

# CIMARRON RIVER BASIN TOTAL MAXIMUM DAILY LOAD

**Water Body: Cimarron River**  
**Water Quality Impairment: pH**

## 1. INTRODUCTION AND PROBLEM IDENTIFICATION

**Subbasin:** Upper Cimarron–Liberal

**County:** Meade

**HUC 8:** 11040006

**HUC 11s (HUC 14s):** 060 (020, 030, & 040)

**Drainage Area:** 62.3 square miles

**Main Stem Segment:** 1; starting at state line and traveling upstream toward Hayne.  
**(Figure 1)**

**Designated Uses:** Special Aquatic Life Support; Primary Contact Recreation; Secondary Contact Recreation; Domestic Water Supply; Food Procurement; Ground Water Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use.

**1998 303(d) Listing:** Table 3 - Predominantly Natural Conditions

**Impaired Use:** Aquatic Life Support

**Water Quality Standard:** pH—Artificial sources of pollution shall not cause the pH of any surface water outside of a zone of initial dilution to be below 6.5 and above 8.5 (KAR 28-16-28e(c)(2)(C))

In stream segments where background concentrations of naturally occurring substances, including chlorides and sulfates, exceed the water quality criteria listed in Table 1a of KAR 28-16-28e(d), at ambient flow, the existing water quality shall be maintained, and the newly established numeric criteria shall be the background concentration, as defined in KAR 28-16-28b(e). Background concentrations shall be established using the methods outlined in the “Kansas implementation procedures: surface water,” dated June 1, 1999... (KAR 28-16-28e(b)(9)).

# Cimarron River TMDL Reference Map Upper Cimarron - Liberal Subbasin

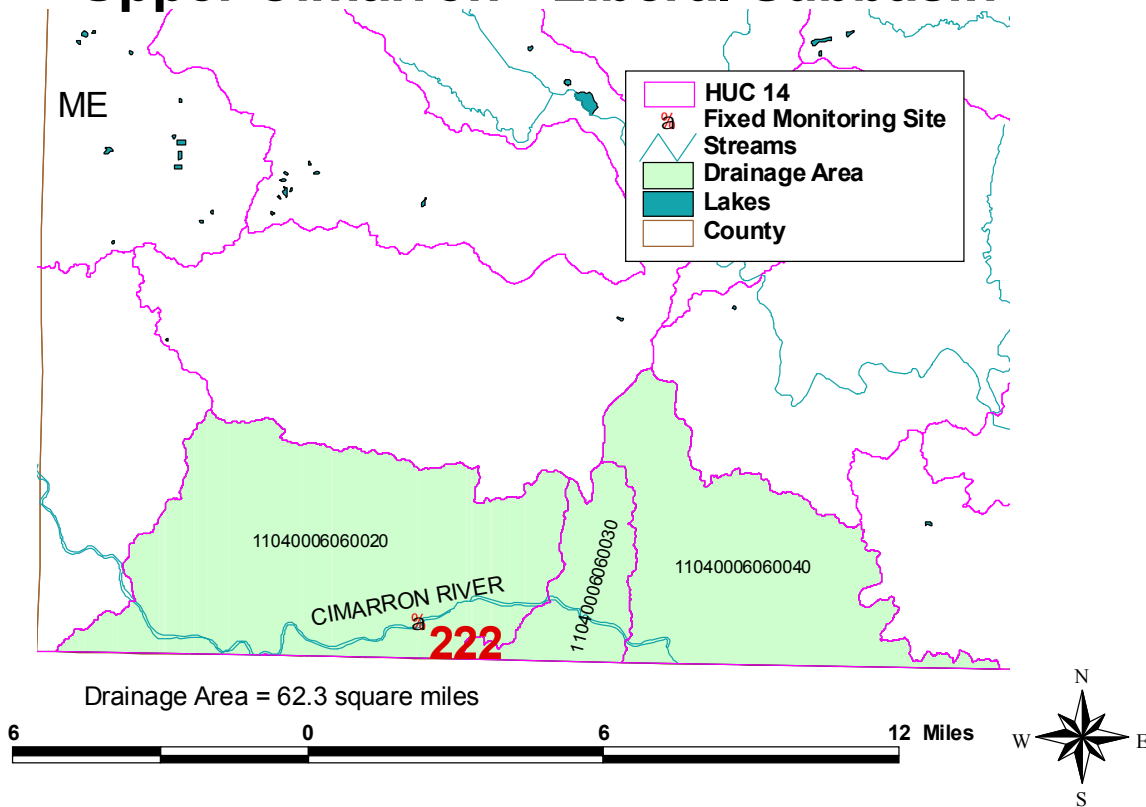


Figure 1

## 2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

**Level of Support for Designated Use under 1998 303(d):** Partially Supporting Aquatic Life Support

**Monitoring Site:** Station 222 near Forgan, OK

**Period of Record Used:** 1987 to 2000

**Flow Record:** Cimarron River flow conditions were estimated by using actual flow data for the Crooked Creek near Englewood (USGS Station 07157500; 1975 - 1999)

**Long Term Flow Conditions:** Median Flow = 10 cfs, 7Q10 = 1 cfs at Crooked Creek near Englewood

**Current Conditions:** The pH levels have ranged from 7.7 to 8.7 over the period of record. This would represent a natural background concentration for the Cimarron River. Excursions were seen in all three seasons. Eighteen percent of samples from water quality site 222 were over the criterion pH of 8.5.

**Desired Endpoints of Water Quality (Implied Load Capacity) at Site 222 over 2005 - 2009:**

The ultimate endpoint for this TMDL will be to achieve the Kansas Water Quality Standards fully supporting Aquatic Life. The current standard of pH between 6.5 to 8.5 was used to establish the TMDL.

Seasonal variation has been incorporated in this TMDL through the documentation of the seasonal consistency of elevated pH levels. Achievement of the endpoints 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**

The pH occasionally exceeds 8.5 units by 0.1 or 0.2 unit in the Cimarron River near Forgan, Oklahoma. Saltwater in the Permian bedrock and ground water in the High Plains aquifer in the river corridor in southeast Seward and southwest Meade counties have pH values usually in the range 7.6-7.9 units based on data in Gutentag et al. (1981). Ground water typically contains dissolved carbon dioxide contents that are much greater than in the atmosphere. When ground water discharges to the surface, much of the dissolved carbon dioxide is lost to the air. This process causes an increase in pH. It is possible that, if the dissolved carbon dioxide of the ground water along the river corridor is great enough, and because the lower flows of the river mainly reflect ground-water discharge, the elevated pH observations could be the result of natural loss of carbon dioxide. Although the pH is slightly elevated, it is not much higher than the typical range of pH (within  $8.0 \pm 0.5$ ) for streams and rivers of Kansas. Thus, a greater component of flow derived from deeper ground-water discharge in the Cimarron River than other rivers could be responsible for the small additional rise in pH. The pH observations slightly exceeding 8.5 units are for data since the late 1980's. The decrease in freshwater discharge from the High Plains aquifer to the river might have accentuated the influence of the saline ground-water discharge on the pH. The pH values for the survey of Gutentag et al. (1981) along the Cimarron River in Seward and Meade counties ranged from 7.6-8.1 units. It is also possible that biological activity under reduced flow conditions is conducive to raising the pH through photosynthesis. This possibility will be explored through monitoring in phase two of this TMDL.

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

Additional sampling and assessment will be necessary to ascertain the amount of natural background pH loading within the watershed.

**Point Sources:** A Wasteload Allocation of zero will be established by this TMDL because of the lack of point sources along the segment. Should future point sources be proposed in the watershed and discharge into the impaired segments, the current wasteload allocation will be revised by adjusting current load allocations to account for the presence and impact of these new point source dischargers.

**Non-Point Sources:** Elevated pH concentrations appear to be a natural consequence of low flows and heavy ground water discharge to the river. There appears to be zero external loading of pollutants to the river that would cause or contribute to the pH impairment. Therefore, the total load allocation will be assigned to natural background.

**Defined Margin of Safety:** The margin of safety provides some hedge against the uncertainty of loading and the chloride endpoint. The current margin of safety is implicit because of the conservative assumption that zero allocations are assigned to anthropogenic sources, i.e., the current loading is natural. In phase two of this TMDL, if necessary, reductions in nutrient loading will be made in order to limit biological activity that may contribute to the pH impairment.

**State Water Plan Implementation Priority:** Because it presently appears that the pH load is natural in source, this TMDL will be a Low Priority for implementation.

**Unified Watershed Assessment Priority Ranking:** This watershed lies within the Upper Cimarron–Liberal Subbasin (HUC 8: 11040006) and is a Category II watershed (watershed in need of protection).

**Priority HUC 11s and Stream Segments:** Pending additional monitoring and assessment, no priority subwatersheds or stream segments should be identified until after 2005.

#### **5. IMPLEMENTATION**

##### **Desired Implementation Activities**

1. Establish appropriate causes for pH rises and determine natural variability in pH on river.

##### **Implementation Programs Guidance**

###### **Water Quality Monitoring and Assessment - KDHE**

- a. Monitor pH levels in river and assess variability over time.
- b. Establish probable causes of pH rises in river.

**Timeframe for Implementation:** Development of a background level- based water quality standard should be accomplished with the 2002 water quality standards.

**Targeted Participants:** Primary participants for implementation will be KDHE .

**Milestone for 2005:** The year 2005 marks the mid-point of the ten year implementation window for the watershed. At that point in time, additional monitoring data from Station 222 and other sites of significance on Cimarron River will be re-examined to confirm the impaired status of the river and the suggested background concentration. In light of this additional data, assessment, allocation and implementation activities will ensue.

**Delivery Agents:** The primary delivery agents for program participation will be the Kansas Department of Health and Environment.

### **Reasonable Assurances**

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

1. 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.
2. K.S.A. 82a-706. Empowers the chief engineer of the Division of Water Resources, KDA, to enforce and administer the laws of this state pertaining to the beneficial use of water and shall control, conserve, regulate, allot and aid in the distribution of the water resources of the state for the benefits and beneficial uses of all of its inhabitants in accordance with the rights of priority of appropriation.
3. 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.
4. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the *Kansas Water Plan*.
5. The *Kansas Water Plan* and the Cimarron 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 TMDL is a Low Priority consideration and should not receive funding.

**Effectiveness:** Minimal control can be exerted on natural contributions to loading.

## 6. MONITORING

KDHE will continue to collect bimonthly samples at Station 222, including pH samples over each of the three defined seasons. Based on that sampling, the status of 303(d) listing will be evaluated in 2006 including application of a numeric criterion based on background concentrations. Should the impaired status remain, the desired endpoints under this TMDL will be refined and direct more intensive sampling will need to be conducted under specified seasonal flow conditions over the period 2005-2009.

## 7. FEEDBACK

**Public Meetings:** Public meetings to discuss TMDLs in the Cimarron Basin were held March 8 and April 25 in Meade. 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 Cimarron Basin.

**Public Hearing:** A Public Hearing on the TMDLs of the Cimarron Basin was held in Meade on May 30, 2000.

**Basin Advisory Committee:** The Cimarron Basin Advisory Committee met to discuss the TMDLs in the basin on October 6, 1999; January 12, 2000; March 8, 2000.

**Discussion with Interest Groups:** Meetings to discuss TMDLs with interest groups include:  
Agriculture: February 28, 2000

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

**Consideration for 303(d) Delisting:** This watershed will be evaluated for delisting under Section 303(d), based on the monitoring data over the period 2005-2009. Therefore, the decision for delisting will come about in the preparation of the 2006 303(d) list. Should modifications be made to the applicable criterion during the ten-year implementation period, consideration for delisting, desired endpoints of this TMDL and implementation activities may be adjusted accordingly.

**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 after Fiscal Year 2005.

## **Reference**

Gutentag, E.D., Lobmeyer, D.H., and Slagle, S.E., 1981, Geohydrology of southwestern Kansas: Kansas Geological Survey, Irrigation Series 7, 73 p.

Approved September 11, 2000.