

# LOWER ARKANSAS RIVER BASIN TOTAL MAXIMUM DAILY LOAD

## Water Body: Arkansas River below Wichita Water Quality Impairment: Fecal Coliform Bacteria

### 1. INTRODUCTION AND PROBLEM IDENTIFICATION

**Subbasin:** Middle Arkansas–Slate

**County:** Sedgwick

**HUC 8:** 11030013

**HUC 11 (HUC 14s):** 100(50,60,80)

**Drainage Area:** 1720 square miles between Derby and Maize

**Main Stem Segments:** 3; starting at the confluence with the Little Arkansas River and ending with the confluence of Cowskin Creek.

**Tributary Segments:** Non-WQLS: E. Chisholm Creek (7)  
Chisholm Creek (6, 8)  
Gypsum Creek (5)

**Designated Uses:** Secondary Contact Recreation and Expected Aquatic Life Support on all segments

Primary Contact Recreation; Domestic Water Supply; Food Procurement; Ground Water Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use for Main Stem Segments

Food Procurement on Big Slough

**1998 303d Listing:** Table 1 - Predominant Nonpoint Source and Point Source Impacts

**Impaired Use:** Primary and Secondary Contact Recreation on Main Stem Segments

**Water Quality Standard:** Fecal Coliform Bacteria: 900 colonies per 100 mL for Primary Contact Recreation in April - October K.A.R 28-16-28e(c)(7)(B) (disapproved);  
2000 colonies per 100 ml for Secondary (KAR 28-16-28e(c)(7)(C))

Classified streams may be excluded from applying these criteria when streamflow exceeds flow that is surpassed 10% of the time ((KAR 28-16-28c(c)(2))

## 2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

**Level of Support for Designated Use under 1998 303d:** Partial Support of Secondary Contact Recreation

**Monitoring Sites:** Station 281 in Derby

**Period of Record Used:** 1985 to 1999

**Flow Record:** Arkansas River at Derby (USGS Station 07144550): 1970-1999

**Flow Conditions:** Average Flow = 1200 cfs, Median Flow = 528 cfs; 7Q10 = 109 cfs

**Current Conditions:** Load duration curves were assembled for three seasons: Spring (Mar-Jul), Summer-Fall (Aug-Oct) and Winter (Nov-Feb) based on long term average monthly flows. Cumulative frequency of flows in the watershed indicate a strong gain in flow moving through the city with the addition of Little Arkansas flow and runoff from within the city. Under runoff conditions, the entire watershed contributes flow and the gain between the Maize and Derby is dramatic. Prior to 1991 and disinfection of Wichita's wastewater, 24 out of 25 samples exceeded 2000 colonies. Over 1991-1999, 10 out of 52 (19%) exceeded the secondary standard.

Load curves were established for Primary and Secondary Contact Recreation criterion by multiplying the flow values along the curve by the applicable water quality criterion and converting the units to derive a load duration curve of colonies of bacteria per day. These load curves represent the TMDL since any point along the curve represents water quality at the standard at that flow. Historic excursions from WQS are seen as plotted points above the load curves. Water quality standards are met for those points plotting below the applicable load duration curves.

Excursions were seen in all three seasons. Nineteen percent of samples were over the criteria. This would represent a baseline condition of partial support of the impaired designated use.

### NUMBER OF SAMPLES OVER BACTERIA STANDARD OF 2000 CTS/100 ml BY FLOW AND SEASON

Station	Season	0 to 10%	10 to 25%	25 to 50%	50 to 75%	75 to 90%	90 to 100%	Cum Freq.
Wichita	Spring	1	1	1	0	0	1	4/23=17%
	Summer	1	1	1	0	0	0	3/12=25%
	Winter	1	0	1	0	1	0	3/17= 17%

A majority of the excursions are associated with runoff conditions. Sampling taken by the city under its Stormwater Program indicates that the Arkansas River entering the city has relatively few violations over the 2000 count criterion. Sampling by KDHE similarly shows few excursions from the water quality standard in the river as it flows from the northwest. Violations pick up

below the confluence with the Little Arkansas River with additional contributions from Chisholm Creek and westside drainages such as Cowskin Creek, Big Slough and Floodway. Under runoff conditions, contributions come from throughout the drainage.

### **Desired Endpoint Condition of Water Quality at Station 218 over 2005 -2009**

The ultimate endpoint for this TMDL will be to achieve Kansas Water Quality Standards fully supporting both Primary Contact Recreation and Secondary Contact Recreation. This TMDL will, however, be phased. Kansas adopted a Primary Contact Recreation standard of 900 colonies per 100 ml but EPA subsequently disapproved that standard. This standard was used to establish a load duration curve shown in the TMDL curve. It is recognized, however, that the Primary Contact Recreation Standard will be revised in the future in accordance with national guidance. A revised Primary Contact Recreation TMDL curve will be established in Phase Two of this TMDL to reflect changes in this Standard. For Phase One the endpoint will be to achieve the Secondary Contact Recreation value of 2,000 colonies per 100 ml and this Phase One load curve is also shown in the TMDL figure. The Kansas Standards allow for excursions above these criteria when the stream flow exceeds flow that is surpassed 10% of the time, for this instance, 2000 cfs. Monitoring data plotting below the TMDL curve will indicate attainment of the water quality standards.

This endpoint will be reached as a result of expected, though unspecified, reductions in loading from the various sources in the watershed resulting from implementation of corrective actions and Best Management Practices, as directed by this TMDL. Achievement of the endpoint indicate loads are within the loading capacity of the stream, water quality standards are attained and full support of the designated uses of the stream has been restored.

### **3. SOURCE INVENTORY AND ASSESSMENT**

**NPDES:** There are a number of NPDES permitted wastewater dischargers located within the city but only one potentially contributes bacteria loading to the river (Wichita WWTP #2). That plant disinfects its wastewater since 1990, resulting in the current condition of excursions from the standards occurring under runoff conditions. The wastewater treatment plants at Park City and Kechi flow into Chisolm Creek and can be considered contributing to the Arkansas River watershed. Similarly, Valley Center effluent flows into the Little Arkansas River below the monitoring site and might contribute to the Arkansas River as it enters the city.

**Livestock Waste Management Systems:** Since the immediate drainage is principally urban, there are few livestock operations within the drainage. Grazing density is light within the city's drainage. However, grazing densities are much higher in the Little Arkansas and Cowskin Creek watersheds, both of which contribute greatly to the Arkansas River.

**Land Use:** Most of the watershed along the river is urban with a high percentage of impervious area. The two main drainages (Little Arkansas River and Cowskin Creek) contributing to the Arkansas River are chiefly cropland with grasslands available for grazing.

**On-Site Waste Systems:** A number of residents within northern Sedgwick County are in rural settings without sewer service, relying instead on on-site waste systems. Failing septic systems contribute nutrient loadings. The sporadic conditions of partial support seem to indicate a lack of persistent loadings from such systems on any grand scale. However, population projections for the Sedgwick County indicate substantial growth in rural population to the year 2020, suggesting that proliferation of on-site systems may be occurring in the watershed.

**Background Levels:** Some fecal bacteria counts may be associated with environmental background levels, including contributions from wildlife, but it is likely that the density of animals such as deer is fairly dispersed across the watershed resulting in minimal loading to the streams below the levels necessary to violate the water quality standards. Loading from domestic pets, however, may be significant sources of bacteria in an urban setting.

#### **4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY**

The nature of bacteria loading is too dynamic to assign fixed allocations for wasteloads and nonpoint loads. Instead, allocation decisions will be made which reflect the expected reduction of bacteria loading under defined flow conditions. These flow conditions will be defined by the presumed ability of point or nonpoint sources to be the dominant influence on stream water quality. Therefore, the allocation of wasteloads and loads will be made by demarcating the seasonal TMDL curves at a particular flow duration level. Flows lower than that designated flow will represent conditions which are the responsibility of point sources to maintain water quality standards, those flows greater than the designated flow are the responsibility of nonpoint sources up to the high flow exclusion value.

**Point Sources:** Kechi uses a lagoon system for wastewater detention and long holding times to minimize the release of fecal bacteria to receiving streams. Valley Center and Park City disinfect their effluent with ultraviolet radiation. Wichita disinfects effluent at its WWTP#2 with chlorine since 1990 and is considering an upgrade to ultraviolet treatment. Ongoing inspections and monitoring of these systems will be made to ensure that minimal contributions come from these sources. Disinfection of wastewater will be the requirement of all point sources, thereby ensuring no loading of bacteria to the creek.

Since the 7Q10 flow condition is generally exceeded 99% of the time, the Wasteload Allocation is defined as the flow regime between 75 and 100% exceedence. For the Arkansas River, the flow ranges would be 0-300 cfs. Future NPDES and state permits will be conditioned such that discharges from permitted facilities will not cause violations of the applicable bacteria criteria at these low flows.

**Nonpoint Sources:** Based on the assessment of sources, the distribution of excursions from water quality standards and the relationship of those excursions to flow conditions, nonpoint sources are seen as the primary cause of water quality violations. Background levels might be represented by the low loads plotting below each of the seasonal curves. Urban runoff may contribute bacteria loads to the river under high flow conditions. Rural contributions from livestock operations may

enter the river from tributary drainages along the Little Arkansas River, Chisolm Creek and Cowskin Creek. These activities would include livestock in small family operations and on pastureland along the streams. Additionally, potentially failing on-site waste systems in and around Wichita may contribute occasionally. Given the runoff characteristics of the watershed, overland runoff can easily carry waste material into streams.

Activities to reduce fecal pollution should be directed toward major stormwater contributing areas in the city and the smaller, unpermitted livestock operations and rural homesteads and farmsteads in the rural portions of the watershed. The Load Allocation assigns responsibility for maintaining water quality below the TMDL curve over flow conditions exceeded less than 75% of the time. Best Management Practices will be directed toward those activities such that there will be minimal violation of the applicable bacteria criteria at higher flows. On-Site waste system integrity should be addressed, primarily in Sedgwick County.

**Defined Margin of Safety:** Because there will not be a traditional load allocation made for fecal bacteria, the margin of safety will be framed around the desired endpoints of the applicable water quality standards. Therefore, evaluation of achieving the endpoints should use values set 100 counts less than the applicable criteria (1,900 colonies for secondary contact recreation) to mark full support of the recreation designated use of the streams in this watershed. By this definition, the margin of safety is 100 colonies per 100 ml and would be represented by a parallel line lying below each seasonal TMDL curve by a distance corresponding to loads associated with 100 colonies per 100 ml.

**State Water Plan Implementation Priority:** Because the Arkansas River lies within an urban setting, but reflects contributions from outlying rural areas, particularly along the Little Arkansas River and Cowskin Creek, this TMDL will be a High Priority for implementation.

**Unified Watershed Assessment Priority Ranking:** This watershed lies within the Middle Arkansas–Slate Subbasin (HUC 8: 11030013) with a priority ranking of 6 (Highest Priority for restoration work).

**Priority HUC 11s and Stream Segments:** Given the total contributions occurring within the drainage of the Arkansas River in and around Wichita, the entire watershed and all segments will be treated as high priority pending additional assessment. The TMDLs for Cowskin Creek and the Little Arkansas River are also high priority and will be implemented concurrently with this TMDL.

## **5. IMPLEMENTATION**

### **Desired Implementation Activities**

1. Renew necessary state and federal permits and monitor permitted facilities for permit compliance
2. Install necessary proper manure and livestock waste storage
3. Install necessary grass buffer strips along streams.

4. Install necessary pasture management practices, including proper stock density on grasslands
5. Remove feeding sites in proximity to streams
6. Reduce livestock use of riparian areas
7. Insure proper on-site waste system operations in proximity to main streams.
8. Evaluate stormwater management options to reduce urban runoff contributions to stream

## **Implementation Programs Guidance**

### **Monitoring and Assessment - KDHE**

- a. Coordinate with the City in monitoring efforts along Arkansas River and contributing drainages.
- b. Conduct a special study to increase spatial and temporal sampling to identify sources of bacteria and significant contributing areas.

### **NPDES and State Permits - KDHE**

- a. Municipal permits for facilities in the watershed will be renewed after 2000 maintaining existing operations of the wastewater treatment systems.
- b. Livestock permitted facilities will be inspected for integrity of applied pollution prevention technologies.
- c. Registered livestock facilities with less than 300 animal units will apply pollution prevention technologies.
- d. Manure management plans will be implemented.

### **Stormwater Management - KDHE**

- a. Review and support urban stormwater management permits and plans, including data collection efforts to isolate runoff contributions of bacteria to stream.
- b. Assist city with evaluation of Best Management Practices which will lead to reduction in bacteria loading from urban settings during runoff.

### **Non-Point Source Pollution Technical Assistance - KDHE**

- a. Support Section 319 demonstration projects for pollution reduction from livestock operations in watershed.
- b. Provide technical assistance on practices geared to small livestock operations which minimize impact to stream resources.
- c. Guide federal programs such as the Environmental Quality Improvement Program, which are dedicated to priority subbasins through the Unified Watershed Assessment, to priority subwatersheds and stream segments within those subbasins identified by this TMDL.
- d. Assist evaluation of stormwater quality from urbanized areas of watershed.

### **Water Resource Cost Share & Non-Point Source Pollution Control Programs - SCC**

- a. Provide alternative water supplies to small livestock operations
- b. Develop improved grazing management plans
- c. Reduce grazing density on pasturelands

- d. Install livestock waste management systems for manure storage
- e. Implement manure management plans
- f. Install replacement on-site waste systems
- g. Coordinate with USDA/NRCS Environmental Quality Improvement Program in providing educational, technical and financial assistance to agricultural producers.

**Riparian Protection Program - SCC**

- a. Design feeding areas away from streams
- b. Develop riparian restoration projects

**Buffer Initiative Program - SCC**

- a. Install grass buffer strips near streams.
- b. Leverage Conservation Reserve Enhancement Program to hold riparian land out of production.

**Extension Outreach and Technical Assistance - Kansas State University**

- a. Educate livestock producers on riparian and waste management techniques.
- b. Provide technical assistance on livestock waste management design.
- c. Continue Section 319 demonstration projects on livestock management.

**Kansas Center for Agriculture Resources and the Environment - Kansas State University**

- a. Complete research on identifying sources of fecal coliform bacteria and evaluating effectiveness of Best Management Practices on reducing bacteria contamination.
- b. Apply methodology to Arkansas River samples to determine probable sources of bacteria in river.

**Agricultural Outreach - KDA**

- a. Provide information on livestock management to commodity advocacy groups.
- b. Support Kansas State outreach efforts.

**Local Environmental Protection Program - KDHE**

- a. Inspect on-site waste systems within one mile of main tributary streams.

**Time Frame for Implementation:** Pollutant reduction practices should be installed within the priority segments during the years 2001-2005, with minor follow up implementation, over 2005-2009.

**Targeted Participants:** Primary participants for implementation will be the City of Wichita and its Stormwater Program and small livestock producers operating without need of permits along the priority stream segments, particularly in the Little Arkansas River and Cowskin Creek drainages. Implemented activities should be targeted at those areas with greatest potential to impact the stream. Nominally, this would be activities located within one mile of the streams including:

1. Facilities without water quality controls
2. Unpermitted permanent feeding/holding areas
3. Sites where drainage runs through or adjacent livestock areas
4. Sites where livestock have full access to stream and stream is primary water supply
5. Grazed acreage, overstocked acreage and acreage with poor range condition
6. Poor riparian sites
7. Near stream feeding sites
8. Failing on-site waste systems
9. Uncontrolled entry points for urban runoff
10. Coincidental areas of impervious surfaces and incidental fecal waste dropping
11. Failing sewer lines

Some inventory of local needs should be conducted in 2001 to identify such areas and activities. Such an inventory would be done by local program managers with appropriate assistance by commodity representatives and state program staff in order to direct state assistance programs to the principal activities influencing the quality of the streams in the watershed during the implementation period of this TMDL.

**Milestone for 2005:** The year 2005 marks the midpoint of the ten-year implementation window for the watershed. At that point in time, milestones should be reached which will have at least two-thirds of the landowners responsible for the activities identified locally for assistance participating in the implementation programs provided by the state. Additionally, sampled data from Station 288 should indicate evidence of reduced bacteria levels at moderate to low flow conditions relative to the conditions seen over 1990-1998.

**Delivery Agents: Delivery Agents:** The primary delivery agents for program participation will be the Wichita Wastewater and Stormwater Programs and Sedgwick County conservation district for programs of the State Conservation Commission and the Natural Resources Conservation Service. Producer outreach and awareness will be delivered by Kansas State Extension and agricultural interest groups such as Kansas Farm Bureau, Kansas Livestock Association, the Kansas Pork Producers Council and the Kansas Dairy Association. On-site waste system inspections will be performed by Local Environmental Protection Program personnel for Sedgwick County.

### **Reasonable Assurances**

**Authorities:** The following authorities may be used to direct activities in the watershed to reduce pollution.

1. K.S.A. 65-164 and 165 empowers the Secretary of KDHE to regulate the discharge of sewage into the waters of the state.
2. K.S.A. 65-171d empowers the Secretary of KDHE to prevent water pollution and to protect the beneficial uses of the waters of the state through required treatment of sewage and established water quality standards and to require permits by persons having a potential to discharge pollutants into the waters of the state.



3. K.A.R. 28-16-69 to -71 implements water quality protection by KDHE through the establishment and administration of critical water quality management areas on a watershed basis.
4. K.S.A. 2-1915 empowers the State Conservation Commission to develop programs to assist the protection, conservation and management of soil and water resources in the state, including riparian areas.
5. K.S.A. 75-5657 empowers the State Conservation Commission to provide financial assistance for local project work plans developed to control nonpoint source pollution.
6. K.S.A. 82a-901, et seq. empowers the Kansas Water Office to develop a state water plan directing the protection and maintenance of surface water quality for the waters of the state.
7. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the *Kansas Water Plan*.
8. The *Kansas Water Plan* and the Lower Arkansas Basin Plan provide the guidance to state agencies to coordinate programs intent on protecting water quality and to target those programs to geographic areas of the state for high priority in implementation.

**Funding:** The State Water Plan Fund annually generates \$16-18 million and is the primary funding mechanism for implementing water quality protection and pollution reduction activities in the state through the *Kansas Water Plan*. The state water planning process, overseen by the Kansas Water Office, coordinates and directs programs and funding toward watersheds and water resources of highest priority. Typically, the state allocates at least 50% of the fund to programs supporting water quality protection. This watershed and its TMDL are a High Priority consideration. Priority should be given to activities which reduce loadings of bacteria and nutrients to the stream prior to 2005.

**Effectiveness:** Nonpoint source controls for livestock waste have been shown to be effective in reducing pollution in locales such as the Herrington Lake watershed. The key to effectiveness is participation within a finite subwatershed to direct resources to the activities influencing water quality. The milestones established under this TMDL are intended to gauge the level of participation in those programs implementing this TMDL.

Should voluntary participation significantly lag below expectations over the next five years or monitoring indicates lack of progress in improving water quality conditions from those seen over 1990-1999, the state may employ more stringent conditions on nonpoint sources in the watershed in order to meet the desired endpoints expressed in this TMDL. The state has the authority to impose conditions on activities with a significant potential to pollute the waters of the state under K.S.A. 65-171d. If overall water quality conditions in the watershed deteriorate, a Critical Water Quality Management Area may be proposed for the watershed, in response.

## 6. MONITORING

KDHE should collect bimonthly samples at Station 218 in order to assess progress in implementing this TMDL over each of the three defined seasons during the initial implementation period. During the evaluation period (2005-2009), more intensive sampling will need to be conducted under specified seasonal flow conditions in order to determine the achievement of the desired endpoints of this TMDL. The manner of evaluation will be consistent with the assessment protocols used to establish the case for impairment in these streams. Following current (1998) Kansas assessment protocols, monitoring will ascertain at this phase if less than 10% of samples exceed the applicable criterion at flows under 2000 cfs with no samples exceeding the criterion at flows under 1000 cfs. Use of the real time flow data available at the Maize, Wichita and Derby stream gaging stations can direct sampling efforts.

An expanded network of monitoring sites should be maintained around the city with sampling coordinated between the state and the city to ascertain likely areas contributing bacteria loads into the river. Some coincidental flow measurements should be made with sampling on these tributaries to the river. Using these data, local program managers need to identify targeted participants of state assistance programs and projected needs for implementing this TMDL. This information should be collected in 2001 in order to support appropriate implementation projects.

Monitoring of bacteria levels in effluent will be a condition of NPDES and state permits for facilities, either mechanical or those using lagoons as the method of wastewater treatment. This monitoring will continually assess the functionality of the systems in reducing bacteria levels in the effluent released to the streams.

## 7. FEEDBACK

**Public Meetings:** Public meetings to discuss TMDLs in the Lower Arkansas Basin were held March 9, 2000 and April 26-27, 2000 in Wichita, Hutchinson, Arkansas City and Medicine Lodge. An active Internet Web site was established at <http://www.kdhe.state.ks.us/tmdl/> to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Lower Arkansas Basin.

**Public Hearing:** A Public Hearing on the TMDLs of the Lower Arkansas Basin was held in Wichita on June 1, 2000.

**Basin Advisory Committee:** The Lower Arkansas Basin Advisory Committee met to discuss the TMDLs in the basin on September 27, November 8, 1999; January 13, 2000, March 9, 2000 and June 1, 2000.

**Discussion with Interest Groups:** Meetings to discuss TMDLs with interest groups include:  
Sedgwick County Technical Advisory Group: August 8, October 14, November 15, 1999, January 20, 2000, April 27, 2000 and May 25, 2000.  
Agriculture: January 12, February 2 and 29, 2000  
Environmental: March 9, 2000

Conservation Districts: November 22, 1999

Industry: December 15, 1999, January 13, February 9 and 22, May 10, 2000

Local Environmental Protection Groups: September 30, November 2, December 16, 1999

City of Wichita: August 25 and November 15, 1999, February 9 and 24, May 5 and June 8, 2000

**Milestone Evaluation:** In 2005, evaluation will be made as to the degree of implementation which has occurred within the watershed and current condition of the Arkansas River. Subsequent decisions will be made regarding the implementation approach and follow up of additional implementation in the watershed.

**Consideration for 303d Delisting:** The river will be evaluated for delisting under Section 303d, based on the monitoring data over the period 2005-2009. Therefore, the decision for delisting will come about in the preparation of the 2010 303d list. Should modifications be made to the applicable water quality criteria during the ten year implementation period, consideration for delisting, desired endpoints of this TMDL and implementation activities may be adjusted accordingly. Once KDHE and EPA agree to an appropriate metric to evaluate Primary Contact Recreation and establish a water quality standard using such a parameter, this TMDL will be modified to incorporate that criterion.

At this phase of the TMDL, assessment for delisting will evaluate if the percent of samples over the applicable secondary contact recreation criterion is less than 10% for samples taken at flows below the high flow exclusion over the monitoring period of 2005-2009. This assessment defines full support of the designated use under water quality standards as measured and determined by current Kansas Water Quality Assessment protocols. These assessment protocols are similar to those used to cite the stream segments in this watershed as impaired on the Kansas 1998 Section 303d list. As protocols and assessments for impairment change for future 303(d) lists, the monitoring data collected under this TMDL will use these new assessments and protocols for delisting consideration.

**Incorporation into Continuing Planning Process, Water Quality Management Plan and the Kansas Water Planning Process:** Under the current version of the Continuing Planning Process, the next anticipated revision will come in 2002 which will emphasize revision of the Water Quality Management Plan. At that time, incorporation of this TMDL will be made into both documents. Recommendations of this TMDL will be considered in *Kansas Water Plan* implementation decisions under the State Water Planning Process for Fiscal Years 2001-2005.

Approved August 9, 2000.