The Delaware River Basin: Courts, Compacts and Commissions

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The Delaware River Basin: Courts, Compacts and Commissions

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Boundaries and Water: Interjurisdictional Issues

Natural Resources Law Center
University of Colorado School of Law
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The Delaware River Basin:
Courts, Compacts and Commissions

R. Timothy Weston

I. Introduction

A. Summary

The Delaware River Basin provides the Nation with perhaps the best case study of experience with alternative methods for resolving interstate conflicts over the water rights and water management. Over the past 70 years, the Delaware Basin States and their citizens have resorted to virtually every conceivable approach for addressing interstate disputes over water - short of invasion and civil war - in the continuing search for viable management of precious and limited water resources. Yet, today - confronted with such divergent and conflicting interests, and in the face of a seven decade history of litigation and negotiation - the Delaware Basin stands as the prime example of interstate cooperation and commitment to dynamic, regional water resources management.

Following six decades of U.S. Supreme Court litigation, the four Delaware Basin States and the Federal Government finally evolved a new legal arrangement - the Federal-Interstate Compact. The Delaware River Basin Commission serves as partnership of Federal and State government committed to joint water resources management and action.

Faced with serious challenges and changing conditions, the DRBC has proven a relatively effective water management tool. DRBC takes credit for key achievements in (1) developing a unified drought management plan; (2) adopting a joint reservoir operations program; (3) resolving interstate conflicts over water allocations and transfers; (4) implementing comprehensive water quality standards; (5) promulgating water conservation standards; and (6) providing a vehicle for joint investment in new water management facilities.

DRBC continues to confront significant water management problems. The Commission's challenge ahead lies in sustaining public and member government support for the long-term solutions identified in the Basin Comprehensive Plan.
B. General References


5. Interstate Water Management Recommendations of the Parties to the U.S. Supreme Court Decree of 1954 to the Delaware River Basin Commission Pursuant to Commission Resolution 78-20, signed by Governors DuPont (Del.), Cuomo (NY), Kean (NJ) and Thornburgh (PA) and Mayor Koch (NYC) (July 1984) ("Good Faith Agreement").


II. Basin Facts and Background

A. Basin Resources and Water Uses

The Delaware Basin watershed forms the major water source for almost 20 million residents of the Northeast Metropolitan Corridor from New York City to Wilmington, Delaware. In relative terms, the Delaware is a small watershed. The Delaware Basin drainage area encompasses only 12,765 square miles, draining one percent of the United States. (See Figure 1.)

With an average annual precipitation of 45 inches,
the Basin is blessed with adequate resources in normal years.

The residents of the Delaware Basin and its service area use 5.7 billion gallons each day to produce electricity for homes and factories, and another 4.3 billion gallons is withdrawn daily for industries, agriculture and public water supply.

B. Key Issues

In the Delaware Basin, the fundamental issue is the balance of out-of-basin diversions to New York and northcentral New Jersey, in-basin consumptive water use through power generation, industry and agriculture, and the minimum flows needed to protect lower basin water supplies located in the Delaware Estuary from salinity intrusion and contamination from numerous point and nonpoint sources.

III. History of Delaware River Litigation

A. Early Efforts at Cooperation and Compacts

During the first two decades of this Century, basin area governments commissioned a series of studies to identify existing and potential water sources to serve growing metropolitan and industrial centers. New York City authorities, after some extensive studies, recommended diversion of upper Delaware Basin water for municipal supply in preference to the polluted sources of the lower Hudson. Simultaneously, New Jersey and
Pennsylvania looked to the Delaware's upper basin with increased urgency as a critical source of their future water supply.

In 1924, the three Basin States appointed commissioners to negotiate a compact or agreement governing the allocation, use, and conservation of the River's waters. The commissioners agreed to a compact, which was ratified by New York, but rejected by the Pennsylvania and New Jersey legislatures. A second appointment of commissioners was made, and a second compact unanimously recommended. Again New York ratified the draft compact in 1927, while the legislatures of Pennsylvania and New Jersey refused to adopt the agreement.


New Jersey sued New York and New York City seeking to block plans to divert up to 600 mgd, claiming that any out-of-basin diversion violated riparian rights. Pennsylvania intervened and proposed a more flexible approach, based on the principle of compensating releases to maintain downstream flows as a quid pro quo for allowing consumptive water use and interbasin transfers.

After hearings before a special master, the Supreme Court ruled that the doctrine of riparian rights does not govern interstate water disputes
Connecticut v. Massachusetts, 282 U.S. 660, 673 (1931). Mr. Justice Holmes delivered the classic pronouncement of the equitable apportionment doctrine: "A river is more than an amenity, it is treasure. It offers a necessity of life that must be rationed among those who have power over it ...." He emphasized that each State has "real and substantial interests in the river that must be reconciled as best they may be. The different traditions and practices in different parts of the country may lead to varying results but the effort always is to secure an equitable apportionment without quibbling over formulas." New Jersey v. New York, 283 U.S. 336, 343 (1931).

Based on this view, the Court rules that New York could divert up to 440 mgd (less than the amount requested by the City), subject to a release plan proposed by Pennsylvania. This downstream flow maintenance program was geared at providing releases from the New York reservoirs sufficient to assure a minimum flow in the Delaware of 1535 cfs at Port Jervis (the tri-state border) and at least .50 c.s.m. (3400 cfs) at Trenton. The maximum release was to be 30% of the average diversion area yield, or 402.6 cfs. The Court further ordered New York to undertake a series of pollution control measures to correct sewage discharges from New York municipalities in the upper basin, and
assure waters flowing to the downstream States was in usable condition.

Essentially, the Court's 1931 Decree established New York's right to a diversion, subject to compensating releases necessary to avoid demonstrated injuries (primarily focused on salinity intrusion and recreation impacts). It affirmed Pennsylvania's request that the New York diversion not constitute a prior appropriation, or confer any superiority of right over New Jersey or Pennsylvania in the use and enjoyment of Delaware Basin waters. In addition, the Supreme Court provided for future review and modification of the Decree under the Court's continuing jurisdiction.

C. INCODEL

The 1931 Decree failed to establish a framework for long-range planning and management. A general basin investigation conducted by the Corps in 1934 noted the growing regional water need, and recommended the advantages of an interstate agency to exercise unified control over water planning and development in the Basin. (Report No. 308, House Document No. 179, 73 Cong., 2d Sess. (Jan. 3, 1934)).

Following the devastating floods of 1936, a meeting of representatives from the four Basin States resulted in the organization of the Interstate
Commission on the Delaware River Basin (INCODEL), as an advisory body in the field of interstate water issues. With limited powers and an uncertain mandate, INCODEL proceeded in response to legislative requests to develop studies for coordinated water supply development in the region. The resulting INCODEL plan called for phased construction of an eight reservoir system. (Interstate Comm'n on the Delaware River Basin, Report on the Utilization of the Waters of the Delaware River Basin (1950)). Failing to receive unanimous support from the Basin States, the proposal collapsed.


1. The Claims: In April 1952, New York City petitioned the Supreme Court to amend the 1931 Decree, to allow an increased diversion of 800 mgd, subject to a proposed new release formula. to augment low flows on the Delaware. Pennsylvania and New Jersey disputed the allegation that New York's increased water requirements were critical, and asserted countervailing claims on behalf of the River-dependent lower basin. The Lower Basin States demanded New York City undertake metering and develop alternative supplies in the Hudson watershed.

2. New York-New Jersey Settlement: Initial negotiations between New York and New Jersey led to a "settlement" under which New Jersey agreed to the
City's 800 mgd request, provided that New Jersey was allowed to divert up to 250 mgd out-of-basin without compensating releases to serve the northcentral Jersey metropolitan area. Pennsylvania strenuously objected.

3. New Jersey-Pennsylvania Settlement: Pennsylvania conditioned its consent to diversion of an average of 100 mgd without compensating releases upon the enactment by New Jersey of legislation which would allow the Commonwealth to develop an impoundment on the mainstem at Wallpack Bend (one of the keystones of the INCODEL Plan), together with certain diversion dams at locations in the lower Delaware. New Jersey Acts of 1953, Ch. 443.

4. The Consent Decree: New York City was authorized to divert up to 800 mgd. As compensation, the City was required to make releases from its three Upper Delaware Reservoirs (Neversink, Pepacton, and Cannonsville) sufficient to maintain a minimum flow of 1750 cfs at the stream gage located at Montague, New Jersey (Milford, Pennsylvania). New Jersey was allowed to divert up to 100 mgd through the Delaware & Raritan Canal to serve the northern Jersey metropolitan area, provided that the State of New Jersey agreed to the development of the mainstem reservoirs and dams specified in the 1953 legislation, and joined with Pennsylvania in submitting that compact legislation to
Congress for its consent. To administer the Decree, the Court appointed an officer of the U.S.G.S. to serve as Delaware River Master with powers to monitor and enforce the diversion and release provisions. The parties explicitly reserved the right to return to the Supreme Court, and petition for amendment of the Decree's provisions.

IV. Development of the Delaware River Basin Compact

A. The Delaware Basin Comprehensive Study.


B. The Delaware River Basin Advisory Committee and Syracuse University Study

V. Delaware River Basin Compact


1. Membership: 4 Governors + 1 Federal member appointed by the President.

2. Alternates: 1 Alternate appointed by each Governor; Federal alternate appointed by the President.

B. Voting Powers

1. Most matters are determined by majority vote.

2. Unanimous votes required for: modification of diversions, release formulas or other rights and obligations under the 1954 U.S. Supreme Court Decree, and for apportionment of Commission's annual budget among Signatory Parties.

C. Planning Functions, §3.2

1. Comprehensive Plan: DRBC must establish and maintain a comprehensive plan for the "immediate and long range development and uses of the water resources of the basin."

2. Water Resources Program: Each year, DRBC must develop a water resources program, based upon the Comprehensive Plan, including a systematic presentation of quality and quantity needs, "balanced by existing and proposed project required to satisfy such
needs." The program is to identify both public and private project, and separate list those projects to be undertaken directly by DRBC.

D. Project Review Authority, §3.8

1. Any project having a "substantial effect on the water resources of the basin" must be submitted to and be approved by DRBC.

2. Project is defined to include:

"any work, service or activity which is separately planned, financed, or identified by the commission, or any separate facility undertaken or to be undertaken within a specified area, for the conservation, utilization, control, development or management of water resources which can be established and utilized independently or an addition to any existing facility, and can be considered as a separate entity for purposes of evaluation."

"Project" includes not only physical facilities, but certain Federal and State regulations, water quality and quantity management program, and plans.

3. DRBC regulations define projects subject to §3.8 review to include:

- Construction, enlargement, or removal of impoundments with storage capacity > 100 million gallons.

- Any surface water or ground water withdrawal with a daily withdrawal rate in any month > 100,000 gpd.

- Construction or expansion of any sewage treatment facility or industrial wastewater treatment facility with a capacity > 50,000 gpd.

- Any change in ground cover on major ground
water infiltration areas involving > 3 mi.²

- Drainage, filling, or alteration of wetlands involving > 25 acres (or lesser area if no Federal or State wetland regulatory program is applicable and the DRBC Executive Director determines the project may have significant regional impact).

- Regional wastewater treatment plans (Clean Water Act §§208 and 201 plans).

- Federal, State and local government facilities, such as highways, affecting water and related land resources.

- Projects which substantially encroach on a stream or the 100-year flood plain of the Delaware River or its tributaries.

E. Regulation of Withdrawals and Diversions

1. Protected Area Program, §10.2

   a. DRBC may delineate areas within the Basis where demands upon resources "have developed or threaten to develop" to such a degree as to create a water shortage or to impair or conflict with the Comprehensive Plan.

   b. Within protected areas, DRBC may administer special permit programs regulating ground and/or surface withdrawals "so as to avoid ... depletion of the natural stream flows and ground waters ... as will adversely affect the comprehensive plan or the just and equitable interests and rights of other lawful users of the same source ...." DRBC Compact §10.5.

   c. Southeastern Pennsylvania Ground
Water Protected Area, 18 C.F.R. Part 430.

2. Emergency Powers, §10.4

In the event of a drought or other conditions which may cause an actual and immediate shortage of available water supply within the basin, or within any part thereof, the commission may, after public hearing, determine and delineate the area of such shortage and declare a water supply emergency therein. For the duration of such emergency as determined by the commission no person, firm, corporation or other public or private entity shall divert or withdraw water for any purpose, in excess of such quantities as the commission may prescribe by general regulation or authorize by special permit granted hereunder.

F. Powers Related to the 1954 Supreme Court Decree

1. Equitable Apportionment: DRBC is empowered, in accordance with the doctrine of equitable apportionment, to allocate Basin waters to and among the signatory States and their subdivisions, and to impose conditions, release requirements and other obligations related to such allocations. §3.3

2. 1954 Decree Rights Protection: Without unanimous consent of the Decree parties (including New York City), DRBC may not impair, diminish or adversely affect diversions, compensating releases, or other rights provided in the 1954 Decree. §3.3(a)

3. Special Emergency Powers: In the event of a drought or other emergency, DRBC may after consultation with the River Master and with the unanimous
vote of its members (the 4 States and Federal Government, but not NYC), declare a state of emergency and direct an increase or decrease in any allocation, diversion or release provided under the Decree.

4. Appeals of DRBC Decree-Related Actions: Any "proper party deeming itself aggrieved" by DRBC actions related to out-of-basin diversions or compensating releases may invoke the original jurisdiction of the U.S. Supreme Court for de novo adjudication or determination.

5. Waiver of Rights to Return to Court: Each Signatory State waived and relinquished for the 100-year duration of the Compact the right to apply for modification of the terms of the 1954 Decree to increase or decrease diversions or releases. §3.4. However, a party may institute a proceeding to modify the decree to increase diversions or releases as necessary to effect a Commission action under §3.3.

G. Water Supply

1. DRBC is empowered to develop and implement plans and project for the use of water for domestic, municipal, agricultural and industrial water supply, including the power to acquire, operate and control projects for storage of and release of waters and for flow control. §§4.1-4.2.

2. No Signatory Party may permit any
augmented flow to be diminished by any diversion or withdrawal. §§4.2(b).

H. Pollution Control

1. DRBC may adopt regulations and standards to control water pollution, and to require treatment of sewage, industrial and other waste. §5.2.

2. Signatory Parties are pledged to prohibit and control pollution and "to cooperate faithfully in the control of future pollution" and "abatement of existing pollution," and further covenant to adopt any necessary legislation to enable the State to implement such pollution control objectives. §5.3.

3. DRBC is given independent authority to enforce Commission water quality standards and to prosecute violations. §5.4.

4. DRBC was among the first agencies to adopt and enforce comprehensive basinwide water quality standards. B. Ackerman, S. Ackerman & D. Henderson, Controlling Pollution Along the Delaware River, 121 U. Pa. La. Rev. 1225 (1973); B. Ackerman, J. Sawyer, The Uncertain Search for Environmental Policy: Scientific Factfinding and Rational Decisionmaking Along the Delaware River, 120 U. Pa. L. Rev. 419 (1972).

I. Flood Protection

1. DRBC may plan, design, construct and operate projects for flood damage reduction. §6.1.
2. DRBC may adopt "recommended standards" relating to the nature and extent of land uses in flood prone areas. Such standards do not impair powers of signatory States and municipalities to adopt zoning and other land use regulations "not inconsistent" with DRBC standards. §6.2. See 18 C.F.R. Part 415, Basin Regulations—Flood Plain Regulations.

J. Watershed Management

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2. DRBC may sponsor projects to encourage soil conservation and to control erosion, to maintain and improve fish and wildlife habitat. §§7.1-7.2.

3. Although instructed to cooperate with other agencies in a coordinated program of watershed management, DRBC may not operate a project unless no other suitable unit or agency is available to operate the project on reasonable conditions. §7.4.

K. Recreation

1. DRBC may provide for development of water-related public recreational facilities, through direct projects or in cooperation with signatory parties, municipalities or other agencies. §8.1.

2. DRBC is barred from operating recreational projects unless it finds that no other suitable agency is available. §8.2.
L. Hydroelectric Projects

1. DRBC is empowered to develop and operate, or to authorize other agencies to develop and operate, dams and related facilities for hydroelectric power. §9.2.

2. DRBC may engage in wholesale marketing of power derived from such project, but may not engage in direct sale to consumers. §9.3.

M. Project Financing and Cost Recovery

1. Capital Financing: DRBC is empowered to issue tax-free bonds, bearing interest at a rate determined by the Commission, with a maximum maturity period of 50 years. Such bonds may be secured by a pledge of revenues from fees and charges assessed and collected by the Commission. DRBC Compact, Art. 12.

2. Project Cost Allocation: DRBC is mandated to establish uniform standards and procedures for evaluating benefits, and for allocating the costs of project affecting the basin. §11.4 Under such a cost-sharing plan, signatory parties may loan, grant, appropriate or advance capital funds to the Commission for construction or operation of any project. §12.20.

3. Rates and Charges, §3.7:

The commission may from time to time after public notice and hearing fix, alter and revise rates, rentals, charges and tools and classifications thereof, for the use of facilities which it may own or operate and for products and services rendered thereby,
without regulation or control by any department, office or agency of any signatory party.

4. Federal Reservation on Water Charges:
In adopting the Compact, Congress added a "reservation" prohibiting DRBC from imposing any charge for water withdrawals or diversions that could have been made lawfully without charge on the effective date of the Compact (i.e., precompact water users were grandfathered). Pub. L. 87-328, §15.1(b).

VI. Experience Under the Compact

A. The First Comprehensive Plan
Concurrent with the adoption of the Compact, the Corps formally reported to Congress in 1961 on its six year comprehensive study. (U.S. Army Corps of Engineers, Phila. Dist., Delaware River Basin Report, House Document 522, 87 Cong., 2d Sess. (1962).) The Corps recommended, and in 1962 Congress authorized, the development of a system of mainstem and tributary multipurpose reservoirs, the centerpiece of which was the Tocks Island Lake Project. (Flood Control Act of 1962, P.L. 87-874) The Corps plan thus became the basis for DRBC's initial Basin Comprehensive Plan, adopted in March 1962. (DRBC Resolution No. 62-4 (March 28, 1962))

B. The 1960's Drought
No sooner was DRBC organized, than it confronted
the record drought of 1962-66. DRBC and parties were slow to recognize the emergency conditions, and a carryover of prior adversarial attitudes culminated in direct confrontation. As storage in the City's reservoirs plummeted during 1965, on June 14 New York City unilaterally suspended its Decree-mandated augmentation of flows in the Delaware, while maintaining out-of-basin diversions. By June 21, the Delaware River Master reported to the Supreme Court of the City's violation of his orders to cease all diversions, and a week later, New Jersey threatened to seek court sanctions. A special summit meeting of the State Governors and the Secretary of the Interior was convened on July 7 and hard choices were made. A basinwide emergency was declared under the Compact, Decree mandated diversion and release rates were adjusted, and the Basin muddled through.

C. Lessons of the 1960's Drought

1. The assumptions of resource availability and yield underlying the Court's prior decisions were rendered obsolete. New York City's Delaware Reservoir system proved physically unable to meet the full diversion and flow objectives at Montague during the record drought conditions of the 1961-67 period. The combined safe yield from the City's three Delaware reservoirs was 40% less than previously estimated. DRBC, "Report
of the Coordinating Comm. for the Reappraisal of the Water Supply Resources of the Delaware River Basin and Service Area" (March 7, 1969).

2. For the southeastern New York area, diversions from the City's Delaware reservoirs provide some 39% of total system yield, and about 50% of the water supply during normal hydrologic conditions. For the lower Delaware Basin, these same reservoirs represent 90% of the total basinwide reservoir capacity, and releases under the Montague formula account for as much as one-half of the flows at Trenton during drought periods.

3. With a record of only 50 years, even the "record drought" would likely be exceeded in the not unforeseeable future.


2. Fate of the Tocks Island Dam

For 30 years, a mainstem dam at Tocks Island and vicinity served as the keystone project of the INCODEL Plan and DRBC Comprehensive Plan. With an at-site yield of 980 cfs, Tocks would have provided a capacity
exceeding the yield of all other Basin reservoirs combined.

1962 Tocks Island Dam Project authorized by Congress.

1964 First appropriations for project.

1965 Delaware Water Gap National Recreation Area surrounding dam site authorized by Congress.

1965-70 Appropriations delayed by Vietnam War.


1971 Construction delayed because of incomplete Environmental Impact Statement.

1972 Congress delays dam construction until environmental issues are resolved.

1974 Congress appropriates $1.5 million for Tocks review study.

1975 DRBC votes 3 to 1 against proceeding with immediate construction of Tocks, but rejects a motion to seek deauthorization of the project.

1975-77 Bills in Congress to deauthorize Tocks fails.

1978 U.S. Dept. of the Interior and President Carter recommend designation of the middle Delaware River as a component of the Wild and Scenic Rivers System; Pennsylvania sues Carter for failure to prepare an environmental impact statement.

1978 Congress enacts legislation designating the Middle Delaware Scenic and Recreational River, 16 U.S.C. §1274(20).
E. DRBC Level B Study

Recognizing the dilemma created by effective preclusion of the Tocks project, DRBC began work in 1977 on the Level B Study, with major funding support from the U.S. Water Resources Council. The Level B Study was designed to take a new look at the Basin, to review possible alternative reservoir projects and actions, and to provide the technical bases and concepts necessary for revision and updating of the Commission's Comprehensive Plan.

F. New York State Conservation Release Act and the 77-20 Study

In the same time frame, the State of New York undertook to implement a new State law requiring New York City to increase the "conservation releases" from the City's reservoirs in order to improve fishery resources and recreational opportunities below the reservoirs. Such substantially increased conservation releases (made on days when releases are not required under the 1954 Decree to meet the Montague objective) threatened to further reduce the already inadequate yield of the City's system to meet Decree mandates. The lower Basin States objected to any unilateral action. Subsequent negotiations led to an interim "experimental" release program, but tied to an agreement by New York State and City to join the lower Basin

G. Good Faith Negotiations

1. Initiation of Negotiations: With passage of the Middle Delaware scenic river designation, Pennsylvania felt itself most aggrieved by the failure of the parties to render and implement decisions. The Commonwealth threatened once again to return to the Court if the Compact arrangements failed to produce meaningful results. The result, as intended, was an agreement by the parties to once again engage in concerted "Good Faith" negotiations regarding the future of water resources management in the region. DRBC Resolution No. 78-20 (December 13, 1978).

2. Key Studies as Input to the Negotiations:


3. Negotiating Process: Rather than focusing constantly on striking positions and splitting differences, the parties attempted to follow a process for "getting to yes" - a process involving assessment of underlying interests and development of creative solutions which serve common interests. Surprisingly, there was little disagreement over the wide range of issues that required decision, and substantial progress was made early in the process (although the discussions themselves extended well beyond the original October 1979 deadline self-imposed by the parties).

H. The 1980-82 Drought

1. DRBC Resolutions No. 80-20 (Oct. 17, 1980); No. 80-24 (Nov. 19, 1980); Nos. 81-1 to 81-5 (Jan. 15, 1981); Nos. 81-8, 81-9 (Feb. 18, 1981); Nos. 81-11, 81-12 (March 25, 1981).

2. Step-by-step actions: With the agreement of all parties, diversions to New York and New Jersey were cut in stages, up to 30%. The Montague flow objective was also reduced in stages and linked to the location of salinity in the lower Basin. A joint drought emergency was declared by the four State
Governors, in their capacity as DRBC Commissioners. Comparable bans on nonessential water uses were adopted and enforced in each of the States. State and Federal reservoirs were brought into a coordinated operation scheme, with the Delaware Commission serving as steam master to assure adequate flows while conserve storage.

3. Over the next six months, these drought emergency measures conserved some 60 billion gallons of water. Supplies began to stabilize and slowly recovered. The crisis was confronted; the common ground was found.

H. The Good Faith Agreement

Interstate Water Management Recommendations of the Parties to the U.S. Supreme Court Decree to the Delaware River Basin Commission Pursuant to Commission Resolution 78-20 (November 1982): Following public hearings in mid-1982, the Good Faith Agreement was finally signed by the Basin States Governors and the Mayor of New York and formally transmitted to DRBC in February 1983.

VII. Management Elements of the Good Faith Plan

A. Salinity standard for the Delaware Estuary.

DRBC Resolution No. 83-11 (June 29, 1983). An interim operating objective was established to provide a reasonable degree of protection to the aquifers serving the Camden area. As additional reservoir storage
capacity becomes available in the Basin, it will be used both to augment water supplies provide a more protective salinity standard.

**B. Management Criteria.** DRBC Resolution No. 83-12 (June 29, 1983) adopted the drought of record as basis for determination and planning of dependable water supply. It was agreed that the Basin's water management system should be capable of providing and protecting reliable supplies for essential uses during the drought equal to the record drought of 1961-67. This does not mean all demands will be met at all times. It does mean that DRBC's plans and actions (including conservation measures, controls on diversions, and projects) will be designed to work through a record drought.

**C. Drought Identification Criteria.** DRBC Resolution No. 83-13 (June 29, 1983) adopted criteria to identify the onset and stages of a drought, using the behavior of the combined storage in the 3 New York City reservoirs as an index of basin hydrology.

**D. Basic Drought Management Plan.** DRBC Resolution No. 83-14 (June 29, 1983) incorporates an operating formula which, at given stages of drought warning and drought, reduces allowable out-of-basin diversions to New York and New Jersey, reservoir releases, and instream flow objectives. These flow
objectives and release requirements, in turn, are linked to the location in each season of the "salt front" in the Delaware Estuary (defined by the 7-day average, 250 mg/l chloride isochlor). The further upstream the salt front moves toward Camden and Philadelphia, the greater the flow objectives and releases mandated to counter salinity intrusion.

E. Coordinated Reservoir Operations. DRBC Resolution No. 84-7 (April 25, 1984): To complement the operations of the New York City reservoirs, the parties developed a plan for coordinated drought operation of other major Federal, State and utility reservoirs in the Basin, including Lake Wallenpaupack (Pennsylvania Power and Light Co.); Lake Nockamixon (Pa. Dept. of Environmental Resources); Blue Marsh, Beltzville, F.E. Walter and Prompton Reservoirs (U.S. Army Corps of Engineers/DRBC). The operations plan places a series of facilities under DRBC's emergency jurisdiction, includes specific schedules and sequences of release and refill geared to maintain key flow and salinity control objectives.

F. Drought Conservation Measures. DRBC Resolution No. 83-14 (June 29, 1983): The drought plan storage curves provide an index triggering the initiation and declaration of emergency actions. If storage drops below the drought operating criterion for five or
more days, a regional emergency is automatically declared. Conservation measures will be undertaken with the objective of reducing overall consumptive and depletive used by 15%. Each State is pledged to develop and carry out contingency plans, involving comparable measures and emergency regulations to conserve water, to be implemented in phases through warning and emergency periods.

G. Depletive Water Use Budget. The Good Faith Agreement directs DRBC to develop and adopt a water use budget, incorporating a regulatory program to limit future consumptive use in such a way as to balance existing, new and expanded uses with the actual availability of storage capacity required to meet salinity objectives and compensate for the consumption. Applications for new or expanded depletive uses within the Basin in excess of the "budget" amount available for allocation will not be approved by the States or by the Commission unless (1) new storage capacity is brought on line, (2) existing uses are proportionally reduced by conservation or abandonment, or (3) the new or expanded uses are offset by water imported from outside the Basin. This element has not be implemented to date.
H. Development of Additional Reservoir Storage.

The Good Faith Agreement commits the parties to a series of early action projects (F. E. Walter, Prompton, Cannonsville, and Merrill Creek) to improve storage capacity and increase flow maintenance capability. Three of the four high priority reservoir projects concentrate on modifications or additions to existing dams.

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<th>Project</th>
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<th>Status</th>
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<tr>
<td>F. E. Walter Reservoir Modification</td>
<td>12/31/90</td>
<td>Delayed due to financing arrangements.</td>
</tr>
<tr>
<td>Prompton Reservoir Modification</td>
<td>12/31/95</td>
<td>PA, NJ and DEL have not agreed to arrangements for financing. Congressional support for implementation is questionable.</td>
</tr>
<tr>
<td>Merrill Creek Reservoir</td>
<td>12/31/86</td>
<td>Delayed, but construction is nearing completion.</td>
</tr>
<tr>
<td>Cannonsville Reservoir Enlargement</td>
<td>1990</td>
<td>Implementation was subject to a feasibility study, which indicated expansion was not cost-effective.</td>
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I. Financing Arrangements for Projects

and Water Charging systems for the DRBC-Sponsored Water Storage Projects of Beltzville, Blue Marsh, and Francis E. Walter Reservoirs (April 7, 1988)

VIII. Reflections on the Delaware Experience

- Dynamic water management problems require flexible and dynamic institutional arrangements.
- Establishing a regional entity is not a solution; it is a vehicle to solutions. A compact commission, on the DRBC model, can be an effective forum for management, if it is used regularly and with vigor.
- To be successful, a regional compact and institution must go beyond planning and prophetic pronouncements. The power to make a decision and see it implemented is essential.
- It takes time and political will to create attitudes and institutions which, in the words of the Delaware Compact, can serve as a vehicle for the exercise of the joint sovereignty of the States over common natural resources.

Appendices
Interstate Water Management
Recommendations of the Parties
to the U.S. Supreme Court
Decree of 1954 to the Delaware
River Basin Commission Pursuant
to Commission Resolution 78-20

Delaware	Governor Pierre S. du Pont, IV
New Jersey	Governor Thomas H. Kean
New York	Governor Mario M. Cuomo
Pennsylvania	Governor Dick Thornburgh
New York City	Mayor Edward I. Koch

NOVEMBER 1982
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<td>30</td>
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</tbody>
</table>
INTRODUCTION

Conditions in the Delaware River Basin have changed substantially over the past two decades. The drought emergency of the mid-1960's and the decision of 1975 not to proceed at that time with construction of the Tocks Island dam, were major background events giving rise to Commission action in 1978 calling upon the parties to enter into good faith discussions (page 30).

The recommendations that follow constitute a series of interrelated management steps designed to respond to changed conditions in the Basin. They are organized around a long-term salinity standard to be achieved through the development of new reservoir storage and flow augmentation capacity, water conservation actions, a drought management plan, and the regulation of new or expanded depletive water uses. Modified conservation releases from the New York City reservoirs to protect and enhance recreation below the reservoirs are proposed to be made permanent, but with required reductions during drought periods.
SECTION I
MANAGEMENT STANDARDS AND CRITERIA

Recommendation 1

The Commission should amend its Comprehensive Plan to include a revised salinity objective. The amendment should include a set of interim and long-term salinity objectives. The interim operating objective should be to limit salinity to a maximum 30-day average of 180 mg/l of chlorides and a maximum 30-day average of 100 mg/l of sodium at River Mile 98 (i.e., one mile upstream from the Walt Whitman Bridge). Through a set of step-by-step actions, a more protective objective should be established by the year 2000 to limit salinity to a maximum 30-day average of 150 mg/l of chlorides and a maximum 30-day average of 83 mg/l of sodium at River Mile 98.

As additional reservoir facilities and storage capacity become available in the Basin they should be used both to augment water supply, and to improve environmental conditions, water quality, and salinity protection. A portion of the new storage capacity recommended in recommendation 5 should be committed to salinity protection. As each unit comes on line, the operating salinity objective should be revised until the year-2000 objective is reached. Simultaneously, a series of depletive water use allocation budgets should be adopted at each stage. Each budget should be designed to meet the operating salinity objective with the capacity of the storage facilities then available.

The salinity objective should be periodically reviewed by the Commission in light of existing conditions and knowledge.

The parties join in this recommendation, in view of the fact that they are also committed to the implementation of the depletive water use budget set forth in recommendation 13, to the implementation of a drought operating formula and conservation programs, as set forth in recommendations 3, 4, 10, 11, and 12, and to the development of projects set forth in recommendations 5, 6, and 7.

All of the parties recognize the benefits of the salinity standards proposed in recommendation 1, but New York City abstains from supporting this recommendation because establishment of salinity standards is properly a matter for decision by the Commission. However, the City does agree with the specific drought operating schedules set forth in recommendation 3, which will assist in controlling salinity during drought periods over the course of this agreement.

Recommendation 2

The Basin's water management system should be capable of providing and protecting reliable water supplies for essential uses during a drought equal in severity to the drought of record, which occurred in the period 1961-1967. The Commission should amend the Comprehensive Plan to include a specific management criterion that the drought of record will be used as the basis for determination and planning of dependable water supply.
Recommendation 3

For purposes of management during a drought, the Parties agree to propose and support adoption by the Commission, pursuant to Section 3.3 of the Compact, a schedule of phased reductions in diversions, releases, and flow objectives as described in this section and set forth in Tables 1 and 2. The formula is based upon a differentiation between "normal", "drought warning" and "drought" conditions as defined by the combined storage levels shown on the operation curves for Cannonsville, Neversink and Pepacton reservoirs (page four). The division of the drought warning zone into upper and lower halves is defined as a physically equal division, or 20 billion gallons in each zone.

### TABLE 1

<table>
<thead>
<tr>
<th>NYC Storage Condition</th>
<th>NYC Div. mgd</th>
<th>NJ Div. mgd</th>
<th>Montague Flow Objective cfs</th>
<th>Trenton Flow Objective cfs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>800</td>
<td>100</td>
<td>1750</td>
<td>3000</td>
</tr>
<tr>
<td>Upper Half--</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drought Warning</td>
<td>680</td>
<td>85</td>
<td>1655</td>
<td>2700</td>
</tr>
<tr>
<td>Lower Half--</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drought Warning</td>
<td>560</td>
<td>70</td>
<td>1550</td>
<td>2700</td>
</tr>
<tr>
<td>Drought</td>
<td>520</td>
<td>65</td>
<td>1100-1650*</td>
<td>2500-2900*</td>
</tr>
<tr>
<td>Severe Drought</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(to be negotiated based on conditions)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Varies with time of year and location of salt front as shown on Table 2.

During drought conditions as defined by the operation curves shown on page four, the Montague and Trenton flow objectives should vary according to the location of the salt front (250 mg/l chloride isochlor 7-day average), in accordance with the following table:
### TABLE 2

Flow Objectives for Salinity Control During Drought Periods

<table>
<thead>
<tr>
<th>Location of &quot;Salt Front,&quot; River-mile*</th>
<th>Montague, N.J.</th>
<th>Trenton, N.J.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upstream of R.M. 92.5</td>
<td>Dec-Apr 1600</td>
<td>Dec-Apr 2700</td>
</tr>
<tr>
<td></td>
<td>May-Aug 1650</td>
<td>May-Aug 2900</td>
</tr>
<tr>
<td></td>
<td>Sept-Nov 1650</td>
<td>Sept-Nov 2900</td>
</tr>
<tr>
<td>Between R.M. 87.0 and R.M. 92.5</td>
<td>Dec-Apr 1350</td>
<td>Dec-Apr 2700</td>
</tr>
<tr>
<td></td>
<td>May-Aug 1600</td>
<td>May-Aug 2700</td>
</tr>
<tr>
<td></td>
<td>Sept-Nov 1500</td>
<td>Sept-Nov 2700</td>
</tr>
<tr>
<td>Between R.M. 82.9 and R.M. 87.0</td>
<td>Dec-Apr 1350</td>
<td>Dec-Apr 2500</td>
</tr>
<tr>
<td></td>
<td>May-Aug 1600</td>
<td>May-Aug 2500</td>
</tr>
<tr>
<td></td>
<td>Sept-Nov 1500</td>
<td>Sept-Nov 2500</td>
</tr>
<tr>
<td>Downstream of R.M. 82.9</td>
<td>Dec-Apr 1100</td>
<td>Dec-Apr 2500</td>
</tr>
<tr>
<td></td>
<td>May-Aug 1100</td>
<td>May-Aug 2500</td>
</tr>
<tr>
<td></td>
<td>Sept-Nov 1100</td>
<td>Sept-Nov 2500</td>
</tr>
</tbody>
</table>

Diversions and releases under this drought operation formula should go into effect automatically whenever combined storage in the City reservoirs declines below the drought warning line and remains below that level for five consecutive days. When the combined storage (including the projected water runoff equivalent of actual snow and ice) reaches a level 15 billion gallons above the drought warning line, and remains above that level for five consecutive days, the drought operation formula should automatically terminate and normal operations provided for in the Decree should be resumed.

Pursuant to Section 3.3(a) of the Compact, the Parties hereby give their unanimous consent to adoption and implementation of this drought operation formula by the Commission. The Parties agree that the drought operation formula will go into effect automatically, and be binding on all parties for not less than 180 days following the triggering of drought warning operation, unless terminated automatically by improved storage conditions as described above. During the 180-day period, the parties will convene no less frequently than once each month to review current conditions, and they may extend, modify, or extend as modified the formula recommended here. If no unanimous agreement as to a continuing drought operation formula is reached within the 180-day period, all parties shall be released from the terms of the formula contained in this agreement and may pursue their rights and obligations under the Delaware River Basin Compact and the U.S. Supreme Court Decree.

The City of New York joins in recommendation 3 but does not by doing so accept any general responsibility under the doctrine of equitable apportionment or otherwise to vary releases from the City's reservoirs in accordance with the location of the salt front.

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*Measured in statute miles along the navigation channel from the mouth of Delaware Bay.
OPERATION CURVES FOR
CANNONSVILLE, PEPACTON AND NEVERSINK RESERVOIRS
Recommendation 4

The Commission should develop a plan for coordinated operation of other existing impoundments during drought periods to complement the operating formula for the New York City reservoirs, as outlined above, in order to maintain reliable supplies for essential uses, to conserve water, and to control salinity.

The plan should include operating criteria for the Beltzville, Blue Marsh, Walter, Prompton and Nockamixon projects, and the hydroelectric power reservoirs in the Basin of the Pennsylvania Power and Light Company and Orange and Rockland Utilities, Inc. Criteria for defining a lower Basin drought warning and drought should be prepared and made part of the plan. The plan should be completed by July 1, 1983, and made part of the Commission's Comprehensive Plan.

SECTION III

WATER STORAGE, WATER SUPPLY AND FLOW AUGMENTATION PROJECTS

The parties agree that the Basin needs additional flow augmentation facilities if the region is to grow and the risk of saline contamination in the estuary is to be held within reasonable bounds. Development of new facilities according to schedules recommended here will allow the Basin to accommodate projected demands for new water use and at the same time realize the year 2000 salinity objective. But achievement of these goals will also require careful monitoring of increased depletive water use and rigorous application of conservation measures during drought periods.

Recommendation 5

The Parties agree to endorse and promote, individually and collectively, construction or modification of the following projects for water supply and flow augmentation for salinity control, according to the following timetables and implementing provisions:

(a) Enlargement of the Francis E. Walter Reservoir in Luzerne County, Pennsylvania.

Implementing Provisions:

- The Parties agree to propose and support adoption by the Commission of an amendment to the Comprehensive Plan adding an updated description of the project, as set forth in Appendix A, page 15.

- The Parties agree to support and assist timely completion of design studies currently underway by the U.S. Army Corps of Engineers.

- The Parties agree to support action by Congress and the Federal Administration to appropriate funds necessary for timely design and construction of this project.
Prior to December 31, 1984, Pennsylvania, New Jersey and Delaware will negotiate arrangements to underwrite and finance non-Federal cost-sharing obligations necessary to complete this project. Such arrangements may include action by the Commission to serve as non-Federal sponsor for water supply storage in the project, pursuant to Article 4 of the Compact and the 1958 Water Supply Act, as amended, 43 U.S.C. §390 b-f.

Prior to December 31, 1984, Pennsylvania, New Jersey and Delaware will negotiate and present for approval by the Commission a plan for utilization of the additional storage provided by the project, including proposed additions to apportionments within the depletive use budget and allocations to be used for improved salinity control within the Delaware Estuary.

The Parties agree that the target date for completion of construction is December 31, 1990.

(b) Enlargement of Prompton Reservoir in Wayne County, Pennsylvania.

Implementing Provisions:

- The Parties agree to propose and support adoption by the Commission of an amendment to the Comprehensive Plan adding an updated description of the project, as set forth in Appendix B.

- Pursuant to §3.3(a) of the Compact, the Parties hereby give their unanimous consent and agree to support adoption by the Commission of a Comprehensive Plan amendment incorporating the following operating policy for the modified Prompton project:

  When New York City is releasing from its reservoirs by direction of the River Master to meet Montague flow objectives--

  (i) inflow to Prompton may be passed through the reservoir and released downstream with no change in the Montague flow objective, or stored in the reservoir with an equivalent reduction in the Montague flow objective; and

  (ii) releases may be made from Prompton storage to meet Trenton flow requirements, and such releases will not be counted as part of the Montague objective.

  When New York City is not releasing from its reservoirs to meet Montague flow objectives--

  (i) inflow at Prompton may be stored (except for minimum conservation releases); and

  (ii) releases may be made from Prompton storage to meet Trenton flow requirements, and such releases will not be counted as part of the Montague objective.
- The Parties agree to support and assist early initiation and timely completion of design studies by the U.S. Army Corps of Engineers.

- The Parties agree to support action by Congress and the Federal Administration to appropriate funds necessary for timely design and construction of this project.

- Prior to December 31, 1986, Pennsylvania, New Jersey, and Delaware will negotiate arrangements to underwrite and finance non-Federal cost-sharing obligations necessary to complete this project. Such arrangements may include action by the Commission to serve as non-Federal sponsor for water supply storage in the project, pursuant to Article 4 of the Compact and the 1958 Water Supply Act, as amended, 43 U.S.C. §390 b-f.

- Prior to December 31, 1986, Pennsylvania, New Jersey, and Delaware will negotiate and present for approval to the Commission a plan for utilization of the additional storage provided by the project, including proposed additions to apportionments within the depletive use budget and allocations to be used for improved salinity control in the Delaware Estuary.

- The Parties agree that the target date for completion of construction is December 31, 1995.

- A proposed revised Comprehensive Plan description of the Prompton project is made part of this report as Appendix B, page 17.

(c) Construction of Merrill Creek Reservoir in Warren County, New Jersey.

Implementing Provisions:

- If determined practicable by feasibility and environmental studies, the Parties agree to support adoption by the Commission of an amendment to the Comprehensive Plan adding a description of this project, as set forth in Appendix C, page 19.

- If approved by the Commission pursuant to the Compact, the project will be developed by the Merrill Creek Owners Group.

- The Parties agree to expedite the processing of necessary permits and approvals for this project.

- The Parties agree that, subject to the completion of necessary feasibility and environmental studies, the target date for completion of construction is December 31, 1986.

Recommendation 6

The State of New York will enlarge the Cannonsville reservoir in Delaware County, New York, if determined to be practicable by feasibility and environmental studies. Subject to the outcome of these studies construction should be completed
by 1990. The requirements of Section IIIB of the U.S. Supreme Court Decree of 1954 relating to excess releases should be waived as to the additional storage included in the Cannonsville modification project. Additional project yield should be used primarily to maintain conservation releases. Secondary purposes should be to support the Montague flow objectives and diversions to New York City within the limits of the 1954 U.S. Supreme Court Decree. The Commission should amend its Comprehensive Plan by adding an updated description of the Cannonsville project. A proposed revised Comprehensive Plan description is made part of this report as Appendix D, page 22.

Recommendation 7

New Jersey will undertake a study to examine potential solutions to the Camden Metropolitan area water supply problems and the related overpumping of the Potomac-Raritan-Magothy aquifer system. Alternatives to be explored should include the proposed conjunctive use of ground and surface water; pumping of ground water from the Cohansey Sands aquifer; and interconnection with and water transfer from the City of Philadelphia.

This study should be completed and an alternative or some combination of alternatives should be selected by December 31, 1985. The selected alternative(s) should be implemented by December 31, 1990.

Recommendation 8

It is recommended that the Commission evaluate the recommendation of its ground water consultants that a field demonstration be made to gather further physical information about the effects of pumping from glacial alluvium to supplement flow augmentation capacity during drought periods.* Possible development of such new sources of supply should be considered as a standby alternative, for use in emergency after the year 2000.

Recommendation 9

The parties are agreed that the proposed Tocks Island project should be held in reserve status for development after the year 2000 if needed for water supply. The Commission should amend its Comprehensive Plan by adding an updated description of the Tocks Island project. A proposed revised Comprehensive Plan description is made part of this report as Appendix E, page 23.

SECTION IV

CONSERVATION

Conservation during drought periods requires extraordinary measures not justified under normal hydrologic conditions. In order to protect public health, economic activity and the environment, conservation of depletive use is of special importance in the Delaware. It is the depletive uses of both surface and ground waters that impact quantitatively upon minimum flows and the Basin's capability to maintain them.

Recommendation 10

Storage conditions in the New York City Delaware Basin reservoirs should be the principal consideration of the Commission in declaring a basinwide drought emergency under the Compact, and the initiation of emergency conservation measures. The operation curves shown on page four should be the basis for such a declaration by the Commission based upon storage conditions. The Commission should include within its Comprehensive Plan a statement of general policy that a drought emergency will be declared for purposes of imposing mandatory in-Basin conservation measures whenever combined storage in the three reservoirs falls into the drought zone shown on the operation curves and remains in that zone for five consecutive days. The statement of policy should also provide that termination of a drought emergency will be considered by the Commission whenever combined storage in the three reservoirs reaches 40 billion gallons above the drought warning level and remains above that level for 30 consecutive days, and that the drought emergency will be terminated by the Commission whenever the combined storage remains above that level for 60 consecutive days unless the Commission unanimously agrees to extend the emergency.

This recommendation is not intended to extend, impair, or conflict with the Commission's authority under the Compact to declare or terminate a drought or water shortage emergency in the Basin, or sub-region thereof, in other instances as conditions may require.

Recommendation 11

The Commission should include within its Comprehensive Plan a statement of general policy that conservation measures in the Basin designed for implementation during drought periods shall be based upon the objective of reducing overall depletive use of fresh water by 15 percent.

Recommendation 12

Each State will prepare drought contingency plans for phased implementation during periods of drought warning and drought. Such plans should be coordinated with action by the Commission in announcing a drought warning and in declaring a drought emergency under the Compact, and should be designed to achieve a target 15 percent reduction in depletive use at drought stage. Contingency plans should be completed no later than December 31, 1983, and should include:

- Identification of those restrictions on non-essential water uses, such as car washing, lawn watering, et cetera, that can be effectively and practically applied; and outline procedures for coordinated initiation and termination of public controls over such uses as drought conditions develop and subside.

- Contingency plans by large water users that provide for phased reduction of use as drought conditions worsen.

- Proposed or existing legal authority to establish emergency conservation programs with enforcement powers, including fines and penalties.
Effective and timely public information services concerning the drought and the necessity for conservation by all classes of water users.

If adequate legal authority does not exist to implement contingency plans, including the foregoing features, the parties should seek such authority prior to December 31, 1985.

SECTION V
DEPLETIVE WATER USE BUDGET

Realization of the year-2000 salinity objective recommended in section I of this report will require that depletive use in the Basin not be allowed to increase in the absence of offsetting storage capacity sufficient to maintain minimum streamflow objectives. In the absence of additional storage facilities, new depletive use coupled with increases in existing depletive use will steadily reduce the ability of existing storage facilities to maintain streamflows needed to realize salinity control objectives. The Basin cannot continue to authorize new depletive use and at the same time defer actions to create new storage capacity.

Recommendation 13

The Commission should develop a regulatory program to limit future depletive water use in such a way as to balance existing, new, or expanded depletive use with the availability of storage capacity required to meet salinity objectives. The principal features of such a program should be:

-- The control area in which the regulatory program would operate would be that area of the basin downstream of the Montague gage and upstream of the Chesapeake and Delaware Canal.

-- Water available for allocation to new or expanded depletive uses within the control area would be limited to that which is in excess of the flows needed to maintain the applicable salinity control objective during drought periods.

-- Applications for new or expanded depletive water uses within the control area that would be in excess of the amount available for allocation would not be approved by the permitting agencies of the States or by the Commission unless new storage capacity is brought on line or existing uses are proportionately reduced by conservation or abandonment, or unless such new or expanded uses are offset by water imported from outside the Basin.

-- Water available for allocation to new or expanded depletive uses would be allocated either among the States in proportion to the percentage of the control area within each State, or to the common pool for use without regard to political boundaries.
If the Commission's regulatory program follows the State-by-State option, water available for allocation to a State would be increased (1) to reflect new storage capacity constructed and financed by that State, its agencies or subdivisions, or (2) to reflect that portion of new storage capacity constructed or financed by the Commission in accordance with agreements among the parties for each project.

If the Commission's regulatory program follows the "common pool" option, allocations to the pool would be increased as new storage units are constructed and water becomes available for new or expanded uses in accordance with existing State and Commission permitting programs.

A depletive water use budget should be adopted and implemented by the Commission no later than December 31, 1985.

SECTION VI

CONSERVATION RELEASES
NEW YORK CITY RESERVOIRS

Table 3 shows the program of augmented conservation releases from the New York City Delaware Basin reservoirs that has been in effect since 1977 on an experimental basis. The purpose of the releases is to protect and enhance the recreational use of waters affected by such releases.

<table>
<thead>
<tr>
<th>Reservoir and Operative Dates</th>
<th>Basic Conservation Release</th>
<th>Augmented Conservation Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neversink</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4/1 - 4/7</td>
<td>5 cfs</td>
<td>45 cfs</td>
</tr>
<tr>
<td>4/8 - 10/31</td>
<td>15</td>
<td>45</td>
</tr>
<tr>
<td>11/1 - 3/31</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Pepacton</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4/1 - 4/7</td>
<td>6</td>
<td>70</td>
</tr>
<tr>
<td>4/8 - 10/31</td>
<td>19</td>
<td>70</td>
</tr>
<tr>
<td>11/1 - 3/31</td>
<td>6</td>
<td>50</td>
</tr>
<tr>
<td>Cannonsville</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4/1 - 4/15</td>
<td>8</td>
<td>45</td>
</tr>
<tr>
<td>4/16 - 6/14</td>
<td>23</td>
<td>45</td>
</tr>
<tr>
<td>6/15 - 8/15</td>
<td>23</td>
<td>325</td>
</tr>
<tr>
<td>8/16 - 10/31</td>
<td>23</td>
<td>45</td>
</tr>
<tr>
<td>11/1 - 11/30</td>
<td>23</td>
<td>33</td>
</tr>
<tr>
<td>12/1 - 3/31</td>
<td>8</td>
<td>33</td>
</tr>
</tbody>
</table>
Recommendation 14

The Commission should amend docket D-77-20, as necessary to authorize on a permanent basis the augmented conservation release schedules at the three reservoirs, as shown in Table 3. The revised docket, a draft of which is attached as Appendix F, page 25, should reflect the following conditions:

-- An additional quantity of water up to 6000 cfs-days should be provided for the relief of thermal stress on aquatic life in the river downstream of the reservoirs and on the mainstem of the Delaware River, designed to prevent to the extent practicable, any water temperature higher than 75°F or daily average water temperature higher than 72°F in the designated downstream areas as determined from measurements at Callicoon, Harvard, Woodbourne, and Hale Eddy gaging sites during the period May 1 to October 31, inclusive. Releases for this purpose should be at the direction of the New York State Department of Environmental Conservation. In order to conserve available water in storage, no thermal stress releases should be made when the reservoirs are in drought warning or drought condition.

-- Whenever combined water storage conditions in the three reservoirs decline to drought warning or drought levels, as shown on the operation curves (page four), the augmented conservation releases should be reduced to the basic rate in effect prior to 1977 for each reservoir, except that larger volumes of water would be released during those periods when the River Master is directing releases to meet the Montague flow objectives. This reduction would be for the purpose of conserving available water in the reservoirs.

-- Conservation releases should be returned to normal augmented levels when combined storage in the three reservoirs reaches 25 billion gallons above the drought warning level, as shown on the operation curves (page four), and remains at or above that level for 15 consecutive days.

-- Increases in the augmented conservation release levels should be made only in accordance with the allowances provided for in the Stipulation of Discontinuance in The City of New York vs. The State of New York Department of Environmental Conservation, Index No. 5840-80, and should be subject to approval by the Commission.

SECTION VII

ENFORCEMENT

1. The Parties consider this agreement to be a whole. Each recommendation and provision of this agreement is considered material to the entire agreement, and failure to implement or adhere to any recommendation or provision may be considered a material breach.

2. Each of the Parties pledges to support implementation of all provisions of this agreement, and covenants that its officers and agencies will not hinder, impair, or prevent any other Party carrying out any provision or recommendation of this agreement.
3. In the event that any Party is substantially hindered or prevented from performing any obligation or implementing any provision under this agreement, by reasons of circumstances beyond the control of the Party (including Acts of God, natural disasters, labor disputes, judicial decrees, or legislative action of Congress), the Parties agree to meet and negotiate an appropriate modification of the applicable provisions of the agreement to reflect the effect of such force majeure. Such modifications may include extensions of applicable schedules and timetables, or agreements on substitute actions to fulfill the objectives and spirit of this agreement.

4. Desiring that this agreement be carried out in full, the Parties agree that disputes between the Parties regarding interpretation, application, and implementation of this agreement shall be settled, to the maximum extent possible, by negotiation and mediation.

   a. If any Party believes another Party has violated or failed to carry out any provision of this agreement, it shall notify such Party, and all other Parties, in writing, specifying the alleged violation or failure.

   b. Any Party alleged to have violated or failed to carry out any provision of this agreement (except for a provision relating to drought operations and construction actions) shall have 120 days from the receipt of notice as provided in paragraph (a) to correct such violation or failure. This period may be extended by the agreement of the Parties.

   c. Within 30 days of notice provided under paragraph (a), all Parties will meet to discuss the alleged violation or failure, and to negotiate an appropriate settlement, including actions to correct such violation or failure. Such discussions and negotiations shall be pursued in good faith for not less than 120 days after original notice.

   d. If the Parties are unable to reach agreement on a settlement, after good faith discussions and negotiations within the period provided in paragraph (c), any aggrieved Party may seek enforcement of this agreement as may be available at law or equity.

5. The Parties agree that performance of the obligation and implementation of the provisions contained in this agreement are necessary to the protection of the health, safety and general welfare of their respective citizens. Accordingly, the Parties agree that, to the maximum extent provided by law, any breach of the obligations or provisions of this agreement may be subject to specific enforcement at equity, or through appropriate proceedings before the Commission.

SECTION VIII
PERIODIC REVIEW

The Parties agree that water management in the Delaware River Basin requires continuing cooperation by the Parties and continued long-term planning studies.
by the Commission. The Parties, in consultation with the Commission, will periodically review this agreement, and recommend such adjustments or modifications as may be required to respond to changing conditions.
The State of Delaware hereby approves the recommendations of the Parties to the U.S. Supreme Court Decree of 1954 herein submitted to the Delaware River Basin Commission pursuant to Commission Resolution No. 78-20.

Signature  Governor

Date  1/1/82
The State of New Jersey hereby approves the recommendations of the Parties to the U.S. Supreme Court Decree of 1964 herein submitted to the Delaware River Basin Commission pursuant to Commission Resolution No. 78-20.

Approved as to form:

[Signature]

Irwin I. Kimmelman
Attorney General

[Signature]

Robert E. Hughey
Dept. of Environmental Protection

[Signature]

Thomas H. Kean
Governor

DATE: 12/27/82
The State of New York hereby approves the recommendations of the Parties to the U.S. Supreme Court Decree of 1954 herein submitted to the Delaware River Basin Commission pursuant to Commission Resolution No. 78-20.
The Commonwealth of Pennsylvania hereby approves the recommendations of the Parties to the U.S. Supreme Court Decree of 1954 herein submitted to the Delaware River Basin Commission pursuant to Commission Resolution No. 78-20.

Date: January 4, 1983

Dick Thornburgh
Governor

Approved as to form and legality:

Robert F. Proctor
Office of General Counsel

David T. Locke
Office of Attorney General
CITY OF NEW YORK

The City of New York hereby approves the recommendations of the Parties to the U.S. Supreme Court Decree of 1954 herein submitted to the Delaware River Basin Commission pursuant to Commission Resolution No. 78-20.

[Signature]

APPROVED AS TO FORM

[Signature]

Acting Corporation Counsel
Proposed Revised Comprehensive Plan
Description of Francis E. Walter Project

Description

The Francis E. Walter project, completed in 1961 as a single-purpose flood control project (with incidental recreation use), will be modified for multiple-purpose development to provide supplies of water and recreational use, as well as the presently authorized flood control. The earth and rock fill dam is located on the Lehigh River 77 miles above its confluence with the Delaware River and about 5 miles north of White Haven, Pennsylvania. At this location the dam controls 288 square miles of drainage area.

The modifications to the existing dam, as originally proposed by the Corps of Engineers to make it serviceable for long-term storage in addition to the present flood control storage involve:

1. Moving and raising the spillway crest.
2. Raising the dam.
3. Adding a concrete conduit to the downstream end of the outlet tunnel.
4. Constructing new dikes and raising existing dikes north of the dam.
5. Clearing of reservoir land and relocating roads subject to inundation.

The modified dam will rise about 263 feet above the stream bed and have a length of about 3,500 feet. The spillway will be raised 31 feet and cut through rock to the north of the dam, and farther north a dike will fill a wale in the reservoir rim. Multi-level outlet works will be provided in the new project. The reservoir for long-term storage of 69,500 acre-feet of water would have a maximum depth of about 185 feet and would extend about 7.0 miles up the Lehigh River and about 4.0 miles up Bear Creek from the dam. Modification of this reservoir will necessitate the purchase of land to be inundated on which flood easements have already been taken and require the acquisition of additional flood easements at high elevations. No economically valuable mineral deposits would be flooded. Relocation of about five miles of Bear Creek Road would be required.

Functions

Supplies of Water. The modified project will augment the flow of the Delaware River at Trenton by 290 cfs on the basis of complete and uniform drawdown of flow augmentation storage (69,500 acre-feet) over a 120-day period.

Reduction of Flood Damages. The 108,000 acre-feet of existing short-term storage is effective in alleviating flooding in the upper reach of the Lehigh River, where damage is confined, primarily, to the Towns of Jim Thorpe, Lehighton, Weissport, Parryville, Palmerton, and Bowmanstown, Pennsylvania. Damage centers in the reach from Lehigh Gap to Allentown, Pennsylvania, include industrial and residential areas located in the vicinity of the towns of Northampton, Hokendauqua, Catasauqua, Allentown, Bethlehem, Freemansburg and Easton, Pennsylvania. The flood control storage will be preserved as previously authorized, and flood reduction benefits will be unaffected by the modifications.
Recreation. The modified Francis E. Walter project will provide for public ownership of the desirable shore area and provide space for development of recreation sites. Operation of the project will consider the downstream flow requirements for stream fisheries and the management of the impoundment for lake fisheries.

Schedule

Modification of the existing Francis E. Walter project is targeted for completion by December 31, 1990.
APPENDIX B

Proposed Revised Comprehensive Plan
Description of Prompton Project

Description

The Prompton project, a single-purpose flood control project (with incidental recreation use) completed in 1960, will be modified for multiple-purpose use to provide supplies of water and recreation benefits as well as the presently designed flood control function. The Prompton dam is located in the valley of the Lackawaxen River about one-half mile upstream of the confluence of Waymart Branch with the river, and about four miles west of Honesdale, Pennsylvania. The present dam controls 60 square miles of drainage area, and is 1,300 feet long and 140 feet high.

The long-term storage and operation for multiple-purposes will require the following additions or modifications to the existing structures:

1. A control tower with gates to control releases from the reservoir and a service bridge.
2. A blanket of impervious material on the valley wall and floor upstream of the dam.
3. Widening of the spillway.
4. Clearing of reservoir land and relocating roads subject to inundation.

The reservoir to be created by long-term storage will extend about 4.4 miles upstream of the dam.

Functions

Supplies of Water. The modified project will augment the flow of the Delaware River at Trenton by 130 cfs on the basis of complete and uniform drawdown of flow augmentation storage (30,900 acre-feet) over a 120-day period.

Reduction of Flood Damage. Flood heights on the Lackawaxen River are substantially reduced by the existing flood control storage of the Prompton project and the Edgar Jadwin dam and reservoir on Dyberry Creek, above Honesdale, Pennsylvania. The towns of Honesdale, located at the confluence of Dyberry Creek with the Lackawaxen River, and Hawley, located between the junctions of Middle Creek and Wallenpaupack Creek with the Lackawaxen River, and several villages and townships located on the lower reaches of the Lackawaxen River are protected. Conversion of the Prompton dam and reservoir to a multiple-purpose development will preserve the flood control function of this project as originally authorized, and flood reduction benefits will be unaffected by the proposed modification.

Recreation. Due to the lack of suitable terrain, recreation potential at this project is limited. However, lands suitable for day-use recreation may be included in the plan of improvement. Operation of the project will consider the downstream flow requirements for stream fisheries and the management of the impoundment for lake fisheries as a coordinated element for full realization of the recreational potential of the project.
Operating Policy

Releases from the project shall be coordinated with releases from the New York City reservoirs and accounted for at the Montague gaging station in accordance with the following policy:

(1) When New York City is releasing from its reservoirs by direction of the River Master to meet Montague flow objectives--

   (a) inflow to Prompton may be passed through the reservoir and released downstream with no change in the Montague flow objective, or stored in the reservoir with an equivalent reduction in the Montague flow objective;

   (b) releases may be made from Prompton storage to meet Trenton flow requirements, and such releases will not be counted as part of the Montague objective.

(2) When New York City is not releasing from its reservoirs to meet Montague flow objectives--

   (a) inflow at Prompton may be stored (except for minimum conservation releases);

   (b) releases may be made from Prompton storage to meet Trenton flow requirements, and such releases will not be counted as part of the Montague objective.

Schedule

Modification of the existing Prompton project is targeted for completion by December 31, 1995.
Proposed Comprehensive Plan
Description of Merrill Creek Project

Location

Merrill Creek Reservoir would be located on a tributary of Pohatcong Creek in Harmony Township, Warren County, New Jersey. The site, which includes an existing small dam and reservoir, is approximately 5.2 miles east-northeast of Phillipsburg, New Jersey. Merrill Creek begins on a small plateau about 1,200 feet above sea level some 3 miles east of the Delaware River. It flows in a southerly direction through a valley to a small existing reservoir. The channel narrows considerably below the existing reservoir and passes through a gap in Scotts Mountain about one mile long. Merrill Creek then enters the Pohatcong Valley and joins Pohatcong Creek four miles south of the existing dam. The stream north of the existing reservoir is 4.3 miles in length and has a drainage area of 3.1 square miles.

To create Merrill Creek Reservoir, a dam would be constructed in the Scotts Mountain gap just downstream of the existing dam. The drainage area above the new dam would be 3.2 square miles.

Functions

The primary function of the Merrill Creek project would be to replace water that is consumptively used by electric generating stations in the Basin, as required by the Commission. During severe drought periods, releases to the Delaware River would be made for this purpose. The project would also provide incidental recreation benefits, and a recreation area is planned for the northeast side of the reservoir. Floodwaters from the upper 3.2 square miles of the Merrill Creek drainage area would be contained in the reservoir. Flood peaks at the Route 57 crossing of Merrill Creek would be reduced by 70 percent, and at the Strawchurch Road crossing by 30 percent.

Description

The project layout is based on facilities necessary to obtain reservoir storage required for a yield of 200 cfs during critical drought periods, and provide for safe operation of the project under all conditions. The layout includes the main dam, saddle dikes, relief spillway, and construction of diversion and conservation outlets. As natural runoff from Merrill Creek is inadequate to refill the reservoir (drainage area 3.2 square miles), a tunnel/pipeline, an inlet/outlet tower, a one-way surge tank and a pumphouse at the Delaware River are provided to insure filling under all hydrologic conditions.

The reservoir is to be formed by placing a compacted earth and rock-fill dam across the Scotts Mountain gap. The maximum height of the main dam is approximately 260 feet. The embankment is approximately 2,450 feet in length along the crest. The width at the crest is 30 feet. Three saddle dikes, two on the northwest side and one on the southeast side, are needed to seal off low areas along the reservoir rim.
The probable maximum flood (PMF) can be stored in the reservoir above elevation 923.0 above mean sea level, the design operating level. In the unlikely event of additional inflow into the reservoir and that discharge through the tunnel/pipeline cannot be implemented, a relief spillway excavated in rock is to be provided to release excess water to Lopatcong Creek. The relief spillway will have a length of approximately 400 feet along the crest at elevation 929.0 on the reservoir upstream side, sloping down to elevation 923.0, a distance of 600 feet to the downstream end.

The inlet/outlet tower, having a hoist house at the top, is to be constructed at the upper end of the tunnel/pipeline running between the reservoir and the Delaware River to house piping, valves, and necessary equipment to admit and release required flows. This reinforced concrete sloping structure is to be located along the northwest rim of the reservoir near Northwest Saddle Dike 1, some 5,000 feet upstream of the main dam. This location will minimize the length of required tunnel through Scotts Mountain, which connects the tower to the pipeline.

The inlet/outlet tower will be approximately 300 feet long and will contain multiple inlet/outlet ports. Each port will be at a different level so that water can be released from that reservoir level at which water temperature and quality most nearly match that of the Delaware River. The hoist house is to contain all necessary controls for operation of the valves, other ancillary equipment, and water quality monitoring devices. The inlet/outlet tower will be unmanned except for maintenance purposes, but will be provided with a security system.

The existing Merrill Creek channel has insufficient capacity to carry all the released flows to the Delaware River. Therefore, a separate conduit is required to carry water between the reservoir and the river. Since a pipeline is also needed to carry the water pumped from the river to the reservoir, a single conduit to serve both purposes is provided.

The inlet/outlet tower is to be connected to the pumphouse by approximately 17,000 feet of pipeline, 1,400 feet of which will be installed in a tunnel. The tunnel will have a finished dimension of 96 inches. The pipe will have a diameter of 57 inches, and except in the tunnel, will be buried a minimum of six feet below the ground surface. The conduit is sized to carry the design pumping rate of 145 cfs to the reservoir and 200 cfs flow from the reservoir back to the river. A one-way surge tank will be installed along the pipeline route to prevent water column separation in the pipeline following motor-pump failure.

A pumphouse to enclose equipment needed to refill the reservoir will be located on the Delaware River (R.M. 192) near Keifer Island. The equipment will have the capacity, utilizing two pumps, to transmit water at the design pumping rate of 145 cfs from the river to Merrill Creek reservoir. Three pumps with electric motors will be provided, one as a stand-by. Each pump is equipped with shut-off and control valves. The pumphouse will have an ice barrier and fixed screens to prevent ice, fish and debris from entering the pump well. Adjacent to the pump chambers, energy dissipator chambers will be in operation during the release of water from the reservoir to the river. The manifold at the end of the water conduit is provided with two sleeve valves, which will control discharge of water to energy dissipating sumps. The sumps, in turn, release the water to the river through overflow weirs.
The gas pipeline that crosses the west edge of the reservoir will be relocated. Relocation will be coordinated with the pipeline owners.

Existing public access to the area will be maintained to the greatest extent feasible. The secondary road through the valley from Route 57 may be terminated near the dam site. Secondary roads from Phillipsburg and Harmony may be connected by a new secondary road along the west ridge of the reservoir. Relocation and termination of these roads will be subject to review and approval of local officials.

Schedule

The Merrill Creek project is targeted for completion by December 31, 1986.
APPENDIX D

Proposed Revised Comprehensive Plan
Description of Cannonsville Project

Cannonsville reservoir, part of the water supply system of the City of New York, is located on the West Branch of the Delaware River in Delaware County, New York, about four miles upstream of the Village of Deposit. It was financed and constructed by the City of New York and placed in operation in 1967.

Cannonsville dam is approximately 2,800 feet long (at the top) with a maximum height of about 175 feet above the original river channel. It has a top width of about 45 feet and is of the compacted (rolled) earth type. At its northerly contact with the valley wall there is a spillway. Spillage is directed into a channel, through a stilling basin, and into an outlet channel that guides the flow into the West Branch of the Delaware River.

Cannonsville reservoir covers roughly 4,800 acres at flow line elevation 1150 feet above mean sea level with a capacity above sill elevation 1027.5 of some 97 billion gallons, and impounds the runoff from a watershed of about 450 square miles. The yield therefrom is used for supplying water to the City of New York, for conservation releases to the West Branch Delaware River, and, together with releases obtainable from the Neversink and Pepacton reservoirs, for meeting the Montague formula of the Supreme Court Decree of 1954.

Cannonsville reservoir will be investigated for modification to increase the storage as described generally in a report of the Temporary Commission on the Water Supply Needs of Southeastern New York (Dec. 15, 1973). The reservoir level would be increased by the installation of gates in the existing spillway, if determined practicable by feasibility and environmental impact studies, which should be completed at the earliest possible date. Subject to the outcome of these studies construction should be completed by December 31, 1990.

Modification of Cannonsville would add approximately 13 billion gallons of additional storage capacity. Additional project yield would be used primarily to maintain conservation releases. Secondary purposes would be to support Montague flow objectives and diversions to New York City within the limits of the 1954 U.S. Supreme Court Decree.
APPENDIX E

Proposed Revised Comprehensive Plan
Description of Tocks Island

Description

The Tocks Island project would be for multiple-purpose development to provide water supplies, flood control, electric power, and recreation. The dam site is on the Delaware River about five miles upstream from the Delaware Water Gap, at the upstream end of Tocks Island. The contributing drainage area is 2,912 square miles, exclusive of 915 square miles that contribute to the Neversink, Pepacton, and Cannonsville reservoirs of the City of New York. The dam would contain about three and one-half million cubic yards of earth and rock, would be 3,000 feet long, and would rise 160 feet above the river bed to elevation 455. Consideration would be given to the development of hydroelectric power including pumped storage. Storage allocations, as determined from studies by the Corps of Engineers, indicate 96,300 acre-feet of inactive long-term storage to elevation 356; 425,600 acre-feet of active long-term storage for supplies of water, power, recreation, and other uses to elevation 410; and 323,500 acre-feet of short-term storage for flood control to elevation 432. The reservoir would extend approximately nine miles up Flat Brook and 37 miles up the Delaware River to Port Jervis, New York. It would necessitate the relocation of affected roads and Delaware Water Gap National Recreation Area facilities. The Town of Matamoras, Pennsylvania, at the upper end of the reservoir would be protected by a dike. The 37-mile section of the Delaware River that would be covered by the reservoir is a component of the National Wild and Scenic Rivers System.

Functions

Supplies of Water. Use of 425,600 acre-feet of active long-term storage at Tocks Island project would augment the flow of the Delaware River at Trenton by 1790 cfs on the basis of complete and uniform drawdown of flow augmentation storage over a 120-day period. Net yield at the site on a year-round basis would be about 980 cfs.

Reduction of Flood Damage. The 1955 flood damages in the reach from Tocks Island to Burlington, New Jersey, exceeded 85 percent of the total damages for the mainstem of the Delaware River, and occurred principally at the damage centers of Easton, Reigelsville, New Hope, and Yardley, Pennsylvania; and Belvidere, Phillipsburg, Trenton, and Burlington, New Jersey. Damages in this reach would be substantially reduced by system operation of the flood-control storage at Tocks Island with other projects in the Comprehensive Plan; the stage of the 1955 flood at Trenton would be reduced by six feet.

Power. The Tocks Island project was originally considered for a conventional hydropower installation of 46,000 kilowatts, a dependable capacity of 20,000 kilowatts, and an average production of 281.5 million kilowatt-hours. Reevaluation of conventional and pumped-storage power schemes resulted in deletion of the conventional hydropower installation from the Comprehensive Plan. In light of current and future uncertainties regarding energy supplies, a full reevaluation of power would be called for when the project is reconsidered after the year 2000.
Recreation. Recreation capacity and facilities of the existing Delaware Water Gap National Recreation Area, developed under P.L. 89-158, would be altered to an extent to be determined by future studies. Reservoir operation would consider fisheries within the impoundment and downstream of the dam. Passage for anadromous fisheries would be provided and consideration given to additional flow augmentation from this project in October and November for moving fish population through the zone of low dissolved oxygen in the estuary.

Schedule

The Tocks Island project is placed in reserve for development if needed for water supply after the year 2000.
The New York State Department of Environmental Conservation (NYDEC) adopted regulations in 1977 to modify the schedule of conservation releases from Cannonsville, Pepacton, and Neversink Reservoirs. The regulations provided for the new schedule of releases to be tried on a limited experimental basis.

The Delaware River Basin Commission (DRBC) approved the experimental release program on May 25, 1977, by Docket decision D-77-20 and extended that approval through May 31, 1983, by Resolution 82-7. Docket decision D-77-20 also directed the parties to the 1954 Decree to develop criteria defining the onset and stages of drought emergencies.

NYDEC proposes to amend the experimental regulations by removing the automatic termination date, deleting the relationship to the "excess quantity" as established by the U.S. Supreme Court Decree (347 U.S. 995 (1954)) and limiting releases according to a reservoir storage curve in time of drought warning and drought.

Research findings and comments from fishermen and recreationists indicate that the program has had a beneficial effect. The DRBC held a hearing on May 28, 1980, on the amended release regulations and a proposal that the Commission's approval of the schedule of augmented releases be made permanent.

Reservoir Release Program

A. New Conservation Releases

In place of the previous New York City schedule of conservation releases, a new conservation release schedule on a year-round basis has been tried as an experimental program and is proposed to be continued on a permanent basis. Under this schedule, the minimum releases from Cannonsville, Pepacton, and Neversink Reservoirs will be as follows:

<table>
<thead>
<tr>
<th></th>
<th>April 1 - June 14</th>
<th>June 15 - Aug. 15</th>
<th>Nov. 1 - March 31</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neversink</td>
<td>45 cfs*</td>
<td>45 cfs</td>
<td>25 cfs</td>
</tr>
<tr>
<td>Pepacton</td>
<td>70 cfs</td>
<td>70 cfs</td>
<td>50 cfs</td>
</tr>
<tr>
<td>Cannonsville</td>
<td>45 cfs</td>
<td>325 cfs</td>
<td>33 cfs</td>
</tr>
<tr>
<td></td>
<td>160 cfs</td>
<td>440 cfs</td>
<td>108 cfs</td>
</tr>
</tbody>
</table>

*cubic feet per second
These total conservation releases break down as follows:

TABLE 1

<table>
<thead>
<tr>
<th>Reservoir and Operative Dates</th>
<th>Column 1 Basic Conservation Release</th>
<th>Column 2 Proposed Augmented Conservation Release</th>
<th>Column 3 Total New Conservation Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neversink</td>
<td>5 cfs</td>
<td>40 cfs</td>
<td>45 cfs</td>
</tr>
<tr>
<td>4/1 - 4/7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4/8 - 10/31</td>
<td>15</td>
<td>30</td>
<td>45</td>
</tr>
<tr>
<td>11/1 - 3/31</td>
<td>5</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Pepacton</td>
<td>6</td>
<td>64</td>
<td>70</td>
</tr>
<tr>
<td>4/1 - 4/7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4/8 - 10/31</td>
<td>19</td>
<td>51</td>
<td>70</td>
</tr>
<tr>
<td>11/1 - 3/31</td>
<td>6</td>
<td>44</td>
<td>50</td>
</tr>
<tr>
<td>Cannonsville</td>
<td>8</td>
<td>37</td>
<td>45</td>
</tr>
<tr>
<td>4/1 - 4/15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4/16 - 6/14</td>
<td>23</td>
<td>22</td>
<td>45</td>
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<tr>
<td>6/15 - 8/15</td>
<td>23</td>
<td>302</td>
<td>325</td>
</tr>
<tr>
<td>8/16 - 10/31</td>
<td>23</td>
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<td>45</td>
</tr>
<tr>
<td>11/1 - 11/30</td>
<td>23</td>
<td>10</td>
<td>33</td>
</tr>
<tr>
<td>12/1 - 3/31</td>
<td>8</td>
<td>25</td>
<td>33</td>
</tr>
</tbody>
</table>

B. Basic Montague Release

At all times, New York City would be required to make such releases as directed by the River Master designed to maintain a minimum basic flow of 1750 cfs at the Montague gaging station, or the excess release rate during the seasonal period, as already required by the Decree.

C. Special Thermal Stress Releases

Special releases may be made from one or more of the reservoirs in order to relieve thermal stress conditions which pose a threat to fisheries. The total volume of such releases shall not exceed 6,000 cfs-days from all reservoirs. Thermal releases, with a one-day lead time, would be made whenever the maximum water temperature in designated downstream areas as determined from measurements at Callicoon, Harvard, Woodbourne, or Hale Eddy is projected to exceed a maximum of 75°F, or a 72°F daily average. If the 6,000 cfs-days reserve is not used by October 31 of any year it will not be used thereafter. No releases for relieving thermal stress would be required from November 1 to April 30 of any year. Releases for purposes of relieving thermal stress shall be at the direction of NYDEC.
D. Drought Warning and Drought Conditions

The augmented conservation release will be reduced to the basic conservation release (shown in Table 1) during drought warning and drought periods as defined by the attached reservoir storage curves marked "Operation Curves for Cannonsville, Pepacton, and Neversink Reservoirs" (page 29) except that when the Delaware River Master directs releases according to the provisions in the 1954 U.S. Supreme Court Decree, New York City shall make such releases from Cannonsville, Pepacton, and Neversink Reservoirs as are necessary and sufficient to maintain the constant minimum flows specified in "A" above on the West Branch Delaware River, East Branch Delaware River, and the Neversink River, and provided that the total amount of water released from the three reservoirs does not exceed the amount directed by the Delaware River Master. If the amount of directed releases by the River Master is not sufficient to maintain the augmented releases from all three reservoirs, the releases from each reservoir will be determined at the discretion of NYDEC and New York City — Department of Environmental Protection (NYC - DEP).

Conservation releases shall be returned to normal augmented levels following a drought. Return to normal augmented levels shall not be made unless and until combined storage in the three reservoirs reaches 25 billion gallons above the drought warning level, as shown by the attached reservoir storage curves (page 29), and remains at or above that level for 15 consecutive days.

Findings

The NYDEC's Amended Part 671 Regulations entitled, Reservoir Release Regulations: Cannonsville, Pepacton, and Neversink Reservoirs adopted May 2, 1980, are consistent with this proposed action.

The Monitoring and Evaluation Program during the experimental reservoir release period has been reported in two performance reports by NYDEC. One for the year July 1, 1977, through June 30, 1978, and a second for the July 1, 1978 through December 31, 1979 period. These evaluations indicate that the conservation release program has been very effective and beneficial and should be continued. The report includes an estimate that an additional 52,500 — 65,500 angler-trips annually could result from the release program. The economic value of these additional angler trips could range from $1,650,000 to $2,066,000 annually.

The project does not conflict with nor adversely affect the Comprehensive Plan. It provides beneficial use of the water resources and does not adversely influence the present or future use and development of the water resources of the Basin.

Decision

I. The project, as described above, with modifications specified hereinafter, is hereby added to the Comprehensive Plan.

II. The project is approved pursuant to Section 3.8 of the Compact, subject to the following conditions:

a. Approval is subject to all conditions imposed by NYDEC.
b. Monthly summaries of reservoir operations submitted by NYC-DEP to NYDEC shall also be submitted to the DRBC.

c. Detailed operational records of each reservoir, maintained by both the City and State Reservoir Release Managers, shall be available to the DRBC upon request.

d. The provisions of the reservoir release program approved herein shall not be applicable to any action taken by NYC-DEP or NYDEC with regard to the operation of the Cannonsville, Pepacton, or Neversink Reservoirs in any emergency situation where there is a threat to the continued existence or safe operation of the dams or tunnels or to any appurtenant structures or to the public health or safety. Any emergency action shall continue only for such time as is necessary to avert the threat and is subject to the approval of the Executive Director of the DRBC.

e. Increases in the augmented conservation release levels may not be made except in accordance with the allowances provided for in the Stipulation of Discontinuance in The City of New York vs. The State of New York Department of Environmental Conservation, Index No. 5840-80, and shall be subject to approval by the DRBC.

f. Releases under emergency conditions. The Commission retains its power under Section 3.3(a) and Article 10 of the Compact to declare a drought emergency after consultation with the River Master, in order to conserve the waters in the Delaware River and its tributaries and in the reservoirs of the Upper Delaware River Basin, in order to protect water supply, health, and safety of the residents of the Delaware River Basin and its service area. The River Master retains all of his powers under the Decree including the powers under Article VII, B.1 of the 1954 Decree to conserve the waters in the river, its tributaries, and in reservoirs owned by the City of New York, or in reservoirs developed by other parties to the Decree after 1954.

BY THE COMMISSION

DATED:
FIGURE 1
OPERATION CURVES FOR
CANNONSVILLE, PEPACTON AND NEVERSINK RESERVOIRS

Storage (billion gallons)

0 20 40 60 80 100 120 140 160 180 200 220 240 260 280

J J A S O N D J F M A M

NORMAL

DROUGHT WARNING

DROUGHT

D-77-20 CP (Revised)
BE IT RESOLVED by the Delaware River Basin Commission:

1. The Commission invites each of the parties to the 1954 Supreme Court Decree in their individual capacities to enter into serious good faith discussions to establish the arrangements, procedures, and criteria for management of the waters of the Delaware Basin consistent with the Compact.

   The Commission also invites the participation or assistance of the United States to the extent it shall be requested by the parties.

2. To assist the parties, the Commission staff shall provide technical information as requested by the parties.

3. The Commission urges the parties to undertake these discussions promptly with the view of concluding by October 1, 1979, unless extended by the agreement of the parties. At the conclusion of the discussions, the Commission invites the parties to submit any agreement reached to the Commission for approval pursuant to the Compact.

4. The Commission requests the chief executive and legal officers of the respective parties to the 1954 Decree to exchange letters agreeing to enter into good faith discussions consistent with this Resolution by December 31, 1978.

5. Each of the parties participating in these discussions preserves any rights, claims or defenses which exist as of the date of this Resolution. This Resolution shall not be deemed an action which shall alter, impair, diminish or adversely affect the rights, powers, privileges, conditions or obligations contained in the Compact or 1954 Decree.

Sherman W. Tribbitt, Chairman pro tem

W. Brinton Whitall, Secretary

ADOPTED: December 13, 1978
A RESOLUTION to amend the Comprehensive Plan and Basin Regulations relating to water quality standards.

WHEREAS, the Commission staff has conducted a comprehensive study of water supply and demand in the Delaware River Basin (Level B Study), and has recommended certain revisions to the Commission's Water Quality Standards relating to salinity (chloride and sodium concentrations) of water in the tidal Delaware River; and

WHEREAS, the Level B Study considered alternative salinity-control standards, expressed as maximum 30-day chloride concentrations at river-mile 98, from 121 mg/l to 220 mg/l, and corresponding sodium concentrations from 67 mg/l to 122 mg/l; and

WHEREAS, the parties to the amended decree of the United States Supreme Court in New York v. New Jersey, 347 U.S. 995 (1954) have recommended certain revisions to the Commission's Water Quality Standards relating to salinity (chloride and sodium concentrations) of water in the Delaware estuary; and

WHEREAS, the Commission held public hearings on May 25, June 2, and June 3, 1983, on these recommended revisions, and has received and considered testimony from water users and other interested parties; now therefore,

BE IT RESOLVED by the Delaware River Basin Commission:

1. The Comprehensive Plan and Article 3 of Basin Regulations--

   Water Quality are hereby amended as follows:
A. Amend subsection 3.30.3C.12 to read:

12. Chlorides. Maximum 30-day average concentration of 180 mg/l at R.M. 98.

B. Insert new subsection 3.30.3C.14 to read:

14. Sodium. Maximum 30-day average concentration of 100 mg/l at R.M. 98.

C. Delete subsection 3.30.4C.12.

/s/ R. Timothy Weston
R. Timothy Weston, Chairman pro tem

/s/ Susan M. Weisman
Susan M. Weisman, Secretary

ADOPTED: June 29, 1983
A RESOLUTION to amend the Comprehensive Plan by establishing the policy that the drought of record will be used as the basis for determination and planning of dependable water supply.

WHEREAS, the Commission staff has conducted a comprehensive study of water supply and demand in the Delaware River Basin (Level B Study), and has recommended certain revisions to the Commission's Comprehensive Plan relating to design drought for water supply and salinity control; and

WHEREAS, the parties to the amended decree of the United States Supreme Court in New York v. New Jersey, 347 U.S. 995 (1954) have recommended certain revisions to the Commission's Comprehensive Plan relating to design drought; and

WHEREAS, the Commission held public hearings on May 25, June 2, and June 3, 1983, on these recommended revisions, and has received and considered testimony from water users and other interested parties; now therefore

BE IT RESOLVED by the Delaware River Basin Commission:

1. The Comprehensive Plan and Article 2 of the Water Code of the Delaware River Basin are hereby amended by the addition of a new Section 2.400 to read as follows:

    2.400 Design Streamflow Criteria

        2.400.1 Water Supply. The drought of record, which occurred in the period 1961-1967, shall be the
basis for determination and planning of dependable Basin water supply.

2.400.2 Salinity Control. The drought of record, which occurred in the period 1961-1967, shall be the basis for planning and development of facilities and programs for control of salinity in the Delaware estuary.

2.400.3 Waste-Assimilative Capacity. (See Section 4.30.7.7 of Basin Regulations--Water Quality--Administrative Manual--Part III.)

/s/ R. Timothy Weston
R. Timothy Weston, Chairman pro tem

/s/ Susan M. Weisman
Susan M. Weisman, Secretary

ADOPTED: June 29, 1983
NO. 83-13

A RESOLUTION to amend the Comprehensive Plan relating to criteria for defining drought warning and drought conditions, and to a schedule of phased reductions in diversions, releases and flow objectives during such periods.

WHEREAS, the allowable diversions out of the Delaware River Basin to New York City and northeastern New Jersey, as well as downstream releases from the City's upper basin reservoirs, are prescribed under the provisions of the 1954 amended decree of the United States Supreme Court; and

WHEREAS, the Commission has declared a drought emergency condition on two occasions in 1965 and 1981 pursuant to Section 3.3(a) and Section 10.4 of the Delaware River Basin Compact; and

WHEREAS, the adoption of criteria in advance as to what constitutes drought conditions warranting emergency action will be useful to water users and the general public, as well as to water management officials of the parties; and

WHEREAS, the experience during these emergencies has shown the value of a drought operation formula setting forth diversion rates and streamflow objectives for guidance of reservoir operation; and

WHEREAS, the Commission has held public hearings on May 25, June 2, and June 3, 1983 on the proposed criteria and schedule recommended by the parties to the amended 1954 decree of the United States Supreme Court, and has received and considered testimony from water users and other interested parties; now therefore,
BE IT RESOLVED by the Delaware River Basin Commission:

1. The Comprehensive Plan and Article 2 of the Water Code of the Delaware River Basin are hereby amended by the addition of new Sections 2.5.3 and 2.5.4 to read as follows:

2.5.3 Schedule of Phased Reductions in Diversions, Releases and Flow Objectives During Drought

A. Criteria Defining Conditions

For purposes of water management pursuant to Section 3.3 and Article 10 of the Compact, diversions of water from the Delaware River Basin by the City of New York and State of New Jersey, compensating reservoir releases from the New York City Delaware Basin Reservoirs, reservoir releases from Beltzville Reservoir, Blue Marsh Reservoir, and other reservoirs under the jurisdiction or control of the Commission, and streamflow objectives at the USGS gaging stations located at Montague, New Jersey, and Trenton, New Jersey, shall be governed by a schedule based upon a differentiation among "normal", "drought warning", and "drought" conditions defined by the combined storage in the Cannonsville, Pepacton and Neversink Reservoirs as set forth in Figure 1 entitled "Operation Curves for Cannonsville, Pepacton and Neversink Reservoirs". The division of the drought-warning zone into upper and lower halves shall be defined as a physically equal division, or 20 billions of gallons in each zone.

B. Schedule of Reductions

The schedules of phased reductions set forth in Tables 1 and 2 shall govern (1) the maximum allowable rates of diversion of waters from the Delaware River Basin by the City of New York and State of New Jersey; (2) the minimum compensating releases to be made by the City of New York from its reservoirs in the upper Delaware Basin; and the streamflow...
FIGURE 1

Operation curves for Cannonsville, Pepacton and Neversink Reservoirs.
TABLE 1

Interstate Operation Formula for Reductions
In Diversions, Releases, and Flow Objectives
During Periods of Drought

<table>
<thead>
<tr>
<th>NYC Storage Condition</th>
<th>NYC Div. mgd</th>
<th>NJ Div. mgd</th>
<th>Montague Flow Objective cfs</th>
<th>Trenton Flow Objective cfs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>800</td>
<td>100</td>
<td>1750</td>
<td>3000</td>
</tr>
<tr>
<td>Upper Half—Drought Warning</td>
<td>680</td>
<td>85</td>
<td>1655</td>
<td>2700</td>
</tr>
<tr>
<td>Lower Half—Drought Warning</td>
<td>560</td>
<td>70</td>
<td>1550</td>
<td>2700</td>
</tr>
<tr>
<td>Drought</td>
<td>520</td>
<td>65</td>
<td>1100-1650*</td>
<td>2500-2900*</td>
</tr>
</tbody>
</table>

Severe Drought (to be negotiated based on conditions)

*Varies with time of year and location of salt front as shown on Table 2.

TABLE 2

Flow Objectives for Salinity Control
During Drought Periods

<table>
<thead>
<tr>
<th>Seven-day Average Location of &quot;Salt Front,&quot; River-mile*</th>
<th>Flow Objective, Cubic Feet Per Second At: Montague, N.J.</th>
<th>Trenton, N.J.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dec-Apr</td>
<td>May-Aug</td>
</tr>
<tr>
<td>Upstream of R.M. 92.5</td>
<td>1600</td>
<td>1650</td>
</tr>
<tr>
<td>Between R.M. 87.0 and R.M. 92.5</td>
<td>1350</td>
<td>1600</td>
</tr>
<tr>
<td>Between R.M. 82.9 and R.M. 87.0</td>
<td>1350</td>
<td>1600</td>
</tr>
<tr>
<td>Downstream of R.M. 82.9</td>
<td>1100</td>
<td>1100</td>
</tr>
</tbody>
</table>

*Measured in statute miles along the navigation channel from the mouth of Delaware Bay.
objectives at the USGS gaging stations located at Montague, New Jersey and Trenton, New Jersey.

During "drought" conditions as defined by Figure 1, the streamflow objectives at the Montague and Trenton gaging stations shall be established as set forth in Table 2, in accordance with the seven-day average location of the 250 mg/l isochlor (the "salt front") in the Delaware Estuary.

C. **Diversion Allowances and Release Requirements**

(1) The City of New York may divert waters from the Delaware Basin at maximum rates equivalent to the quantities set forth in Table 1.

(2) The State of New Jersey may divert waters from the Delaware River Basin, from the Delaware River or its tributaries in New Jersey, at maximum rates equivalent to the quantities set forth in Table 1.

(3) The City of New York shall release water from one or more of its storage reservoirs in the upper Delaware Basin in quantities designed to maintain the minimum basic rates of flow at the USGS gaging station located at Montague, New Jersey, as set forth in Tables 1 and 2.

D. **Computation of Diversions**

(1) Diversions by the City of New York during "normal" conditions, as defined by Figure 1, shall be computed as provided in Section III.A.4. of the Amended Decree of the U. S. Supreme Court in New Jersey v. New York, 347 U.S. 995 (1954). At no time during a twelve-month period of the Water Year, commencing June 1, shall the aggregate total quantity diverted by the City of New York, divided by the number of days elapsed since the preceding May 31, exceed the maximum permitted rate of diversion.
(2) Diversions by the State of New Jersey during "normal" periods, as defined by Figure 1, shall be computed as provided in Section V.B. of the amended Decree of the U.S. Supreme Court in New Jersey v. New York, 347 U.S. 995 (1954). The total diversion by the State of New Jersey shall not exceed an average of 100 mgd as a monthly average, with the diversion on any day not to exceed 120 million gallons, and its total diversion without compensating releases shall not exceed 100 mgd during any calendar year.

(3) Diversions by the City of New York and State of New Jersey set forth in Table 1 during "drought warning" and "drought" conditions as defined by Figure 1, shall be computed as a daily running average, commencing on the day such drought warning or drought operations become effective, as provided in subsection E of this Section. If the allowable diversion for any condition period following entry into drought warning operations is not fully used, the unused portion may not be credited or used during subsequent periods.

(4) Upon return to normal condition operations, following a period of drought warning or drought operations, diversions by the City of New York and State of New Jersey shall be computed as averages commencing upon the date of return to normal operations.

E. Effective Period for Drought Operating Schedule

(1) The schedule of diversions, releases and streamflow objectives for "drought warning" operations as provided in Subsection B shall go into effect automatically whenever the combined storage in the New York City Delaware Basin Reservoirs declines below the drought
warning line, defined in Figure 1 and remains below that line for five consecutive days.

(2) The schedule of diversions, releases and streamflow objectives for "drought" operations as provided in Subsection B shall go into effect immediately whenever the combined storage in the New York City Delaware Basin reservoirs declines below the drought line defined in Figure 1, and remains below that line for five consecutive days.

(3) When the combined storage in the New York City Delaware Basin reservoirs (including the projected water runoff equivalent of actual snow and ice within the watersheds tributary to the reservoirs) reaches a level 15 billion gallons above the drought warning line, as defined in Figure 1, and remains above that level for five consecutive days, the drought warning and drought operations schedules set forth in Subsection B shall automatically terminate, and normal operations shall be resumed as provided in the Amended Decree of the U. S. Supreme Court in New Jersey v. New York, 347 U.S. 995 (1954).

(4) Pursuant to Section 3.3(a) of the Compact, the Parties to the U. S. Supreme Court Decree in New Jersey v. New York, 347 U.S. 995 (1954), have given their unanimous consent to adoption and implementation by the Commission of the drought operation schedules provided in this section. The Parties have agreed that the drought operation formula will go into effect automatically, and be binding on parties for not less than 180 days following the triggering of drought warning operations, unless terminated automatically by improved storage conditions as provided in Subsection E.3. During the 180-day period following triggering of drought warning operations, authorized representatives of the City of
New York, States of Delaware, New Jersey, and New York, and Commonwealth of Pennsylvania, as parties to the U. S. Supreme Court Decree, shall convene no less frequently than once each month to review current conditions, and they may extend, modify, or extend as modified the schedules provided in this section. If no unanimous agreement as to a continuing drought operation formula is reached within the 180-day period, all Parties shall be released from the terms of the formula and schedules and may pursue their rights and obligations under the Delaware River Basin Compact and the U. S. Supreme Court Decree.

2.5.4 Drought Emergency Actions

A. Criteria Defining Conditions

For purposes of water management pursuant to Section 3.3 and Article 10 of the Compact, the determination of drought warning and drought conditions shall be based upon the combined storage in the Cannonsville, Pepacton and Neversink Reservoirs, in accordance with Figure 1, entitled "Operation Curves for Cannonsville, Pepacton and Neversink Reservoirs". The division of the drought-warning zone into upper and lower halves shall be defined as a physically equal division, or 20 billions of gallons in each zone.

B. Drought Emergency Declaration

It is the policy of the Commission that a drought emergency will be declared for purposes of imposing mandatory in-basin conservation measures and other appropriate actions whenever combined storage in the New York City Delaware Basin reservoirs falls into the drought zone as defined in Figure 1 for five consecutive days. Termination of a drought emergency will be considered by the Commission whenever combined storage in the New York City Delaware Basin reservoirs reaches a level 40 billion
gallons above the drought warning line as defined in Figure 1 and remains above that line for 30 consecutive days. The drought emergency will be terminated by the Commission whenever the combined storage in the New York City Delaware Basin reservoirs reaches 40 billion gallons above the drought warning line defined in Figure 1 and remains above that line for 60 consecutive days, unless the Commission unanimously agrees to extend the emergency.

Effect of Policy

This policy is not intended to extend, impair, or conflict with the Commission's authority under the Compact to declare or terminate a drought emergency or water-shortage emergency in the Basin, or subregion thereof, in other instances as conditions may require.

/s/ R. Timothy Weston
R. Timothy Weston, Chairman pro tem

/s/ Susan M. Weisman
Susan M. Weisman, Secretary

ADOPTED: June 29, 1983
A RESOLUTION to amend the Comprehensive Plan by the addition of policy on the conservation of water.

WHEREAS, the Delaware River Basin Comprehensive (Level B) Study of May, 1981 concluded that the goal of a 15 percent reduction in depletive use shall be established for application during declared water emergencies; and

WHEREAS, the Governors of the four Basin States and the Mayor of New York City have unanimously agreed to the Interstate Water Management Recommendations of the Parties to the U.S. Supreme Court Decree of 1954 to the Delaware River Basin Commission Pursuant to Commission Resolution 78-20; and

WHEREAS, Recommendation 11 of these Interstate Water Management Recommendations states that:

The Commission should include within its Comprehensive Plan a statement of general policy that conservation measures in the Basin designed for implementation during drought periods shall be based upon the objective of reducing overall depletive use of fresh water by 15 percent; and

WHEREAS, the Commission held public hearings on May 25, June 2, and June 3, 1983 on this proposed amendment, and has received and considered testimony from water users and other interested parties; now therefore,

BE IT RESOLVED by the Delaware River Basin Commission:
The Comprehensive Plan and Article 2 of the Water Code of the Delaware River Basin are amended by the addition of new Section 2.1.4 to read as follows:

2.1.4 Depletive Use Reduction During Drought

It shall be the policy of the Commission that conservation measures in the Basin designed for implementation during drought periods shall be based upon the objective of reducing overall depletive use of fresh water by 15 percent.

/s/ R. Timothy Weston
R. Timothy Weston, Chairman pro tem

/s/ Susan M. Weisman
Susan M. Weisman, Secretary

ADOPTED: June 29, 1983
A RESOLUTION to amend the Comprehensive Plan relating to coordinated operation of Delaware River Basin Reservoirs during basinwide drought.

WHEREAS, the Governors of the four Basin States and the Mayor of New York City have unanimously agreed to the Interstate Water Management Recommendations of the Parties to the U. S. Supreme Court Decree of 1954 to the Delaware River Basin Commission Pursuant to Commission Resolution 78-20; and

WHEREAS, Recommendation 4 of these Interstate Water Management Recommendations declares in pertinent part that:

The Commission should develop a plan for coordinated operation of other existing impoundments during drought periods to complement the operating formula for the New York City reservoirs in order to maintain reliable supplies for essential uses, to conserve water, and to control salinity.

The plan should include operating criteria for the Beltzville, Blue Marsh, Walter, Prompton and Nockamixon projects, and the hydroelectric power reservoirs in the Basin of the Pennsylvania Power and Light Company and Orange and Rockland Utilities, Inc.; and

WHEREAS, the Delaware River Basin Commission's Flow Management Technical Advisory Committee has conducted a study and made recommendations for a coordinated plan for basinwide drought situations; and

WHEREAS, the Commission held a public hearing on March 28, 1984 on this recommended plan and has received and considered testimony from water users and other interested parties; now therefore

BE IT RESOLVED by the Delaware River Basin Commission:

1. The Comprehensive Plan and Article 2 of the Water Code of the Delaware River Basin are hereby amended by the addition of a new Section 2.5.5 to read as follows:
2.5.5 Coordinated Operation of Lower Basin and Hydroelectric Reservoirs During a Basinwide Drought.

During "drought" conditions as defined by Figure 1 in Section 2.5.3A, the Francis E. Walter, Prompton, Beltzville, Blue Marsh, Nockamixon, Lake Wallenpaupack and Mongaup hydroelectric reservoirs, will be utilized to complement the drought management operations of the New York City reservoirs. The priority of lower basin reservoir use to meet Trenton flow objectives is set forth in Table 1.

Table 1

Priority of Use for Existing Lower Basin Reservoirs during Drought

<table>
<thead>
<tr>
<th>Priority</th>
<th>Trenton Objective</th>
<th>Remaining Storage (%)bg</th>
<th>cfs-days Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Prompton*/**</td>
<td>73.7/9.89</td>
<td>5,475</td>
</tr>
<tr>
<td>2</td>
<td>F.E. Walter**</td>
<td>68.9/5.13</td>
<td>3,595</td>
</tr>
<tr>
<td>3</td>
<td>Beltzville to Elev. 615</td>
<td>68.7/9.00</td>
<td>6,364</td>
</tr>
<tr>
<td>4</td>
<td>Blue Marsh to Elev. 283***</td>
<td>38.0/5.10</td>
<td>7,411</td>
</tr>
<tr>
<td>5</td>
<td>Nockamixon to Elev. 385</td>
<td>36.8/2.74</td>
<td>3,700</td>
</tr>
<tr>
<td>6</td>
<td>Beltzville to Elev. 590</td>
<td>3.4/0.45</td>
<td>7,198</td>
</tr>
<tr>
<td>7</td>
<td>Blue Marsh to Elev. 273</td>
<td>13.0/0.97</td>
<td>2,735</td>
</tr>
<tr>
<td>8</td>
<td>Nockamixon to Elev. 325.5</td>
<td>1.0/0.13</td>
<td>13,745</td>
</tr>
</tbody>
</table>

* Subject to reconstruction of temporary control gate (depending on final negotiations with the Corps of Engineers).
** Would first require filling of temporary storage, so would not likely be available during the first year of a drought (use subject to final negotiations with the Corps of Engineers).
*** Blue Marsh Reservoir augments flow of the Schuylkill River and the Delaware River downstream of the Trenton gage at Philadelphia; however, for estuarine salinity control, flow augmentation in the Schuylkill River has roughly the same effect as an equal augmentation in the Delaware River at Trenton.
**** Sufficient storage would be retained to supply the needs of the Western Berks Water Authority.
Lake Wallenpaupack and the Mongaup reservoirs would be called upon to provide releases to assist in meeting the Montague flow objective in the summer and fall periods whenever reservoir releases would have to be directed by the River Master. These releases would be independent of lower basin release requirements needed to maintain flows at Trenton. After issuance of a Conservation Order by the Commission, the power companies, as agreed upon, shall make power generation releases from storage only in accordance with Commission direction. For Lake Wallenpaupack, the schedule is set forth in Table 2.

While the Lake Wallenpaupack schedule is designed to meet drought management requirements, the Lake levels have been established to preserve the recreation value of the Lake during the summer months.

Table 2
Lake Wallenpaupack Elevation Schedule During Drought Conditions

| Month  | Elevation (ft.) | Daily Average* Discharge (cfs/24 hr.)*
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>June</td>
<td>1187.0</td>
<td>308</td>
</tr>
<tr>
<td>July</td>
<td>1185.0</td>
<td>297</td>
</tr>
<tr>
<td>August</td>
<td>1182.0</td>
<td>232</td>
</tr>
<tr>
<td>September</td>
<td>1179.0</td>
<td>247</td>
</tr>
<tr>
<td>October</td>
<td>1176.0</td>
<td>254</td>
</tr>
<tr>
<td>November</td>
<td>1173.0</td>
<td>282</td>
</tr>
<tr>
<td>December</td>
<td>1170.0</td>
<td>25</td>
</tr>
<tr>
<td>January</td>
<td>1171.1</td>
<td>25</td>
</tr>
<tr>
<td>February</td>
<td>1172.2</td>
<td>25</td>
</tr>
<tr>
<td>March</td>
<td>1176.6</td>
<td>25</td>
</tr>
<tr>
<td>April</td>
<td>1180.0</td>
<td>25</td>
</tr>
<tr>
<td>May</td>
<td>1184.9</td>
<td>25</td>
</tr>
<tr>
<td>June</td>
<td>1187.0</td>
<td>308</td>
</tr>
</tbody>
</table>

* Based on 1960's drought of record inflows.
** Daily release volume may be provided during "on peak" power periods.

For the Mongaup reservoirs, a drought operation rule curve will be followed. The rule curve will be based on maximum available storage of 15.38 billion gallons for the total system and will provide for refilling the system during the worst hydrologic year of record and for maintaining a minimum release. Daily average discharge for the period June-November inclusive
generally will be on the order of 100-150 cfs/24-hours and for the period December-May inclusive generally will be on the order of 20-30 cfs/24-hours.

Temporary storage in Prompton reservoir would be used to help meet the Trenton objective; however, depending on upper and lower Basin conditions, Prompton releases could also be used for a Montague objective if there was a critical need to conserve storage in the New York City Delaware Basin reservoirs and the combined storage in the Beltzville and Blue Marsh reservoirs was above 70% of capacity.

Francis E. Walter reservoir will be called upon to meet the Trenton flow objective only after any storage in Prompton is depleted. It is understood, however, that until this dam is modified to retain water supply storage, its function is flood control. It will not likely be available for flow maintenance during the first year of a drought if such drought is declared subsequent to June 1, or the end of the heavy spring runoff period. Water could be stored temporarily in flood control storage upon issuance of requests for storage and releases after issuance of a Conservation Order by the Commission. In the event of a threatening major storm, temporarily stored water may have to be released in order to restore the necessary flood protection capacity of the dam. Water may also have to be released in order to draw down to the winter drought pool level at elevation 1,370. (See Table 3). If releases to meet winter drought pool requirements or to prepare for a storm occur when releases are not required for the Trenton flow objective, then the Montague requirement would be adjusted in order to save equivalent water in the New York City Delaware Basin reservoirs. In so doing, the storage saved in the New York City reservoirs would be available for use later should the drought persist, or be available, if conditions improve, to return to a normal condition at an earlier date, at which time restrictions could be lifted.
Table 3
Temporary Emergency Water Supply Storage at F.E. Walter Reservoir
(Pursuant to Drought Declaration)

<table>
<thead>
<tr>
<th>Elevation</th>
<th>Surface Area (acres)</th>
<th>Storage (inches (acre-ft.) (bg) (runoff))</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.E. Walter Reservoir— (DA 288 sq mi.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drought Summer Pool*</td>
<td>1392</td>
<td>824</td>
</tr>
<tr>
<td>Drought Winter Pool**</td>
<td>1370</td>
<td>587</td>
</tr>
<tr>
<td>Normal Pool</td>
<td>1300</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>1245</td>
<td>0</td>
</tr>
</tbody>
</table>

* Drought summer pool=11.30 billion gallons of temporary water supply storage (32% of flood control storage).
** Drought winter pool=6.21 billion gallons of temporary water supply storage (18% of flood control storage).

While it is clearly understood that the water supply storage at Beltzville and Blue Marsh reservoirs is to be used for water supply and to control salinity intrusion into the Delaware estuary during low flow periods, it is also recognized that extensive recreational development is established on these lakes, which should be protected to the extent possible. Accordingly, the operation plans for both of these reservoirs, as well as Nockamixon, in drought emergencies have recognized these multiple uses, with water supply having precedence.

After Francis E. Walter, then Beltzville, Blue Marsh, and Nockamixon reservoirs are used in that order down to the elevations indicated in Table 1 for priorities 3 and 4, at which elevations recreation will become affected. Recreation will then be eliminated at Beltzville and Blue Marsh while retaining fish life, as those two reservoirs are drawn down to the elevations indicated as priorities 5 and 6. Finally, all remaining usable storage would be utilized as indicated by priorities 7 and 8.
When only conservation releases are being made from the lower Basin reservoirs, they will be modified according to Table 4, beginning with "drought warning" conditions; as defined by Figure 1 in Section 2.5.3A. Drought conservation releases will terminate and return to normal at the same time as augmented conservation releases are restored at the New York City Delaware reservoirs.

Table 4
Conservation Releases

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Normal Conservation Release (cfs)</th>
<th>Drought Warning and Drought Conservation Release (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.E. Walter</td>
<td>50</td>
<td>43</td>
</tr>
<tr>
<td>Prompton</td>
<td>inflow-outflow</td>
<td>6</td>
</tr>
<tr>
<td>Beltsville</td>
<td>35</td>
<td>15</td>
</tr>
<tr>
<td>Blue Marsh</td>
<td>41 (50*)</td>
<td>21 (30*)</td>
</tr>
<tr>
<td>Nockamixon</td>
<td>11</td>
<td>7</td>
</tr>
</tbody>
</table>

* With Western Berks Water Authority release included. As the future needs of the Authority increase, the release will correspondingly increase.

Operation of the lower Basin reservoirs for drought management will continue until termination of the drought emergency declaration by the Commission.

2. This operating plan will be reviewed by the Commission periodically. and will be subject to revision when additional water storage projects become operational.

/s/ George J. Kanuck, Jr.
George J. Kanuck, Jr., Chairman pro tem

/s/ Susan M. Weisman
Susan M. Weisman, Secretary

ADOPTED: April 25, 1984
RECOMMENDATIONS FOR ALTERNATIVE FINANCING AND WATER CHARGING SYSTEMS FOR THE DRBC-SPONSORED WATER STORAGE PROJECTS OF BELTZVILLE, BLUE MARSH, AND FRANCIS E. WALTER RESERVOIRS

PURSUANT TO DRBC RESOLUTION NO. 85-35

By
Commissioners and Staff
of the
Delaware River Basin Commission

April 7, 1988
I. INTRODUCTION

The Delaware River Basin Commission's (DRBC) current method for financing the existing water storage projects of Beltzville and Blue Marsh is twofold. Annual capital appropriations are made each year by Pennsylvania and New Jersey in the amounts of $25,000 and $2,000, respectively. Additional revenues are obtained by charging post-Compact surface water users for water withdrawn and returned, as well as water consumed (evaporated or otherwise lost to the Basin's hydrologic cycle).

The current charging rate is $0.06 per thousand gallons consumed and $0.0006 per thousand withdrawn and returned. This charging rate is reduced for any user in proportion to the users reduced impact on chloride levels in the estuary (replacement factor effect).

Presently, the DRBC charges forty-three (43) post-Compact surface water users a total of approximately $800,000 per year. Those revenues combined with the $27,000 per annum state contributions are enough to meet the annual principal, interest, operation and maintenance and associated project cost commitments for the Beltzville and Blue Marsh Projects.

The problem is that if these few Basin users were required to pay the additional annual costs for the proposed Francis E. Walter Project, their annual charges would increase approximately twelve-fold. This is unconscionable.

Most of the major users in the Basin are pre-Compact water users and Section 15.1(b) of the Compact precludes us from charging them for the cost of necessary DRBC-sponsored projects, even though they do benefit.

That is the reason the DRBC recommends amendment of Section 15.1(b) in Congress -- to allow user charges to be levied on all water users to the extent that their use necessitates the projects.

Various approaches to a "fair and equitable" charging system have been considered extensively over the past two years. They were included in three different processes culminating in the following documents:

- The DRBC issuance entitled Background Paper - Financing Basin Water Projects and Potential Modification of Section 15.1(b) of the Delaware River Basin Compact;
- Report On Relative Benefit Allocation and Alternative Water Charge Schedules for Commission Sponsored Reservoir Projects. The Delaware River Basin Commission, Volumes 1 and 2, as prepared by the firm of Black & Veatch; and
- Final Summary Report and Recommendations of the Water Project Financing and Water Charges Advisory Committee, prepared pursuant to DRBC Resolution No. 85-35.
II. SUMMARY OF THE "BACKGROUND PAPER"

The DRBC "Background Paper" considered such factors as:

- The reliability of the charging system to generate revenues to secure project bonds;

- Equity between pre- and post-Compact water users;

- The necessity to revise Section 15.1(b) of the Compact to provide equity among users;

- The fact that ground water users, as well as surface water users, benefit from DRBC-sponsored water storage projects;

- A two-tiered charging system wherein pre-Compact users would pay less than post-Compact users;

- Four options for a charging system based simply upon a lower rate for water withdrawn and returned, and a higher rate for water consumed, with the other variable being higher and lower rates for post- and pre-Compact users, respectively; and

- Other general options such as: 1) increase state contributions to the DRBC Capital Fund; 2) raise rates for post-Compact users only; 3) and don't build the project.

The "Background Paper" was aired at open briefings for the purpose of obtaining public reaction at the following locations:

- Wilmington, Delaware April 30, 1985
- King of Prussia, Pennsylvania May 13, 1985
- West Trenton, New Jersey May 20, 1985

III. SUMMARY OF THE INDEPENDENT CONSULTANT'S RECOMMENDATIONS

Utilization of an independent consultant to recommend alternative charging systems based upon water users' benefits to be derived from the projects was urged by the State of Delaware. That, coupled with many comments received during the public briefings on the "Background Paper" which recommended that all users should pay their "fair share," led the Commissioners to unanimously pass the resolution authorizing the independent study.

It is important to point out that the Water Project Financing and Water Charges Advisory Committee held back-and-forth communications with the consultant, Black & Veatch, during various stages of the consultant's effort and the Committee's deliberations.
Another important element that changed during the consultant's effort was that it was decided that the two existing DRBC-sponsored water storage projects, Beltzville and Blue Marsh, should be incorporated into any charging system with the new project of F. E. Walter. The rationale for that approach was that all three projects would be operated as a system for the benefit of all. The Advisory Committee agreed with that approach.

The Black & Veatch report focused on three types of water charging alternatives. First was a hybrid "benefits/cost causative" approach dubbed the "Benefits Based Charge" and known as Alternative A. It included the following elements:

- Compensation for depletive use 43%
- Reduced risk of restriction of essential depletive use 10%
- Increased supply for future depletive use 20%
- Salinity control 24%
- Increased reliability of supply 2%
- Recreation downstream 1%

100%

The "Alternative A" water charging included a single set of assumptions as follows:

- Post-Compact users would pay at a rate three times that of pre-Compact;
- Both surface and ground water users would pay the same rate, based upon their location in the Basin, unless they directly benefited from salinity protection, in which case they would pay more;
- The cost would be based upon four projects (Beltsville, Blue Marsh, F.E. Walter, and Prompton);
- Some surface water users would pay a small amount for increased reliability of supply;
- A charging threshold of 100,000 gpd withdrawal would be applied, exempting those under and not billing for the first 100,000 gpd for those over;
- The New Jersey diversion depletion charging factor would be 100%;
- Merrill Creek Owners Group adjustment factor would be 95%; and
- Agricultural irrigation charges would be based on 100% of depletive use.

This resulted in a totally user pay alternative which produced the following picture:
### Water Use Revenues

<table>
<thead>
<tr>
<th>State</th>
<th>$</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>$41,100</td>
<td>0.20</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>9,530,600</td>
<td>46.17</td>
</tr>
<tr>
<td>New Jersey In-Basin</td>
<td>9,040,800</td>
<td>46.17</td>
</tr>
<tr>
<td>New Jersey Diversion</td>
<td>1,599,300</td>
<td>7.77</td>
</tr>
<tr>
<td>New Jersey Total</td>
<td>10,640,100</td>
<td>51.55</td>
</tr>
<tr>
<td>Delaware</td>
<td>429,000</td>
<td>2.08</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$20,640,800</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

This "Alternative A" charging scenario was included in Black & Veatch's draft final report and caused considerable controversy when released to the Advisory Committee and other major users.

It generated opposition from several members of the New York Congressional delegation because DRBC's Comprehensive Plan policy, adopted pursuant to the "Good Faith" agreement held that the three down-Basin states would finance F. E. Walter and Prompton.

Some major users in the Basin claimed that they would pay an inordinately large amount, especially some surface water users in the estuary. The agricultural users opposed any fee, and D&R Canal diversion users thought the 100% charge for depletive use was too high. Similarly, the electric utility users felt that only a 5% credit for their construction of Merrill Creek was unfair.

Confronted with that opposition, the DRBC Commissioners requested Black & Veatch to return to the drawing board.

Two additional approaches to a charging system were considered, involving three projects (exempting Prompton).

The second system, known as "Alternative B - Cost Causative Charge," focused upon the costs of providing benefits from the three projects. Though it included the factor of salinity control due to sea level rise, it did not include the factor related to improving the salinity standard from 180 ppm to 150 ppm. However, the pricing system did include a surcharge for salinity protection.

The assumptions for thirteen (13) different scenarios under "Alternative B" were:

- Threshold charge: Over 100,000 gpd withdrawal;
- N.J. diversion depletive use factor: 10%, 50%, or 100%;
- Merrill Creek Owners Group adjustment factor: 52%, 75% or 95%;
- Agricultural Irrigation: 100% of depletive use or 50% of withdrawals.

It is important to point out that the DRBC Commissioners did not direct Black & Veatch to establish a set of alternatives which would provide some "up-front" funding by the States to pay for a "public good" category, as requested by the Advisory Committee.
The results of the 13 different combinations of assumptions produced the following ranges of revenues.

<table>
<thead>
<tr>
<th>% Revenues by State</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>New York 0.28</td>
</tr>
<tr>
<td>Pennsylvania 49.74</td>
</tr>
<tr>
<td>New Jersey In-Basin 45.16</td>
</tr>
<tr>
<td>New Jersey Diversion 12.69</td>
</tr>
<tr>
<td>New Jersey Total 56.92</td>
</tr>
<tr>
<td>Delaware 4.92</td>
</tr>
</tbody>
</table>

The mix of assumptions for each of the 13 scenarios was requested by the three down-Basin State Commissioners.

The third set of alternatives was called the "Alternative C - Advisory Committee Alternative." The Advisory Committee's review of the preliminary draft report of Black & Veatch prompted a request for eight additional water charge alternatives. The requested alternatives are similar to Alternative A benefits based charges, except there is no benefit assignment for future depletive uses and all charges in New York State are exempt. Also, the charges were to be based on three projects, excluding Prompton, as was the case for "Alternative B".

The variables in the assumptions for Alternative C were:

- New Jersey Diversion Depletive Use Factor: 10% and 100%;
- Merrill Creek Owners Group Adjustment Factor: 52% and 95%;
- Agricultural Irrigation: 50% of Withdrawals and 100% of depletive use.

Revenues by State which would be produced by the eight scenarios of "Alternative C" follow:

<table>
<thead>
<tr>
<th>% Revenues by State</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>Pennsylvania 50.41</td>
</tr>
<tr>
<td>New Jersey In-Basin 49.66</td>
</tr>
<tr>
<td>New Jersey Diversion 11.71</td>
</tr>
<tr>
<td>New Jersey Total 56.35</td>
</tr>
<tr>
<td>Delaware 2.37</td>
</tr>
</tbody>
</table>
IV. THE ADVISORY COMMITTEE RECOMMENDATIONS

Final recommendations of the Advisory Committee were submitted to the DRBC on October 7, 1987. These recommendations were also submitted to the four Basin states' environmental agency heads:

- Commissioner Richard T. Dewling - New Jersey D.E.P.
- Secretary John E. Wilson - Delaware D.N.R.E.C.
- Secretary Arthur A. Davis - Pennsylvania D.E.R.
- Commissioner Thomas C. Jorling - New York D.E.C.

In summary, the Committee recognized the need for additional storage facilities in the Basin and urged the development of projects necessary to meet those needs, utilizing the following principles:

1. States should fund the "public good" benefits portion of the projects which should include, but not be limited to:
   - water quality, fisheries and recreation
   - sea level rise repulsion
   - estuarial saline standard improvement
   - reserve for future uses
   - coverage for those users exempt from charging and receiving credits
   - secondary economic benefits;

2. User charges should be based upon a "benefits analysis," rather than upon a uniform charge for all users;

3. A limited exemption should be developed for all water users, and should be no greater than necessary to provide a cost efficient administration of the user charges program;

4. New York State water users should be exempt from any water use charges if the Cannonsville Project or another acceptable alternative consistent with the "Good Faith" negotiations is implemented by New York State;

5. New Jersey should pay for a certain portion of the water diverted by the D&R Canal, as negotiated by the Commission;

6. Pre-Compact users should pay at a lesser rate than post-Compact users;

7. DRBC should build only one storage project at a time, and such scheduling should be based upon development of a reservoir operating plan, utilizing existing and proposed facilities;

8. Agriculture should be entitled to a credit for recharge;

9. Self-suppliers should be entitled to a credit against water use charges considering:
   - releases made during low flow periods as directed by regulatory agencies;
o capital and O&M costs to operate such instream release facilities;

o similar credit should be given to those operating pump storage facilities;

o the "release" should be determined as a certain quantity of water which provides a benefit to the Basin which would otherwise have to be provided by DRBC;

10. A user charge imposed upon one user should not be such that it subsidizes other users;

11. DRBC should administer the user fee program, but should have flexibility to utilize state or other agencies in collecting charges or funds;

12. The Black & Veatch report should not be the only basis for establishing user fees. Other issues such as those raised by the electric utilities should be considered;

13. Credits should be given to in-Basin transfers during low-flow conditions; and

14. DRBC should describe to the public its Basin operating plans for drought conditions, including the criteria to trigger emergency measures, and the expected frequency of those actions.

Further, the Committee believed that modification of 15.1 (b) was essential to implementation of a new water charging program, but it was necessary for the states to disclose their intentions to provide necessary financial support and act in accordance with the above recommendations.

V. CONSIDERATION OF POLICY ISSUES

The past ten years have demonstrated that the Delaware River Basin is quite vulnerable to drought. During the same period, the Delaware River Basin Commission has improved its modeling capabilities to assess the impacts of droughts, drought operations and storage requirements. These evaluations have reaffirmed the critical need for the F. E. Walter project. Without this project, modeling shows that some degree of drought response actions would be required in 50% of the years. F. E. Walter would greatly increase the amount of water the Commission would have to manage the flows entering the estuary, from 19.5 bg to 42.5 bg. In addition, the 16 bg provided by Merrill Creek Reservoir essentially triples the amount of upstream water available to maintain salinity standards and to replace consumptive uses of water.

The current DRBC salinity standard of 180 ppm chlorides, 30-day average at River Mile 98, and the projected chloride standard of 150 ppm at the year 2000, are both less stringent than the chloride standard DRBC maintained through 1983. However, the F. E. Walter project purpose is to maintain adequate flows for salinity protection during drought periods, and not to prevent salinity fluctuations in the estuary during normal times.
These two additional reservoirs, F.E. Walter and Merrill Creek, will not totally eliminate the threat of drought restrictions, but computer simulations show that they will make it possible to attain the salinity standard for the year 2000, despite sea level rise and projected water uses. The modeling also shows that while a few severe droughts will necessitate emergency actions such as marshalling other Basin reservoirs, the frequency of such actions will drop to about one third as often and when they do occur, the reservoirs would be used to a much lesser extent.

A major issue has been whether the states should provide funding toward this reservoir. Up-front funding has been considered by the Commissioners and a major question which has arisen is what should the states pay for. It has been suggested that they pay for future depletive water uses, the "public good" benefit, the improved salinity standards, sea level rise, or small exempted users. Then the question arises as to how much each of these elements costs, in relation to the major reasons for which the project is being built.

In a benefits approach, all kinds of factors can be put forth for consideration, but the real and most pressing reasons for the project are related to compensating for those factors which increase chloride levels in the estuary. The F.E. Walter project, along with the two existing DRBC-funded water storage projects of Beltzville and Blue Marsh, benefit the Basin by compensating for those factors which are:

1. Existing depletive water use in the Basin, whether pre- or post-Compact and as adjusted for relative effect in causing chloride intrusion;
2. Sea level rise;
3. The need to improve the chloride standard from 180 ppm to 150 ppm;
4. Out-of-Basin Diversion (New Jersey); and
5. Increased or new depletive water uses.

The Commissioners recognized that it would be inequitable for existing water users to pay for future water users, especially since some future users may be economic competitors. Therefore, the Commissioners recommend that the states fund future use up-front. Salinity is of primary importance to the users in the estuary and, therefore, the Commissioners believe that these users should pay a salinity surcharge.

In the final analysis, the Commissioners had to determine how much state funding could be expected to be allocated to this project. The Commissioners believe that the maximum amount which can be provided by the states is $20.8 million. This amount, utilized up-front, would substantially reduce the amount of money which the Commission will have to borrow to finance the project. The purpose of this up-front money is to defray costs to existing users, so they don't have to pay for future users, and to pay for the public good benefits of the project which cannot be attributed to specific users. In general, individual user fees would be reduced by about 40 percent from earlier studies if the up-front funding is provided.
Table 1 shows that a $20.8 million state contribution would reduce the annual cost of financing from $10.7 million to $8.8 million. This table also shows that if the Commission begins to collect user fees during the first year of construction, the annual financing costs would be reduced from $18.6 million to $10.7 million, due to having a substantial revenue source during the construction period of five years.

Assuming the states' willingness to provide $20.8 million, a method of distributing the remaining costs to the users was determined. One of the significant factors in determining a proposed cost allocation is the financial underwriting by the states. In obtaining the bonds to finance the project, the states will be requested to serve as underwriters to secure the loans. The Commissioners have agreed that the percentage each state should underwrite should be as close as possible to the expected revenues from users in its own state. The Commissioners recommend the existing water uses should be used to determine that percentage. The underwriting percentages work out to 46% each for New Jersey and Pennsylvania and 4% for Delaware.

To determine the cost allocation, the Commissioners decided to use three factors to assess the user: consumptive water use, nonconsumptive water use, and a salinity surcharge for users in the estuary. Several policy issues were also raised by the Advisory Committee which had to be addressed before a final proposal could be put forward. Those issues are discussed below.

**Issue: Should the charge be based on water withdrawn, depleted or both?**

The present DRBC surface water charging system charges for both consumptive and nonconsumptive use with consumptive use charged at a 100 to 1 ratio compared to nonconsumptive use. The current charging rates are $0.06/1000 gallons consumptive and $0.0006/1000 gallons nonconsumptive. The current charging system also recognizes the effect of both uses on chloride in the estuary by applying a replacement factor to those users below the mouth of the Schuylkill River. Normally, municipal use is 10% consumptive, agriculture is 90% consumptive and industry is on a case-by-case basis. Since ground water is not included in the current charging program, charges for agriculture uses are now at a minimum.

Black & Veatch, in the Alternative A charging schedule, recommended a charge for depletive use and also included a small withdrawal charge for users that withdraw directly from the portions of the Delaware and its tributaries that receive flow augmentation -- the so-called Increased Reliability of Supply. Also, for salinity control, the effective withdrawal of surface waters between River Mile 118.5 to River Mile 76 was used. All Potomac Raritan Magothy ground water withdrawals were charged for in the chloride standard improvement benefit category. Charging Alternative B used withdrawal charges of either 1/100th or 1/50th of the Depletive Use Charge. Alternative C was similar to Alternative A in charging for withdrawals.

The DRBC "Background Paper" used four options for a charging system based simply upon a lower rate for water withdrawn and returned, and a higher rate for water consumed. The range used for post-Compact use was 50 to 1 and 100 to 1.
Table 1

Annual Revenue Needs With Bonds at 8% for 20 years

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Start Collections</td>
<td>Start Collections</td>
<td>Start Collections</td>
<td>Start Collections</td>
</tr>
<tr>
<td></td>
<td>@ End of Project: No up-front: Bonds @ $160,000,000</td>
<td>@ End of Project: $20.8 million up-front: Bonds @ $128,000,000</td>
<td>@ Beginning of Project: No up-front: Bonds @ $85,000,000</td>
<td>@ Beginning of Project: $20.8 million up-front: Bonds @ $67,000,000</td>
</tr>
<tr>
<td>1. Beltzville &amp; Blue Marsh 0 &amp; M</td>
<td>$864,000</td>
<td>$864,000</td>
<td>$864,000</td>
<td>$864,000</td>
</tr>
<tr>
<td></td>
<td>30,000</td>
<td>30,000</td>
<td>30,000</td>
<td>30,000</td>
</tr>
<tr>
<td>2. F. E. Walter</td>
<td>Debt Service</td>
<td>16,296,000</td>
<td>13,036,800</td>
<td>8,657,300</td>
</tr>
<tr>
<td></td>
<td>Debt Service Coverage</td>
<td>1,629,600</td>
<td>1,303,700</td>
<td>865,700</td>
</tr>
<tr>
<td></td>
<td>Plus Major Repairs &amp; Replacement</td>
<td>500,000</td>
<td>500,000</td>
<td>500,000</td>
</tr>
<tr>
<td></td>
<td>O &amp; M (Includes Recreation)</td>
<td>(1,140,700)</td>
<td>(912,600)</td>
<td>(606,000)</td>
</tr>
<tr>
<td></td>
<td>Interest Earnings on Reserve</td>
<td>406,000</td>
<td>406,000</td>
<td>406,000</td>
</tr>
<tr>
<td></td>
<td>Program Administration</td>
<td>18,584,900</td>
<td>15,227,900</td>
<td>10,717,000</td>
</tr>
</tbody>
</table>

**Notes:**

- Debt service on $160,000,000, 8% for 20 years.
- Debt service on $128,000,000, 8% for 20 years.
- Debt service on $85,000,000, 8% for 20 years.
- Debt service on $67,000,000, 8% for 20 years.
- 10% for debt service coverage, major repairs and replacement.
- 0 & M for F. E. Walter & Rec. O & M at F. E. Walter.
A major reason for charging for both water depleted and water withdrawn and returned (nonconsumptive use) is that depletive water use is estimated, whereas water withdrawn and returned can be measured through metering and other devices. A dual system improves the reliability of the revenue base to help compensate for errors of estimate.

Recommendation: Develop a charging system which incorporates charges with nonconsumptive use at 1.5% of depletive use.

Issue: Should the charging program include a charge for both surface and ground water?

Although DRBC's present water charges program includes only surface water users, the Level B Study Report findings and subsequent "Good Faith" negotiations concluded that depletive use for ground water also affected Basin hydrology and attendant chloride levels in the estuary.

This was based on the fact that almost all ground and surface waters in the Delaware River are interconnected. Ground water provides the base flow of Basin streams. Between 60 and 90 percent of annual stream discharge has its origin in ground water. During drought and low-flow conditions, virtually 100% of streamflow is supplied by ground water percolation, unless upstream reservoirs provide a conservation release for flow augmentation. Consumptive and nonconsumptive use of ground water, thus, places a strain on Basin reservoirs similar to that imposed by surface water withdrawals — the only difference being the point of taking. It is recognized, however, that there is a greater lag time associated with ground water effects because of ground water's slower movement through underground strata to surface streams.

The Advisory Committee did not recommend against inclusion of ground water users in a new charging system.

Recommendation: Include both surface and ground water users in the charging system.

Issue: Should agriculture be given an allowance for saving recharge areas?

The Advisory Committee recommended that agriculture be given an allowance for saving recharge areas without specifying a percentage credit. The Black & Veatch report made an alternative assumption to charge agricultural irrigators only 50% of water withdrawn, based on recommendations of the DRBC Commissioners. That seems reasonable, recognizing that all three down-Basin States are encouraging retention of agricultural lands through other programs, such as lower tax assessment for farmlands or purchasing development rights. However, this is an allowance to the agricultural irrigators, and not an exemption since their saving of lands for recharge benefits total Basin hydrology and precludes building more storage. To be equitable, it seems that golf courses should receive this same 50% allowance.

Recommendation: The charging schedule should provide for a 50% allowance for agricultural irrigation and golf courses for both nonconsumptive and depletive water use.
**Issue:** Should those providing surface water storage be given an allowance?

The Advisory Committee recommends that self-suppliers with reservoir storage should be entitled to a credit against water use charges considering:

- releases made during low-flow periods as directed by regulatory agencies;
- capital and O&M costs to operate such instream release facilities;
- similar credit should be given to those operating pumped storage; and
- the "release" should be determined as a certain quantity of water which provides a benefit to the Basin which would otherwise have to be provided by DRBC.

The electric utilities have provided the Merrill Creek Project to augment streamflows to the extent of evaporative losses from generating facilities named in the Merrill Creek Docket. The Advisory Committee and electric utility members on that Committee have recommended that a credit or allowance be given for providing that reservoir -- with no specific percentage recommended by the Committee as a whole. Fifty-two percent (52%) of the time DRBC reservoirs operate without Merrill Creek releasing. During the other 48% of the time, Merrill Creek is releasing gallon for gallon to compensate for depletive use. However, 1.5 gallons of release is needed to make up for each 1.0 gallon evaporated; therefore, DRBC is required to provide one-third of all water released to compensate for the power depletive use; and an additional 16% of the time (one-third of 48%) must be credited to DRBC. Hence, the electric utilities for their facilities cited in the Merrill Creek Docket rely upon DRBC storage 68% of the time (52% + 16%).

Similarly, those users in the Basin which have provided their own surface storage in significant amounts (greater than 180 days storage) provide a flow augmentation to Delaware River tributaries well above the natural flow during low-flow periods. The Advisory Committee recommended that those water users be given a credit or allowance for this ongoing benefit to the Basin hydrology. The down-Basin State Commissioners agree and feel that a 50% reduction to their annual billing based upon nonconsumptive and depletive use is reasonable.

**Recommendation:** Provide a reduced rate of 68% for the electric utility companies whose facilities are named in the Merrill Creek Docket; and a reduced charging rate of 50% for those users having surface water storage greater than 180 days, provided conservation releases from their reservoirs are maintained.

**Issue:** What should be the charge for the Delaware & Raritan Canal diversion?

The Advisory Committee recommended that the D&I Canal out-of-Basin users be charged, but that the rate be negotiated by the down-Basin
Commissioners. Those negotiations have been completed and agreement has been reached that the D&R users would be charged for 60% of their diversion at the in-Basin depletive use rate and 40% of their diversion at the nonconsumptive use rate.

**Issue: Should any credits be given for in-Basin transfers?**

The Advisory Committee recommends that credits should be given to in-Basin transfers during low-flow conditions. This recommendation was never really considered by Black & Veatch or the Commission. Since the Commission has not and probably will not charge for in-Basin transfers (Chester Water Authority, as an example) during either normal or low-flow conditions, no credit should be considered during only low-flow conditions.

**Recommendation:** No credits will be given to in-Basin transfers during low-flow conditions.

**Issue: Should there be a difference between the pre- and post-Compact water charges?**

The Advisory Committee recommends that pre-Compact users should pay at a lesser rate than post-Compact users.

Black & Veatch discussed the post- and pre-Compact water charge rates by indicating that during drought conditions, the Basin could require augmented flow to compensate for pre-Compact users' depletive uses, even if there was no post-Compact depletive use. The level of augmentation for pre-Compact users is less than the level of augmentation required for post-Compact use, which must be fully offset by reservoir releases. Later, the DRBC directed the use of a ratio of 3 to 1 for determining water use charges. It is also noted that the critical drought of the 1960s was 30 to 40 percent more severe than the earlier design drought of the 1930s, significantly increasing the need to compensate for pre-Compact uses.

The League of Women Voters testified that the same rate should be used for all users. They stated that there is not much difference between pre-Compact depletive use and total depletive use. Also pre- and post-Compact users have the same effect on chloride levels.

As stated above, depletive water use, whether pre- or post-Compact, has the same effect on chloride levels and the projects provide the same benefits for all. Also, it would be a very difficult task to determine pre-Compact use of the thousands of ground water users. So, why have any differentiation between pre- and post-Compact users? The time, effort, and possible legal battles in determining the pre-Compact levels of ground water use for the hundreds of users would be a difficult task of great duration. The States did not include a "grandfather" clause section in their respective passage of Compact legislation. And, one of the major reasons that DRBC is seeking amendment of Section 15.1(b) is to treat all users in the Basin the same, as to benefits provided by the projects.

**Recommendation:** Charge both pre-Compact and post-Compact in-Basin users at the same rate based upon their location in the Basin.
Issue: Should some users be exempt from paying water use charges and what should be the threshold for charging?

Recommendation 5 of the "Good Faith" report indicated that the three down-Basin States of Pennsylvania, New Jersey and Delaware will negotiate arrangements to underwrite and finance the non-Federal, cost-sharing obligation necessary for the Walter project modifications. New York State was not included.

Black & Veatch allocated some nominal costs to New York State in charging Schedules A and B. Charging Schedule C eliminated New York from any charges. The Advisory Committee recommended that "assuming that the Cannonsville Project or other acceptable alternatives consistent with the "Good Faith" negotiations are implemented by New York State, the New York State users should be exempt from any water use charges in conjunction with financing the construction of the lower-Basin water storage projects. However, depletive uses in New York State within the Basin are already compensated for by New York City's Release Program, under the Supreme Court Decree of 1954.

Communities in Pennsylvania and New Jersey, above the Montague gauging station, also have their depletive use compensated for by New York City releases. Therefore, a strong argument exists to exempt all users above the Montague gauging station, which is the case under our present charging system. Similarly, those depletive water users in the lower extremities of the Basin cause no chloride intrusion effect and are presently exempt from charging. The Advisory Committee also found no fault from exempting those. Above Montague, Subbasin 1 represents 2.5% of depletive use, and Subbasins 11 and 12 in the lower extremities represent less than 1%.

Another class of users that could logically be exempted from the charging system are the thousands of rural users on individual wells. It would cost much more to bill them than the annual fee would produce. It is estimated that a deficit in collections would amount to approximately $400,000 per year if small and rural individual well users were billed, assuming a billing procedure for the thousands of individual users was even possible. The deficit would fall on the other paying users. Therefore, an exemption to such small users seems reasonable. Also, many rural users have a land acreage which provides for considerable ground water recharge, similar to farmers and agriculture.

As to a threshold for collecting an annual fee, a cutoff of 10,000 gpd seems reasonable. At a hypothetical charging rate of $60.00/million gallons for depletive use and two percent of that for nonconsumptive use, the annual bill would be $25.84 for those withdrawing 10,000 gpd. This charge would be the minimum amount required to cover the administrative costs incurred in billing a user.

Recommendation: Exempt users in Subbasins 1, 11, and 12 and users under 10,000 gpd. Establish a threshold for billing at 10,000 gpd or more; or a billing fee of $25.00 or more.
Issue: Will water charging rates escalate appreciably in the future if the F. E. Walter Project is the only new storage added to the two existing DRBC-sponsored projects of Beltzville and Blue Marsh?

This should not occur if water use remains at its current level or nominally increases in the future. The Commission has plans to proceed with only the F. E. Walter project at this point in time. Although the legislation introduced in Congress in 1986 limited the charging system to the two existing projects, plus F. E. Walter and Prompton, the Commissioners recommend that reference to Prompton be dropped in any 15.1(b) modification this year.

Water sales revenues received will only be used to cover the cost categories identified on page 9; and will not be used to defray other DRBC operating expenses. The charging rates will actually decrease when the bonded indebtedness attributable to construction of the F. E. Walter Project is satisfied.

Some public comments have stated that the individual states should collect the water supply charges, not the Commission. The Commission (4/5 of it) is governed by the Basin States, since the Governors direct the actions of the DRBC. And, the present DRBC water sales and billing program to repay costs associated with the existing Beltzville and Blue Marsh projects has been handled effectively by the DRBC. The Commissioners believe that adding another level of administration for collections is unnecessary.

**Proposed Charging Schedule**

Based on the recommendations for the various issues, the following assumptions are used to determine a proposed fee structure:

- Surface and ground water at same rate;
- No difference between pre- and post-Compact;
- Agricultural irrigators, golf courses, and public water suppliers maintaining at least 180 days of storage, all at 50% of rate;
- Electrical utilities charged at 68% of rate for those facilities in Merrill Creek Docket;
- Nonconsumptive use at 1.5% of depletive water use rate;
- D&R Canal out-of-Basin withdrawals charged for 60% of depletive use rate and 40% of nonconsumptive use rate;
- Depletive water use and nonconsumptive use adjusted for chloride effect (replacement factor);
- Small users (under 10,000 gpd or less than $25.00/yr charge) and Subbasins 1, 11 and 12 exempted; and
- Up-front financing by states is $20.8 million; the total construction cost is estimated to be $103.6 million; total annual amount to be collected in revenues is $8.83 million.
Applying these assumptions to current water uses (1986 estimates), the following table is derived and forms the basis for determining the charges:

**Table 2**

Charging Elements in Million Gallons/yr.
After Replacement Factor Applied and Allowances Considered

<table>
<thead>
<tr>
<th>Category</th>
<th>DWU</th>
<th>NCU</th>
<th>DWU</th>
<th>NCU</th>
<th>DWU</th>
<th>NCU</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pennsylvania</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Municipal Use</td>
<td>24,294</td>
<td>235,382</td>
<td>7,156</td>
<td>68,649</td>
<td>1,318</td>
<td>11,868</td>
</tr>
<tr>
<td>Industry</td>
<td>16,252</td>
<td>239,455</td>
<td>4,054</td>
<td>102,836</td>
<td>1,346</td>
<td>63,889</td>
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<tr>
<td>Power</td>
<td>5,176</td>
<td>465,833</td>
<td>1,939</td>
<td>381,210</td>
<td>316</td>
<td>116,072</td>
</tr>
<tr>
<td>Golf Club</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irrigation</td>
<td>2,060</td>
<td>229</td>
<td>331</td>
<td>36</td>
<td>41</td>
<td>4</td>
</tr>
<tr>
<td>Skiing</td>
<td>384</td>
<td>434</td>
<td>26</td>
<td>29</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Institution</td>
<td>393</td>
<td>3,550</td>
<td>984</td>
<td>8,928</td>
<td>3</td>
<td>24</td>
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<tr>
<td>Agricultural</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Irrigation</td>
<td>265</td>
<td>58</td>
<td>1,839</td>
<td>408</td>
<td>18</td>
<td>4</td>
</tr>
<tr>
<td>D&amp;R Canal*</td>
<td></td>
<td></td>
<td>16,425</td>
<td>10,950</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Sub-Total for Depletive and non-consumptive use (76.4% of Charging Revenues)</strong></td>
<td>48,824</td>
<td>944,941</td>
<td>32,754</td>
<td>573,046</td>
<td>3,042</td>
<td>191,861</td>
</tr>
<tr>
<td><strong>New Jersey</strong></td>
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<td></td>
</tr>
<tr>
<td>Industry</td>
<td>12,463</td>
<td>53,929</td>
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<td>296</td>
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<tr>
<td><strong>Delaware</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

*Assumes Annual Average of 75 mgd and 60%/40%, depletive to nonconsumptive use.

**Method explained in Part 1 of the Black and Veatch Report.**

An approximate estimate of user fees, based on this table and annual revenue needs of $8.83 million would be $61.16/mg for depletive water use, $0.92/mg for nonconsumptive use and $31.24/mg as a salinity charge. Using these proposed fees, the revenues which would be generated are given in Table 3.

**Table 3**

Total Annual Revenues and Charging Rates

<table>
<thead>
<tr>
<th>Rate</th>
<th>Pennsylvania</th>
<th>New Jersey</th>
<th>Delaware</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>DWU ($61.16/mg)</td>
<td>$2,986,100</td>
<td>$998,700</td>
<td>$186,000</td>
<td>$4,170,800</td>
</tr>
<tr>
<td>NCU ($0.92/mg)</td>
<td>869,300</td>
<td>517,100</td>
<td>176,500</td>
<td>1,562,900</td>
</tr>
<tr>
<td>Estuary ($31.24/mg)</td>
<td>389,300</td>
<td>1,684,700</td>
<td>9,200</td>
<td>2,083,200</td>
</tr>
<tr>
<td>D &amp; R ($37.07/mg)</td>
<td>1,014,700</td>
<td></td>
<td></td>
<td>1,014,700</td>
</tr>
<tr>
<td></td>
<td>$4,244,700</td>
<td>$4,215,200</td>
<td>$371,700</td>
<td>$8,831,600</td>
</tr>
</tbody>
</table>

Percent 48.06 47.73 4.21 100.0