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## PURPOSE OF STUDY

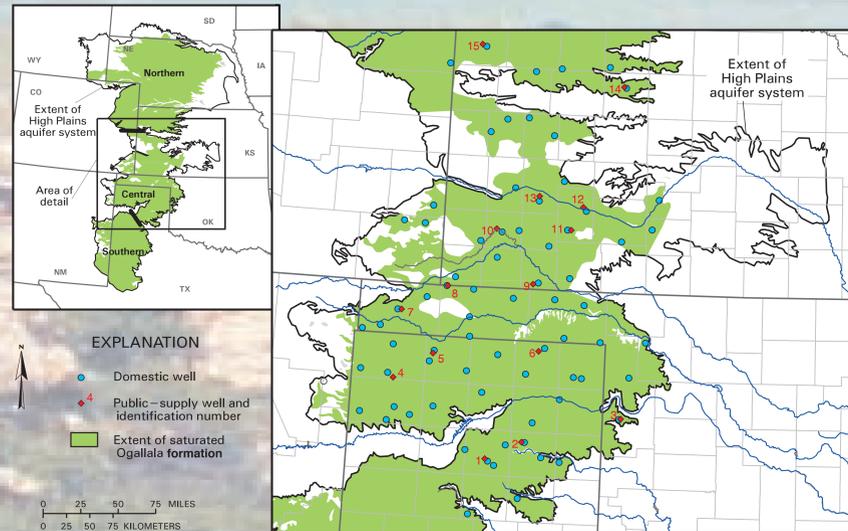
**FACT:** 95% of people living in the central High Plains get their drinking water from ground-water sources.  
**FACT:** 82% of people drinking ground water in the central High Plains are served by public water-supply systems.

**QUESTION:** Is the water quality determined by sampling domestic wells the same as that determined by sampling public-supply wells?

**QUESTION:** Is it better to sample public-supply or domestic wells to assess the broad-scale water-quality conditions in a regional aquifer?



Public-supply well, central High Plains



Location of the High Plains aquifer system, the Ogallala formation, and domestic and public-supply wells sampled in 1999

## APPROACH

Identify public-supply wells in the central High Plains that were in close proximity (within 5 miles) to domestic wells being sampled as part of a regional reconnaissance of water quality.

Select for sampling the identified public-supply wells serving the 15 largest populations.

Concurrent with domestic well sampling, sample the public-supply wells using the identical sampling procedures and analyze the water samples for the same set of constituents using the same analytical techniques.

Compare statistically and graphically the water-quality results from paired wells considering land use, well construction, and operational differences between public-supply and domestic well types.

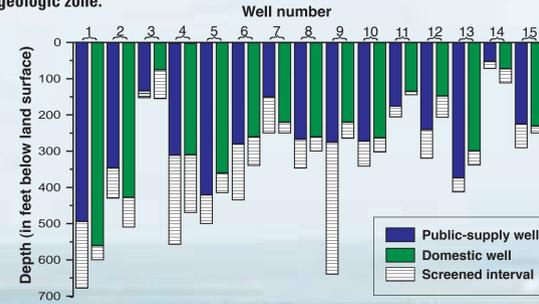


Domestic well in frost pit, central High Plains

## RESULTS

Land-use settings were predominantly agricultural (greater than 50%) for all wells with the exception of one public-supply well (well no. 1).

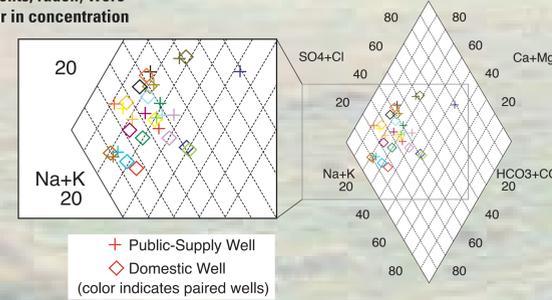
Though public-supply wells were commonly deeper and had longer screened intervals than domestic wells, screened intervals of paired wells usually overlapped and wells produced water from at least part of the same hydrogeologic zone.



Well depths and screened intervals of paired domestic and public-supply wells sampled during comparison study in central Ogallala formation, 1999

Primary differences between paired domestic and public-supply wells were operational (pumping rates and duration).

Constituents derived from natural processes such as rock/water interactions or radioactive decay (major ions, trace elements, radon) were statistically very similar in concentration between paired wells.



Relative major-ion percentages for paired domestic/public-supply wells in the central Ogallala formation.

Water samples from several public-supply wells contained more recently recharged water (based on tritium content) and a greater percentage of pesticide detections (27% of domestic wells and 53% of public-supply wells) than samples from paired domestic wells.

SITE NUMBER	PESTICIDES DETECTED		TRITIUM PRESENT	
	Domestic Wells	Public-Supply Wells	Domestic Wells	Public-Supply Wells
1	nd	●	—	—
2	nd	●	nd	★
3	nd	nd	—	—
4	nd	●	nd	nd
5	nd	●	nd	nd
6	nd	●	nd	nd
7	●	●	nd	★
8	nd	nd	nd	nd
9	nd	nd	—	—
10	nd	●	nd	★
11	nd	●	nd	★
12	●	●	—	—
13	nd	nd	—	—
14	●	●	—	—
15	●	●	—	—

●, at least one pesticide detected; ★, tritium concentration indicates recent water; nd, not detected; —, not analyzed

## CONCLUSIONS

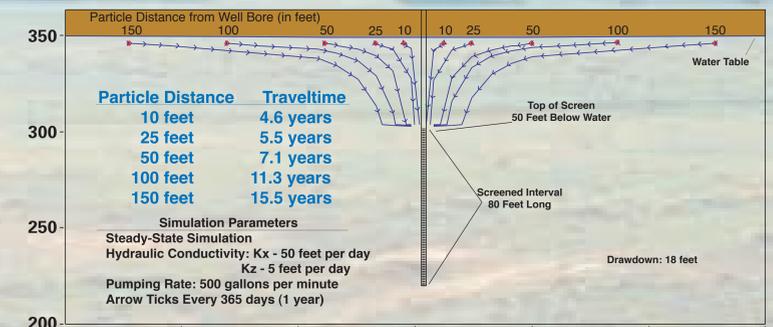
There were differences in the quality of water produced from paired domestic and public-supply wells in the Ogallala formation in the central High Plains.

Due to higher pumping rates and longer pumping duration, public-supply wells create large capture zones and greater drawdown; recently recharged water containing agricultural chemicals from near the water table was more quickly drawn to the public-supply wells than the nearby domestic wells.

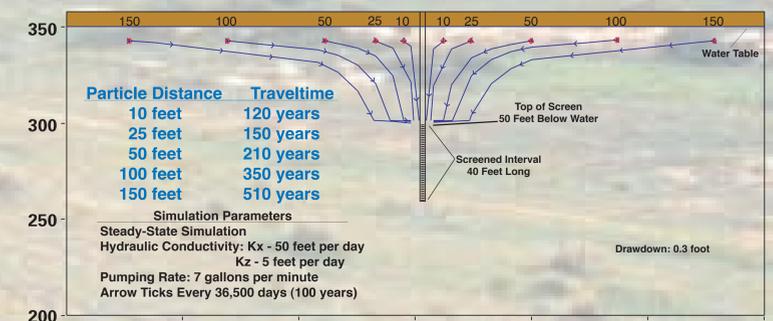
Sampling domestic wells in the central Ogallala formation cannot be used to determine the quality of municipal source water in the study area.

Domestic wells provide a better assessment than public-supply wells of the broad scale water-quality conditions in the Ogallala formation in the central High Plains.

### Particle Tracking Simulation for Generic Public-Supply Well



### Particle-Tracking Simulation for Generic Domestic Well



Numerical MODFLOW (McDonald and Harbaugh, 1988) particle-tracking simulation showing movement and traveltime of near-water-table constituents to generic public-supply and domestic wells similar to those in the Ogallala formation of the central High Plains.