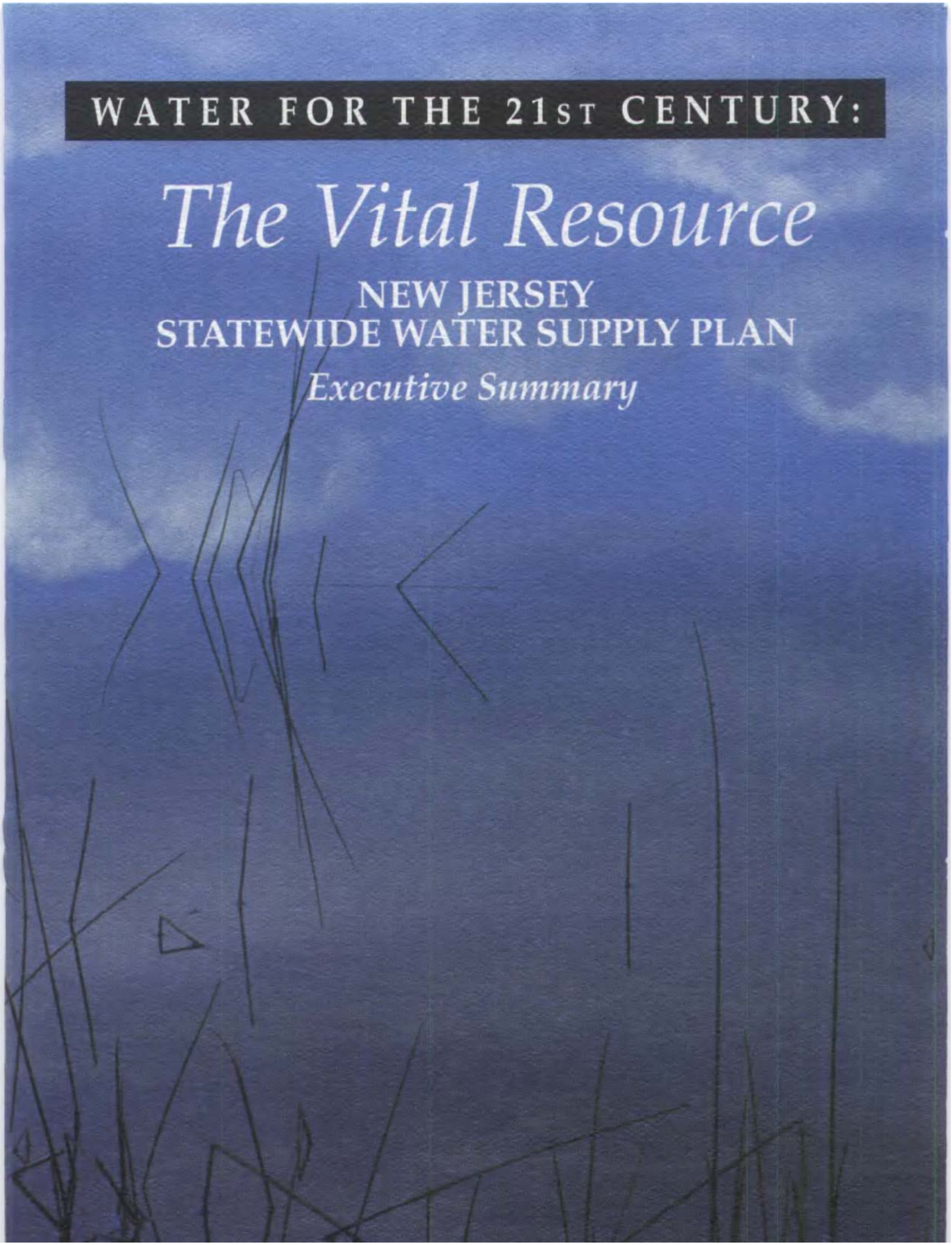
WATER FOR THE 21ST CENTURY:

The Vital Resource

NEW JERSEY STATEWIDE WATER SUPPLY PLAN

Executive Summary



WATER FOR THE 21ST CENTURY:

The Vital Resource

NEW JERSEY STATEWIDE WATER SUPPLY PLAN

August 1996

STATE OF NEW JERSEY
Christine Todd Whitman, Governor

Department of Environmental Protection
Robert C. Shinn, Jr., Commissioner

Policy and Planning
Lewis Nagy, Assistant Commissioner

Office of Environmental Planning
Robert Tudor, Administrator

The mission of the New Jersey Department of Environmental Protection is to assist the residents of New Jersey in preserving, sustaining, protecting and enhancing the environment to ensure the integration of high environmental quality, public health and economic vitality.

New Jersey Department of Environmental Protection
Office of Environmental Planning
P.O. Box 418
Trenton, NJ 08625-0418

Printed on Recycled Paper

ACKNOWLEDGEMENTS

The Department of Environmental Protection would like to take this opportunity to thank the various individuals listed below for their efforts and contributions on the New Jersey Statewide Water Supply Plan. This document represents a great deal of preparation and hard work on the part of the Water Supply Advisory Council and its Public Advisory Committee. Also, a special thanks to the consultant team of CH2M Hill, Metcalf & Eddy and NJ First for their contribution of task outputs and dedicated work efforts which were invaluable tools in the development of this document. Thanks also to the U.S. Geological Survey-Water Resources Division for its significant input to the estimation of ground water yields for this project.

The development of this document was overseen by the Office of Environmental Planning within Policy and Planning and involved numerous professional staff from other offices as well:

Robert Tudor, Administrator
Martin A. Bierbaum, J.D., Ph.D., Former Administrator
Daniel J. Van Abs, Ph.D., Assistant Administrator and Project Manager
Nicholas P. Zripko, Project Planner and Coordinator

NJ Water Supply Advisory Council (WSAC)

Represented Interest	*Appointed member*
Industry	David Cohen
Agriculture	George Beyer
Residential	Eugene Engelbrecht
Academic	Eugene Golub, Ph.D.
Public Water Company	Dean Noll, P.E.
Environment	David Peifer
Private Water Company	Howard Woods, Jr., P.E.

Public Advisory Committee (PAC)

Organization	*Representative*
NJ Farm Bureau	George Beyer
US Geological Survey	Herb Buxton
NJ Federation of Planning Officials	Joseph Doyle
US Natural Resources Service	Thomas Drewes
Stockton State College	Claude Epstein
ANJEC	Abigail Fair
Passaic River Coalition	Ella Filippone
NJ Board of Regulatory Commissioners	Jack Fitzpatrick
SMCMUA/AEA of NJ	Harry Gerken
NJ Society of Municipal Engineers	William Goble
Atlantic City MUA	Neil Goldfine
Rutgers University	Michael Greenberg, Ph.D.
Delaware River Basin Commission	Gerald Hansler
NJ League Women Voters	Peggy Haskin
Rutgers University	Robert Hordon, Ph.D.
NJ Department of Agriculture	George Horzepa
Office of State Planning	Robert Kull
NJ Federation of Sportsmens Clubs	George McCloskey
NJ Builders Association	Michael McGuiness
NJ Audubon Society	Bill Neil
Garden State Water Company	George Powell
NJ Department of Public Advocate	Susan Reisner
NJ Water Supply Authority	Rocco Ricci
Rutgers University	Theodore Shelton, Ph.D.
WRA of Delaware River Basin	Bruce Stewart
NJ Pinelands Commission	John Stokes
Public Service Electric & Gas	Mark Strickland
Hackensack Water Company	Pen Tao, P.E.
Alliance for Action	Ellis Vieser
Elizabethtown Water Company	Norbert Wagner
NJ County Planners Association	Raymond Zabihach, P.P.

New Jersey Department of Environmental Protection

Co-authors

Robert Canace,
NJ Geological Survey
Kimberly Cenno,
Office of Environmental Planning
Asghar Hasan, P.E.,
Bureau of Water Allocation
Robert A. Kecskes,
Office of Environmental Planning
Richard Kropp, P.E.,
Bureau of Water Allocation
John Malleck,
Office of Environmental Planning
Joseph J. Mattle,
Office of Environmental Planning
Joseph A. Miri, Ph.D.,
Water Supply Element
Steven Nieswand, P.E.,
Water Supply Element
Terri Romagna,
Office of Environmental Planning
Philip Royer, P.E.,
Bureau of Safe Drinking Water
Paul Schorr, P.E.,
Bureau of Safe Drinking Water
Daniel J. Van Abs, Ph.D.,
Office of Environmental Planning
Nicholas P. Zripko,
Office of Environmental Planning

Print Coordinator

Kyra Hoffmann,
Office of Environmental Planning

Graphic Design

Paul Kraml
Office of Communications

Special acknowledgements and appreciation are extended to all other individuals and agencies not listed who provided information and assistance for this document.

TABLE OF CONTENTS

LIST OF TABLES	*VIII*
LIST OF FIGURES	*VIII*
EXECUTIVE SUMMARY	*IX*
CHAPTER ONE	
Introduction	1
A. General Introduction to New Jersey Statewide Water Supply Plan	1
B. Overview of Water Supply Planning in New Jersey	1
C. Major Legislative Mandates That Affect Water Supply Planning	3
D. Overview of Original 1982 Plan	3
E. Major Issues Leading to The NJSWSP Process	5
F. Description of NJSWSP Process	6
G. Process for Future NJSWSP	7
CHAPTER TWO	
Hydrology and Hydrogeology of the State	**9**
A. Introduction	9
B. Geology and Topography	9
C. Precipitation Rates and Patterns	9
D. Major Aquifers of the Physiographic Provinces of New Jersey	9
E. Major Surface Water Resources of New Jersey	18
F. Selection of Planning Areas	18
G. The Hydrologic Cycle and Its Relationship to Planning Areas	19
CHAPTER THREE	
Estimating and Projecting the Availability of Water	**25**
A. Background	25
B. The Problem of Definitions	25
C. The Assumptions and Limitations of Availability Estimates	26
D. Reliability in Estimating Water Availability	29
E. "Water Availability" as a Policy Statement	29
F. Water Availability and The Hydrologic Cycle	30
G. Estimating Water Availability	30
H. Methodology for Estimating Water Availability	31
I. Issues for Future Analysis/Strategic Recommendations	33
CHAPTER FOUR	
Estimating and Projecting Demands for Water	**39**
A. Overview of the Projection Methodology	39
B. Basic Elements of Water Demand Projections	39
C. Selection of Projections for the NJSWSP	41
D. Estimates of Water Demands Through the Year 2040	42
E. Reliability Factors Related to the Projections	44
F. Issues for Future Analysis/Strategic Recommendations	46

TABLE OF CONTENTS

CHAPTER FIVE

Comparing Water Availability and Demands **49**

A. Overview of the Water Balance Model 49

B. Regional Comparisons of Water Availability and Demands 49

C. Data Interpretation 54

D. Analysis of Water Deficit and Surplus Projections 56

E. Maintenance of the Water Balance Model 57

F. Issues for Future Analysis/Strategic Recommendations 57

CHAPTER SIX

Regional Water Supply Initiatives **59**

A. Overview of General and Cross-Cutting Water Supply Initiatives 59

B. Financial and Legal Resources for Implementation 63

Recommended Initiatives for Planning Areas Anticipated to be in Deficit During the Planning Period **67**

C. Initiatives for Planning Areas 4, 5 and 6 — Upper Passaic, Lower Passaic/Rahway and Hackensack River Watersheds 67

D. Initiatives for Planning Areas 10 and 11 — Raritan and South River Watersheds 73

E. Initiatives for Planning Areas 13, 15 and 16 — Manasquan, Metedeconk and Toms River Watersheds 77

F. Initiatives for Planning Areas 14 and 17 — Rancocas Creek and Camden Delaware Tributaries Watersheds 81

G. Initiatives for Planning Area 18 — Mullica River Watershed 85

H. Initiatives for Planning Areas 20 and 21 — Salem, Cohansey and Maurice River Watersheds 89

I. Initiatives for Planning Area 23 — Cape May Coastal Watershed 93

Recommended Initiatives for Planning Areas Not Anticipated to be in Deficit During the Planning Period **97**

J. Initiatives for Planning Areas 1, 2 and 3 — Middle Delaware-Flat Brook-Wallkill/Pequest Watersheds 97

K. Initiatives for Planning Areas 7, 8 and 9 — Pohatcong/Musconetcong/Trenton Delaware Tributaries 99

L. Initiatives for Planning Area 12 — Navesink/Swimming River Watersheds 101

M. Initiatives for Planning Area 19 — Atlantic Coastal Watershed 103

N. Initiatives for Planning Area 22 — Great Egg Harbor River Watershed 105

CHAPTER SEVEN

Protection, Management and Conservation of Water Supply Resources **107**

A. Protecting the Resource 107

B. Maximizing the Benefits of Water Supplies 115

TABLE OF CONTENTS

CHAPTER EIGHT

The State Water Allocation Program: The Balance Among Water Uses and Users **127**

A. Historical Perspective 127

B. The Water Allocation Permit Program 128

C. Water Resource Yields 129

CHAPTER NINE

Infrastructure Choices, Development and Maintenance **135**

A. General Policy Considerations 135

B. Major Infrastructure Issues 136

C. Recommendations: Major Infrastructure Issues 142

D. Appropriate Infrastructure Financing Roles for the Statewide Water Supply Plan and 1981 Bond Fund 143

E. Recommendations: Water Supply Loan Program 149

CHAPTER TEN

The Water Supply Action Program for New Jersey **151**

A. Overview: Emphasis on Watershed-Based Management 151

B. Statewide Water Supply Plan Implementation 152

C. Management Initiatives 153

D. Capital Projects 160

E. Funding Strategy 161

F. Legislative and Regulatory Actions 162

G. Relationship of the NJSWSP to Regulatory Programs 162

H. Updates, Revisions and Progress Evaluations of the NJSWSP 163

I. NJDEP Organizational Responsibilities 163

GLOSSARY **167**

ENDNOTES **171**

ACRONYMS **173**

APPENDICES LISTING (*separate volume)

Appendix A

Legislative Authorities*

Appendix B

State Water Conservation Strategy*

Appendix C

1994 Statewide Water Supply Plan Progress Report*

Appendix D

NJ Statewide Water Supply Plan Reference Documents*

Appendix E

Depletive Water Use Project for RWRPA of NJ*

Appendix F

Map of 23 Planning Areas of NJ (insert) Inside Back Cover

LIST OF TABLES

Table 1.1	Major Legislative Mandates	2
Table 1.2	1993 NJSWSP Action Program	4
Table 2.1	Recharge Estimates for Planning Areas	20
Table 3.1	Available Water by Planning Area	32
Table 4.1	Comparison of Demands Using Population Projections	42
Table 4.2	1990 Surface and Ground Water Demands	43
Table 4.3	Comparison of Population Projections from Three Studies	45
Table 5.1	Major Water Supply Sources by Planning Area	50
Table 5.2	1990 to 2040 Water Balance Summaries by Planning Area	53
Table 9.1	Instream Ammonia and Nitrate versus Chlorine Demand	138
Table 10.1	1995 NJSWSP Action Program	164

LIST OF FIGURES

Figure 2.1	Physiographic Provinces of New Jersey	10
Figure 2.2	Average Annual Precipitation Rates of NJ	11
Figure 2.3	Major Geologic Units of NJ	12
Figure 2.4	Outcrop Areas of Major Coastal Plain Aquifers	13
Figure 2.5	Cross-Section Through the Piedmont and Highlands	15
Figure 2.6	Bedrock Aquifers of Northern Physiographic Provinces	16
Figure 2.7	New Jersey Surface Waters	17
Figure 2.8	Regional Water Resource Planning Areas	21
Figure 2.9a	Hydrologic Cycle of Watershed-Predevelopment	22
Figure 2.9b	Hydrologic Cycle of Watershed-Development	23

EXECUTIVE SUMMARY

New Jersey's waters belong to its residents, held in trust and managed for them by the State of New Jersey. New Jersey receives in excess of 40 inches of annual precipitation, on average, providing water for recreation, a large population, one of the nation's largest industrial concentrations, and aquatic life that requires a regular flow of clean water. Most of the State has viable ground and surface water supplies (see **Chapter Two**). However, even plentiful precipitation does not guarantee that droughts will not cause major water supply disruptions or that aquifers cannot be depleted. To ensure that New Jersey could cope with all foreseeable water needs and droughts, the Water Supply Management Act and the Water Supply Bond Act (Bond Fund) were approved in 1981, establishing a management framework and a source of public funding — $350 million — to help fulfill it. The Department of Environmental Protection (NJDEP) was entrusted with primary responsibility for both acts.

NJDEP in 1982 adopted the first New Jersey Statewide Water Supply Master Plan (1982 Plan), as required by the Water Supply Management Act. The 1982 Plan included major recommendations to improve surface water supply capacity (primarily in northeastern and central New Jersey), ensure proper maintenance of aging water supply infrastructure, investigate the status of major aquifers and plan for future water supply needs. As required by the Water Supply Bond Act, the 1982 Plan also determined which public water supply efforts were eligible for funding from the Bond Fund.

New Jersey has taken great strides to improve its water supplies based on the 1982 Plan. The Wanaque South Project/Monksville Reservoir and the rehabilitation of the Delaware & Raritan Canal provided major supply increases. The Manasquan Reservoir in Monmouth County, three major pipelines in the Central Passaic River Basin and Middlesex County, and the Tri-County Project near Camden provide surface waters to replace stressed aquifer supplies, based on research and feasibility studies funded by the Bond Fund. Scores of water supply systems have been upgraded using low-interest loans from the Bond Fund. Much more is known about New Jersey's aquifers and significant efforts are in progress to protect these supplies, again supported by the Bond Fund. In short, the 1982 Plan has been a major success for New Jersey.

Based on successes of the 1982 Plan and recognizing that available supplies, projected needs for water supplies, development trends and knowledge regarding ecological water needs and water management concepts were changing, NJDEP began to develop a new plan. This New Jersey Statewide Water Supply Plan (NJSWSP) was developed by the NJDEP with the invaluable assistance of three consulting firms,[1] the Water Supply Advisory Council (WSAC) and its Public Advisory Committee (PAC). The NJSWSP constitutes a complete revision and replacement of the 1982 Plan.

Comparing Water Supply Availability and Demand

Estimates of New Jersey's available water, including individual surface water supplies and regional ground water availability, are fundamental to water supply planning. To improve the NJDEP's ability to identify potential water shortfalls, the state was divided into twenty-three Regional Water Resource Planning Areas (planning areas) based on surface watersheds.[2] Future versions of the NJSWSP will also be watershed-based, using a system of watersheds and watershed management areas newly developed for New Jersey's Watershed Management Strategy.

The water availability estimates (see **Chapter Three**) are critical tools for water supply planning. However, they are still estimates. Surface and ground water supply yields are based on the supply's ability to provide water throughout periods of stress — these "safe" or "dependable" yields will change if different levels of "stresses" are assumed. Still, surface water "safe yields" are relatively well known. In contrast, too little is known even now about the state's aquifers to fully define ground water availability. Therefore, the NJSWSP uses "planning thresholds" based on known aquifer stress but recognizes that better assessments are needed. Finally, yields can increase or decrease if water is transported from one watershed to another. The NJSWSP measured these "interbasin transfers" or "depletive water uses" for the first time.

The total safe yield of surface water supplies in New Jersey is approximately 850 million gallons per day (MGD). Based on the planning thresholds, available ground water is approximately 900 MGD. Assuming that these values are fairly independent

(i.e., the use of ground water below the planning thresholds does not affect surface water yields significantly or vice versa), **the total estimated yields are approximately 1,750 MGD**. However, these estimates must be used with great caution for several major reasons:

- The estimates of available ground water may be somewhat inaccurate;
- Ground water and surface water are interrelated;
- The use of ground water may be constrained by existing development or contamination threats;
- The method of water supply development and use can reduce the yields below optimum levels;
- Statewide statistics do not reflect whether available water is located near the point of demand. Significant regional or local deficits can be masked by statewide estimates.

The next step is to estimate recent (1990) water demand and to project demand through the planning period of 1990 to 2040 (see **Chapter Four**). The 1990 demand was approximately 1,500 MGD. **The 2040 demand is projected to be 1,790 MGD**. Although any projections beyond twenty years or so are clearly questionable, the demands provide useful "benchmarks" for planning because the protection of water sources and the development of new supplies can often take decades. Water supply planning must look well beyond our current ability to predict population or demand trends.

Estimates of current or future deficits or surplus supplies are derived from results of the two previous chapters (see Chapter Five). Deficit analyses are a critical tool in water supply planning, providing a target for planning. Where deficits are forecast, improved data may provide a sufficient explanation, or there may be a need for increased conservation, improved management, new supplies or some combination. However, even where no deficits are forecast many supply issues may exist such as more localized supply deficits, aging infrastructure or pollution threats.

Several regions are highlighted in Chapter Five.

- **Northeastern New Jersey** provides clear evidence of one major success for the 1982 Plan. With three new water supplies, no regional deficits are forecast based on the model used. The Hackensack and Lower Passaic/Rahway River areas will likely experience increased use of supplies from the Upper Passaic area, according to projections, but those supplies are available. However, extreme caution is necessary in this region, which is the most highly and densely populated area of New Jersey. The projections need to be continually checked against new data, and improved modeling is needed. Conservation and integrated reservoir management will still be needed during drought periods. Sub-regional issues such as ground water depletion will also be a continuing concern in this area. Still, the water supply situation has greatly improved since 1982.
- The **South River watershed and the Camden metropolitan area** were confirmed as problem areas due to depleted aquifers. Both were recently the focus of new supply construction that will greatly ease the aquifer stress over time. However, the extent of aquifer depletion and anticipated growth (especially in the Camden area) make continued monitoring of these regions critical.
- The **Toms River and Metedeconk Creek watersheds** of Ocean County have been identified as a significant long-term concern, primarily because the area relies heavily on ground water supplies and is projected to nearly double in population during the planning period. Ground water research supported through the Bond Fund is seeking more accurate estimates of ground water availability in this area.
- The **Maurice River watershed** in Cumberland County was identified as an area of concern for the first time. Surface water supplies could be disrupted by droughts. Ground water provides nearly all water supplies. Salt water intrusion from the Delaware Bay and deeper ground water units is a concern, as is existing ground water pollution. Based on preliminary results, ground water research was begun in the area using the Bond Fund to better assess the ground water availability.
- Finally, the **Cape May peninsula** was also confirmed as an area of concern. Salt water intrusion to aquifers at the tip of Cape May is occurring, and the county's projected growth will result in significant demand increases. Considerable aquifer research has been supported through the Bond Fund and local governments, providing valuable information to address these issues.

Statewide Water Supply Initiatives

The consultant reports, recent studies funded or developed by the NJDEP and other agencies, evolving water management concepts and the results of Chap-

ters Three through Five provide support for a wide range of statewide and regional recommendations in **Chapter Six**. Some are management initiatives that prevent or delay deficits, while others are capital project initiatives that will provide additional supplies. Most of the statewide initiatives are addressed in more detail in **Chapters Seven through Nine** (on water supply resource management, water allocation and infrastructure development and management).

Statewide management initiatives include the following:

- **Water Resources Protection** — Given the large and growing population of New Jersey and the spread of development across water supply watersheds and aquifers, more emphasis on watershed-based pollution control and aquifer recharge protection is absolutely necessary. Specific recommendations include:
  - Efforts to protect surface and ground water supplies should be integrated with a broader effort in watershed-based water resources management, including wastewater management. A partnership is required among state, county and municipal governments and agencies, water purveyors and wastewater dischargers and all other major interests to implement watershed management efforts. The Bond Fund should be one funding source for this effort, in proportion to the water supply protection benefits
  - Aquifer recharge and well head protection efforts should continue, including the mapping of recharge areas and well head protection areas for public community water supply wells, and the provision of assistance to local efforts
  - A long-term revenue source should be developed to fund th acquisition of critical water supply protection lands, both for ground and surface water supplies. In the interim, $20 million should be allocated from the Bond Fund for loans
- **Water Supply Management** — The existing water allocation program will be a key component of any effort to improve water supply management. Balancing allocations among water users, proper accounting for water used, and improved coordination among water users to stretch supplies during droughts will all be necessary.
  - Innovative methods of supply management should be encouraged, including integrated management of reservoir systems for drought management, conjunctive use of multiple water supplies, use of aquifers in Water Supply Critical Areas during drought periods, and streamlined permitting for alternative technologies such as Aquifer Storage and Recovery
  - The definition and methodology for determining surface water "safe yields" and ground water "dependable yields" must be assessed and revised if necessary to take into account better understanding of surface and ground water interactions, new technologies, conjunctive water use and system interconnections
  - Watershed management policy must be developed and implemented that includes specific objectives for instream flow maintenance to protect aquatic habitats and other uses, the ranking of water uses to clearly establish policy on the relative rights to water during drought periods, and the discouragement of depletive water uses that reduce safe yields, especially in regions that do or may face deficits
  - Drought management planning should be updated to address the potential for short but severe droughts and other scenarios that might disrupt supplies
- **Water Conservation** — Conservation has two facets. First, water should not be wasted at any time. Improved, long-term conservation reduces stress on aquifers, aquatic ecosystems and water supplies that are near capacity. Second, conservation during drought is a critical aspect of drought management. New Jersey, as with other states, cannot afford to finance water supplies large enough to ensure that water use may continue unabated during droughts.
  - Water conservation should be included in all water resource planning and management, with increased emphasis on industrial, landscaping, agricultural and residential settings, including education and incentives
  - Structural water conservation should be preferred over nonstructural methods for long-term conservation (i.e., other than drought periods), with availability of Bond Fund loans for structural water conservation projects
  - Water-conserving rate structures should be encouraged through regulatory and incentive mechanisms
  - Wastewater reuse is a viable but underutilized form of water conservation that should be increased. Indirect reuse is appropriate for most water uses, while direct reuse is appropriate for

certain industrial and agricultural uses but not for drinking water supplies

- **Water Delivery Management** — The Safe Drinking Water Act helps ensure that water supply systems are capable of delivering sufficient water of acceptable quality to all their customers. While the major water suppliers are capable generally of providing such service on a regular basis, small systems have a history of operational and public health problems. Efforts are needed to reduce the number of poorly-managed systems, both new and existing. Continued assistance for the improvement of existing systems (both treat ment and delivery) is recommended.
  - The Rehabilitation Loan Program should be continued in its current form, supported by the Bond Fund at a rate of $10 million per year, but expanded in scope to include loans for: treatment to address surface water contamination problems; new treatment facilities needed to comply with Safe Drinking Water Standards; and rehabilitation of treatment facilities. A priority should be placed on distressed cities and "Centers" as defined by the State Development and Redevelopment Plan. Such funds should not be made available to non-viable water systems
  - The Interconnections Loan Program should be continued, but funds should not be available for interconnection projects that result in the discontinuation or elimination of any existing, usable interconnection or water supply source
  - The Loan Program should be made available for all costs related to the Small Water Company Takeover Act by any local government, if action is taken by the Board of Public Utilities (BPU) to improve implementation of the Act
  - Consideration should be given to establishing a capitalization program (providing zero interest Bond Fund loans matched by market rate loans) for larger projects to stretch the availability of public funds
  - A water supply infrastructure needs survey should be developed based on existing efforts
  - An analysis of improved methods to manage water treatment plant residuals (sludge) should be conducted

Chapter Six also points out that although investor-owned water purveyors serve 42% of New Jersey's residents, only publicly-owned systems are eligible for low-interest loans from the Bond Fund. Limited loans are available from the Economic Development Administration, but even so the customers of investor-owned purveyors pay their own financing costs and help pay for Bond Fund loans to other systems. A mechanism for balancing the benefits to all water supply customers should be developed and implemented.

Regional Water Supply Initiatives

Chapter Six recommends special action, beyond the statewide management initiatives, in a number of regions to address acute or long-term projected deficits and other management concerns.

- **Upper Passaic, Lower Passaic/Rahway and Hackensack River Watersheds** — Although no deficits are projected during the planning period, this region provides water to 45 percent of New Jersey's population. Caution is needed to ensure that future deficits are avoided. Recommendations include:
  - Develop detailed simulation water supply model for the region, including the ability to test various system management and drought scenarios
  - Protect existing water supplies through watershed-based management as a priority due to the high concentration of water supplies in the region
  - Address sub-regional water supply shortages, such as in excessively used aquifers
- **Raritan and South River Watersheds** — These two regions are closely linked by surface water supply lines. Population growth results in a projected deficit close to the end of the planning horizon. Recommendations include:
  - Conjunctive use of ground water (especially increasing such efforts in the South River watershed) and surface water supplies should be explored
  - Structural water conservation could slow the need for new supplies and should be pursued
  - The Kingston Quarry Reservoir or Confluence Pumping Station are preferred options when new supplies are needed
- **Manasquan, Metedeconk and Toms River Watersheds** — Strong population growth, especially within the Toms River watershed, is projected to result in sizable water supply deficits within the planning period. Recommendations include:
  - A detailed assessment of ground water availability should be conducted to provide better deficit estimates

- Optimization of water resources through aggressive water conservation and improved placement of water supply wells are needed to reduce aquifer stress
- The feasibility and viability of conjunctive use of ground and surface waters, and of interconnections among the watersheds (including the Manasquan Reservoir) should be analyzed

- **Rancocas Creek and Camden Area Delaware Tributary Watersheds** — Southern Burlington County, Camden County and much of Gloucester County are included within Water Supply Critical Area No.2 and must reduce the existing stress on the Potomac-Raritan-Magothy (PRM) aquifer system. Growth projections, though not extremely high, emphasize the need for:
  - Connection with the Tri-County Water Supply Project to reduce the PRM aquifer use by many municipalities
  - Careful analysis, development and protection of alternative water supplies in areas that the Tri-County Project is not currently expected to serve, such as the Cohansey Aquifer in the southern part of this region
- **Salem, Cohansey and Maurice River Watersheds** — The Maurice River watershed is estimated to have an existing water supply deficit. Alternative supplies are constrained by ecological concerns and the potential for salt water intrusion. The Salem and Cohansey River watersheds are potential supply areas. Recommendations for the com bined region include:
  - Assess need for and the economic and human health impacts of reducing or halting surface water withdrawals during drought periods
  - Assess ground water availability to better define projected deficits, analyze the potential using ground water to offset deficits and develop supplies as appropriate
  - Encourage the affected counties to create an advisory regional water supply council to coordinate local actions
- **Cape May Coastal Watershed** — Current and future stresses on this region's aquifers must be reduced, as significant surface water supplies are unlikely. Recommendations include:
  - Water conservation, both for the tourism industry and year-round uses, is critical to reduce aquifer stresses
  - Emphasis should be placed on well head and aquifer recharge protection to protect the quality and quantity of unconfined aquifers
  - Analysis, selection and development of alternative supplies conducted on a regional level to optimize use of existing and future supplies

Future Steps for the NJ Statewide Water Supply Plan

The major recommendations of Chapters Three through Nine are summarized in **Chapter Ten**. This chapter also includes the 1996 Statewide Water Supply Plan Action Program, which allocates Bond Funds for the purposes supported by the NJSWSP. The Water Supply Management Act and the Water Supply Bond Act require that any appropriations of Bond Funds must be for purposes listed in the Statewide Water Supply Plan Action Program. The Water Supply Advisory Council (WSAC) will help the NJDEP ensure that the NJSWSP recommendations and initiatives are accomplished in a timely fashion and provide recommendations for modifications and updates.

The NJDEP intends to periodically update the NJSWSP as needed to make minor changes in the 1996 Statewide Water Supply Plan Action Program. An extensive revision of the NJSWSP is planned within the next five to seven years. The revision will reflect new population and demand projections, improved understanding of regional water supply issues, progress made in implementing this NJSWSP and new recommendations for future action.

CHAPTER TEN

The Water Supply Action Program for New Jersey

The New Jersey Statewide Water Supply Plan (NJSWSP), as a policy and strategy document, sets forth major initiatives required to ensure that sufficient quantities of water supplies are available to all parts of the State into the foreseeable future at the highest quality possible and for a reasonable cost. The NJSWSP addresses issues regarding reasonable limits on water supplies to protect other uses and users of water resources, including aquatic and water-related ecosystems. As mandated by the 1981 Water Supply Management Act and the 1981 Water Supply Bond Act, it also establishes the eligible projects for appropriations from the Bond Fund and allocates specific amounts of funding to each eligible use, within the constraints of the two acts. The 1981 Water Supply Bond Act mandates that appropriations from the Bond Fund may only be used for purposes included within the NJSWSP.

This chapter summarizes the action items contained in Chapters 3 through 9 of the NJSWSP and lists the eligible projects for funding from the Bond Fund (including allocations identified through the 1982 NJ Water Supply Master Plan — the 1982 Plan — and its updates that are continued through this Water Supply Action Program).

A. Overview: Emphasis on Watershed-Based Management

Traditional water supply planning in New Jersey and throughout the nation has generally focused on the development of conventional water supplies. Numerous reservoirs were constructed in previously rural watersheds to serve cities in the northeastern and central regions of the state and aquifers were tapped wherever migrating populations chose to reside. The majority of New Jersey's conventional water supplies are now developed. Although New Jersey's water supplies are sufficient for the foreseeable future in most regions, some regions (mostly those relying heavily on ground water) are presently in actual or estimated deficit. Other regions are expected to face deficit and water quality degradation conditions before the year 2040. Regarding supplies that will continue to experience surpluses during this time, the effects of development may also impair the quality of these supplies. The remainder of undeveloped conventional supplies are either relatively modest in size, or will be difficult to develop due to land use conflicts and environmental constraints. Consequently, if New Jersey is to meet its future water supply needs, a diverse range of strategic water management actions will be required that focus on better management and judicious use of existing supplies. Some of these actions will involve capital projects, but many will not.

The primary theme of the NJDEP's water supply management initiatives will be directed toward:

- protecting the quality of the State's water supplies in concert with traditional and evolving water quality protection programs;
- strategically expanding water conservation and reuse efforts;
- emphasizing strategies that provide the most efficient means to sustain our water supplies, while simultaneously ensuring that other water-related beneficial uses are maintained;
- developing additional water supplies as necessary after consideration of the first three approaches.

These initiatives will not be successful, however, unless new approaches are taken that emphasize more anticipatory and preventive measures. Present institutions, programs and public policy associated with water resources management consist of a "patchwork" of narrowly confined, too often conflicting or competing, objectives and jurisdictions. This phenomenon has led to impaired water supplies, reductions in supply yield and ecosystem degradation in some areas, despite the improvements that have occurred in others. Considerable progress has been achieved since the 1982 Plan was adopted by the NJDEP, but much more progress is required in the near future. In order to succeed, water supply initiatives will need to be part of an overall approach that emphasizes, evaluates and manages the total use and benefits of water within common hydrologic boundaries (i.e, watersheds).

The watershed-based approach to water resource management offers opportunities to improve overall benefits. This consensus-building approach:

- views the water resources and water-related uses in a watershed as an interactive "system" that must be managed as such;
- establishes goals and objectives that proactively ensure that the water resources of the watershed are managed in the best long-term interests of the public and the environment;
- identifies root causes of problems that could prevent these objectives from being met; and
- develops innovative and integrated strategies to meet the objectives.

Inherent to the watershed approach are basic principles to sound water supply planning and management. First, the approach is "multiple-use planning" by nature. By stressing the linkage between land use and water resource management, decisions that may potentially affect water supplies and other resources are made within a broad framework. Ideally, cross-media effects are thereby reduced, water quality, water supply and ecosystem efforts are integrated, and an overall environmental and economic benefit is realized.

Second, the approach advances a forum where the perspectives of the general population and stakeholders in the watershed are represented, reflecting regional and local needs and priorities against a backdrop of New Jersey statutes and legal doctrines regarding the "public trust" nature of water resources.

Third, watershed management focuses on responsibility and financial accountability by identifying all levels of government and other institutions involved in water supply and resource management and their respective roles. The structure allows for greater resolution of water supply issues and other resource problems at the local level and promotes self-sufficiency. State government can limit its involvement to those functions that are the most appropriate while still assuming an oversight and leadership role. A new governmental entity will not necessarily be required; rather, existing programs provide an excellent foundation on which to build within the watershed framework.

Fourth and last, the approach seeks to make maximum use of existing water management systems and the development of non-structural alternatives. Resources are thereby conserved for the enjoyment and benefit of future generations.

While recognizing that the challenges will be formidable, the NJDEP embraces the watershed management approach because it provides a comprehensive, integrated strategy to manage all of the state's water resources with all segments of society having a voice in the process. The NJSWSP was developed so as to be compatible with the watershed approach.

B. Statewide Water Supply Plan Implementation

Chapters 3 through 9 pointed out the most significant statewide and regional water supply problems, constraints and issues in New Jersey and made both general and specific recommendations as to how these should be addressed. Each of those topics presents challenges, opportunities and requirements that need to be considered. The principles of sound water supply planning are discussed above; it is on these principles that the NJDEP will base its actions. Several of the issues and problems need to be resolved within the next few years while others can be addressed over more time. Below is a discussion of the methodology that was used to determine the timetable for addressing the state's water supply issues and problems.

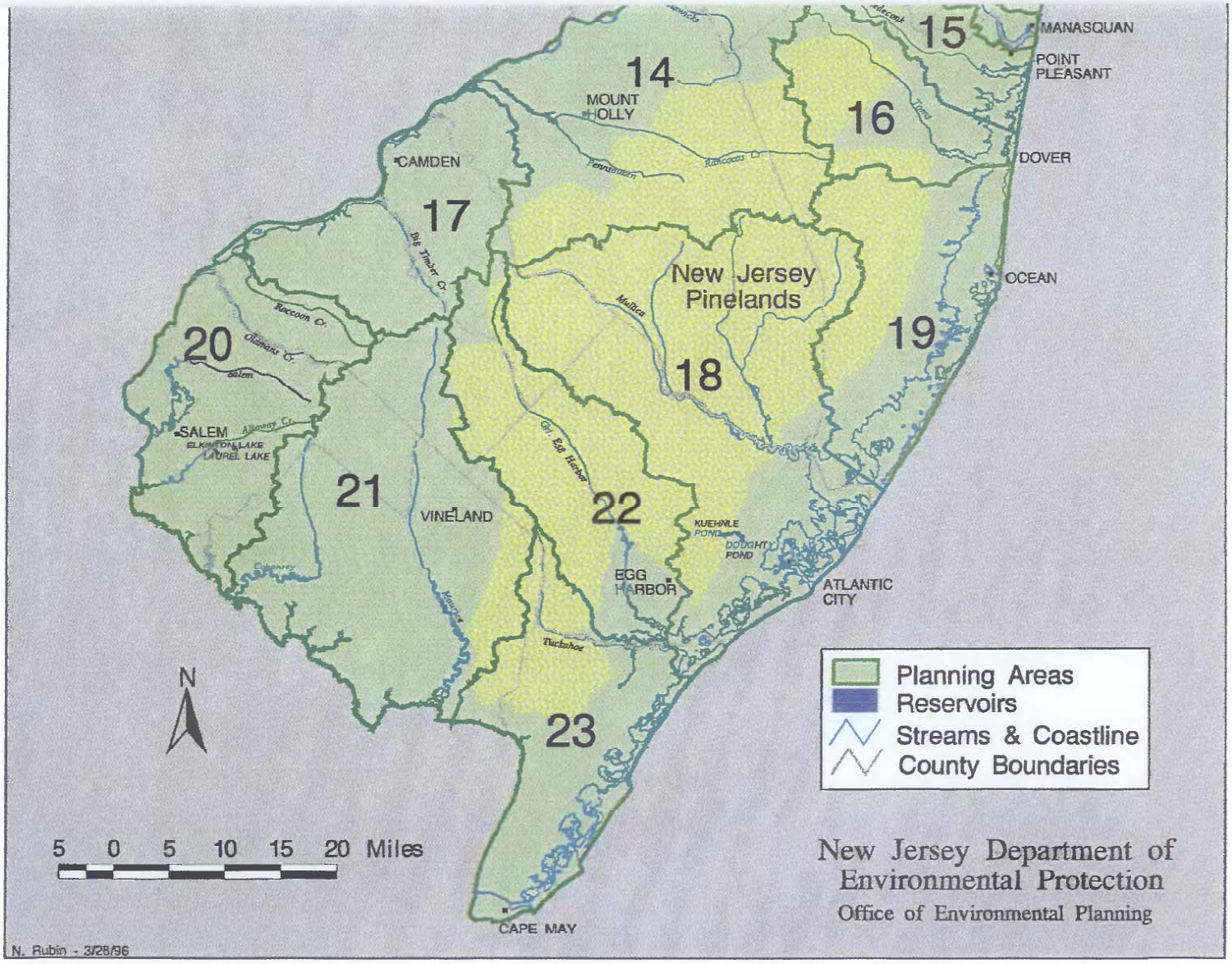
This action program employs two approaches (one for statewide initiatives and another for regional initiatives) for implementing the recommendations and initiatives described in Chapters 3 through 9. For statewide initiatives, criteria that receive the highest priorities include those that will achieve the greatest progress in the following categories:

- initiatives that minimize public health risks through protection of the source quality of the water supplies serving the largest populations;
- strategies that result in sustainable and economical regional water supplies;
- efficient water conservation strategies (both demand-side and supply-side) that conserve water for the largest populations;
- water management initiatives that maintain ecosystems where these are related to water supply management; and
- integrated water management efforts that conclude in multiple benefits by applying multidisciplinary approaches (i.e., where broader watershed management efforts are initiated).

Risk-based criteria and characteristics are to be employed to determine which planning areas require more rapid regional initiatives. The criteria and characteristics to be used will be incorporated within the NJDEP's watershed priority system. Water supply

NJ Statewide Water Supply Plan

23 Planning Areas


14
15
16
17
18
19
20
21
22
23
MANASQUAN
POINT PLEASANT
MOUNT HOLLY
DOVER
CAMDEN
OCEAN
New Jersey Pinelands
SALEM
ELKINTON LAKE
LAUREL LAKE
VINELAND
KUEHNLE POND
DOUGHTY POND
EGG HARBOR
ATLANTIC CITY
CAPE MAY
N
5 0 5 10 15 20 Miles
Planning Areas
Reservoirs
Streams & Coastline
County Boundaries
New Jersey Department of Environmental Protection
Office of Environmental Planning
N. Rubin - 3/28/96

characteristics such as the amount of deficit (current or future), size and growth of affected population, vulnerability to contamination, and ability to withstand drought will be factors included in this list for future investigations. Until this watershed ranking system is developed, no schedule or costs will be provided. Schedules and costs are provided for investigations currently underway. The actions are described briefly in this chapter; additional details are described in the chapters listed in parentheses after each action item. For many of the action items, supporting documentation may be found in the consultant team reports prepared for this project (see Appendix D for listing).

C. Management Initiatives

These efforts focus on water supply protection, more efficient use of existing supplies and water conservation. They are divided into four categories and are discussed in detail in Chapters 3 through 9. The 1995 Statewide Water Supply Plan Action Program table at the end of this chapter lists the recommendations, estimated costs and planned schedules. Previous and proposed allocations from the Bond Fund and other sources for each program and initiative are also summarized in the table, continued from the 1982 Plan and its periodic Updates. Programs will be both statewide, where appropriate, and targeted in watersheds pursuant to the watershed ranking system being developed by the NJDEP.

1. Water Resources Protection

These programs are designed to protect the quality of the State's surface and ground water supply sources. A great deal of progress has been made over the last two decades in protecting our water supplies, especially from contamination that emanates from site-specific sources. However, significant development continues to occur in the water supply watersheds and over ground water supplies. Consequently, the new focus of water resource protection programs must be on the management of nonpoint pollution sources and the maintenance of aquifer recharge, but will include the integrated management of point source pollution where necessary. In a State with finite water resources, water quality degradation can place an major strain on our water supplies. Contamination of our water supplies often increases the cost of water because new treatment systems must be installed. In the worst-case scenario, contamination can render an entire supply useless. Managing nonpoint pollution sources will represent a formidable challenge. The NJDEP has consequently initiated the watershed approach and several statewide efforts to address the nonpoint source and point source problem together.

- **Surface Water Protection** - This initiative emphasizes the protection of surface water supplies used for drinking water. It is recommended that this initiative continue in full force and that models be developed that allow the NJDEP and local land-use agencies to quantify the effects of land use activities on surface water supplies so that management practices can be developed to reduce these effects. Also, the NJDEP will cooperate with the Legislature to ensure that any proposed watershed protection legislation will sufficiently protect surface water supplies. *(Chapters 3.J and 7.A) Funding Source: 1981 Bond Fund Allocation: $0.505 million (new allocation)*

- **Aquifer Protection** - Delineating aquifer recharge areas and managing activities in these areas that potentially can degrade or reduce drinking water supplies are the objectives of this initiative. The NJDEP recommends that this program be continued and that analytical tools be developed which will allow the NJDEP and local land-use planners to estimate the impacts of land use activities on the state's ground water supplies and to design programs to reduce these impacts, especially those caused by nonpoint sources. *(Chapters 3.J and 7.A) Funding Source: 1981 Bond Fund Allocation: $1 million (no change)*

- **Well Head Protection** - The objective of this initiative is to minimize the risks to public water supply wells by delineating areas around them that are most vulnerable to contamination and managing activities within these areas. Well head protection areas for over 2700 public community water supply wells in 20 counties are being delineated by the NJDEP. Public noncommunity water supply wells and large groupings of domestic wells are also included in the program. It is recommended that this program be vigorously continued. *(Chapter 7.A) Funding Source: 1981 Bond Fund Allocation: $3 million (no change)*

- **Acquisition of Critical Water Supply Protection Areas** - The NJDEP recommends that legislation be adopted that provides a stable source of revenue to purchase the most critical, developable or developed lands within potable supply watershed lands, aquifer recharge areas and well head protection areas that serve as major water supplies in order to protect them from imminent or major water quality deterioration. Numerous complex issues will need to be addressed, including cost-effectiveness, lands previously purchased by purveyors for water quality protection purposes, which revenue source(s) is most appro-

priate for this purpose, how the revenue source would be collected, who would maintain the properties, coordination with other land preservation programs, etc. Until this legislation is adopted, $20 million for loans is allocated from the Bond Fund for the purchase of some limited lands for critical water supply protection. *(Chapter 7.A) Funding Source: 1981 Bond Fund Allocation: $20 million (new allocation)*

- **Municipal Land Use Law** - The NJDEP proposes to develop a guidance document that describes various methods by which municipalities may carry out the water supply and water quality objectives of this statute in the development of their natural resource inventories, municipal master plans and development review ordinances. Demonstration studies in volunteer municipalities will be performed. *(Chapter 7.A) Funding Source: 1981 Bond Fund Allocation: $0.25 million (new allocation)*

- **Regional Aquifer Studies and Research** - There is a need to continue investigations of ground water resources where excessive use and its consequent effects (saltwater intrusion, stream flow depletion, etc.) may be threatening supplies. Once these studies are completed, feasibility studies that evaluate alternate water supplies are generally performed. Planning areas where additional analysis or research will be needed are the Toms/Metedeconk, Salem/Cohansey/Maurice, Mullica, and Camden Tributaries/Rancocas watersheds. In addition, portions of other planning areas may require investigations as a result of an assessment made during the watershed characterization process. *(Chapters 6 and 7) Funding Source: 1981 Bond Fund Allocation: $0.385 million (new allocation in addition to $19.65 million existing allocation)*

- **Watershed Management** - The objective of the water supply component of watershed management is to balance and prioritize water supply needs with other beneficial uses, and to integrate management of water and water-related land use activities so as to ensure that the yield and the quality of the watershed's water supplies are maintained. The NJDEP recommends that future water supply planning be conducted within the watershed management context. It is recommended that the Toms/Metedeconk, Mullica/Great Egg and Upper Passaic/Lower Passaic/Hackensack watersheds have management plans developed to protect water quality as water supply priority areas. Funds are also allocated for up to two more areas. *(Chapter 6) Funding Source: 1981 Bond Fund Allocation: $0.5 million for five watershed management areas (new allocation)*

2. Issues for Future Analysis

- **State Development and Redevelopment Plan** - Current piecemeal development patterns are often to the detriment of the State's water supplies (e.g., local development of ground water supplies in close proximity to the saltwater front, depletive ground water diversions up stream of potable surface water intakes). The NJDEP recommends that water supply planning and the State Development and Redevelopment Plan be more closely coordinated to ensure that objectives of both initiatives are met; potential conflicts need to be resolved, including the prevention of the proliferation of non-viable water utilities. Proposed efforts regarding an Environmental Master Plan may be useful toward this end.*(Chapters 4.F, 7.A and 9.D) Funding Source: General State appropriations - Watershed management*

- **Water Supply Protection Aspects of the Surface Water Quality Standards** - Efforts will be made in the future to better integrate the NJDEP's surface water quality standards with surface water supply management so as to ensure that both initiatives' objectives are met. A portion of this effort will be to evaluate the surface water use designations and water quality criteria with respect to their adequacy to protect surface water supplies. *(Chapters 7.A and 9.A) Funding Source: General State appropriations*

- **Wastewater Treatment Plant Upgrades** - It is important that wastewater treatment plants that discharge upstream of existing and future surface water supplies continue to meet high standards and that these discharges continue to allow water treatment plants to meet drinking water standards. The Upper Passaic/Hackensack planning areas will be specifically evaluated to determine the adequacy of the regulatory process. There are other planning areas in the state where similar evaluations will need to be performed, as wastewater inputs increase over time. Additionally, policy will need to be developed which ensures that wastewater regionalization does not have significant negative effects on the state's water supplies. *(Chapter 6.D) Funding Source: Federal Clean Water Act Grants*

3. Water Supply Development and Management

Ensuring that adequate water is available to meet current and future demand is the primary objective of this initiative. New approaches to water supply development and management must be considered as demand increases and as the NJDEP watershed approach evolves for managing water resources. Emphasis must be placed on enhanced management of existing supplies, in conjunction with the water quality protection initiatives discussed above. Included among the structural options are interconnections among various users, conjunctive water use of two or more sources, direct (for non-potable uses) and indirect wastewater reuse, aquifer storage and recovery, desalination and the use of new and improved treatment technologies that are capable of transforming previously impaired water into potable supplies. Significant technical and cost analyses are often necessary prior to developing and implementing these approaches. There are also non-structural water supply management initiatives that, when implemented, provide opportunities to extend existing and new water supplies. Among these initiatives are improved drought rule curves, optimum withdrawal strategies, and coordinated wastewater and water supply development.

- **Water Supply Management Data Base** - Since the 1982 Plan was developed, the NJDEP's water supply management data base has been significantly improved. There is much information, however, that needs to be incorporated. An up-to-date GIS-linked data base for water supply management is critical to water supply management. More detailed water use information will also be required from the major water purveyors in order to better understand water use patterns. Finally, periodic updates will be appropriate to incorporate new water use, wastewater discharge and population data and projections. *(Chapter 4.J) Funding Source: 1981 Bond Fund Allocation: $0.5 million (new allocation)*

- **Water Use Ranking** - The NJDEP proposes to rank and determine preference among uses of the various water resources used for water supply. The issue is the primacy of needs (e.g., public water supply, agriculture, manufacturing, recreation, aquatic life, pollutant discharge attenuation) during critical flow periods. While this initiative will be conducted in detail on a watershed-specific basis, it will be many years before all watershed planning is completed. Consequently, the NJDEP recommends that in the interim a more generic policy be developed as the basis for water use ranking. *(Chapters 7.A and 8.C) Funding Source: 1981 Bond Fund Allocation: $0.15 million (new allocation in combination with In-Stream Flows allocation, below)*

- **In-Stream Flows** - In conjunction with water use ranking, in-stream flow maintenance goals for ecosystem protection, recreation, wastewater assimilation and other uses should be established. The NJDEP plans to conduct research that identifies the quantity of water required for particular sets of uses and needs, analyze the implications of these requirements, and develop policy based on its findings. *(Chapters 3.J and 8.C) Funding Source: 1981 Bond Fund Allocation: See Water Use Ranking, above.*

- **Optimum Withdrawal Strategies** - The NJDEP proposes to develop a guidance document that describes appropriate optimization strategies that municipalities and purveyors should implement in order to ensure that reliable long-term water supplies are maintained, as well as to meet the objectives of the water use ranking and in-stream flow initiatives. Conjunctive water use with aquifer storage and recovery will likely evolve as a major water supply alternative in the future. Analysis is recommended, including the potential for using recovering critical water supply area aquifers during drought. *(Chapters 3.J, 6.B and 7.B) Funding Source: Water allocation fees, existing contracts (no additional allocation)*

- **Effects of Hydrologic Modifications on Water Availability** - Changes to the natural landscape that accompany development can stress water supplies during low rainfall periods and impair freshwater-dependent ecosystems. The NJDEP proposes that a hydrologic model be developed that can estimate the hydrologic effects of development in water supply watersheds so that proactive strategies can be implemented. *(Chapters 3.J and 8.C) Funding Source: 1981 Bond Fund Allocation: $0.1 million (new allocation)*

4. Issues For Future Analysis

- **Analysis of Safe Yield** - There is a need to re-analyze the definition and the methods the NJDEP employs to quantify water availability to avoid overuse, as well as to implement the water use ranking initiative. Also, purveyors that employ conjunctive water use and wastewater reuse systems should be required to quantify their safe or dependable yield where it has not been clearly defined. Last, purveyors that are constrained by water quality concerns should have the opportunity to re-analyze their yields if source quality

has improved since these constraints were invoked. *(Chapters 3.J and 8.C) Funding Source: 1981 Bond Fund Allocation: $0.05 million (new allocation, including Dependable Yield, below)*

- **Dependable Yield/Refinement of Planning Thresholds** - The planning threshold for ground water availability requires refinement to ensure that ground water supplies are not over- or under-allocated, either of which could result in inefficient water supply decisions. Also, the dependable yield definition needs to be re-evaluated to ensure that its use maintains long-term reliability and does not result in negative effects on other users and uses. *(Chapters 3.J and 8.C) Funding Source: 1981 Bond Fund Allocation: see Analysis of Safe Yield, above.*
- **Water-Banking** - The NJDEP needs to analyze the concept of water-banking if it is to encourage conjunctive water use. Banking consists of allowing water to be preserved in the present for water supply purposes and other beneficial uses in the future. In addition, the NJDEP needs to ensure that all viable, future reservoir sites are protected from infringement and diminishment. *(Chapter 7.B) Funding Source: General State appropriations*
- **Effect of Withdrawals that Stress Supply Availability** - NJDEP policy is needed where requests are made for water allocations that exceed the water availability planning threshold. Also, there is a need to evaluate the 100,000 GPD threshold for water allocation permits in some areas. Numerous withdrawals less than this threshold can have the same effect as one major withdrawal. Last, the NJDEP will prepare draft policy that will determine who will be responsible for conducting additional hydrological investigations and related studies, when they will need to be performed, how they will be funded, legislative needs, etc. *(Chapter 3.J) Funding Source: General State appropriations*
- **Water Availability Monitoring** - The importance of monitoring the regional effects of numerous withdrawals cannot be overestimated. While the existing monitoring network is generally adequate, increases in demand will require a more comprehensive and regional network to methodically provide baseline information, detect trends, serve as an early warning system and provide sufficient data for computer models. The NJDEP plans to assess its monitoring program in the near future and determine how this program can be funded. *(Chapter 3.J) Funding Source: to be determined.*
- **Use of Contaminated Ground Water Supplies**- The NJDEP needs to develop policy concerning under which circumstances users of ground water supplies that become contaminated should treat that supply or turn to other supplies. In addition, there is a need to better coordinate water supply management and contaminated ground water sites. It is imperative that remedial actions at these sites do not employ depletive disposal methods if feasible, especially in planning areas prone to water supply shortages. The NJDEP should require pump-treat-reinject methods, unless impractical or the treated water is used as a supply. *(Chapters 7.B and 9.E) Funding Source: to be determined.*

5. Water Conservation

While New Jersey has significantly improved its water conservation efforts over the last few years through its requirements for water-saving plumbing fixtures and water conservation plans for all major users of water, much will need to be done in the future as a means of deferring water supply deficits. Until recently, water was viewed as an inexpensive, unlimited resource. There is a need to refocus our attention. Very few "conventional" water supplies remain available, and those that remain generally will yield less supply at a greater cost and will be subject to a larger number of environmental and other siting constraints.

There are several other trends that, when combined, create an impetus for reevaluating the way we use water. The cost to treat potable and waste water has escalated over the years as new water quality standards are implemented. In many parts of the State, combined water and sewer service costs are more than $1,000 annually for the average household. In other parts of the State new connections to sewage treatment plants are not allowed because the plants are at capacity. More efficient plumbing fixtures and appliances are available which could reduce sewage flows and defer sewage treatment plant expansion. They can also delay the need for new water supply storage, treatment and distribution facilities.

It is estimated that there can be a 10-30 percent reduction in water use in individual homes if water conservation devices were installed and certain outdoor water uses were reduced, such as through the use of developed turf and other landscape designs that are drought-tolerant.

Reducing the unnecessary use of water will be a major objective of the NJDEP. The initiatives specified in this chapter should serve to meet this objective. It should be noted, however, that a distinction

needs to be made regarding statewide and regional water conservation initiatives because different circumstances will often deserve different strategies. There are numerous forms of water use and water users; cost-effective strategies will need to be developed for each.

State Water Conservation Strategy - This recent document concluded that the NJDEP should reaffirm its support for the principles of water conservation and demand reduction as effective and efficient alternatives in water resources planning and management through an educational, non-regulatory and incentive-based approach. The approach would provide for the following:

1. Expansion of the water conservation public education program, especially in the school curriculum and conservation landscaping for adults.
2. Formation of a public-private partnership to improve the efficiency of turf irrigation.
3. Emphasis on structural conservation measures rather than behavioral conservation measures (except during drought), due to the greater certainty and reliability of the former.
4. Acceleration of structural conservation measures and other efforts in water supply deficit areas, including expediting unaccounted-for-water-loss reduction compliance schedules and provisions for low or no-interest loans, especially to those public utilities that agree to implement conservation rate structures. Continued support should be given to such efforts in Cape May County and other deficit-prone areas. (Chapter 6.C and 6.G)
5. Application of proven, new plumbing technological advances that use less water and provide equal performance. A proposal should be made to the NJ Department of Community Affairs that automated lawn sprinkler systems have rain sensors that activate them rather than being time-activated regardless of need.
6. Proposal to the Board of Public Utilities to evaluate allowing water utilities to treat water saving plumbing fixtures as capital costs, as is currently the case for residential energy conservation fixtures.
7. Promotion of conservation rate structuring for those utilities using declining block rates, especially those utilities seeking expanded water allocations.
8. Encouragement to local and regional entities to tailor their conservation plan to meet particular local conditions. Offer planning and financial support.
9. Proposal to require large self-supplied water users that experience source or supply problems to perform water audits every five years.
10. Proposal for monitoring plumbing code enforcement.

(Chapter 7.B): Funding Source: 1981 Bond Fund Allocation: $0.83 million (new allocation for various purposes outlined above, in addition to existing allocation of $1.6 million)

6. Other Water Conservation Initiatives

- **Unaccounted-For-Water** - Unaccounted-for-water is the result of water service infrastructure leaks, illegal or unmetered hookups, fire protection, etc., and typically represents 10 to 30 percent of total demand. The NJDEP recommends that the program to require reduction of excessive unaccounted-for-water continue. *(Chapter 9.D) Funding Source: General State appropriations and water supply systems*
- **Industrial Water Conservation** - Industrial demand (excluding large self-supplied, industrial cooling demand) represents a significant portion of total statewide demand. There are often cost-effective opportunities to reduce industrial demand. The NJDEP proposes that industries depletively or consumptively utilizing the largest quantities of water perform water audits once every five years or when new or expanded water allocation permit applications are submitted. *(State Water Conservation Strategy, Appendix B) Funding Source: General State appropriations*
- **Water Supply Infrastructure Loan Program** - The Water Supply Infrastructure Loan Program has accomplished much over the last decade, providing $86 million in loans to rehabilitate inadequate systems (September 1993). The NJDEP should consider expanding this program to provide loans for nonpotable water reuse and water conserving plumbing replacement projects in planning areas experiencing deficit conditions. *(Chapter 9.D) Funding Source: 1981 Bond Fund Allocation (see Water Delivery Management-Water Supply Loan Program, below)*
- **Consumptive Water Use Management** - Consumptive water use is the permanent removal of water from its source supply, primarily through evaporation at or near the location from where it was withdrawn. The NJDEP needs to develop an inventory of consumptive water uses in order to assess their impacts on water supplies. The results should be incorporated into the Water Balance Model. Once completed, the NJDEP will

evaluate initiatives that could reduce consumptive water uses. Among the initiatives to be considered will be incentives for the non-consumptive use of water. *(Chapter 7.B) Funding Source: 1981 Bond Fund Allocation (see Section 3 above, regarding Water Supply Management Data Base).*

- **Depletive Water Use Management** - Depletive water use refers to the exportation of water whereby there is no opportunity for reuse within its source area. Wastewater system regionalization is considered to be the largest depletive water use. Policy has recently been drafted that discourages depletive water uses in various circumstances. This policy should be finalized and implemented. It is recommended that consideration also be given to factor the costs of alternative water supplies when evaluating the cost-effectiveness of proposed depletive wastewater facilities. *(Chapters 3.J and 7.B) Funding Source: General State appropriations*

7. Water Delivery Management

The primary objective of this program is to ensure that adequate quantities of suitable quality water are available at the point of use. Being the most densely populated state in the nation, New Jersey's water delivery system is both extensive and complex. In many cases, also, the systems are very old. There is a need to continuously monitor, maintain and develop interconnections between systems to ensure an adequate supply of water for emergency and regular uses. The NJDEP will continue its efforts in this regard, as well as provide funds for the rehabilitation of inadequate systems.

It is proposed that the Water Supply Loan Program will undergo fundamental changes with respect to which systems are provided funds for rehabilitation. A priority system is being considered based on public safety needs, the amount of water saved and the status of the regional water supply with respect to potential deficit. It is suggested that some of the funds that were traditionally used for infrastructure improvement be shifted to water conservation improvements in deficit regions, when it is concluded that this is the more cost-effective option. It is also proposed that funding be expanded for treatment upgrades to meet new drinking water standards, with treatment to meet primary standards having priority over treatment to meet secondary standards but both being eligible.

- **Water Supply Loan Program** - This program provides low-interest (revolving) loans from the Bond Fund to public-owned water purveyors for certain types of water system improvements. Approximately $120 million has been allocated to date (of which $20 million is from repaid loans); $100 million has been appropriated and is presently committed or pending commitment. These priorities will be set by regulations rather than the NJSWSP to allow flexibility year-to-year. The NJDEP proposes to re-prioritize the loan program in the following ways:

1. Emphasize maintenance and rehabilitation infrastructure in urban centers, in recognition of principles set forth by the State Development and Redevelopment Plan and the greater age of such systems.
2. Continue the existing program for small local project loans and consider utilizing a program similar to the Wastewater Treatment Financing Program for other projects.
3. Construct facilities that ensure continued use of existing surface water supplies.
4. Rehabilitate contaminated ground water supplies where cost-effective and practical, especially in urban areas, and especially where the loss of such supplies would result in increased stress on existing surface water supplies or on ground water supplies from already-stressed aquifers.
5. Construct wastewater reuse facilities for direct (nonpotable) and indirect (potable and nonpotable) water supply, especially where such reuse would reduce the stress on existing water supplies *(Chapters 7.B, 9.C and 9.D).*
6. Construct interconnections to ensure adequate system redundancy and drought response capabilities.
7. Construct facilities to meet Safe Drinking Water Act requirements, with a priority for meeting primary standards but with eligibility for projects to meet secondary standards.
8. Conduct an infrastructure needs survey to determine the overall financing needs of public and investor-owned water supply systems in New Jersey for near future (completed in 1995).
9. Construct capital projects identified in Chapter 6 of the NJSWSP. *(Chapter 9.E)* Funding Source (for items 1 through 7): *1981 Bond Fund Allocation: $40.0 million (new allocation for fiscal years 1995, 1996 and 1997, in addition to $120 million existing allocation), and $10 million per annum (new allocation beyond fiscal year 1997)* Funding Source (for item 9): 1981 Bond Fund Allocation and other sources (new and existing allocations as shown on Water Supply Action Program table at the end of this chapter)

8. Other Water Delivery Management Initiatives

- **Drought Management in the Passaic and Hackensack River Watersheds** - The densely populated areas of the northeast are typically more vulnerable to the effects of drought than the rest of New Jersey. The NJDEP recommends that a Passaic/Hackensack River watershed hydrologic model be developed that would:

  1. update and verify the safe yields of the system, including factors related to interbasin water and wastewater transfers and ground water availability and use;
  2. allow for "testing" of several water supply alternatives (e.g., interconnections, conjunctive water use, altered reservoir management, wastewater reuse and improved river water quality) that could potentially increase yield;
  3. improve the drought rule curve for the system;
  4. provide the NJDEP with improved capabilities to manage the water supplies of the system during various kinds of stresses (e.g., repeat drought of record, short but severe drought); and.
  5. allow the evaluation of water quality impacts on different drought scenarios.

  These efforts will be coordinated with affected purveyors. *(Chapters 6.C and 9.B) Funding Source: 1981 Bond Fund Allocation: $0.4 million (new allocation)*

- **Statewide Drought and Emergency Management** - The management of water use during drought and emergency conditions is of paramount importance. Recent dry spells have provided the NJDEP with experiences on how to better deal with drought situations which should prove useful in cooperative water management endeavors under taken between the NJDEP and water purveyors. In addition, purveyor conservation and emergency plans need to be updated to include defined "triggers" when specific management actions will be initiated to avert a water emergency. The NJDEP recommends that policy be developed to this end. *(Chapter 9.B) Funding Source: to be determined*

- **Water Supply Treatment Residuals Management** — A number of relatively new drinking water treatment, industrial pretreatment and sludge (residuals) management regulations have resulted in significant technical, technological and regulatory issues for water purveyors. NJDEP recommends that a Treatment Residuals Study be performed to provide guidance to all water purveyors regarding residuals management. *(Chapter 9.B) Funding Source: 1981 Bond Fund Allocation: $0.4 million (new allocation)*

9. Issues For Future Analysis

- **Non-Viable Water Systems** - There is a demon strated need to improve the management of existing non-viable (inadequately operated or financed) water supply systems. Further, since there is the potential for the proliferation of non-viable systems in the future as development continues to shift to suburban and rural areas, the NJDEP recommends an evaluation of necessary legislative and regulatory revisions be made in concert with the Board of Public Utilities to reduce the potential for such systems to be created. *(Chapter 9.D) Funding Source: General State appropriations*

- **Loans to Privately-Owned Water Utilities** - The 1981 Water Supply Bond Act does not authorize the NJDEP to provide loans to investor-owned water utilities, despite the fact that all taxpayers pay for publicly-owned water system subsidies and State management efforts funded by the Bond Fund and that over half of the water provided by community water supply systems in the state is provided by investor-owned utilities. The NJDEP recommends that a funding mechanism be developed that increases the equity between consumers of publicly-owned and investor-owned water purveyors. *(Chapter 6.J) Funding Source: to be determined*

- **Federal Drinking Water State Revolving Fund** - The federal government is considering the creation of a drinking water revolving fund in which the states would be provided with upwards of $1 billion annually to provide low-interest loans to public water supply systems. It is envisioned that this program would require a 20 percent State match. Funding sources need to be evaluated. The State should recommend to Congress that this fund should provide loans to investor-owned water systems. *(Chapter 9.D) Funding Source: matching fund source to be determined*

- **Infrastructure Choices** - There is the need to integrate our land use, water supply, water quality and wastewater infrastructure planning efforts to ensure that water continues to be of suitable quality and of ample quantity. The NJDEP plans to prioritize watershed planning initiatives in regions of the state where such opportunities exist to improve overall water quality and quan-

tity. A cooperative project with the Office of State Planning and the NJ Department of Transportation will be undertaken to address this issue. *(Chapters 3.J, 7.A and 9.A) Funding Source: 1981 Bond Fund Allocation; portion of Growth Areas Feasibility Study appropriation*

D. Capital Projects

1. Overview

These types of projects are capital-intensive, structural projects that provide additional water in a specific planning area or areas in order to reduce, eliminate or avoid projected water supply deficits. The majority of these projects were identified in regional feasibility studies conducted after approval of the 1982 Plan using the Bond Fund and generally are "conventional" projects by nature. Examples include such facilities as reservoirs, regional pipelines and new well fields. Precursor activities such as feasibility studies, interconnection studies and hydrogeologic investigations fall in this category if it appears that major capital projects will result from them.

As a result of the 1982 Plan and earlier planning efforts, a total of $786.55 million in public and private funds has been expended on or committed to several major capital projects, including $217.55 million from the Bond Fund. Consequently, the most densely populated portions of the State possess or will soon possess sufficient regional supplies well beyond the turn of the century (as long as water quality problems are avoided and delivery systems are adequate; sub-regional problems still may exist). There may be a need to improve surface water operations in the northeastern and central portion of the State, including some new interconnections to meet local needs. These needs will be addressed by various studies described below and continuous updating (and improvement) of the NJDEP's data base, which will monitor demand and availability.

The New Jersey shore and the southwestern portion of the State, however, are expected to experience the greatest growth: several planning areas in these regions may potentially be in water supply deficit and thus will need special attention over the next decade. Several investigations are currently underway in these areas, but others will need to be initiated soon. It is anticipated that these studies will conclude that conjunctive surface/ground water capital projects and well field relocation (including multi-aquifer use) projects will be needed to meet the growing water supply needs of these areas. Future reductions in depletive water use, including water conservation, may also be necessary.

2. Recognized Capital Projects

- **South River Regional Pipeline** - The Middlesex Water Company's South River Regional Pipeline is now completed and providing water to meet the cutbacks specified for Water Supply Critical Area #1. *(Chapter 6.D) Funding Source: Investor-owned utility*

- **Tri-County Project** - The NJ American Water Company Delaware River water treatment plant is complete (initial phase) and the regional pipeline to meet mandated cutback for Water Supply Critical Area #2 is currently under construction. The NJDEP supports new loan-funded interconnections for publicly-owned utilities to tie into the regional pipeline. *(Chapter 6.F) Funding Source: Private sector for pipeline and treatment plant; public sector and 1981 Bond Fund for connections to project*

- **Southern Cape May Alternative Water Supply** - A feasibility study is nearly complete which evaluated the saltwater intrusion problem in the southern portion of Cape May County and measures of mitigating this problem. Withdrawals from the Cohansey aquifer in the southern-most part of the county need to be reduced and alternative supplies implemented to compensate for the reduction. The NJDEP would support funding for capital projects that mitigate the intrusion problem as a long-term solution.

  The City of Cape May has identified desalination as its preferred water supply alternative to mitigate the saltwater intrusion threat. NJDEP intends to support this project if an evaluation concludes that it is a cost-effective sub-regional alternative, that it will not prohibit water supply options that are critical to neighboring municipalities, and it has been demonstrated that the project acts to reduce the rate of saltwater intrusion in southern Cape May County. This project will be included into the NJSWSP if it meets all the above mentioned criteria. The costs for constructing a desalination facility and related infrastructure to serve Cape May City has been estimated at $3.5 million. However, there is the potential that the criteria may not be met and that other projects will be more effective in addressing the problems of the area, or that supplementary projects will be necessary to address the full scope of water supply issues in the area. Therefore, an allocation from the Bond Fund up to an amount of $5.0 million in low-interest loans is made to fund the selected project(s). *(Chapter 6.I) Funding Source: 1981 Bond Fund authorization: up to $5.0 million from the Water Supply Loan Program (see above)*

- **Kingston Quarry Reservoir** - The Eastern Raritan Water Supply Feasibility Study determined that the most cost-effective water supply project to be implemented in the Raritan and South River planning areas is the Kingston Quarry Reservoir. The New Jersey Water Supply Authority will be the project sponsor. If this project is not feasible due to complications with the quarry owners, the Confluence Pipeline would be the alternate selected project with the same project sponsor. Although the projects will not be needed for some time, commitments are required in the near future. *(Chapter 6.D) Funding Source: 1981 Bond Fund Allocation: Deferred until project selected (approximately $57 million for Kingston Quarry Reservoir, or $71 million for Confluence Pipeline)*

- **Manasquan, Metedeconk and Toms River Area Study** - The Metedeconk and Toms River planning areas have significant projected water supply deficits, while the Manasquan River planning area is anticipated to experience surplus supplies due to the existence of the Manasquan Reservoir. It is recommended that a feasibility study be conducted to determine the extent of the long-term problem in the Metedeconk/Toms River areas in more detail, and then determine the most cost-effective and environmentally sound methods for ensuring adequate supplies, such as alternate supplies in the deficit areas or a regional interconnection between them and Manasquan River planning area. *(Chapter 6.E) Funding Source: 1981 Bond Fund Allocation: Existing allocation (Ocean County Feasibility Study)*

- **Alternative Supplies for the Salem, Cohansey and Maurice River Watersheds** - The Maurice River planning area is vulnerable to saltwater intrusion and stream flow depletion. In contrast, the Salem/Cohansey planning area may have adequate water supplies for the duration of the planning period and perhaps beyond. An investigation is necessary to define the magnitude of the problem in the deficit area. In the event that the problem is relatively severe, a feasibility study will need to be performed. *Chapter 6.H) Funding Source: 1981 Bond Fund Allocation: $0.125 million (new allocation for feasibility study. Allocations exist for initial ground water investigation)*

- **F.E. Walter Reservoir Expansion** - The expansion of the F.E. Walter Reservoir in Pennsylvania would significantly reduce the frequency of drought warnings and drought emergencies in the Delaware River Basin. The NJDEP has allo cated $10 million for the State's share of the project from the Bond Fund. However, this project has been delayed because of changes needed to the 1961 Delaware River Basin Compact. In order to overcome these shortcomings, the US Congress would have to revise the Compact. New Jersey, as a Compact member, supports this revision. *(Chapter 6.D) Funding Source: 1981 Bond Fund Allocation: $10.5 million (no change)*

E. Funding Strategy

The NJDEP will continue to play an active role in providing financial assistance for water supply projects and programs throughout the state. Local government, water utility fees and the private sector will continue to be key sources of capital funding for projects, and in fact will provide the majority of future funding as they have in the past. The primary benefit of the Bond Fund is its ability to provide funding for critical needs, initiatives that provide public benefits beyond any one water supply system, correction of long-standing infrastructure needs, and support to innovative efforts and major capital projects that otherwise might not take place or be successful.

The NJSWSP has concluded that management, protection and rehabilitation of existing water supplies in conjunction with conservation of water will for the most part defer the need to seek large regional supplies for several decades. Consequently, it is recommended that most of the remaining Bond Fund be used to extend these supplies as far as possible through an array of management options as described above, including system rehabilitation, conservation, protection of water resources and improved water system management. (Chapter 6.J)

1. Issues for Future Analysis

- Financial incentives need to be provided to the private sector to provide important water supply improvements recommended in the NJSWSP. A major reason for such incentives is to provide equity to the affected ratepayers, who currently help support incentives for publicly-owned systems while also paying market rates (through the investor-owned purveyors) for their own needs. It is recommended that the NJDEP perform an analysis of incentives that ultimately can reduce water use, and protect and extend supplies. Included in this analysis will be a reexamination of excluding investor-owned purveyors from the Bond Fund, along with incentives to water users themselves. If found to be viable, the State could recommend to Congress that Federal tax laws be revised to allow for

water supply loans to be made to the private sector. In the interim, direct State support of activities that benefit investor-owned water supply systems without directly subsidizing them will be continued. *Funding Source: General State appropriations for analysis; to be determined for investor-owned funding*

- A needs survey should be conducted for all purveyors to determine the infrastructure and financial needs throughout the State. The needs survey should use existing surveys as a foundation for more detailed analysis. This survey will be increasingly important if the proposed Safe Drinking Water Act amendment includes funds for a revolving loan program. *Funding Source: 1981 Bond Fund Allocation: $0.3 million (new allocation)*
- An assessment needs to be made of restructuring Bond Fund repayments so that more funds can be recycled back into the loan program. Also, an assessment should be made of a renewable funding source so that the burden of water supply management is shared among the state's population. *Funding Source: General State appropriations*
- A further review of the existing loan program should be made to determine if its present priorities will meet future needs. *Funding Source: General State appropriations*

F. Legislative and Regulatory Actions

Several existing or proposed statutes will need to be revised if the NJSWSP is ultimately going to be fully successful.

- There have been many proposals for the State to purchase several watershed lands in New Jersey as well as watershed lands in other States where water from those lands flow into New Jersey. While the Bond Fund can and should be used as a funding source for some of these purchases, it would quickly be depleted if it were to be used for the purchase of a significant portion of any one of the larger watershed lands under consideration. It is therefore recommended that other sources of funding and other land conservation approaches be considered for this purpose in the long term. *(Chapter 7.A) Funding Source: Green Acres Program (partial); additional sources to be determined*
- Proposed watershed protection laws are intended to protect the water quality of reservoirs and surface water withdrawals. Since these proposals will have profound effects upon these water supplies, the NJDEP should closely coordinate with the legislative sponsors. Major issues include the cost-effectiveness of management measures, the protection of ground water, integration with existing and developing programs, management of existing land uses, creation of a cooperative relationship between various water laws (water supply and water quality) and between various levels of government (including the role of municipal governments. *(Chapter 7.A) Funding Source: to be determined*
- Statutes and regulations dealing with stream passing flow deserve to be re-considered, especially in consideration of our knowledge of the interrelationship between surface and ground water as well as the fact that NJDEP is evolving toward a watershed management approach. It is possible that some passing flows defined by law or court order are no longer defensible due to major changes in water quality and environmental concerns since the time of their adoption. *(Chapters 3.J, and 8.C) Funding Source: to be determined*
- If analysis concludes that it would be to the State's advantage to expand its loan program to serve investor-owned purveyors, the NJDEP would recommend that the 1981 Water Supply Bond Act be revised or that a supplemental funding source be developed. *(Chapter 6.J) Funding Source: to be determined*
- In order to prevent the proliferation of non-viable water companies throughout the State the NJDEP, in concert with the Board of Public Utilities, will recommend that laws and regulations be reviewed to determine their adequacy, and then revised to the extent necessary to minimize the development of non-viable systems. *(Chapters 4.B and 9.D) Funding Source: General State appropriations*
- The NJDEP should renew its efforts to have the United States Congress revise the 1961 Delaware River Basin Compact so that the F.E. Walter Reservoir can be expanded to serve as a water supply. *(Chapter 6.D) Funding Source: General State appropriations*

G. Relationship of the NJSWSP to Regulatory Programs

The NJSWSP establishes a planning framework that identifies water supply problems and public issues, and proposed activities, objectives and policies to address these problems and issues. It is important that State and local decision makers involved in wa-

ter supply matters are aware of these activities, objectives and policies in order to reduce the potential for future conflict, especially in deficit areas. The NJSWSP is not binding on any government, government agency or regulatory program except to the extent that the use of Bond Fund is proposed, at which point the NJSWSP is fully binding.

H. Updates, Revisions and Progress Evaluations of the NJSWSP

As required by the 1981 NJ Water Supply Management Act, the NJDEP shall revise and update the NJSWSP periodically, which NJDEP intends to interpret as being at least once every five years. Each revision and update shall be accompanied by a progress evaluation. In addition, progress evaluations shall be prepared and submitted to the New Jersey Legislature as and where required by individual appropriations from the Bond Fund. *Funding Source: 1981 Bond Fund Allocation: $0.3 million (new allocation)*

I. NJDEP Organizational Responsibilities

The Office of Environmental Planning and the Water Supply Element (or their organizational successors) will have the primary responsibilities for coordinating, overseeing and carrying out the initiatives set forth in the NJSWSP. The Office of Environmental Planning will have the primary responsibility for coordinating the periodic update and revision of the NJSWSP, and for general water supply planning initiatives.

TABLE 10.1

1995 NJ STATEWIDE WATER SUPPLY PLAN ACTION PROGRAM

(in millions of dollars)

PROGRAMS AND PROJECTS	1982-1993 WATER SUPPLY BOND ALLOCATIONS	NEW WATER SUPPLY BOND ALLOCATIONS	TOTAL WATER SUPPLY BOND ALLOCATIONS	APPROPRIATED WATER SUPPLY BOND FUNDS	UNAPPROPRIATED WATER SUPPLY BOND FUND ALLOCATIONS	PREVIOUS COMMITMENTS FROM OTHER FUNDING SOURCES	ANTICIPATED COMMITMENTS FROM OTHER FUNDING SOURCES	SCHEDULE
MAJOR CAPITAL CONSTRUCTION PROJECTS								
1. Major Projects								
A.. Delaware & Raritan Canal Improvements	20.550	-	20.550	20.550		-	-	completed
B. Wanaque South Including Monksville Reservoir	42.000	-	42.000	42.000		101.000	-	completed
C. Manasquan Reservoir	72.000	-	72.000	72.000		-	-	completed
D. F.E. Walter Reservoir Modification	10.500	-	10.500	-		114.000	-	not in progress
E. Merrill Creek Reservoir	-	-	-	-		217.000	-	completed
F. Tri-County Water Supply Project	-	-	-	-		170.000	-	in progress
G. Water Supply for South River Area	-	-	-	-		40.000	-	completed
TOTAL	**145.050**	**0.000**	**145.050**	**134.550**	**10.500**	**642.000**	**0.000**	
WATER RESOURCES EVALUATIONS								
2. Feasibility Studies								
A. Salem/Cohansey/Maurice Rivers Feasibility Study	-	0.125	0.125	-		-	0.125	1998-2000
B. Estuary Impact Feasibility Study	n/a	-	n/a	1.000		-	-	-
C. Passaic-Hackensack Water Supply Basin Feasibility Study	n/a	-	n/a	0.800		-	-	-
D. Ocean County Feasibility Study	n/a	-	n/a	0.500		-	-	-
E. Manasquan River Water Supply Feasibility Study	n/a	-	n/a	0.800		-	-	-
*F. Growth Areas Feasibility Study **	n/a	-	n/a	1.800		-	-	-
*G. Buried Valley Feasibility Study **	n/a	-	n/a	0.600		-	-	-
H. Northwest Mercer County Feasibility Study	n/a	-	n/a	0.200		-	-	complete
I. Cape May County Regional Area	n/a	-	n/a	n/a		-	-	complete
J. Evaluation of Contaminated Wellfields & Alternate Supplies	n/a	-	n/a	n/a		-	-	-
K. South River Basin Area	n/a	-	n/a	n/a		-	-	complete
L. Camden Metropolitan Area	n/a	-	n/a	n/a		-	-	complete
M. Atlantic County Regional Area	n/a	-	n/a	n/a		-	-	complete
N. Consolidations and Extensions of Service	n/a	-	n/a	n/a		-	-	complete
O. Eastern Raritan Basin Area	n/a	-	n/a	n/a		-	-	complete
P. Hudson Main Stem	n/a	-	n/a	n/a		-	-	ongoing
Q. Delaware River Flow Augmentation Feasibility Study	n/a	-	n/a	0.800		-	-	-
R. General Appropriation	-	-	-	9.231		-	-	-
TOTAL	**20.000**	**0.125**	**20.125**	**15.731**	**4.394**	**0.420**	**0.125**	
3. Ground Water Studies								
A. Analysis of ASR/Conjunctive Use Facilities (South/Toms/Metedeconk/Manasquan River Basins)	-	0.200	0.200	-		-	0.200	1996-1997
B. Refinement of Ground Water Availability Thresholds	-	0.150	0.150	-		-	0.150	-
C. Confirmation of Withdrawals in Mullica Basin	-	0.035	0.035	-		-	0.035	1996
D. Atlantic County Ground Water Study	n/a	-	n/a	0.690		-	-	-
E. Cooperative Map: Statewide Map of Geological Formations	n/a	-	n/a	0.690		-	-	-
F. Confined Coastal Plain Ground Water Study	n/a	-	n/a	0.690		-	-	-
G. Vincetown /Mount Laurel-Wenonah Aquifer Ground Water Study	n/a	-	n/a	0.690		-	-	-
H. Buried Valley Ground Water Study	n/a	-	n/a	0.690		-	-	-
I. Lamington Ground Water Study	n/a	-	n/a	0.690		-	-	-
J. Northwest Mercer County Ground Water Study	n/a	-	n/a	0.690		-	-	-
K. Rockaway Ground Water Study	n/a	-	n/a	0.690		-	-	-
L. Germany Flats Ground Water Study	n/a	-	n/a	0.690		-	-	-
M. General Appropriation	-	-	-	12.140		-	-	-
TOTAL	**19.650**	**0.385**	**20.035**	**18.350**	**1.685**	**3.900**	**0.385**	
4. Regional Water Resources Evaluations								
A. Passaic Basin Mgt./Operation Simulation Model	-	0.400	0.400	-		-	-	1997-1999
B. Passaic Basin Watershed Mgt. Plan	-	0.500	0.500	-		-	0.500	1996-2001
C. Toms River/Metedeconk Estuary Impact Study	-	0.200	0.200	-		-	0.200	1992-1996
D. Toms/Metedeconk River Watershed Mgt. Plan	-	0.250	0.250	-		-	0.250	1995-1998
E. Camden Trib./Rancocas Water Supply Evaluation	-	0.200	0.200	-		-	0.200	1998-2001
F. Mullica River Water Supply Evaluation	-	0.300	0.300	-		-	0.300	1999-2000
G. Ground Water/Surface Water Management	-	0.100	0.100	-		-	0.100	1999-2000

TABLE 10.1

1995 NJ STATEWIDE WATER SUPPLY PLAN ACTION PROGRAM

(in millions of dollars)

PROGRAMS AND PROJECTS	1982-1993 WATER SUPPLY BOND ALLOCATIONS	NEW WATER SUPPLY BOND ALLOCATIONS	TOTAL WATER SUPPLY BOND ALLOCATIONS	APPROPRIATED WATER SUPPLY BOND FUNDS	UNAPPROPRIATED WATER SUPPLY BOND FUND ALLOCATIONS	PREVIOUS COMMITMENTS FROM OTHER FUNDING SOURCES	ANTICIPATED COMMITMENTS FROM OTHER FUNDING SOURCES	SCHEDULE
H. Salem/Cohansey/Maurice Rivers Water Supply Evaluation	-	0.400	0.400	-		-	0.400	1997-2000
I. Great Egg Harbor River Basin Evaluation	n/a	-	n/a	0.200		-	-	-
J. Cape May Aquifer Recharge Evaluation	n/a	-	n/a	0.100		-	-	complete
K. Wetlands Impact Study	n/a	-	n/a	1.000		-	-	1997
L. Metedeconk/Toms/Tuckahoe River Basins Evaluation	n/a	-	n/a	0.600		-	-	1997
M. Cedar Creek/Forked River/Sloop Creek Evaluation	n/a	-	n/a	0.600		-	-	-
N. Lamington Evaluation	n/a	-	n/a	0.400		-	-	complete
O. Rockaway River Basin Evaluation	n/a	-	n/a	0.200		-	-	complete
TOTAL	**9.000**	**2.350**	**11.350**	**3.100**	**8.250**	**0.000**	**1.950**	
WATERSHED & AQUIFER PROTECTION								
5. Well Head Protection								
A. Delineation of Interim Well Head Protection Areas	n/a	-	n/a	1.000		-	-	-
B. County/Regional Demo. Projects & Competitive Grant Programs	n/a	-	n/a	0.350		-	-	-
C. County/Local Outreach Programs	n/a	-	n/a	0.250		-	-	-
D. Finalized Well Head Protection Areas Demo. Projects	n/a	-	n/a	0.100		-	-	-
TOTAL	**3.000**	**0.000**	**3.000**	**1.700**	**1.300**	**0.000**	**0.000**	
6. Demonstration Projects/Other Studies								
A. Ocean County Project for Maintenance of Stormwater Basins	n/a	-	n/a	n/a		-	-	complete
B. Mercer County Non-point Source Pollution Control Project	n/a	-	n/a	n/a		-	-	cancelled
C. Middlesex County Aquifer Protection	n/a	-	n/a	n/a		-	-	ongoing
D. Sussex County Septic System Management	n/a	-	n/a	n/a		-	-	complete
E. Watershed Buffers	n/a	-	n/a	n/a		-	-	complete
TOTAL	**8.000**	**0.000**	**8.000**	**2.300**	**5.700**	**0.000**	**0.000**	
7. Watershed Management Planning								
A. Model to Predict Effects of NPS on Water Supplies	-	0.500	0.500	-		-	0.500	1997-1999
B. Model to Predict Hydrologic Effects on Water Supplies	-	0.100	0.100	-		-	0.100	1999-2000
C. Watershed Management Entity Analysis	-	0.005	0.005	-		-	-	1997-1998
D. Development of Instream Flows/Watershed Ranking	-	0.150	0.150	-		-	-	1997
E. Development of Five Watershed Plans	-	0.500	0.500	-		-	-	-
F. Municipal Guidance Manual to Develop/Protect Water Supplies	-	0.250	0.250	-		-	-	1998-2000
TOTAL	**0.000**	**1.505**	**1.505**	**0.000**	**1.505**	**0.000**	**0.600**	
8. Water Supply and Watershed Protection								
A. Acquisition of Water Supply Protection Areas	-	20.000	20.000	-		-	-	-
TOTAL	**0.000**	**20.000**	**20.000**	**0.000**	**20.000**	**0.000**	**0.000**	
9. Water Conservation								
A. Reduction of Depletive/Consumptive Uses Evaluation	-	0.030	0.030	-		-	-	1998-1999
B. Passaic Basin Water Conservation Implementation Plan	-	0.100	0.100	-		-	-	1997-1999
C. Mullica Basin Water Conservation Implementation Plan	-	0.100	0.100	-		-	-	1997-1999
D. Landscape/Industrial Water Conservation Program	-	0.300	0.300	-		-	-	1997-1999
E. Statewide Water Conservation Program	-	0.300	0.300	-		-	-	1997-2000
F. Cape May County Water Conservation Program	n/a	-	n/a	0.125		-	-	1997-1998
G. General Appropriation	-	-	-	1.000		-	-	-
TOTAL	**1.600**	**0.830**	**2.430**	**1.125**	**1.305**	**0.000**	**0.000**	
10. Water Management Planning								
A. Water Supply Management Data Base	-	0.500	0.500	-		-	0.500	1995-1997
B. Generic Safe/Dependable Yield Analyses	-	0.050	0.050	-		-	0.050	1997-1998
C. Completion of Water Resources Geographic Information System	n/a	-	n/a	0.450		-	-	-
D. USGS Matching Funds for Water Management Planning	n/a	-	n/a	0.500		-	-	completed
TOTAL	**2.000**	**0.550**	**2.550**	**0.950**	**1.600**	**0.000**	**0.550**	

TABLE 10.1

1995 NJ STATEWIDE WATER SUPPLY PLAN ACTION PROGRAM

(in millions of dollars)

PROGRAMS AND PROJECTS	1982-1993 WATER SUPPLY BOND ALLOCATIONS	NEW WATER SUPPLY BOND ALLOCATIONS	TOTAL WATER SUPPLY BOND ALLOCATIONS	APPROPRIATED WATER SUPPLY BOND FUNDS	UNAPPROPRIATED WATER SUPPLY BOND FUND ALLOCATIONS	PREVIOUS COMMITMENTS FROM OTHER FUNDING SOURCES	ANTICIPATED COMMITMENTS FROM OTHER FUNDING SOURCES	SCHEDULE
11. Statewide Water Supply Plan Revision								1996
TOTAL	1.750	0.300	2.050	1.750	0.300	0.000	0.000	
12. Special Water Treatment Study								
A. Treatment Residuals Study	-	0.400	0.400	-		-	-	-
TOTAL	0.600	0.400	1.000	0.600	0.400	0.000	0.000	
PURVEYOR INFRASTRUCTURE LOAN PROGRAMS								
13. Water Supply Infrastructure Rehabilitation								
A. Infrastructure Needs Survey	-	0.300	0.300	-		-	-	1996-1997
B. Infrastructure Loans	-	40.000	40.000	-		-	-	ongoing
TOTAL	120.000	40.300	160.300	100.691	59.609	0.000	0.000	
14. Interconnection Testing & Improvements								
TOTAL	15.000	0.000	15.000	8.068	6.932	0.000	0.000	
15. Polluted Wellfields & Inadequate Small Systems								
A. Loans for Construction of Water Supply Facilities to Replace Wells	n/a	-	n/a	n/a		-	-	ongoing
TOTAL	25.000	0.000	25.000	25.000	0.000	0.000	0.000	
16. Miscellaneous Appropriations (administrative, etc.)								
TOTAL	0.000	0.000	0.000	8.000	-8.000	0.000	0.000	
GRAND TOTAL	370.650	66.745	437.395	321.915	115.480	646.320	3.610	

Note:
Appropriations and allocations above $350 million rely on loan repayments.
* funding source for projects in various locations in the state.

New Jersey
Department of
Environmental
Protection

Office of
Environmental
Planning

August 1996