

APPENDIX E

SUMMARY OF SPECIAL STUDY:

**GROUNDWATER RECHARGE IN THE CENTRAL HIGH PLAINS OF
TEXAS: ROBERTS AND HEMPHILL COUNTIES**

Appendix E

Summary of Special Study Conducted for the PWPA

The Bureau of Economic Geology (BEG) conducted several studies to determine recharge rates for the Ogallala aquifer in Roberts and Hemphill counties. The report titled “Groundwater Recharge in the Central High Plains of Texas: Roberts and Hemphill Counties”, was written in conjunction with the Panhandle Groundwater Conservation District and focuses on both Roberts and Hemphill Counties. This study report was adopted on July 14, 2009 and submitted to the TWDB on July 27, 2009. The findings of these studies were considered in the Update of the Northern Ogallala Groundwater Availability Model, which is included in Appendix F. Below is a brief synopsis of these studies.

Recharge Estimate for Roberts County based on Groundwater Chloride Data

The Roberts County study found a median recharge rate for the central portion of the county of 0.26 inches per year. The study found that little to no recharge occurs beneath rangeland vegetation. The highest recharge rates, which represent only about 2% of the study area, range from 0.7 to 0.9 inches per year. The higher recharge rates were found in drainage areas, which appear to function in a similar way to playa lakes in other regions. The density of playa lakes in Roberts County is very low, with all playa lakes located in the southeastern portion of the county.

This study confirmed previous estimates that there is little to no recharge beneath rangeland vegetation. The regional median recharge rate in the recent study, 0.26 inches per year, is similar to previous regional estimates for the central High Plains based on chloride data analyses.

Recharge in the Central High Plains based on Unsaturated Zones Field Studies

This study that focused on Roberts and Hemphill Counties study also found that little to no recharge occurs beneath vegetated rangeland. Six of nine test locations in a rangeland setting indicated essentially no recharge to the aquifer. Two of the nine test locations indicated recharge rates of 0.11 and 0.14 inches per year. Recharge rates were not estimated for the ninth location. The absence of recharge in most rangeland areas can be attributed to low permeability soils and evapotranspiration of the natural grasses and shrubs.

Where rangeland was converted to dryland agriculture, recharge did not increase in a test location in Roberts County but did increase in a Hemphill County test location to 0.41 inches per year. The test location in Roberts County has a low permeability clay loam soil.

The study found increased recharge under all irrigated locations. Two test locations in Robert County were found to have recharge rates of 1.9 and 2.2 inches per year, and a test location in Hemphill County had an estimated recharge rate of 1.3 inches per year.

Evaluation of one test location in a dry drainage channel in Roberts County indicated high recharge rates. It is estimated that a lower bound on the recharge rate may be 0.7 inches per year. The study also evaluated recharge beneath impoundments in Robert County and found the recharge rate to be between 0.6 and 1.4 inches per year.

General Observations from the Ogallala Aquifer Recharge Studies

The studies indicate that the regional recharge rates in Roberts and Hemphill counties are relatively low and similar to values estimated in previous studies. It is noted in both reports that different site conditions result in different recharge rates. The Roberts and Hemphill Counties study evaluated the following site conditions, in order of increasing recharge rates: vegetated rangeland, dryland agricultural areas, irrigated agricultural areas, drainage channels, and impoundments. The results from the studies are summarized in the following table.

Recharge Rates in Inches per Year in Roberts and Hemphill Counties

Description of Area	Roberts County	Hemphill County
Regional Recharge	0.26	N/A
Rangeland	0.0 – 0.2	0.0 – 0.2
Dryland Agriculture	0.0	0.4
Irrigated Agriculture	0.8 – 1.9	0.6
Drainage Channel	>0.7	N/A
Impoundment	0.6 – 1.4	N/A