**PROJECT TITLE: Evaluating Groundwater – Surface Water Interaction and Impact of Nitrate Contamination Contributing to the Vermillion River**

**I. PROJECT STATEMENT**

The Vermillion River is a well-known and well-studied river that flows from Scott County through the center of Dakota County to the Mississippi River. Significant sections of the western river are designated as trout stream because it is largely fed by groundwater. Uniquely, the eastern portion of the river contributes back to groundwater in and around the City of Hastings. Surface water quality is threatened by increasing levels of nitrate that are a concern to both aquatic organism health and the drinking water supply. Groundwater is the primary source of drinking water for residents and the surface water is potentially impacting municipal and private well drinking water supplies in the area.  Specifically, Dakota County monitoring indicates that the South Branch sub-watershed appears to be a major contributor to rising nitrate levels. The drinking water standard for nitrate is 10 mg/L and nitrate levels in the Hasting’s public wells recently measured a maximum concentration of 8.2 mg/L. In addition, private well sampling completed by the County and the Minnesota Department of Agriculture (MDA) shows nitrate levels in the area are well above the drinking water standard.

This project will focus on addressing two concerns in order to identify and prioritize targeted efforts to improve surface water and groundwater quality along the Vermillion River, and address the serious problem of nitrate contamination:  (1) Develop a better understanding of the Vermillion River surface water impacts to the groundwater; and (2) Identify significant sources contributing nitrate to the South Branch Vermillion River subwatershed. This project supports the County’s goal to achieve **sufficient and sustainable high quality water resources and water supplies**; and supports Vermillion River Watershed Management Plan goals.

**II. PROJECT ACTIVITIES AND OUTCOMES**

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| **Activity 1:** Determine surface water impacts to the groundwater | **Budget: $ 170,000** |

The Hastings Drinking Water Supply Management Area (DWSMA) is the largest DWSMA in the state (close to 60,000 acres), with the majority of the area falling outside the city limits. It encompasses the Vermillion River South Branch subwatershed. Based on the proposed state Groundwater Protection Rule (Rule 1573), the Hastings DWSMA would fall under Mitigation Level 2 due to its high nitrate concentrations (greater than 8 mg/L). The City of Hastings currently has six municipal wells, and the City of Vermillion has two municipal wells that are potentially impacted by surface water quality, in addition to the hundred plus private wells located in the area. Therefore, it’s important to better understand the surface water – groundwater interaction and the impact the Vermillion River has on the groundwater and the drinking water supply quality. This will be completed by developing a detailed surface water – groundwater flow model using current hydrogeological data and real-time field data to better define and quantify the impact to groundwater quality. A field monitoring program will be implemented to validate the groundwater model. Development of the model will result in a better understanding of the nitrate fate and transport from surface water to groundwater in the municipal wells and private drinking water wells. Determining the source of nitrates in the groundwater will help the MDA, Minnesota Department of Health (MDH), Dakota County, and the City of Hastings determine where to focus efforts to reduce nitrate contamination.

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| **Outcome** | **Completion Date** |
| 1. Detailed Groundwater Flow Model that will determine surface water impact to groundwater, and quantify nitrate contribution from the Vermillion River. | June 30, 2021 |
| |  |  | | --- | --- | | **Activity 2:** Identify significant nitrate sources in the South Branch subwatershed | **Budget: $98,000** | | Surface water sampling indicates that the South Branch subwatershed is significantly impacted by nitrates, but does not exceed the state standard of 10 mg/L. The South Branch subwatershed is characterized by agricultural land use, course-textured soils, and a high water table. Due to the high water table, agricultural lands are generally drained through tile line outlets and ditches in order to lower the water table and make agricultural production more viable. This study will help determine why nitrate concentrations are increasing in the subwatershed, which could be a result of several factors: increase in drain tiling and/or ditches, increases or changes in agricultural uses, or inadequate nutrient management. The study will help identify and prioritize areas where targeted efforts can protect and improve water quality, as well as wildlife and aquatic habitat. It will also help the MDA focus Best Management Practices or Alternate Management Tools for better implementation of the Nitrogen Fertilizer Management Plan and the proposed Groundwater Protection Rule. Project scope may include identification of existing drain tile, classification of agricultural land use, and sampling artificial drainage areas and surface water within the entire South Branch subwatershed in order to determine source contribution. | | | | | |
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| **Outcome** | **Completion Date** |
| 1. Identification of significant sources of nitrates from point and non-point sources by geographic areas within the subwatershed. | June 30, 2022 |

**III. PROJECT PARTNERS AND COLLABORATORS:**

This project was developed in coordination with, and complementary to, a “sister” project that will be submitted by the St. Croix Watershed Research Station. ***Neither of these projects is dependent on the other; however, each will be enhanced by the other.*** This project was also developed in collaboration with the MDA, MDH, Vermillion River Watershed Joint Powers Organization (VRWJPO), and the City of Hastings. The VRWJPO has contributed funds or in-kind services on similar past projects and is likely to continue its support during this project phase. The Dakota County Soil and Water Conservation District (SWCD) is also a critical partner in providing outreach and technical assistance since they currently conduct surface water sampling for the VRWJPO.

**IV. LONG-TERM IMPLEMENTATION AND FUNDING:**

The combined outcomes of Activities 1 and 2 will result in a model that estimates changes in nitrate concentrations in surface water and groundwater, based on different land management scenarios. More detailed implementation plans will be developed based on project findings, which will be used to recommend strategies to reduce nitrate in surface water and groundwater, and improve aquatic habitat.  Costs for future projects cannot be estimated until this phase is completed, but this initial funding could leverage millions for future investments. Reducing nitrate concentrations in the drinking water supply will not only minimize health impacts to Dakota County residents, but will also help reduce the costs associated with municipal and private well water treatment.

**V. SEE ADDITIONAL PROPOSAL COMPONENTS:**

**A. Proposal Budget Spreadsheet**

**B. Visual Component or Map**

**C. Project Manager Qualifications and Organization Description**

**D. Letter or Resolution**