Burrton Oil Field Brine Encroachment

Kansas Corporation Commission
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History

Burrton Oil Field

The Burrton Oil Field, west of the City of Burrton, Reno County, was first discovered in February 1931. Oil companies at this time had various options for disposal of their produced brine, a waste component of oil production, but the most common was the use of the "evaporation pit". The evaporation pit had the lowest initial cost, as well as operating cost when compared to the high cost of drilling and completing a well for deep saltwater disposal. Evaporation pits in the Burrton Oil Field ranged in size from 500 to 10,000 square feet and were 1 to 15 feet deep. Produced brine was flowed into evaporation pits where it escaped by seepage downward, (not by evaporation) contaminating the fresh water of the Equus Beds. According to the State Board of Health in 1939, the Burrton Oil Field produced 44,047 barrels of brine daily. At that time 34.7% was handled by deep disposal, 27.5% was handled by shallow or intermediate disposal wells, and 37.8% by brine evaporation pits. Through the efforts of the State Board of Health all producers were encouraged to use deep disposal wells, and abandon the use of all evaporation pits and shallow wells. By late 1944, 95% of all produced brine went to deep disposal, 3% to shallow or intermediate disposal wells and 2% to evaporation pits.

Photo of an evaporation pit, circa 1930's

Equus Beds

Beginning in 1938, the City of Wichita began an investigation for a new water well field west of Halstead in Harvey County. On September 1, 1940 the new Wichita municipal water supply system was placed into operation with a total of 25 water wells. In addition to municipal water wells, there are thousands of domestic water wells and 1,800 irrigation wells that use the Equus beds as a source of fresh water.

Contamination and Remediation Investigations

Historical

Many city, state and federal agencies have been involved with the investigation of the groundwater contamination from the Burrton Oil Field including representatives from the KCC, the KDHE, Groundwater Management District 2 (GMD 2), the Kansas Water Office, the Kansas Water

Authority, the Kansas Geological Survey, the U.S. Geological Survey, and the Bureau of Reclamation. Early phases of work included identifying zones within the Equus Beds Aquifer and contamination levels within these zones. A monitoring well network was put into place to gather data to develop methods to manage or remediate the contamination. The KCC committed to funding annual water quality analysis from the monitoring well network, which is overseen by the GMD 2. In April 1997, the KCC contracted with Burns & McDonnell consultants to evaluate potential high chloride remediation alternatives using groundwater and contaminant transport modeling, and associated cost estimates. The area of investigation called the Burrton Intensive Groundwater Use Control Area (IGUCA) covered approximately 22 square miles in the vicinity of Burrton where brine contamination exceeded 250 mg/L of chlorides. In the Burrton IGUCA Remediation Study, Burns & McDonnell recommended reverse osmosis (RO) as the preferred treatment technology for removing chlorides from the groundwater as a way of converting a portion of the plume into drinking water. It was also suggested a pilot study be installed to develop additional data and operational experience for determining more precisely how the aquifer would react to clean up measures. In 2000 the KCC in cooperation with the Bureau of Reclamation, completed data acquisition at a pilot study site east of the city of Burrton using a mobile RO unit. The KCC has continued to use the water well drilled for the pilot study as a recovery well removing contaminated water from the Equus Beds, and disposing brine down a deep Class II saltwater disposal well.

Bureau of Reclamation Mobile Lab

Potential Remediation Scenarios

Earlier this year the KCC contracted Burns & McDonnell to update the contaminant transport model to predict where the plume might be in year 2046. Plume movement was predicted for each of the following remediation scenarios: 1) plume control using both contamination extraction wells, and fresh water gradient control wells pumping at 4,000 gpm, 2) plume control with extraction wells, a 3 million gallon per day RO treatment plant and 4 recharge basins; and 3) no remediation activities. A comparison of the three models indicates very minor differences in the plume's eastward extent in 2046. Conversely, if the pumping rate were increased to 8,000 gpm, excessive amounts of salt inflow from the Arkansas River would be brought into the Equus Beds, contaminating areas that would otherwise have fresh water, making large remediation efforts very expensive and counter-productive.