

**BEFORE THE OKLAHOMA WATER RESOURCES BOARD
STATE OF OKLAHOMA**

IN THE MATTER of Determining the)
Maximum Annual Yield for the Garber-)
Wellington Groundwater Basin underlying parts)
of Cleveland, Lincoln, Logan, Lincoln,)
Oklahoma, Payne and Pottawatomie Counties)

**ORDER ESTABLISHING THE
TENTATIVE MAXIMUM ANNUAL YIELD OF THE
GARBER-WELLINGTON GROUNDWATER BASIN**

On this 20th day of August, 2019, there came for consideration a proposed order to establish the tentative determination of the maximum annual yield for Garber-Wellington Groundwater Basin. Based on the hydrologic surveys and investigations made, the Oklahoma Water Resources Board ("Board") makes and enters the following tentative findings, tentative conclusions and order and directives.

TENTATIVE FINDINGS

1. The Board has made or caused to be made hydrologic surveys and investigations of the Central Oklahoma aquifer which is located under parts of the following counties in central Oklahoma: Cleveland, Lincoln, Logan, Oklahoma, Payne and Pottawatomie. The hydrologic surveys and investigations reviewed for this order include the U.S. Geological Survey (USGS) Scientific Investigations Report 2013-5219, Hydrogeology and Simulation of Groundwater Flow in the Central Oklahoma Aquifer, Oklahoma, 1987 to 2009, and Simulation of Available Water Storage, 2010-2059, by Mashburn, S.L., Ryter, D.W., Neel, C.R., Smith, S.J., and Magers, J.S. (2014) (herein USGS Report), reports and information referenced therein; USGS Water-Supply Paper 2357-A, Ground-Water-Quality Assessment of the Central Oklahoma Aquifer, Oklahoma: Results of Investigations, by Christenson, S.C., and Havens, J.S. (1998); and a Board staff report entitled Garber-Wellington Groundwater Basin: Hydrologic Survey and Simulation of Water Available in Storage, August 2019.

2. The Central Oklahoma aquifer consists of the Permian-age Garber Sandstone; Wellington Formation; and Chase, Council Grove, and Admire Groups; as well as Quaternary-age alluvium and terrace deposits. The basin is seventeen percent (17%) confined on the western edge by the Permian-age Hennessey Group. The thickness of the Central Oklahoma Aquifer ranges in thickness from approximately zero feet to more than 900 feet.

3. Groundwater wells located throughout the aquifer yield 65 gallons per minute on the average which qualifies the aquifer as a major groundwater basin. As defined by 82 O.S. § 1020.1, a major groundwater basins yield at least 50 gallons per minute.

4. The quality of groundwater produced from groundwater wells in the aquifer is considered good, although variability exists depending on location within the aquifer. The groundwater generally contains less than 500 milligrams per liter (mg/L) total dissolved solids.

5. The total land area overlying the aquifer, including all or parts of Cleveland, Logan, Lincoln, Oklahoma, Payne, and Pottawatomie counties, is approximately 2,891 square miles or 1,850,000 acres. See maps marked Attachment 1 and 2 to this Order.

6. As demonstrated by USGS groundwater flow model, the amount of groundwater in storage within the Central Oklahoma aquifer in 2009 was estimated to be 98,676,000 acre-feet, using the specific yield of 0.13 and a mean saturated thickness of 392.5 feet.

7. a. The total amount of recharge for the aquifer is estimated at 283,703 acre-feet per year, using the rate of recharge of approximately 1.84 inches per year.

b. To calculate the total amount of discharge from the basin, the Board assumes full withdrawal of groundwater authorized by rights to use the groundwater established under state laws as they existed prior to July 1, 1973, with such rights being recognized in final orders determining prior rights to use groundwater. For the aquifer, prior rights authorize withdrawal of 94,764 acre-feet per year. Therefore, the total discharge attributable to the assumed full exercise of prior rights over the 20-year period is 1,895,280 acre-feet.

8. The Central Oklahoma aquifer has a mean transmissivity of 1,057 feet squared per day.

9. The potential for pollution in the aquifer includes elevated concentration of arsenic, chromium, selenium, and uranium due to desorption from solid phase aquifer materials under alkaline conditions. Elevated levels of chloride, fluoride, nitrate, manganese, sulfate and total dissolved solids may also exist. However, the water quality is not expected to significantly alter the amount of water available from the basin for the typical purposes for which groundwater in this basin is used.

10. From the hydrologic surveys and investigations and based on information in Tentative Findings Nos. 5 through 9 above, the maximum annual yield of the Central Oklahoma aquifer over a 20-year period is tentatively determined to be 8,418,592 acre-feet per year. The 20-year period for the tentative determination calculation was assumed to begin in 2009. Based on the maximum annual yield for the 20-year period, the equal proportionate part of the yield allocated to each acre of land overlying the aquifer area would be 4.55 acre-feet per acre per year.

11. From the hydrologic surveys and investigations and based on information in Tentative Findings Nos. 5 through 9 above, the maximum annual yield of the Central Oklahoma aquifer over a 37-41 year period is tentatively determined to be 3,700,480 acre-feet per year. The equal proportionate part of the yield to be allocated to each acre of land overlying the aquifer area, based on the maximum annual yield and total land area overlying the area, is tentatively determined to be 2.0 acre-feet per acre per year.

TENTATIVE CONCLUSIONS

12. The Board is given authority by the Oklahoma Groundwater Law, 82 O.S. Supp. 2000, Sections 1020.4, 1020.5 and 1020.6 to make hydrologic surveys and investigations, enter orders to make tentative determinations, hold hearings on the tentative determinations and make final determinations of the maximum annual yields of each groundwater basin and subbasin. The Board is also given authority to cooperate with state and federal agencies engaged in similar surveys and investigations and may accept and use the findings of such agencies.

13. In reviewing the hydrologic surveys and other information, the Board tentatively determines that the Central Oklahoma aquifer may be designated a "major groundwater basin" as defined by the Oklahoma Groundwater Law. See Section 1020.1(3) of Title 82 of the Oklahoma Statutes.

14. According to Section 1020.5 of Title 82 of the Oklahoma Statutes, after completing hydrologic surveys, the Board is to make a tentative determination of the maximum annual yield of groundwater to be produced from a basin or subbasin based upon the following:

- a. total land area overlying the basin or subbasin;
- b. amount of water in storage in the basin or subbasin;
- c. rate of recharge to and total discharge from the basin or subbasin;
- d. transmissibility of the basin or subbasin; and
- e. possibility of the basin or subbasin from natural sources.

The maximum annual yield is to be based on a minimum basin life of 20 years from the date of the final order determining the maximum annual yield.

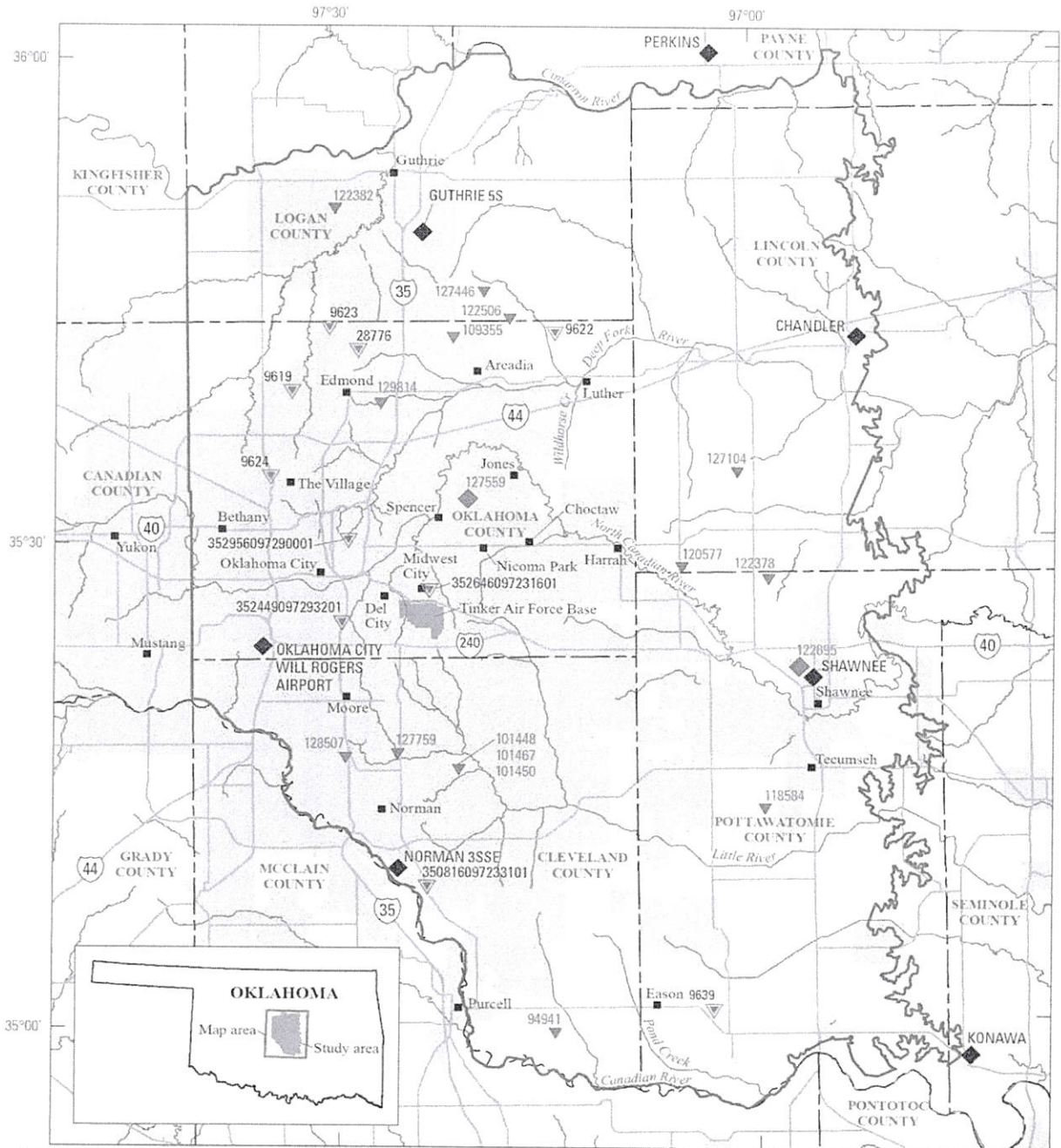
15. After a tentative maximum annual yield for a basin is determined, hearings are to be called and held in centrally located places within the area of the major groundwater basin. The hydrologic survey and information relied on to make the tentative order is to be made available for all interested persons, and notice is to be provided as required by Section 1020.6 of Title 82 of the Oklahoma Statutes.

ORDER AND DIRECTIVES

IT IS THEREFORE ORDERED by the Oklahoma Water Resources Board that the Central Oklahoma aquifer underlying areas in Cleveland, Lincoln, Logan, Oklahoma, Payne and Pottawatomie Counties shall be and the same is hereby designated the Garber-Wellington Groundwater Basin, that the basin is hereby declared to be a major groundwater basin under the provisions of the Oklahoma Groundwater Law, that the tentative determination of the maximum annual yield of the basin is 3,700,480 acre-feet, and that the equal proportionate part of the yield to be allocated to each acre of land overlying the basin, based on the maximum annual yield and total overlying land area, is tentatively determined to be 2.0 acre-feet per acre per year.

IT IS FURTHER ORDERED that hearings be held in a centrally located places within the area of the groundwater basin, that the hydrologic survey and information relied on to establish the tentative order be made available to interested persons, and that notice of the hearings be given as required by law. After said hearings, a proposed final order shall be prepared and submitted to the Board for consideration as required by law.

Attachment 1. Boundaries of the Garber-Wellington Groundwater Basin.



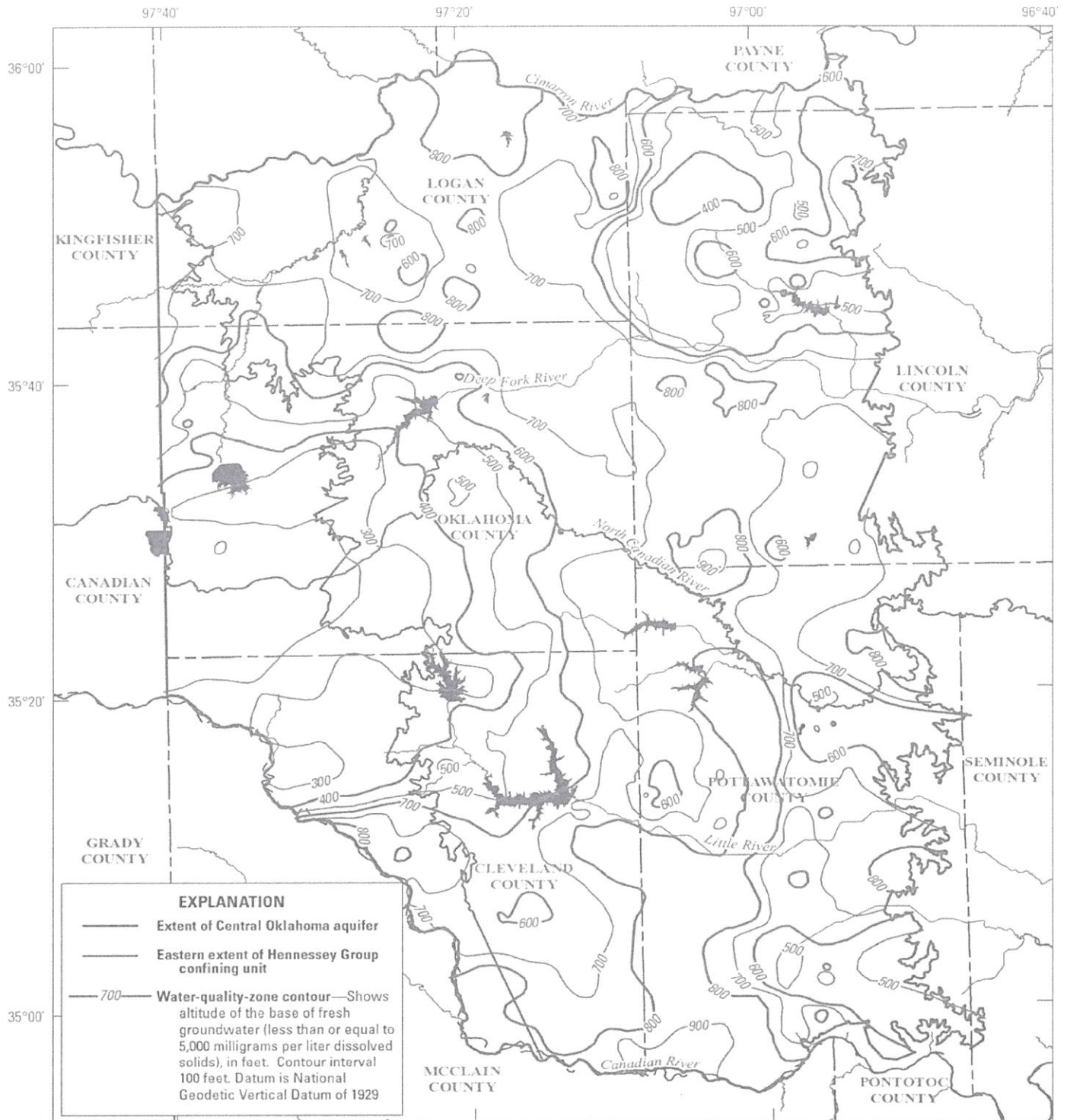
Base from Horizon Systems Corporation, 2010, University of Oklahoma Center for Spatial Analysis, 2013, and U.S. Census Bureau, 2001 Universal Transverse Mercator projection, Zone 14 North American Datum of 1983

Central Oklahoma aquifer from Runkle, Christenson, and Rea, 1997

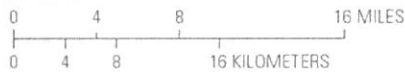


EXPLANATION	
	Cities and incorporated places
	Extent of Central Oklahoma aquifer (study area)
	Cooperative observer station (precipitation, snowfall, and temperature) and identifier
	Continuous recorder well with Oklahoma Water Resources Board (OWRB) identifier
	Mesonet weather station and continuous recorder well with OWRB identifier
	Periodic water-level well with OWRB identifier
	Periodic water-level well with U.S. Geological Survey identifier
	City and name

Attachment 2. Elevation of the base of the Garber-Wellington Groundwater Basin.



Base from Horizon Systems Corporation, 2010, and University of Oklahoma Center for Spatial Analysis, 2013 Universal Transverse Mercator projection, Zone 14 North American Datum of 1983



Central Oklahoma aquifer and Hennessey boundaries from Runkle, Christenson, and Rea, 1997 Contours modified from Christenson and others, 1992