

To: DEQ Water Quality Staff**Date:** November 28, 2014**From:** Jennifer Wigal, *Surface Water Management Section Manager*
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Andrea Matzke, *WQ Standards and Assessment Section***Subject:** Implementation Instructions for the Water Quality Criterion Dinitrophenols (CAS #: 25550-58-7)

This memo clarifies how the chemical group dinitrophenols (DNP) in effluent and surface water is measured to determine compliance with water quality criteria.

Criterion Summary

Oregon water quality standards include numeric criteria for dinitrophenols and one of its isomers—2, 4 dinitrophenol to protect human health and aquatic life (OAR 340-041-0033(3) and (4), and Tables 30 and 40). There are no associated aquatic life criteria (See table below).

Chemical	Human Health Criteria		Aquatic Life Criteria (Freshwater)		Aquatic Life Criteria (Saltwater)	
	Water + Org (µg/L)	Org Only (µg/L)	Acute (µg/L)	Chronic (µg/L)	Acute (µg/L)	Chronic (µg/L)
Dinitrophenols	62	530	---	---	---	---
Dinitrophenol 2, 4-	62	530	---	---	---	---

Key Issues

As referenced in the ATSDR¹, dinitrophenols have 6 isomers:

1. 2,3-Dinitrophenol (66568)
2. 2,4-Dinitrophenol (51285)
3. 2,5-Dinitrophenol (329715)
4. 2,6-Dinitrophenol (573568)
5. 3,4-Dinitrophenol (577719)
6. 3,5-Dinitrophenol (586118)

The question raised was whether it is appropriate to add all the DNP isomers together and then compare the data results to the criteria for DNP. The DEQ lab researched the availability of standards for the isomers of DNP. The 2,5-DNP isomer is referenced in EPA methods, but is rarely seen in a laboratory's standard analyte list. DEQ also conducted a brief search for some of the other isomers and found that the remaining isomers are typically available as neat

¹ ATSDR. Toxicological Profile for Dinitrophenols. See <http://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=729&tid=132>

chemicals (pure, solid form) only and some are cost prohibitive. For example, 1 gram of ≥98% 2,3-DNP from Sigma-Aldrich is around \$300. Conversely, standards for 2,4 DNP are common and not cost prohibitive. In addition to the standards' cost and availability issues, the DEQ lab is unsure without further research if all of the isomers could even be resolved/separated using commonly used technology. Therefore, the lab recommends analyzing for 2,4-dinitrophenol only rather than the entire class of dinitrophenols.

In addition, the DEQ Toxicologist recommended against adding all 6 isomers together as this approach presumes cumulative toxicity without knowledge of the relative toxicities of the components. His suggestion was to also use 2,4 DNP toxicity as a surrogate for the DNP criterion.

Inquiries to EPA Region 10² and EPA Headquarters indicate that there is no specific guidance on this chemical group and that because it is a non-priority pollutant, EPA does not anticipate re-examination of this criterion in the near future. EPA indicated that the same reference dose was used for 2,4 DNP and dinitrophenols to derive criteria. The 2,4 DNP is the isomer most in use industrially and the one most likely to be encountered.

Recommended Analytical Method

The recommended method or method modification for 2,4 DNP is **EPA Method 604, 625 or 1625B**. To determine the applicable quantitation limits for individual permit holders, please refer to Schedule B of the relevant permit. For older permits without quantitation limits in Schedule B, please refer to Revision 3.0 of the [Reasonable Potential Analysis for Toxic Pollutants IMD](#) to determine applicable quantitation limits.

Implementation Instructions

Dinitrophenols are not currently listed in Appendices D or J of 40 CFR 122 and are not required as part of the federally mandated priority pollutant scan.

Since dinitrophenols are listed as a state water quality criterion, current policy as described in **Sections 2.2.2 and 2.2.4** of the **RPA IMD rev. 3.1**, is to require monitoring and subsequent evaluation for pollutants when one of the conditions³ described in the RPA IMD occurs. In the event where monitoring for dinitrophenols are indicated, staff are directed to require monitoring and analysis for 2,4 DNP in lieu of dinitrophenols and use the resulting data as a surrogate when evaluating reasonable potential and calculating water quality based effluent limits (WQBEL).

The RPA Workbook has been set up with notations to this effect and will automatically use 2,4 DNP data in lieu of dinitrophenols data.

² E-mail from Matt Szelag, EPA Region 10. November 2, 2011.

³ Generally, all domestic facilities greater than 1 MGD, minor domestic facilities where the pollutant is “known” to be present and industrial facilities where the pollutants is “expected” to be present will be required to monitor and evaluate for dinitrophenols.

Conclusion

In summary, it is not appropriate to sum up the isomers of DNP to measure the DNP chemical group given the costs and issues of finding standards for all the isomers for the purposes of determining reasonable potential. Instead, DEQ recommends using 2,4-DNP as the surrogate measurement for DNP criteria, given its prevalence in the environment and because both DNP and 2,4 DNP utilize the same reference dose. There are also questions about the validity of simply adding the isomers together without knowledge of the relative toxicities of the components. In addition, water quality staff will assess the need for dinitrophenols criteria during the next review of human health criteria for toxics pollutants.