

Missouri Department of Natural Resources

# Total Maximum Daily Load Information Sheet

## Gabriel Creek

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### Water Body Segment at a Glance:

**County:** Morgan  
**Nearby Cities:** Stover  
**Length of impairment:** 1 mile  
**Pollutant:** Biochemical Oxygen Demand (BOD), Non Filterable Residue (NFR)  
**Source:** Two Stover Wastewater Treatment Lagoons  
**Water Body ID:** 883



State map showing location of watershed

**TMDL Priority Ranking:** Permit in lieu of TMDL approved 2007

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### Description of the Problem

#### Designated beneficial uses of Gabriel Creek

- Livestock and Wildlife Watering
- Protection of Warm Water Aquatic Life
- Protection of Human Health (Fish Consumption)
- Whole Body Contact Recreation

#### Use that is impaired

- Protection of Warm Water Aquatic Life

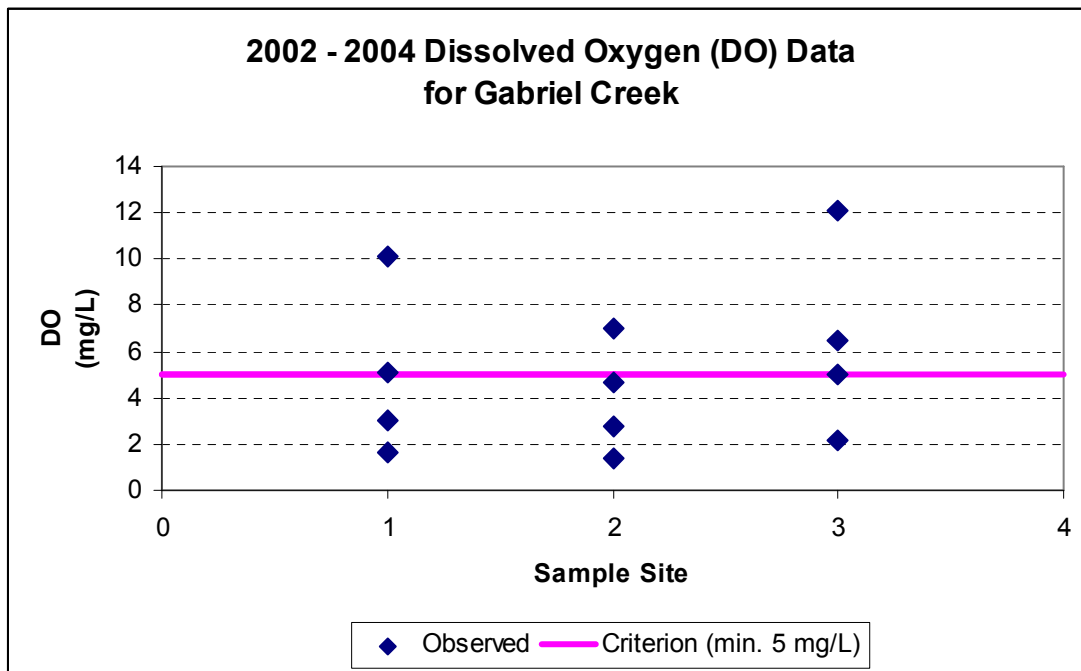
#### Standards that apply

- The Missouri Water Quality Standard, found in 10 CSR 20-7.031 Table A, for dissolved oxygen (related to BOD) in streams is a minimum of 5.0 mg/L (milligrams per liter or parts per million).
- Standards for NFR may be found in the general criteria section of the WQS, 10 CRS 20.7.031 (d) (A) (C) which states:
  - Waters shall free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses.
  - Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses.

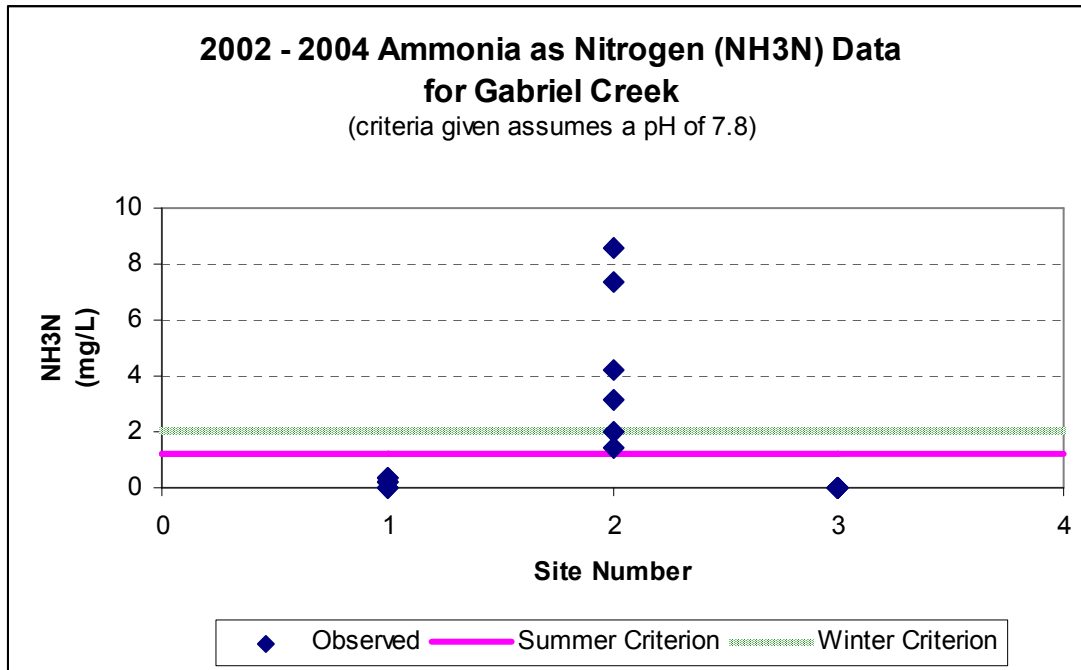
### Background information and water quality data

Gabriel Creek shows reduced diversity of aquatic invertebrates (water insects and crayfish) and low levels of dissolved oxygen downstream from the two Stover wastewater treatment lagoons. The lagoons discharge near the headwaters of Gabriel Creek and the upstream flow is very low, ranging from zero to 0.01 cubic feet per second. The effluent contribution to the stream is 10 to 80 times that of the stream flow itself. There are no other wastewater treatment plants or other known anthropogenic sources that would cause low dissolved oxygen (DO) upstream of the lagoons. The listing for the impaired reach was based on stream surveys conducted on August 5, 1982, June 24, 1992, and August 10, 1993, above and below the lagoon systems. On those dates, department personnel observed violations of Missouri’s narrative standards for Volatile Suspended Solids directly downstream and attributable to the lagoons. These included odor, duckweed, organic sludge deposits, and filamentous algae. The creek upstream was reported as “looking good overall.” Subsequent sampling from 2002 to 2004 demonstrated a significant reduction of DO below the treatment facilities. Data from 2004 also documented a morning DO of 5.0 mg/L upstream of the treatment facility, further confirming the belief that the facilities are the sole source of the impairment (See data in graphs and table below).

The two permits were reissued April 13, 2007 with new limits for BOD, NFR and ammonia. These were submitted to the U.S. Environmental Protection Agency in lieu of a TMDL. EPA approved this submittal July 27, 2007. The permit for the Southwest Lagoon was issued with limits ensuring stream water quality standards will be met. The water quality standard for DO of 5.0 mg/L will be achieved by limiting the effluent to a BOD of 25 mg/L maximum daily limit. The standard for NFR (as a narrative of no objectionable bottom deposits downstream) will be achieved by limiting the effluent to a 25 mg/L TSS maximum daily limit. A treatment plant upgrade will be needed to achieve the necessary permit limits. As stated in the permit, the final effluent limits shall become effective three years from the date of permit issuance (i.e., effective on April 13, 2010).

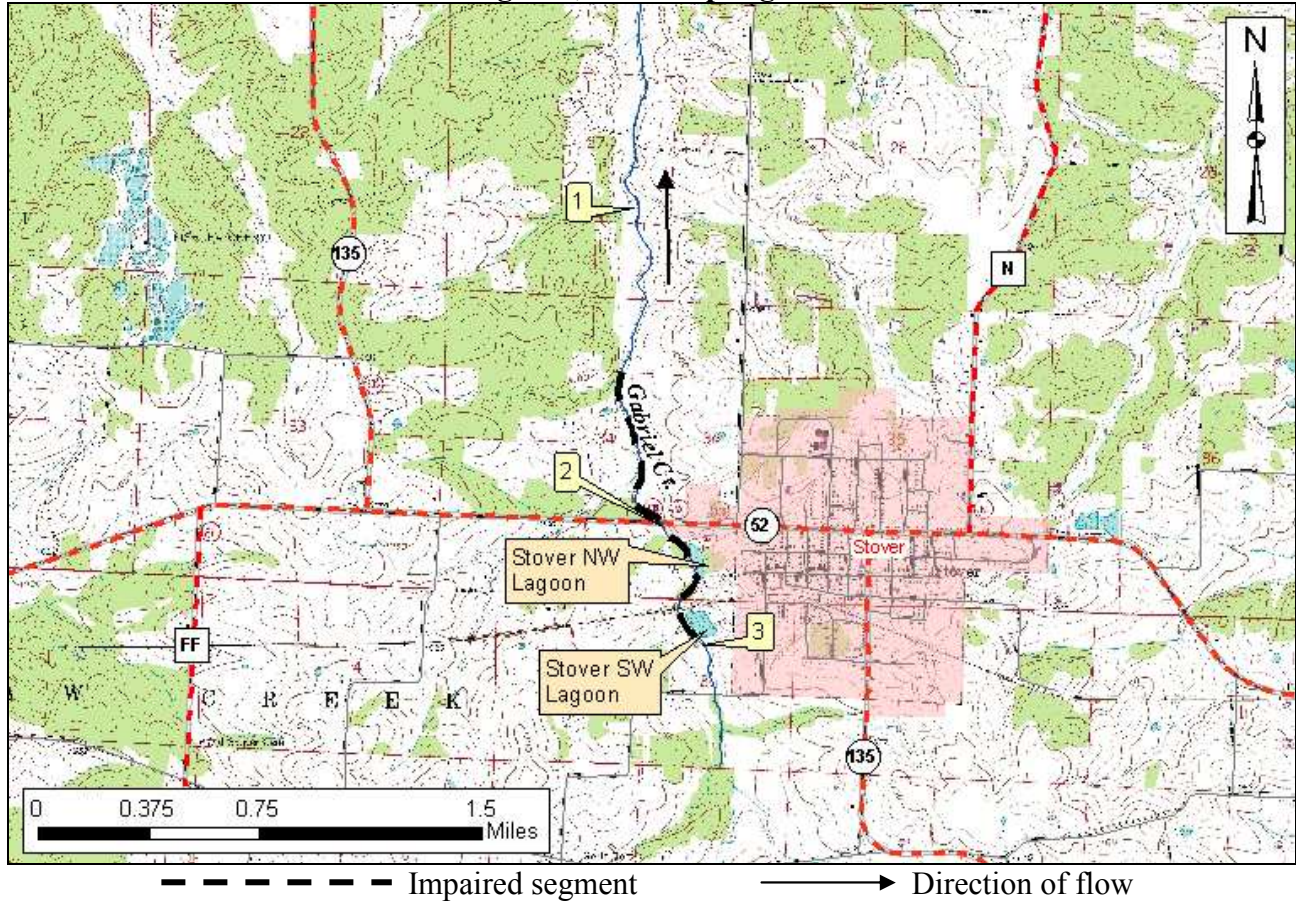


The permit for the Northwest Lagoon retains the previous permit's limits for BOD and TSS. However, it also includes a compliance schedule for the city to cease discharges from, and submit a closure plan for, this lagoon within four years of permit issuance, and eliminate the lagoon in accordance with the closure plan within five years of permit issuance.



<b>Mean Water Quality Data for Gabriel Creek, for Two Water Quality Studies 2002 and 2003</b>						
Sampling Site	Flow (cfs)	A.M. Water Temp. (°C)	A.M. Diss. Oxygen (mg/L)	Ammonia (mg/L)	Total Suspended Solids (mg/L)	Volatile Suspended Solids (mg/L)
Gabriel Cr. 0.1 mi. upstream of Stover Southwest Lagoon	0.0	19	2.2	<0.03		
Stover SW Lagoon effluent	0.10	22.5	2.2	4.36	100	86
Stover Northwest Lagoon effluent	0.18	23	<1	10.77	72	51
Gabriel Cr. 0.1 mi. downstrm of Stover NW Lagoon	0.25	19	<b>1.4</b>	<b>5.83</b>	5	<5
Gabriel Cr. 1.3 mi. downstrm of Stover NW Lagoon	0.25	19.5	<b>1.6</b>	0.27	8	5
Gabriel Cr. 2.0 mi. downstrm of Stover NW Lagoon	0.10	17		<0.03	8	<5

**Map showing the impaired segment of Gabriel Creek in Morgan County, Mo., the two Stover Lagoons, and sampling sites**



**Sample Sites**

- 1 – Gabriel Cr. 1.3 miles below Stover NW Lagoon
- 2 – Gabriel Cr. 0.1 mile below Stover NW Lagoon at State Hwy 52
- 3 – Gabriel Cr. 0.1 miles above Stover SW Lagoon

**For more information call or write:**  
Missouri Department of Natural Resources  
Water Protection Program  
P.O. Box 176, Jefferson City, MO 65102-0176  
1-800-361-4827 or 573-751-1300 office  
573-522-9920 fax  
Program Home Page: [www.dnr.mo.gov/env/wpp/index.html](http://www.dnr.mo.gov/env/wpp/index.html)