

Distribution and Possible Sources of Polychlorinated Biphenyls in Dated Sediments from the Newark Bay Estuary, New Jersey

T. J. Iannuzzi,¹ S. L. Huntley,¹ N. L. Bonnevie,¹ B. L. Finley,² R. J. Wenning¹

¹ ChemRisk®—A Division of McLaren/Hart, Stroudwater Crossing, 1685 Congress Street, Portland, Maine 04102, USA

² ChemRisk®—A Division of McLaren/Hart, 1135 Atlantic Avenue, Alameda, California 94501, USA

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Abstract. Two hundred and forty-six sediment samples from Newark Bay, New Jersey and its tributaries (the Passaic River, Hackensack River, Kill van Kull, and Arthur Kill and its tributaries, the Elizabeth River and Rahway River) were assayed for commercial Aroclor® mixtures and non-ortho and mono-ortho coplanar polychlorinated biphenyls (PCBs) between 1990 and 1993. In addition, chronological profiles of PCBs in sediments from pre-1940 to the present were determined using radioisotope activities of ²¹⁰Pb and ¹³⁷Cs. The objectives of this study were to (a) determine the spatial and temporal distributions of PCBs in sediments, (b) identify their possible sources, and (c) evaluate the potential for sediment toxicity within the Newark Bay Estuary. Aroclors® 1248 and 1254 were detected in surface and buried sediments in each waterway. The highest concentrations occurred primarily in buried sediments from the Passaic River and Newark Bay at depths corresponding to historical deposition during the 1960s and 1970s, the peak manufacturing period for Aroclors®. In surface sediments, the highest concentrations were measured in the Passaic River, Rahway River, Kill Van Kull, and ship berths at Port Elizabeth and Port Newark in Newark Bay. Coplanar PCBs were detected throughout the estuary at much lower concentrations than the Aroclors. Results from the Passaic River indicate that the lower reach is contaminated with relatively high levels of PCBs, in part due to a relatively high depositional environment and the accumulation of PCB-contaminated sediments from local and upstream sources. Comparisons to available benchmark sediment quality values and calculated toxicity equivalent concentrations raise a concern that Aroclors® 1248 and 1254 and coplanar PCBs, respectively, may adversely effect aquatic organisms in the estuary.