

Ground Water Quality Standard for Tri-cresyl phosphate

(mixed isomers)

CASRN #1330-78-5

Tri-*o*-cresyl phosphate # 78-30-8, Tri-*m*-cresyl phosphate # 563-04-2

October 2015

& Tri-*p*-cresyl phosphate # 78-32-0

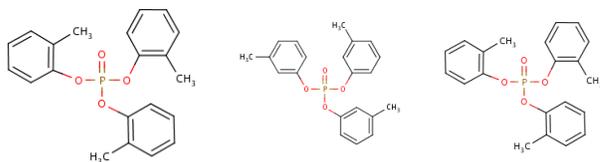
NJDEP

Summary of Decision: In accordance with the New Jersey Ground Water Quality Standards rules at N.J.A.C. 7:9C-1.7, the Department of Environmental Protection (Department) has developed an interim specific ground water quality criterion of 3 µg/L and PQL of 0.1 µg/L (ppb) for Tri-cresyl phosphate. The basis for this criterion and PQL are discussed below. Pursuant to N.J.A.C. 7:9C-1.9(c), **the applicable constituent standard is 3 µg/L.**

Tri-cresyl phosphate

Molecular Formula: C₂₁H₂₁O₄P

Molecular Structure:



Background: Tri-cresyl phosphate is a mixture of three different isomers that is used as an additive in lubricating oils, as a plasticizer and as a flame retardant.

Reference Dose: The Office of Science developed an Interim Specific Reference Dose and Groundwater Criterion for Tri-ortho-cresyl phosphate (TOCP) (Stern, 2010) at the request of the Site Remediation Program (SRP). Subsequent discussions with SRP indicated that that TOCP was present on site in only one sample. All other detects of this family of compounds were for "tricresyl phosphates – total." Based on this information, the Office of Science was asked to consider an Interim Specific RfD and Groundwater Criterion for total tricresyl phosphates (TCP). The RfD and Criterion were based on protection against organophosphate-induced delayed neuropathy (OPIDN). Given the evidence suggesting that mixed isomers containing at least one *o*-cresol component can have at least as great an OPIDN potential as TOCP, it is prudent to apply the RfD derived for TOCP to the derivation of mixed TCP isomers. The RfD for TOCP is 4×10^{-4} mg/kg/day. It is recommended that the same RfD be applied to mixtures characterized as total TCP.

Therefore, the Reference Dose used as the basis of the ground water quality criterion for Tri-cresyl phosphate is 4×10^{-4} mg/kg/day.

Derivation of Ground Water Quality Criterion: The ground water quality criterion was derived pursuant to the formula established at N.J.A.C. 7:9C-1.7(c)4, using 4×10^{-4} mg/kg/day as the Reference Dose (as explained above), and standard default assumptions:

$$\frac{4 \times 10^{-4} \text{ mg/kg/day} \times 70 \text{ kg} \times 0.02}{2 \text{ L/day}} = 3 \text{ } \mu\text{g/L}$$

Where:

4×10^{-4} mg/kg/day = derived RfD
70 kg = assumed weight of an adult human
0.02 = assumed relative source contribution
2 L/day = assumed daily volume of water consumed

Derivation of PQL: The method detection limit (MDL) and the practical quantitation level (PQL) are performance measures used to estimate the limits of performance of analytic chemistry methods for measuring contaminants. The MDL is defined as "the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analytic concentration is greater than zero" (40 CFR Part 136 Appendix B). USEPA recommends that the MDL be multiplied by a factor of five or 10 to account for the variability and uncertainty that can occur at the MDL. The Department uses a value of five as the median upper boundary of the inter-laboratory MDL distribution from the New Jersey certified laboratory community and multiplies the MDL by five to derive the PQL. Establishing the PQL at a level that is five times the MDL provides a reliable quantitation level that most laboratories can be expected to meet during day-to-day operations.

Tri-cresyl phosphate appears as a listed parameter in [National Environmental Methods Index \(NEMI\)](#). The limit of detection in the method is specified as 20 ppb. As explained above, the PQL is established by multiplying the limit of detection by five, $20 \text{ ng/L} \times 5 = 100 \text{ ng/L}$ or 0.1 ppb (reported as one significant figure). **Therefore, the Department has established a PQL of 0.1 ppb for Tri-cresyl phosphate.**

Conclusion: Based on the information provided above (and cited below), the Department has established an interim specific ground water quality criterion of $3 \text{ } \mu\text{g/L}$ and a PQL of $0.1 \text{ } \mu\text{g/L}$ (ppb) for Tri-cresyl phosphate. *Since the ground water quality criterion is higher than the PQL for this constituent, pursuant to N.J.A.C. 7:9C-1.9(c), the applicable constituent standard for Tri-cresyl phosphate is $3 \text{ } \mu\text{g/L}$.*

Technical Support Documents: *Interim Specific Ground Water Quality Criterion Recommendation Report for Tri-cresyl phosphate*, Alan H. Stern, Dr.P.H., D.A.B.T., NJDEP, December 10, 2010; *Procedure for Describing Process for Development of Analytical Practical Quantitation Levels (PQLs) for Tri-cresyl phosphate*, R. Lee Lippincott, Ph.D., NJDEP, March 19, 2014.

References: Interim Specific Reference Dose and Groundwater Criterion for Tri-ortho-cresyl phosphate (TOCP) November 16, 2010

