DEPARTMENT OF NATURAL RESOURCES

Cold Spring Groundwater Study

Annual Report to the Legislature
07/10/2018

This report was prepared in response to Laws of 2016, Chapter 189, Article 3, Section 44, Part b

The commissioner must conduct necessary monitoring of stream flow and water levels and develop a groundwater model to determine the amount of water that can be sustainably pumped in the area of Cold Spring Creek for area businesses, agriculture, and city needs. Beginning July 1, 2017, the commissioner must submit an annual progress report to the chairs and ranking minority members of the house of representatives and senate committees and divisions with jurisdiction over environment and natural resources. The commissioner must submit a final report by January 15, 2022.

Estimated cost of preparing this report (as required by Minn. Stat. § 3.197) was $1,139.

Background

The 2016 Minnesota Legislature directed the Minnesota Department of Natural Resources (DNR) to "*conduct necessary monitoring of stream flow and water levels and develop a groundwater model to determine the amount of water that can be sustainably pumped in the area of Cold Spring Creek for area businesses, agriculture, and city needs.*" Laws of 2016, Chapter 189, Article 3, Section 44, Part b

Multiple scientific investigations demonstrate that groundwater pumping in and around the City of Cold Spring reduces groundwater flow into Cold Spring Creek, a designated trout stream. Minnesota law bars DNR from permitting water appropriation from designated trout streams, either through direct surface water withdraw or groundwater pumping (MN Stat. 103G.285 subd. 5 & 287 subd. 2). The glacial aquifer system, which is strongly connected to Cold Spring Creek, supplies groundwater to the City of Cold Spring (the City), Cold Spring Brewing Company (CSBC), and numerous private wells and agricultural irrigation wells.

The City and CSBC are actively planning for potential growth and developing strategies to meet their current and anticipated water supply needs. To inform these planning efforts, and pursuant to the 2016 legislative directive, the DNR is building a groundwater flow model that can be used to determine current and projected effects of groundwater use on streamflow in Cold Spring Creek. Developing a groundwater flow model is a multi-step process. DNR completed a critical initial step in 2018 by developing an interim model based on all available data. The interim model calculates the effect of groundwater use on the average low flow in Cold Spring Creek over a long period of time (years to decades). The model can also predict the effects of changes to existing and future pumping in the area of interest. The results from the interim model are sufficient to approximate how much water can be sustainably pumped from the City and CSBC wells in relation to stream flow in Cold Spring Creek.

Completed Tasks

Completed during fiscal year 2018.

- Prepared the Data Collection Work Plan
- Identified and engaged stakeholders and technical experts
- Developed an interim groundwater model
- Distributed groundwater model report to the Technical Advisory Group (TAG)

In-progress Tasks

- Ongoing field data collection, which will continue until 2020
- Evaluating potential scenarios using the interim groundwater model
- Determine whether a transient (varying conditions) groundwater model is needed to accomplish the goals of the Cold Spring groundwater study

Field Data Collection

In 2017 the DNR developed a Data Collection Work Plan and shared it with the Technical Advisory Group. The plan identified the highest priority data to continue gathering and new efforts to fill in data gaps that are used in model construction and calibration. The following activities were completed or are ongoing:

- Obtained daily flows from the City and CSBC wells
- Obtained well construction data from City wells 1 and 2
- Measured synoptic water levels that are used in model calibration
- Monitored stream flow at Cold Spring Creek
- Monitored water levels in 10 lakes within the area
- Installed and monitored shallow wells near continuous stream monitoring stations
- Installed and monitored streambed piezometers near continuous stream monitoring stations
- Used thermal imagery to determine the most prominent areas of groundwater inflow along Cold Spring Creek.

During February 2018, a field team used thermal imagery, capturing photographs along Cold Spring Creek (Figures 1 and 2), to determine the locations of springs along the creek and where groundwater inflow is the most prominent (Figure 3). In May 2018, the DNR sent letters requesting 106 well owners' permission to measure water levels in their wells. Several field teams measured water levels in 20 private wells and 10 permanent monitoring wells in June 2018. These measurements provide a snapshot of the water levels in the Cold Spring area. These data will be used to help further verify the groundwater model. The DNR continues to operate and maintain two continuous stream flow gages, three additional monitoring sites along Cold Spring Creek, and numerous groundwater level monitoring wells in the area.

Engage Stakeholders

Minnesota Department of Natural Resources staff identified technical and non-technical stakeholders throughout the study area, including cities, industries, commercial users, and agricultural irrigators. On December 13, 2017 the DNR held a public meeting to update stakeholders on the project and explain steps to move the project forward. DNR also created a GovDelivery email notification list, and provided two GovDelivery updates in January and May 2018.

Engaging Technical Experts

During fall 2017 and winter 2018, the DNR held four meetings with the Technical Advisory Group (TAG) formed for the Cold Spring work. The meetings allow DNR and other participants to share technical information and help ensure DNR's work aligns with industry standards. The following individuals are included in the TAG:

- Dr. Bob Tipping, Minnesota Geological Survey - University of Minnesota
- Mr. Jeppe Kjaersgaard - Minnesota Department of Agriculture
- Dr. Jon Walker - United States Geological Survey
- Mr. John Woodside - Minnesota Department of Health
- Mr. Larry Kramka - Foth Engineering (representing Cold Spring Brewing Company)
- Mr. Mark Brigham - United States Geological Survey
- Mr. Mark Janovec - Stantec (representing City of Cold Spring)
- Mr. Mike MacDonald - Minnesota Department of Agriculture
- Mr. Perry Jones - United States Geological Survey

Developing the Interim Groundwater Model

In late 2017 and early 2018, the DNR constructed and calibrated the interim groundwater model. The DNR sought advice from the TAG during model calibration and construction to ensure that the model would be suitable for its intended purpose. A draft Interim Groundwater Model Report was provided to the TAG in late June 2018. The group will review the report and the DNR will solicit TAG members' feedback and address comments or questions about the model and model results.

The interim groundwater model is a steady state model that simulates average conditions over a long period of time (years), as opposed to conditions that fluctuate seasonally, over periods of months. Typically, when needed, a transient model capable of simulating seasonal changes is built after the interim model is complete. Through building the interim model for Cold Spring Creek, the DNR has learned that the varying conditions (i.e., transient) model may not be necessary. The interim model may be sufficient to provide the information needed to inform planning necessary to use water sustainably. The need for additional modeling will be discussed extensively with the Technical Advisory Group and other stakeholders during the summer and fall of 2018.

Application of the Interim Groundwater Model

The interim groundwater model was used to compare three different potential groundwater use scenarios. These scenarios are described in the Draft Cold Spring Groundwater Study Interim Model Report that the Technical Advisory Group is currently reviewing. The initial scenarios and draft results are presented below:

- Scenario 1 - All wells in the area pump at the volumes reported for 2016, averaged over the year (2016 is the most recent period with reported use). This model scenario indicates that pumping the

2016 water volumes near Cold Spring Creek diverted 0.31 cubic feet per second (cfs) of baseflow from the creek, about 41 percent (as measured at the upstream gage) and 0.34 cfs of baseflow from the creek, about 19 percent at the downstream gage.

- Scenario 2 - All wells within 1,000 feet of Cold Spring Creek are turned off and City wells 4, 5, and 6 supply the total 2016 demand. In this scenario, the model predicts a baseflow depletion of 0.12 cfs, about 17 percent at the upstream gage and 0.12 cfs, about 7 percent at the downstream gage.
- Scenario – 3 All wells within 1,000 feet of Cold Spring Creek are turned off and City wells 4, 5, and 6 supply the total 2016 demand, plus an additional 200 million gallons per year for growth. In this scenario, the model predicts a baseflow depletion of 0.20 cfs, about 28 percent at the upstream gage and 0.21 cfs, about 12 percent at the downstream gage.

These scenarios are intended to inform future planning for the City and Cold Spring Brewing Company and the results are draft pending the TAG review. Other scenarios may be evaluated as needed.

Figure 1. Photograph along Cold Spring Creek taken in January 2018.

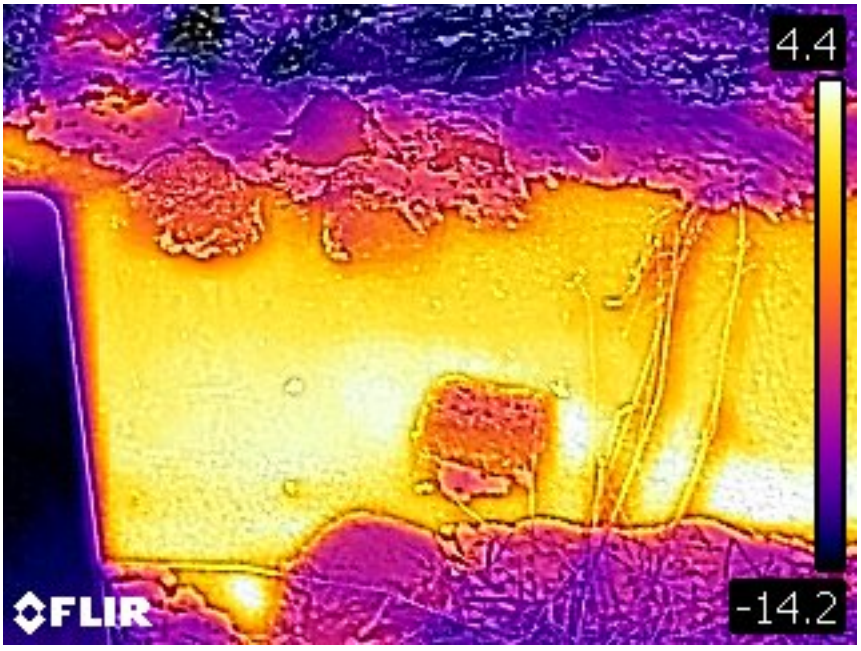

Figure 2. Thermal photograph along Cold Spring Creek in January 2018. The white/light yellow areas are warm areas, liquid water. The purple and blues are cool areas, snow and ice. Warm areas in the winter represent groundwater inflow because groundwater is typically about 48-50 degrees F.

Figure 3. Cold Spring Creek water source

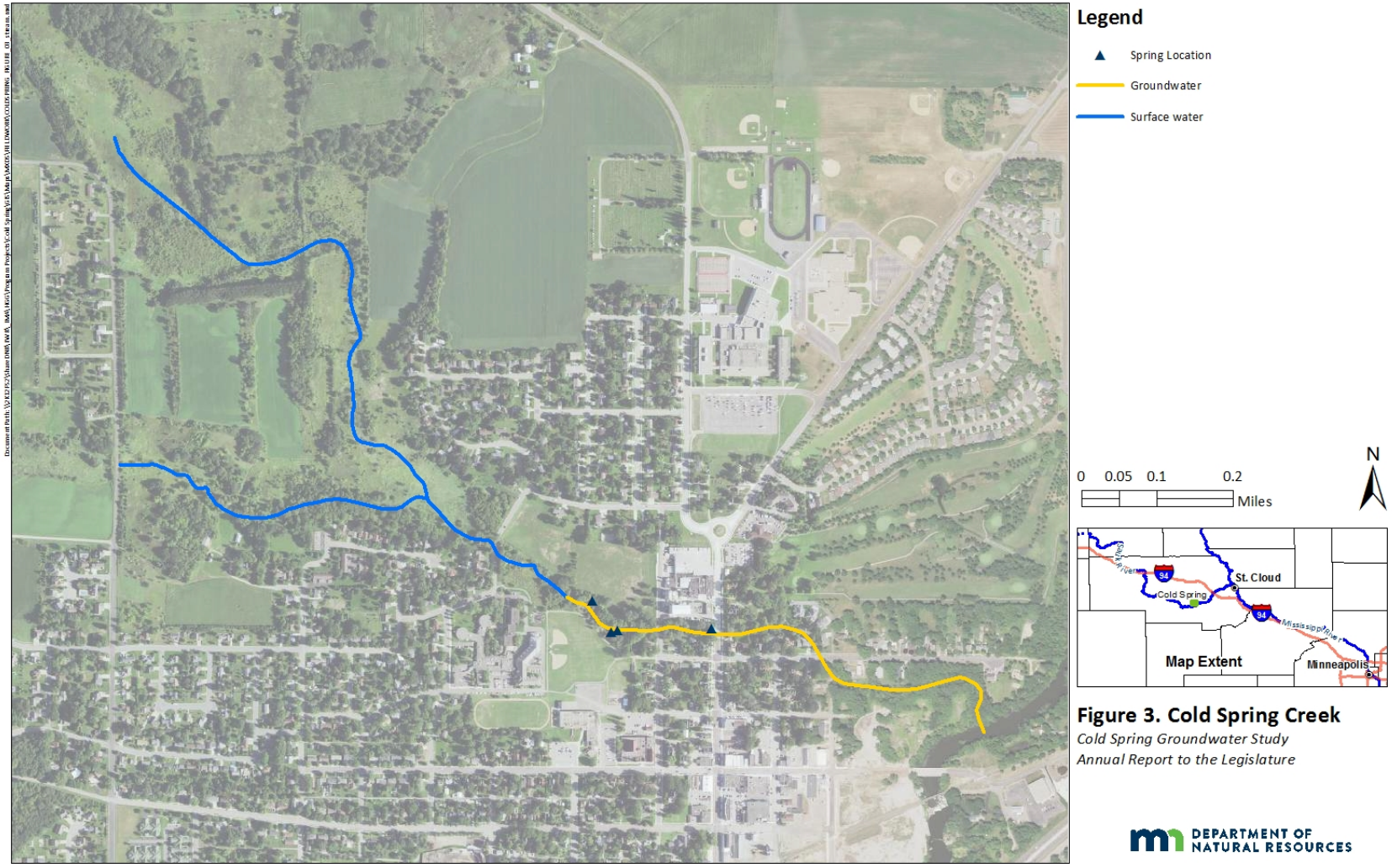

Figure 3. Cold Spring Creek
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