Cannington Water Supply Wells:

Delineating Nitrate Issue Contributing Areas, Vulnerability and Threats Assessment
Durham Region

Source Protection Committee Meeting
October 16, 2025

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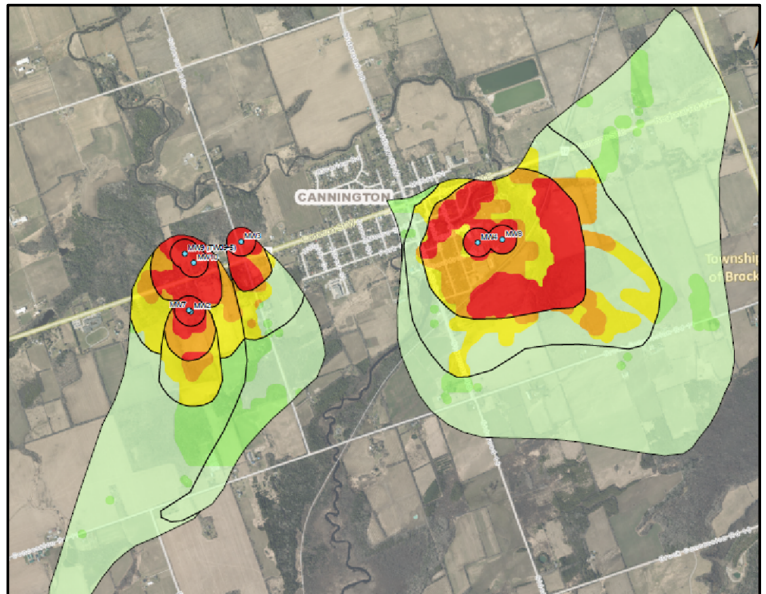
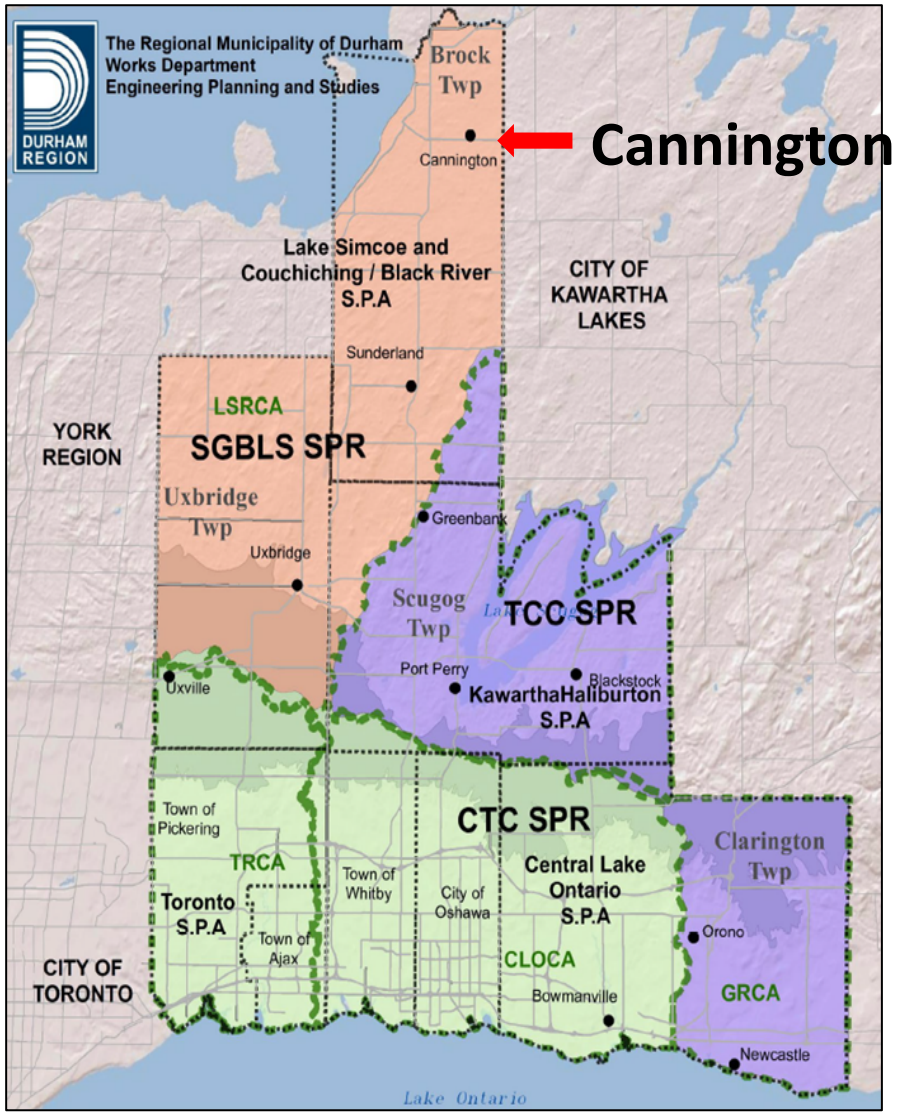
Introduction & Context

- Well 8 (Arena Well Field) is currently offline due to nitrate levels exceeding the 10 mg/L Maximum Acceptable Concentration (MAC).
- Nitrate concentrations in Wells 2, 4, 7, 9, and 10 (Gravel Pit Well Field) are approaching 50% of the MAC and are trending upward.
- Regulatory requirements under Ontario's Source Protection framework support delineation of Issue Contributing Areas (WHPA-ICA)





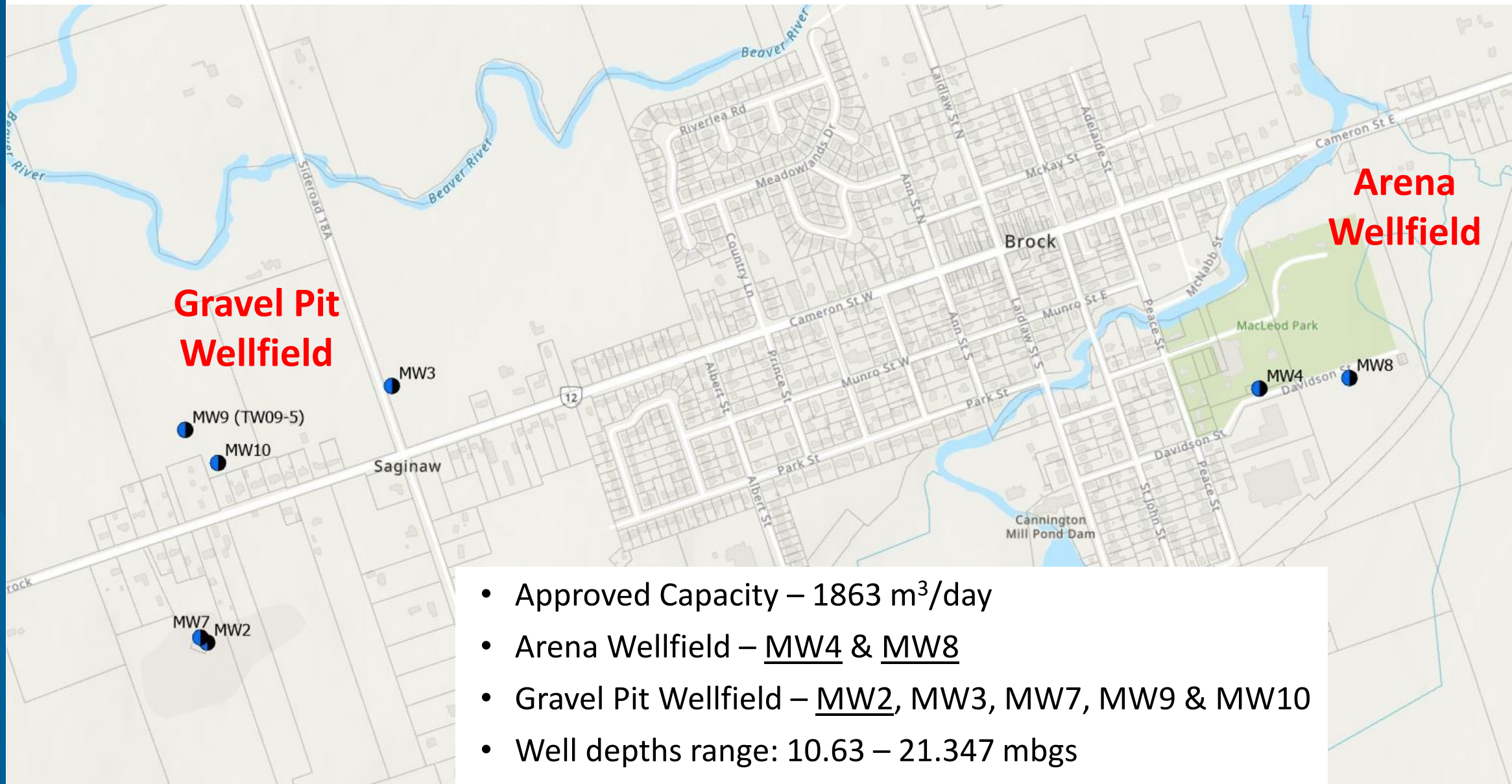
Background

- Service Population – 2,433 (2021)
- 2010: Assessment Report Finalized (Approved in 2015)
- 2011: Cannington Environmental Assessment (EA) was completed, identifying the need for additional water supply.
- 2016: Well 6 Decommissioned
- 2017: Wells 9 & 10 Drilled
- 2021: Section 34 for new Wellhead Protection Areas (WHPAs) and wells initiated
- 2022: Noticeable increasing nitrate trend in several wells
- 2023: Section 34 for new wells 9 & 10 approved by the Ministry of the Environment, Conservation and Parks (MECP)
- 2023: Well 8 nitrate reached 8 mg/L and well is taken offline
- 2023: Technical Work Initiated to identify Sources of Nitrate and Assess Options for Management (including Establishment of WHPA-ICA (Issue Contributing Area))
- 2024: Well 8 nitrate reaches 12.5 mg/L (Is Taken Offline)
- 2025: Well 8 exceeds drinking water limit and taken offline

Scope of Updated Drinking Water Issue Evaluation

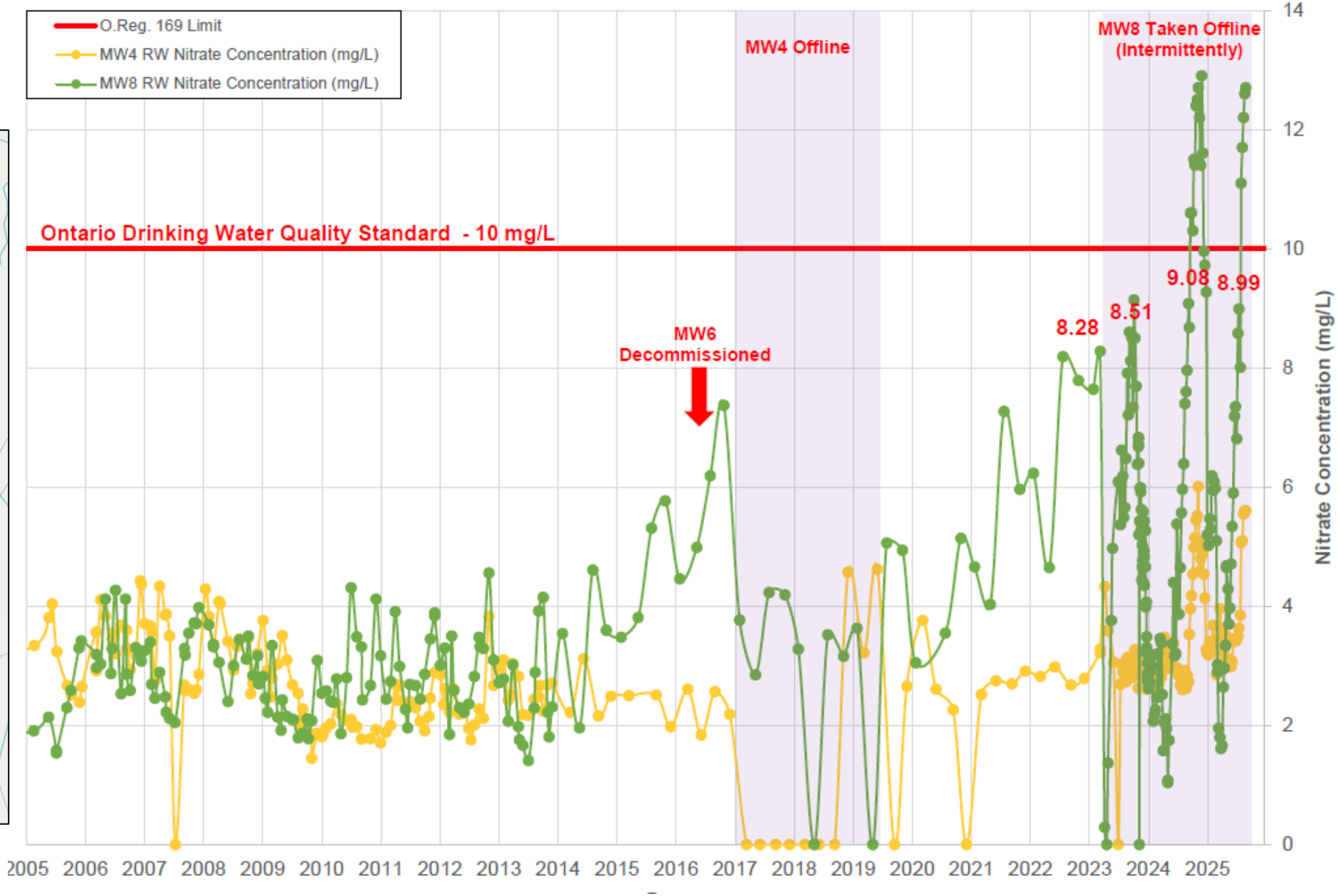
- Review Geological Setting and Well Construction/Operation History
- Review Approved Vulnerable Areas and Policies (Updated in 2023)
- Review Dissolved Nitrate Concentration Trends (Water Supply and Monitoring Wells)
- Review Threat Activities Associated with Nitrate & Source Protection (SPP) Policies.
- Assess Possible Sources of Nitrate
- Assess potential connection to surface water (WHPA-E at Arena Well Field
- Review Stratigraphy/Groundwater Flow Patterns
- Assess Correlation of Observed Nitrate with Precipitation
- Assess Correlation of Observed Nitrate with Pumping
- Assess Correlation of Observed Nitrate with Groundwater Elevation Change
- Evaluate Drinking Water Issue

Cannington Municipal Supply Wells



- Approved Capacity – 1863 m^3/day
- Arena Wellfield – MW4 & MW8
- Gravel Pit Wellfield – MW2, MW3, MW7, MW9 & MW10
- Well depths range: 10.63 – 21.347 mbgs

Nitrate Trends: Arena Wellfield

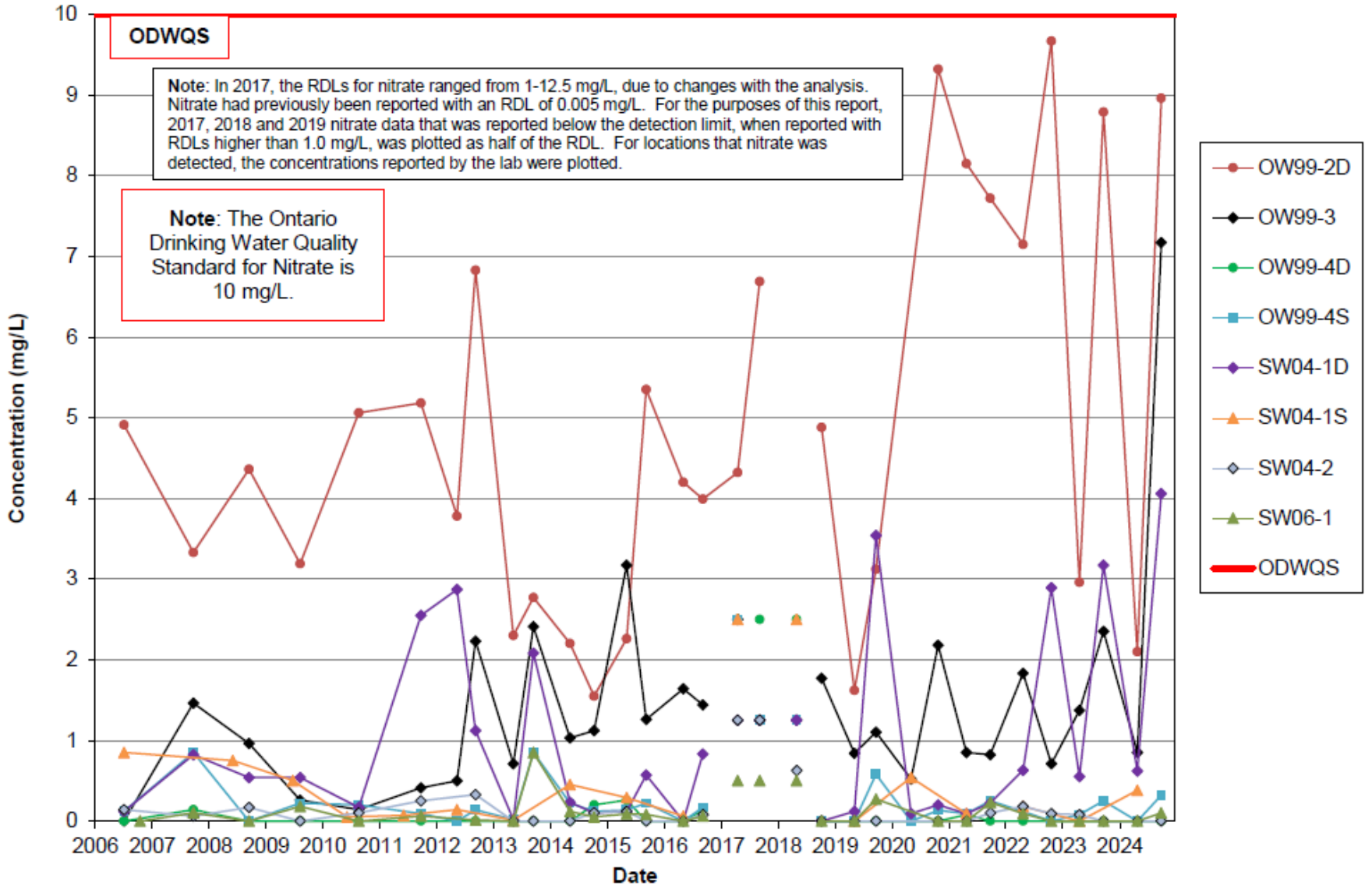


Operational Best Management Practices

- MW8 is taken offline at 8 mg/L
- Increased frequency of water quality sampling for Municipal Wells
- Installing additional monitoring wells
- Increased frequency for sampling for monitoring wells
- Real-time data via an in-line nitrate analyzer at MW8
- In negotiations with landowner to lease farmland south of MW8

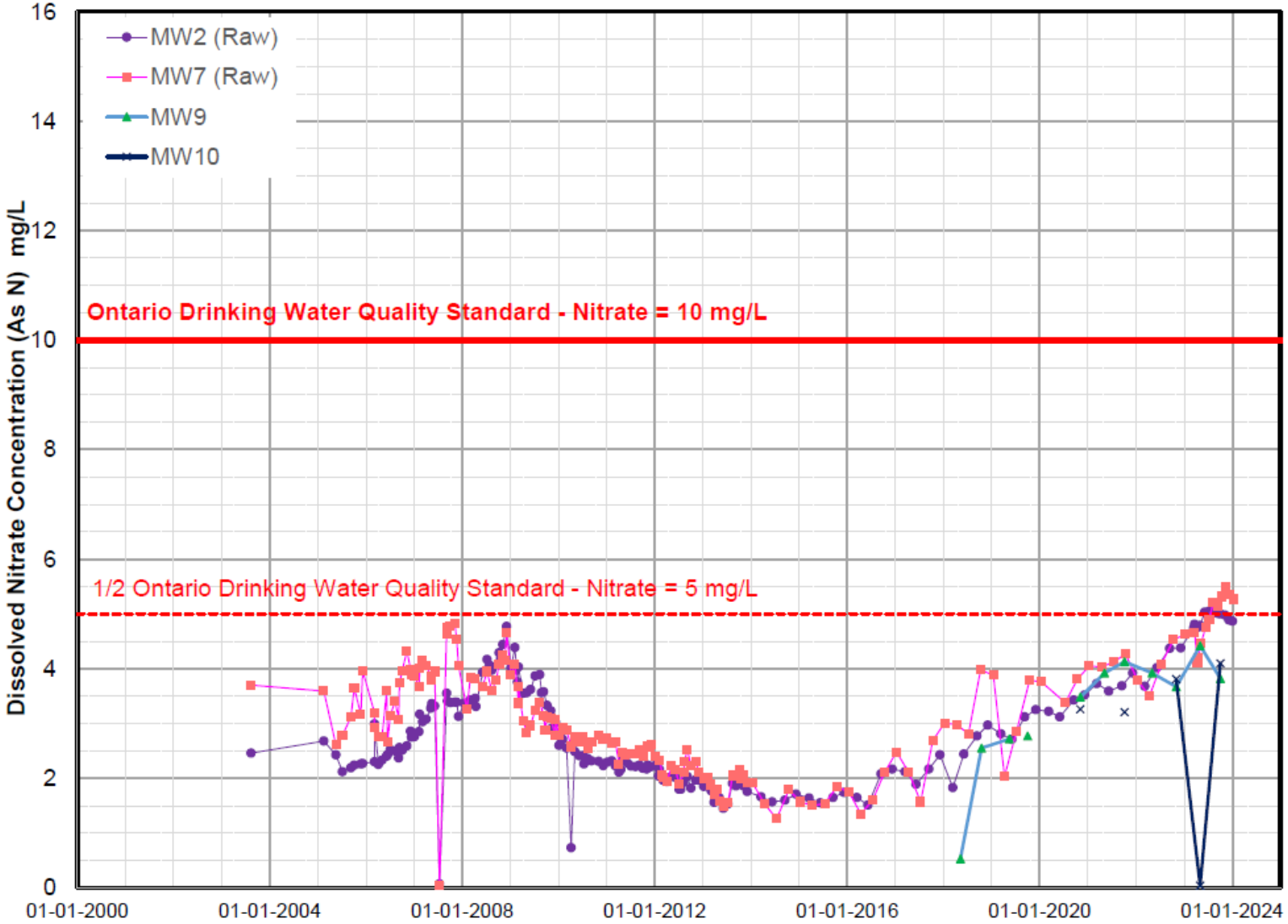
Nitrate Trends: Arena Wellfield

Water Quality Trends – Monitoring Wells



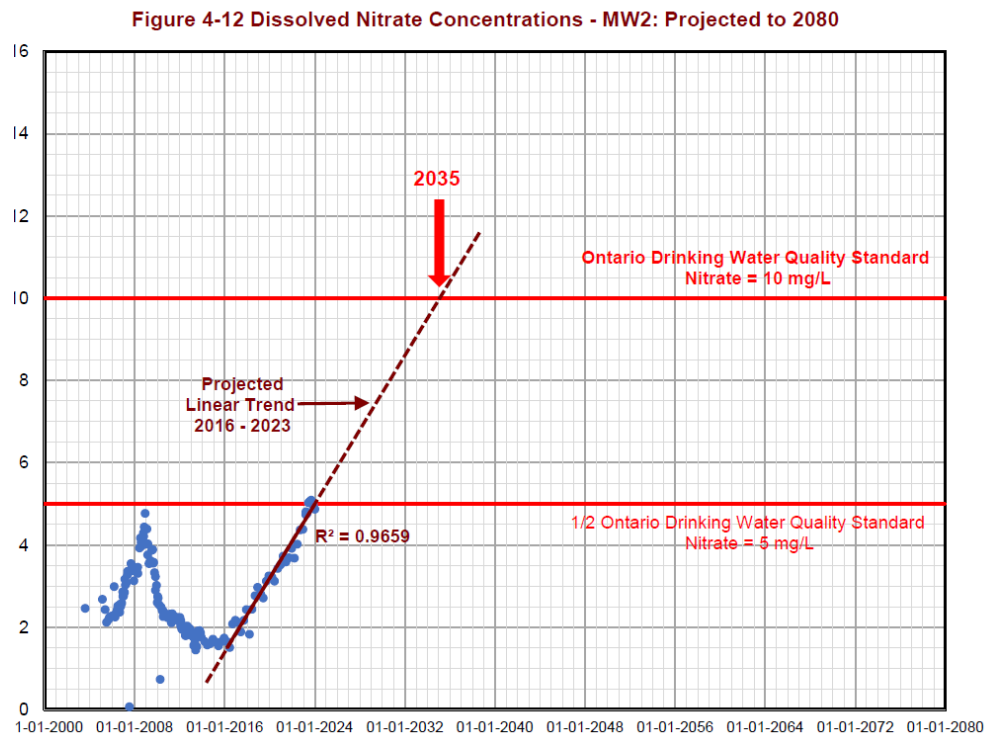
Nitrate Trends: Gravel Pit Wellfield

Figure 4-10 Dissolved Nitrate Concentrations - Gravel Pit Wellfield: 2003 - 2024

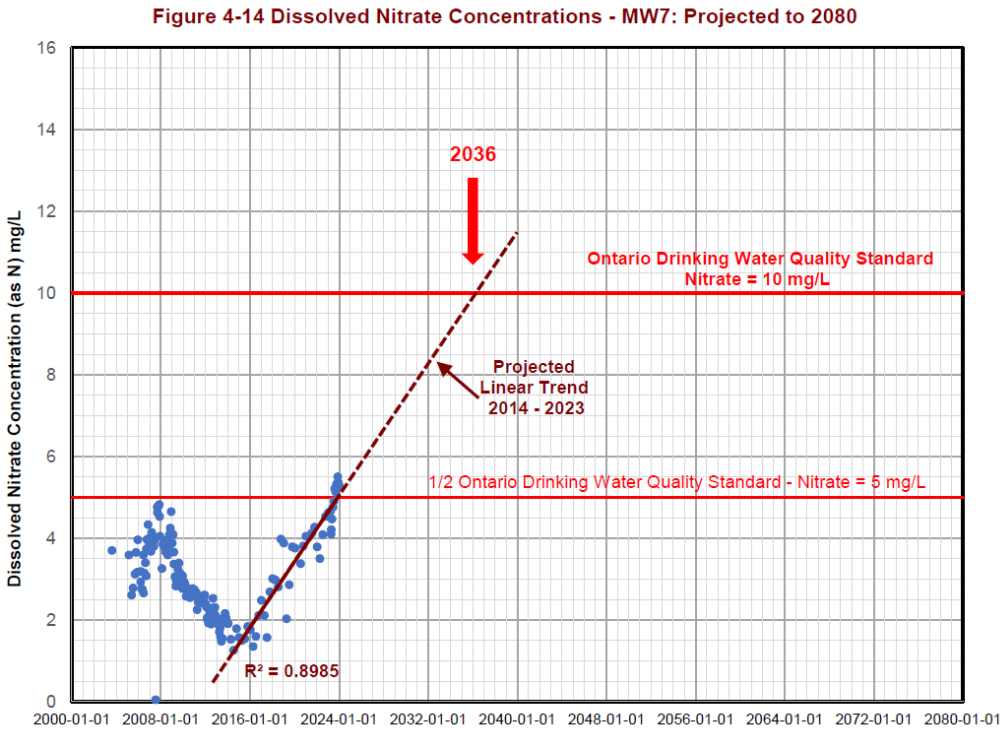


Nitrate Trends: Gravel Pit Wellfield

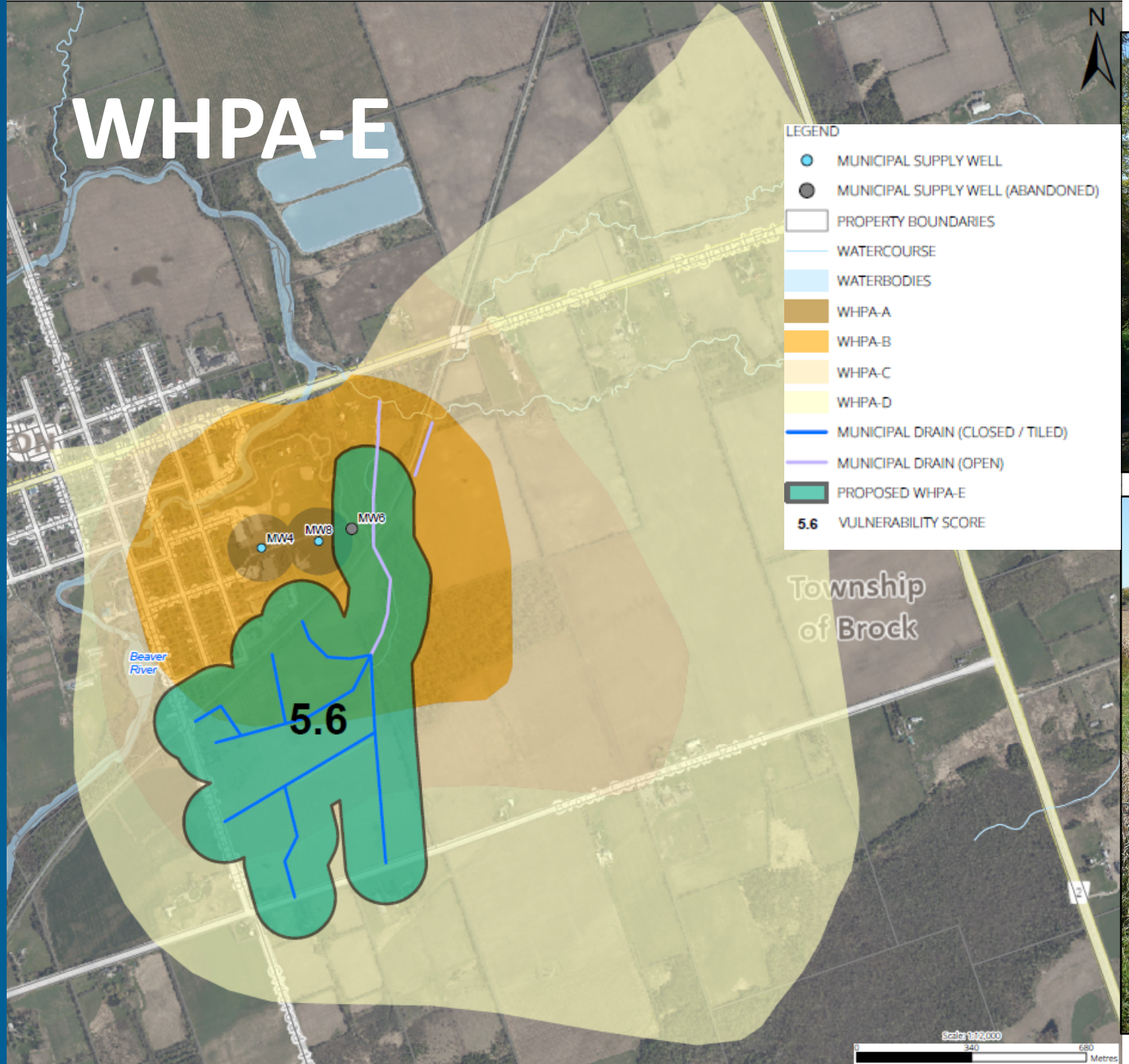
Well 2



Well7



WHPA-E

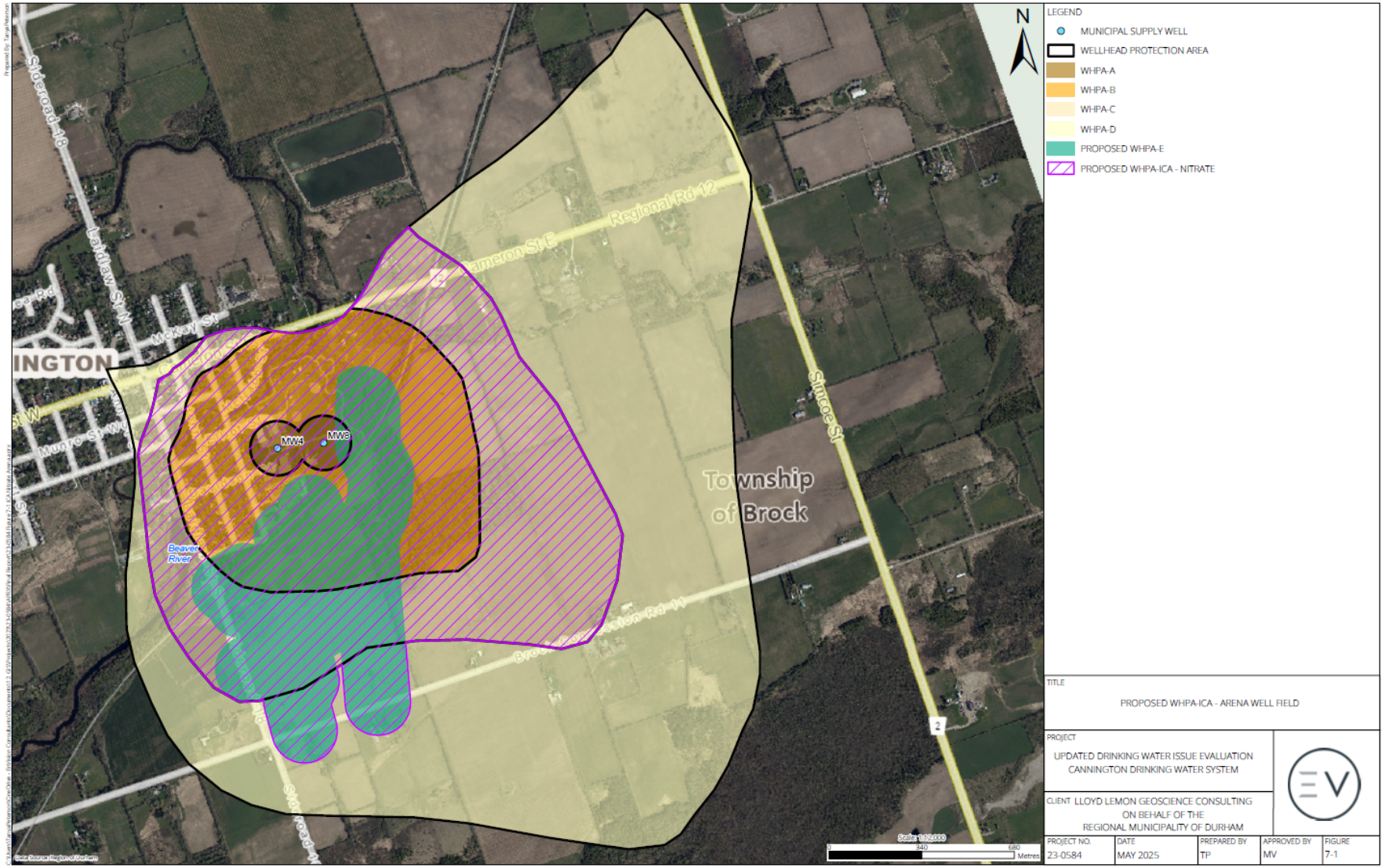

N
LEGEND
MUNICIPAL SUPPLY WELL
MUNICIPAL SUPPLY WELL (ABANDONED)
PROPERTY BOUNDARIES
WATERCOURSE
WATERBODIES
WHPA-A
WHPA-B
WHPA-C
WHPA-D
MUNICIPAL DRAIN (CLOSED / TILED)
MUNICIPAL DRAIN (OPEN)
PROPOSED WHPA-E
5.6 VULNERABILITY SCORE
MW4
MW8
MW6
5.6
Beaver River
Township of Brock
Scale 1:12,000
0
340
680
Metres

Vulnerability Scores (2021)

Prescribed Drinking Water Threats - Nitrate

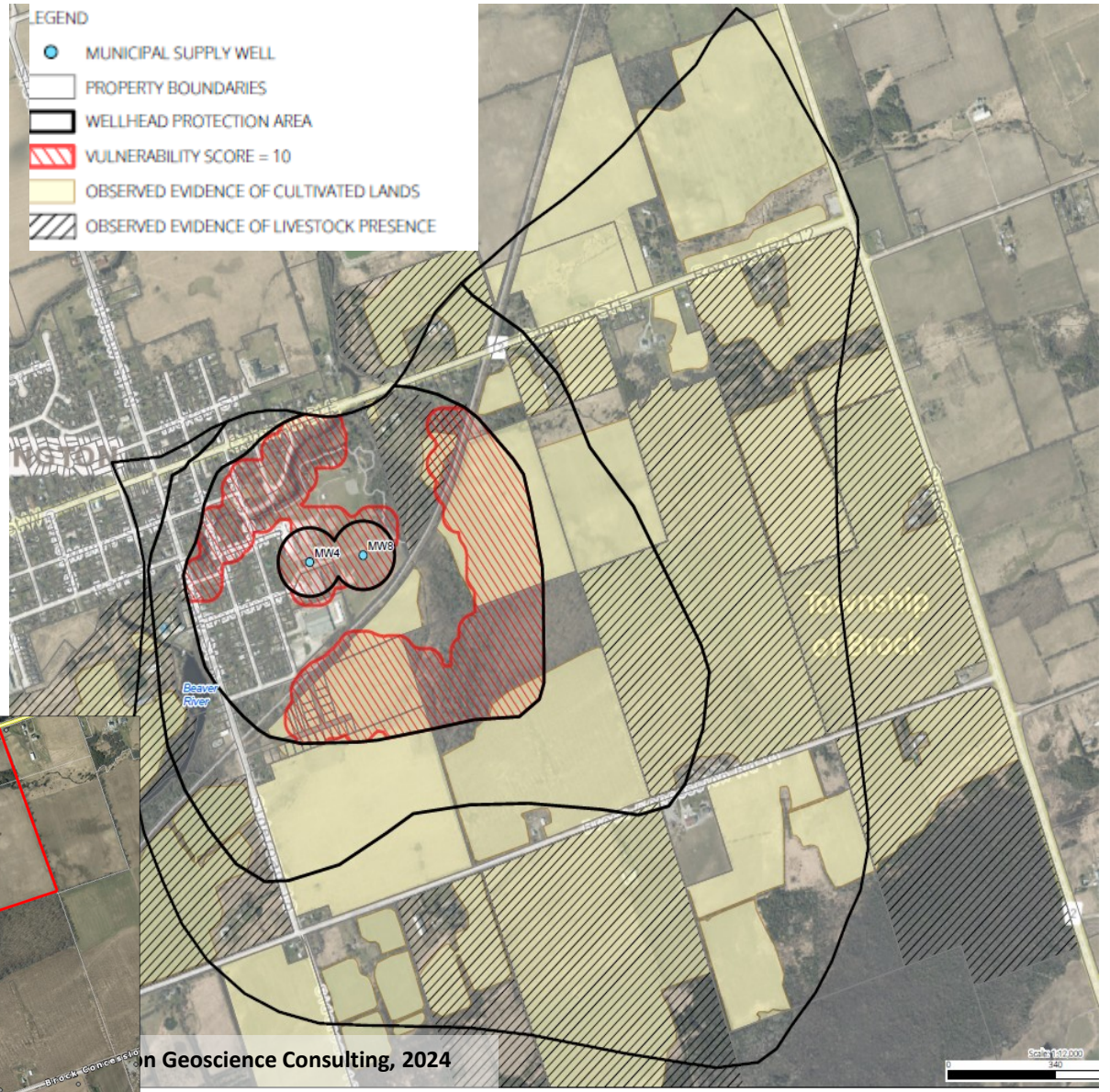
- (1) The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act
- (2) The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.
- (3) The application of agricultural source material to land
- (4) The storage of agricultural source material.
- (6) The application of non-agricultural source material to land
- (7) The handling and storage of non-agricultural source material.
- (8) The application of commercial fertilizer to land
- (9) The handling and storage of commercial fertilizer to land
- (21.1) The use of land as livestock grazing or pasturing land.
- (21.2) The use of land as an outdoor confinement area or a farm-animal yard

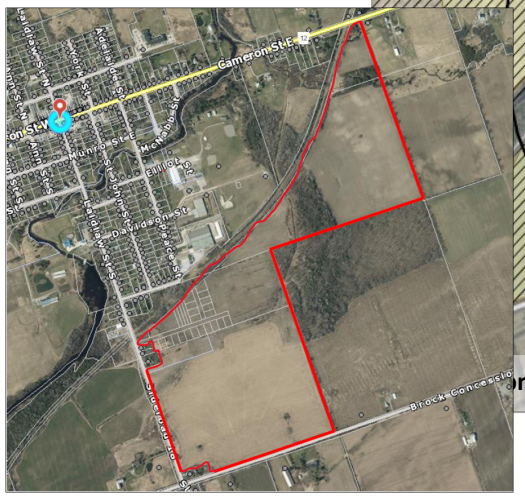
Identified WHPA-ICA (Nitrate) – Arena Well Field



Land Use: Arena Wellfield

- Mainly an agricultural community
- Mix of cultivated lands and livestock
- Industrial properties in WHPA-A/B
- Private sewage systems are outside the urban boundary

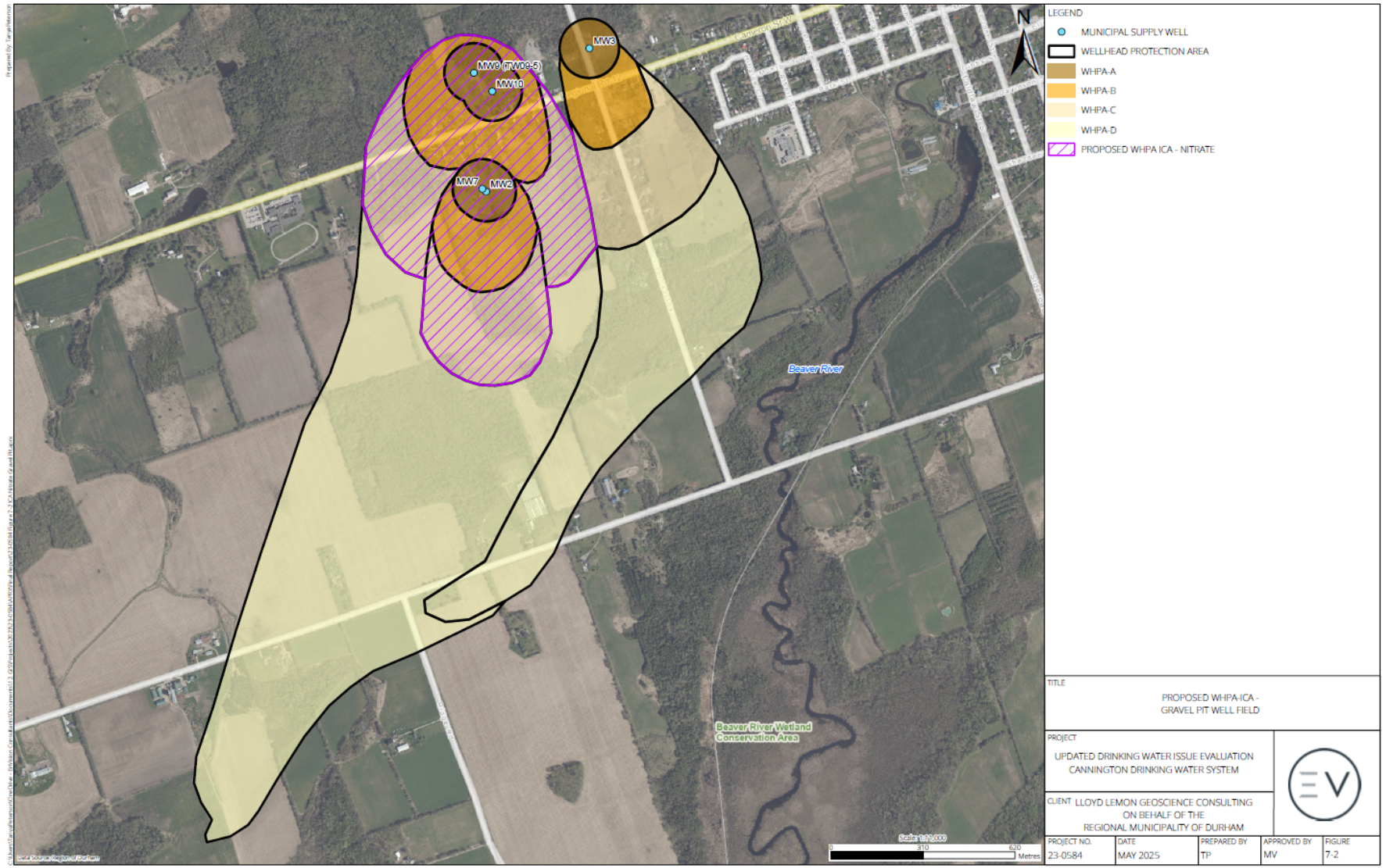




Potential Significant Drinking Water Threats (SDWT) (WHPA-ICA Arena Well Field)

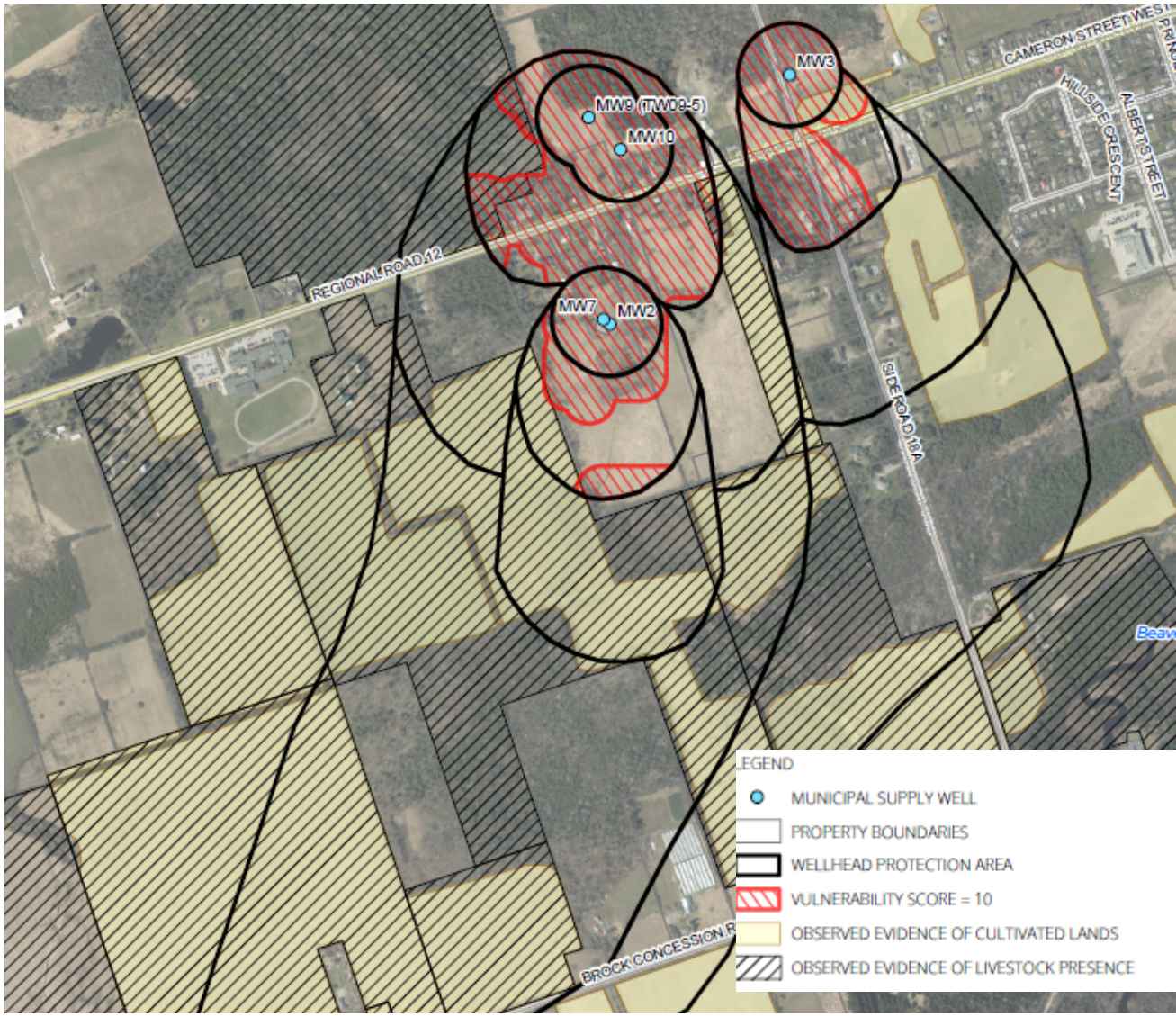
- Private On-Site Sewage Systems: 35 on 35 parcels (29 Residential)
- Application of Agricultural Source Material: 192 on 192 parcels (178 Residential)
- Storage of Agricultural Source Material: 186 on 186 parcels (178 Residential)
- Application of Commercial Fertilizer to Land: 194 on 194 parcels (178 Residential)
- Handling and Storage of Commercial Fertilizer to Land: 187 on 187 parcels (178 Residential)
- Application of Non- Agricultural Source Material: 0
- Handling and Storage of Non- Agricultural Source Material: 0
- Livestock Grazing/Pasturing: 6 on 6 parcels
- Outdoor Confinement or Farm Animal Yard: 6 on 6 parcels

Identified WHPA-ICA (Nitrate) – Gravel Pit Well Field



Land Use: Gravel Pit Wellfield

- Mainly an agricultural community
- Mix of cultivated lands and livestock
- Private sewage systems are outside the urban boundary



Potential Significant Drinking Water Threats (SDWT) (WHPA-ICA Gravel Pit Well Field)

- Private On-Site Sewage Systems: 26 on 26 parcels (21 Residential – already addressed)
- Application of Agricultural Source Material: 24 on 24 parcels (22 Residential)
- Storage of Agricultural Source Material: 24 on 24 parcels (22 Residential)
- Application of Commercial Fertilizer to Land: 26 on 26 parcels (22 Residential)
- Handling and Storage of Commercial Fertilizer to Land: 24 on 24 parcels (22 Residential)
- Application of Non- Agricultural Source Material: 0
- Handling and Storage of Non- Agricultural Source Material: 0
- Livestock Grazing/Pasturing: 2 on 2 parcels
- Outdoor Confinement or Farm Animal Yard: 2 on 2 parcels

Summary

- Elevated Concentrations of Dissolved Nitrate at Arena Well Field Required Management Actions
- Investigations into Sources Supports Establishment of WHPA-ICA for Nitrate at Arena and Gravel Pit Well Fields
- Identified WHPA-E and WHPA-ICA (2) to be added to Assessment Report
- Significant Threat Counts to be Updated in Assessment Report
- Source Protection Plan policies for WHPA-ICA (Nitrate) will require review to ensure that they are applicable for conditions observed in the WHPA-ICA for Cannington.

THANK YOU

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