

# *Equus* Beds Aquifer Storage and Recovery Project 1995-2002

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*Equus* Beds GMD2

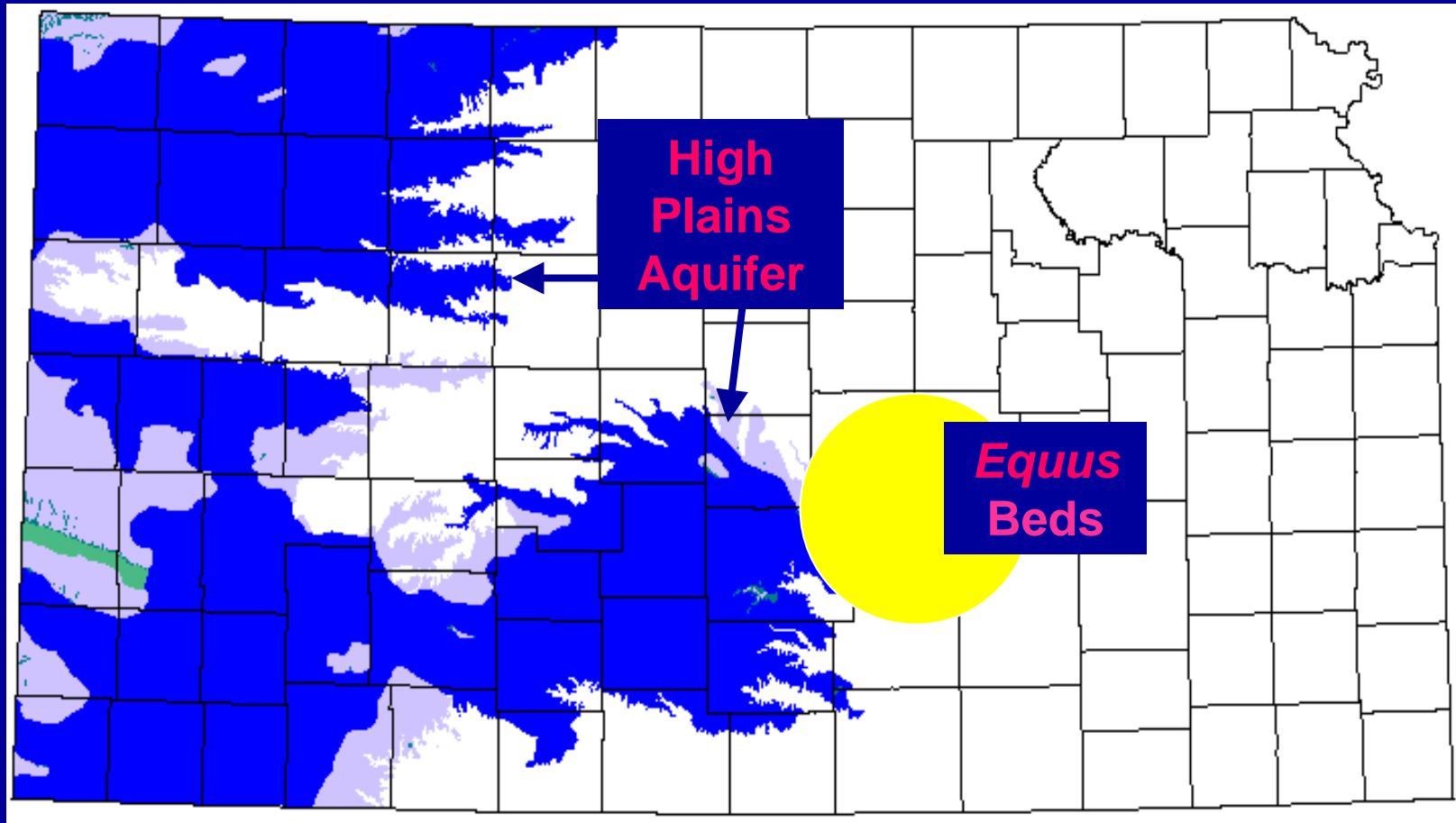


# *Equus* Beds Recharge Project

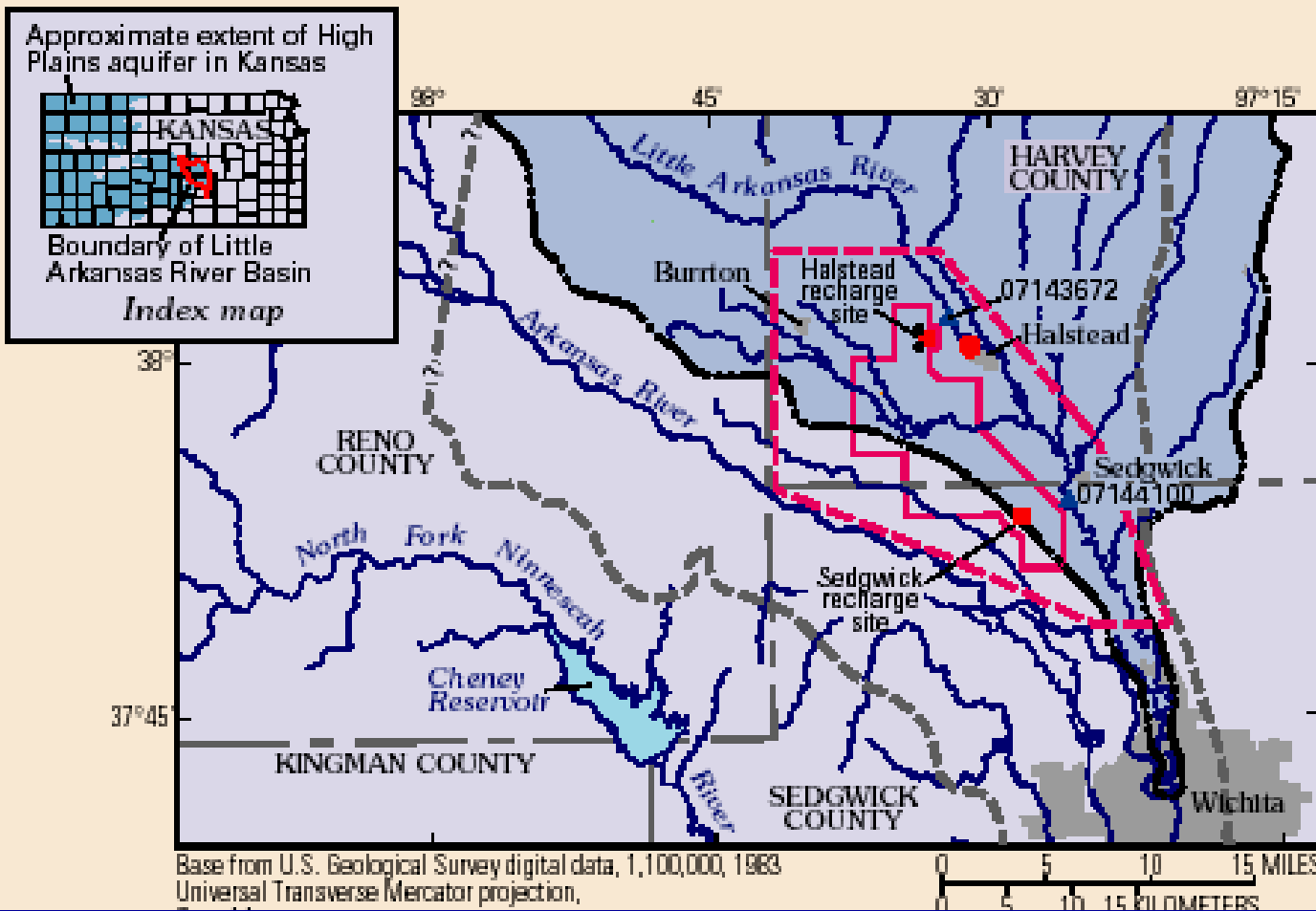
- *Equus* Beds Aquifer
- Water issues
- Roles of different agencies and funding
- Results of water supply study
- Concepts of Aquifer Storage and Recovery
- Results of Demonstration study
- Future plans

# *Equus Beds Aquifer*

*Equus Beds aquifer is the eastern-most extent of High Plains Aquifer in Kansas*

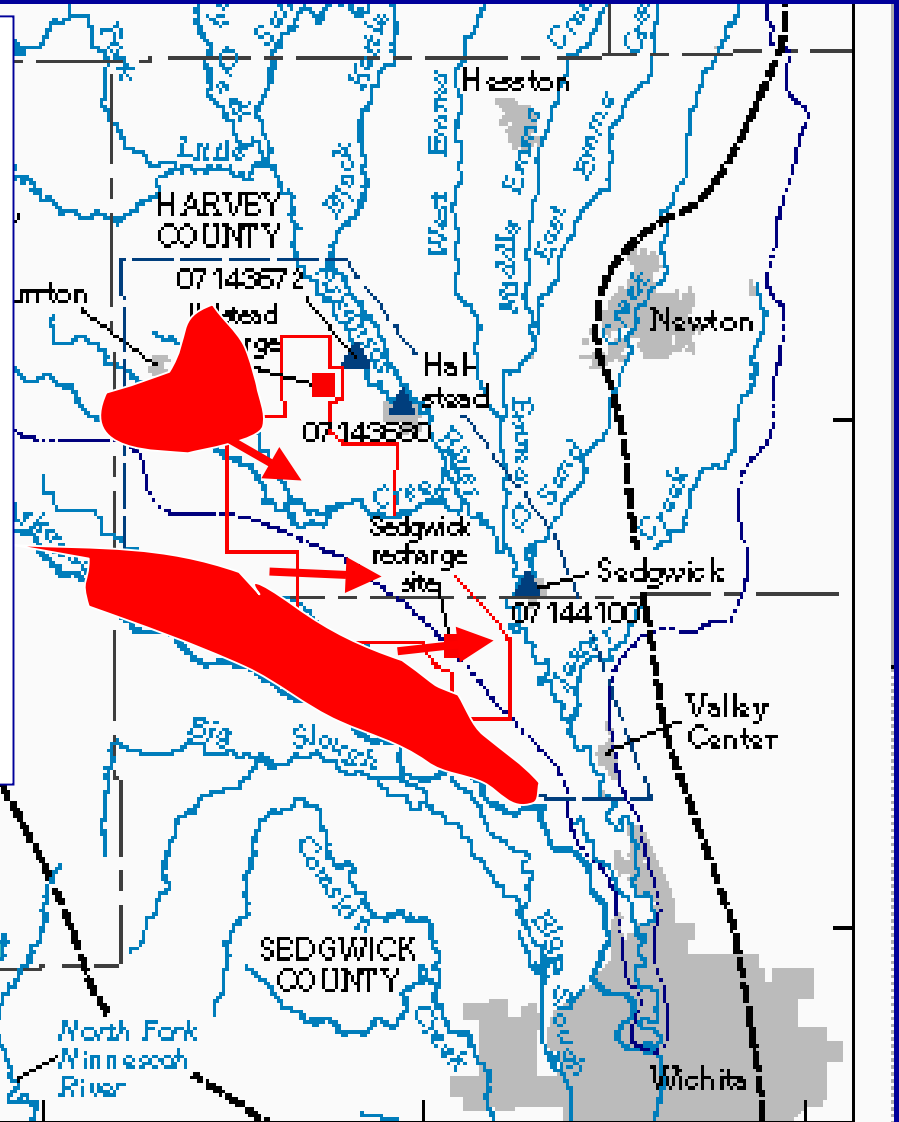


# Area of Recharge Project and Wichita Water Supplies



# Water Issues

- Previous studies by GMD2, USGS, and Bureau of Reclamation demonstrate that chloride brines and the Arkansas River will migrate into the well field area by 2050.
- Water Supply Study by Burns and McDonnell demonstrates that Wichita's projected water needs will exceed capacity of Cheney and Well field by 2015.



USGS  
Topological Survey digital data, 1:100,000, 1983  
NAD 83, UTM projection.

0 5 10 15 MILES  
0 5 10 15 KILOMETERS

# Why is salt water migrating?

**More than 30 feet of water-level decline since 1940**

- Since 1940, agricultural and municipal pumping created a depression encouraging migration of the chloride plumes toward the well field
- 65 billion gallons are available for storage to return to 1940 water levels.

# Proposed Common Solutions

- **Make greater use of Cheney Reservoir when available**
- **Recharge *Equus* Beds to store excess runoff from the Little Arkansas River and deter migration of saltwater**
- Expand usage of Local well field
- Redevelop Bentley well field
- Water conservation

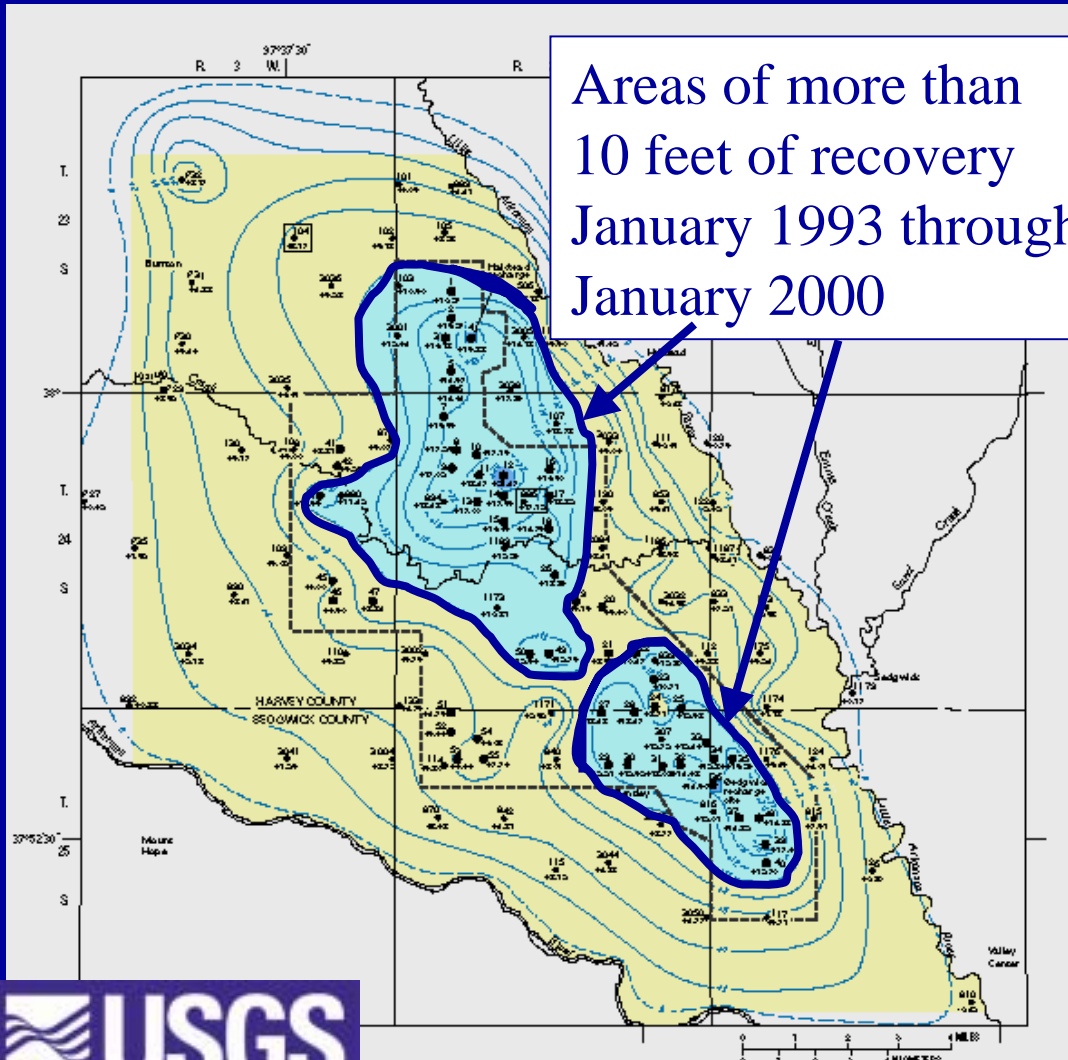


# Roles of Demonstration Project Participants

City of Wichita	Need Water, provide funding, oversight and data collection and operation
Burns and McDonnell	Project and Engineering Design
Mid Kansas Engineering	Engineering Design, data collection
GMD2	Regulation and Technical oversight
KS Division of Water Resources	Regulation and Technical oversight
KS Dept. of Health and Environment	Regulation and Technical oversight
US DOI, Bureau of Reclamation	Technical oversight and funding
US Environmental Protection Agency	Technical oversight
US Geological Survey	Data interpretation and collection, Technical resource, funding



# Greater use of water from Cheney has a positive effect on *Equus* Beds water levels



Water levels have recovered since the low in 1993 partly because of decreased pumping by Wichita and normal to wet precipitation decreasing agricultural pumping

# Concepts of Artificial Recharge

Recharge water is from Little Arkansas River using “above-base flow” water

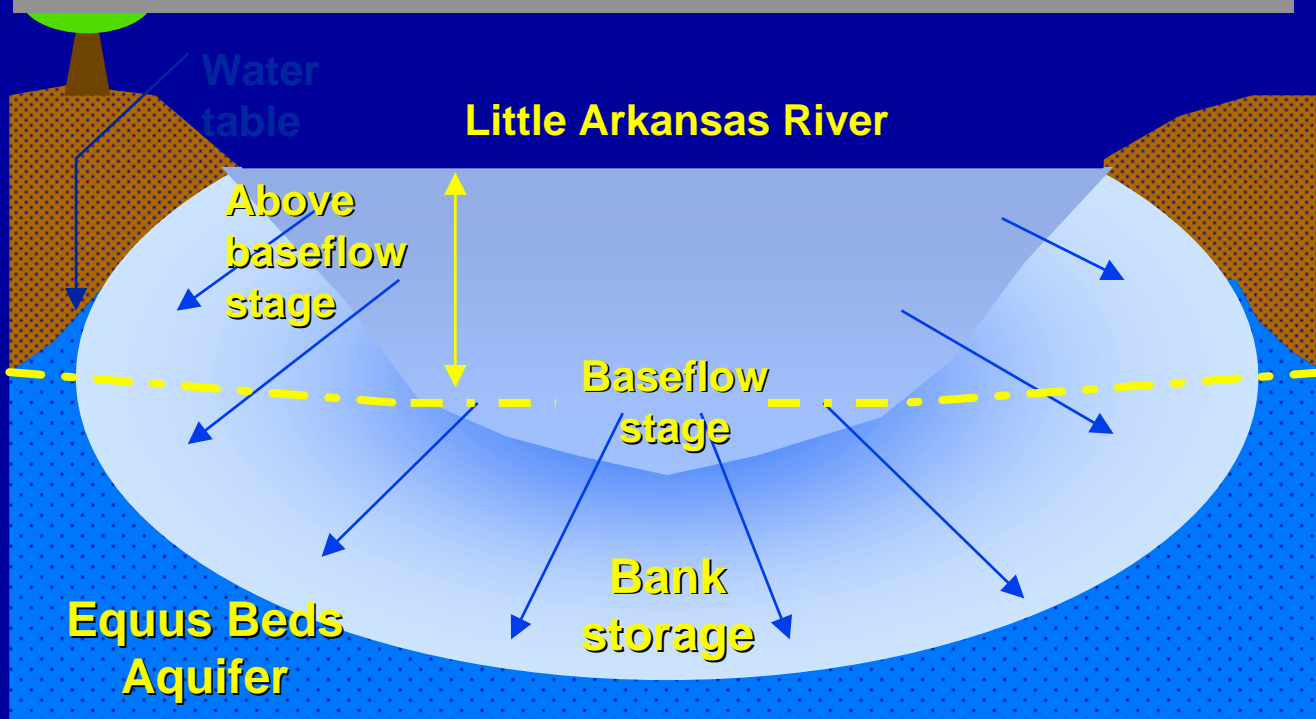
- River flow above the “base flow” set by the State
- Long-term average of about 150,000 acre-feet of above-base flow water per year
- Generally good water quality

# Goals of 5-Year Demonstration Project

- Verify bank storage concept
- Determine quality of source water
- Determine impacts to aquifer
- Evaluate recharge methods and techniques
- Develop data to support future permit requests

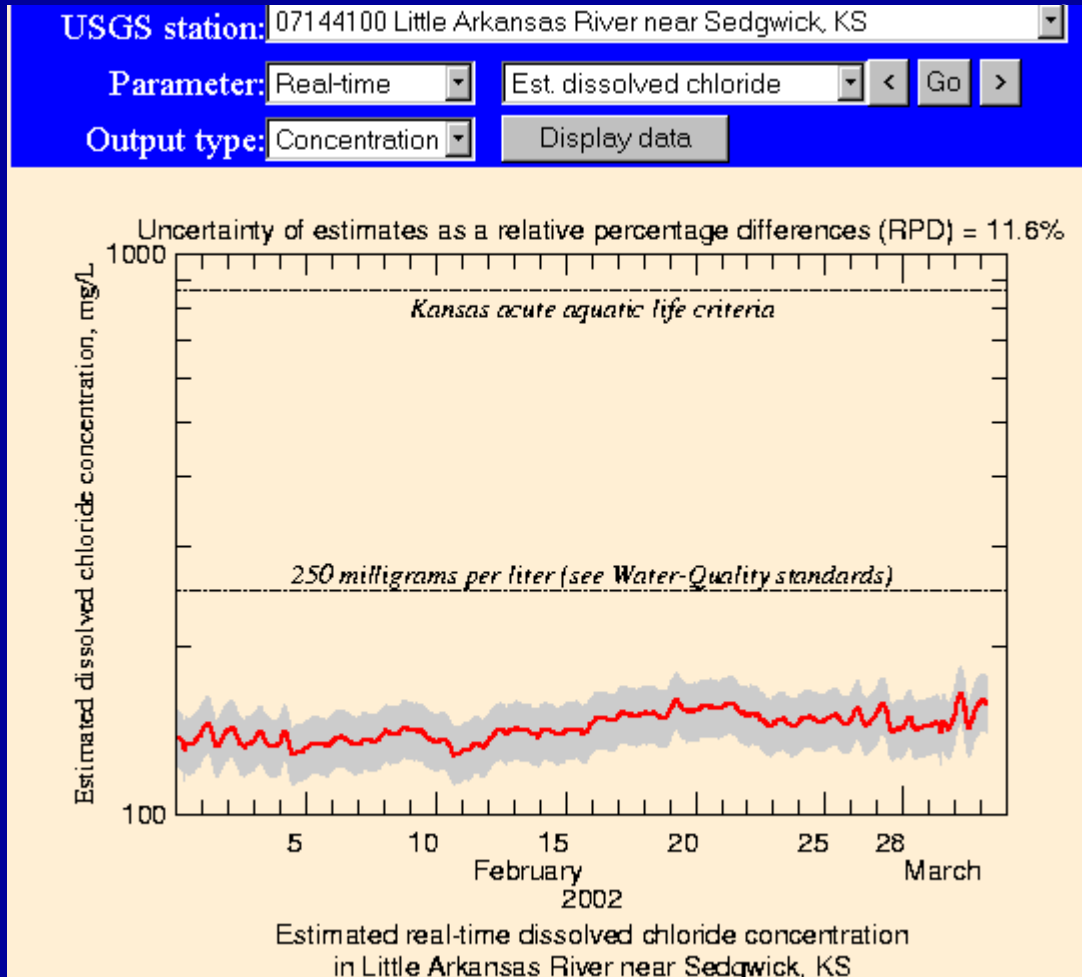
# Verify bank storage concept

Generalized cross section illustrating bank storage along the Little Arkansas River during above baseflow stage. Potential quantity of bank storage available is approximately 65 billion gallons per year.



Concept was confirmed on the basis of water-level data, ground-water modeling, and water quality.

# Source Water Quality-RTQW



New real-time water-quality approach using in-stream water quality monitors, collected samples, and regression analysis developed to estimate concentrations in surface water before it is recharged.

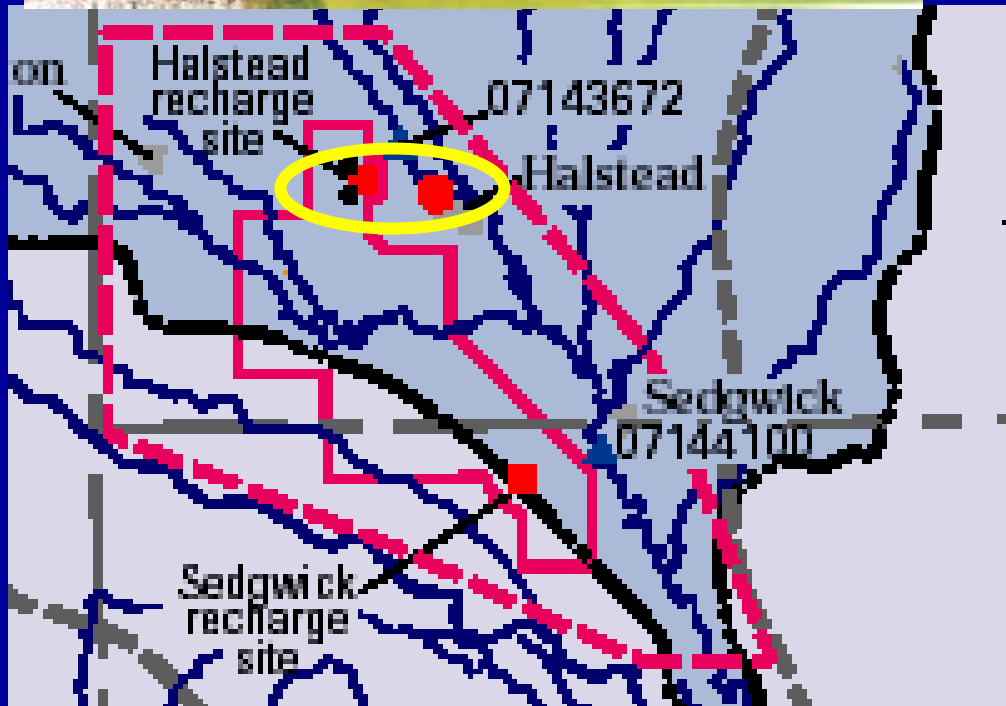


<http://ks.water.usgs.gov/Kansas/rtqw/>

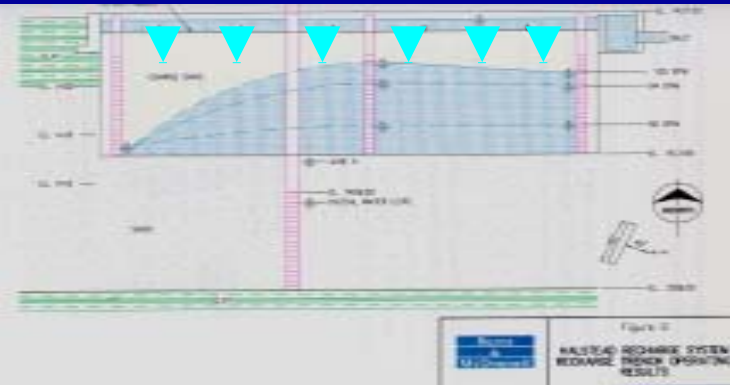
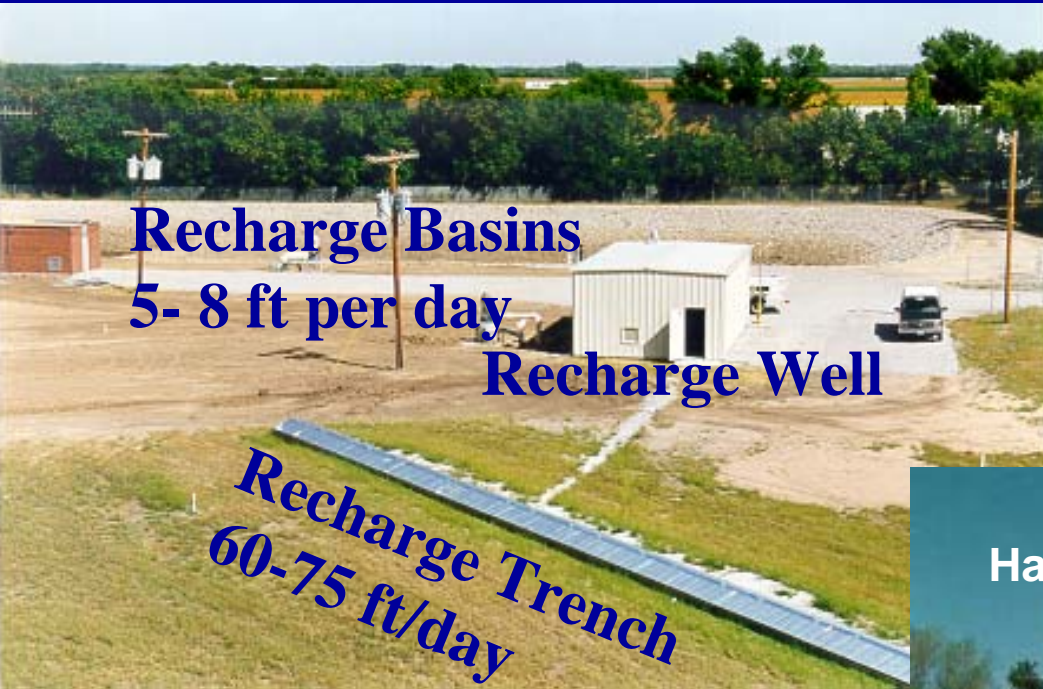
# Halstead Recharge System



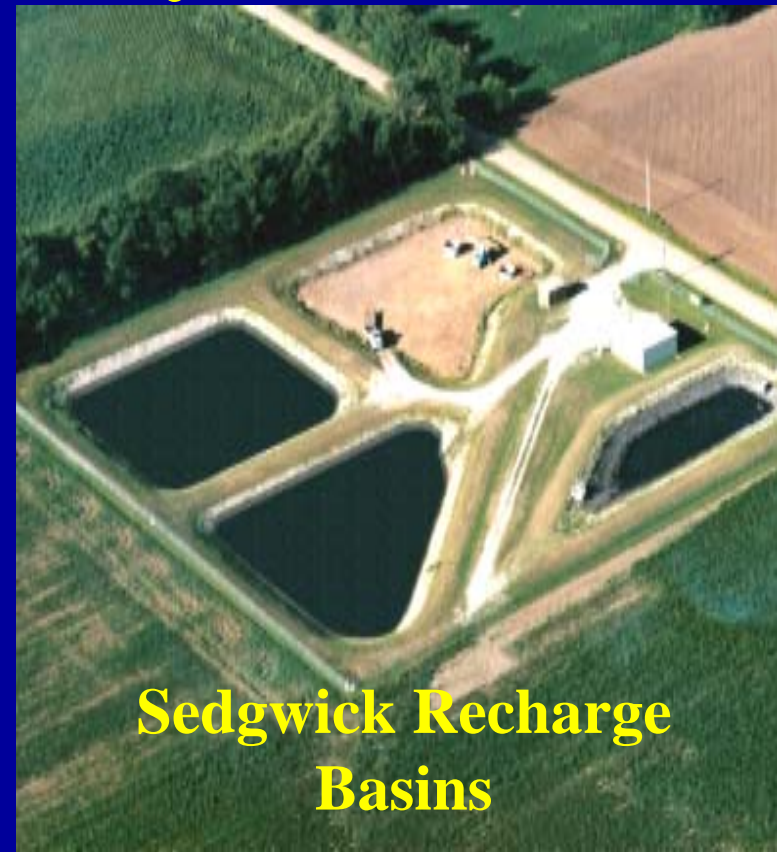
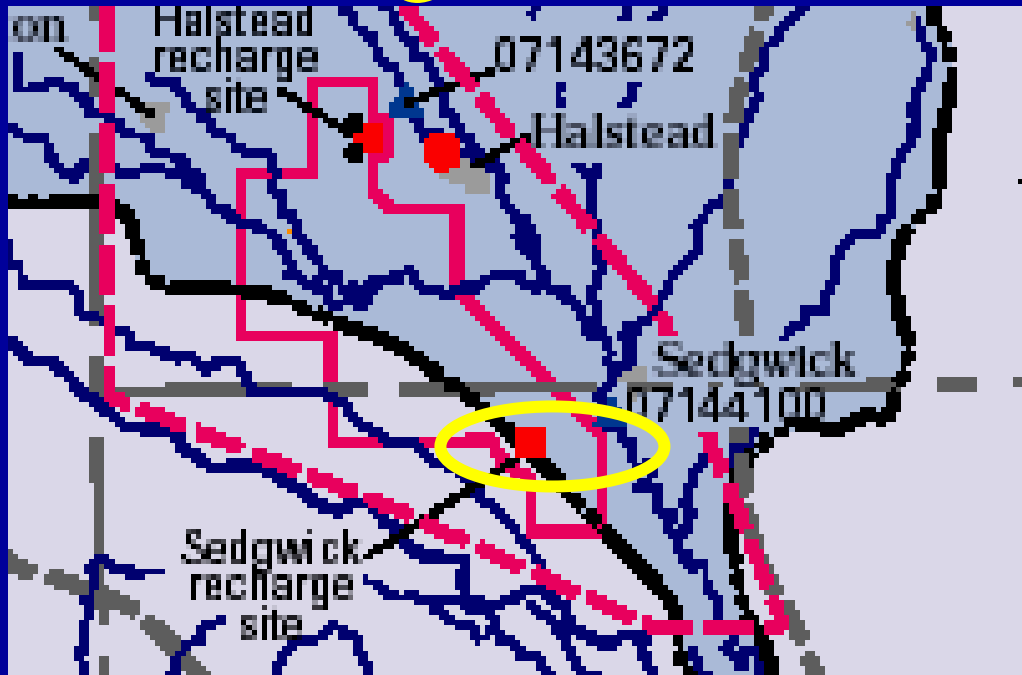
- Large capacity well induces streamflow into the well
- Water is pumped 3 miles to the west and recharged through either a trench, basins, or recharge well



# Halstead Recharge System



# Sedgwick Recharge System



Water is withdrawn from the Little Arkansas River, treated to remove sediment and pesticides, and then piped 2 miles and recharged through surface basins



# Sedgwick Recharge System

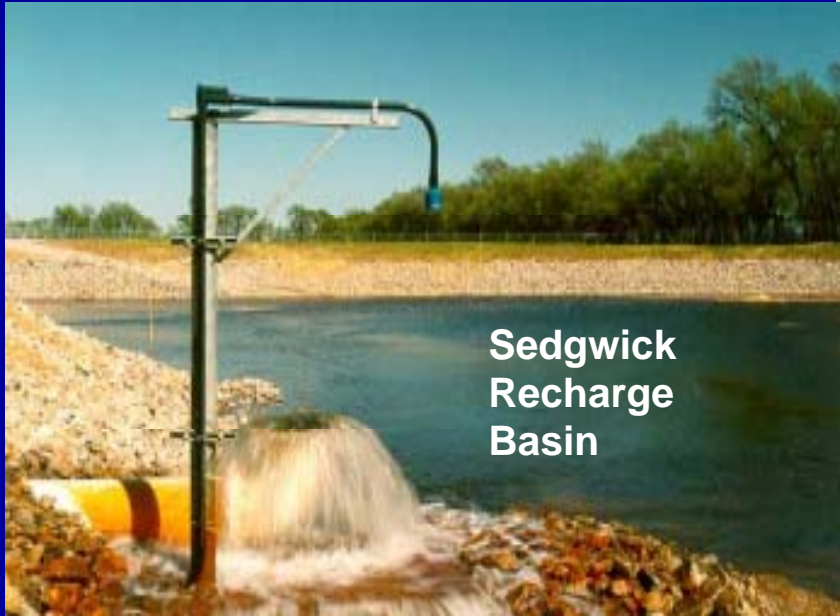
**Intake on Little Arkansas River**



**Treatment Plant**



**Sedgwick  
Recharge  
Basin**



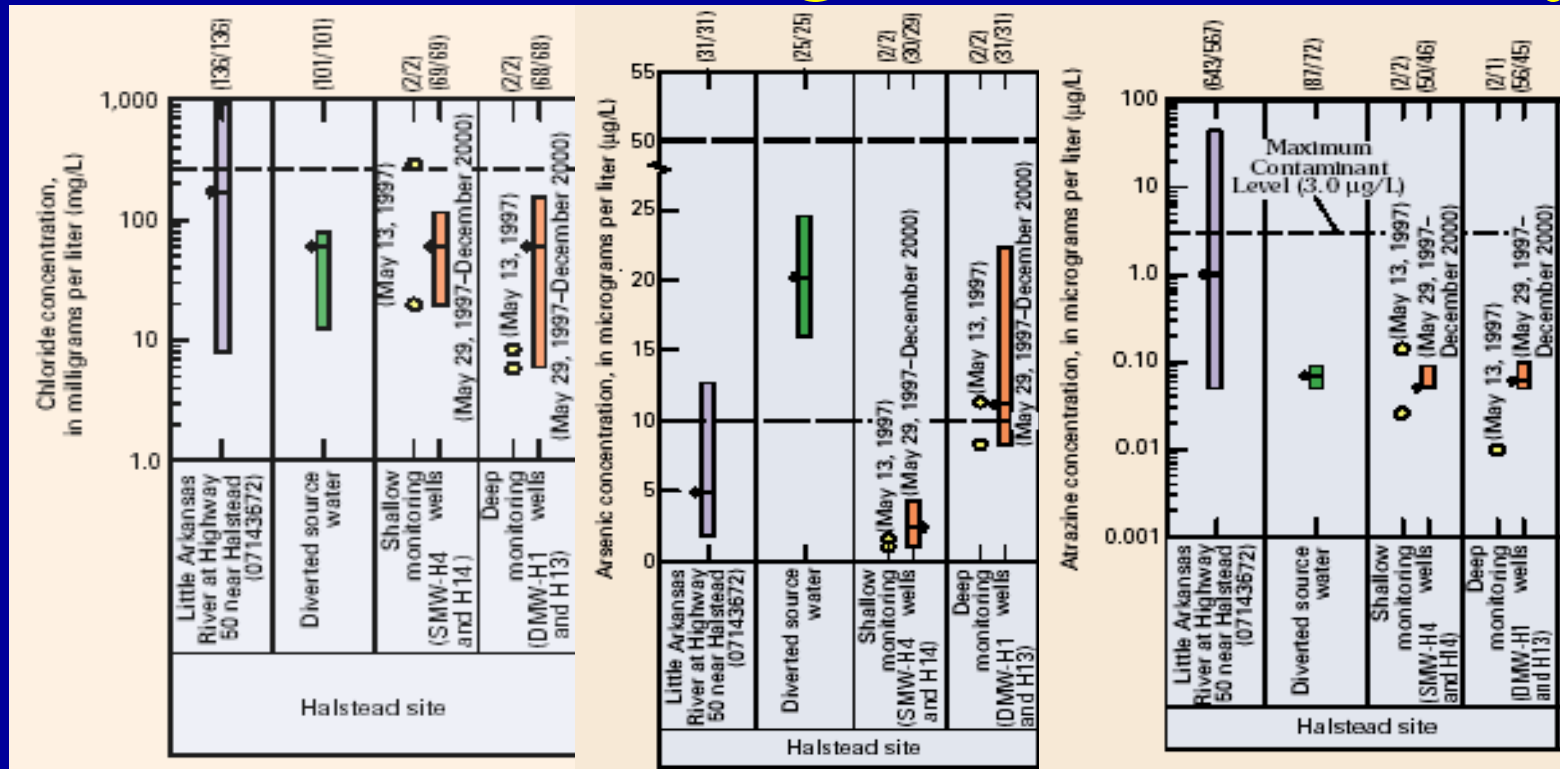
**Sedgwick Recharge  
Basins**



# Summary of water quality

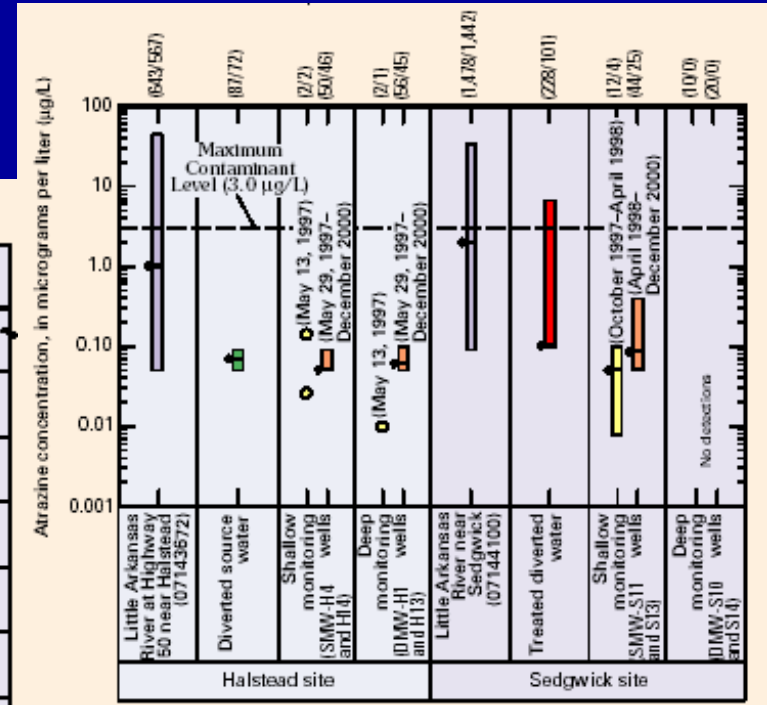
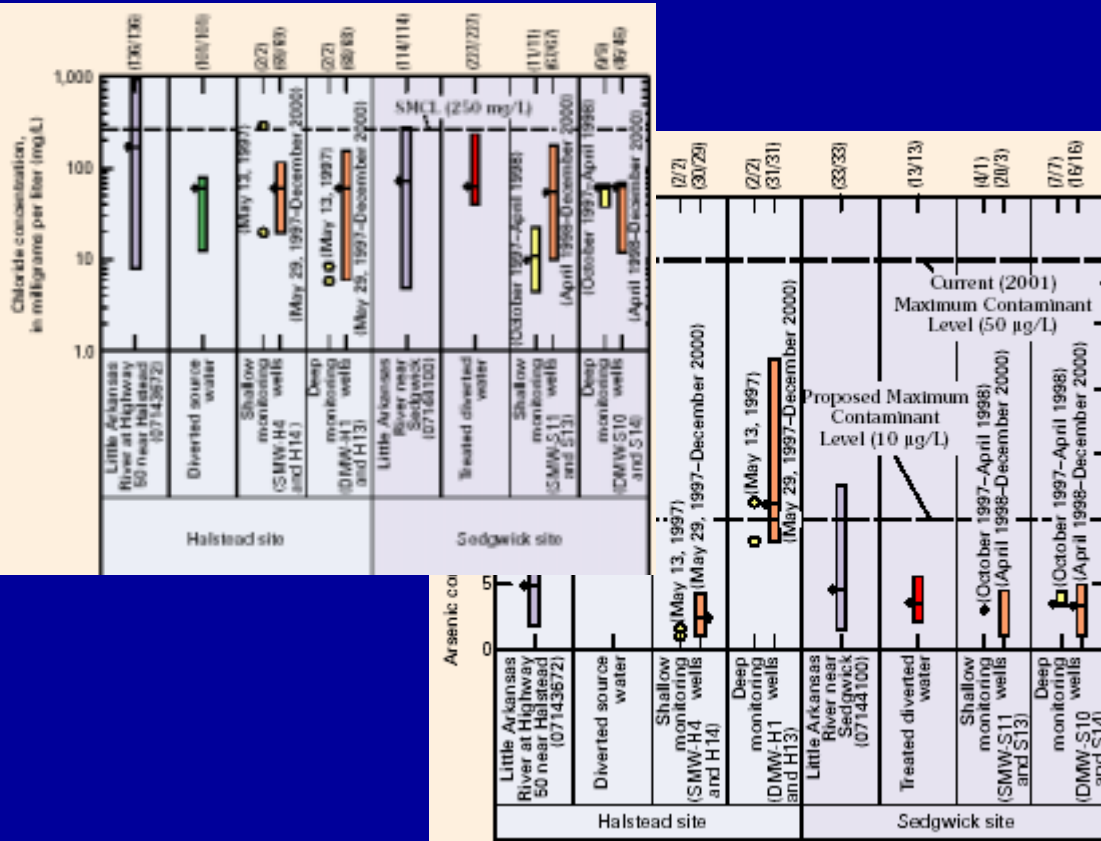
- More than 4,000 samples were collected and analyzed for more than 400 chemicals and bacteria in surface and ground water before and after recharge.
- Before recharge, only fecal coliform, chloride, and atrazine frequently exceeded MCLs in surface water and Halstead recharge water and one well at the Halstead recharge site exceeded the 2001 MCL for arsenic.
- Concentrations of these constituents after recharge were similar to concentrations before recharge.

# Halstead Recharge Water Quality



- After recharge, chloride and atrazine concentrations were substantially less than MCLs and were similar to concentrations before recharge.
- Arsenic concentrations increased to more than the 2001 EPA MCL in only one well compared to before recharge concentrations.

# Sedgwick Recharge Water Quality



Median concentrations of chloride, atrazine, fecal coliform bacteria, and arsenic were all below MCLs before and after recharge.



# Recharge Quantities

## Results (January 1, 2002)

- 1.1 Billion Gallons recharged (3,400 acre-feet)

**27,000 people for one year**

- Halstead
  - Recharge basins      73 Million Gallons
  - Recharge Trench      6 Million Gallons
  - Recharge Well      855 Million Gallons
- Sedgwick      136 Million Gallons

# Recharge Methods effectiveness

- Recharge wells are most effective recharge technique
- Recharge trench is more effective at recharging water than basins
- Recharge basins are effective, but require some maintenance

# Future Full-Scale Plans

- **100 MGD Aquifer Storage and Recovery (ASR) system**
  - > 75 MGD diversion wells (53 wells)
  - > 25 MGD surface water diversion
- **Phase I (in progress)**
  - > 10 MGD
  - > 7 diversion wells
  - > 3 ASR wells
  - > 3 basins
- **Areal Assessment well network for water quality and water levels at 38 well nests (1 per every 4 square miles)**
- **Continued surface and ground water quantity and quality monitoring**

# Information available on the web

- Information updated on the world wide web at <http://ks.water.usgs.gov/Kansas/equus/>

Includes real-time water quality and water-quantity data and recharge volumes

Reports are available in html and also by request



Equus Beds GMD2

