Following is the text of the Executive Summary to the Public Hearing Response Document on the proposed Determination Regarding the Assimilative Capacity of the Tidal Delaware River for Volatile Organics and Toxicity. This document was released prior to the action taken by the commission at its January 26, 2000 meeting. A copy of the complete Response Document can be obtained by contacting the DRBC at 609-883-9500.

EXECUTIVE SUMMARY

Based upon scientific studies and assessments conducted by the Delaware River Basin Commission ("DRBC" or "Commission"), the Commission is proposing to determine that allocations of the waste assimilative capacity for two volatile organic compounds ("VOCs") - 1,2 - dichloroethane ("DCE") and tetrachloroethene ("PCE") -- are necessary to maintain stream quality objectives for the tidal Delaware River between Trenton, N.J. and Delaware Bay ("the Estuary"). The DRBC is further proposing that allocations of the waste assimilative capacity of the Estuary are necessary for acute and chronic toxicity to maintain stream quality objectives near a number of point source discharges that individually violate the stream quality objectives.

The proposed actions are intended to ensure compliance with stream quality objectives the Commission adopted in 1996 to protect the health of approximately two million residents of southern New Jersey, Delaware and southeastern Pennsylvania who rely on surface water withdrawals from the Estuary for their drinking water; the additional populations in Pennsylvania, New Jersey and Delaware who rely on domestic and public water supply wells drawing drinking water from aquifers in hydraulic contact with the Estuary; and the thousands of people who eat fish caught in the Estuary. DCE and PCE have been identified by the U.S. Environmental Protection Agency ("U.S. EPA") as "probable human carcinogens."[(1)] Acute and chronic toxicity indicate the combined effect of multiple pollutants on aquatic life.

The proposed determination that allocations of the waste assimilative capacity are necessary for the two probable human carcinogens and toxicity ("the proposed determination"), if adopted, will enable the DRBC to assist the states in establishing Total Maximum Daily Loads ("TMDLs")[(2)] as appropriate under the federal Clean Water Act. Ultimately, staff recommends that, following review of any new data or information, wasteload allocations and other effluent requirements should be established, as appropriate, to provide the basis for controlling discharges of these pollutants to the Estuary.

The proposed process for developing wasteload allocations, which coincides with steps similar to those established or proposed by the U.S. EPA for developing and implementing TMDLs is as follows:

1. A determination that the assimilative capacity of the Estuary for a specific pollutant is exceeded under specified design conditions.

2. Establishment of a numerical value for the assimilative capacity for the pollutant (a "TMDL" under U.S. EPA regulations), that will be allocated to point source loadings, non-point source loadings and a margin of safety.

3. Implementation of Wasteload Allocations ("WLAs") for point sources and Load Allocations ("LAs") for non-point sources to ensure that the TMDL is met.

The DRBC staff are proposing at this time action limited to:

- Step 1 for all four pollutants; and
- Step 2 for the two volatile organic pollutants identified as "probable human carcinogens."

Numerical values for the assimilative capacity of the Estuary for acute toxicity have already been defined.[(3)] A numerical value for the assimilative capacity of the entire Estuary for chronic toxicity is not proposed to be established at this time because additional study is needed to characterize the nature and extent of cumulative chronic toxicity in the Estuary. Exceedences of the Commission's stream quality objectives by individual discharges, however, provide a basis for the Commission to proceed with the development of WLAs for those individual discharges.

The proposed action will enable the states to adopt TMDLs for the two VOCs. It will also initiate a process by which WLAs and other effluent requirements ultimately may be established by the Executive Director of the Commission for all four pollutants. Although the draft WLAs were prepared to illustrate the potential impacts of the proposed determination on individual discharges, the proposed action will not itself establish any individual WLAs or other effluent requirements. Such individual limits will be established only after review of any new data or information by the Commission, in consultation with the dischargers and state regulators.

DRBC staff recommends that the following steps should follow the proposed determination:

1. Meetings between Commission staff and state/federal permitting authorities to determine how WLAs issued by the Commission would be utilized in discharge permits.
2. Meetings with dischargers to discuss data and information needs, and the process to be used to establish the WLAs.
3. Development of individual WLAs by Commission staff for issuance by the Executive Director. (Any discharger objecting to its WLA may appeal and request a hearing as provided in Articles 5 and 6 of the Commission's Rules of Practice and Procedure.)
4. Use of the WLAs by state permitting authorities, as appropriate, to establish permit requirements.

SCIENTIFIC AND PROCEDURAL BASIS FOR DETERMINATION

The proposed determination for the two VOCs is based upon simplified mathematical formulas and complex mathematical models that predict pollutant concentrations in the Estuary under design conditions. The design conditions reflect assumptions about pollutant loading and stream flow for the Delaware River and its tributaries that take into account federal requirements for establishing TMDLs.[(4)] These assumptions are intentionally conservative to protect human health and aquatic life. The proposed

determination for acute and chronic toxicity is based upon data from samples of wastewater discharged by individual point sources.

The proposed determination follows a ten-year effort that commenced in 1989 when the Commission initiated its Estuary Toxics Management Program.

The Commission held public hearings on the proposed determination on May 3, 1999 in Wilmington, Delaware; on May 5, 1999 in West Trenton, New Jersey; and on May 11, 1999 in Philadelphia, Pennsylvania. The public record on the proposed determination remained open for 30 days from the final hearing date in order to allow sufficient time for additional written comment. By the close of the comment period on June 11, 1999, the Commission had received oral or written comments from 23 individuals and organizations. Commenters included governmental organizations; environmental/resource organizations; and industries, municipalities and county agencies with discharges to the Estuary, as well as a coalition of 23 industrial and municipal dischargers to the Estuary.

The technical issues related to this determination have been discussed by the Commission's Toxics Advisory Committee ("TAC" or "committee"). The committee consists of representatives from various interest groups, including the four signatory states to the Delaware River Basin Compact, the regulated community, environmental community, academia, agriculture, fish and wildlife management, and public health. In addition to reviewing draft documents that support the determination, the committee has met four times since the public hearings to discuss and resolve issues raised during the public hearing process. Minutes of the numerous meetings reflect the committee's support of this action.

At its latest meeting on December 6, 1999, the TAC discussed a number of proposed findings and recommendations. These are set forth below, as well as in a table included in Appendix 5 of this Response Document.

The committee agreed by a vote of 8 to 2 (municipal and industrial members opposed) that "based upon simple mass balances and complex mathematical modeling, the assimilative capacity of the tidal Delaware River has been exceeded for 1, 2-dichloroethane (DCE) in Zones 2 and 3 under design conditions." See Estuary Zones map on page 4.

By a vote of 8 to 2, with the same members opposed, the committee found that "based upon simple mass balances and complex mathematical modeling, the assimilative capacity of the tidal Delaware River has been exceeded for tetrachloroethene (PCE) in Zones 2 and 3 under design conditions."

The committee further recommended by a vote of 8 to 2, with the same members opposed, that "TMDLs should be established for 1, 2-dichloroethane and tetrachloroethene to meet water quality objectives in Zones 2 and 3 using the complex mathematical model and procedures contained in the Commission's water quality regulations."

By a unanimous vote, the committee recommended that "localized exceedences of the assimilative capacity of the tidal Delaware River for acute and chronic toxicity have been identified for some individual discharges. It is recommended that controls on acute and chronic toxicity be implemented for individual point sources to ensure that applicable water quality criteria are achieved." The committee

approved an earlier version of this recommendation before revising it and approving the foregoing text. The text of the earlier version is provided in the table in Appendix 5.

By a vote of 9 to 0, with one abstention, the committee found that "data regarding the existence of Estuary-wide chronic toxicity are scientifically equivocal. We therefore recommend that a workgroup of the Toxics Advisory Committee be established to cooperatively characterize the nature and extent of cumulative chronic toxicity and recommend controls, as necessary."

Finally, the committee unanimously approved a motion affirming the importance of its role in "ensuring the scientific credibility of toxics evaluations and related administrative actions performed for the Delaware Estuary." The complete text of this finding is provided in the table in Appendix 5.

DRBC STAFF RESPONSES TO PUBLIC OBJECTIONS

Opponents of this proposed action have raised issues relating to the use of mathematical models to determine that the assimilative capacity of the Estuary has been exceeded for the two probable carcinogens; the tributary and discharge data used for model calibration and TMDL development; and the validity of developing a TMDL for chronic toxicity.

Assessment Approaches

Three approaches were used in evaluating whether the assimilative capacity of the Estuary is being exceeded for DCE and PCE. The first approach involved an evaluation of ambient monitoring data. The second approach involved the use of simple mathematical formulas, such as multiplying the water quality criteria by the appropriate design flow for the receiving water. The third approach included the use of more complex mathematical models. The DRBC staff's proposed determination for the two chemical compounds is based only on the latter two approaches.

1. Ambient data. Ambient data are generated from samples taken periodically at selected locations in the water body. Although they appear to provide the clearest and simplest evidence that assimilative capacity has been exceeded, ambient data for carcinogens can rarely provide proof of either exceedence or non-exceedence. First, sampling is by nature sporadic and key conditions cannot be scientifically controlled. Results are influenced by such variables as the location of particular discharges relative to the time and location of sample collection; meteorological conditions, including precipitation during the hours, days or weeks prior to sampling; tidal conditions prior to and at the time of sampling; the concentration of pollutants in each discharge during the hours, days or weeks prior to sampling; the flow of discharges on a particular day; and tributary flows, among other factors. Second, determining exceedence of assimilative capacity for carcinogens requires development of long-term average data from ambient samples. A suitable data set for DCE and PCE does not exist for the Delaware Estuary.

Data from the early 1990s show the presence of DCE at levels an order of magnitude higher than the water quality criterion of 0.383 micrograms per liter (µg/l). Maximum concentrations observed during this period were 4.1 µg/l at the Navy Yard (River Mile, or "RM," 93.2), 3.2 µg/l opposite Wharton Street in Philadelphia (RM 98.5), 2.5 µg/l at the Ben Franklin Bridge (RM 100.2), and 1.3 µg/l at the Betsy Ross Bridge (RM 104.7). In the mid-1990s, neither DCE nor PCE was detected in Estuary samples. At that time, however, the detection limits for these chemicals were approximately ten times higher than the stream quality objectives. Thus, an assessment of compliance with these objectives based on the ambient data could not be made. DRBC did not perform sampling for volatile organics from 1996 through 1998 due to other monitoring priorities and the use of mathematical models to determine exceedences of stream quality objectives. Sampling was resumed in July 1999, however, with more sensitive analytical procedures capable of detecting VOCs at levels below the stream quality objectives. Results from the July sampling indicate levels of DCE slightly below the stream quality objectives in Zone 3. Because a long-term average is required and asimilative capacity must be determined under design conditions for stream flow, loadings, and the pollutant, DRBC decided that a modeling approach is warranted. Only mathematical models are capable of providing data that consistently reflect the necessary conditions.

2. Simplified Mathematical Approach. A simplified mathematical approach also was used to evaluate whether assimilative capacities for DCE and PCE are being exceeded at the appropriate design flow conditions. This approach is perhaps best described by the formula: assimilative capacity = stream quality objective x design downstream flow. A net downstream flow (accounting for the changing direction of water movement due to the tides) was determined using a hydrodynamic model for the Estuary, assuming the appropriate design flow of all tributaries and average tidal conditions. No fate processes (i.e., chemical physical and biological degradation processes) are deemed operative in this approach. Next, the net downstream flow was multiplied by the applicable stream quality objective to obtain the assimilative capacity for each zone of the river. The resulting capacity was compared to the combined loading from all point sources in the zone. This approach indicated exceedences of the assimilative capacity for both DCE and PCE in Zones 2 and 3 of the river, where critical drinking water withdrawals occur and demonstrated connections to groundwater exist. The simple model also showed the potential for loadings in Zones 4 and 5 to contribute to exceedences of the assimilative capacity in Zone 3.

3. Complex Mathematical Model. Given the hydrodynamic complexity of the Estuary, the numerous point source discharges, and the various fate processes affecting toxic pollutants, mathematical models are needed to determine whether assimilative capacity is exceeded under design conditions that are protective of human health and aquatic life. The DRBC staff selected as its complex model the Water Quality Analysis Simulation Program developed by the U.S. EPA in 1988. This model is described in greater detail on pages 7 and 8 of the 1998 DRBC report entitled "Wasteload Allocations for Volatile Organics and Toxicity: Phase I TMDLs for Toxic Pollutants in the Delaware River Estuary"("Wasteload Allocations Report"). This report is available on the Commission's website at www.drbc.net or by calling the Commission at (609) 883-9500. The model consists of two components: a hydrodynamic model and a water quality model specific to each pollutant. It was used not only to determine that the assimilative capacity of the Estuary is being exceeded, but also to assign a numerical value to the assimilative capacity (a TMDL) and to develop draft WLAs.

Although the proposed action will not itself establish any individual WLAs or other effluent requirements, it will initiate a process by which, after review of any new data or information by the Commission, WLAs and other effluent requirements ultimately may be established by the Executive Director in consultation with the dischargers and state regulators. In developing the basis for the proposed determination, the Commission staff also developed draft wasteload allocations for individual sources, using the Equal Marginal Percent Reduction ("EMPR") procedure. The EMPR procedure consists of two steps: a baseline analysis, where each discharge is evaluated independently, and a multiple discharge analysis, where the cumulative impact of all discharges is evaluated. The wasteload allocation procedure, like the model, is described in greater detail on pages 2 through 6 of the Wasteload Allocations Report.

Critical conditions used in the models for determining the TMDLs and draft WLAs include the design tributary flows, design effluent flows, effluent concentrations, and tidal hydrodynamics. The design tributary flows are specified in DRBC regulations. The flow values used in the mathematical model were calculated from data for the years 1970 to 1995 and are listed in Table 3 of the Wasteload Allocations Report. Design effluent flows were developed in accordance with DRBC regulations and are listed in Table 2 of the same report. Effluent concentrations are discussed in the next section of this Executive Summary. Average tidal hydrodynamics were used.

The complex mathematical model shows exceedences of assimilative capacity for both DCE and PCE under design conditions in Zones 2 and 3 of the river, affecting drinking water withdrawals from both surface water and groundwater for southeastern Pennsylvania and New Jersey.

Discharge and Tributary Data

Out of a total of 76 discharges to the Estuary, 42 are included in the draft wasteload allocations for DCE and 40 are included in the draft wasteload allocations for PCE. The loading assigned to each of the discharges is described in the aforementioned Wasteload Allocations Report. Loadings were assigned to each of the discharges based upon criteria contained in DRBC regulations and discussed on page 13 of the report. In general, monitoring data provided in Discharge Monitoring Reports ("DMRs") submitted by National Pollutant Discharge Elimination System ("NPDES") permittees were the source of effluent data. The Wasteload Allocations Report presents available data through September 1998 and a draft loading for each of the industrial discharges (Table 4) and municipal discharges (Table 5) included in the allocation process for DCE. Table 8 of the report contains the available data through September 1998 and a draft loading for each of the industrial and municipal discharges used in the allocation process for PCE.

Loadings from the tributaries were based upon actual monitoring data or the stream quality objective, whichever is lower. The boundary concentrations were set to zero in instances where the volatile organic compounds were not detected in monitoring data. Sediment contributions of the two compounds were considered minimal.

Chronic Toxicity

No numerical value for the assimilative capacity of the Estuary for chronic toxicity is being established by this recommended Commission action. Wasteload allocations or other effluent requirements for chronic toxicity that may be issued following this action will be limited to the baseline analysis portion of the wasteload allocation procedure. Allocations and effluent requirements will thus be limited to each individual discharge without consideration of any other discharge to the Estuary. Additivity of discharges is not an issue at this time, and will be addressed only after additional ambient and wastewater sampling and chemical analyses are performed.

Regarding the use of chronic toxicity in a TMDL, toxicity is an indicator parameter much like biochemical oxygen demand ("BOD"), total suspended solids ("TSS"), and fecal coliform. Indicator parameters are used as a surrogate for the causative agent and represent the resulting effect of a number of specific compounds on a biologically-important endpoint. In the case of BOD, both carbon and nitrogen-containing compounds are oxidized by microorganisms, resulting in a decrease in the oxygen of the receiving water. BOD was the original focus of early water quality modeling efforts, with the concomitant development of numerous water quality models for fresh and estuarine water bodies.

The use of indicator parameters in water quality modeling is not new. In the 1980s, the U.S. EPA began to utilize toxicity testing in addition to traditional chemical methods to address both toxic and non-conventional pollutants from industrial and municipal sources. In 1984, the agency issued a national policy on the development of water quality-based permit limitations for toxic pollutants that recommended the use of toxicity tests to "establish control priorities, assess compliance with State water

quality standards and set permit limits to achieve those standards." Toxicity testing was recommended due to the large number of toxic chemicals that may potentially be discharged, and the inability to predict the effects of chemical mixtures.

The U.S. EPA issued a guidance document in 1991 to assist in the implementation of its policy (U.S. EPA, 1991). Section 4, entitled "Exposure and Wasteload Allocation," specifically addresses the modeling of effluent toxicity. It recommends the use of toxic units when modeling effluent toxicity and the use of a first order decay rate if instream toxicity measurements are available as in the Delaware River Estuary. It further recommends that modeling of effluent toxicity be limited to dilution estimates and that toxicity be assumed to be additive and conservative, even when different effluents affect different biota.

Acute Toxicity

No numerical values for the assimilative capacity of the Estuary for acute toxicity are being established by this recommended Commission action, because these values have already been defined.[(5)] Wasteload allocations or other effluent requirements for acute toxicity that may be issued following this proposed action will be limited to the baseline analysis portion of the wasteload allocation procedure. Allocations and effluent requirements will thus be limited to each individual discharge without consideration of any other discharge to the Estuary. Draft allocations were developed for individual discharges using the tidal CORMIX models discussed on pages 8 and 9 of the Wasteload Allocations Report, and the guideline dimensions contained in the Commission's water quality regulations. In accordance with the regulations, dischargers may request alternative dimensions as long as they demonstrate compliance with the Commission's other regulatory requirements.

ADDITIONAL DRBC STAFF RESPONSES TO PUBLIC COMMENTS

During the conference session prior to the Commission's business meeting on October 27, 1999, DRBC staff presented to the Commissioners and public a report on the status of the proposed determination regarding volatile organics and toxicity. The presentation slides and relevant portion of the conference notes are included in Appendix 4.

The DRBC's Toxics Advisory Committee ("TAC" or "committee") discussed and voted upon a series of findings and recommendations related to the proposed determination at its December 6, 1999 meeting. The actions of the committee are described earlier in this summary. They were also the subject of a staff presentation during the conference session held prior to the Commission's business meeting on December 8, 1999. The presentation slides and relevant portion of the conference notes are included in Appendix 5.

The public record for receipt of written comments closed on June 11, 1999. Notwithstanding this closing date, the DRBC has received additional written comments from various sources, and there have been other developments that warrant comment.

Detailed responses to comments received by June 11, 1999 are set forth hereafter in this Response Document.

To provide the DRBC Commissioners with a complete record for decision-making, the submissions received since June 11, 1999 and the DRBC staff's comments on these submissions will be provided to the Commissioners and released to the public prior to the next meeting of the DRBC, scheduled for January 26, 2000.

Notes:

1. The number of proven human carcinogens is extremely small since no testing on humans is performed. The designation "probable human carcinogen" is the second-highest risk classification (Group B) in the U.S. EPA's weight-of-evidence classification scheme. It means that although the weight of evidence of observed effect on humans from epidemiological studies is limited, there is sufficient evidence of carcinogenicity in animals to support an inference of carcinogenic risk to humans. U.S. EPA Office of Marine and Estuarine Protection, Office of Water Regulations and Standards, ASSESSING HUMAN HEALTH RISKS FROM CHEMICALLY CONTAMINATED FISH AND SHELLFISH: A GUIDANCE MANUAL, September 1989, page 21. The other classifications in the U.S. EPA scheme are "human carcinogen" (Group A); "possible human carcinogen" (Group C); "not classifiable as to human carcinogenicity" (Group D); and "evidence of noncarcinogenicity for humans" (Group E). Id., pages 21-22. The Commission's regulations provide for stream quality objectives to protect against the carcinogenic effects of pollutants in categories A, B and C of the U.S. EPA classification scheme. See DRBC Administrative Manual – Part III, Water Quality Regulations, § 3.10.3D.1 (setting forth the Commission's policy). Also see § 3.30.2 Table 6 (establishing stream quality objectives for carcinogens for the Delaware Estuary).

2. Under EPA's rules, a TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. See EPA Office of Water web site, at www.epa.gov/OWOW/tmdl/intro.html# definition. A precise (and lengthy) legal definition of the EPA term can be found at (40 CFR 130.2(i)). The DRBC, in its Administrative Manual - Part III, Water Quality Regulations, defines "TMDL" more simply as "the maximum daily loading of a pollutant from all sources which still ensures that the water quality objectives are met." § 4.30.7(C)(2).

3. See DRBC Administrative Manual - Part III, Water Quality Regulations, § 4.20.5A.1.e.

4. See 40 CFR § 130.7(c)(1) (U.S. EPA requirements for establishing TMDLs.)

5. See DRBC Administrative Manual - Part III, Water Quality Regulations, § 4.20.5A.1.e.