



# Geoffrey F. Bruce Fellowship in Canadian Freshwater Policy

## **Contemporary Challenges to Drinking Water Source Protection: A Critical Evaluation of the Ontario *Clean Water Act*, 2006 and Chemicals of Emerging Concern**

### **Policy Brief**

**By**

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## Executive Summary

The Ontario Walkerton tragedy of May 2000 prompted the enactment of the *Clean Water Act, 2006* (CWA) to protect water quality and quantity at its source. This policy brief examines the evolution and structure of the CWA framework and its capacity to address contaminants of emerging concern (CECs). The case of 1,3-diphenylguanidine (DPG), a tire wear leachate that enters drinking water sources via stormwater road runoff, reveals that the 2021 amendments to the Tables of Drinking Water Threats (a policy instrument under the CWA) no longer include chemicals. This omission suggests a shift away from chemical-specific risk identification, potentially limiting the CWA's ability to address CECs. Addressing certain procedural, informational, and policy-related shortcomings highlighted in this brief could enhance the CWA's ability to adapt to CECs and uphold the integrity of municipal drinking water protection. Key recommendations to strengthen the CWA framework consist of: (1) mandating timely integration of emerging contaminants, (2) increasing transparency through public access to the lookup table database, (3) regularly updating technical rules, and (4) expanding policies to address non-point source stormwater runoff.

## Introduction

The CWA is foundational provincial water legislation established “to protect existing and future sources of [municipal] drinking water.”<sup>1</sup> However, it remains uncertain how this legislation addresses CECs, such as persistent, mobile-in-water, and toxic (PMT) chemicals, like 1,3-diphenylguanidine (DPG).<sup>2</sup> This chemical drains into surface drinking water sources from road run-off during rainstorms (Johannessen et al., 2021), raising a public health concern due to its physical-chemical properties.<sup>3</sup> DPG is “considered to be the most frequently detected [rubber additive] in stormwater runoff and surface water, with concentration levels up to microgram per liter, and it has also been detected in maternal and umbilical cord blood” (Zhang et al., 2025, p. 2). “Laboratory studies involving animal exposure have demonstrated that DPG exhibits reproductive toxicity, neurotoxicity, and endocrine disruption” (Zhang et al., 2025, p. 2). Research has also raised concerns that it may be reproductively toxic to humans (Environment Canada & Health Canada, 2013; Sühling, 2023). This brief examines: How, and in what ways, could the CWA account for CECs, like DPG, that enter drinking water sources through stormwater road runoff?

## Policy Context: The CWA's Move Away from Chemicals

The CWA has established a framework<sup>4</sup> for identifying and addressing drinking water threats. Under the CWA's O. Reg., 287/07 (titled “General”), 22 prescribed drinking water threats (PDWTs) are listed, which are specific activities that can harm the quality or quantity of drinking

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<sup>1</sup> *Clean Water Act, 2006*, S.O. 2006, c. 22 [hereinafter known as CWA].

<sup>2</sup> According to Feng et al. (2023, p. 1), CECs are “a group of pollutants that have recently raised concerns due to their potential ecological and human health-related risks. Many of these contaminants have not yet been included in existing management protocols, and current efforts to prevent and mitigate their risks are insufficient.” One such contaminant of contemporary relevance is the tire wear chemical DPG. This chemical compound is used as a secondary accelerator in the vulcanization of rubber, particularly in tire manufacturing (Hall, 2025).

<sup>3</sup> Classified as a PMT substance, DPG threatens the quality of water resources due to its inherent physical-chemical properties (Reemtsma et al., 2016). These innate properties include high polarity, low volatility, and low potential to sorb to organic matter, all of which limit degradation and promote DPG's transport through aquatic environments. As a result, PMT substances like DPG can penetrate groundwater aquifers, evade removal in advanced wastewater treatment plants, and contaminate drinking water sources (Fries et al., 2022).

<sup>4</sup> The CWA framework refers to the legislation, regulations, Director's Technical Rules, Tables of Drinking Water Threats, assessment reports, and source protection plans (SPPs).

water sources (**Figure 1**). These threats<sup>5</sup> are identified so they can be managed or prohibited in vulnerable areas. Since 2009, chemicals associated with various PDWTs were accounted for in the Tables of Drinking Water Threats (Ontario, 2009). The Tables of Drinking Water Threats outline the specific scenarios (e.g., quantity, proximity, land area) under which a PDWT activity poses a significant risk to drinking water. These scenarios are known as circumstances and help determine when action is required to manage the threat. These Tables of Drinking Water Threats previously referenced chemicals associated with the PDWT activities. However, in 2021, the Ministry of the Environment, Conservation and Parks (MECP) moved away from acknowledging chemicals associated with the PDWT activities and imbedded the Tables of Drinking Water Threats into part XII of the 2021 Director's Technical Rules<sup>6</sup> (MECP, 2021).

1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the <i>Environmental Protection Act</i> .	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.
5. The management 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.	10. The application of pesticide to land.	11. The handling and storage of pesticide.	12. The application of road salt.
13. The handling and storage of road salt.	14. The storage of snow.	15. The handling and storage of fuel.	16. The handling and storage of a dense non-aqueous phase liquid.
17. The handling and storage of an organic solvent.	18. The management of runoff that contains chemicals used in the de-icing of aircraft.	19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	20. An activity that reduces the recharge of an aquifer.
	21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard.	22. The establishment and operation of a liquid hydrocarbon pipeline. O. Reg. 385/08, s. 3; O. Reg. 206/18, s. 1.	

**Figure 1.** Activities that are PDWTs under CWA, O. Reg 287/07, General s.1.1(1).

<sup>5</sup> A drinking water threat is defined in Section 2(1) of the CWA as “an activity or condition that adversely affects or has the potential to adversely affect the quality or quantity of any water that is or may be used as a source of drinking water” (CTC Source Protection Committee, 2024).

<sup>6</sup> The Director's Technical Rules, established under section 107 of the CWA, outline the requirements for assessing risks to drinking water sources in Ontario and any matter that is authorized or required to be included in an Assessment Report. These rules were first released in 2008, and are amended from time to time (e.g., 2009, 2013, 2017/18, 2021).

## Policy Brief Scope

Given that DPG is not currently regulated<sup>7</sup> as part of a PDWT under the CWA, research was undertaken to determine how DPG could be accounted for under the CWA's O. Reg 287/07's PDWT number two (the establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage) and circumstance 2.3.<sup>8</sup> The brief was scoped to only examine the Credit Valley - Toronto and Region - Central Lake Ontario (CTC) Source Protection Region's (SPR)'s Assessment Reports and Source Protection Plan (SPP),<sup>9</sup> as the CTC SPR encompasses the Don River watershed where the chemical of relevance (DPG) was detected (CTC Source Protection Committee, 2024; Johannessen et al., 2022).

## Findings: Procedural, Informational, and Policy-Related Barriers

Overall, a review of the practice of water source protection planning with respect to DPG revealed the CWA legal and policy framework as being conceptually flexible but constrained in practice by procedural, informational, and policy-related barriers. While the CWA is designed to be science-based and adaptable, the mechanisms intended to integrate new or emerging threats – such as Rules 119 and 120<sup>10</sup> – are rarely used and slow to activate. These limitations are compounded by a lack of public access to key hazard rating data, making it difficult for stakeholders to assess whether contaminants like DPG and other CECs are being considered. Recent amendments to the 2021 Director's Technical Rules, and the removal of chemical-specific information from the Tables of Drinking Water Threats, further obscure the ability to scrutinize whether the 2021 Director's Technical Rules are precautionary in principle and adequately responsive to emerging contaminants. However, SPP policies may offer an avenue for addressing stormwater runoff-related CECs if the policies are reformulated more broadly to include stormwater as a non-point source of pollution.<sup>11</sup> These findings point to a need for greater transparency and inclusive policy mechanisms to ensure that Ontario's source water protection framework keeps pace with CECs.

Several procedural administrative barriers (**Figure 2**) hinder the timely implementation of Rule 119 and Rule 120 which permit the assessment of new drinking water threat activities. First, the process requires the Source Protection Committee (SPC) to identify the activity as a potential threat that cannot be already regulated through other legislative approvals (federal or provincial). Then, the Director must confirm the potential threat qualifies as a drinking water threat and assign a hazard rating based on five factors: toxicity, environmental fate, quantity, likelihood of release,

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<sup>7</sup> DPG is not regulated under the federal legislation *CEPA, 1999* (Environment Canada & Health Canada, 2013). However, “DPG is a registered substance under the European Chemicals Agency REACH regulation, where it is classified as toxic to aquatic organisms, with a potential to cause long-term adverse effects in the aquatic environment. Specifically, DPG is considered toxic to fish, aquatic invertebrates, and algae, and is not readily biodegradable. DPG is also classified as a [PMT] substance and as a very persistent, very mobile (vPvM) substance, under criteria developed by the German Environment Agency” (California Department of Toxic Substances Control, 2021).

<sup>8</sup> Each PDWT has a number of circumstances associated with it. PDWT number two includes circumstance 2.3 which is: “2.3 Storm water management facilities and drainage systems: Outfall from a storm water management facility or storm water drainage system” (Ministry of the Environment, Conservation, and Parks, 2021).

<sup>9</sup> The CTC Source Protection Plan applies to all three Source Protection Areas within the region: Credit Valley, Toronto and Region, and Central Lake Ontario. <https://www.ctcswp.ca/source-protection-plan/the-ctc-source-protection-plan>

<sup>10</sup> In the Director's Technical Rules, Rule 119 outlines a criteria for identifying non-prescribed activities as drinking water threats and Rule 120 outlines a method for assigning chemical hazard ratings to non-prescribed drinking water threat activities (Ministry of the Environment, Conservation, and Parks, 2021).

<sup>11</sup> “Non-point sources involve contaminants that are released from multiple or dispersed locations, such as the spreading of road salt or runoff from agricultural land” (O'Connor, 2002, p. 93).

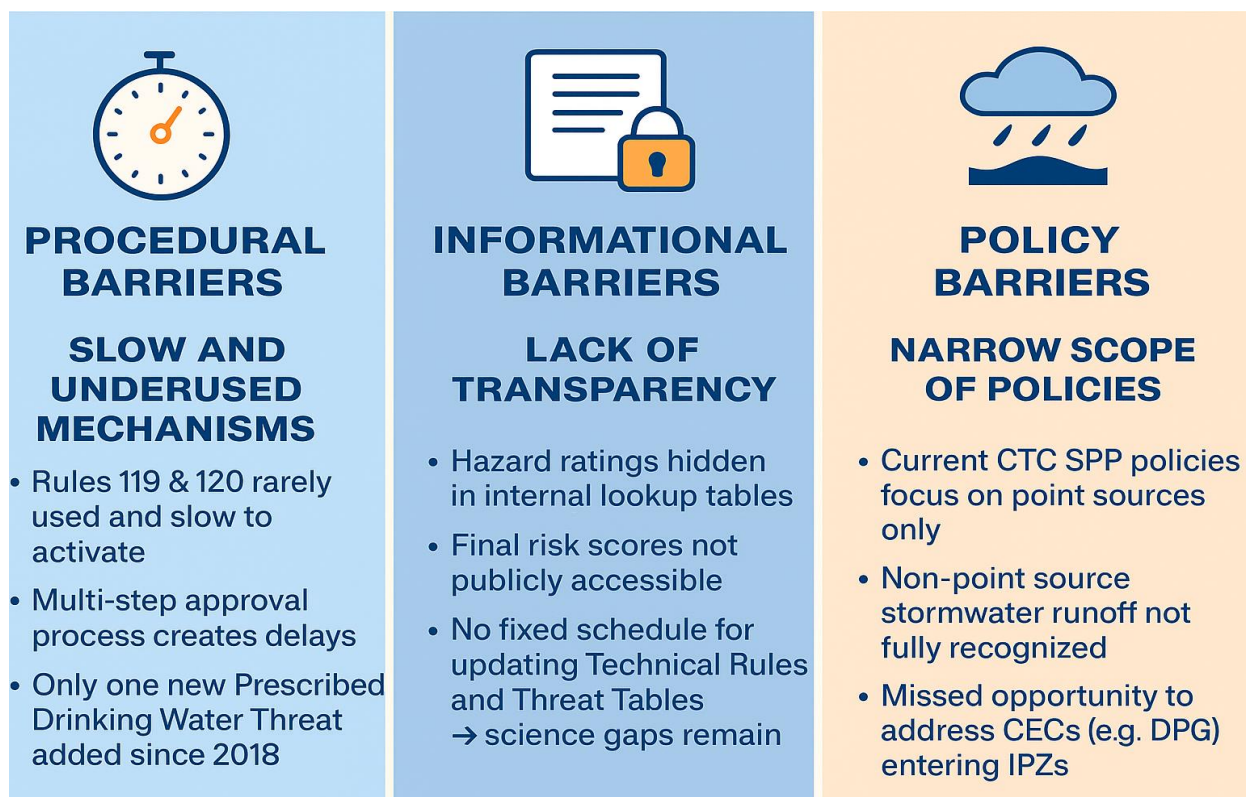
and type of vulnerable area in which the activity is or would be located (MECP, 2021). While these rules theoretically allow for the integration of novel contaminants into the risk assessment framework, in practice the mechanism appears to be underutilized and often too slow to respond to rapidly evolving science – as demonstrated by the addition of only one PDWT (# 22) in 2018 (see **Figure 1** above).

In addition to the procedural barriers that hinder the inclusion of CECs under the CWA, informational gaps (**Figure 2**) also exist through the lack of transparency in the Tables of Drinking Water Threats. Specifically, the omission of hazard ratings and final risk scores in the Tables of Drinking Water Threats further complicates the assessment of CECs by the public.<sup>12</sup> Hazard ratings are embedded in a lookup table database which is not openly accessible to the general public; hence, stakeholders and researchers face challenges in accessing, independently verifying, and interpreting how threat classifications were derived and implemented. Furthermore, while the MECP is committed to reviewing and updating the Director’s Technical Rules periodically (as seen in 2009, 2013, 2017/18, and 2021), it appears the Director’s Technical Rules and the Tables of Drinking Water Threats are not updated after a set time period (as implied in an informal discussion with a senior MECP staff member). Instead, these technical documents are amended when ‘enough’ scientific evidence emerges indicating that amendments are required. Based on the lack of established update timelines for such technical documents, it could be argued that amendments are not frequently reviewed to keep pace with scientific discoveries.

Policy related challenges (**Figure 2**) also exist; the analysis of circumstance 2.3 under PDWT number two in O. Reg 287/07, General s.1.1(1), reveals potential for addressing contaminants like DPG from stormwater runoff. However, current policies within the CTC SPP primarily target point sources of stormwater (e.g., discharge from stormwater management facilities) and fail to recognize Intake Protection Zones (IPZs) as vulnerable areas. This oversight underscores the need for clearer policy mechanisms to address non-point source pollution draining into IPZs.

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<sup>12</sup> According to the most recent 2021 Director’s Technical Rules the risk score is calculated using a simple formula: *Risk Score = Hazard Rating x Vulnerability Score* (Ministry of the Environment, Conservation, and Parks, 2021). The hazard rating reflects how dangerous a contaminant is based on the four factors (toxicity, environmental fate, quantity, and release to environment). This hazard rating is already established for PDWTs or determined by the Director for non-PDWTs. The vulnerability score represents how sensitive a specific area is to contamination, with higher scores indicating greater susceptibility (Ministry of the Environment, Conservation, and Parks, 2021).



**Figure 2.** Procedural, informational, and policy barriers limit the CWA’s responsiveness to CECs. Image generated using artificial intelligence ([ChatGPT](#)).

### Conclusion and Policy Recommendations

By addressing the procedural, informational, and policy-related gaps discussed above, the CWA’s capacity to respond to emerging threats and ensure the continued safety of municipal drinking water sources may be strengthened.

Recommendations (1), (2), (3) are directed to the Director and staff of the Conservation and Source Protection Branch at the MECP and recommendations (1) and (4) are directed to the CTC SPC.

- (1) A streamlined time-bound process for implementing Rules 119 and 120 should be mandated to ensure SPCs and the Director can more rapidly integrate novel contaminants into the CWA’s framework.
- (2) Select internal guidance documents (e.g., the lookup table database) can also be made publicly accessible to further promote transparency and public trust in the decision-making process.
- (3) A fixed schedule could be established to review and update technical documents, such as the Director’s Technical Rules, to help ensure that new scientific findings are incorporated in a timely manner.
- (4) Existing policies within the CTC SPP could be expanded to explicitly address non-point source stormwater road runoff and its associated CECs entering IPZs.

## Bibliography

- California Department of Toxic Substances Control. (2021). Other Tire-Derived Chemicals of Interest Summary and Questions 2021. [https://dtsc.ca.gov/wp-content/uploads/sites/31/2021/06/Other-Tire-Derived-Chemicals-of-Interest-Summary-and-Questions-2021\\_ADA.pdf](https://dtsc.ca.gov/wp-content/uploads/sites/31/2021/06/Other-Tire-Derived-Chemicals-of-Interest-Summary-and-Questions-2021_ADA.pdf)
- CTC Source Protection Committee. (2024). *Approved Source Protection Plan: CTC Source Protection Region*. [https://www.ctcswp.ca/source-protection-plan/the-ctc-source-protection-plan/rpt\\_20240229\\_ctcspp\\_v6\\_clean\\_approved\\_fnl\\_merged.pdf](https://www.ctcswp.ca/source-protection-plan/the-ctc-source-protection-plan/rpt_20240229_ctcspp_v6_clean_approved_fnl_merged.pdf)
- Environment Canada, & Health Canada. (2013, June 28). *Screening Assessment for the Challenge Guanidine, N,N'-diphenyl- (Diphenylguanidine)*. <https://www.canada.ca/en/environment-climate-change/services/evaluating-existing-substances/screening-assessment-forchallenge-guanidine-nn-diphenyl-diphenylguanidine-chemical-abstracts-service-registr.html>
- Feng, W., Deng, Y., Yang, F., Miao, Q., & Ngien, S. K. (2023). Systematic Review of Contaminants of Emerging Concern (CECs): Distribution, Risks, and Implications for Water Quality and Health. *Water*, 15(22), Article 22. <https://doi.org/10.3390/w15223922>
- Fries, E., Grewal, T., & Sühring, R. (2022). Persistent, mobile, and toxic plastic additives in Canada: Properties and prioritization. *Environmental Science: Processes and Impacts*, 10. <https://doi.org/10.1039/d2em00097k>
- Hall, P. (2025, June 24). *Looking at the future of DPG in rubber*. SMITHERS. <https://media-cdn.smithers.com/mediacontainer/medialibraries/smithersb4f/resources/2025/downloads/smithers-evaluating-dpg-alternatives.pdf>
- Johannessen, C., Helm, P., Lashuk, B., Yargeau, V., & Metcalfe, C. D. (2022). The Tire Wear Compounds 6PPD-Quinone and 1,3-Diphenylguanidine in an Urban Watershed. *Archives of Environmental Contamination and Toxicology*, 82(2), 171–179. <https://doi.org/10.1007/s00244-021-00878-4>
- Johannessen, C., Helm, P., & Metcalfe, C. D. (2021). Detection of selected tire wear compounds in urban receiving waters. *Environmental Pollution*, 287, 117659. <https://doi.org/10.1016/j.envpol.2021.117659>
- MECP. (2021, December 3). *2021 technical rules under the Clean Water Act | ontario.ca*. Ontario. <http://www.ontario.ca/page/2021-technical-rules-under-clean-water-act>
- O'Connor, D. R. (2002). Chapter 4 The Protection of Drinking Water Sources. In *Part Two Report of the Walkerton Inquiry: A Strategy for Safe Drinking Water* (pp. 81–146). Ontario Ministry of the Attorney General. [https://www.archives.gov.on.ca/en/e\\_records/walkerton/report2/pdf/Chapter\\_4.pdf](https://www.archives.gov.on.ca/en/e_records/walkerton/report2/pdf/Chapter_4.pdf)



Ontario. (2009, November 16). *Tables of Drinking Water Threats*. Ontario.

Reemtsma, T., Berger, U., Arp, H. P. H., Gallard, H., Knepper, T. P., Neumann, M., Quintana, J. B., & Voogt, P. de. (2016). Mind the Gap: Persistent and Mobile Organic Compounds—Water Contaminants That Slip Through. *Environmental Science & Technology*, 50(19), 10308–10315. <https://doi.org/10.1021/acs.est.6b03338>

Sührling, R. (2023). *An overlooked issue: Persistent, mobile, organic plastic additives as drinking water contaminants*. Urban Water Faculty Seminar Event, Toronto Metropolitan University.

Zhang, H.-Y., Han, Y., Hu, L.-X., Chen, Y., Ying, G.-G., & Zhao, J.-L. (2025). A comprehensive reconnaissance and risk assessment of rubber additives and their transformation products (RATPs) in groundwater: 1,3-Diphenylguanidine (DPG) as a pressing ecological concern. *Water Research*, 277, 1–9. <https://doi.org/10.1016/j.watres.2025.123279>

### **List of Laws**

*Clean Water Act, 2006*, S.O. 2006, c. 22

### **List of Regulations**

O. Reg 287/07 GENERAL, enacted under the *Clean Water Act, 2006*, S.O. 2006, c. 22

O. Reg 231/07 SERVICE OF DOCUMENTS, enacted under the *Clean Water Act, 2006*, S.O. 2006, c. 22

O. Reg 284/07 SOURCE PROTECTION AREAS AND REGIONS, enacted under the *Clean Water Act, 2006*, S.O. 2006, c. 22

O. Reg 288/07 SOURCE PROTECTION COMMITTEES, enacted under the *Clean Water Act, 2006*, S.O. 2006, c. 22