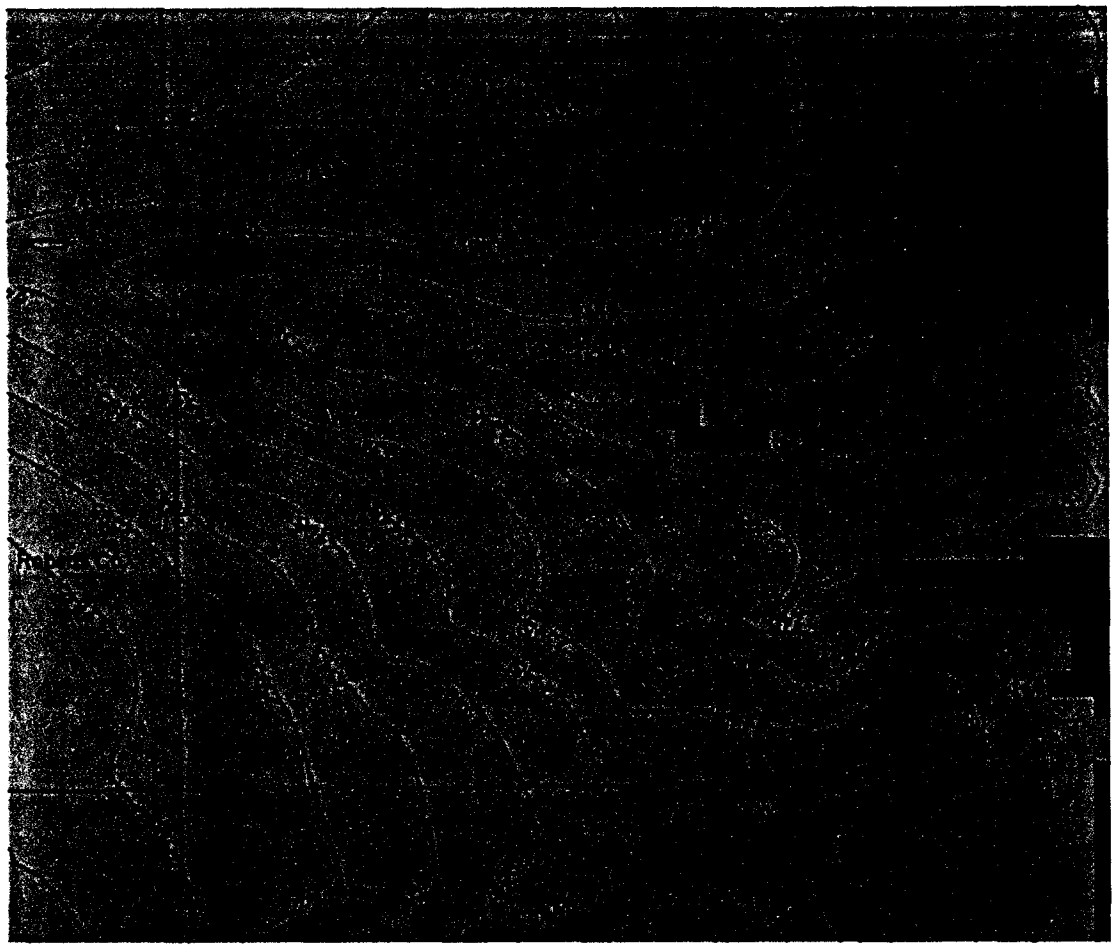
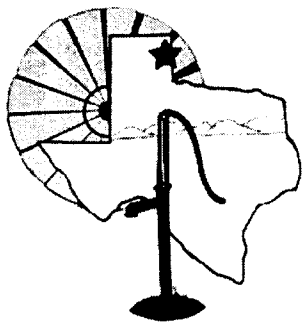


Figure 2: Water-level elevation in 2055 in the predictive run. North is towards the top of the graph, the contour interval is 50 feet, and the dark gray cells are inactive cells in the model.



HEMPHILL COUNTY UNDERGROUND WATER CONSERVATION DISTRICT

P.O. Box 1142 * 401 Purcell Street
Canadian, Texas 79014
Phone 806 323-8350 * Fax 806 323-9574

NOTICE OF PUBLIC HEARING ON PROPOSED NEW MANAGEMENT PLAN

The Hemphill County Underground Water Conservation District ("District") will conduct a public hearing concerning the District's possible repeal of its existing Management Plan and adoption of proposed new, replacement Management Plan. The purpose of the public hearing is to provide interested members of the public the opportunity to appear and provide oral or written comments to the District related to the proposed new plan.

1.0 Date, Time, and Place of Public Hearing.

The date, time and place of the public hearing is as follows:

Date:	Tuesday, July 10, 2007
Time:	6:30 p.m.
Location:	Commissioner's Courtroom, Hemphill County Courthouse 400 Main Street Canadian, Texas 79014

2.0 Brief Explanation of the Proposed New Management Plan.

The District is proposing to repeal its existing Management Plan and replace it with a proposed new Management Plan. Pursuant to Chapter 36 of the Texas Water Code, the District is obligated to periodically update its Management Plan. The District is proposing the new Plan in order to achieve compliance with the mandates of Chapter 36. The new Plan would reorganize and re-format the District's Management Plan, and would revise and expand the District's management goals and objectives. An exhaustive analysis of the differences between the District's current Management Plan and proposed new Management Plan is not attempted here. All interested persons are encouraged to review the proposed new Management Plan for themselves by obtaining a copy from the District, as provided below.

3.0 Procedures for Submitting Comments on the Proposed New Management Plan.

3.1 Oral Comments.

Any person may appear in person, or by authorized representative, at the public hearing

on the proposed new Management Plan. Any person making an appearance must indicate their desire to make oral comments on the registration form provided by the District at the public hearing. A person must disclose any affiliation on the registration form and, if applicable, the authority to speak for a person represented. Any other person attending the public hearing will be considered by the District to be an observer not desiring to make comment on the proposed new Management Plan. The District will not consider any comments of an observer in its proceedings.

The presiding officer will establish the order of oral comments of persons at the hearing. As appropriate, the presiding officer may limit:

(1) the number of times a person may speak;

(2) the time period for oral comments;

(3) cumulative, irrelevant, or unduly repetitious comments;

(4) general comments that are so vague, undeveloped, or immaterial as to be impracticable for the District to ascertain the intent or purpose of the person making the general oral comments and that are otherwise unhelpful to the District in analyzing the proposed new Management Plan;

(5) the time period for asking or responding to questions; and

(6) other matters that come to the attention of the presiding officer as requiring limitation.

3.2 Written Comments.

Written comments on the proposed new Management Plan must be filed with the District by no later than the close of the public hearing. Written comments may be filed as follows:

(1) by hand delivery at the official address of the District, 401 Purcell Street, Canadian, Texas 79014;

(2) by mail to P.O. Box 1142, Canadian, Texas 79014; or

(3) by hand delivery to the presiding officer at the public hearing.

Please note that while the District will consider written and oral comments, it will not prepare formal written responses to comments for review and consideration by the Board of Directors of the District when it deliberates on whether to adopt the proposed new Management Plan.

4.0 Procedures for Obtaining the proposed new Management Plan.

A copy of the proposed new Management Plan may be obtained from the District as follows:

(1) calling (806) 323-8350;

(2) visiting the offices of the District at 401 Purcell Street, Canadian, Texas; or

(3) visiting the District's website at www.hemphillucwd.org

5.0 Opportunity to Appear and Comment at Board Meeting at Which the Proposed New Management Plan May be Adopted.

The meeting of the District's Board of Directors at which the proposed new Management Plan will be considered for adoption will be an open meeting and, at that meeting, the public will be allowed to make comments, subject to whatever reasonable limits as to the number, frequency and length of comments the District is empowered to impose pursuant to the Texas Open Meetings Act, TEX. GOV'T CODE ANN. ch. 551.

ISSUED THIS 19th DAY OF JUNE, 2007.

_____

Janet Guthrie
General Manager
Hemphill County Underground Water Conservation District