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## 2016 USGS Water Use Grant Project Proposal for Kansas

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### Applicant:

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Division of Water Resources  
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Commencement date: November 1, 2016

Completion date: October 31, 2018

Official authorized to commit the applicant to proposed projects and enter into negotiations with USGS:

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## Abstract

The Kansas Department of Agriculture, Division of Water Resources collects water use data for all water rights within the state of Kansas. Nearly all of the water use tiers are met by Kansas except for monthly irrigation data. Monthly irrigation data could potentially be estimated based on seasonal trends, but no monthly data is currently being collected on annual irrigation water use reports as it has been deemed infeasible due to the large number of irrigation rights within the state. The water use data Kansas collects helps Kansas to address concerns outlined by the SECURE Water Act and state-specific priorities as reported water use is the driver for managing water rights in the state. Kansas water use data is reported by point of diversion, where the water was pumped from, and is related to a place of use, where the water was used. Because Kansas water use data is site specific, it can easily be interpreted and transferred to users who wish to analyze the data. DWR collaborates with other state agencies, the USGS, universities, groundwater management districts and many other organizations to ensure data quality and make data available to the public. Water use data can be downloaded through a web service the Kansas Geological Survey (KGS) hosts for DWR called the Water Information Management and Analysis System (WIMAS). Kansas is also working with the Water Data Exchange (WaDE) to make water use data more effectively available. Specific water use data requests, such as area summaries and multi-year analyses can also be made through Kansas' Open Records Request system. The current Water Rights Information System (WRIS) database, where water use and water right data is stored, has served the agency well for the last two decades, but there are ever-increasing demands on the database to provide for easier and more reliable data entry, querying, and broader data availability for intra- and inter-agency customers as well as the public at large. The current implementation of WRIS relies on obsolete data input and query forms that are becoming difficult to maintain and pose ever-increasing security risks not only to the data housed in WRIS but also to the agency's IT infrastructure. The agency needs to migrate the WRIS database from Oracle to Microsoft SQLServer in order to regain and maintain data access and interpretability, save on licensing fees, ensure KDA Technical Services section can provide assistance, maintenance, and security, and implement improvements to data QA/QC, entry, and use. A temporary employee would be brought on full-time to lead the project over a projected two-year development period after which the ongoing maintenance and support functions would be passed on to permanent agency IT staff. During the development phase, biweekly meetings will be held with KDA-DWR staff to track progress.



South Fork of the Republican River near St. Francis, KS

March 2, 2016 Chelsea Erickson, KDA-DWR

## Introduction

The Kansas Division of Water Resources (DWR) is one of the Divisions of the Kansas State Department of Agriculture (KDA). DWR is charged with responsibility to control, conserve, regulate, allot and aid in the distribution of the State's water resources through the administration of state laws, interstate compacts, and other assigned programs. DWR's role has become increasingly demanding as new responsibilities such as developing and implementing water conservation areas and in dealing with increasingly more complex interstate water issues which will have a significant bearing on Kansas' water resources. One of the major statutory responsibilities given to DWR is the Kansas Water Appropriation Act (K.S.A. 82a-701 et seq.). In 1945, the legislature enacted the Kansas Water Appropriation act which requires a water user to obtain a permit from the Chief Engineer (who is also the director of DWR) to appropriate the water of the state, with an exception for water used for domestic purposes. Until January 1, 1978, DWR's role, as it related to water rights, was primarily one of administration. After that date it became unlawful in Kansas, except for domestic use and other minor exceptions, to divert water for any beneficial purpose without the prior written approval of the Chief Engineer. This change fundamentally shifted the role of DWR to one of regulation. The limited nature of the state's water resources has required a shift in philosophy from one of development to one of conservation and management of water. There are currently over 32,500 active water rights in Kansas. Legislation has also been enacted to include such items as mandatory permits before water may be used, temporary permits to use water, inter-basin water transfers, Water Assurance District eligibilities, and provided tools to manage the use of water such as Intensive Groundwater Control Areas, Artificial Recharge projects, Augmentation projects, Local Enhanced Management Areas, and Water Conservation Areas. Some of these are applied by order of the Chief Engineer, but others may be done on a voluntary basis. This workplan provides an overview of Kansas water use data, describes the present system Kansas uses for storing water use data, compares the structure of Kansas water use data to the structure of the USGS defined water use tiers, discusses the significance of the migration project to the SECURE Water Act and state of Kansas' priorities, describes the transferability of Kansas water use data, describes the various parties Kansas collaborates with to make data available, and outlines the database migration project Kansas is submitting for the USGS Water Use Grant Application.

## Kansas Water Use Data Collection Overview

Kansas water use data is collected and published by the Division of Water Resources' (DWR) water appropriation program with help from the water management program for coding and quality assurance. The Kansas Water Use Reporting Program yields important information on how water is used in Kansas. Kansas water use data is used including:

1. The source of water used
2. The location water was diverted from
3. The location where water was used

4. A metered quantity of water used
5. Rate and hours of diversion
6. Use made of water –use is reported by all but domestic uses
7. Use of chemigation
8. Compliance and enforcement activities
9. Impairment investigations support information
10. Conserver Reserve and Enhancement Program enrollment eligibility
11. Potential abandonment of water rights
12. Water Banking
13. Interstate Compact Administration
14. Solutions to other inquiries

Each year, about 14,000 water use report forms for approximately 32,500 active water rights are mailed to water right holders for Kansas' 14 classified beneficial uses of water. The forms are to report water use for the year that just ended. In December, 2016, with the finishing up of the Kansas River basin, water quantity meter requirements will be in effect for all water users across the state of Kansas.

The largest water use category for Kansas is irrigation. The other categories are Municipal, Industrial, Hydraulic Dredging, Stockwatering, Recreation, Contamination Remediation, Artificial Recharge, Thermal Exchange, Dewatering, Fire Protection, Water Power, Sediment Control and Domestic. All forms are preprinted with Name, Address and specific water right information by file number(s) based on data from the Water Right Information System (WRIS) database. The irrigation forms are presently printed by another State



Example irrigation meter, February 7, 2012 GMD #3

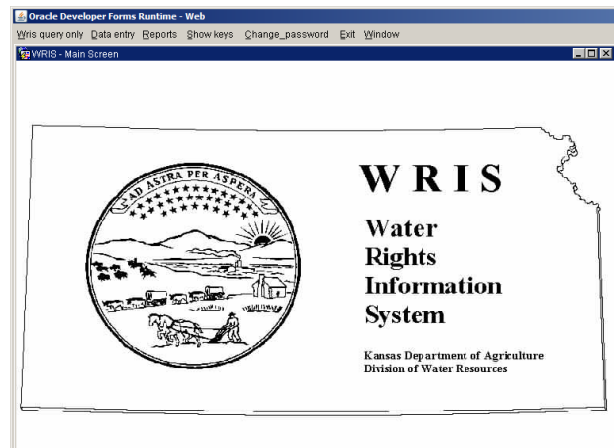
agency, while the non-irrigation reports are printed on 8½" x 11" papers in-house. The bulk mailing of the entire group of water use reports is targeted for the first working week in January. The reports are due back to the Division of Water Resources by March 1, pursuant to Kansas Law, K.S.A. 82-732. Failure to file the required water use report by the March 1, deadline subjects the owner to civil penalties not to exceed \$250 per water right file number. Non-reporting penalties will be increased as of the 2016 water use reporting year to a maximum of \$1,000 per file to help address reoccurring and intentional failures to file reports.

The received reports are stamped with the day they were received, and sorted by use type in order of Person ID, which is a unique number assigned to each person or entity recognized in the WRIS database. An initial data entry stage is completed which lists the date of receipt along with a check-off flag to show the water use report has been successfully filed. Each report is then initially reviewed by staff of the water use unit and is “coded”, which results in a single letter code being assigned to reported water which indicates the type of data presented by the water user. Almost all letters of the alphabet are currently in use to show either a “use” or “non-use” code with more specific information integrated into which specific code is applied to each point of diversion on the report. Coding is an extensive process in which each point of diversion on every water use report (about 48,000 points of diversion total) undergoes a first analysis by an environment scientist, who earmarks the data for later classification, comparison and general inquiry. After the coding process is completed, the reports go to the data entry section for entry of water use data with assigned codes into the WRIS database. Data entry is to be accomplished by April 15 each year, to meet one of Kansas’ obligations under the Republican River Compact which is state and federal law.

Online water use reporting was made available in Kansas 2014, and as of 2016 all water use types may report through the online portal. Reporting online complies with the water use reporting requirements of the Kansas Water Appropriation Act and if a report is submitted online a paper report should not be submitted. DWR’s online reporting portal was developed in cooperation with the Kansas Geological Survey and the Kansas GIS Data Access and Support Center. Water users are mailed an annually changing PIN and a static Person ID number at the beginning of each year which they use to access their personalized entry form. To view the start page of the website, please go to <http://www.kswaterusereport.org/report/login.cfm>. For the 2015 water use reporting year 1,881 reports, representing 5,635 water rights, were submitted online, representing 15% of all water use reports received in 2015. Kansas’ online reporting system has many checks worked into the program to catch entry errors and improve data integrity. Online entry also removes the time required for coding and entering data by DWR staff. DWR has received very positive feedback from users of the online portal and plans to keep improving and using the portal as an alternative to paper reporting.

## Description of Present System

The primary tool used by DWR for enforcement, management, planning, and research in water resources matters is the Water Rights Information System (WRIS). WRIS is a digital database containing all water rights on record in the state of Kansas. WRIS is currently in the Oracle database environment and



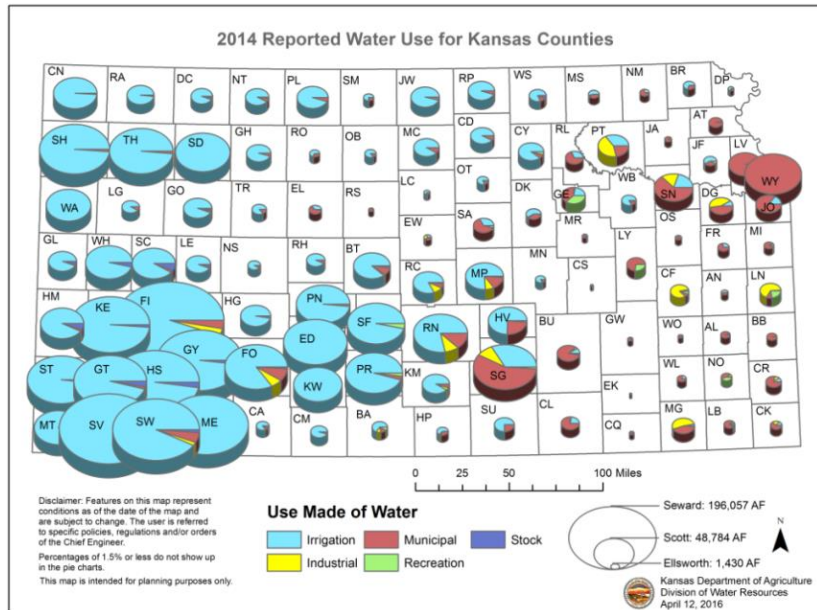
populated with data that was migrated from a mainframe computer system in 1996 and all data since then. It is used daily by DWR staff to make decisions pertaining to the appropriation and management of water. It is also used by other state, federal, and local agencies, as well as universities. Water use data can be obtained either through an online web-portal maintained cooperatively with the Kansas Geological Survey's Water Information Management and Analysis System (WIMAS) or through computer-generated data distributed through open records requests. WRIS is an absolutely vital tool to DWR and without it, it would be nearly impossible for DWR to fulfill its statutory requirements.

WRIS is currently housed on servers owned by the state of Kansas and is stored in an Oracle 10G database. Web entry forms are used by DWR employees to enter data into the database, make changes to data, create data summaries, and many other day-to-day tasks. The current web entry forms were developed in Java version 6.31. This version of Java is no longer supported by Oracle and cannot be updated without rewriting the web entry forms—a task which is infeasible due to lack of expertise, budget constraints, and the need to move to a less costly and more suitable database structure. Many of the forms originally developed are no longer functioning properly and the workflow is disjointed due to long paths that users must take in order to get to required entry fields.

WRIS is one of three remaining KDA databases that are still based in Oracle; all other KDA databases that were in Oracle in the department have since been migrated to SQLServer. SQLServer is now the preferred database due to department expertise with the structure, sufficient functionality for DWR needs, and reduced licensing fees. The KDA Information Technology (IT) section keeps software developers in-house who are skilled in working with SQLServer. Their expertise has been used in setting up and maintaining other department databases. Because the Java version is obsolete it is unrealistic to continue to staff KDA IT with personnel that have skills to maintain and develop in that environment. Once the database is upgraded, changes in functionality and forms updates will be possible to make them more usable, a thing that has not been possible for many years due to the outdated version of Java. Oracle is an extremely versatile program and has functionality far beyond what DWR needs to support Kansas water use and water right data. SQLServer's functionality is complex enough to allow what functionality DWR requires without being overly complex. SQLServer is a Microsoft product and licensing for it is included in KDA's licensing with other Microsoft products. Currently DWR spends approximately \$11,500 each year in licensing fees for Oracle associated with WRIS. This cost is part of a \$60,000 annual fee that is split between the divisions in KDA which are using those last three Oracle databases. Plans are currently being made for the migration of the other two KDA databases from Oracle to SQLServer. Once the other two databases have been transferred, sole responsibility for that \$60,000 Oracle licensing fee will lie with DWR. DWR would like to migrate WRIS from Oracle to SQLServer over the next year to minimize funds spent on unnecessary licensing fees.

## Kansas Comparison to USGS Grant Tiers

Kansas has met nearly all of the Tier 1, 2 and 3 baseline goals as defined in the USGS Water Use Data and Research Financial Assistance Guidance document. WRIS does not store consumptive use, but it is calculated on a case-by-case basis in Kansas throughout the life of a water right. Consumptive use is defined as the gross diversions minus 1) waste of water as defined in K.A.R. 5-1-1 (cc) and 2) return flows to the source of supply. Return flows include both through surface water runoff, which is not waste, and deep percolation. Consumptive use is calculated in Kansas on a case-by-case basis in order to ensure that changes to uses made of water do not result in increases in overall consumptive use (K.A.R 5-5-8). Records of these consumptive use calculations are stored in individual water right files, which are in paper format. Consumptive use changes are primarily of concern when changing a water right from an irrigation use to a non-irrigation use (see K.A.R. 5-5-8 through 5-5-12 for processing details). Water use categories are outlined below in regards to each of the tier goals.



Category	<b>BASELINE GOALS (Tier 1)</b>	<b>Tier 2</b>	<b>Tier 3</b>
<b>Public Supply</b>	<p>Monthly withdrawals reported by system, water source, and water type.</p> <p>Deliveries to domestic users from public-supply systems, and populations served.</p>	<p>Site-specific annual and monthly withdrawals (by intake, well, or well field) reported by water source, and by water type.</p> <p>Quantity of water purchased between systems, and source(s) of purchased water.</p>	<p>Interbasin transfers.</p> <p>System uses (internal and other non-revenue uses) and losses.</p>

	Report system information relevant to HUC-8 and county, and groundwater withdrawals with aquifer designation.	Quantity of water sold between systems.  Reporting and/or verification of water deliveries for domestic, commercial, industrial, thermoelectric and other use.	Improve estimates of populations served by site (for example, by surface-water intake, well or well field).  Use of reclaimed wastewater for public or landscape irrigation.
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### **Municipal Water Use (Public Supply)**

The Kansas DWR collects nearly all of the above referenced information in tiers 1, 2 and 3 except for the last part of tier 3: use of reclaimed wastewater for public or landscape irrigation, which is collected by the Kansas Department of Health and Environment (KDHE), a different state agency. Beginning and ending meter readings, metered quantities, hours pumped, rate of pumping, well depth, depth to water, and date the well was measured are collected on each annual water use report. Well depths and rate data are not actively followed up on by the agency or stored in WRIS, so these portions are typically left blank or very roughly estimated by the user. Annual municipal water diversions are reported on a site specific basis and are statutorily required by all water right holders across the state accurate to the gallons unit. Monthly municipal water use diversions summarize use from all points of diversion on each entity's (municipality or other water supplier) water use report accurate to the thousand gallons unit. Monthly municipal water use data is broken down into 1) raw water diverted under all rights, 2) water purchased from other suppliers, 3) water sold to other suppliers, 4) water sold to industrial, stockwater, feedlot and bulk water service connections, 5) water sold to residential and commercial customers, 6) metered water provided free and 7) unaccounted for water (column 1 + column 2 – column 3 – column 4 – column 5 – column 6 = column 7). Entities submit annually the population served and number of connections to their system. Connections include individual assessments on numbers of 1) residential, 2) commercial/institutional, 3) industrial, 4) pasture/stockwater/feedlot, 5) other (public services provided free, churches, fire departments, etc.) and active residential connections outside of the city limits. There is a section of the Kansas municipal water use report where wastewater discharge can be accounted for, but this data is not actively followed up on by the agency or stored in WRIS, so this section is typically left blank or very roughly estimated by the user. Reclaimed wastewater data is neither collected by DWR nor stored in WRIS. Water purchased and sold between municipal water users is also tracked on the annual report accurate to the thousand gallons unit.

In Kansas, "Municipal use" refers to the various uses made of water delivered through a common distribution system operated by any of the following:

- (1) a municipality;
- (2) a rural water district;
- (3) a water district;
- (4) a public wholesale water supply district;
- (5) any person or entity serving 10 or more hookups for residences or mobile homes; or
- (6) any other similar entity distributing water to other water users for various purposes.

Kansas municipal use also includes the use of water by restaurants, hotels, motels, churches, camps, correctional facilities, educational institutions, and similar entities using water which do not qualify as domestic users.

### Industrial Water Use

Category	<b>BASELINE GOALS (Tier 1)</b>	<b>Tier 2</b>	<b>Tier 3</b>
<b>Industrial</b>	Annual withdrawals by facility, reported by water source, by water type, and industry classification.	Site-specific (by intake and/or well) annual and monthly withdrawals reported by water source, by water type, and industry classification.	Site-specific consumptive use estimates.
	Groundwater withdrawals reported with reference to aquifer.	Deliveries from public supply to industrial facilities and deliveries from other sources, such as treated wastewater.	Site-specific discharges to surface water, or land application.

Kansas DWR collects nearly all of the above referenced information in all three tiers for industrial use. Beginning and ending meter readings, metered quantities, hours pumped, rate of pumping, well depth, depth to water, and date the well was measured are collected on each annual water use report. Rate and well depth related data are not actively followed up on by the agency or stored in WRIS, so these portions are typically left blank or very roughly estimated by the user. Annual industrial water diversions are reported on a site-specific basis and are statutorily required by all water right holders across the state accurate to the gallons unit. Monthly data by entity is broken down to show 1) water diverted from all authorized points of diversion, 2) water purchased from all other entities, 3) water sold to other entities and 4) the total amount of water used by the industry (column 1 + column 2 – column 3 = column 4). Additionally, for industrial users that secure portions of their water through water assurance districts, though the user reports such use on their annual water use report, the agency will not

store those portions in WRIS because they are accounted for by the Kansas Water Office. This is done to avoid double charging industrial users on water protection fees. This is a relatively small amount of water overall, but must be obtained from the paper reports if total water use from the entity is desired. Industrial consumptive water use is not stored in WRIS but can be calculated on a case-by-case basis (K.A.R. 5-5-8 through 5-5-12).

In Kansas, industrial use refers to the use of water in connection with the manufacture, production, transport, or storage of products, or the use of water in connection with providing commercial services, including water used in connection with steam electric power plants, greenhouses, fish farms, poultry operations that are not incidental to the operation of a traditional farmstead pursuant to K.S.A. 82a-701(c) and amendments thereto, secondary and tertiary oil recovery, air conditioning, heat pumps, equipment cooling, and all uses of water associated with the removal of aggregate for commercial purposes except the following:

- (1) The evaporation caused by exposing the groundwater table or increasing the surface area of a stream, lake, pit, or quarry by excavation or dredging, unless the evaporation has a substantially adverse impact on the area groundwater supply; and
- (2) hydraulic dredging.

Industrial use also includes the poultry production in Kansas. Water rights are required for facilities using 15 acre-feet or more per year, this can be estimated by the head count of poultry are described by K.A.R. 5-3-22.

### Irrigation Water Use

Category	BASELINE GOALS (Tier 1)	Tier 2	Tier 3
<b>Irrigation-Crop</b>	<p>Aggregate annual withdrawals reported by water source, by water type, acres irrigated, and method of irrigation.</p> <p>Aggregate areas may be sub-county levels, but are feasible to summarize to county or HUC8.</p>	<p>Site-specific monthly withdrawals by well and/or diversion from surface-water feature, or delivery from reclaimed wastewater.</p> <p>Monthly withdrawals reported by water source, water type, with associated acres irrigated and crop type, and method of irrigation system.</p>	<p>Consumptive use and conveyance loss estimates by aggregate area (sub-county, county, HUC8, or up to HUC12.</p> <p>Site-specific return flows.</p>

The Kansas DWR collects all of the above referenced information in the first tier. Beginning and ending meter readings, metered quantities, acres irrigated, crop type, system type, hours pumped, rate of pumping, well depth, depth to water, and date the well was measured are collected on each annual water use report. Well depth and rate data are not actively followed up on by the agency or stored in WRIS, so these portions are typically left blank or very roughly estimated by the user. Annual irrigation water diversions are reported on a site specific basis and are statutorily required by all water right holders across the state accurate to the gallons unit. Tier two is not met as DWR has determined that requiring monthly withdrawals for irrigation to be reported for each point of diversion would not be feasible due to the large number of irrigation wells in Kansas, burden to the user, lag time between when the data was measured versus when it was reported, higher priority objectives, uncertain value of the data to Kansas and the lack of resources to properly gather, check and enter the data into WRIS. Tier three, site-specific return, is not stored in WRIS. Irrigation consumptive water use is not stored in WRIS but can be calculated on a case-by-case basis (K.A.R. 5-5-8 through 5-5-12). In Kansas, Irrigation use refers to the use of water for the following:

1. the growing of crops;
2. the watering of gardens, orchards, and lawns exceeding two acres in area; and
3. the watering of golf courses, parks, cemeteries, athletic fields, racetrack grounds, and similar facilities.

### Thermoelectric

Category	BASELINE GOALS (Tier 1)	Tier 2	Tier 3
<b>Thermoelectric</b>	Site-specific, annual and monthly withdrawals, and net power generation reported by cooling-system type (once-through or recirculating), by water source and by water type, and the source of the information (plant, govt. agency, etc.).  Site-specific return flows.	Site-specific annual and monthly consumptive use.	

Nearly all tiers met, see the industrial use section.

## Self-Supplied Domestic

Category	BASELINE GOALS (Tier 1)	Tier 2	Tier 3
<b>Self-Supplied Domestic</b>	Self-supplied domestic populations, by HUC8 and county, and by water source.	Studies of actual metered domestic withdrawals, monthly by source. Improve estimates of self-supplied populations by utilizing property data and/or public water supply service areas, or other methods.	

While some domestic users in Kansas turn in water use reports, the majority of them do not –as it is not required for domestic users to own water rights or turn in annual water use reports. Values for statewide domestic use can be reasonably inferred from property data or population and regional GPCDs, which are calculated annually using Kansas’ water use data by the USGS. Though this information is not required, data submitted by domestic water right users to DWR often consists of annual diversions with hours and rates of operation or head count for very small livestock operations.

## Irrigation – Golf Courses

Category	BASELINE GOALS (Tier 1)	Tier 2	Tier 3
<b>Irrigation, Golf Courses</b>	Site-specific annual and monthly withdrawals reported by water source, by water type, and acres irrigated. Groundwater withdrawals designated by aquifer.	Consumptive use estimates, by course, reported by month or annual.  Acres irrigated by system type, by course.	

Golf course irrigation is reported under irrigation water use in Kansas. Tier one and two are both met, except for the monthly diversion data and consumptive use. Irrigation – golf course consumptive water use is not stored in WRIS but can be calculated on a case-by-case basis (K.A.R. 5-5-8 through 5-5-12).

## Stockwatering (Livestock) Water Use

Category	BASELINE GOALS (Tier 1)	Tier 2	Tier 3
Livestock	Annual withdrawals for major facilities, reported by water source and by water type.	Site-specific annual and monthly withdrawals for all facilities reported by source of water, and by water type.  Site-specific animal counts and animal type.	Improved and verified coefficients for water use per head for animal type, confined or open-range, seasonal variability, and other variables.  Water withdrawals from sources supported by USDA programs to protect streams.

The Kansas DWR collects all of the above referenced information in all three tiers for stockwatering. Some entities report withdrawals on a monthly basis. Some users include summaries by point of diversion others provide comprehensive details on their water use operations such as head of livestock watered.

In Kansas, Stockwatering refers to water used for the watering of livestock and other uses of water directly related to either of the following:

1. The operation of a feedlot with the capacity to confine 1,000 or more head of cattle.
2. Any other confined livestock operation or dairy that would divert 15 or more acre-feet of water per calendar year.
3. Stockwatering shall not include the irrigation of feed grains or other crops.

For the purposes of this subsection, a group of feedlots or other confined feeding operations shall be considered to be one feedlot or confined feeding operation if both of the following conditions are met:

1. There are common feeding or other physical facilities.
2. The group of facilities is under common management.

Kansas law defines average consumption for other livestock in K.A.R. 5-3-22, if the annual total calculated from the daily consumption is 15 or more acre-feet per year then a water right is required and use must be reported.

## Mining

Category	BASELINE GOALS (Tier 1)	Tier 2	Tier 3
<b>Mining</b>	Annual withdrawals reported by HUC-8 and county, by source of water, and by water type.	Site-specific annual and monthly withdrawals. Site-specific commodity identified.	Evaluation/reporting on water use by process (commodity processing, dewatering, dust suppression, etc.).  Reporting on return flows/discharge of water from dewatering.

Use of water for Mining is reported under Industrial water use in Kansas. This water use category is reported annually on a site specific basis. Monthly industrial-mining data is collected by entity.

## Aquaculture

Category	BASELINE GOALS (Tier 1)	Tier 2	Tier 3
<b>Aquaculture</b>	Annual withdrawals reported by HUC-8 and county, by source of water, and by water type.	Site-specific annual and monthly withdrawals. Site-specific facility information (method, species cultured, etc.)	

In Kansas, water used for Aquaculture (fish farms) is included under industrial use. All tiers met.

## Commercial

Category	BASELINE GOALS (Tier 1)	Tier 2	Tier 3
<b>Commercial</b>	Annual and monthly deliveries from public supply for commercial use.	Site-specific annual and monthly withdrawals for self-supplied establishments.	

All tiers met. In Kansas, Commercial water use is included within the municipal water use report for the city in which the commercial entity resides. These are not broken down by

individual entities, but rather a count of how many commercial connections the city provides for is kept and total diversions for all of those connections together is recorded. Self-supplied commercial users with water rights will report water under Industrial use, however, very small self-supplied commercial users are treated as domestic users and are not required to submit water use.

### Hydroelectric

Category	BASELINE GOALS (Tier 1)	Tier 2	Tier 3
<b>Hydroelectric Power</b>	Site-specific, annual and monthly water use (water use to spin turbines) by water source and water type, and the source of the information (plant, govt. agency, etc.).		

Hydroelectric water use is reported under Industrial water use in Kansas and also includes water power for non-consumptive water use from the Bowersock dam in Lawrence, KS. All tiers are met.

### Wastewater Treatment

Category	BASELINE GOALS (Tier 1)	Tier 2	Tier 3
<b>Wastewater Treatment</b>	Annual and monthly deliveries from wastewater treatment plants to other users. Specify category delivered to (i.e. industrial, thermoelectric, irrigation, etc.)		

The Kansas Department of Health and Environment collects this data as well as permitting and enforcing regulations. This data is not stored in WRIS.

More detailed information on uses made of water, how beneficial use is determined, the process for applying for water rights and much more can be found in the Rules and Regulations of the Kansas Water Appropriation Act, [https://agriculture.ks.gov/docs/default-source/statutes-water/kwaa\\_rules\\_regs57C3ADA8D515.pdf?sfvrsn=4](https://agriculture.ks.gov/docs/default-source/statutes-water/kwaa_rules_regs57C3ADA8D515.pdf?sfvrsn=4).

## Water Right Information System Migration Project

The Division of water resources WRIS database is the backbone of Kansas' water use reporting system. It provides the information on water rights used to mail out reports to the state at the beginning of each year and is where the data returned from water users is ultimately stored.

UMV	Year	Person ID	Seq	Last Name	First Name	Field Office

WRI ID	PDIV ID	County	WRI Num	Quid	Batt ID	Ctr	Town	Township	Range	Dir	Section	Seq	Date Report Received	Overlap File #	Chemigation?	WRI Re Code

WRIS entry form for annual water use data

WRIS contains 25 years of reliable water use data representing over 32,500 active water rights, some water use data is available prior to the 1970s, but since reporting was not required then the oldest data is rather incomplete. Kansas water use data is used to answer questions related to statewide water use, its source, place of use, time of use, the amount of water sold between entities, the administration of water rights, approval of new water right applications and water right changes, and many more integral tasks performed by DWR and other users of the data. It is because of DWR's dependency on this database that keeping it functional is becoming more and more of a concern to KDA, DWR.

Very few improvements in the functionality of the WRIS forms have been made over the last 10 years, with bug fixes being the primary improvements. WRIS is currently running in an Oracle 10G database, the capabilities of which exceed the needs of the WRIS infrastructure. The annual cost of KDA licensing fees with Oracle is approximately \$60,000 which is shared between the three databases that run off of Oracle. The portion of this total fee that DWR is currently responsible for is \$11,500, which is expected to rise as other divisions within KDA move their data out of Oracle over the next few years. The annual cost of licensing fees for SQLServer are already worked into licensing covered through other Microsoft product licensing Kansas holds, so no further expense would be incurred due to the migration. DWR's in-house Technical Services Department (KDA-IT) are advocating moving the WRIS database from the Oracle database to a SQLServer in order to regain and maintain data access and interpretability, meet state security initiatives, save on licensing fees, ensure KDA-IT can provide assistance/maintenance, and implement improvements on data QA/QC, entry, and use. Forms that were previously created with Java will be developed in an asp.net or html browser.

Another main driver for DWR to make this upgrade is that the database expert, Jim Bagley, plans to retire in the next few years. Having him available to consult throughout the migration process is of upmost importance as he is the only person still with DWR who understands the intricacies of the database, the relationships between all of the many tables, needed improvements to the data structure, and the history behind why the database was originally set up as it was. Trying to migrate the data without Jim would not only make the process more difficult but would greatly increase the chances of losing data integrity.

A timeline of two years with roughly monthly work meetings, more often as the project demands, between the KDA-IT's database developers and DWR water rights specialists, following the Agile Software Development strategy, would be conducted to actively work through the development process and keep things moving in the intended direction. A new

temporary employee would be hired by KDA-IT to lead the project over the two-year development period with aid of permanent employees who the database would then be passed back to for maintenance and future improvements. The following tasks to point 4, building reports that existed in the previous setup, will be accomplished by the KDA IT project leader over a two-year period with monthly work meetings and updates with DWR staff. This would effectively get DWR to a point where the database could be used, but there would still be functionality improvements and connections to external sources that will need to be made. Because of this Kansas will also be planning to submit another request in 2017 requesting funds for the second half of this project in which DWR will finish and the tasks outlined in steps 4 through 8.

1. Migrate data architecture while keeping referential integrity
  - a. Tables
  - b. Primary keys
  - c. Foreign keys
  - d. Data types
  - e. Allowance of nulls
2. Build database objects
  - a. Views
  - b. Functions
  - c. Sequences
  - d. Triggers
  - e. Domains
3. Build “screens” for users
  - a. Data entry
  - b. Changes
  - c. Queries
  - d. Ad hoc/data mining enhancements
4. Build reports
  - a. Water right information report
  - b. Amount statistics report
  - c. County appraisers report
  - d. Generation of water use reports
  - e. Republican River model area
  - f. Overlap groups
  - g. Compliance and enforcement
  - h. Nonuse notices
  - i. Time to complete notices
  - j. Time to perfect notices
  - k. CREP
  - l. WRCP
  - m. Place of use GIS layer
5. Interfaces with other programs
  - a. KGS online water use reporting application
  - b. KGS Water Information Management and Analysis System (WIMAS) web download
  - c. ArcGIS WIMAS toolbar
  - d. Water Structures Inventory Database

- e. Expansion of publically available water use data –set boundaries
  - f. Access to WRIS through mobile devices
- 6. Routine data checks
  - a. Recreating tools such as the macro-enabled spreadsheets DWR uses to run routine checks
- 7. Make queries available for checking common issues (location entry, water use outliers, etc.)
- 8. Future improvements
  - a. Added routine data checks: Approximately biweekly checks that a data entry specialist could run to pull common entry issues, such as latitude and longitude comparisons to county or basin, would improve data integrity and usability.
  - b. Tool to pull water use and water right info from commonly used boundaries: Water use from common spatial extents such as counties, Regional Planning Areas, basins, and Groundwater Management Districts would decrease the amount of time spent on Open Records Act Requests and other common data requests.
  - c. Tool to track sources and purchasers of water for municipal and industrial uses: Would be used to better track water sold/purchased across the state and aid in calculating water protection fees.
  - d. Expand usability of publically available data: Water use data is used by many external agencies and individuals and the most common way of accessing this data is through open records requests. This requires DWR employees to create datasets of individual requests that could more effectively be made available via a publically available web interface, such as ArcGIS online.
  - e. Water use available by different spatial extents, i.e., county, township, groundwater management district, basin, etc.
  - a. Selectable fields to customize data to users' requests

## Other Water Use Improvement Priorities

Many potential projects were discussed prior to Kansas determining that the WRIS update was the most important priority for DWR, these projects include:

- 1) Creating a place of use geospatial layer for WIMAS: WIMAS is an ArcToolbox tool created by DWR and KGS to facilitate the use of common geospatial layers in daily workflows. WIMAS allows users to easily find common data layers and download water use data by a radius around a particular water right file, county, DWR basin, or viewable map extent. The place of use layer would link water rights and points of diversions to their associated places of use and display the respective acres irrigated. This project was tabled with hopes of tackling it after the WRIS migration.
- 2) Improving data quality: DWR currently uses a macro-enabled spreadsheet to walk through common checks on irrigation water use data directly after the water use is

entered; however, other use types (municipal, industrial, etc.) do not have macro-enabled spreadsheets developed. The other use types go through a separate rounds of QA/QC which are highly dependent on analyzing output from queries in excel. This results in a similar procedure, but requires the person running the queries and analyzing the data to be more familiar with data processing. This project was tabled in hopes of creating automated checks within the database through the WRIS migration.

- 3) Creating more predefined geospatial WRIS selections for analyzing data: DWR spends a lot of time fulfilling water use data request for different spatial extents such as regional planning areas (RPAs), intensive groundwater use control areas (IGUCAs), groundwater management districts (GMDs), local enhanced management areas (LEMAs), water conservation areas (WCAs), counties, DWR basins, groundwater model domains, and various other spatial extents. Having more predefined queries available or the option to pull data given the extent of any defined geospatial layer would decrease processing time and reduce the possibility of errors occurring in data due to incorrect processing. This project was tabled with hopes of tackling it after the WRIS migration.
- 4) Distributing data entry workload: Data quality and timely entry have recently become priorities for DWR. Currently DWR has only one employee specializing in entry for a water related data in our headquarters office. This position is responsible for entering data on annual water use reports, compliance investigations, water right new and change applications, findings and orders, and much more. During water use season other headquarters staff have been required to assist in data entry in order to meet department deadlines, which puts them behind in their regular duties. Hiring of an additional employee would help with data entry and QA/QC efforts. This project was tabled in hopes of automated checks developed through the WRIS migration and online water use reporting helping in the QA/QC and entry efforts, and due to the limitations on funding for this project.
- 5) Converting water right documents on paper and old onion-skin to digital files: Many of the original documents, including water use reports, from before the 1970s are stored on onion-skin paper (very thin and subject to crumbling and tearing) and microfilm, both of which are reaching the ends of their usable lives. Creating a digital copy of these would ensure that these records are kept safe and accessible by DWR staff and the public. This project was tabled due to the exorbitant costs and time commitments associated with scanning these documents.
- 6) Installing telemetered totalizing water flowmeters on irrigation wells: One of the USGS defined tiers that Kansas does not currently meet is monthly irrigation data. DWR has not done this previously due to the huge amount of irrigation water rights in Kansas and the infeasibility of requiring irrigators to keep up with monthly withdrawals. Telemetered totalizing water flowmeters on irrigation wells could easily and accurately gather water use data while also saving on data entry and reporting requirements. This would originally be implemented as a pilot project with approximately three to five test sites.

From the success or failure of the operation DWR would determine if this could be a feasible way to obtain higher resolution state-wide data. This project was tabled to focus resources on the database migration described above which is a much higher priority to DWR at this time.

## The SECURE Water Act and Kansas Water Use Data

The Kansas water use database migration relates to the SECURE Water Act in that the improvements to data accessibility and security will not only increase the usability of data, but the addition of reports and queries for tracking water sold between municipalities and industries will make tracking water supply much more efficient. Water used for power generation, hydroelectric or thermal exchange, could also be easily gathered through premade queries and forms on demand. Kansas has an interconnected system of reservoirs which are used for flood control and maintaining streamflows in the eastern half of the state. These are primarily Federal reservoirs maintained by the Corps of Engineers and storage has been purchased from them through the Kansas Water Office (KWO). KWO then sells the water under contract to users and natural flows can also be used to fulfill downstream water rights given that enough streamflow is maintained to meet minimum streamflow requirements. DWR is currently working on improving the capabilities of tracking water from KWO reservoirs to its users, a process that has been unable to accomplish through querying the database up to now. One of the main purposes of the SECURE Water Act is to secure water for beneficial uses, and that is the primary purpose of water use data collection in Kansas as this data is used to enforce and regulate both surface water and groundwater use across the state.

## State Priorities

Migrating the WRIS database is a priority for the Kansas Department of Agriculture most notably because of the huge security risk posed by using such out-of-date Java forms. This security risk has been identified by KDA-IT as a major threat that needs to be rectified to ensure data integrity. KDA plans have all databases off of Oracle in the next three years, and DWR's WRIS migration fits into this plan.

The water use data Kansas collects helps Kansas work toward reaching goals outlined in the Kansas Governor's 50-year Water Vision. In response to Kansas Governor Brownback's charge to create a 50-year water vision in Kansas, the Kansas Department of Agriculture (KDA)



partnered with the Kansas Water Office, Kansas Water Authority, Kansas Department of Health and Environment, Wildlife, Parks and Tourism, and the Governor's Council of Economic Advisors to develop the Vision for the Future of Water Supply in Kansas. In response to Phase I action items of the Vision, KDA is coordinated five Water Vision Education and Outreach Working Group meetings to identify needs, develop statewide education and outreach materials, and implement tangible action steps to help all Kansans understand the importance of water and water issues in the state. Education and outreach materials were primarily created using water use data stored in WRIS. One of the goals of the migration is to make summaries, such as those requested through Vision process (Regional Planning Areas, Groundwater Management Districts, and counties) more readily available through premade queries and reports. As things currently stand, only a few DWR staff familiar with the database structure, scripting, GIS and data manipulation are capable of creating summaries and spatial analyses of water use data.

## **Transferability of Kansas Water Use Data Program**

The basis of any successful water use program is its data storage system. If a water use program cannot effectively and securely store, edit, and access its data, then the data is fundamentally useless. To the extent that other states have not developed a relational database to house their water use data, the work that KDA will perform to modernize the WRIS database will provide a valuable template for not only the structure to house the data, but also a catalog of attributes help other states think about the kinds of data that will be useful in managing their own water resources.

## **Collaboration**

DWR regularly works with the Kansas USGS Water Science Center (USGS) and was originally introduced to the USGS water use grant funding opportunity by DWR's contact out of the Lawrence, KS office, Jenny Lanning-Rush. Jenny answered questions and helped DWR understand what all needed to be submitted in the initial application for funding to develop the workplan. Two members from the DWR water use team, Andy Terhune and Ginger Pugh, attended the USGS Water Use Grant discussion session in Salt Lake City, Utah, to gather information and provide feedback to the USGS. In Salt Lake City, DWR was able to speak with other state water use collectors and compare where they were in terms of the USGS water use tiers. This helped Kansas understand that DWR's water use reporting system is fairly far advanced beyond most other states' systems.

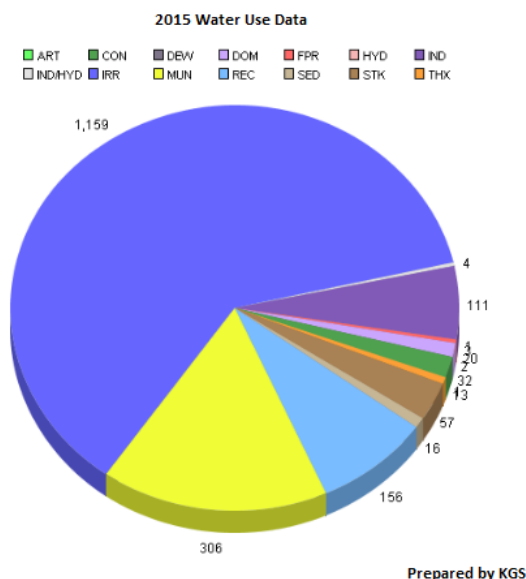
DWR has collaborated with the USGS through Jenny on potential projects to use for applying for funding, and has further projects beyond what is outlined in this workplan which DWR plans to attempt in the future –for example, an irrigation telemetry pilot project for gathering monthly irrigation data. Three members of the DWR water use team, Andy Terhune, Chris Beightel, and Ginger Pugh, participated in the June 15, 2016, water use development and

research conference call. Copies of the Kansas workplan in various stages of completeness have been sent to Jenny to track progress and seek suggestions. During the construction of the workplan DWR has been very glad to have access to Jenny to bounce ideas off of and to seek answers from for the application process.

Outside of the scope of the workplan, DWR has memorandum of understanding (MOU) in place with the USGS to produce annual gallons per capita per day (GPCD) calculations from Kansas water use data. The USGS is in regular contact with DWR throughout development of the GPCD dataset and DWR provides peer reviews of the data releases. The production of this GPCD data involves a significant amount of quality checking of the data covered under the USGS/DWR MOU executed by Jenny Lanning-Rush in the Lawrence USGS office. Jenny's predecessor, Joan Kenny, was instrumental in building the Kansas municipal water use report and has trained DWR employees on municipal water use report coding, which she used to assist with through the MOU prior to retiring. Jenny has access to the WRIS database and queries it through SQLDeveloper, she then analyses the data, compiles lists of potential problems in data entry or trends compared to previous years, and passes these problem files on to DWR who verifies and corrects the issues as needed. This process greatly increases the accuracy of Kansas water use data and DWR is very pleased to have this MOU in place. The USGS also produces an annual summary of irrigation water use in Kansas which follows a similar process as the GPCD publican and also helps to improve data quality. DWR also provides peer reviews for the irrigation water use data release.

The USGS has worked with DWR and KGS to improve online water use report, most particularly in regards to municipal water use reporting. DWR, USGS and KGS is currently working on a way to automate checks between user entered population data and census population data for the service area. There have been reoccurring issues with users duplicating residential connection data as population data on municipal water use reports, which can greatly understate the actual population served. This check DWR is adding would compare residential connections to population and if the value was a certain percentage different than the projected population, display a message to the user that their population may be in error.

**Water Use Reports Submitted Online by Use Type**



DWR also collaborate with universities, groundwater management districts and many other organizations to ensure data quality and make data available to the public. Water use data

can be downloaded through a web service KGS hosts for DWR called the Water Information Management and Analysis System (WIMAS). Kansas is also working with the Water Data Exchange (WaDE) to make Kansas water use data more accessible. Specific water use data requests, such as area summaries and multi-year analyses can also be made through Kansas' Open Records Request system.

## **Water Use Grant Summary**

Kansas is very proud to have an extensive and effective water use reporting system and wants to ensure that the data collected remains in a viable and accessible format for years to come. Migrating WRIS to SQLServer would allow DWR to meet state priorities in security and accessibility as well as make data more accessible for external users. DWR enjoys working closely with the USGS on water use data and would like to maintain this good relation through easier and more secure access to Kansas water use data. KDA-DWR looks forward to improving the Kansas water use database over the next few years.