

## Groundwater Technical Memorandum

Date: May 31, 2024  
To: Jack Gleason, Region 3 South District Hydrologist Supervisor  
From: Ellen J. Considine, PG. Hydrologist 4 Supervisor and John Farmer, Groundwater Hydrologist  
Subject: **Updated** 1984-6141 Elko New Market well interference potential  
Reviewed by: Amanda Yourd, Groundwater Specialist

### PROFESSIONAL GEOLOGIST

*I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Geologist under the Laws of the State of Minnesota.*

License No: 50027      Signature: \_\_\_\_\_

## Introduction

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In late 2022, the City of Elko New Market (City; MPARS permit number 1984-6141) requested an amendment to their groundwater appropriation permit. The City is currently permitted to pump 135 million gallons per year (MGY); the amendment requested an additional 230 MGY, i.e., a total annual volume of 365 MGY. The City pumps from three wells (Elko Wells 2, 3, and 4); it is proposed that the increased groundwater demand would be pumped from the same three wells.

An aquifer test was conducted at Elko Wells 2, 3, and 4 during November and December 2023, and an aquifer test report describing the results was issued on May 15, 2024 (Considine & Yourd, 2024). The aquifer test analysis found that pumping Elko Wells 2, 3, and 4 at the proposed rates could cause well interference at some domestic wells within 2 miles. That analysis had assumed that each well would pump at its maximum rate for up to 30 consecutive days (the equivalent of 3.0 million gallons per day).

In a meeting on May 30, 2024, the City provided DNR with more detailed information about how they will pump their wells. The City indicated that its peak groundwater pumping rate will be 1.2 million gallons per day. DNR revised well interference calculations to reflect the lower pumping rate and found that, at that rate, **only domestic wells within 1 mile may be at risk of well interference.**

This memo describes the analysis that was conducted to calculate the risk of well interference based on the revised peak monthly pumping volume. This memo lists what is known about domestic wells within one mile, presents the risk of well interference for wells where enough is known about the well construction to determine the risk, and recommends where additional information is needed. This memo is a supplement to the aquifer test report and supersedes the well interference memo dated May 24, 2024.

## Calculating risk of well interference

The aquifer test demonstrated that the pumped aquifers (Prairie du Chien (OPDC) and Jordan (CJDN)) are strongly connected to the buried Quaternary (QBAA or QBUA) aquifer, so wells in those units could be at risk of well interference. Domestic wells open to aquifers that include the OPDC, CJDN, QBAA, and/or QBUA could be at risk, as could wells with unknown screened/open intervals. Wells screened in other aquifers are at very low to zero risk of well interference and were excluded from further analysis.

The risk of well interference at a given well is calculated as follows:

1. Use the AQTESOLV (Duffield, 2007) “local” model parameters calculated in Considine and Yourd (2024) to predict drawdown at each domestic well after one month of pumping Elko Wells 2, 3, and 4 constantly at the maximum pumping rate.
  - In the model, it was assumed that all wells in the OPDC, CJDN, QBAA, QBUA, or unknown aquifers (as described above) were in the pumped aquifer.
2. Subtract the predicted drawdown at a given well’s location from the static water level listed on the well log.
3. Calculate the remaining water column above the well’s pump (assumed to be set at the bottom of the drop pipe).
4. If there is less than 10 feet of water remaining above the pump, then the well is at risk of well interference.

Although the methodology described above does not explicitly account for a well’s self-drawdown (i.e., how much the domestic well lowers its own water level when it pumps), 10 feet of water remaining above the pump is sufficient water column for most domestic wells in Minnesota in DNR’s experience.

## Well interference risk for domestic wells listed in MWI

Many wells in Minnesota are catalogued in the Minnesota Well Index (Minnesota Geological Survey and Minnesota Department of Health (MWI/CWI), 2016), but not all wells are listed there. Even if a well is listed in the MWI, it is common for the well construction information to be incomplete. At minimum, the DNR needs, well depth, static water level, and pump depth to calculate risk of well interference.

As of this writing, there are 174 domestic wells on parcels within one mile of Elko Wells 2, 3, and 4 listed in the MWI. Of these, there are 129 wells that had enough information in the MWI for DNR to analyze risk of well interference. DNR’s well interference risk assessment for these 129 wells is listed below and in Table 1.

### *Wells at risk for interference*

Of the wells that had complete information, there are 7 at risk of well interference. One of these seven wells have less than 10 feet of water above the pump without the City pumping and are thus at risk of well interference even without accounting for drawdown caused by the City’s use (Table 2 attached). The remaining 6 wells are at risk of well interference due to the City’s pumping (Table 3 attached).

New Market Well 3 is a backup to Elko Wells 2, 3, and 4 that may be used during emergencies. This well may be at risk of well interference if it is pumped at the same time as Elko Wells 2, 3, and 4, but the pump depth setting is unknown. DNR recommends obtaining the pump setting for this well to determine if the well is at risk. Depending on the results of the evaluation, the pump may need to be lowered.

### **Wells with unknown risk for well interference**

The well depth, static water level, and/or pump setting of 45 domestic wells is not known, so the risk of well interference cannot be calculated at this time. The City is working with residents to acquire more information about those wells so DNR can assess risk of well interference.

### **Wells at low risk for well interference**

The remaining 122 wells are at low risk for well interference. DNR does not recommend any further action for these wells.

**Table 1. Status of well information and well interference risk for wells listed in the MWI within 1 mile\***

Status of well construction information	Well interference risk	Number of wells
Complete	At risk due to City's pumping	6
Complete	At risk without City's pumping	1
Incomplete	Unknown risk	45
Complete	Low risk	122

\*Wells that are on parcels within one mile of Elko Wells 2, 3, and 4 and are listed in the MWI to be in OPDC, CJDN, QBAA, QBUA or unknown aquifers.

### **Domestic wells not listed in MWI**

In DNR's experience, 30% to 50% of domestic wells statewide are not listed in the MWI. These wells are "unknown unknowns", i.e., it is not known if they exist, how many exist, what aquifer they are in, or what the risk of well interference for those wells is. There are over 1,300 parcels within 1 mile of Elko New Market's wells which could have domestic wells not listed in MWI. DNR's analysis described herein does not quantify the existence of or risk to those wells.

## **Conclusions and recommendations**

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There are a total of 7 wells at risk of well interference:

- One well is at risk of going out of water without Elko New Market's pumping (Table 2 attached). DNR recommends that the City contact the well owners and/or their well drillers to obtain the most up-to-date information about those wells and provide that information to DNR for further evaluation.
- There are 6 wells at risk of well interference from Elko New Market's pumping (Table 3 attached). DNR recommends that the City have a plan for restoring a water supply promptly and agree to restore water supply at the 6 high-risk residences if they have out-of-water problems.

There are 45 wells with incomplete information in the MWI at unknown risk of well interference:

- DNR is working with the City to obtain the missing well information.
- Once the information is received, DNR will evaluate the risk of interference to these wells.

New Market Well 3 may be at risk of well interference:

- DNR recommends that City obtain that information and provide it to DNR for further evaluation.

- Depending on the results of that evaluation, DNR may recommend that the City lower the pump in New Market Well 3 to ensure continuity of water supply during emergencies.

## References

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Considine, E. J., & Yourd, A. (2024). *Aquife Test Report MPARS permit amendment request 1984-6141, City of Elko New Market*. Minnesota Department of Natural Resources.

Duffield, G. (2007). User's Guide. *AQTESOLV for Windows Version 4.5*. Reston, VA: HydroSOLVE, Inc.

Minnesota Geological Survey and Minnesota Department of Health (MWI/CWI). (2016). *Minnesota Department of Health*. Retrieved from Minnesota County Well Index:  
<https://www.health.state.mn.us/communities/environment/water/mwi/index.html>

## Attached Figures and Tables

Figure 1. Elko New Market well interference risk area

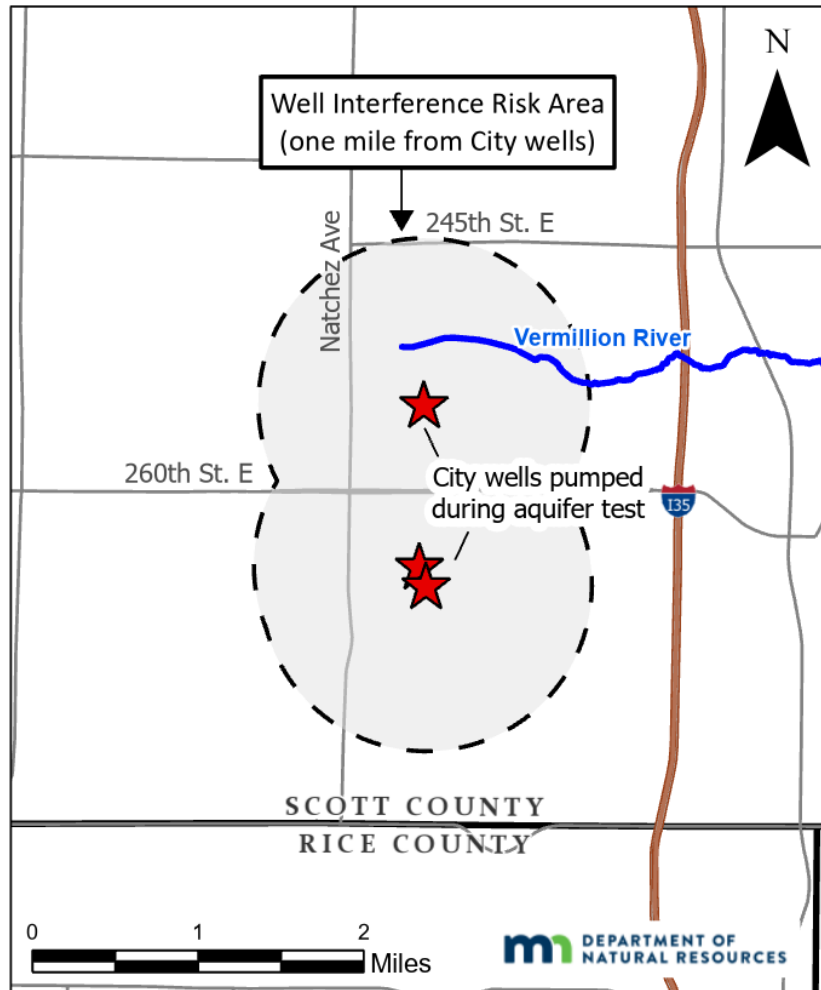


Table 2. Wells at risk of well interference *without* pumping from Elko Wells 2, 3, and 4

Owner or well name	Unique Number	Well Information Source†	Address	Recommended action
JASPERS, MARK	510447	MWI-V	10195 Ptarmigan	Confirm depth to water and pump setting, send to DNR for evaluation.

**Table 3. Wells at risk of well interference from pumping Elko Wells 2, 3, and 4**

<b>Owner or well name</b>	<b>Unique Number</b>	<b>Well Information Source†</b>	<b>Address</b>	<b>Recommended action</b>
TONSAGER, FRANCES	186303	MWI-V	26500 France AV	Restore water supply if out of water
DAVIDSON, KEN	449027	MWI-V	10051 Ptarmigan DR	Restore water supply if out of water
ROBERTS, LEWIS	451172	MWI-V	9260 275th ST E	Restore water supply if out of water
EARL, LARRY	491018	MWI-V	25031 Natchez AV	Restore water supply if out of water
WEITZEL, JEFFREY	562292	MWI-V	26340 Thomas AV	Restore water supply if out of water
PASSMORE, KERRY	812917	MWI-U	26627 Woodcrest CI	Restore water supply if out of water

† MWI-V: Minnesota Well Index Verified Location; MWI-U: Minnesota Well Index Unverified Location