INTRODUCTION
Prompted by concern for their county’s water resources, Kane County officials selected the Illinois State Water Survey (ISWS) and Illinois State Geological Survey (ISGS) to conduct a 5-year study. The multidisciplinary investigations were initiated in 2002 and will provide baseline water-resources data, analyses, and tools for future analyses of water resources available to the county. This paper presents selected information from the shallow groundwater-mapping investigation, which is fully described in ISWS Contract Report 2007-06, Kane County Water-Resources Investigations: Final Report on Shallow Aquifer Potentiometric Surface Mapping (1).

STUDY AREA AND WELL NETWORK
The study area (Figure 1) included Kane County and adjacent townships in surrounding counties covering a total of 120 square miles. The study area includes parts of Lake, DuPage, and commercial wells (Figure 2) was developed between May 2002 and August 2003 and collecting about ISWS well owners and operators. During September and October 2003, all wells in the network were monitored as quickly as possible and groundwater-level measurements were collected. Groundwater levels, also generally referred to as a natural, rising and falling in response to groundwater withdrawal, recharge, evaporation, and transpiration. Heads often follow seasonal cycles that are most obvious in shallow aquifers and where pumping effects do not overwhelm natural cycles. Hydrologic heads usually have the greatest magnitude in areas with unconfined aquifers and have the greatest rate. Collecting head measurements during such a brief time helped increase data variability from seasonal water level fluctuations.

SHALLOW HYDROGEOLOGIC FRAMEWORK
Dey et al. described the geology of the uppermost bedrock and unconsolidated materials in the study area 1,2,3,4,5,6,7 (Figure 3). For the purposes of this mapping, seven geologic units were defined based on similar geologic, hydrogeologic, and stratigraphic characteristics and were used as a conceptual basis for head mapping. They are: Surficial Henry Unit, Yorkville Sand Unit, Batavia Sand Unit, Ashmore Unit, Glasford Unit, and shallow bedrock aquifer. These units were defined based on textural descriptions of the deposits (i.e., surficial materials, surficial materials that are not necessarily hydraulically connected or fully saturated). A benefit of using a stratigraphic approach was that information from the mapping investigations could be more readily used for groundwater modeling purposes.

WELLS AND WATER USE
ISWS records indicate there may be 15,000 or more wells in Kane County and a majority appear to be drawing water from the shallow bedrock aquifer. In addition, the ISWS Illinois Water Inventory Program has information pertaining to 52 high-capacity wells (Figure 4), which accounted for 0.6 billion gallons (gal) or 9.6 percent of the total 6.6 billion gal of reported groundwater withdrawals (1996-2001). Of these high-capacity wells, 87 percent of the withdrawals came from 89 percent of the withdrawals from high-capacity wells were from surficial geologic units and illustrate the elevation to which water will rise, in turn defining areal and areal extent of the groundwater flow.

USE OF MAPS
Head maps can be used to characterize regional groundwater flow, identify areas of groundwater recharge and discharge, determine regional effects of groundwater withdrawals, and provide a baseline to compare with future groundwater conditions. Several observations can be made about the head map for the shallow bedrock aquifer (Figure 5). First, groundwater flow west of the Fox River is predominantly to the south and east. East of the Fox River, flow is to the south and west. Second, areas of relatively low head (particularly in east-central and southeastern Kane County) may reflect large withdrawals from the aquifer. Third, the hydraulic connection between aquifers, and/or discharge to surface water bodies like the Fox River. The maps produced for this investigation have been useful for developing a conceptual model of groundwater flow and corresponding mathematical groundwater flow models for a wide range of analyses, including aquifer development scenarios.

CONCLUSIONS
An extensive effort was undertaken to assemble a network of 1010 wells to determine groundwater conditions in Kane County. These data also served as a basis to develop a conceptual model of groundwater flow and corresponding mathematical groundwater flow models. Based on the resulting maps and other data collected, the following conclusions can be made:

1. At least seven shallow aquifers are used for water supply in Kane County. The most laterally continuous is the shallow bedrock, but the most productive units appear to be sand and gravel deposits.
2. In 2003, 52 high-capacity wells accounted for 6.6 billion gal or 9.6 percent of the total reported groundwater withdrawals of 9.9 billion gal from the shallow aquifers in Kane County.
3. Head data were of sufficient density to construct head maps for three aquifers: the Ashmore Unit, Glasford Unit, and shallow bedrock aquifer.
4. The head maps have multiple uses. They can characterize regional groundwater flow, identify areas of groundwater recharge and discharge, determine regional effects of groundwater withdrawals, and act as a baseline for comparison with future groundwater conditions.
5. Groundwater flow west of the Fox River is mostly south and east. East of the Fox River, flow is mostly south and west.
6. Areas of relatively low head (particularly in east-central and southeastern Kane County) may reflect large withdrawals from the aquifer, hydraulically connected aquifers, and/or discharge to surface water bodies like the Fox River.
7. Previous nomenclature for aquifers of Kane County (i.e., Valtijarvi, Kaneville, Bloomington, and St. Charles) may need to be further assessed for its ability to accurately represent hydraulic connections between coarser-grained (lithostratigraphic) units.

Figure 1. Study Area
Figure 2. Well Network
Figure 3. Shallow geologic materials in the study area.
Figure 4. High-capacity wells in Kane County
Figure 5. Shallow bedrock aquifer head surface

REFERENCES