1 EXECUTIVE SUMMARY

The ultimate goal of this project is to describe the reduction in pollutant loading and implementation activities needed so that Upper Mississippi River reaches can meet the water quality standard for aquatic recreation due to Escherichia coli (E. coli), a bacteria used to indicate the potential presence of waterborne pathogens that can be harmful to human health. In meeting this goal, the implementation of best management practices (BMPs) in critical areas may also help reduce other contaminants of concern investigated during this study.

This project is a joint effort between the Minnesota Pollution Control Agency (MPCA) and the Minnesota Department of Health (MDH) in close coordination with a multitude of project partners.

The project is located in central Minnesota along the Mississippi River Corridor from Royalton to Hastings.

A large number of Minnesota’s residents rely on the Mississippi River for both drinking water and as a place for recreational activities. While specific recreational user data (boating, swimming, wading) is not known at this time, between 940,000 and 950,000 Minnesotans use the Mississippi River between Royalton and Hastings for drinking water.

All surface waters in Minnesota, including lakes, rivers, streams, and wetlands, are protected for aquatic recreation where this use is attainable. This beneficial use is associated with a specific numeric water quality standard for bacteria that reduces the risk of illness from this pollutant in water. Although most are harmless themselves, fecal indicator bacteria are used as an easy-to-measure surrogate to evaluate the microbiological suitability of recreational and drinking waters, specifically, the presence of pathogens. Water contaminated with pathogenic bacteria from human or animal fecal material can cause illness in humans such as nausea, vomiting, fever, headache, and diarrhea, but more serious illness is a possibility. The Total Maximum Daily Load (TMDL) study and protection plan uses the standard for E. coli and addresses 22 impaired reaches and 29 protection reaches (Table 2-3 and Table 2-4).

The majority of the TMDL study and protection plan focuses on the Mississippi River Corridor, and, specifically, portions of three Major Watersheds (8-digit HUCs): Mississippi River – Sartell Watershed (07010201), Mississippi River – St. Cloud Watershed (07010203), and the Mississippi River – Twin Cities Watershed (07010206).

The following analyses were conducted for the TMDL Study Reaches (22 TMDL study reaches impaired for aquatic recreation due to bacteria) and the corresponding TMDL Subwatersheds:

- Potential Bacteria Sources (Section 4)
- Water Quality Analysis Including Load Duration Curves (Section 6)
- TMDL Calculations (Section 7)
- Implementation Strategies (Section 9)

TMDLs were derived for five flow regimes (from low to high flows) using the load duration curve method. TMDLs range from 0.833 billion org/d to 53.7 billion org/d for low flows and
from 32.1 billion org/d to 514 billion org/d for high flows. The impaired reaches require load reductions from 0% to 97%, varying for each reach and flow regime, to meet the *E. coli* standard.

Additional subwatersheds (Protection Subwatersheds) were identified in order to support the protection of surface waters that are not known to be impaired for bacteria. The Protection Subwatersheds (independent of the TMDL Subwatersheds) focus on the Mississippi River corridor from Royalton to Hastings. They are composed of drainage areas to 1) reaches not known to be impaired for bacteria, including Mississippi River mainstem reaches and their direct drainage areas, 2) five impaired Mississippi River mainstem reaches for which TMDLs have been deferred, and 3) downstream portions of tributaries that directly discharge to the Mississippi River and that are not known to be impaired (for details refer to Section 2.6). The following project components were completed for the Protection Subwatersheds and their corresponding Protection Reaches:

- Potential Bacteria Sources (Section 4)
- Water Quality Analysis Including Load Duration Curves (Section 6)
- Implementation Strategies (Section 9)

Additional water quality analyses were also conducted for tributaries that directly discharge to the Mississippi River and are part of an existing or future/planned TMDL (Appendix E).