

# MARAIS DES CYGNES BASIN TOTAL MAXIMUM DAILY LOAD

## Waterbody: Pottawatomie Creek Water Quality Impairment: Dissolved Oxygen

### 1. INTRODUCTION AND PROBLEM IDENTIFICATION

**Subbasin:** Upper Marais des Cygnes      **County:** Miami, Franklin, Anderson and Linn

**HUC 8:** 10290101

**HUC 11 (HUC 14s):**      **050** (050, 060, 070, 080 and 090)  
   **060** (010, 020, 030 and 040)

**Drainage Area:**                      373.8 square miles

**Main Stem Segments:**      WQLS: 51, 53, 55, 56, 58 and 59 (Non-WQLS 61 and 63); starting at confluence with Marais des Cygnes River and traveling upstream to northern Anderson County (**Figure 1**).

**Tributary Segment:**      WQLS: Mosquito Creek (52)  
   WQLS: Sac Branch (54) *1998 303(d) list identifies this WQLS correctly, but stream name of Sac Branch, South Fork is incorrect. Correct stream name of WQLS (54) is Sac Branch (as in Figure 1).*  
   WQLS: Dry Creek (57)  
   WQLS: Sac Creek (60)  
   WQLS: Cedar Creek (66)  
   WQLS: S. Fork Pottawatomie Creek (67)  
   Non-WQLS: Bradshaw Cr (75)  
   Non-WQLS: N. Fork Sac Branch (segment not labeled)

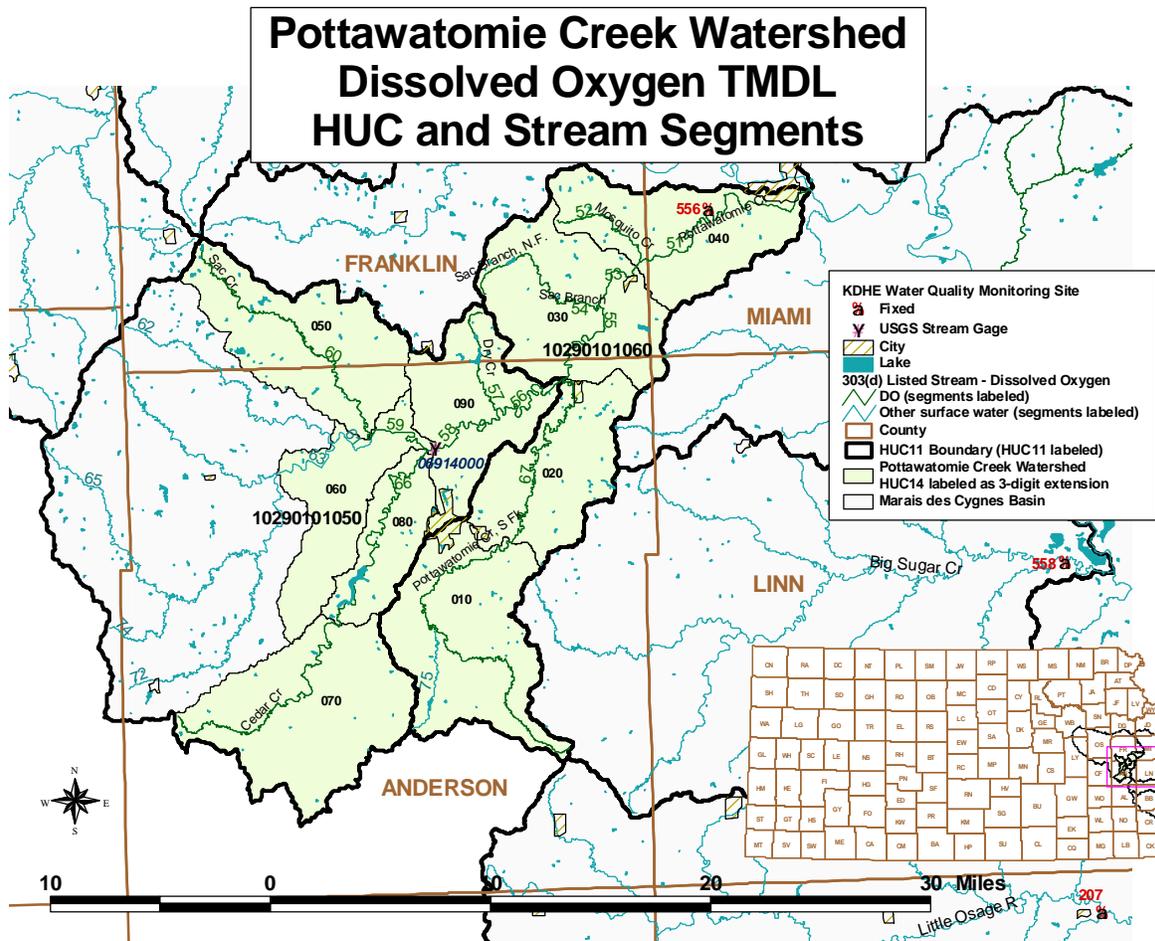
**Designated Uses:**                      Special Aquatic Life Support, Primary Contact Recreation; Domestic Water Supply; Food Procurement; Ground Water Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use for Main Stem Segments.

Expected Aquatic Life Support for Mosquito Creek, Sac Branch, N. Fork Sac Branch, Dry Creek, Sac Creek and Cedar Creek; Food Procurement for Sac Creek and Cedar Creek; Domestic Water Supply for Cedar Creek. Special Aquatic Life Support, Secondary Contact Recreation; Domestic Water Supply; Food Procurement; Ground Water Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use for S. Fork Pottawatomie Creek.

**1998 303(d) Listing:**      Table 1 - Predominant Non-point Source and Point Source Impacts

**Impaired Use:** Aquatic Life Support

**Water Quality Standard:** Dissolved Oxygen: 5 mg/L (KAR 28-16-28e(c)(2)(A))



**Figure 1**

## **2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT**

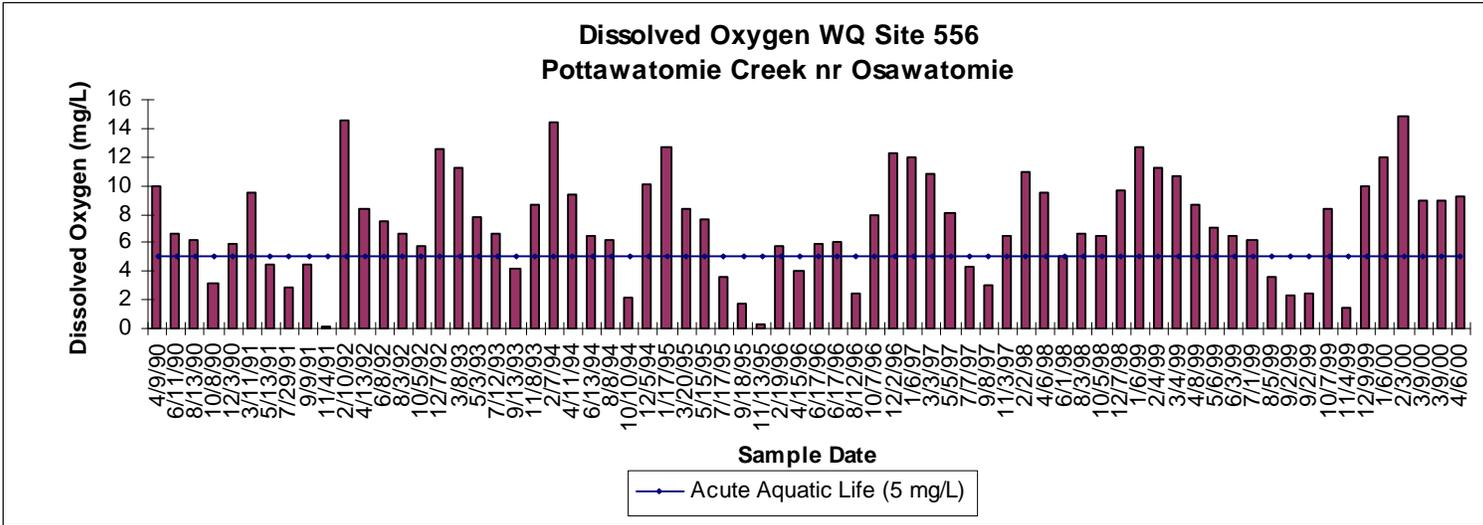
**Level of Support for Designated Use under 1998 303(d):** Not Supporting Aquatic Life

**Monitoring Sites:** Station 556 near Osawatomie

**Period of Record Used:** 1990-2000 for Station 556 (Figure 2)

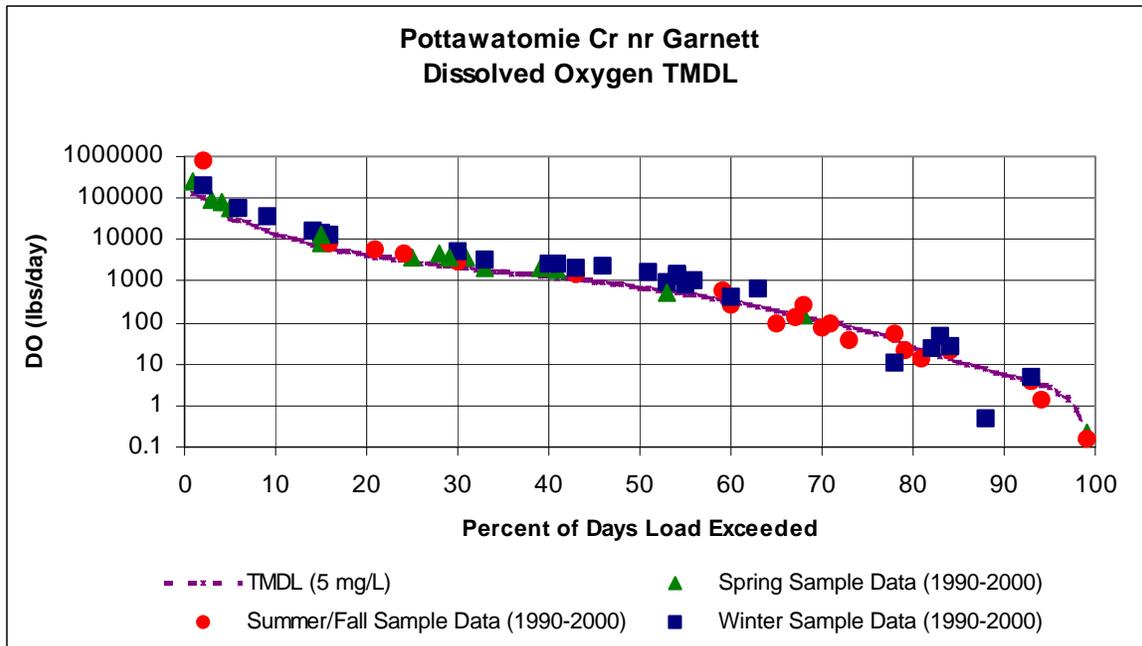
**Flow Record:** Pottawatomie Creek near Garnett (USGS Station 06914000); 1971 to 1999.

**Long Term Flow Conditions:** 10% Exceedence Flows = 460 cfs, 7Q10 = 1 cfs



**Figure 2**

**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. Sample data for the sampling site were categorized 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 the Aquatic Life criterion by multiplying the flow values for Pottawatomie Creek along the curve by the applicable water quality criterion and converting the units to derive a load duration curve of pounds of DO per day. This load curve graphically displays the TMDL since any point along the curve represents water quality at the standard at that flow. Historic excursions from water quality standards (WQS) are seen as plotted points below the load curves. Water quality standards are met for those points plotting above the applicable load duration curves (**Figure 3**).



**Figure 3**

During the analysis of sample date flow it was noted that the historical flow record on two sample dates (5/13/91 and 7/17/95) indicates, in each instance, that the previous day's average daily flow was much lower than the sample date's average daily flow (6 to 20 times less). This indicates that a runoff event occurred on the sample date and likely occurred after the early morning sample was taken at site 556. To more accurately characterize the flow condition during which these samples were taken, the previous day's average daily flow was used in calculations. The average daily flow on 5/13/91 was 134 cfs and the flow on 5/12/91 was 22 cfs. The average daily flow on 7/17/95 was 81 cfs and the flow on 7/16/95 was 4 cfs. These modifications are noted in Table 2 by italics in the flow column.

Excursions were seen in all seasons and are outlined in Table 1. Six percent of Spring samples and 55% of Summer-Fall samples were below the aquatic life criterion. Eleven percent of Winter samples were under the aquatic life criterion. Overall, 24% of the samples were under the criterion. This would represent a baseline condition of non-support of the impaired designated use.

No DO violations have been encountered at flows exceeding 22 cfs on Pottawatomie Creek near Osawatomie, therefore a critical low flow can be identified on Pottawatomie Creek as those flows of 22 cfs or less.

**Table 1**

**NUMBER OF SAMPLES UNDER DISSOLVED OXYGEN STANDARD OF 5 mg/L BY FLOW**

Station	Season	0 to 10%	10 to 25%	25 to 50%	50 to 75%	75 to 90%	90 to 100%	Cum Freq.
Pottawatomie Creek near Osawatomie (556)	Spring	0	0	0	1	0	0	1/18 = 6%
	Summer	0	0	0	6	2	4	12/22 = 55%
	Winter	0	0	0	0	2	1	3/27 = 11%

A watershed comparison approach was taken in developing this TMDL. The Little Osage River watershed and the Big Sugar Creek watershed (Water Quality Sampling Sites 207 and 558, respectively, in these watersheds were not impaired by low DO) have similar land use characteristics, are of similar size and are located near the Pottawatomie Creek watershed. The relationship of DO to Biochemical Oxygen Demand (BOD), water temperature, turbidity, nitrate, phosphorus and stream flow were used in the comparisons.

Table 2 outlines those water quality data for the samples taken on the same date for comparison watersheds between 1990 and 2000 when DO was below the aquatic life criterion for sample site 556.

At site 556 the average BOD concentration for the samples was about 8 to 30% higher than that of site 558 and 207, respectively, while average nitrate, phosphorus, temperature, turbidity and flow to some extent were much the same. This indicates that, in addition to the naturally driven climatic factors of extremely low flow and high water temperature which cause occasional DO

excursions, a probable oxygen demanding substance load is being added to Pottawatomie Creek upstream of site 556 and, under certain conditions, is likely a factor influencing some of the DO violations.

**Table 2**

COL DATE	DO (mg/L)			BOD (mg/L)			NITRATE (mg/L)			TEMP Degrees C			TPHOS (mg/L)			TURBIDITY (FTU)			Flow (cfs)	
	WQ Site	WQ Site	WQ Site	WQ Site	WQ Site	WQ Site	WQ Site	WQ Site	WQ Site	WQ Site	USGS 0691-4000	USGS 0691-7000								
	556	207	558	556	207	558	556	207	558	556	207	558	556	207	558	556	207	558	556	207
10/8/90	3.2	5.7	3.8	2.7	2.5	2	0.03	0.08	0.07	15	14	16	0.1	0.06	0.09	30.6	11.8	29	1.3	4.3
5/13/91	4.4	6.1	5.9	2.4	2.7	3.6	0.43	0.39	0.34	20	21	21	0.18	0.21	0.2	50.9	74.5	60	22	80
7/29/91	2.9	5.4	2.5	3.7	4.1	4.8	0.07	0.07	0.05	21	22	23	0.17	0.13	0.15	8.8	17.9	27.2	0.01	3.2
9/9/91	4.5	5.4	3.9	3.8	2.5	2.6	0.11	0.13	0.12	22	24	23	0.14	0.12	0.11	13.6	10.8	16	0.16	0.28
11/4/91	0.1	9.4	2.6	15	5	5.1	0.02	0.04	0.02	0.01	3	2	0.62	0.49	0.15	36	36.5	7.2	0.01	0.26
9/13/93	4.2	7	6	2.2	3.7	4.2	0.16	0.27	0.55	20	20	20	0.1	0.58	0.32	15	184	113	6.2	1.3
10/10/94	2.2	6	3.2	3.5	3.8	3.2	0.01	0.01		13	12		0.05	0.06	0.1	8	11	19	3.2	0.49
7/17/95	3.6	6.7	4	2.5	2.7	3.1	0.34	0.05	0.11	25	26		0.1	0.1	0.16	19	17	32	4	11
9/18/95	1.8	5.3	4.5	3.9	2.8	4.1	0.05	0.07	0.04	18	18		0.10	0.05	0.14	4	14	27	0.15	0.78
11/13/95	0.3	8.7	1.2	9.8	2.4	9.2	0.04	0.04	0.04	4	4		0.42	0.06	0.44	12	5	7	0.29	0.04
8/12/96	2.4	6.1	4.8	3.9	2.9	2.7	0.15	0.23	0.2	20	21	20	0.11	0.15	0.14	10	14	16	0.01	2.4
7/7/97	4.3	6.3	6	2.52	1.65	1.8	0.27	0.55	0.4	24	24	24	0.10	0.16	0.16	24	65	40	4.1	96
9/8/97	3	6.6	5.8	2.46	2.13	1.65	0.13	0.1	0.18	23	24	23	0.08	0.08	0.10	18	15	24	0.88	3.4
8/5/99	3.6	7.5	5.1	2.25	2.1	6.51	0.21	0.01	0.01	28	29	28	0.09	0.08	0.9	22	16	215	13	4.8
9/2/99	2.35	4.9	4.4	1	1	1	0.085	0.09	0.1	26	26	26	0.09	0.07	0.16	11	10.1	32	7.7	0.34
11/4/99	1.4	3	2.9	3.33	3.84	4.14	0.01	0.01	0.01	11	10	11	0.13	0.11	0.21	4.9	5.6	6.9	1.4	0.41
<b>AVERAGE</b>	<b>2.77</b>	<b>6.26</b>	<b>4.16</b>	<b>4.06</b>	<b>2.86</b>	<b>3.73</b>	<b>0.13</b>	<b>0.13</b>	<b>0.15</b>	<b>18.1</b>	<b>18.6</b>	<b>19.8</b>	<b>0.16</b>	<b>0.16</b>	<b>0.22</b>	<b>18</b>	<b>32</b>	<b>42</b>	<b>4.03</b>	<b>13.1</b>

### Desired Endpoints of Water Quality at Site 556 over 2005 - 2009

The desired endpoint will be reduced biochemical oxygen demand from artificial sources such that average BOD concentrations remain below 3.0 mg/l in the stream which results in no excursions below 5 mg/l of DO detected between 2005 - 2009.

This desired endpoint should improve DO concentrations in the creek at the critical lower flows (0-22 cfs) in the warmer months of the year (May-November). Seasonal variation is accounted for by this TMDL, since the TMDL endpoint is sensitive to the low flow and/or higher temperature conditions, generally occurring in the specified months.

This endpoint will be reached as a result of expected, though unspecified, reductions in organic 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 this endpoint will provide full support of the aquatic life function of the creek and attain the dissolved oxygen water quality standard.

### 3. SOURCE INVENTORY AND ASSESSMENT

**NPDES:** There are five NPDES permitted wastewater dischargers within the watershed (**Figure 4**). These systems are outlined in Table 3.

**Table 3**

DISCHARGING FACILITY	STREAM REACH	SEGMENT	DESIGN FLOW	TYPE
Garnett North MWTP	Pottawatomie Cr. via unnamed tributary	58	0.35 mgd	Mech.
Garnett South MWTP	S.F Pottawatomie Cr.	67	0.17 mgd	Mech.
Greeley MWTP	S.F Pottawatomie Cr.	67	0.055 mgd	Lagoon
Lane MWTP	Pottawatomie Cr.	51	0.03357 mgd	Lagoon
USD #288 - Central Heights School	N.F. Sac Branch	54	0.01 mgd	Lagoon

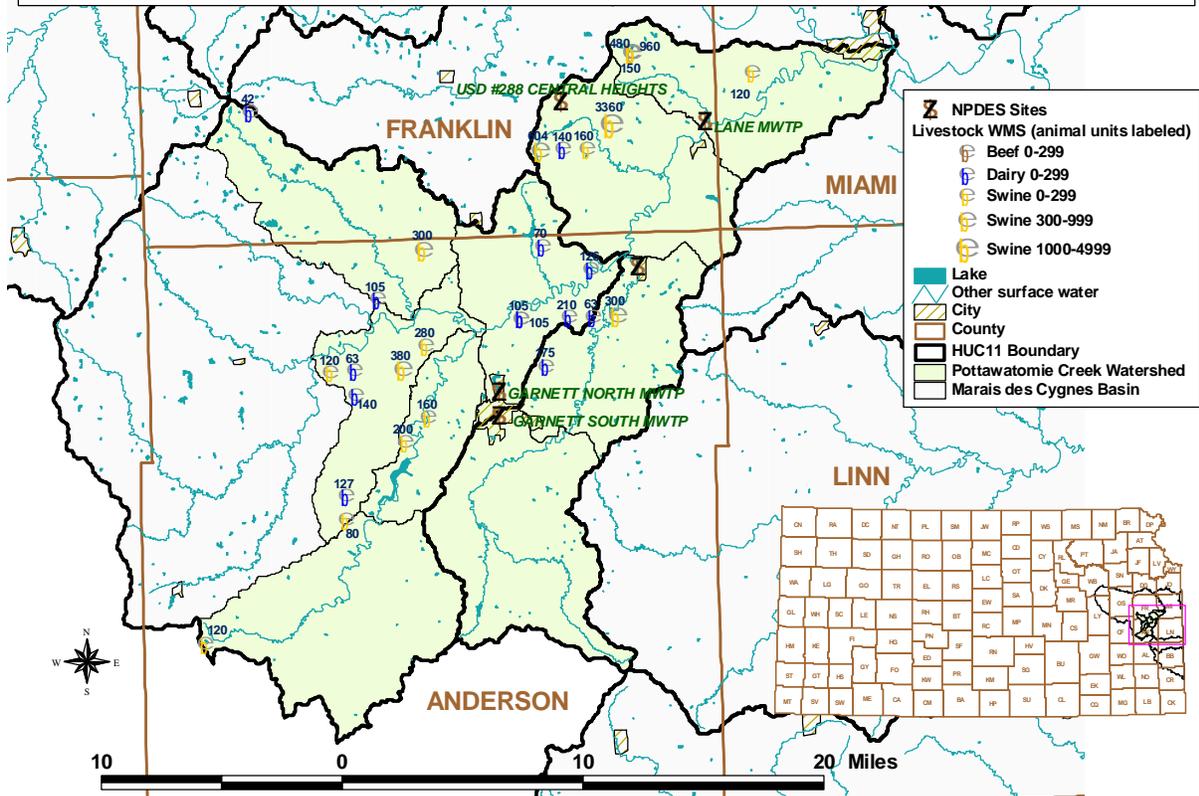
Population projections for Garnett, Greeley and Lane to the year 2020 indicate modest growth. Projections of future water use and resulting wastewater appear to be within design flows for each of the current system’s treatment capacity. Examination of municipal effluent monitoring indicates the incidence of BOD levels in excess of permits limits is fairly rare. USD# 288 has discharged only once since 1996 and this was to perform lagoon repairs.

**Livestock Waste Management Systems:** Twenty nine operations are registered, certified or permitted within the watershed. The facility type is either beef, dairy or swine. Most of these facilities are either located along the main stem reach or listed tributaries (**Figure 4**). Potential animal units for all facilities in the watershed total 9,245. The actual number of animal units on site is variable, but typically less than potential numbers.

**Land Use:** Most of the watershed is grassland (56% of the area), cropland (33%), woodland (9 %) or urban use (1%). Most of the grassland is located around the perimeter (higher elevations) of the watershed. Based on 1997 water use reports, none of the cropland in the watershed is irrigated. The grazing density estimate is average to high (35-62 animal units/mi<sup>2</sup>) when compared to the densities across the Marais des Cygnes and Missouri Basins (**Figure 5**).

**On-Site Waste Systems:** Most of the watershed’s population density is low (5 - 19 persons/mi<sup>2</sup>) when compared to densities across the Marais des Cygnes and Missouri Basin except for areas associated with the city of Garnett (32-41 persons/mi<sup>2</sup>) which is average for the Marais des Cygnes and Missouri Basins (**Figure 5**). The rural population projections for Anderson and Franklin Counties through 2020 show significant growth (27 - 37% increase respectively). The rural projection for Miami County through 2020 shows substantial growth (95% increase).

## Pottawatomie Creek Watershed NPDES Sites and Livestock Waste Management Facilities



**Figure 4**

**Contributing Runoff:** The watershed’s average soil permeability is 0.5 inches/hour according to NRCS STATSGO data base. About 99% of the watershed produces runoff even under relative low (1.71"/hr) potential runoff conditions. Under very low (1.14"/hr) potential conditions, this potential contributing area is reduced only marginally (84%). Runoff is chiefly generated as infiltration excess with rainfall intensities greater than soil permeabilities. As the watershed’s soil profiles become saturated, excess overland flow is produced. Generally, storms producing less than 0.57"/hr of rain will still generate runoff from about 72% of this watershed, chiefly from the upper two thirds of the watershed and along the stream channels.

**Background Levels:** Some organic enrichment may be associated with environmental background levels, including contributions from wildlife and stream side vegetation, but it is likely that the density of animals such as deer is fairly dispersed across the watershed and that the loading of oxygen demanding material is constant along the stream. For wildlife this loading should result in minimal loading to the streams below the levels necessary to violate the water quality standards.

# Pottawatomie Creek Watershed Land Use, Population and Grazing Density

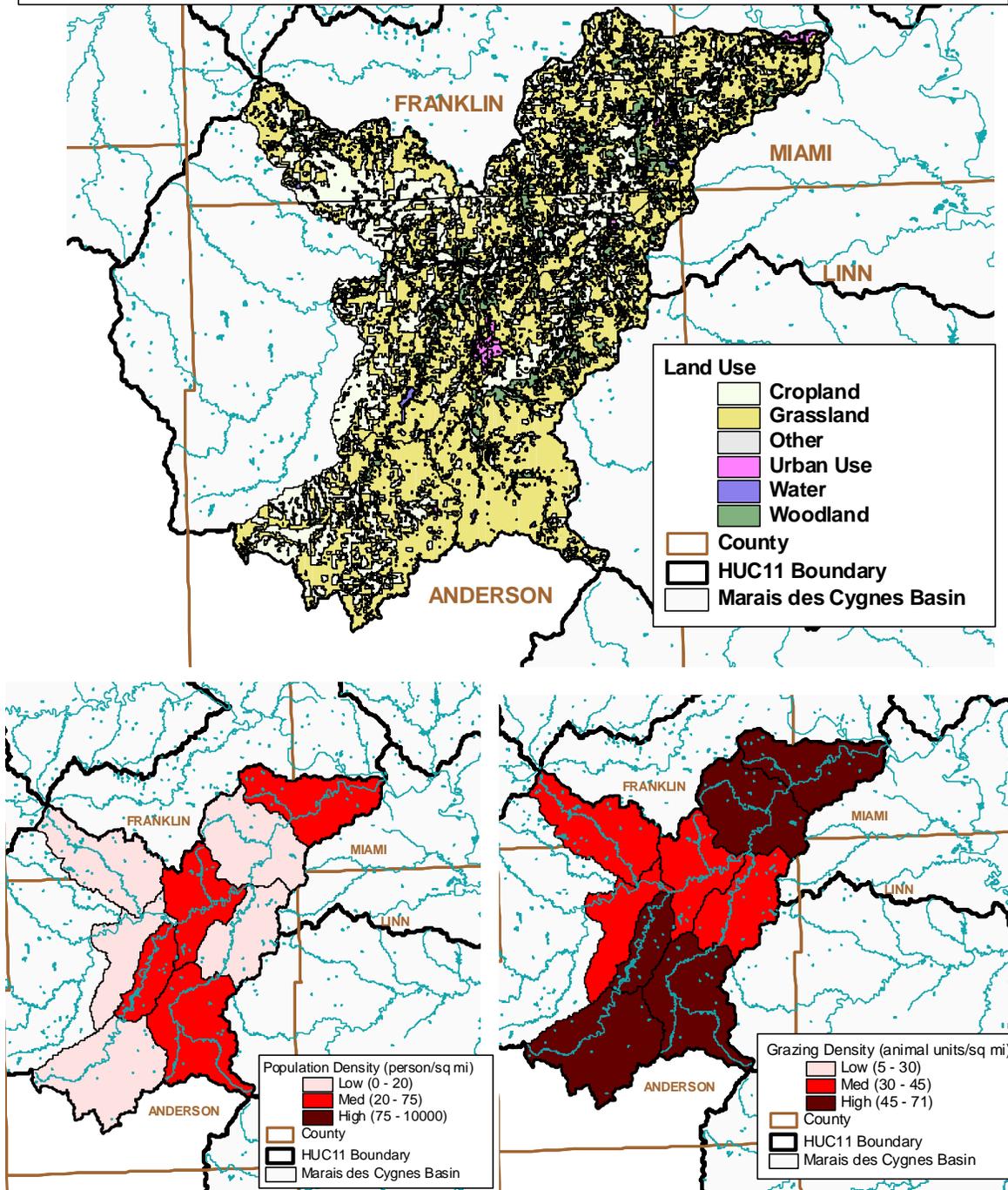


Figure 5

#### 4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY

It is presumed that reductions in BOD loads will reduce DO excursions under certain critical flow conditions. Therefore, the allocation of wasteloads and loads will be made in terms of BOD reductions. Yet, because DO is a manifestation of multiple factors, the initial pollution load reduction responsibility will be to decrease the BOD over the critical range of flows encountered on Pottawatomie Creek. These reductions have been based on the relationship between DO and BOD for the samples taken at Water Quality Monitoring site 556 as compared to the relatively unimpaired Little Osage River and Big Sugar Creek watersheds and their water quality monitoring sites (207 and 558). Allocations relate to the BOD levels seen in the Pottawatomie Creek at site 556 relative to sites 207 and 558 for the critical lower flow conditions. Based on this relationship, BOD concentrations at site 556 need to be reduced by 26% (so that in stream average BOD is 3 mg/L or less). Additional monitoring over time will be needed to further ascertain the relationship between BOD reductions of point and non-point sources, flow conditions, water temperatures and DO levels along the stream.

For this phase of the TMDL, the average condition is considered across the seasons, to establish goals of the endpoint and desired reductions. Therefore, the target average daily BOD level was multiplied by the average flow estimated for Pottawatomie Creek across all flow conditions. This is represented graphically by the integrated area under each BOD load duration curve established by this TMDL. The area is segregated into allocated areas assigned to point sources (WLA) and nonpoint sources (LA). Future growth in wasteloads should be offset by reductions in the loads contributed by nonpoint sources. This offset along with appropriate limitations should eliminate the impairment. This TMDL represents the “Best Professional Judgment” as to the expected relationship between physical factors, organic matter and DO.

**Point Sources:** The point sources are responsible for maintaining their systems in proper working condition and appropriate capacity to handle anticipated wasteloads of their respective populations. All cities contributing oxygen demanding substances within the watershed appear to be within their respective design flows for their populations through 2020. The State and NPDES permits will continue to be issued on 5 year intervals, with inspection and monitoring requirements and conditional limits on the quality of effluent released from this facility. Ongoing inspections and monitoring of the systems will be made to ensure that minimal contributions have been made by this source.

Based upon the preceding assessment, point sources contributing a BOD load in the Pottawatomie Creek Watershed upstream of site 556 will be considered in this Wasteload Allocation. Streeter-Phelps analysis indicates the present BOD permit limit for each point source maintains DO levels above 5 mg/L for flows greater than or equal to the 7Q10 of 0.1 cfs and, until additional in stream monitoring can further define the DO/BOD relationship, is therefore assumed to correspond to maintaining an average of BOD of less than 3 mg/L at the sampling site across this flow condition and achieves the Kansas Water Quality Standard for DO of 5 mg/L.

By K.A.R. 28-16-28c(c)(1) for flows less than 0.1 cfs, classified streams may be excluded from

the application of some or all of the requirements of K.A.R. 28-16-28e(c). This condition (0 - 0.1 cfs) occurs at the 95-99% exceedence. The sum of the design flows of the point sources (0.96 cfs) redefines the lowest flow seen at site 556 (80-99% exceedence), and the WLA (plus a background LA) equals the TMDL curve across this flow condition (**Figure 6**).

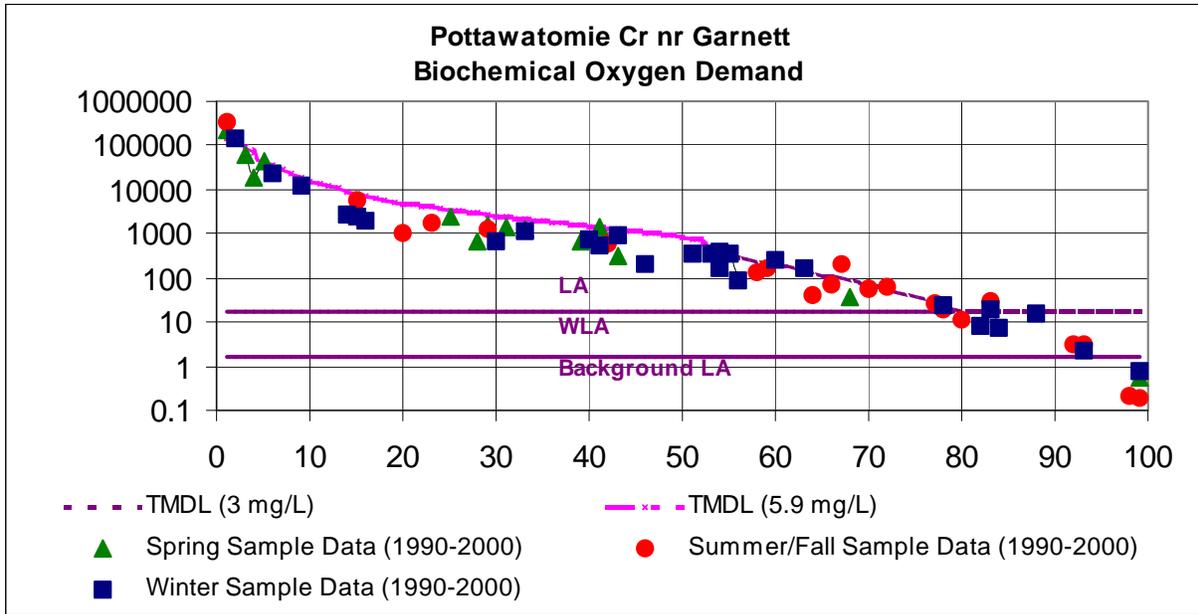
From this, the WLA for the city of Garnett North Plant defined at sample site 556 is 8.8 lbs/day BOD, the WLA for the city of Garnett South Plant is 4.3 lbs/day BOD, the WLA for the city of Greeley is 1.4 lbs/day BOD, the WLA for the city of Lane is 0.84 lbs/day BOD and the WLA for the USD #288 (Central Heights School) is 0.24 lbs/day BOD across all flow conditions (**Figure 6**).

The city of Garnett is under a schedule of compliance to upgrade its north and south waste treatment plants by July 1, 2001. The system upgrades should not only reduce the BOD load in effluent by 75% over the current system, but the effluent will also be re-aeriated after denitrification resulting in DO of 6 mg/L in the effluent. The BOD load reduction by the city of Garnett should be sufficient to meet the BOD endpoint of 3 mg/L at water quality sampling site 556.

**Non-Point Sources:** Based on the prior assessment of sources, the distribution of excursions from water quality standards at site 556 and the relationship of those excursions to runoff conditions and seasons, non-point sources are also seen as a contributing factor to the occasional DO excursions in the watershed.

The samples from Pottawatomie Creek show there were no DO violations at flows in excess of 22 cfs. The Load Allocation assigns responsibility for reducing the in stream BOD levels at site 556 to 3 mg/L across the 0.96 - 22 cfs range of the critical flow condition (53 - 79% exceedence) and maintaining the in stream BOD levels at site 556 to the historical levels of 5.9 mg/L for flows in excess of 22 cfs (which is 90<sup>th</sup> percentile of BOD samples for flows above 22 cfs for Pottawatomie Creek near Garnett). A background LA was established at site 556 based on the BOD target of 3.0 mg/L and the 7Q10 of 0.1 cfs. The background LA across all flow conditions is 1.62 lbs/day BOD. Therefore, the sum of these two LA is 1.62 lbs/day for flows from 0 - 0.96 cfs (80 - 99% exceedence) and then increases as the LA increases for flows greater than 0.96 cfs to the TMDL curve (**Figure 6**). Sediment control practices such as buffer strips and grassed waterways should help reduce the non-point source BOD load under higher flows as well as reduce the oxygen demand exerted by the sediment transported to the stream that may occur during the critical flow period.

To address the DO violations that occurred because of low flow and high seasonal temperatures alone (as on 9/22/99 and 11/4/99 from Table 2), riparian vegetation restoration should occur adjacent to the main stem of Pottawatomie Creek to provide shade for the stream and generally reduce surface water temperatures during the seasons of concern.



**Figure 6**

**Defined Margin of Safety:** The Margin of Safety will be implied based on conservative assumptions used in the permitting of the point source discharges including coincidence of low flow with maximum discharge from the treatment plant, associated CBOD content and temperature of the effluent, and the better than permitted performance of the treatment plant in producing effluent with BOD well below permit limits under critical seasonal conditions.

**State Water Plan Implementation Priority:** Because this watershed has indicated some problem with dissolved oxygen which has short term and immediate consequences for aquatic life, this TMDL will be a High Priority for implementation.

**Unified Watershed Assessment Priority Ranking:** This watershed lies within the Upper Marais des Cygnes River Subbasin (HUC 8: 10290101) with a priority ranking of 5 (High Priority for restoration work).

**Priority HUC 11s and Stream Segments:** Because of the location of the water quality sampling site in the watershed, priority should be directed toward baseflow generating and conducting stream segments; the main stem of Pottawatomie Creek (segments 51, 53 and 55) and listed tributaries in HUC11 10290101060, and then extending with diminishing priority upstream on the main stem (segments 56, 58 and 59) and listed tributaries in HUC11 10290101050.

## 5. IMPLEMENTATION

### Desired Implementation Activities

1. Where needed, restore riparian vegetation along main stem.

2. Install grass buffer strips where needed along streams.
3. Renew state and federal permits and inspect permitted facilities for permit compliance
4. Install proper manure and livestock waste storage.
5. Insure proper on-site waste system operations in proximity to main streams.
6. Insure that labeled application rates of chemical fertilizers are being followed.

## **Implementation Programs Guidance**

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

- a. Municipal permits for facilities in the watershed will be renewed after 2002 with continuation of DO and BOD monitoring and permit limits preventing excursions in these criteria.
- 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.

### **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. Provide technical assistance in urban and agricultural setting on practices geared to minimize chemical fertilizer impact to stream resources.
- d. Guide federal programs such as the Environmental Quality Improvement Program, which are dedicated to priority subbasins through the Unified Watershed Assessment, to priority watersheds and stream segments within those subbasins identified by this TMDL.

### **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. Develop riparian restoration projects along main stem especially those areas with baseflow.
- b. Design winter feeding areas away from streams.

**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. Educate chemical fertilizer users on proper application rates and timing.
- c. Provide technical assistance on livestock waste management design.
- d. Continue Section 319 demonstration projects on livestock management.

**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 priority stream segments (12 and 13 on the main stem and tributary segments 14 and 54).

**Timeframe for Implementation:** Pollution reduction practices should be installed along the main stem and listed tributaries within the priority subwatersheds over the years 2002-2006, with follow up implementation thereafter.

**Targeted Participants:** Primary participants for implementation will be the identified point sources and landowners immediately adjacent to the creek. Implemented activities should be targeted to those stream segments with greatest potential contribution to baseflow. Nominally, this would be most likely be:

1. Areas of denuded riparian vegetation along the targeted main stem.
2. Facilities without water quality controls
3. Unbuffered cropland adjacent to stream
4. Sites where drainage runs through or adjacent livestock areas
5. Sites where livestock have full access to stream and stream is primary water supply
6. Poor riparian sites
7. Sites which have an urban runoff component
8. Failing on-site waste systems

Some inventory of local needs should be conducted in 2002 to identify such 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 2006:** The year 2006 marks the mid-point 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 riparian restoration or buffer strips, cited in the local assessment, participating in the implementation programs provided by the state. Additionally, sampled data from site 556 should indicate evidence of improved dissolved oxygen levels at the critical flow conditions relative to the conditions seen over 1990-2000. At this early stage of implementation the establishment of riparian vegetation and buffer strips is important and it is acknowledged that, in the case of riparian vegetation, it may take 20 years and beyond to provide a shade canopy over the stream.

**Delivery Agents:** The primary delivery agents for program participation will be the conservation districts for programs of the State Conservation Commission and the Natural Resources Conservation Service. Producer outreach and awareness will be delivered by Kansas State County staff managing. On-site waste system inspections will be performed by Local Environmental Protection Program personnel for Anderson, Franklin and Miami counties.

**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-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 Marais des Cygnes 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 High Priority consideration.

**Effectiveness:** Riparian restoration projects are being touted as a significant means for water temperature buffers of streams. Non-point 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 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 1990-2000, the state may employ more stringent conditions on agricultural producers and urban runoff 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. 65-171. 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 will continue to collect bimonthly samples at Station 556 including dissolved oxygen samples. Based on that sampling, the status of 303(d) listing will be evaluated in 2010. Should impaired status remain, the desired endpoints under this TMDL will be refined and more intensive sampling will need to be conducted under specified seasonal flow conditions over the period 2005-2009.

Monitoring of BOD levels in effluent will continue to be a condition of NPDES and state permits for facilities. This monitoring will continually assess the functionality of the systems in reducing organic levels in the effluent released to the streams.

Local program management needs to identify its targeted participants of state assistance programs for implementing this TMDL. This information should be collected in 2001 in order to support appropriate implementation projects.

## 7. FEEDBACK

**Public Meeting:** The public meeting to discuss TMDLs in the Marais des Cygnes Basin was

held February 28, 2001 in Ottawa. 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 Marais des Cygnes Basin.

**Public Hearings:** Public Hearings on the TMDLs of the Marais des Cygnes Basin were held in Fort Scott on May 30 and Ottawa on May 31, 2001.

**Basin Advisory Committee:** The Marais des Cygnes Basin Advisory Committee met to discuss the TMDLs in the basin on October 4, 2000, February 28 and May 30, 2001.

**Milestone Evaluation:** In 2006, evaluation will be made as to the degree of implementation which has occurred within the watershed and current condition of Pottawatomie Creek. Subsequent decisions will be made regarding the implementation approach and follow up of additional implementation in the watershed.

**Consideration for 303(d) Delisting:** The 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 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.

**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 2002-2006.