

**AMBIENT SURFACE WATER QUALITY
STANDARDS DOCUMENTATION****CHEMICAL:** Phenanthrene**CAS NO.(s):** 85-01-8**BASIS (Human/Aquatic):** Human**WATER CLASSIFICATION:** AA; AA-s; A; A-s**STANDARD:** 50 ug/l **Note E****REMARKS:****SUMMARY INFORMATION:**

Polynuclear aromatic hydrocarbons (PAHs) are a class of compounds which contain three or more aromatic rings. PAHs are ubiquitous substances generated from natural sources such as forest fires and volcanoes as well as from human activities, including emissions from coal- and gas-fired boilers, electric power plants, municipal and industrial incinerators and a wide variety of industrial processes. Benzo(a)pyrene, the most thoroughly studied of the PAHs, is an animal oncogen as defined in Part 701.1(p).¹ Other PAHs have also been implicated as oncogens although the data may be less conclusive than for benzo(a)pyrene. Some investigators have proposed that if a characteristic "bay region" exists in the molecule, the PAH can be transformed to a reactive metabolite which is able to react with genetic material.² Available oncogenicity and mutagenicity data on PAHs with four or more rings and a "bay region" have generally supported this hypothesis. PAHs with four or more rings and a "bay region" will be considered as potential oncogens unless there are sufficient data to the contrary.

The toxicologic data base for phenanthrene has been reviewed.³⁻⁵ It is the only 3-ring PAH with a "bay region". Although phenanthrene has shown genotoxic activity in three of 21 short-term tests,⁵ the available data from bioassays suggest little or no oncogenic potential. The basis for the lower than expected activity of the phenanthrene epoxides is not known. It has been suggested^{6,7} that the low mutagenic activity and lack of apparent oncogenicity are due to the small size of phenanthrene and the production of polar epoxide metabolites which may result in poor interaction with DNA.

STANDARD DERIVATION:

Phenanthrene is a 3-ring PAH with a "bay region" for which the available bioassay data are inadequate to indicate its oncogenic potential. Although the molecule contains a "bay region", the weight of evidence suggests little or no genotoxic activity, and sufficient justification for chemical correlation to benzo(a)pyrene is lacking. Therefore, the general guideline of 50 ug/l is recommended as the ambient water quality standard for phenanthrene.

REFERENCES:

- (1) N.Y.S. Department of Health. 1984. Documentation for ambient surface water quality standard for benzo(a)pyrene.
- (2) Lehr, R.E. et al. 1981. The bay region theory: history and current perspectives. In: Polynuclear Aromatic Hydrocarbons. Cooke, M. et al. (eds.). Batelle Press. Columbus, Ohio. pp. 21-37.
- (3) National Research Council (U.S.A.) 1983. Polycyclic Aromatic Hydrocarbons: Evaluations of Sources and Effects. National Academy Press. Washington, D.C.
- (4) International Agency for Research on Cancer. 1983. IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. 32: 419-430.
- (5) U.S. Environmental Protection Agency. 1980. Ambient water quality criteria for polynuclear aromatic hydrocarbons. NTIS No. PB81-117806.
- (6) Levin, W. et al. 1982. Oxidative Metabolism of Polycyclic aromatic hydrocarbons to ultimate carcinogens, Drug Metab. Rev., 13(4), 555-580,
- (7) Wood, A. et al., 1979, Mutagenicity and tumorigenicity of phenanthrene and chrysene epoxides and diol epoxides, Cancer Res., 39, 4069-4077.

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