Below is a summary of background information on the Ontario Drinking Water Quality Standard (ODWQS) for NDMA. This was an MECP action item from the TRAC meeting held on June 13, 2024 to address a comment made by Dr. Ulysses Klee (Conestoga College professor and student project advisor) following the presentation on NDMA treatment technologies provided by students at Conestoga College. Dr. Klee noted that the ODWQS for NDMA was established many years ago and drinking water standards may vary between jurisdictions. Discussed with the ministry's Drinking Water Standards team in the Environmental Sciences & Standards Division (ESSD) the following information is provided:

N-Nitrosodimethylamine (NDMA):

- Regulatory Standard –
    - Ontario was one of the first jurisdictions in the world to develop a standard for, and regulate, NDMA in drinking water. This was the result of the contamination of the drinking water (municipal) aquifers in Elmira contaminated with NDMA from industrial operations (releases to the environment). In 1991, the ministry developed an Interim Maximum Acceptable Concentration (IMAC) of **9 nanograms per litre (ng/L), or 0.009 micrograms per litre (ug/L).**
    - In 2003, the IMAC became legally enforceable as an ODWQS under Ontario Regulation 169/03 (O. Reg. 169/03: ONTARIO DRINKING WATER QUALITY STANDARDS), made under the Safe Water Drinking Act (2002) (Safe Drinking Water Act, 2002, S.O. 2002, c. 32 (ontario.ca)).
- Standard Development –
    - Drinking water standards are established using generally accepted scientific principles that include peer-reviewed publications and best available information.
    - The standards development process includes two major components:
        - Risk assessment – Scientific evaluation of the health effects or other impacts of exposure to a substance. This process results in a limit proposed that is protective of health.
        - Risk management – Evaluation of implementation issues (e.g., availability of test methods, treatment technologies, health benefits, etc.).

- Risk assessment - Life-time exposures are considered in the development of drinking water standards.
    - Carcinogenic substances are set between 10^{-5} to 10^{-6} (1 in 1,000,000 people) life-time risk.
- Risk management - Analytical capability and treatment technology are also considered.
- NDMA's carcinogenicity (cancer causing) is widely recognized. Based on results from animal studies, NDMA is an animal carcinogen.
    - The US EPA lists NDMA as a Class B2 carcinogen (probable human carcinogen) based on sufficient evidence of carcinogenicity in animals.
- The development of the ODWQS for NDMA is based on an incremental lifetime cancer risk derived at this level (0.009 ug/L) was between 1 in 100,000 (10^{-5}) and 1 in 1,000,000 (10^{-6}) people based on scientific studies at that time.

- Supporting Documentation -
    - Additional information on the ODWQS and development of standards are provided in the ministry's document "*Technical Support Document for Ontario Drinking-water Quality Standards, Objectives and Guidelines*" (MECP, Revised June 2006) (4449e Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines (wcwc.ca)).
    - Table 2 of the ODWQS Technical Document provides the Chemical Standards, including the Interim Maximum Acceptable Concentration (IMAC) for NDMA of 0.009 ug/L.
    - Appendix A of the ODWQS Technical Document provides the following description of NDMA: "*The interim maximum acceptable concentration for NDMA is 0.000009 mg/L (0.009 ug/L). NDMA is rarely used industrially but has been used as an antioxidant, as an additive for lubricants and as a softener of copolymers. It has been detected in some foods particularly smoked foods and very occasionally in treated river/lake water in heavily farmed locations. NDMA is an animal carcinogen*."
- Other jurisdictions (Drinking Water Standards) -
    - Health Canada: In 2011, Health Canada published a Canadian Drinking Water Quality Guideline for NDMA (Guidelines for Canadian Drinking Water Quality: Guideline Technical Document: N-Nitrosodimethylamine

(NDMA) - Canada.ca) of 40 ng/L, or 0.04 ug/L (Maximum Acceptable Concentration or MAC). For NDMA, Health Canada's guideline is based on lifetime cancer risk per 1 in 100,000 people (i.e., 10^{-5}), which also takes into consideration treatment system limitations.

- Ontario opted to maintain its more stringent ODWQS of 9 ng/L. It was not because Health Canada's derivation was problematic, but rather, the ODWQS would ensure that wastewater and drinking water treatment systems utilizing chlorination that use chloramines for disinfection would optimize its treatment process as NDMA can be formed as an unintended byproduct during chloramination in the presence of some amine compounds.

- United States: NDMA is listed as a priority pollutant by the US EPA, but there is no US Federal drinking water standard (i.e., there is no maximum contaminant level (MCL)). The NDMA standards established by US States vary from State to State, with some being above and some below the ODWQS.
- World Health Organization (WHO): WHO's drinking water guideline for NDMA is 100 ng/L (0.1 µg/L).

Based on available science and the inherit conservatism used in the evaluation to develop the ODWQS for NDMA, the ministry does not anticipate amending the ODWQS for NDMA.