

Ground Water Quality Standard for Cobalt

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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 100 µg/L and PQL of 0.5 µg/L (ppb) for Cobalt. 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 100 µg/L.**

Background: The Department reviewed the U.S. Environmental Protection Agency's (USEPA) National Center for Environmental Assessment (NCEA) document entitled "Risk Assessment Issue Paper for: Derivation of a Provisional RfD for Cobalt and Compounds (CASRN 7440-48-4)" (NCEA, 2002) to determine whether the toxicity factor derived by NCEA is appropriate to utilize as the basis for an interim specific ground water quality criterion.

Reference Dose: The NCEA RfD was based on a study conducted by Duckham and Lee (1976) in which hemoglobin increased in patients undergoing renal dialysis given 0.18 mg cobalt/day. Based on this study, the Department determined that an RfD of 0.02 mg/kg/day is protective and appropriate for use as the basis for an interim specific ground water quality criterion.

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 0.02 mg/kg/day as the Reference Dose (as explained above), and standard default assumptions:

$$\frac{0.02 \text{ mg/kg/day} \times 70 \text{ kg} \times 0.2}{2 \text{ L/day}} = 0.14 \text{ mg/L (rounds to 0.1)} = \mathbf{100 \mu\text{g/L}}$$

Where:

0.02 mg/kg/day = the derived RfD

70 kg = the assumed weight of an adult human

0.2 = the assumed relative source contribution

2 L/day = the 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 analyte 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.

Cobalt appears as a listed parameter in a published analytical method – “USEPA 200.8, *Metals in Waters by ICP/MS*”. The limit of detection in the method is specified as 0.09 ppb. As explained above, a more conservative detection limit is established using a multiplier of five. $0.09 \times 5 = 0.45$ ppb. Therefore, the Department has established the PQL for cobalt as 0.5 ppb.

Conclusion: Based on the information provided above (and cited below), the Department has established an interim specific ground water quality criterion of 100 µg/L and a PQL of 0.5 µg/L (ppb) for cobalt. 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 cobalt is 100 µg/L .**

Technical Support Documents: *Interim Specific Ground Water Quality Criterion Recommendation Report for Cobalt*, Dr. Gloria Post, NJDEP, August 17, 2007; *Procedure for Describing Process for Development of Analytical Practical Quantitation Levels (PQLs) for Cobalt*, R. Lee Lippincott, Ph.D., NJDEP, February 26, 2007.

References:

USEPA (2002). U.S. Environmental Protection Agency’s (USEPA) National Center for Environmental Assessment (NCEA) document entitled “Risk Assessment Issue Paper for: Derivation of a Provisional RfD for Cobalt and Compounds (CASRN 7440-48-4)” (NCEA, 2002)

USEPA. [“Method 200.8: Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma-Mass Spectrometry”](#). Revision 505. EMMC Version. Environmental Monitoring Systems Laboratory. Office of Research and Development. U.S. Environmental Protection Agency. Cincinnati, Ohio.



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