

for Main Stem Segments, N. F. Walnut Creek, Long Branch Walnut Creek, Middle Fork Walnut Creek , N. F. of Middle Fork Walnut Creek and South Fork Walnut Creek.

Expected Aquatic Life Support and Secondary Contact Recreation on all other segments.

1998 303(d) Listing: Table 1 - Predominant Non-point Source Impacts
Table 3 - Predominant Natural Conditions

Impaired Use: Domestic Water Supply

Water Quality Standard: 250 mg/l for Domestic Water Supply (KAR 28-16-28e(c)(3)(A))

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)).

2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Level of Support for Designated Use under 1998 303(d): Partially Supporting Domestic Water Supply.

Monitoring Sites: Station 595 near Ness City (primary site)(**Figure 1**), Station 596 near Alexander and Station 597 near Heizer (downstream sites).

Period of Record Used: 1990 to 1999

Flow Record: Walnut Creek at Nekoma (07141780) 1975 -1998

Long Term Flow Conditions: 7Q10 = 1 cfs

Upper Walnut Creek Sulfate TMDL Reference Map

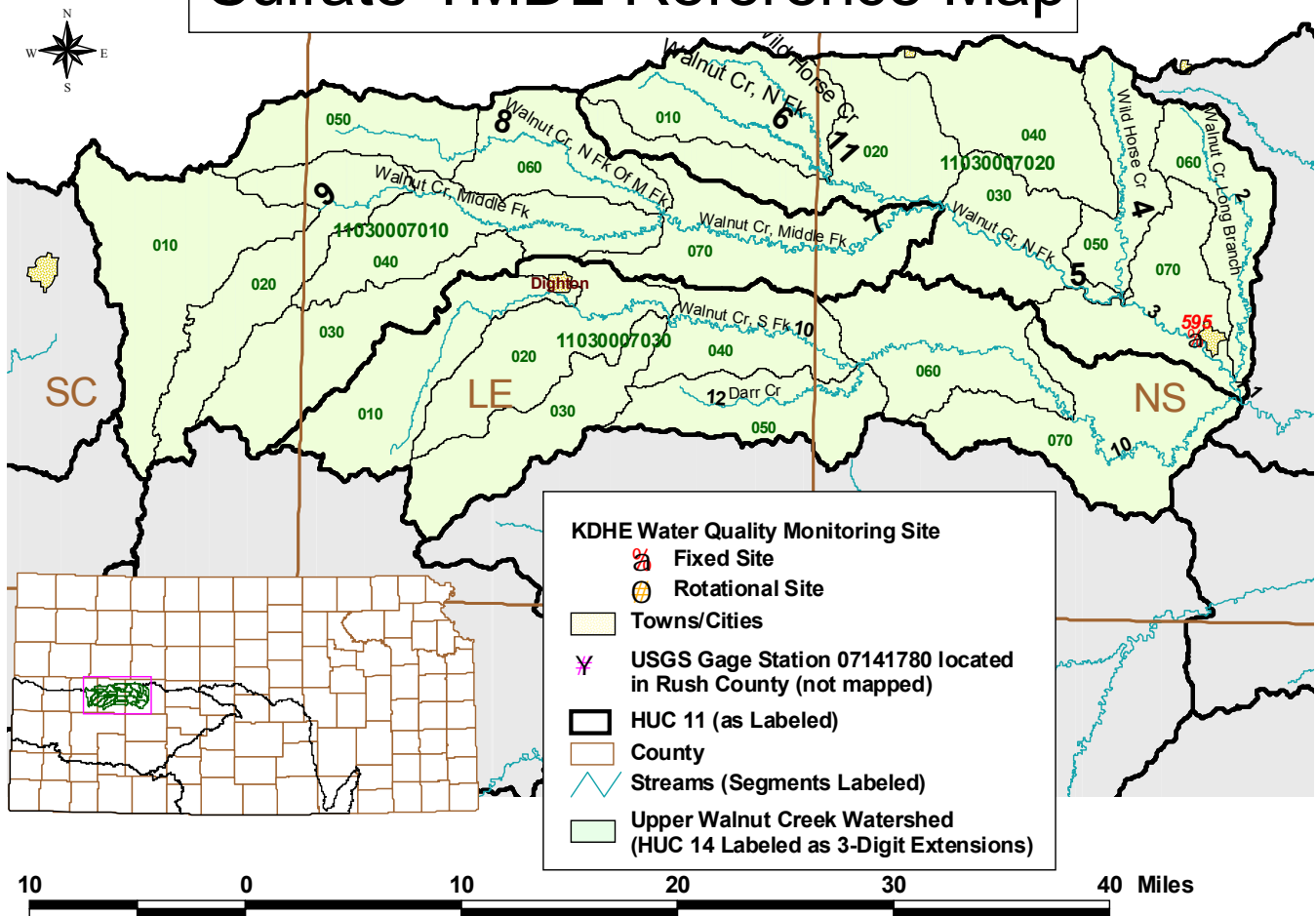


Figure 1

Current Conditions: Since loading capacity varies as a function of the flow present in the stream, this TMDL represents a continuum of desired loads over all flow conditions, rather than fixed at a single value. Flow duration data were determined from the Nekoma Gage Station for each of the three defined seasons: Spring (Mar-Jul), Summer-Fall (Aug-Oct) and Winter (Nov-Feb). High flows and runoff equate to lower flow durations; baseflow and point source influences generally occur in the 75-99% range. Load curves were established for Domestic Water Supply

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 tons of sulfate 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.

At Water Quality Monitoring Site 595, excursions were seen in two of the three defined seasons. Nineteen percent of Spring samples and none of Summer-Fall samples were over the sulfate criterion. Twenty nine percent of Winter samples were over the criterion. Overall, 16% of the samples were over the criteria. This would represent a baseline condition of partial support of the impaired designated use.

NUMBER OF SAMPLES OVER SULFATE STANDARD OF 250 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.
Ness City (595)	Spring	2	2	0	0	0	0	4/21 = 19%
	Summer	0	0	0	0	0	0	0/14 = 0%
	Winter	0	4	0	0	0	0	4/14 = 29%

A comparison of sulfate concentrations for all water quality monitoring sites in the watershed on those dates where monitoring site 595 exceeded that standard shows those exceedences are occurring across the entire watershed. Because of this relationship, this TMDL will use water quality site 595 as the primary monitoring site.

COLLECTION DATE	595 SULFATE (mg/L)	596 SULFATE (mg/L)	597 SULFATE (mg/L)
4/26/94	265	270	285
1/29/97	259.1	261.45	281.42
3/18/97	263.55	275.39	285.24
4/21/98	285.92	386.02	361.72
6/16/98	250.55	267.64	295.08
02/09/99	252.67	283.68	276.19
12/14/99	263.39	276.05	277.9
01/11/00	269.42	287.30	275.09

The excursions have primarily occurred in recent years. It is likely that groundwater contributing geologic formations in the Walnut Creek watershed have a naturally high level of sulfate. Above normal precipitation in the mid to latter 1990s and the resulting reduction in irrigation from the Walnut Creek alluvium has caused groundwater levels to rise near the creek. This increase in groundwater levels has enhanced its contribution to baseflow in the watershed. As baseflow becomes a more dominant component in stream flow, so should the sulfate concentration.

Desired Endpoints of Water Quality (Implied Load Capacity) at Site 595 over 2005 - 2009:
The ultimate endpoint for this TMDL will be to achieve the Kansas Water Quality Standard of 250 mg/l. Seasonal variation in endpoints is accounted for by TMDL curves established for each season and will be evaluated based on monitoring data from 2005-2009. 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. Monitoring data plotting below the TMDL curve will indicate attainment of the water quality standards..

If additional assessments indicate loads are derived from natural sources, consistent with the Kansas Implementation Procedures for Surface Water, a numeric criteria based on the background concentration may be developed using the mean concentration of instream measurements gathered when stream flow was less than the median flow on Walnut Creek. A minimum of five data points are needed to determine the background concentration.

3. SOURCE INVENTORY AND ASSESSMENT

As previously noted, it is likely that groundwater contributing geologic formations in the Upper and Lower Walnut Creek watershed have a naturally high level of sulfate. As baseflow has become a more dominant component in stream flow in recent years, so has the sulfate concentration.

Excursions were also noted under higher flows. Although, additional source assessment should be conducted to confirm the mechanism for these excursions, it is believed that bedrock outcropping and underlying alluvial sediments of the watershed contain large amounts of gypsum. This prevalence of gypsum at or near the land surface in the watershed of Walnut Creek contributes substantial amounts of sulfate in runoff to streams as a result of natural dissolution of the mineral.

Contributing Runoff: The watershed's average soil permeability is 1.2 inches/hour according to NRCS STATSGO data base. About 95% of the watershed produces runoff even under relative low (1.5"/hr) potential runoff conditions. Under very low (<1"/hr) potential conditions, this contributing area is greatly reduced (9%). Runoff is chiefly generated as infiltration excess with rainfall intensities greater than soil permeabilities. As the watersheds' soil profiles become saturated, excess overland flow is produced. Generally, storms producing less than 0.5"/hr of rain will generate runoff from only 4.5% of this watershed, chiefly along the stream channels.

4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY

Additional assessment will be necessary to ascertain the amount of natural versus anthropogenic sulfate loading within the watershed. The following can be anticipated:

Point Sources: A current Wasteload Allocation of zero is established by this TMDL because of the lack of point sources in the watershed. 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: It is believed that the majority of sulfate load is background in nature. The Load Allocation, based on the existing standard, will be 1,215 pounds per day at the 7Q10.

Defined Margin of Safety: The Margin of Safety will be ten percent of the applicable sulfate load, or 135 pounds per day at 7Q10.

State Water Plan Implementation Priority: Because it appears this watershed's sulfate load is likely natural in source, this TMDL will be a Low Priority for implementation.

Unified Watershed Assessment Priority Ranking: A portion of this watershed lies within Upper Walnut Creek (11030007) Subbasin with a priority of 46 (Medium Priority for restoration work) and a portion lies in the Lower Walnut Creek (11030008) Subbasin which is classified as category II, a watershed meeting the goals needed to sustain water quality.

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. Minimize anthropogenic oriented contributions of sulfate loading to river.

Implementation Programs Guidance

Until the 2005 assessment of the continuation of monitoring is made no further direction can be made to those implementation programs.

Timeframe for Implementation: Continued monitoring over the years 2001-2005.

Targeted Participants: No targets until 2005 assessment.

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 595 and assessments will be examined to confirm the impaired status of the river, evaluate the suggested background concentration and determine the level, if any, of anthropogenic loading to the creek. Should the case of impairment remain, allocation and implementation activities will ensue.

Delivery Agents: Depending upon confirmation of impairment and assessment of probable sources, the primary delivery agents for program participation will be the conservation districts for programs of the State Conservation Commission, the Natural Resources Conservation Service, and the Kansas Department of Agriculture, Division of Water Resources..

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 non-point source pollution.
6. 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.
7. 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.
8. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the *Kansas Water Plan*.
9. The *Kansas Water Plan* and the Upper Arkansas River 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 Stations 595, 596 and 597, including sulfate samples over each of the three defined seasons. Based on that sampling, the status of 303(d) listing will be evaluated in 2005 including application of a numeric criteria based on background concentrations. Should 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. 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 if less than 10% of samples exceed the applicable criterion. Use of the real time flow data available at the Nekoma stream gaging station can direct sampling efforts.

7. FEEDBACK

Public Meetings: Public meetings to discuss TMDLs in the Upper Arkansas Basin were held March 8 and April 24 in Garden City and April 25, 2000 in Great Bend. 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 Upper Arkansas Basin.

Public Hearing: A Public Hearing on the TMDLs of the Upper Arkansas Basin was held in Garden City on May 31, 2000.

Basin Advisory Committee: The Upper Arkansas Basin Advisory Committee met to discuss the TMDLs in the basin on October 6, 1999; January 11 and 24, 2000; March 8, 2000;

Discussion with Interest Groups: Meetings to discuss TMDLs with interest groups include:
Associated Ditches of Kansas: October 6, 1999; January 28, 2000; March 8, 2000; and April 24, 2000.
Agriculture: February 28, 2000
Environmental: March 9, 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 Upper and Lower Walnut Creek. Subsequent decisions will be made regarding implementation approach and follow up on additional implementation in subwatersheds.

Consideration for 303(d) Delisting: Upper and Lower Walnut Creek 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 2010 303(d) list. Should modifications be made to applicable criterion during the ten year implementation period, consideration for delisting, desired endpoints of this TMDL and implementation activities may be adjusted accordingly.

For this TMDL, assessment for delisting will evaluate if the percent of samples over the applicable criterion is less than 10% for samples taken 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 after Fiscal Year 2005.

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