

**Missouri Department of Natural Resources  
Water Pollution Control Program**

**Total Maximum Daily Load (TMDL)**

**for**

**Eleven Point River  
Howell County, Missouri**

**Completed December 6, 2000**

**Approved January 12, 2001**

**Total Maximum Daily Load (TMDL)  
For Eleven Point River  
Pollutant: Chlorine**

**Name: Eleven Point River**

Location: Near Willow Springs in Howell County, Missouri

Hydrologic Unit Code (HUC): 11010011-010001

Water Body # (WBID): 2604

Missouri Stream Class: C (Class C streams may cease to flow in dry periods but maintain permanent pools which support aquatic life.)<sup>1</sup>

Beneficial Uses: Livestock and Wildlife Watering, Protection of Aquatic Life and Human Health- Fish Consumption (Cool Water Fishery)

Size of Impaired Segment: 0.4 miles

Location of Impaired Segment: Wholly contained in S ½ Section 33, T27N, R9W

Pollutant: Chlorine

Pollutant Source: Willow Springs Municipal Wastewater Treatment Plant

Permit Number: NPDES Permit No. MO-0102288

TMDL Priority Ranking: Medium

## **1. Background and Water Quality Problems**

The Eleven Point River immediately below the outfall of the Willow Springs wastewater treatment plant (WWTP) was inspected by Missouri Department of Natural Resources (MDNR) Water Pollution Control Program staff during summer low flow conditions in 1990 and 1993. On both occasions a chlorine odor was present, stream substrate seemed to be very light in color, and the stream was devoid of algae, aquatic invertebrates and fish immediately downstream of the outfall. On these two occasions the stream was also observed about 0.6 miles downstream of the outfall. Fish and aquatic invertebrates were present and there was no evidence of bleaching of the substrate or chlorine odor. Based on these observations 0.4 miles of the stream were judged to be impaired due to chlorine toxicity.

---

<sup>1</sup> See 10 CSR 20-7.031(1)(F)

The source of the chlorine is believed to be the Willow Springs WWTP since that facility uses chlorine to disinfect wastewater. During the 1990 stream inspection, the stream upstream of the WWTP outfall did have aquatic life and during the 1993 inspection, there was no upstream flow and thus no upstream source. These observations support the conclusion that the WWTP is the source of the chlorine.

The Willow Springs facility is served by an oxidation ditch wastewater treatment plant with a design flow of 0.63 cubic feet per second (cfs). The discharge is regulated by NPDES permit MO-0102288, which was issued July 18, 1997, and expires July 17, 2002. Disinfection of wastewater at this facility down to the level of 400 fecal coliform colonies/100 ml monthly average and 1000 colonies/100 ml daily maximum is required by the Missouri effluent regulation 10 CSR 20-7.015 (4)(B)4. If chlorine is used as a disinfectant, 10 CSR 20-7.015 (4)(B)5 requires dechlorination of the effluent if the outfall is within one mile of a classified stream and the  $7Q_{10}^2$  low flow of the receiving stream is less than 50 times the volume of the effluent design flow. Since the Willow Springs WWTP effluent discharge is to a classified stream with a  $7Q_{10}$  low flow of zero, dechlorination is required.

The discharge is located in the SE SW Section 33, T27N, R9W. This is near the upstream end of the Eleven Point River and is at the upstream end of a nearly 25-mile segment of the river that is classified as a “losing stream”, one that loses much or all of its flow to the groundwater system. This “losing stream” classification does not affect the chlorine standard. Most of the other streams in the upper portion of the watershed are also “losing streams” and much of this flow emerges at Greer Spring, the second largest spring in Missouri, about 30 miles ESE of Willow Springs.

## **2. Description of the Applicable Water Quality Standards and Numeric Water Quality Targets**

### **Designated Uses:**

The designated uses of this section of the Eleven Point River, WBID 2604, are Livestock and Wildlife Watering, Protection of Aquatic Life and Human Health-Fish Consumption (Cool Water Fishery). The stream classifications and designated uses may be found at 10 CSR 20-7.031 (1)(C) and Table H.

### **Anti-degradation Policy:**

Missouri’s Water Quality Standards include the EPA “three-tiered” approach to anti-degradation, and may be found at 10 CSR 20-7.031(2).

Tier I defines baseline conditions for all waters -- it requires that existing beneficial uses are protected. TMDLs would normally be based on this tier, assuring that numeric criteria (such as dissolved oxygen, ammonia) are met to protect uses.

Tier II requires no degradation of high-quality waters, unless limited lowering of quality is shown to be necessary for “economic and social development.” A clear implementation policy for this tier has not been developed, although if sufficient data on high-quality waters are

---

<sup>2</sup> The 7-day average minimum flow with a recurrence interval of 10 years. Indicates drought conditions.

available, TMDLs could be based on maintaining existing conditions, rather than the minimal Tier I criteria.

Tier III (the most stringent tier) applies to waters designated in the water quality standards as outstanding state and national resource waters; Tier III requires no degradation under any conditions. Management may require no discharge or prohibition of certain polluting activities. TMDLs would need to assure no measurable increase in pollutant loading.

This section of the Eleven Point River is more than 20 miles upstream of the portion designated as a National Scenic River. Thus, this TMDL will result in the protection of existing beneficial uses, which conforms to Missouri's Tier I anti-degradation policy.

### **Specific Criteria and Numeric Water Quality Target:**

The specific criteria for chlorine are found in Missouri's Water Quality Standards, 10 CSR 20-7.031 Table A, page 17. There are no numeric criteria for Cool Water Streams, and in their absence, the criteria for Warm Water Streams are used. The only beneficial use with chlorine criteria is protection of aquatic life. The criteria are 0.01 mg/L chronic and 0.019 mg/L acute, expressed as total residual chlorine (TRC).

The numeric water quality target for this TMDL will be the 0.01 mg/L chronic standard applied at the end of the pipe.

### **3. Calculation of Load Capacity**

Load capacity is defined as the maximum pollutant load that will still attain water quality standards. In this TMDL, the load capacity will be defined by the conditions leading to the highest instream level of Total Residual Chlorine (TRC). These conditions would occur when the WWTP is running at full capacity and there is no upstream flow to dilute the effluent. Under these conditions, the chronic standard of 0.01 mg/L would need to be met. The formula for load capacity is given below:

$$(design\ stream\ flow\ in\ cfs)(maximum\ allowable\ pollutant\ concentration\ in\ mg/L)(5.395^*) = pounds/day \quad (1)$$

\*5.395 is the constant used to convert cfs times mg/L to pounds/day.

Given a design upstream flow of zero and a WWTP design flow of 0.63 cfs, solving this equation gives:  $(0.63\ cfs)(0.01\ mg/L)(5.395) = 0.034\ pounds/day\ TRC$ .

### **4. Load Allocation (Nonpoint Source Load)**

There are no known nonpoint sources of TRC in the impaired stream segment. Thus the nonpoint source load allocation for TRC is zero pounds per day.

### **5. Waste Load Allocation (Point Source Loads)**

The point source waste load allocation would be calculated by formula (2).

$$(WWTP\ design\ flow\ in\ cfs)(effluent\ TRC\ limit\ in\ mg/L)(5.395) = TRC\ pounds/day \quad (2)$$

This formula gives:  $(0.63\text{cfs})(0.01\text{ mg/L})(5.395) = 0.034\text{ pounds/day}$ .

## **6. Margin of Safety**

The Margin of Safety is implicit based on the following conservative assumptions. The Wasteload Allocation calculation assumes the critical low flow of zero when the Willow Springs WWTP is discharging at a magnitude as high as its design flow. This circumstance would be a rare occasion. Also, this part of the Eleven Point is effluent dominated, therefore, the water quality is really the Willow Springs effluent quality. The permit monitoring will provide assurance that the water quality standards will be achieved and therefore provides another degree of conservatism in the TMDL.

## **7. Seasonal Variation**

Because the impairment is due to a single point source, and there are no nonpoint sources, the consideration of the critical low flow takes into account seasonality. It would be at that low flow where concern would arise as to not meeting the chlorine permit limit and thus violating Missouri Water Quality Standards.

## **8. Implementation and Monitoring Plans**

Willow Springs NPDES permit MO 0102288 was re-issued July 18, 1997, with a monthly average and daily maximum allowable TRC of 1 mg/L in effect until June 30, 1999. Beginning July 1, 1999, and continuing until the end of the permit in July 17, 2002, dechlorination was required. A monthly average and daily maximum of 0.01 mg/L must be maintained. The permit also requires quarterly monitoring of TRC in the effluent. As with all of Missouri's TMDLs, if continuing monitoring reveals that water quality standards are not being met, the TMDL will be reopened and re-evaluated accordingly. This TMDL will be incorporated into Missouri's Water Quality Management Plan.

## **9. Reasonable Assurances**

The MDNR has the authority to write and enforce NPDES permits. Inclusion of a dechlorination requirement and effluent limits into a state NPDES permit, and quarterly monitoring of the effluent reported to MDNR, should provide reasonable assurance that instream water quality standards will be met.

## **10. Public Participation**

These water quality limited segments are included on the approved 1998 303(d) list for Missouri. The MDNR Water Pollution Control Program developed this TMDL. A public notice period was held from Oct. 27 to Nov. 26, 2000. Groups receiving the public notice announcement included the Missouri Clean Water Commission, the affected facility, the Water Quality Coordinating Committee, the TMDL Advisory Committee, Stream Team volunteers in the watershed, and others that routinely receive the public notice of NPDES

permits. Comments were received from the Missouri Department of Conservation, Sierra Club and the Missouri Chapter of American Fisheries Society. Some adjustments were made to the TMDL document in response to comments received, but the overall approach and the numeric targets remain unchanged. Copies of the notice, the comments and MDNR's response to the comments are on file with MDNR.

#### **11. Appendices and List of Documents on File with MDNR**

Appendix A – Land use map for Eleven Point River watershed

Appendix B – Topographic map showing WWTP location and impaired segment

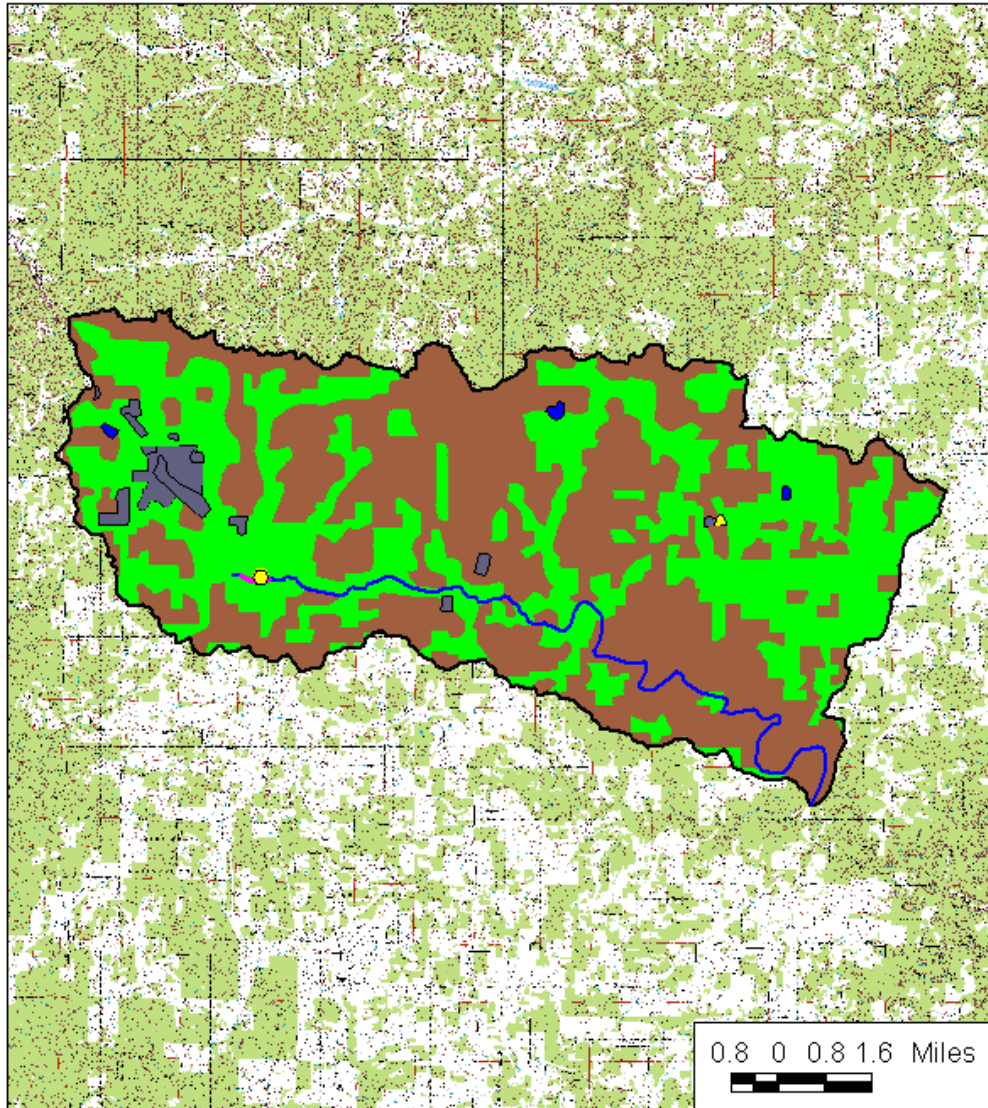
Willow Springs WWTP - NPDES Permit No. MO-0102288

Public Notice announcement

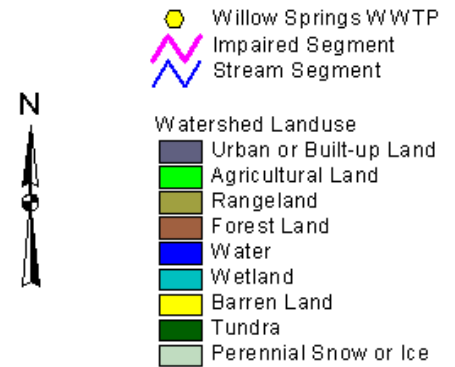
Public comments

MDNR's response to public comments

# Appendix A. Land Use Types for Eleven Point River Watershed (11010011-010001)



Land Use Type	Area (acres)	
Urban or Built-up Land		1035
Residential	757	
Commercial and Services	191	
Industrial	10	
Mixed Urban or Built-up	56	
Other Urban or Built-up	21	
Agricultural Land		20584
Cropland and Pasture	20584	
Forest Land		25680
Deciduous Forest Land	25680	
Water		86
Reservoirs	86	
Barren Land		18
Strip Mines	18	



## Appendix B. Map of Willow Springs WWTP and Impaired Segment Eleven Point River, Howell County, Missouri

