Introduction

The Kansas Water Resources Institute (KWRI) is part of a national network of water resources research institutes in every state and territory of the U.S. established by law in the Water Resources Research Act of 1964. The network is funded by a combination of federal funds through the U.S. Department of the Interior/Geological Survey (USGS) and non-federal funds from state and other sources.

KWRI is administered by the Kansas Center for Agricultural Resources and the Environment (KCARE) at Kansas State University. An Administrative Council comprised of representatives from participating higher education or research institutions, state agencies, and federal agencies assists in policy making.

The mission of KWRI is to: 1) develop and support research on high priority water resource problems and objectives, as identified through the state water planning process; 2) facilitate effective communications among water resource professionals; and 3) foster the dissemination and application of research results.

We work towards this mission by: 1) providing and facilitating a communications network among professionals working on water resources research and education, through electronic means, newsletters, and conferences; and 2) supporting research and dissemination of results on high priority topics, as identified by the Kansas State Water Plan, through a competitive grants program.
Research Program Introduction

Our mission is partially accomplished through our competitive research program. We encourage the following through the research that we support: interdisciplinary approaches; interagency collaboration; scientific innovation; support of students and new young scientists; cost-effectiveness; relevance to present and future water resource issues/problems as identified by the State Water Plan; and dissemination and interpretation of results to appropriate audiences.

In implementing our research program, KWRI desires to: 1) be proactive rather than reactive in addressing water resource problems of the state; 2) involve the many water resources stakeholders in identifying and prioritizing the water resource research needs of the state; 3) foster collaboration among state agencies, federal agencies, and institutions of higher education in the state on water resource issues; 4) leverage additional financial support from state, private, and other federal sources; and 5) be recognized in Kansas as a major institution to go to for water resources research.
Sediment Baseline Assessment

Basic Information

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<td>Descriptors:</td>
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<td>Principal Investigators:</td>
<td>Dan Devlin, Will Boyer, Brock Emmert, Bruce McEnroe, DeAnn Presley, C. Bryan Young</td>
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Publications

There are no publications.
Sediment Baseline Assessment: Assessment of sediment contribution from three watersheds in North-East Kansas

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Overview: The watershed modeling study of three watersheds in North-east Kansas was conducted to determine sources of sediment and potential management measures to reduce sediment transport in streams and sediment delivery to water bodies. The three study watersheds, Banner Creek Watershed, Centralia Lake Watershed, and Atchison County Lake Watershed, of comparative size from about 6,000 to 12,000 acres and located within the same Western Corn Belt Plains eco-region in Kansas, were selected for the analysis. SWAT model was used as a watershed model.

The Soil and Water Assessment Tool (SWAT) model: SWAT is a continuous, physically based hydrologic and water-quality model developed to assess the impacts of land practice management and climate variations on non-point source pollution in complex watersheds, from catchment to river basin scale, that has been developed and supported since 1990s (Arnold et al. 1998, Douglas-Mankin et al. 2010). In SWAT, a watershed is divided into subwatersheds according to flow accumulation and stream network delineation procedures. Within each subwatershed, geo-referenced homogeneous units with uniform average slope, land use, and soil type are further identified and aggregated into HRUs. SWAT components calculate various hydrologic and physical parameters within each HRU and stream network on a daily basis. Outputs from all HRUs within a subwatershed are summed and routed through the stream network to the watershed outlet where they can be compared with monitoring data for model calibration and validation.

Model setup: Three SWAT models were built for three studied watersheds using the input database information from online and local sources. The watersheds were delineated with the GIS module in SWAT using a 10 m × 10 m digital elevation model for Jackson, Brown, and Nemaha Counties. The watershed outlet for each watershed was set at the streamflow gaging station location downstream of the Banner Lake, Centralia Lake, or Atchison County Lake. The stream network was created during the delineation process. Each watershed was divided into three subarea groups of high, medium, and low slope using a 3% and 6% slope thresholds. The areas of high slope (>6%) occupy 52% of the Banner Creek Watershed, 46% of the Centralia Lake Watershed, and 20% of the Atchison County Lake Watershed, while the areas of low slope (<3%) occupy 14%, 42%, and 40%, respectively. The slope analysis shows the prevalence of high slope areas in Banner Creek and Centralia Lake watersheds (>45%), while low slope areas are prevalent in Atchison County lake and Centralia Lake watersheds (>40%).

The land-use data base was created based on field reconnaissance survey conducted by Dr. Devlin and Mr. Boyer, and used as input land-use coverage for the SWAT models. This study used a summary of watershed management practices collected for Delaware River WRAPS. The Centralia Lake Watershed and the Atchison County Lake Watershed had majority of land use in row-crop agriculture (78% and 75%, respectively), while the Banner Creek Watershed had majority in rangeland and pasture (87%). The difference in land use between the two row crop dominated watersheds (Centralia and Atchison) and a
grassland watershed (Banner) manifests the main goal of the project that is to assess management mitigation strategies to improve water-quality in agricultural watersheds. For Centralia Lake Watershed, corn was planted in 17% of land, soybeans in 31%, and winter wheat in 8%. For Atchison Lake Watershed, corn covered 29% of the land, while soybeans were planted in 39%. For Banner Creek Watershed, 67% of grassland was grazed and 27% was hayed. Based on the field reconnaissance survey and analysis of digital ortho imagery, the following conservation practices were applied to row-crop fields: terraces coupled with contour farming, terraces with waterways, no tillage or residue management practice, and conventional tillage.

Daily precipitation and maximum and minimum temperature data were acquired from National Climatic Data Center (NCDC 2009) weather stations (COOP ID# 143134, 143620, and 145744) located within 5 km of watersheds for the years of 2000 through 2010. Daily values for other weather variables (solar radiation, relative humidity, and wind speed) were simulated with the weather generator embedded in SWAT. For each watershed, a USGS gaging station was identified for streamflow and suspended sediment calibration. The selected gaging stations were monitored by Kansas Geological Survey from April 2009 to December 2010: 393817095260100 at Clear Creek at Decator Road near Horton used for Atchison County Lake Watershed, 392552095484100 at Banner Creek at M Road used for Banner Creek Watershed, and 394126096073500 at Black Vermillion River Tributary above Centralia Lake used for Centralia Lake Watershed. Watershed areas that drain into the gaging stations were parts of three studied watersheds and covered 47% of Banner Creek Watershed, 62% of Atchison County Lake Watershed, and 35% of Centralia Lake Watershed. The calibrated areas of the watershed were delineated into 10 subwatersheds for Banner Creek, 7 watersheds for Atchison Lake, and 5 subwatersheds for Centralia Lake. The number of HRUs were 1193, 791, and 662, respectively.

Model calibration: Three SWAT models were run from 1/1/2005 to 12/31/2010 with a three-year (1/1/2005-12/31/2007) spin-off period. Daily simulated streamflows from 4/1/2009 to 12/31/2010 were collected at the watershed outlet to compare with the stream-monitoring USGS station data available for this period only. The results from 2005 to 2010 were collected to analyze the watershed hydrologic and suspended sediment conditions.

Monthly model performance was assessed using coefficient of determination (R2), NSE, and PBIAS (Moriasi et al. 2007). A set of 11 model parameters were selected for model calibration. The parameters were selected from SWAT modules on surface flow, baseflow, evapotranspiration, and weather (snowmelt and freezing). The streamflow calibration was declared acceptable when calibration coefficients reached the satisfactory/good threshold value. For example, the NSE coefficient for Banner Creek Lake and Atchison County Lake Watersheds SWAT models reached values above 0.5 and 0.6, while it was above 0.3 for the Centralia Lake model. The lower value of the NSE for the Centralia Lake Watershed model was due to lower model performance in 2010 (NSE=0.18), while NSE=0.68 in 2009.

Results and analysis: Average annual streamflow yield for the studied watersheds was calculated from the SWAT outputs. The streamflow yield (called water yield in SWAT) is composed of overland runoff, baseflow yield, and lateral flow yield. Additionally, suspended sediment yield contributing with surface runoff into the stream was collected at all subwatersheds that drain into a streamflow gage station. The units of water yield were converted to tons per square mile. The units of sediment yield were converted to acre-foot per square mile. The results are shown in the table below:
Water yield was calculated the lowest for Centralia Lake Watershed and the highest for Banner Creek Watershed. The values appear to be lower than the values observed at the gage stations. The observed values were higher than 800 acre-ft/sqmi at all three gage stations. Although the calibration results were declared satisfactory, the difference in high stream flow peaks from excessive surface runoff between monitored and simulated data could contribute to the overall difference in annual average water yield.

Sediment yield for Centralia Lake Watershed was three times higher than the yield for Banner Creek Watershed. This is a result that is easy to understand due to row-crop production widely adopted in Centralia Lake Watershed, while it was minimal in Banner Creek Watershed; 78% of all the fields compared to only 5.5%. However, the sediment contribution to a stream can be simulated higher for Banner Creek Watershed if the model takes into account gully erosion. From the reconnaissance survey data and aerial imagery in Banner Creek Watershed and Delaware River Watershed it was observed that majority of rangeland contains a developed network of gullies. During high peak flows such network of eroded land can produce an amount of suspended sediment comparable with the amount carried by surface runoff (which was simulated by SWAT). Another important erosion factor not well modeled in SWAT is streambank erosion. Since, the values presented in the table above show only suspended sediment yields from the overland erosion, streambank and channel bed erosion can also contribute to total sediment load measured at a gage station. Sediment yield produced by the SWAT model for Atchison County Lake Watershed was almost three times higher than the yield for Centralia Lake Watershed. The load was unusually high and need to be adjusted by further calibrating the model. The calibration attempts are currently underway.
Objective

The Kansas Forest Service (KFS) in cooperation with the Kansas Water Resources Institute (KWRI) will perform riparian forest health inventory and functioning condition classification analysis in the watershed above Centralia Lake using the Sediment Baseline Work Plan (2/2/2009) as a guide to implementation.

Activities/Deliverables

1. The KFS will conduct forest inventory and assessment on 6 sites within a 100 foot stream zone where The Watershed Institute (TWI) has already established data collection locations for geomorphologic information to determine extent, composition, and condition of riparian forests. All sites will be georeferenced.

   During FY 11, 12 riparian forest inventory and assessment plots were performed within the Centralia Lake watershed (Figure 1). It was determined to collect data from 12 plots, 6 more than indicated in the original grant narrative, for statistical validity. Data and photos from all 12 plots have been georeferenced. Plots did not occur on the 6 pre-established TWI data collection locations as previously planned in the original grant narrative. This is because the TWI locations completely lacked riparian forest landcover, and would not have provided adequate riparian forest stand data to satisfy the KFS assessment method. Instead, existing tracts of riparian forest were located using GIS, and the appropriate landowners were contacted to request KFS access.

2. ArcPad 7.1 software will be used to collect the following forest stand data: stocking/density, species composition (including invasives), volume, basal area, trees/acre, canopy class, and regeneration. Additionally, active channel width and forest buffer width will be collected to help determine functioning condition based on SVAP and PFC guidelines (BLM).

   During FY 11, the aforemention data was collected from the 12 Centralia Lake watershed plots. The on-the-ground forest inventory and assessment data was combined with existing GIS data (e.g., existing riparian land cover, active channel width) to determine
riparian forest functioning condition (classification based on SVAP and PFC). Forest stand data was used to calculate per acre estimates of forest basal area, stocking/density, and regeneration for all riparian areas within the Centralia Lake watershed. Data will be used for future riparian forestry BMP targeting and promotion.

3. Data will be incorporated and results summarized into a report including forest inventory information from Atchison County Lake watershed and Banner Creek Lake watershed for comparative purposes. The report will be shared with the Baseline Sediment Working Group and other partners.

During FY 11, riparian forest stand data from both Atchison County Lake and Banner Creek Lake watersheds was being collected as part of a related project (U.S. Forest Service Competitive Grant funding: “Assessment of Riparian Forests to Reduce Sedimentation of Federal Reservoirs”). Data from all three watersheds have been recently combined and analyzed using SAS v.9.1 statistical software. A final report is currently being produced, and will be provided to the Baseline Sediment Working Group in October, 2012. K-State Research and Extension Forestry and a graduate student within the K-State Department of Horticulture, Forestry, and Recreation Resources (KSU HFRR) are currently assisting with data analysis and the creation of the final report.

Publications

None that were supported by this grant. However, a KSU HFRR M.S. graduate student (Dalila Maradiaga) presented preliminary riparian forest assessment results from the Centralia Lake, Banner Creek, and Atchison County Lake watersheds during the 2012 Kansas Natural Resources Conference:


Information Transfer Program

NA

Student Support

No graduate students were supported by these funds. However, a KSU HFRR M.S. graduate student (Dalila Maradiaga) is significantly involved with the project because of her work on the
U.S. Forest Service Competitive Grant funding project: “Assessment of Riparian Forests to Reduce Sedimentation of Federal Reservoirs.”

NIWR-USGS Student Internship Program

NA

Notable Achievements and Awards

None

Figures

Figure 1: Location of the 12 riparian forest assessment inventory plots performed within Centralia Lake watershed, KS.
Three transects have been completed in the watershed for Atchison County Lake, and four transects each have been completed for the watersheds above Banner and Centralia Lakes, respectively. Soils were cored to a depth of 120 cm and described by horizon. Approximately half of the soil cores have been described as of May 2012, and will be completed by June 30, 2012. Samples from the A horizons have been submitted to the Kansas State University Department of Agronomy’s Soil Testing Laboratory for the analysis of total carbon and nitrogen, as well as Mehlich-3 P. The Mehlich-3 was added at the request of staff from the Kansas Water Office in conjunction with work that is being conducted on grids in producer-owned fields throughout the Centralia Lake watershed. As the remainder of the cores are described the samples will be submitted to the Soil Testing Laboratory. At two locations per transect the infiltration rates were measured using mini-disk infiltrometers. All soil sampling and infiltration measurements are completed for all three watersheds and data analysis is ongoing. Upon completion of the description and laboratory analyses, a comparison between the observed properties and values will be made with data for the soil mapunits inventoried in the Soil Survey Geographic (SSURGO) database. Results will be provided to the USDA-NRCS for use in continued updates to the SSURGO database. Furthermore, the data will be provided to watershed model users for the potential input into watershed models. For example, if the values of infiltration and horizon thickness vary with land use, modelers could use our data in concert with the land use data to compare actual with observed data for runoff and/or sediment yield of the watersheds, thus leading to increased understanding of the function and performance of the watersheds and water quality/quantity within the lakes.
### Basic Information

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### Publications

There are no publications.

Aquifer Storage and Recovery in Near-Surface Aquifers: Development of a New Recharge Approach Using Small-Diameter, Low-Cost Wells
Problem Statement

Aquifer storage and recovery (ASR) is the artificial recharge and temporary storage of water in an aquifer during times when water is abundant, and recovery of all or a portion of the water during times when it is needed (Pyne, 2005). In recent years, interest in ASR has increased due to various concerns such as declining groundwater resources, vulnerability of surface water supplies to contamination and reservoir sedimentation, and unfavorable projections of future climate change. Most climate change scenarios indicate that due to a likely increase in future global temperature, there will be more severe and prolonged droughts, with precipitation events becoming more intense but less frequent (IPCC, 2007). By capturing and storing excess water in the underground when precipitation is plentiful, ASR offers one of the most practical approaches for resources managers to combat future water-supply challenges. Compared to a traditional surface-water reservoir, aquifer storage eliminates evaporative losses and the need to convert large land areas into reservoirs, provides a much larger storage capacity (which is critical in the case of multi-year drought), and is much less vulnerable to surface-water contamination activities. Because of these advantages, the number of ASR projects that are either fully operational or in various phases of development is quickly growing across the United States.

A successful implementation of ASR typically involves four key components, 1) an aquifer that is suitable for temporarily storing a large volume of water, 2) source water that is of good quality and quantity, 3) a means to transfer the source water into the
aquifer, and 4) a means to recover the water from the aquifer. Currently, many limiting factors still hinder the effectiveness of ASR as a new tool for water resources management (Pyne, 2005; Sophocleous, 2009). One of the major technical challenges has been how to design artificial recharge systems that can efficiently transfer source water into the aquifer. Typically aquifer recharge is achieved through various surface infiltration methods (such as basins and trenches) and/or large-diameter injection wells. Surface infiltration methods only work when the storage aquifer is shallow, and no low-permeability layers exist between the ground surface and the aquifer that would constrain downward movement of recharge water. Moreover, surface methods require adequate land area available at reasonable cost. Due to their dependency on natural soil conditions, surface infiltration methods have a limited infiltration capacity. This can greatly undermine the performance of ASR during times when precipitation is intense and a significant amount of water must be stored within a short duration. Surface infiltration methods are often supplemented with injection wells that typically have a diameter of 40 cm or larger. These large-diameter injection wells are equipped with high-power pumps so that water can be forcefully injected into the aquifer at a high rate. When surface infiltration methods are not applicable, e.g., the storage zone is deep or there is a near-surface zone of low permeability, injection wells are the only aquifer recharge option. In general, large-diameter injection wells are more expensive than surface infiltration methods, as they require a much higher amount of logistical and infrastructure support for pump operation and maintenance. Well clogging remains a problem at many ASR projects (Brown et al., 2005), although it can be somewhat alleviated by operating the wells in a dual-purpose mode for both water recharge and recovery (Pyne, 2005).

In this research we investigate a new recharge method for near-surface aquifers using small-diameter, low-cost wells installed with direct-push (DP) technology. Unlike the large-diameter injection wells, the DP wells are typically small in diameter (less than 10 cm), low in construction and maintenance costs, and limited to depths less than 30 m. Water is allowed to move through the wells by gravity, so the required logistical and infrastructure support are modest. DP wells can be employed either as a supplemental or alternative recharge option to the surface methods, could greatly increase the effectiveness of ASR in near-surface aquifers.

**Objectives and Methods**

The main objective of this research is to increase the effectiveness of ASR in near-surface aquifers by developing a new aquifer recharge method through small-diameter, low-cost wells installed with DP technology. Unlike the common large-diameter injection wells that typically have a diameter of 40 cm or larger and require expensive logistical and infrastructure support, the DP wells are small in diameter (less than 10 cm), low in construction and maintenance costs, and limited to depths less than 30 m. Water is allowed to move through the wells by gravity so the required logistical and infrastructure support are modest. DP wells can be employed either as a supplemental or alternative recharge option to surface infiltration methods as long as the aquifer for water storage is relatively shallow.
In this research, we combine numerical model simulations with field tests to systematically investigate the utility of DP wells in artificially recharging near-surface aquifers. We use a site in the Lower Republican River (LRR) basin in Kansas to perform the proposed field investigations (Figure 1a). Figure 1b shows a cross-section of lithology at the site. The sand and gravel portion of the Belleville formation on the south part of the ancestral Republican River valley, which is overlain by a thin layer of silt and clay (also part of the Belleville formation), is used as the intended aquifer for water storage. In addition to the site characteristics suitable for this project, various Kansas state agencies have become increasingly interested in considering ASR implementation in this area as a potential water-resources management method for utilizing high flows of the Republican River in the LRR basin.

(a) Location of proposed study area in the Lower Republican River basin

(b) Lithologic cross-section of the ancestral Republican River valley in the study area

Figure 1. (a) Location of proposed study area within a stream valley on the south part of the ancestral Republican River valley. (b) Lithologic cross-section of the ancestral Republican River valley in the study area.
This research involves two major activities, 1) a series of numerical simulations to evaluate the recharge process of DP wells, surface infiltration basins and trenches, and 2) field water recharge tests under different conditions to directly assess the practical usefulness of DP wells as an artificial recharge option alternative or supplement to the surface methods. The insights developed from the numerical simulations will provide important guidelines for designing and conducting the recharge tests in the field. Numerical simulations will be performed using the fully-integrated, multiphysics modeling software (Comsol). The DP wells for the field tests at the LRR site will be installed using a Kansas Geological Survey (KGS) DP unit (Geoprobe).

**Project Activities and Results**

During the first year of the project (9/1/2011 - 8/31/2012), our research tasks are 1) to conduct a series of numerical simulations to rigorously evaluate the recharge process of DP wells, surface infiltration basins and trenches, and 2) to perform a series of EC and HPT profiles using a KGS DP unit (Geoprobe) to better characterize the subsurface hydrogeology at the LRR test site. The major project activities we have performed are:

a) Comsol installation and training. We installed the Comsol software on a KGS parallel computing PC cluster. The parallel version of Comsol allows us to increase tremendously the computational speed for the ASR numerical simulations planned for this summer. The PI’s (Liu and Brookfield) also attended a Comsol training workshop and spent days learning how to use Comsol for ASR simulations.

b) Site hydrogeology study and field scoping. We performed a detailed hydrogeology study for the ASR field site using two online KGS databases – Water Well Completion Records (WWC5; http://www.kgs.ku.edu/Magellan/WaterWell/index.html) and Water Well Levels (WIZARD; http://www.kgs.ku.edu/Magellan/WaterLevels/index.html). We investigated over twenty lithology logs in the general study area and identified four potential locations for performing DP characterization and field recharge tests (see Appendix).

**II. Publications**

This research has not resulted in any publications due to the limited project time.

**III. Information Transfer Program**

During the first year of this project, teleconference and meetings have been arranged among very state agencies including, Kansas Water Office (Susan Stover) and Division of Water Resources, Kansas Department of Agriculture (Scott Ross) to provide frequent project updates. Scott Ross is also providing support to establish site access with the landowners for performing field work.

As the project goes into the second year, we will dissipilate project results through 1) reports and presentations to regulatory agencies; 2) presentations at local, regional, and
national scientific meetings; 3) public information circulars and open-access web publications; 4) short courses and webinars; and 5) articles in peer-reviewed literature. We anticipate the results will be of particular interest to various state agencies and local entities such as Kansas Department of Health and Environment (KDHE), Kansas Water Office (KWO), and Lower Republican River Stakeholder Management Committee (LRRSMC). We will emphasize the transfer of our research findings to KDHE, KWO and LRRSMC and other interested personnel in our outreach activities. Specifically, the project results will be presented at meetings ranging from the American Institute of Hydrology Seminar in Topeka, to the Water and the Future of Kansas Conference, to educational seminars of the KWO and KDHE. Summary of the main findings will be published in public information circulars and open-access web publications (e.g., KSG open-file report) in a timely fashion.

We also anticipate the results of this project will be of significant interest to other states, research institutes and professionals. To effectively transfer the project results to the interested audience beyond Kansas, we will make presentations at national meetings of scientific organizations such as the Geological Society of America and the American Geophysical Union. To allow ready access to the results by the general public, a project page will be created on the KGS web site and project data and reports will be posted there. The results will also be published in scientific journals frequently read by practicing hydrologists. Project results will also be incorporated into short courses and webinars (e.g., Midwest GeoSciences Webinar series) for technology transfer to practicing professionals.

III. Student Support

Due to the limited time between project funding and the start of school, we couldn’t recruit a graduate student to work on the ASR project in the fall semester of 2011. Nevertheless, we successfully recruited a graduate student (Brant Konetchy from Trinity University) that will start working on the ASR project this summer. This project also supported an undergraduate student as part of the 2012 KGS Applied Geohydrology Summer Research Program. A visiting student from Helmholtz Centre for Environmental Research-UFZ, Leipzig, Germany is also trained in this project (funding fully provided by UFZ).

IV. USGS Summer Intern Program

None.
Appendix: Field Hydrogeology and Scoping

This area is most suitable for ASR based on the thin thickness of top clay layer and deep water table.

Figure A1. Distribution of WWC5 water wells in the ASR project area. The lithology log for each marked well is shown as follows.
WATER WELL RECORD
Form WW-5 KSA 80a-1212

1. LOCATION OF WATER WELL:
   County: Republic
   NE, SE
   Section Number: 1
   Township Number: N
   Range Number: E
   SW Corner of Republic, KS
   Distance and direction from nearest town or city street address of well if located within city? #1

2. WATER WELL OWNER:
   Name: James Hurley
   City, State, Zip Code: Republic, KS
   Application Number:

3. WEIR/STATION ADDRESS, BOX #:
   Board of Agriculture, Division of Water Resources

4. DEPTH OF COMPLETED WELL:
   Depth (ft): Groundwater Encountered: 10 ft.
   Water level below and surface measured on (month/year): 6.20.91
   Pump test data: Well water was 240 ft. after 1 hour pumping, 125 gpm
   Est. Yield: 125 gpm, Well water was 240 ft. after 1 hour pumping
   Bore Hole Diameter: 9 in. to 30 ft.
   Well WATER TO BE USED AS: 5 Public water supply
   8 Air conditioning
   11 Injection well
   Domestic: 2 Feedlot
   6 Oil field water supply
   9 Dewatering
   12 Other (Specify below): Irrigation
   16 Lawn and garden only
   16 Monitoring well
   17 Rock and gravel
   23 Mineral
   32 Chemical/bacteriological sample submitted to Department? Yes X No
   If yes, (month/year) sample was submitted:
   Water Well Disinfected? Yes X No

5. TYPE OF BLANK CASING USED:
   Steel: 3 RMP (SR)
   PVC: 6 Asbestos-Cement
   9 Other (Specify below): Fiberglass
   7 Threaded
   2 Welded
   8 CASING JOINTS: Glued X Clamp

6. SCREEN OR PERFORATION MATERIAL:
   1 Steel
   3 Stainless steel
   2 Brass
   4 Galvanized steel
   5 Fiberglass
   8 RMP (SR)
   9 Abs
   10 Asbestos-cement
   11 Other (Specify below)
   12 None used (open hole)

7. SCREEN PERFORATION OPENINGS:
   Continuous slot
   Mill slot
   Wire wrapped
   6 Drilled holes
   Louvered slotted
   4 Key punched
   7 Torch cut
   10 Other (Specify below)

8. SCREEN PERFORATED INTERVALS:
   From: 16 ft. to 30 ft.
   From: 30 ft. to 10 ft.
   From: 10 ft. to 0 ft.

9. GRAVEL PACK INTERVALS:
   From: 4 ft. to 30 ft.
   From: 30 ft. to 10 ft.
   From: 10 ft. to 0 ft.

10. GROUT MATERIAL:
    1 Neat cement
    2 Cement grout
    3 Bentonite
    4 Other (Specify below)

11. GROUT INTERVALS:
    From: 0 ft. to 9 ft.
    From: 9 ft. to 0 ft.

What is the nearest source of possible contamination:
10 Livestock pens
14 Abandoned water well
12 Sewer line
11 Fuel storage
15 Oil well/Gas well
9 Septic tank
7 Pit privy
16 Other (Specify below)
1 Water line
5 Cess pool
8 Sewage lagoon
13 Insecticide storage
6 Artesian
4 Septic tank
2 Water line
3 Cess pool
2 Water line

12 CONTRACTOR'S OR LANDOWNERS CERTIFICATION:
   This water well was 1 reconstructed, 2 reconstructed, or 3 plugged under my jurisdiction and was completed on (month/year):
   6-29-91
   This Water Well Record was completed on (month/year): 6-23-91

INSTRUCTIONS: Use typewriter or ball point pen. PLEASE PRINT CLEARLY and PROOF clearly. Please fill in blanks, underline or circle the correct answers and sign top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-7526. Telephone: 913-266-5566. Send one to WATER WELL OWNER and retain one for your records.
1. LOCATION OF WATER WELL:
   - County: Republic
   - Township Number: 36
   - Range Number: 5

2. WATER WELL OWNER:
   - Name: Kent Swartz
   - Address: 112 W. Main
   - Application Number: N/A

3. LOCATE WELL'S LOCATION IN SECTION BOX:
   - Depth of Completed Well: 26 ft.
   - Max. Water Level: 8 ft.
   - Pump Test Date: 6/16/98
   - Bore Hole Diameter: 8 in.
   - Well Water Use: 5 Public Water Supply, 6 Air Conditioning, 11 Injection Well, 12 Other (Specify below)
   - Chemical/Bacteriological Sample: Yes

4. TYPE OF BLANK CASING USED:
   - Schedule: X
   - PVC: 16 Asbestos-cement
   - Steel: 16 Groumette

5. CASING HEIGHT ABOVE LAND SURFACE:
   - Height: 12 in.
   - Weight: 237 lbs.
   - Wall Thickness or Gauge: .214

6. GROUT MATERIAL:
   - Type: Bentonite

7. CONTRACTOR'S OR LANDOWNER'S CERTIFICATION:
   - This Water Well was constructed, reconstructed, or plugged under my jurisdiction and was completed on 6/16/98 and the record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 138

   Michael Batkins, by (signature)

   Instructions: Use typewriter or ball point pen. Please fill in blanks, underline or circle the correct answers. Send three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66601-0001. Telephone 913-296-5549. Send one to WATER WELL OWNER and retain one for your records.
**WATER WELL RECORD**

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>County</td>
<td>Republic</td>
</tr>
<tr>
<td>Fraction</td>
<td>NE 1/4 SW 1/4 NW 1/4</td>
</tr>
<tr>
<td>Section Number</td>
<td>31</td>
</tr>
<tr>
<td>Township Number</td>
<td>T 1</td>
</tr>
<tr>
<td>Range Number</td>
<td>R 4</td>
</tr>
<tr>
<td>Street address of well if located within city</td>
<td>No</td>
</tr>
<tr>
<td>Board of Agriculture, Division of Water Resources Application Number</td>
<td>Republic, Kansas 66964</td>
</tr>
<tr>
<td>Depth of completed well</td>
<td>47 ft Bore Hole Diameter 30 ft. to 47 ft. and 10 ft.</td>
</tr>
<tr>
<td>Well Water to be used as</td>
<td>Domestic 3, Feeding 3, Oil field water supply 9, Dewashing 9, Irrigation 4, Industrial 7, Lawn and garden only 10, Observation well 12 Other (Specify below)</td>
</tr>
<tr>
<td>Well’s static water level</td>
<td>37 ft. below land surface measured on 8 month 21 day 1980 year</td>
</tr>
<tr>
<td>Pump Test Data</td>
<td>Well water was 40 6 3/4 ft. after 1 hour pumping 31/4 gpm</td>
</tr>
<tr>
<td>Est. Yield</td>
<td>350 gpm Well water was 40 10 11 ft. after 24 hour pumping 210 gpm</td>
</tr>
<tr>
<td>Type of Blank Casing Used</td>
<td>5 Wrought iron 8 Concrete tile Casing Joints: Glued 15 Clamped 15</td>
</tr>
<tr>
<td>3 RMP (SR) 6 Asbestos-Cement 9 Other (Specify below) Welded 11 Other (Specify below)</td>
<td></td>
</tr>
<tr>
<td>Blank casing dia</td>
<td>8 in. to 3 5/8 in. Dia 3 1/2 in. to 3 in. Dia 3 in. to 2 1/2 in. Dia</td>
</tr>
<tr>
<td>Casing height above land surface</td>
<td>25 lbs./ft. Wall thickness or gauge No 12 7 7</td>
</tr>
<tr>
<td>Type of Screen or Perforation Material</td>
<td>7 PVC 10 Asbestos-cement</td>
</tr>
<tr>
<td>Screen or Perforation Openings Area</td>
<td>5 Gauzy wrapped 8 Saw cut 11 None (open hole)</td>
</tr>
<tr>
<td>5 Mill slot 6 Wire wrapped 9 Drilled holes 12 None used (open hole)</td>
<td></td>
</tr>
<tr>
<td>Screen-Perforation Dia</td>
<td>4 Key punched 7 Torch cut 10 Other (Specify)</td>
</tr>
<tr>
<td>Screen-Perforated Intervals</td>
<td>From 36 ft. to 47 ft. Dia 47 ft. From 47 ft. to 13 ft. Dia</td>
</tr>
<tr>
<td>Gravel Pack Intervals</td>
<td>From 13 ft. to 47 ft. Dia 47 ft. From 47 ft. to 13 ft. Dia</td>
</tr>
<tr>
<td>GROUT MATERIAL</td>
<td>1 Neat cement 2 Cement grout 3 Bentonite 4 Other</td>
</tr>
<tr>
<td>Grouted Intervals</td>
<td>From 3 ft. to 13 ft. Dia 13 ft. From 13 ft. to 3 ft. Dia</td>
</tr>
<tr>
<td>What is the nearest source of possible contamination</td>
<td>10 Fuel storage 14 Abandoned water well</td>
</tr>
<tr>
<td>2 Septic tank 4 Cess pool 7 Sewage lagoon 11 Fertilizer storage 15 Oil well/Gas well</td>
<td></td>
</tr>
<tr>
<td>2 Sewer lines 5 Septic pit 8 Feed yard 12 Insecticide storage 16 Other (Specify below)</td>
<td></td>
</tr>
<tr>
<td>Gravel</td>
<td>6 Pit gravel 9 Livestock pens 13 Waste/tie sewer intake</td>
</tr>
<tr>
<td>Direction from well</td>
<td>South 150 ft. Water Well Disinfected? Yes X No</td>
</tr>
<tr>
<td>If yes: Pump Manufacturer’s name</td>
<td>Pumped</td>
</tr>
<tr>
<td>Model No</td>
<td>4 HP 30 HP 75 HP 150 HP 220 HP</td>
</tr>
<tr>
<td>Depth of Pump intake</td>
<td>45 ft.</td>
</tr>
<tr>
<td>Pumps Capacity rated at</td>
<td>2000 gpm gal. min.</td>
</tr>
<tr>
<td>Type of pump</td>
<td>2 Submersible 3 Jet 4 Centrifugal 5 Reciprocating 6 Other</td>
</tr>
<tr>
<td>CONTRACTOR’S OR LANDOWNER’S CERTIFICATION</td>
<td>This water well was X constructed, 2 reconstructed, or 3 plugged under my jurisdiction and was completed on 18 month 15 day 1980 year and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor’s License No. 359</td>
</tr>
<tr>
<td>This Water Well Record was completed on 12 month 30 day 1980 year under the business name of Daryl Cox Inc. by signature Manager</td>
<td></td>
</tr>
<tr>
<td>LOCATE WELL’S LOCATION WITH AN “X” IN SECTION BOX</td>
<td>X</td>
</tr>
<tr>
<td>ELEVATION</td>
<td>15 50</td>
</tr>
<tr>
<td>Depth of Groundwater Encountered</td>
<td>1 2 3 4 5 6 (Use a second sheet if needed)</td>
</tr>
<tr>
<td>INSTRUCTIONS: Use typewriter or ball point pen, please press firmly and PRINT clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Division of Environment, Water Well Contractors, Topeka, KS 66620. Send one to WATER WELL OWNER and retain one for your records.</td>
<td></td>
</tr>
<tr>
<td><strong>1. Location of well:</strong></td>
<td>Republic</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>County</strong></td>
<td>SW 1/4</td>
</tr>
<tr>
<td><strong>Fraction</strong></td>
<td>30</td>
</tr>
<tr>
<td><strong>Section number</strong></td>
<td>30</td>
</tr>
<tr>
<td><strong>Township number</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Range number</strong></td>
<td>5</td>
</tr>
<tr>
<td><strong>Street address of well location if in city:</strong></td>
<td>NE corner of Republic KS</td>
</tr>
<tr>
<td><strong>Owner of well:</strong></td>
<td>James Hurley</td>
</tr>
<tr>
<td><strong>City, state, zip code:</strong></td>
<td>Republic KS 66964</td>
</tr>
</tbody>
</table>

4. Locate with "T" in section below:

```
<table>
<thead>
<tr>
<th>N</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>NW</td>
<td>NE</td>
</tr>
<tr>
<td>SW</td>
<td>SE</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
N 1/4 Mile
```

5. Type of well:

<table>
<thead>
<tr>
<th>Top Soil</th>
<th>Clay's</th>
<th>0 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silty</td>
<td>Clay</td>
<td>40 63</td>
</tr>
<tr>
<td>Sand</td>
<td>Clay</td>
<td>63 70</td>
</tr>
</tbody>
</table>

6. Bore hole dia. in. 6.75. Completion date: 12.31.97


8. Use:

<table>
<thead>
<tr>
<th>Domestic</th>
<th>Public supply</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. Casing:

<table>
<thead>
<tr>
<th>Material</th>
<th>Diameter</th>
<th>Below</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. Screen Manufacturer's name: SET STREAM

11. Static water level:

<table>
<thead>
<tr>
<th>Depth</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. Pumping level below land surface:

<table>
<thead>
<tr>
<th>Depth</th>
<th>Hours</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

13. Water sample submitted:

<table>
<thead>
<tr>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

14. Well head:

<table>
<thead>
<tr>
<th>Type</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15. Well grouted:

<table>
<thead>
<tr>
<th>Grouted</th>
<th>Description</th>
<th>Concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

16. Nearest source of possible contamination:

<table>
<thead>
<tr>
<th>Fr.</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

17. Pump:

<table>
<thead>
<tr>
<th>Manufacturer's name</th>
<th>HP</th>
<th>Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

18. Elevation:

<table>
<thead>
<tr>
<th>Topography</th>
<th>Hill</th>
<th>Slope</th>
<th>Upland</th>
<th>Valley</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

19. Remarks:

<table>
<thead>
<tr>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

20. Water well contractor's certification:

<table>
<thead>
<tr>
<th>Signature:</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Forward the white, blue and pink copies to the Department of Health and Environment.
LOCATION OF WATER WELL:

Fraction: 5N 15S 14SW 14

Section Number: 50

Township Number: T 1 S

Range Number: R 4 E 5

Distance and direction from nearest town or city street address of well if located within city:

RE: WATER WELL OWNER: HELEN HUNTER

R4, St. Address, Box # Republic

City, State, ZIP Code: Republic KS 66856

Board of Agriculture, Division of Water Resources

Application Number:

LOCATE WELLS LOCATION WITH AN "X" IN SECTION BOX:

Depth(s) Groundwater Encountered:

38 ft. 2 ft. 3 ft.

WELL'S STATIC WATER LEVEL:

38 ft.

Pump test data: Well water was after hours pumping gpm

Bore Hole Diameter: 9 6 in.

WELL WATER TO BE USED AS:

5. Public water supply

8. Air conditioning

11. Injection well

1. Domestic

3. Feedlot

6. Oil field water supply

9. Dewatering

12. Other (Specify below)

Oiling

4. Industrial

7. Lawn and garden only

10. Monitoring well

Was a chemical/bacteriological sample submitted to Department? Yes... No... X...

If yes, what % of sample was submitted Water Well Disinfected? Yes X No.

TYPE OF BLANK CASING USED:

5. Wrought iron

8. Concrete tile

Casing Joints: Glued X Clamped

Steel

3. RMP (SR)

6. Asbestos-Cement

9. Other (Specify below)

Welded

ABS

4. Fiberglass

7. Threaded

Fiberglass

6. Galvanized steel

9. Other (Specify below)

Welded

Casing height above land surface: 16 ft. 14 ft.

in. 6 ft. 3 ft.

lbs. ft. Wall thickness or gauge No.

1.255

10. Asbestos-cement

Continuous side:

5. Cased wrapped

8. Saw cut

11. Other (Specify below)

None (Open hole)

4. Key punched

7. Torch cut

10. Other (Specify below)

3. Mill slit

6. Wire wrapped

9. Drilled holes

SCREEN-PERFORATION OPENINGS ARE:

Screen-Perforated Intervals:

From...

44.1 ft. to...

54.5 ft.

From...

20 ft. to...

60 ft.

Other (Specify below)

1. Septic tank

4. Lateral lines

7. Pit privy

10. Livestock pens

2. Sewer lines

5. Gess pool

8. Sewage lagoon

11. Fuel storage

3. Watertight sewer lines

6. Septage pit

9. Feedyard

12. Fertilizer storage

13. Insecticide storage

What is the nearest source of possible contamination:

1. 1.25 ft. to 2.0 ft.

2. 1.0 ft. to...

3. 0 ft. to...

Other: X

GROUT MATERIAL:

1. Neat cement

2. Cement grout

3. Bentonite

4. Other: X

Grout Intervals:

From...

4.2 ft. to...

5.4 ft.

From...

3.0 ft. to...

4.0 ft.

How many feet?

LITHOLOGIC LOG

FROM TO

PLUGGING INTERVALS

FROM TO

74 12 Top Soil & Clay's

53 54 Sand & Gravel

54 60 Shale

CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (m/d/yyyy) X 9-29-23 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's license No.

This Water Well Record was completed on (m/d/yyyy) X 9-29-23 under the business name of X Martin Well Drilling. X

BY (Signature)

INSTRUCTIONS: Use typewriter or ball point pen. PLEASE PRESS FIRMLY AND USE BLACK INK. Please print in block style; underline or circle the correct answers. Send three copies to Kansas Department of Health and Environment, Bureau of Water. Kansas, 66020, 0010. Telephone: 316-266-2040. Send one to WATER WELL OWNER and retain one for your records.
**WATER WELL RECORD**  Form WW-5  KSA 52a:1212

<table>
<thead>
<tr>
<th>Location of Water Well</th>
<th>Fraction</th>
<th>Section Number</th>
<th>Township Number</th>
<th>Range Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>County</td>
<td>Republic</td>
<td>25</td>
<td>T</td>
<td>S</td>
</tr>
</tbody>
</table>

**Distance and direction from nearest town or city:**

**Street address of well if located within city:**

<table>
<thead>
<tr>
<th>Well Water to be used as</th>
<th>5 Public water supply</th>
<th>8 Air conditioning</th>
<th>11 Injection well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Domestic Feeder</td>
<td>6 Oil field water supply</td>
<td>9 Dwelling well</td>
<td>12 Other (Specify below)</td>
</tr>
</tbody>
</table>

**Depth of Completed Well:**

3.2 ft. Bore Hole Diameter

30 in. to 32 ft. and

In. to 10 ft.

**Well’s Static Water Level:**

18 ft. below land surface measured on Aug 15, 1983

30 ft. day

**Pump Test Data:**

Well water was 32 ft. after 1/24 hours pumping 29 gpm

**Type of Blank Casing Used:**

5 Wrought iron

8 Concrete tile

Casing Joints: Glued. 1.5

2 Steel

3 RMP (SR)

6 Other (Specify below)

**Type of Screen or Perforation Material:**

7 PVC

Asbestos-cement

**Screen or Perforation Openings Are:**

3 Stainless steel

5 Fiber glass

6 RMP (SR)

9 ABS

2 Brass

3 Galvanized steel

6 Concrete tile

9 Other (Specify below)

**Louvered Shutter:**

5 Wire wrapped

5 Drilled holes

5 Other (Specify below)

**GROUT MATERIAL:**

1 Neat cement

4 Other

**Grouted Intervals From:**

0 ft. to 10 ft.

From 10 ft. to 20 ft.

From 20 ft. to 30 ft.

From 30 ft. to 40 ft.

**What is the nearest source of possible contamination:**

None

10 Fuel storage

14 Abandoned water well

14 Septic tank

6 Sewage lagoon

11 Fertilizer storage

15 Oil well / Gas well

15 Sewer lines

16 Water main

16 Other (Specify below)

**Direction from well:**

150.00

**Was a chemical bacteriological sample submitted to Department:**

Yes [X] No

If yes, was sample submitted on: Month Day Year

**If yes, Pump Manufacturer’s name:**

Model No.

HP

Volts

**Pumps Capacities rated at:**

GPM

Gal/min

**Type of pump:**

1 Submersible

2 Turbine

3 Jet

4 Centrifugal

5 Reciprocating

6 Other

**Contractor’s or Landowner’s Certification:**

This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on May 30, 1983.

**This Water Well Record was completed on:**

June 26, 1983

**Elevation:**

**Depth of Groundwater Encountered:**

18 ft. 11 in.

219 ft.

320 ft.

272 ft.

**Elevation:**

**LOCATION WITH AN X IN SECTION BOX:**

**LITHOLOGIC LOG:**

<table>
<thead>
<tr>
<th>FROM</th>
<th>TO</th>
<th>LITHOLOGIC LOG</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
<td>Blue clay</td>
</tr>
<tr>
<td>12</td>
<td>19</td>
<td>Sandy clay</td>
</tr>
<tr>
<td>19</td>
<td>23</td>
<td>Soil clay</td>
</tr>
<tr>
<td>23</td>
<td>30</td>
<td>Sandy gravel</td>
</tr>
<tr>
<td>30</td>
<td>32</td>
<td>Soil</td>
</tr>
</tbody>
</table>

**Lithologic Log:**

**SEND TWO COPIES TO KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT, DIVISION OF ENVIRONMENT, WATER WELL CONTRACTORS, TOPEKA, KS 66620. SEND ONE TO WATER WELL OWNER AND RETAIN ONE FOR YOUR RECORDS.**
1. Location of well: Republic
   County: Republic
   Township number: 30
   Range number: 4
   Section number: 0
   Fraction: NE

2. Distance and direction from nearest town or city:
   Street address of well location if in city: KS
   City, state, zip code: Republic KS 66964

3. Owner of well: Max Towner
   Address: Republic KS 66964

4. Locate with "X" in section below:
   Sketch map:

5. Type and color of material:
   From: 0
   To: 5
   Top soil: Clay
   Sand & gravel:
   Clay:
   Sand & mud:
   Shale:
   Sand & gravel:
   Clay:
   Sand & mud:
   Shale:

6. Bare hole dia.: 5 in.
   Completion date: 1-11-65
   Wall depth: 35 ft.

7. Cable tool: Rotary
   Drill: Dug
   Hollow: Jetted
   Bored: Reverse rotary
   Other:

8. Use: Domestic
   Public supply
   Industry
   Irrigation
   Air conditioning
   Other:

9. Coating: Material:
   Height: at grade below
   Pile:
   Surface:
   Other:

10. Screen: Manufacturer's name
    Jet Stream
    Type: Slotted Perc.
    Dia.: 5 in.
    Length: 20 ft.
    Set between: 15 ft. and 35 ft.
    Nipple:
    Material:
    Other:

11. Static water level:
    No./day/ft.
    9 ft. below land surface. Date: 1-1-65

12. Pumping test:
    Pumps:
    1 hr. pumping:
    3 hr. pumping:
    6 hr. pumping:
    24 hr. pumping:
    Extended maximum yield:

13. Water sample submitted:
    Yes
    No
    Date:

14. Wall head completion:
    Pitless adapter: 14 inches above grade

15. Wall grouted:
    Yes
    No
    Vertical cement:
    Concrete:
    Depth from:

16. Nearest source of possible contamination:
    Fr:
    Direction:
    Type:
    Wall disconnected upon completion:
    Yes
    No

17. Pump:
    Manufacturer's name:
    Metal number:
    Size:
    Horsepower:
    Length of drop pipe:
    Type:
    Submersible:
    Turbine:
    Jet:
    Recirculating:
    Camphor:
    Other:

18. Education:
    Topography:
    HIll
    Slope
    Upland
    Valley

19. Remarks:

20. Water well contractor's certification:
    This well was drilled under my jurisdiction and this report
    is true to the best of my knowledge and belief.

Form WWC-5
Forward this white, blue and pink copies to the Department of Health and Environment.
#8

**WATER WELL RECORD** Form WWCS KSA 82a-1212

1. **LOCATION OF WATER WELL**
   - County: Republic
   - Section Number: 19
   - Township Number: T 1 S
   - Range Number: N 4 E

2. **WATER WELL OWNER**
   - ROA, St. Address, Box #: Republic
   - Zip Code: 65666

3. **DEPTH OF COMPLETED WELL**
   - Bore Hole Diameter: 7.5 in.
   - Depth: 32 ft.
   - Observation Well: Sedeck Well
   - Well's static water level: 6 ft.
   - Water was measured: 7 inch
   - Month: 1
   - Day: 19
   - Year: 81

4. **TYPE OF BLANK CASING USED:**
   - 1. Steel
   - 2. Polyvinyl Chloride (PVC)
   - 3. Stainless steel
   - 4. Brass
   - 5. Galvanized steel
   - 6. Concrete tile
   - 7. Fiberglass
   - 8. Wrought Iron
   - 9. Other (specify below):
   - 10. Asbestos cement

5. **TYPE OF SCREEN OR PERFORATION MATERIAL:**
   - 1. Steel
   - 2. Polyvinyl Chloride (PVC)
   - 3. Stainless steel
   - 4. Brass
   - 5. Galvanized steel
   - 6. Concrete tile
   - 7. Fiberglass
   - 8. Wrought iron
   - 9. Other (specify below):
   - 10. None

6. **GROUT MATERIAL:**
   - 1. Cement grout
   - 2. Bentonite
   - 3. Neat cement
   - 4. Other

7. **GROUTED INTERVALS FROM:**
   - 1. 0 to 10 ft.
   - 2. 10 to 20 ft.
   - 3. 20 to 30 ft.
   - 4. 30 to 40 ft.
   - 5. 40 to 50 ft.
   - 6. 50 to 60 ft.
   - 7. 60 to 70 ft.
   - 8. 70 to 80 ft.
   - 9. 80 to 90 ft.
   - 10. 90 to 100 ft.

8. **LOCATION WITH AN 'X' IN SECTION BOX:**

9. **ELEVATION:**
   - Depth to Groundwater Encountered: 14.80 ft.
   - (Use second sheet if needed)

10. **INSTRUCTIONS:** Use typewriter or ball point pen, please press firmly and PRINT clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment Division of Water Resources, Water Well Contractors, Kansas, 66620. Send one to WATER WELL OWNER and retain one for your records.
### WATER WELL RECORD

**Form WW-5**  
**KSA 62a-1212**  
**ID No.** #9

#### LOCATION OF WATER WELL:
- **County:** Republic
- **RRS, St. Address, Box #:** 1109 S 1100th
- **City, State, ZIP Code:** Belleville, KS 66938

#### DEPTH OF COMPLETED WELL:
- **130 ft. ELEVATION:**
- **Well’s Static Water Level:** 3 ft. below land surface measured on **09/29/2021**

#### TYPE OF BLANK Casing USED:
- **PVC:** 5 Wrought iron
- **ABS:** 8 Concrete tile

#### SCREEN OR PERFORATION OPENINGS ARE:
- **Continuous slot:** 1
- **Mill slot:** 3
- **Wire wrapped:** 6
- **Drilled holes:** 9

#### GROUT MATERIAL:
- **Neat cement:** 1
- **Cement grout:** 2
- **Bentonite:** 3
- **Other:** 4

#### LITHOLOGIC LOG:

<table>
<thead>
<tr>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>23</td>
</tr>
<tr>
<td>23</td>
<td>30</td>
</tr>
</tbody>
</table>

#### CONTRACTOR’S OR LANDOWNER’S CERTIFICATION:
- This water well was constructed, reconstructed, or plugged under my jurisdiction and was completed on (mod/day/year): 10/25/2021  
- The water well record was completed on (mod/day/year): 10/25/2021

#### INSTRUCTIONS:
- Use typewriter or ball-point pen. PLEASE PRINT CLEARLY and FILL OUT CAREFULLY. Please print in black, underline or circle the correct answers. Send two copies together to Kansas Department of Health and Environment, Bureau of Water, Geology Section, 1000 SW Jackson St., Suite 430, Topeka, Kansas 66612-1367. Telephone 1-800-245-5323. Send one to WATER WELL OWNER and retain one for your records.
**LOCATION OF WATER WELL:**

<table>
<thead>
<tr>
<th>County</th>
<th>Republic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fraction</td>
<td>NW to NE to NE to SE</td>
</tr>
<tr>
<td>Township Number</td>
<td>Range Number</td>
</tr>
<tr>
<td>31</td>
<td>4</td>
</tr>
</tbody>
</table>

Distance and direction from nearest town or city street address of well if located within city: 3/4 East of Republic Ks.

**WATER WELL OWNER:** Dorothy Hoops

**R.R., St. Address, Box #**

| Republic Ks.6964 |

**Application Number:**

**DEPTH OF COMPLETED WELL:** 70 ft.

**ELEVATION:** 13.70 ft.

**WELL'S STATIC WATER LEVEL:** 54 ft.

**ft. below land surface measured on: mo/day/yr** 6.28 85 gpm

**Pump test data:**

- Well water was pumped 7 gpm for 3 hours.

- Hours pumping: 7

- GPM: 7

**WELL WATER TO BE USED AS:**

- Public water supply: 5
- Air conditioning: 8
- Injection well: 11
- Domestic: 3
- Feeder: 6
- Oil field water supply: 9
- Dewatering: 12

**Was a chemical/bacteriological sample submitted to Department?** Yes No

**Type of Blank casing used:**

- Wrought iron: 5
- Concrete tile: 8
- CASING JOINTS: Glue: X Tape: Clamped

**Type of Screen or perforation material:**

- PVC: 10
- Asbestos-cement: 11
- 12

**Screen or perforation openings are:**

- Gauze wrapped: 6
- Saw cut: 11
- None (open hole)

<table>
<thead>
<tr>
<th>Continuous slot</th>
<th>3 MIll slot</th>
<th>Wire wrapped</th>
<th>9 Drilled holes</th>
</tr>
</thead>
</table>

**Louvered shutters:**

- Key punched: 4
- Torch cut: 7
- Wrench cut: 10

**Gravel pack intervals:**

- From: 16 to 70 ft.
- From: 16 to 70 ft.
- From: 16 to 70 ft.
- From: 16 to 70 ft.
- From: 16 to 70 ft.
- From: 16 to 70 ft.
- From: 16 to 70 ft.

**GROUT MATERIAL:**

- Neat cement: 1
- Bentonite: 3
- Other: 4

**Grout intervals:**

- From 0 to 18 ft.
- From 18 to 45 ft.
- From 45 to 58 ft.
- From 58 to 70 ft.

**On the nearest source of possible contamination:**

- Livestock pens: 10
- Abandoned water well: 14
- Fuel storage: 11
- Oil well/Gas well: 15
- Fertilizer storage: 12
- Other (specify below): 16

**Contractor's or landowner's certification:**

This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/yr) 6.28 85.

This Water Well Record was completed on (mo/day/yr) 6.28 85. This record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 165.

Name of Contractor: Maruhn Well Drilling Inc. 1985

**INSTRUCTIONS:** Use typewriter or ball point pen. Please press firmly and print clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Division of Environment, Environmental Geology Section, Topeka, KS 66620. Send one to WATER WELL OWNER and retain one for your records.
**LOCATION OF WATER WELL:**

- **County:** Republic
- **Section Number:** 20
- **Township Number:** T 1 S
- **Range Number:** 14 E0

**WATER WELL OWNER:** Brd Ranch

**WELL LOCATION WITHIN CRESTED Ks:**

**DEPTH OF COMPLETED WELL:** 85 ft.

**ELEVATION:**

- Depths of Groundwater Encountered:
  - **ft. 1:** 56.5
  - **ft. 2:**
  - **ft. 3:**

**WELL STATIC WATER LEVEL:** 22 ft. below land surface measured on Monday, 9/26/00

**Pump test data:**

- Well water was 1.0 gpm after 8 hours pumping
- Well water was 0.0 gpm after 8 hours pumping

**Bore Hole Diameter:** 10 in. to 22 ft.

**WELL WATER TO BE USED AS:**

- Public water supply
- Air conditioning
- Injection well
- Other: (Specify below)

**TYPE OF SCREEN OR PERFORATION MATERIAL:**

- 1 Steel
- 3 Stainless steel
- 2 Brass
- 4 Galvanized steel
- 8 RMP (SR)
- 1 Other (Specify)

**GROUT MATERIAL:**

- 1 Cement grout
- 2 Cement grout
- 4 Other

**GROUT INTERVALS:**

- From 6.5 ft. to 25 ft. from
- From 6.4 ft. to
- From 6.7 ft. to
- From 8.5 ft. to

**SCREEN-PERFORATED INTERVALS:**

- From .05 to .25 ft.

**PLUGGING INTERVALS**

- 0 ft. to 37 ft.
- 37 ft. to 62 ft.
- 62 ft. to 83 ft.
- 83 ft. to 90 ft.

**CONTRACTORS OR LANDOWNER’S CERTIFICATION:**

This water well was constructed, reconstructed, or plugged under my jurisdiction and was completed on (Specify date)...

This Water Well Record was completed on (Specify date)...

(Signature)
#12

## Location of Water Well

- **County**: Republic
- **Section Number**: 29
- **Township Number**: 1
- **Range Number**: 5
- **Distance and direction from nearest town or city**: 2 miles NW of Republic
- **Street address of well if located within city**: #12

## Water Well Owner
- **Name**: James C. Hurling
- **Address**: Republic, KS, 66947
- **Application Number**: K3-692

## Well Completion Details
- **Depth of Well**: 85 feet
- **Well Water to be Used**: 5 Public water supply
- **Domestic**: Yes
- **Feeding**: 8 Oil field water supply
- **Irrigation**: No

## Pump Test Data
- **Pump Test Data**: 11 Injection well
- **Est. Yield**: 13,750 gpm

## Type of Blank Casing Used
- **Concrete tile**: 6
- **Concrete tile**: 3
- **Concrete tile**: 9
- **Concrete tile**: 6
- **Concrete tile**: 1
- **Concrete tile**: 2
- **Concrete tile**: 8
- **Concrete tile**: 11
- **Concrete tile**: 12

## Screen or Perforation Material
- **Steel**: 2
- **Concrete**: 3
- **Concrete**: 1
- **Concrete**: 1
- **Concrete**: 1

## Grout Material
- **Concrete**: 2
- **Concrete**: 1
- **Concrete**: 3
- **Concrete**: 5

## Well Disinfected
- **Was a chemical/bacteriological sample submitted to Department?**: Yes
- **Was a chemical/bacteriological sample submitted to Department?**: No

## Well Drilling by
- **Location**: Shale Drilling, Inc.

## Water Well Record
- **Form WW-2**: KSA 83a-1212
- **Depth to Groundwater Encountered**: 59 feet
- **Depth to Water Table**: 10 feet
- **Depth to Water Table**: 21 feet
- **Depth to Water Table**: 28 feet
- **Depth to Water Table**: 50 feet
- **Depth to Water Table**: 58 feet
- **Depth to Water Table**: 71 feet
- **Depth to Water Table**: 82 feet
- **Depth to Water Table**: 86 feet
- **Depth to Water Table**: 101 feet
- **Depth to Water Table**: 101 feet

## Well Drilling by
- **Department of Agriculture, Division of Water Resources**

---

*INSTRUCTIONS: Use typewriter or ball-point pen, please press firmly and PRINT clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Division of Environmental Quality, Water Well Contractors, Topeka, KS 66620. Send one copy to WATER WELL OWNER and retain one for your records.*
#13

<table>
<thead>
<tr>
<th>1. Location of well</th>
<th>County</th>
<th>Republic</th>
<th>Township number</th>
<th>Range number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NW/1A</td>
<td>SW/1A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 2. Distance and direction from nearest town or city | 0   | 6 mi SW |

| 3. Owner of well | Vella Tenti |

| 4. Locate with "X" in section below: |

| N | W |

| Sketch map: |

<table>
<thead>
<tr>
<th>5. Type and color of material</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topsoil &amp; clay</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>Silt</td>
<td>23</td>
<td>57</td>
</tr>
<tr>
<td>Silt - mud to fine</td>
<td>57</td>
<td>66</td>
</tr>
<tr>
<td>Clay</td>
<td>66</td>
<td>70</td>
</tr>
<tr>
<td>White wheat sand</td>
<td>70</td>
<td>83</td>
</tr>
<tr>
<td>Rock</td>
<td>83</td>
<td>84</td>
</tr>
<tr>
<td>Carlisle Shale</td>
<td>84</td>
<td>85</td>
</tr>
</tbody>
</table>

| 6. bore hole dia. | 3"    | completion date | 6/8/25 |

<table>
<thead>
<tr>
<th>7. Cable type</th>
<th>Rotary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive</td>
<td>Dog</td>
</tr>
<tr>
<td>Hollow &amp; Set</td>
<td>Bored</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8. Uses: Domestic</th>
<th>Public supply</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation</td>
<td>Air conditioning</td>
<td>Truck</td>
</tr>
<tr>
<td>Lens</td>
<td>Oil field water</td>
<td>Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9. casing: Material</th>
<th>Weight</th>
<th>Height Above Surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threaded</td>
<td>1/2&quot; Pvc</td>
<td>15&quot;</td>
</tr>
</tbody>
</table>

| 10. Screen: Manufacturer's name | 5 X 8 |

| 11. Static water level: |
| 91 ft below land surface | 3/1/25 |

| 12. Pumping level below land surfaces: |
| 30 ft below | 1 hr. pumping | 300 g.p.m. |

| 13. Water sample submitted: |
| No. of days | 0 |

| 14. Wellhead composition: |
| Flat top adapter | 12 inches above grade |

<table>
<thead>
<tr>
<th>15. Well ground water level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth from</td>
</tr>
</tbody>
</table>

| 16. Nearest source of potable water:|
| Well distance |

| 17. Pump: |
| Manufacturer's name | 5 X 8 |
| Metal number | 3/8 x 3/8 |

| 18. Remarks: |
| Form VHC-5 |

---

Forward the white, blue and pink copies to the Department of Health and Environment.
WATER WELL RECORD

Form WWC-5

Division of Water Resources, App. No. #14

1 LOCATION OF WATER WELL:

County: Republic
Fraction: ¼ SW ¼ NE ¼
Section Number: 29
Township Number: T 11 S
Range Number: R 4 W

Global Positioning Systems (decimal degrees, min. of 4 digits)
Latitude: 39° 56' 27.7" N
Longitude: 097° 47' 23" W

2 WATER WELL OWNER: Tiejen and Sons
RR#: St. Address, Box #: 401 N. Railroad St.
City, State, Zip Code: Byron, NE 68325

Elevation:
Datum:

Data Collection Method: Hand held

3 LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:

 Depth(s) Groundwater Encountered:

Well Screen was

Pump test data:

WELL'S STATIC WATER LEVEL:

Est. Yield:

WELL WATER TO BE USED AS:

WELL STORED IN:

WATER QUALITY:

Sample was submitted to Department?

Sample was submitted to a laboratory?

Was a chemical/bacteriological sample submitted to Department?

Was a chemical/bacteriological sample submitted to laboratory?

4 DEPTH OF COMPLETED WELL:

5 TYPE OF CASING USED:

Casing joints:

Screen Perforation Openings Are:

Screen-Perforated Intervals:

Gravel pack intervals:

6 GROUT MATERIAL:

What is the nearest source of possible contamination?

Direction from well?

FROM TO

6th

7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION:

INSTRUCTIONS: Use typewriter or ball point pen.

PLEASEPRESSFIRMLYandPRINTclearly. Please fill in blanks and circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Geology Section, 1000 SW Jackson St., Suite 420, Topeka, Kansas 66612-1367. Telephone 785-296-5522. Send one to WATER WELL OWNER and retain one for your records. Fee of $5.00 for each constructed well. Visit us at http://www.kdheks.gov/waterwell/index.html.

KSA 82a-1212
<table>
<thead>
<tr>
<th>1. Location of well: County</th>
<th>Republic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fraction</td>
<td>NE 1/4 SW 1/4 NE 1/4</td>
</tr>
<tr>
<td>Section number</td>
<td>29</td>
</tr>
<tr>
<td>Township number</td>
<td>1</td>
</tr>
<tr>
<td>Range number</td>
<td>5 8 4</td>
</tr>
</tbody>
</table>

2. Distance and direction from nearest town or city: 7 miles SW of Byron, NE.

3. Owner of well: Byron, NE. 68825

4. Locate with "X" in section below: Sketch map:

<table>
<thead>
<tr>
<th>N</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>NW</td>
<td>NE</td>
</tr>
<tr>
<td>SW</td>
<td>SE</td>
</tr>
</tbody>
</table>

5. Type and color of material:

- Teson & clay: O X
- Fine sand: 8 12
- Clay: 12 16
- Sand & gravel: 16 66
- Limestone: 66 69
- Chalk: 69 70

6. Bore hole dia.: 6.0 in. Completion date: 6-7-78

7. Cable tool: Rotary
Canned: Drop
Hollow rod: Sefred
Reverse rotary

8. Use: Domestic
Public supply: Industry

9. Casing: Material: ACP
Helix: Above water
Threaded: Welded
Surface: 12 in.
Height: 36 in.

10. Screen: Manufacturer's name: Johnson
Type: \( \text{Type}\)
Size: 75 mm
Length: 21.75 ft.

11. Static water level: 14 ft. below land surface Date: 8/1/78

12. Pumping level below land surface: 14 ft. after 1 hr. pumping

13. Day: 1000 g.p.m. Estimated minimum yield: 1000 g.p.m.

14. Water sample submitted: Yes

15. Well head completion: Yes

16. Well grated: Yes

17. Nearest source of possible contamination: No

18. Elevations:
- Terrain: HILL
- Slope: X
- Field: Valley

19. Remarks:

20. Water well contractor's certification: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

21. Address: Byron, NE 68825
Business name: Winkenbank Co.

22. Authorized representative: Date: 6-7-78

Forward the white, blue, and pink copies to the Department of Health and Environment.

Form WWC-5
WATER WELL RECORD

LOCATION OF WATER WELL:
- County: Republic
- Township: 20
- Range: 1 R
- Section: 16

WATER WELL OWNER:
- Name: Allen Hunley

LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:

- Depth(s) Groundwater Encountered: 1, 2 ft.
- Well's Static Water Level: 15 ft. below land surface measured on: 4.13.99
- Pump test data: Well water was unknown ft. after 20 days pumping, 10 gpm
- Well Water TO BE USED AS: 7 Lawn and garden only
- Injection well

WELL TO BE USED AS: 7 Lawn and garden only
- Injection well

Was a chemical/bacteriological sample submitted to Department? Yes

TYPE OF BLANK CASING USED:
- Steel: 3
- RMP (SR): 6
- Asbestos-Cement: 9
- Other (specify below):
- 1 Stainless steel
- 6 Fiber glass
- 9 RMP (SR)
- 12 Other (specify below)

Casing height above land surface: 16 in., weight: lbs./ft.

SCREEN OR PERFORATION MATERIAL:
- 1 Continuous slot
- 3 Mill slot
- 20 Louvered shutter
- 4 Key punched
- 7 Torch cut
- 20 Other (specify)

SCREEN OR PERFORATION INTERVALS:
- From: 1 to 70 ft.
- From: 1 to 70 ft.

GRANULAR INTERVALS:
- From: 1 to 70 ft.
- From: 1 to 70 ft.

GROUT MATERIAL:
- 1 Neat cement
- 2 Cement grout
- 3 Bentonite
- 4 Other

LITHOLOGIC LOG:
- 1.0-15.0 ft. Top shell
- 16.0-20.0 ft. Gravel

PLUGGING INTERVALS:

CONTRACTOR'S OR LANDOWNER'S CERTIFICATION:
- This water well was (X) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on: 4.13.99
- Additional information: This Water Well Record was completed on: 4.13.99

INSTRUCTIONS: Use typewriter or ball point pen. PLEASE PRINT firmly and legibly. Please fill in blanks or circle the correct answers and send to your Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-0007. Telephone: 913-296-5600. Send one copy to WATER WELL OWNER and retain one for your records.
**WATER WELL RECORD**

Form WWC-5  KSA 82a-1212

---

**LOCATION OF WATER WELL:** Republic, NE

**COUNTY:** Republic

**SECTION NUMBER:** 20

**TOWNSHIP NUMBER:** 1

**RANGE NUMBER:** H

---

**WATER WELL OWNER:** Howard Millen

**RFP #, ST. ADDRESS, BOX #:** 215 5th Ave., Beatrice, NE

**ZIP CODE:** 68310

**APPLICATION NUMBER:** 17

---

**DEPTH OF COMPLETED WELL:** 86 ft.

**ELEVATION:** 16 ft.

**WELL'S STATIC WATER LEVEL:** 49 ft.

**Pump test data:**

- Well water was contained in a 10,000 gallon tank.
- Hours pumping: 20 hours.
- GPM: 60

**Est. Yield:** 100 gpm

**Bore Hole Diameter:** 3.5 in.

---

**WELL WATER TO BE USED AS:**

- Domestic: 3
- Feedlot: 6
- Oil field water supply: 9
- Dewatering: 12
- Other: 0

---

**TYPE OF BLANK CASING USED:**

- 1 Steel
- 3 PVC
- 4 ABS

**BLANK CASING DIAMETER:**

- 1 = 1 in.
- 2 = 2 in.
- 3 = 3 in.
- 4 = 4 in.
- 5 = 5 in.
- 6 = 6 in.
- 7 = 7 in.
- 8 = 8 in.
- 9 = 9 in.
- 10 = 10 in.
- 11 = 11 in.
- 12 = 12 in.
- 13 = 13 in.
- 14 = 14 in.

**SCREEN OR PERFORATION MATERIAL:**

- 1 Steel
- 3 Stainless steel
- 4 Galvanized steel
- 10 Steel casing
- 11 Other: 11

**SCREEN OR PERFORATION OPENINGS:**

- 1 Continuous slotted
- 2 Louvered shutter
- 3 Mill slotted
- 7 Torch cut
- 4 Key punched
- 6 Wire wrapped
- 8 Other: 0

**GRAVEL PACK INTERVALS:**

- From 60 ft. to 80 ft.

---

**GROUT MATERIAL:**

- 1 Neat cement
- 2 Cement grout
- 3 Bentonite
- 4 Other: 4

**GROUT INTERVALS:**

- From 0 ft. to 20 ft.

---

**LITHOLOGIC LOG:**

- 0 21 Top Soil Clay
- 21 84 Sand & Gravel
- 84 95 Shale

---

**CONTRACTOR'S OR LANDOWNER'S CERTIFICATION:**

This water well was constructed, reconstructed, or plugged under my jurisdiction and was completed on (mo/day/year): 8/16/71.

This Water Well Record was completed on (mo/day/year): 8/16/71.

---

**INSTRUCTIONS:** Use typewriter or ball point pen. Please print clearly and legibly. Please fill in blanks, underline or circle the correct answers. Send one copy to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620. Telephone: 913-296-5345. Send one to WATER WELL OWNER and retain one for your records.
**WATER WELL RECORD**

**Form WWCS**  KSA 82a-1212

1. **LOCATION OF WATER WELL**
   - County: Republic
   - Section Number: 20
   - Township Number: T 1 S
   - Range Number: R 5 W

   Distance and direction from nearest town or city: N 1/4 mi S 1/4 N 1/4 E 3/4

2. **WATER WELL OWNER**
   - J. D. Hurley

3. **DEPT OF COMPLETED WELL**
   - Depth: 110 ft
   - Borehole Diameter: 10 in
   - Well Diameter: 8 in

4. **WELLS**
   - Public Water Supply: 1
   - Industrial: 1
   - Residential: 2
   - Other: 6

5. **Casing Material**
   - Type: Iron
   - Material: Concrete

6. **SPRINGS**
   - Location: Republic, Kansas 66964
   - Application Number: 82045

7. **PUMP TEST DATA**
   - Well water was: 95 ft after 1 hour pumping
   - Usable water was: 1500 gpm

8. **TYPE OF BLANK CASING USED**
   - Diameter: 6 in
   - Length: 10 ft

9. **TYPE OF SCREEN OR PERFORATION MATERIAL**
   - Type: Steel
   - Material: Stainless Steel

10. **SCREEN OR PERFORATION OPENINGS ARE**
    - Continuous slots
    - Mill slots

11. **GROUT MATERIAL**
    - Material: Cement grout
    - Other: Bentonite

12. **LOCATION OF WATER WELL**
    - Location: Republic, Kansas 66964

13. **GROUTED INTERVALS FROM**
    - Type: Sandstone
    - Depth: 100 ft

14. **CONTRACTOR'S OR LANDOWNER'S CERTIFICATION**
    - Date: December 28
    - Year: 1982

15. **LOCATE WELL ON LOCATION BOX WITH AN X IN SECTION BOX**
    - Section: 20

16. **ELEVATION**
    - Depth: Groundwater encountered: 1

---

*INSTRUCTIONS: Use typewriter or ball point pen. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Division of Water, Water Well Contractors, Topeka, KS 66620. Send one to WATER WELL OWNER and retain one for your records.*
#19 – water level is wrong based on wizard
LOCATION OF WATER WELL:

County: Republic
Fraction: 1/4
Section Number: 21
Township Number: T
Range Number: 15

Distance and direction from nearest town or city street address of well if located within city:
3/4 mile South + 3/4 mile West of Byron, Nebraska.

WATER WELL OWNER:

54821 Kane

Board of Agriculture, Division of Water Resources

City, St., ZIP Code:
Concordia, KS 66901

Application Number:

LOCATE WELL'S LOCATION WITH AN 'X' IN SECTION BOX:

[Diagram with coordinates marked]

WELL'S DEPTH OF COMPLETED WELL: 100 ft. ELEVATION:

Depth(s) Groundwater Encountered:
1. 63 ft. 2. 63 ft. 3. 63 ft.

WELL'S STATIC WATER LEVEL: 63 ft. below land surface measured on m/d/yr: 5/12/99

Pump test data:
Well water was 66 ft. after 1 hour pumping, 500 gpm
Est. Yield: 1500 gpm
Well water was 66 ft. after 1 hour pumping, 1200 gpm

Bore Hole Diameter: 26 in. in. to 100 ft. and

WELL WATER TO BE USED AS:
5 Public water supply
8 Air conditioning
11 Injection well
12 Other (Specify below)

O Irrigation

Was a chemical/bacteriological sample submitted to Department? Yes... No

If yes, no day/year sample was submitted

TYPE OF BLANK CASING USED:
5 Wrought iron
6 Concrete tile

Casing Joints:
Dapped

TYPE OF SCREEN OR PERFORATION MATERIAL:
1 Steel
3 RMP (SR)
10 Asbestos-cement
4 ABS
6 Asbestos-Cement
9 Other (specify below)

Screen or Perforation Openings Are:
5 Gauzed wrapped
6 Wire wrapped
8 Saw cut
11 None (open hole)

Other (specify):

Screen-Perforated Intervals:
From: 60 ft. to 100 ft.

Gravel Pack Intervals:
From: 20 ft. to 100 ft.

GROUT MATERIAL:
1 Neat cement
4 Other
2 Bentonite
7 Cement grout

What is the nearest source of possible contamination:
1 Septic tank
4 Lateral lines
10 Livestock pens
2 Sewer lines
15 Abandoned water well
3 Watertight sewer lines
8 Sewage lagoon
6 Seepage pit
17 Fuel storage
2 Abandoned well
5 Storage tank
13 Insecticide storage

CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This well was
constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was
completed on (m/d/yr): 5/12/99

This Water Well Record was completed on (m/d/yr): 5/12/99

INSTRUCTIONS: Use toy pen or ball point pen. PLEASE WRITE CLEARLY AND PRINT.
LOCATION OF WATER WELL:

County: Republic
N.E. ¼ N.E. ¼ N.W. ¼

Section Number: 31
Township Number: T 1 S
Range Number: R 4 E

Distance and direction from nearest town or city street address of well if located within city:

WATER WELL OWNER:

Board of Agriculture, Division of Water Resources

Application Number:

LOCATE WELL'S LOCATION WITHIN AN "X" IN SECTION BOX:

Depth(s) Groundwater Encountered:

WELL'S STATIC WATER LEVEL:

Pump test data:

Est. Yield:

Bore Hole Diameter:

WELL WATER TO BE USED AS:

Domestic

3 Feeder:

Oil field water supply

Dewatering

Other (Specify below)

2 Irrigation

4 Industrial

7 Lawn and garden only

10 Monitoring well

Was a chemical/bacteriological sample submitted to Department? Yes ___ No ___

If yes, mo/day/yr sample was submitted

Water Well Disinfected? ___ Yes ___ No ___

TYPE OF BLANK CASING USED:

1 Steel

3 RMP (SR)

5 Wrought iron

8 Concrete tile

CASING JOINTS: Glued ___ Clamped ___

4 ABS

7 Fiberglass

10 Asbestos-cement

Abrease-Cement

9 Other (Specify below)

2 Brass

4 Galvanized steel

5 Stainless steel

8 RMP (SR)

11 Other (Specify below)

Blank casing diameter:

Casing height above land surface:

WATER WELL DRILLING

INSTRUCTION: Use typewriter or ball point pen. PLEASE PRINT CLEARLY. Please fill in blank, underline or circle the correct answers. Send three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-2001. Phone: 913-296-5645. Send one to WATER WELL OWNER and retain the other two copies.
<table>
<thead>
<tr>
<th>Field</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Location of well</td>
<td>Republic SW 1/4 Neva SE 1/4</td>
</tr>
<tr>
<td>2. Distance and direction from nearest town or city</td>
<td>Byron NE 1/2 1/4</td>
</tr>
<tr>
<td>3. Owner of well</td>
<td>Byron NE 1/2 1/4</td>
</tr>
<tr>
<td>4. Locate with &quot;X&quot; in section below:</td>
<td>Sketch map</td>
</tr>
<tr>
<td>5. Type and color of material</td>
<td>Brown Top Soil &amp; Clay</td>
</tr>
<tr>
<td></td>
<td>Red Sand &amp; Gravel</td>
</tr>
<tr>
<td></td>
<td>Clay Brown</td>
</tr>
<tr>
<td></td>
<td>Sand &amp; Gravel Red</td>
</tr>
<tr>
<td></td>
<td>Abbe White</td>
</tr>
<tr>
<td></td>
<td>Carlisle Shale</td>
</tr>
<tr>
<td>6. Bore hole dia.</td>
<td>8</td>
</tr>
<tr>
<td>7. Completion date</td>
<td>11-1-74</td>
</tr>
<tr>
<td>8. Use: Domestic</td>
<td>Public supply</td>
</tr>
<tr>
<td>9. Casing: Material</td>
<td>PVC</td>
</tr>
<tr>
<td></td>
<td>Weight 60 lbs/ft.</td>
</tr>
<tr>
<td></td>
<td>Wall thickness: 3.0 in.</td>
</tr>
<tr>
<td></td>
<td>Depth: 18 ft.</td>
</tr>
<tr>
<td>10. Screen Manufacturer name</td>
<td>Johnson</td>
</tr>
<tr>
<td>11. Static water level</td>
<td>20 ft. below land surface</td>
</tr>
<tr>
<td></td>
<td>Date: 11-1-74</td>
</tr>
<tr>
<td>12. Pumping level below land surface</td>
<td>-2 ft.</td>
</tr>
<tr>
<td></td>
<td>Date: 11-1-74</td>
</tr>
<tr>
<td>13. Water sample submitted</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Date: 11-1-74</td>
</tr>
<tr>
<td>14. Well head completion</td>
<td>No.</td>
</tr>
<tr>
<td></td>
<td>Diameter: 1/2 inch above grade</td>
</tr>
<tr>
<td>15. Well gravel?</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Type: Concrete</td>
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<tr>
<td></td>
<td>Depth: 0 ft.</td>
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<tr>
<td>16. Nearest source of possible contamination</td>
<td>No</td>
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<tr>
<td></td>
<td>Type: Field</td>
</tr>
<tr>
<td>17. Pump</td>
<td>Not Installed</td>
</tr>
<tr>
<td></td>
<td>Manufacturer: Johnson</td>
</tr>
<tr>
<td></td>
<td>Model number: 1 HP 40 Volt</td>
</tr>
<tr>
<td></td>
<td>Length of drop pipe: 0 ft.</td>
</tr>
<tr>
<td></td>
<td>人物: Turbine</td>
</tr>
<tr>
<td></td>
<td>Set: Reciprocating</td>
</tr>
<tr>
<td></td>
<td>Casing: Other</td>
</tr>
<tr>
<td>18. Elevation: Topography:</td>
<td>Upland</td>
</tr>
<tr>
<td>19. Remarks:</td>
<td></td>
</tr>
<tr>
<td>20. Water well contractor's certification:</td>
<td>S &amp; F DRAINING 222</td>
</tr>
<tr>
<td></td>
<td>Address: 2323 S 43rd St.</td>
</tr>
</tbody>
</table>
1. LOCATION OF WATER WELL
   - County: Republican
   - Section Number: 15
   - Township Number: T
   - Range Number: R

2. WATER WELL OWNER
   - Name: Harold Mitchell
   - Address: Republic, Kansas

3. DEPTH OF COMPLETED WELL
   - Bore Hole Diameter: 137 ft
   - Feet: 11 in
   - Inches: in
   - Total Foot: ft

4. Well Water to be Used as:
   - Public Water supply: 5
   - Air conditioning: 8
   - Injection well: 11
   - Other (specify below): 12

5. Irrigation
   - Domestic: 3
   - Feedlot: 6
   - Oil field water supply: 9
   - Dewatering: 12

6. Well's static water level:
   - R. ft. below land surface measured on: 10 ft
   - Month: 6
   - Day: 2
   - Year: 5

7. Pump Test Data
   - Well water was: 4.5
   - Hours pumping: 1.5
   - Gpm: 100

8. TYPE OF BLANK CASING USED:
   - Wrought iron: 5
   - Concrete tile: 8
   - Concrete material: 9
   - Casing Joints: Glue X, Clamped

9. TYPE OF SCREEN OR PERFORATION MATERIAL:
   - Stainless steel: 3
   - Fiber glass: 6
   - ABS: 9

10. SCREEN OR PERFORATION OPENINGS ARE:
    - Continuous slot: 1
    - Mill slot: 3
    - Wire wrapped: 6
    - Torch cut: 7

11. Direction from well: 50
    - How many feet: 50
    - Water Well Disinfected? Yes X, No

12. GROUT MATERIAL:
    - Cement: 2
    - Bentonite: 4
    - Other: 10

13. CONTRACTORS OR LAND OWNERS CERTIFICATION:
    - This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on: 10/1/78
    - Month: 10
    - Day: 1
    - Year: 1978

14. DEPTH OF PUMP Intake:
    - Foot: 12
    - Centrifugal: 6
    - Other: 12

15. LOCATION OF WATER WELL WITH AN "X" IN SECTION BOX
    - Top Soil & Clay: 50
    - Sand & gravel: 125
    - Clay: 127
    - Sand & mud: 133
    - Shale: 133

16. ELEVATION:
    - Depth of groundwater encountered: 1.9
    - ft
    - Use a second sheet if needed

INSTRUCTIONS: Use typewriter or ball point pen, please press firmly and PRINT clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Division of Water Resources, Water Well Contractors, Topeka, KS 66620. Send one to WATER WELL OWNER and retain one for your records.
Figure A2. Potential ASR project locations determined from lithology logs and a field scoping trip. The photos of four potential locations are shown as follows.

The irrigation well on the pivot to the east of the creek, north of Diamond Road is water right 20394, NC SW of 16-01S-04W (Lewis Duensing being the water use corespondent).

The irrigation well to the west of the creek, north of Diamond Road is water right 24804 NW SE SE 17-01S-04W (Egbert and Loretta Schardt WUCs).

Note: Google maps lists county RD 90 as CO RD 9 and Diamond Road as CO RD D.
Location 1 – North of Diamond, West of Creek; Land owner: Egbert & Loretta Schardt

Assessment: This is potentially the best location for our project. The site is a little further away from the Diamond rd so we will have a little more privacy. We can get water from the center pivot well, which appears only a few hundred feet to the west on the map. There is not much top clay/site layer and we may be able to construct infiltration basin even without a bobcat. The downside is that land surface is low and we may have flooding problem, but we can probably plan ahead to avoid it.
Location 2 – South of Diamond, West of Creek; Land owner: Allen & Barbara Hurley

Assessment: The main advantage for this site is its high surface elevation so we don't need to worry about flooding. Also there is a wire fence that can provide a little more security if we are going to leave the long term monitoring equipments (maybe another DTS job box, pressure sensors, seepage meters ...). The disadvantage is that we may have to dig a little deeper to remove the top clay/silt layer and there is no nearby well for us to get source water. But we can probably just drill a well on our own if other options are not available.
Location 3 – North of Diamond, East of Creek; Landowner – KED Farm Inc.

Assessment: This site is fenced too and is close to a feedlot well. So potentially we can get water from the well. The disadvantage, in addition to the low elevation (similar to location 1), is its closer proximity to a center pivot well, but probably not much of a concern for our project.
Location 4 – South of Diamond, East of Creek; Landowner – Randall Rahe

Assessment: This site is not fenced and relatively closer to the road, and so less secure compared to other locations. It also has a low elevation and there are no nearby wells.
The KWRI is committed to transferring knowledge generated by its researchers to clientele. The KWRI uses a variety of methods. These include:

1. The 28th annual statewide water conference held on September 30, 2011. The theme was “Kansas Water Resources: Vision for 2050.” Approximately 215 people attended. Twenty-six scientific presentations were presented in plenary and concurrent sessions. Nineteen scientific posters were presented in the poster session. For the second year, an undergraduate/graduate student poster award program was conducted to encourage student participation. Twelve students participated. The agenda is included with this report.

2. Two statewide conferences, the Kansas Water Forums (February 29 in Wichita and March 1 in Hays), were held in partnership with the Kansas Water Office. The theme was “Just Add Water: Kansas and the Economy.” The Kansas Water Forums have the goal of presenting science and policy issues around water quality and water quantity. This past year there were 415 total attendees at the forums. The major topic this year was hydraulic fracturing for gas and oil and the impact on Kansas water resources. The agenda is included with this report.

3. An educational symposium, “Conserving the Ogallala Aquifer,” was held on the Kansas State University campus on October 19, 2011. The symposium was sponsored by the Kansas Water Resources Institute and focused on providing stakeholders and faculty a research update and input on research priorities. The day long symposium had 75 attendees.

4. The KWRI website, http://www.kcare.ksu.edu/p.aspx?tabid=921, is used to transfer project results and inform the public on issues and scientists on grant opportunities.
Governor's Water Conference

Basic Information

<table>
<thead>
<tr>
<th>Title</th>
<th>Governor's Water Conference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Number</td>
<td>2011KS98B</td>
</tr>
<tr>
<td>Start Date</td>
<td>3/1/2011</td>
</tr>
<tr>
<td>End Date</td>
<td>2/29/2013</td>
</tr>
<tr>
<td>Funding Source</td>
<td>104B</td>
</tr>
<tr>
<td>Congressional District</td>
<td>2nd</td>
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<td>Research Category</td>
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<tr>
<td>Focus Category</td>
<td>Water Use, Sediments, Economics</td>
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<tr>
<td>Descriptors</td>
<td></td>
</tr>
<tr>
<td>Principal Investigators</td>
<td>Dan Devlin</td>
</tr>
</tbody>
</table>

Publications

Kansas Water Resources: Vision for 2050

28th Annual

Water and the Future of Kansas Conference Program

September 30, 2011
Capitol Plaza Hotel
Topeka, Kansas

Sponsored by
Kansas Water Resources Institute
Kansas Center for Agricultural Resources and the Environment
K-State Research and Extension
U.S. Geological Survey
Agenda

7:00 a.m.
Poster Setup

8:00 a.m.
Registration opens

8:30 a.m.
Welcome
Daniel Devlin, Director of KWRI and KCARE

8:40 a.m.
Vision for the Future of Kansas Water Resources
Kansas Governor Sam Brownback (videotaped)

8:50 a.m.
Current and Projected Conditions of the Ogallala/High Plains Aquifer
Brownie Wilson, Kansas Geological Survey

9:20 a.m.
Break and Poster Viewing

9:50 a.m.
Wichita Water 2050: A Plan for Sustainable Water Resources
Debra Ary, City of Wichita

10:25 a.m.
Trends for Water Use in the U.S.
Eric Evenson, USGS WaterSmart Program Leader

11:00 a.m.
Dealing with Drought and Water Resources in Texas
Weir Labatt, Texas Water Development Board

11:40 a.m.
Poster Viewing

Noon
Lunch
My Experience with International Comparative Water Law
Speaker: John Peck, University of Kansas Law School
Announcement of Student Poster Award

1:15 p.m.
CONCURRENT SESSIONS

Ogallala Sustainability
Moderator: Jim Butler, Kansas Geological Survey

1:10 p.m.
Evolution of groundwater management practices in the Kansas High Plains aquifer towards sustainability
Mario Sophocleous, Kansas Geological Survey

1:30 p.m.
Interpretation of hydrographs from the index well sites in the High Plains Aquifer in western Kansas
Jim Butler, Kansas Geological Survey

1:50 p.m.
Fuzzy aquifer subunits – A concept for water right reallocations in Southwest Kansas GMD#3
Brownie Wilson, Kansas Geological Survey

2:10 p.m.
Recent research on the Ogallala Aquifer
David Steward, Kansas State University

The Future of Public Water Utilities
Moderator: Don Snethen

1:10 p.m.
Managing Water in 2050: Implications of Macrotrends
Edward Means, ARCADIS/Malcom Pirnie

2:10 p.m.
Salina Water Supply Master Plan
Martha Tasker, City of Salina

Sedimentation of Kansas Reservoirs I
Moderator: Edward Martinko, Kansas Biological Survey

1:10 p.m.
Kansas base line sediment overview
Chris Gnau, Water Office

1:30 p.m.
Use of continuous turbidity and modeling to quantify the effect of altered reservoir release strategies on sedimentation in John Redmond Reservoir from 2007-2010
Casey Lee, U.S. Geological Survey
1:50 p.m.  
Edward Martinko, Kansas Biological Survey

2:10 p.m.  
Development of automated extraction of reservoir pre-impoundment surfaces from acoustic echosounder data  
Jude Kastens, Kansas Biological Survey

Quality of Surface and Groundwater  
Moderator: Marcia Schulmeister, Emporia State University

1:10 p.m.  
Uranium in the Upper Arkansas River and impact on the Ogallala High Plains Aquifer  
Don Whittemore, Kansas Geological Survey

1:30 p.m.  
Nutrient losses in surface runoff from claypan soil receiving turkey litter and fertilizer  
Dan Sweeney, Kansas State University

1:50 p.m.  
Determining reference conditions of wetlands in the Central Plains  
Donald Huggins, Kansas Biological Survey

2:10 p.m.  
Water Quality Results From BMP Implementation In The Little Arkansas River Watershed  
Ron Graber, Kansas State University

Reservoir and Watershed Economics  
Moderator: Lane Letourneau, Kansas Department of Agriculture

1:10 p.m.  
Economic benefits of recreation at three Kansas reservoirs and impacts to the quality of recreation due to navigation releases  
Natalie Postel, CDM

1:30 p.m.  
Tillage date for Kansas: results from 2010 survey  
DeAnn Presley, Kansas State University

1:50 p.m.  
Economic analysis of crop rotation net returns and water quality in the Cheney Lake watershed  
Michael Langemeier, Kansas State University

2:10 p.m.  
Economics of Nutrient and Sediment Reduction Strategies for Tuttle Creek Lake
Craig Smith, Fort Hays State University

Assessment Tools and Benchmarks

1:10 p.m.
Kansas Weather Data Network
Mary Knapp, Kansas State University

1:30 p.m.
Conservation status of reference streams in Kansas
Robert Angelo, Kansas Department of Health and Environment

1:50 p.m.
RESonate: A new ArcGIS® toolbar designed to facilitate rapid and low-cost hydrogeomorphic assessments at the river-valley and river reach scales
Bradley Williams, Kansas Biological Survey

2:10 p.m.
Application of Rosgen's BANCS model for northeast Kansas and the development of predictive streambank erosion curves
Chris Sass, Kansas State University

Stream Bank Erosion and Restoration

1:10 p.m.
U.S. Army Corps of Engineers projects for bank erosion and sediment management in the Kansas River Basin
John Shelley, U.S. Army Corps of Engineers

1:30 p.m.
The influence of stream active channel width or riparian forest species composition within the Delaware River watershed
William Beck, Kansas Forest Service

1:50 p.m.
Red cedar revetments for bank stabilization
Charles Barden, Kansas State University

2:10 p.m.
Stream channel succession and sediment yield, Black Vermillion River, Kansas
Tim Keane, Kansas State University

2:30 p.m.
Break

2:45 p.m.
CONCURRENT SESSIONS

Irrigation Management Research
Moderator: Joe Harner, Kansas State University

2:45 p.m.
Crop response to limited irrigation
Norman Klocke, Kansas State University

3:05 p.m.
Preseason irrigation with diminished irrigation capacities
Alan Schlegel, Kansas State University

3:25 p.m.
Crop selection and irrigation scheduling decision tools for limited water resources
Norman Klocke, Kansas State University

3:45 p.m.
Irrigation management in Kyrgyz Republic
Nazgul Sharshenova, Kansas Water Office

Climate Change Impacts on Water Resources
Moderator: Susan Stover, Kansas Water Office

2:45 p.m.
Changing climate means more or less water for the future of Kansas?
Charles Rice, Kansas State University

3:05 p.m.
Agricultural and Rural Community Perspectives on Climate Change
Ben Champion, Kansas State University

3:25 p.m.
Simulating the effects of a changing climate on water resources
Andrea Brookfield, Kansas Geological Survey

3:45 p.m.
Farmer's land use decisions adaption to climate change
Dietrich Earnhart, University of Kansas

Sedimentation of Kansas Reservoirs II
Moderator: Susan Metzger, Kansas Water Office

2:45 p.m.
Role of streambank restoration in reservoir sustainability
Susan Metzger, Kansas Water Office
3:05 p.m.
Bathymetric and sediment surveys of Augusta City Lake and August – Santa Fe Lake
Mark Jakubauskas, Kansas Biological Survey

3:25 p.m.
Continuous monitoring for suspended-sediment transport to and from small impoundments in
northeast Kansas, March 2009–May 2011
Guy Foster, U.S. Geological Survey

3:45 p.m.
Modification of the V* method of estimating sediment in low gradient streams
Robert Everhart, Kansas Biological Survey

Water Quality Biological Properties
Moderator: Andrew Ziegler, U.S. Geological Survey

2:45 p.m.
Cyanobacterial blooms: tastes, odors, and toxins
Jennifer Graham, U. S. Geological Survey

3:05 p.m.
Ecological responses to hydrogeomorphic fluctuations in the Kansas River: consequences of
river alteration
Brian O'Neill, Kansas Biological Survey

3:25 p.m.
Examining the Kansas River phytoplankton community
Sara Schmidt, Kansas Biological Survey

3:45 p.m.
Preliminary Assessment of Cyanotoxin Occurrence in the United States
Keith Loftin, U. S. Geological Survey

WRAPS and Other Resources for Watershed Management
Moderator: Jaime Gaggero, Kansas Department of Health and Environment

2:45 p.m.
Kansas WRAPS now and in the future
Jaime Gaggero, Kansas Department of Health and Environment

3:05 p.m.
Roll out the rain barrels
Stacie Minson, Kansas State University

3:25 p.m.
Watershed restoration and protection in the Upper Wakarusa Watershed: a vision for 2050
Tom Huntzinger, Kansas Alliance for Wetlands and Streams

3:45 p.m.
Wichita WRAPS
Becky Lewis, City of Wichita, and Brian Meier, Burns & McDonnell

Kansas Water Resources Institute
Moderator: Dan Devlin, KWRI

2:45 p.m.
Understanding grant opportunities through the Water Resources Institute of Kansas
Dan Devlin, KWRI

3:05 p.m.
Kansas Weather Data Network
Mary Knapp, Kansas State University

4:00 p.m.
Conference Ends

Poster Presentations

Student:

A Study to Identify Groundwater to Surface Water Interaction in the Ogallala Aquifer. Andy Allen, Water Resources Engineering, Kansas State University, David Steward, Department of Civil Engineering, Kansas State University.

A New Method to Characterize the Spatial Variability of Infiltration in the Field. Sarah Auvenshine, Department of Civil Engineering, Kansas State University, David Steward, Department of Civil Engineering, Kansas State University.

A High-resolution Approach to Modeling the Fate and Occurrence of Arsenic in the Equus Beds Aquifer. John Barker, Earth Science Department, Emporia State University, Marcia Schulmeister, Earth Science Department, Emporia State University.

A Spatial Analysis of Farm Ponds in Kansas. Ryan Callihan, Department of Geography, University of Kansas.

Regional Assessment of the Effects of Corn Stover Removal as a Bioenergy Feedstock on Soil Erosion by Water. Ian Kenney, Department of Agronomy, Kansas State University.

Comparing Riparian Woodlands in the Watersheds of Three Northeast Kansas Lakes. Dalila Maradiaga, Department of Horticulture, Forestry and Recreation Resources, Kansas State University, Charles Barden, Department of Horticulture, Forestry and Recreation Resources,
Kansas State University
, William Beck, Kansas Forest Service, Kansas State University.

An Inventory of the Kansas River
. Heidi Mehl, Department of Geography/Hydrology, Kansas State University and
Friends of the Kaw, Bryanna Pockrandt, Kansas State University, Diana Restrepo, Biology,
University of Kansas, Melinda Daniels, Department of Geography, Kansas State
University, Cynthia Annett, Friends of the Kaw, Laura Calwell, Friends of the Kaw.

Direct-push Electrical Conductivity Assessment of a Chloride Plume in the Equus Beds Aquifer,
Kansas. Dolores Neshyba-Bird, Earth Science Department, Emporia State University, Marcia
Schulmeister, Earth Science Department, Emporia State University.

Evapotranspiration measurement techniques in turfgrass. Kenton Peterson, Department of
Horticulture, Forestry and Recreation Resources,
Kansas State University, Dale Bemer, Department of Horticulture, Forestry and Recreation
Resources, Kansas
State University, Jack Fry, Department of Horticulture, Forestry and Recreation Resources,
Kansas State
University, Steve Keeley, Department of Horticulture, Forestry and Recreation Resources,
Kansas
State University
, M. B. Kirkham, Department of Agronomy, Kansas State University.

Agricultural Contaminants and Stream-Aquifer Interaction in the Upper Neosho River, a Mid-
Continent River. Jacob Petty, Earth Science Department, Emporia State University, Marcia
Schulmeister, Earth Science Department, Emporia State University.

Rock Creek's Natural Resource Inventory Assessment
. Diana Restrepo, Biology, University of Kansas, Tom Huntzinger, Upper Wakarusa
WRAPS, Cynthia Annett, Kansas State University
, Raymond Pierotti, Department of Ecology and Evolutionary Biology, University of
Kansas
, Heidi Mehl, Department of Geography, Kansas State University.

Sediment Quantity In Pristine Prairie Streams: Do Burning And Bison Have An Effect?
Danelle Russell, Division of Biology, Kansas State University
, Walter Dodds, Division of Biology, Kansas State University, Bartosz Grudzinski, Department
of Geography, Kansas State University, Melinda Daniels, Department of Geography, Kansas
State University.

Faculty/Staff/Professional:

Analysis of 2011 Western Kansas High Plains Aquifer Water Levels. Geoffrey Bohling and
Brownie Wilson, Kansas Geological Survey, University of Kansas.
Water Use in Kansas
  William R. Eubank, Division of Water Resources, Kansas Department of Agriculture.

Flooding Damage along Two Major Kansas Rivers.  Wayne A. Geyer and Charles L. Barden, Department of Horticulture, Forestry and Recreation Resources, Kansas State University, Robert L. Atchison, Kansas Forest Service, Kansas State University.


Emergency Action Plans and Hazard Classifications for Kansas Dams
  Cindy Higgins, Division of Water Resources, Kansas Department of Agriculture Kansas Biological Survey
  , Mark Jakubauskas, Kansas Biological Survey, University of Kansas.

Acoustic Remote Sensing of Total Phosphorus in Reservoir Bottom Sediments
  Mark Jakubauskas, Donald Huggins, Jerry Denoyelles, Ed Martinko and Ryan Callihan, Kansas Biological Survey, University of Kansas.

From the Dust Bowl to the Mud Bowl: Economics of Reservoir Sedimentation. Craig Smith, Agriculture Department, Fort Hays State University
  , Jeff Williams, Department of Agricultural Economics, Kansas State University, Pouyan Nejadhashemi, Biosystems and Agricultural Engineering, Michigan State University, Sean Woznicki, Biosystems and Agricultural Engineering, Michigan State University, Bill Golden, Department of Agricultural Economics, Kansas State University, Kyle Douglas-Mankin, Department of Biological and Agricultural Engineering, Kansas State University.
Kansas Water Forums
Wichita and Hays, Kansas
February 29 - March 1, 2012
Water has always been key to Kansas' economy, and that is especially true with oil and gas development. This forum will explore energy development in Kansas, particularly the new technologies of horizontal drilling and hydraulic fracturing (fracking) and its potential impact on water supplies. The economic boom from the new development is welcome, yet there are questions as to the impacts on water and land.

Industry experts and state agencies will present fact based information on oil and gas development, its trends and potential in Kansas, related water issues and the permitting processes.

Oklahoma will share their experiences with the recent boom of the shale gas development.

The forum will also explore related questions on how an energy company identifies energy sources to meet future demands and the role of government in energy development.

A town hall discussion of what the government's role should be in energy development will complete the day.

Who should attend? Anyone involved with or interested in water, energy, or growth issues is encouraged to attend.

### Forum Topics

- **Overview of Water Forums - Kansas Water Office**
- **Oil and Gas Development**
  - Horizontal drilling - Is this the next Big Thing? - Kansas Geological Survey
  - Horizontal wells, fracking and regulation - Kansas Corporation Commission
  - Water permitting - Division of Water Resources
- **Development, Production and Water**
  - Shell Exploration and Production Company
- **Watering the Boom in Oklahoma**
  - Supplies, Demands and Neighbors - Oklahoma State Water Board
- **Water Bills in the 2012 Kansas Legislature**
  - Kansas Water Office
- **Planning the Mix of Energy Sources to Meet Future Demands**
  - Weather Energy

### Town Hall Discussion

**What is the role of government in energy development?**

Panel:
- Kansas Department of Commerce
- Kansas Independent Oil and Gas Association
- Kansas Corporation Commission
- City of Wellington

Moderator: Rex Buchanan, Kansas Geological Survey

### Registration

Meetings are open to the public but space is limited. **Registration is required**

Early registration is $15. Late registration after February 22, 2012 will be $20.

To register and pay online visit: [www.kwo.org](http://www.kwo.org). For more information call: 1-816-535-4400 or contact us at: kwo-info@kwo.ks.gov

Registration fees cover lunch, refreshments and meeting materials.
Conserving the Ogallala Aquifer
Research and Extension Symposium
Sponsored by the Kansas Water Resources Institute
IGP Main Conference Room
KSU Campus, Manhattan
Wednesday, October 19, 2011

Purpose: 1) To summarize KSU’s past and current research efforts on conserving the Ogallala Aquifer.

2) To obtain stakeholder input on future research needs.

Agenda

2:00 p.m. Welcome and Introductory Remarks - Dr. Dan Devlin, Director, KCARE

2:10 p.m. An Overview of the Ogallala Aquifer: - Dr. David Brauer, Research Scientist, USDA-ARS, Bushland, Texas

2:40 p.m. Kansas Irrigation Trends and Impacts – Dr. Danny Rogers, Department of Biological and Agricultural Engineering

3:00 p.m. Break

3:20 p.m. Effectiveness of Irrigation Technologies - Dr Norm Klocke and Dr. Freddie Lamm, Western Kansas Agricultural Research Center

4:00 p.m. Economic Implications of Water Management Policy - Dr. Bill Golden, Department of Agricultural Economics

4:40 p.m. Irrigation Scheduling using Climatic Data for a Range of Weather Conditions - Dr. Danny Rogers, Department of Biological and Agricultural Engineering

5:20 p.m. Setting the Future Research and Extension Objectives

5:50 p.m. Social

6:30 p.m. Oktoberfest Tailgate Meal
USGS Summer Intern Program

None.
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Notable Awards and Achievements


Farm Foundation; Agriculture, Food, Nutrition, and Natural Resources R&D Roundtable; Exemplary R&D Collaborations: Adoption of BMPs and Water Quality (Little Ark Watershed, KS), Case Study Selected for Special Recognition (1 of 14 selected nationally [61 nominated]) (www.farmfoundation.org).

Farm Foundation; Agriculture, Food, Nutrition, and Natural Resources R&D Roundtable; Exemplary R&D Collaborations: Ogallala Aquifer Program, Case Study Selected for Special Recognition (1 of 14 selected nationally [61 nominated]) (www.farmfoundation.org).

USDA-NIFA, Project of Excellence, Sources and Abatement of Fecal Bacteria in a High Priority TMDL Watershed in NE Kansas.


NIFA National Water Quality Project of Excellence Recognition for the extension and research program, Measuring Success of a TMDL Implementation Plan: Land, Stream, and Economic Responses to Targeted Stakeholder Actions.