





## **Table of Contents**

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### Part 1: The Dynamic Strategic Planning Process

Introduction

Purpose

Core Principles

Agency Goals

Conditions Analysis

Consistency with Water 2030

### Part 2: The Strategic Plan

Strategic Mix of Initiatives: Presentation and Discussion

Executive Summary

Statewide Initiatives

Northern Region

Southern Region

Aquidneck Region

Island Region

Strategic Mix of Initiatives: Timeframes

Business Plan (0-2 Years)

Short Range (2-10 Years)

Long Range (10+ Years)

Integration and Implementation

## **Appendices**

---

A- Water Use and Efficiency Act Rule

B- Draft Report on RI Wastewater Reuse Assessment

C- Big River Management Area Policies

D- Water Supply and Demand Estimating

E- WRB and WRBC Bylaws

F- 1915 Public Law Chapter 1278 for Providence Water Supply

G- Northern Region Water Supply – Long Range Options

H- Southern Region Water Supply – Short Range Options (HAP and New Groundwater Development)

I- Southern Region Water Supply – Long Range Options

a. Financial Analysis for Long Range Options

J- 1989 EPA Objection Letter for Construction of Big River Reservoir

1990 EPA Final Determination

K- South County Groundwater Resources

L- Stafford Pond Use Agreement for Stonebridge Water District

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## **Introduction: An Overview of the Dynamic Strategic Planning Process**

The RI Water Resources Board (WRB) has the responsibility to “regulate the proper development, protection, conservation and use of the water resources of the state”. This obligation can be met through one of WRB’s fundamental responsibilities: to develop and administer long and short range strategic plans<sup>1</sup>.

For decades the WRB administered components of what many consider our strategic plans. Although our progress has been deliberate and measurable with programs such as the Emergency Interconnection Program, Source Water Protection Program, Supplemental Water Studies, Water Use and Availability Studies, and annual data collection; the WRB has not fully articulated a long and short range strategic plan that can be shared with our communities, water suppliers, and other stakeholders. This dynamic strategic planning process will weave together the WRB’s history of water supply programs, scientific research, and water resource use statistics into a platform to discuss our strategic planning initiatives.

This strategic planning session is innovative, comprehensive, and accommodates the articulated goals of our partners. The State’s water resources and infrastructure are distinct and quantifiable, enabling us to start a planning process with a wealth of information to guide us. WRB staff has compiled this information in this document to provide our partners with a common level of knowledge so that options and alternatives for water resource management can assist our consideration and prioritization of innovative strategic initiatives.

Throughout the process of developing strategic planning options for the WRB, staff focused on meeting the following tests<sup>2</sup>:

<b><i>Innovation:</i></b>	Alter the rules of the organization
<b><i>Prioritization:</i></b>	Force major changes to be made
<b><i>Optimization:</i></b>	Align resources
<b><i>Value Creation:</i></b>	Create distinct identity
<b><i>Consistency:</i></b>	Demonstrate consistent thinking and actions
<b><i>Evolution:</i></b>	Allow for continuous inquiry and learning

The strategic plan includes a mix of projects, policies and programs organized in immediate (2 year), short range (2-10 year), and long range (over 10 years) time frames. The strategic plan will be put into action through an Implementation Plan after the Board discusses, modifies, and adopts it. The WRB will track and update the implementation of individual programs and projects through our monthly meetings and annual Business Plan and budget processes. The WRB’s articulated short and long range plans will become our template for the future use of the water resources of the State for staff, municipalities, and the general public.

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<sup>1</sup> RIGL 46-15-22 Transfer of powers and duties to the water resources board  
<http://www.rilin.state.ri.us/Statutes/TITLE46/46-15/46-15-22.HTM>

<sup>2</sup> New Commons Dynamic Strategic Planning Practices, Robert J. Leaver

**“It shall be the duty of the Water Resources Board to regulate the proper development, protection, conservation and use of the water resources of the State”<sup>3</sup>**

This simple statement from our legislative declaration broadly defines the *purpose* of the WRB. It is comprehensive and uses action statements that compel staff to implement the core principles of the Board members on behalf of the public. So why is it so important for the WRB to go through this strategic planning process? Our State manages water resources through silos of Federal, State and local programs. Despite individual best efforts to coordinate, water resources management occurs through issuance of individual permits, construction and maintenance of individual water supply facilities, operations of various businesses operations, and efforts of grassroots organizations to protect and restore our environment. Although our stakeholders achieve individual success in their use of water resources, in the absence of a formally articulated strategic plan that integrates all our stakeholders’ goals, the State (and the WRB) has not achieved the same level of success.

This WRB strategic planning session is by definition broader than our individual stakeholders programs and interests. The strength of our strategic planning comes from the acknowledgment of the broad responsibility of the Board (our *purpose*), while simultaneously considering individual stakeholder purposes and needs. Why does the WRB need to perform this work? Simply because the “development, protection, conservation and use” of water resources transcends political and physical boundaries, and integrated strategic planning will ensure a sustainable use of our water resources for future generations. The WRB must strive to accommodate the goals of our stakeholders that align with our purpose, and develop solutions that guide the “development, protection, conservation, and use of the water resources of the State”. This statutory mandate is restated for emphasis because of the actionable descriptions regarding the regulation of the State's water resources – water must continue to be actively *used and managed* in addition to being *protected and conserved*.

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<sup>3</sup> RIGL 46-15-1 Legislative Declaration <http://www.rilin.state.ri.us/Statutes/TITLE46/46-15/46-15-1.HTM>

## Core Principles

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The articulation of Core Principles emphasizes why each member of the WRB and our partners care passionately about water resources. These Core Principles shape our opinions, motivate our actions, and can bind us together on issues that are controversial and at times divisive. The Core Principles that we identified are derived from the various mission statements, core values, and other declarative statements of our partners and will guide our decision making throughout the strategic planning process (Core Principle themes are color coded for emphasis):

“...water supply management, protection, development, and *use* must be fully integrated.....and *implemented* under a process which emphasizes efficiency of *use* and management, minimization of waste, protection of existing supplies, demand management, drought management, conservation, and all other techniques to ensure that our water resources serve the people of Rhode Island for the longest time, in the most efficient *use*, and in an *environmentally sound manner*”<sup>4</sup>

“...Our goals include *clean, safe and affordable water*; prevention of health threatening pollution; creation of environmentally safe *jobs and businesses*; and empowerment of people to make democracy work”<sup>5</sup>

“...promote *efficiency* and *conservation* to ensure an environmentally sound level of stream flow and adequate water for priority uses such as *economic development*”<sup>6</sup>

“... new major source(s) of supply must be *constructed* to provide backup capacity for the Scituate Reservoir and its related treatment and transmission components. In addition, the new source(s) must be able to provide sufficient additional capacity to ensure a *healthy economy* for the benefit of the citizens of Rhode Island.”<sup>7</sup>

“We believe that legislation and regulations favorable to all sectors of agriculture should be aggressively developed in *cooperation* with allied groups possessing common goals.”<sup>8</sup>

“Our mission is to *create jobs*, help companies expand and develop their workforce, and identify opportunities to *bring new companies into our state*.”<sup>9</sup>

“In order to retain and encourage the expansion of our present industries, and to *attract new industries*, and to promote the proper growth and *desirable economic growth* of the entire state, and to sustain the viability of water resource-dependent natural systems, agriculture, and recreation, state government *must play an active role* in fostering and guiding the management of water resources”<sup>10</sup>

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<sup>4</sup> RIGL 46-15-1 Legislative Declaration <http://www.rilin.state.ri.us/Statutes/TITLE46/46-15/46-15-1.HTM>

<sup>5</sup> Clean Water Action - Mission Statement <http://www.cleanwateraction.org/about/>

<sup>6</sup> Coalition for Water Security – Initiative Statement <http://www.coalitionforwatersecurity.org/about.html>

<sup>7</sup> RI Water Works Association –Water Supply Position Statement <http://www.riwwa.net/Position06FinalDraft.pdf>

<sup>8</sup> Rhode Island Farm Bureau – Farm Bureau Beliefs <http://rifb.org/farmbureaubeliefs.html>

<sup>9</sup> RI Economic Development Corporation – Mission Statement <http://www.riedc.com/about/mission-and-strategy>

<sup>10</sup> RIGL 46-15-1 Legislative Declaration <http://www.rilin.state.ri.us/Statutes/TITLE46/46-15/46-15-1.HTM>

“The Rhode Island Water Resources Board, as an *independent water supply agency*, is vital to the success of this legislation and will provide *necessary balance* in working toward the *sustainability* of Rhode Island's water resources”<sup>11</sup>

“State agencies need to become *advocates for positive solutions* by removing overlapping and burdensome planning and regulatory requirements”<sup>12</sup>

“...a state’s quality of life and *environmental health* are pivotal in attracting, keeping and *growing business*. A healthy business climate and a healthy environment are therefore part of the overall economic system.”<sup>13</sup>

“...to focus public attention on natural resource problems, to *provide leadership* when action on natural resource problems is necessary, and *to take other actions to foster better management* of the *natural environment* for the benefit of humans and all other life.”<sup>14</sup>

A review of these published Core Principles from our partners resulted in the following themes:

- Water is integral to the current and future *economic prosperity* of the State.
- WRB and our partners must *take action* to create and regulate policy and programs.
- Water resource management requires *environmentally sustainable* use for success.
- WRB must actively support the responsible *use* of water resources.

Several of these Core Principles transcend individual stakeholder programs and remind us that we often have more in common than not. These principles will guide our development and review of the Strategic Mix of Priority Initiatives.

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<sup>11</sup> RIGL 46-15.8-2 Legislative Findings <http://www.rilin.state.ri.us/Statutes/TITLE46/46-15.8/46-15.8-2.HTM>

<sup>12</sup> RIGL 46-15.8-5 Duties of state agencies <http://www.rilin.state.ri.us/Statutes/TITLE46/46-15.8/46-15.8-5.HTM>

<sup>13</sup> Grow Smart RI - Core Values

<http://www.growsmartri.org/index.cfm?fuseaction=Page.viewPage&pageId=473&parentID=471>

<sup>14</sup> Audubon Society of Rhode Island – Mission Statement <http://www.asri.org/general-news/about-the-audubon-society-of-rhode-island.html>

## **Agency Goals**

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The goals for the WRB are derived from statutes<sup>15</sup> and reflect the diversity of our partners. These goals are broad, and similar to our Core Principles, will guide our review of the Strategic Mix of Initiatives:

**Goal #1:** Regulate the proper *development* of the water resources of the State.

The development of water resources must consider all uses of water; including human consumption, agriculture, environmental protection, recreation, economic development, and other uses. The WRB must take action to develop new sources of supply that align with our demand projections and our Core Principles.

**Goal #2:** Regulate the proper *protection* of the water resources of the State.

The protection of the State's water resources is not efficiently coordinated, resulting in overlap in some areas and lack of protection in others. The WRB must integrate our programs with our partners to ensure that the State's limited water resources are appropriately protected.

**Goal #3:** Regulate the proper *conservation* of the water resources of the State

The conservation of water resources is the central theme in the recently adopted Water Use and Efficiency Act and corresponding rule. The conservation of water will reduce impacts on the environment, reduce expenses for the maintenance and replacement of water supply systems, and assist in identifying, justifying and developing new water sources. The WRB must engage the major water suppliers and municipal leaders to ensure the success of this conservation goal.

**Goal #4:** Regulate the proper *use* of the water resources of the State

Rhode Island's historic use of water resources played a significant role in the development of wealth and prosperity in our State, and it is certainly vital to our state's current economic recovery. The WRB monitors the use and availability of water resources through a network of stream gages, groundwater monitoring wells, weather stations, and scientific models. Trends in water use are identified through the WRB's annual reporting program through our major water suppliers. The staff analysis of water resource use and availability data has revealed short and long range deficits of water resources in several areas of the State, prompting the need for our strategic planning sessions. The WRB must advance our analysis of the use of water resources in order to develop new sources of supply for the existing uses of water and future economic growth.

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<sup>15</sup> RIGL 46-15-1 Legislative Declaration <http://www.rilin.state.ri.us/Statutes/TITLE46/46-15/46-15-1.HTM>

## Conditions Analysis

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Our Conditions Analysis reflects the circumstances that affect the WRB and our partners. We analyze conditions that are external and internal, existing and emergent. This Conditions Analysis differs from conventional SWOT<sup>16</sup> analysis due to our knowledge of the water supplies, water use, and the well-documented environmental and hydrologic features of the State. The WRB's existing compilation of studies, models and reports enable the staff to analyze our water resources in practical ways that are solution-oriented and innovative. The conditions that are relevant to our analysis are:

- 1) **Supply of Water:** RIDEM's Streamflow Depletion Methodology (SDM) and conventional reservoir safe yield analysis provide reasonable approximations of the availability of the States' water supplies. The WRB's analysis of the resulting "Resource Protection Goal" is a significant condition that identifies immediate, short and long range actions required to protect the water resources of the State
- 2) **Economic Development:** As the local and State elected officials address the fiscal condition of the State, a common goal to promote new and sustainable economic development has emerged to bind us all together. The WRB has a vital role to play related to the responsible use of water, specifically for economic development. The WRB must prepare for economic growth through this strategic planning process and plan and develop new sources of supply for when they are needed.
- 3) **Demand for Water:** Water demand is estimated using residential uses, resource protection goals, agricultural requirements, and economic development goals. The coupling of demand projections with the availability of water resources creates deficient conditions that compel the WRB to act to avoid conflicts. The WRB must develop new water supplies, improve existing and emergent water resource programs, and to identify financial mechanisms to accommodate future demand.
- 4) **Risk Management:** The State's water resources are highly dependant on the frequency and timing of precipitation (supply), and corresponding peak use (demand). Other water resource risks include the quality of our water resources. The reservoirs of the State easily manage risk through stored water, whereas our groundwater systems have no storage and are highly vulnerable (high risk). The WRB must mitigate the condition of current and future water resource risks by carefully developing sustainable (risk tolerant) policies and programs that meet our goals.
- 5) **Austerity:** Funding at the Federal, state and local levels are diminishing and the demand for water has also decreased (reducing revenues for individual water suppliers). Future expenditures for water resource programs will greatly benefit from our articulated strategic plans where partnering on a regional or statewide basis is encouraged. Austerity must be a financial condition that needs to be considered when planning for any policy or programs that involve the State's water resources.

In summary, the conditions that drive our strategic planning process include fiscally constrained decisions that propel our state forward toward economic prosperity, while balancing the articulated goals of various state agencies (resource protection, agriculture, land use, and economic development).

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<sup>16</sup> Strength, Weakness, Opportunity, and Threat (SWOT) analysis; Albert S. Humphrey

## **Consistency with Water 2030**

WRB played a central role in the development of state guide plan elements related to water supply and water resource management. The consolidation of several plans into the draft Water 2030 plan has resulted in a restatement of statewide goals. This section relates the activities, programs and initiatives to the most pertinent goals of the current draft Water 2030 plan.

### **Manage the sustainable water use and development of the water resources of the state**

Most of the Board's initiatives relate directly to and implement this goal. The Board has broad responsibilities for inventorying and evaluating the capacity of the water resources of the state (resource assessment). The business plan, short and long range plans and the materials developed by staff for the strategic planning process continue this important role. Water availability guidance, Water Supply System Management Planning revisions, the development of a BRMA land management plan, annual data reporting, realigned Board funding programs, South County groundwater acquisition and other statewide initiatives implement this goal.

### **Protect and Preserve the health and ecological functions of the water resources of the state.**

Several statutory provisions charge the Board with broad planning, drinking water source protection, and water quality protection responsibilities. Statewide surcharges are collected and managed by WRB to implement the provisions of the Water Supply Protection Act of 1997 (RIGL 46-15.3) This is one of the funding initiatives that will be reviewed to align with identified risks and needs. Alternative supply options that propose to alleviate stressed areas also implement this goal as does the WSSMP program which includes as a key element, a Water Quality Protection Component.

### **Ensure a reasonable supply of quality drinking water for the State**

While all day to day planning and data analysis relate to this goal generally, the conservation and demand management initiatives are most directly related to this goal. Specifically, Initiative 6 requires major suppliers to submit a Demand Management Strategy (DMS) in amendment to their WSSMP and an annual progress report. Initiative 10 continues the public lawn maintenance and watering guidelines and public outreach program. The proposed exploration of water reuse and recharge opportunities also relates to this goal.

### **Ensure the protection of public health, safety and welfare and essential drinking water resources during water supply emergencies**

The Board has responsibilities for monthly water conditions monitoring and for coordinating drought response. In addition the Board undertakes planning to evaluate future risk and to develop mitigation strategies, like emergency water interconnections, redundant, alternative and/or supplemental supply. The WSSMP (emergency plans) and the proposed vulnerability assessment of critical supplies relate directly to this goal. In addition, short and long term options that address sole dependency on groundwater either through supplemental supplies or storage serve to mitigate system wide risk associated with drought and other water emergencies.

### **Integrate water resources planning across intergovernmental and regional jurisdictions**

The WSSMP program, water availability guidance, and interstate compact initiatives relate directly to this goal. In the near term the focus is on more fully integrating community comprehensive planning with water supply planning. The WRB role is to facilitate initiatives that benefit the system as a whole.

**Ensure adequate technical, managerial, and financial capacity of water systems**

The WSSMP program, review of annual reports, and the initiative to evaluate the Board's financial programs relate to this goal. The WSSMP revisions should reflect the Water Use and Efficiency Act and assist suppliers with management and rate structures that support long term system viability.

**Manage and plan for water systems that support sustainable, compact land use and concentrate development within the urban service boundary and or growth centers.**

The strategic plan and the demand estimating process acknowledge the urban services boundary and plan for potential sources that could also support growth centers.



## Strategic Mix of Priority Initiatives

### Executive Summary

#### Statewide Initiatives

The Statewide Initiatives address the WRB's role of statewide water resource management, water resource data collection and distribution, interagency cooperation, and financial assistance for projects of statewide significance that might not otherwise be funded. The purpose of these initiatives is to ensure that long range considerations for the proper use, development, protection and conservation of water resources remain paramount and to recognize that the sum total of local initiatives may not always align with the long term interests of the state. These statewide initiatives continue into the short and long range.

#### Regional Initiatives

**The Northern Region** has sufficient quality and quantity of water resources, but also has some areas that are at risk due to lack of redundant sources of supply. Initiatives focus on East Providence and Bristol County (BCWA) due to reliance on one source, funding restrictions, and the opportunity to use existing supplies (surplus water from Pawtucket Water Supply Board). In addition there is a short term need to fully evaluate the public law that obligates Providence Water Supply Board to provide water in high quantities to areas that they do not currently serve.

**The Southern Region** has deficiencies related to sole reliance on groundwater with no storage. There is some opportunity to reduce demand through conservation and by implementing more stringent restrictions in the summer to support increased population and agricultural uses. Both Short and Long Range options were developed:

Short Range:

HAP Options. There are three (3) alternatives to provide water to QDC/NK through KCWA (PWSB). The preferred alternative is Option 1.

- Option 1 - Use the existing emergency interconnections (5 MGD)
- Option 2 - Construct 2 miles of pipeline (7 MGD)
- Option 3 - Construct 6 miles of pipeline (12 MGD).

New Groundwater Source Options- Staff conducted an assessment of Southern Region aquifers using geologic study data, test well data, GIS analysis and engineering reviews to assess potential for supplemental, redundant and/or new sources of groundwater.

- Southern Region Water Supply Project – Increase groundwater withdrawals in certain aquifers that are estimated to have additional capacity to alleviate areas that currently exceed resource protection goals.
- BRMA wells – Market groundwater withdrawals from the BRMA as a short range alternative for water supply.

Long Range: New Source for entire Southern Region. There are five (5) options to provide water for current and future demands. Each option includes a scalable treatment facility. The volumes of water produced would range from 5-35 MGD. In addition each option includes an alternative transmission line size that matches the reduced treatment capacity and lowers costs and water available to the Southern Region. The reservoir would still have capacity to provide redundant supply to the Northern Region in the future.

The long range water supply options and alignments are:

Option 1: Big River Reservoir

- Option 1A: Big River Reservoir with Route 3 transmission alignment
- Option 1B: Big River Reservoir with Route 2 transmission alignment
- Option 1C: Big River Reservoir with Route 1 transmission alignment

Option 2: Desalination

- Option 2A: Centralized Desalination Facility at QDC
- Option 2B: Decentralized Desalination Facilities throughout South County

Option 3: Aggressive Conservation

- Option 3A: Aggressive Conservation (45 GPCD) for Southern Region
- Option 3B: Aggressive Conservation (45 GPCD) and connection to PWSB

**The Aquidneck and the Islands Regions** include the assessment of critical water supplies and emergency water supply connections.

## Statewide Initiatives<sup>17</sup>

**Summary:** The Statewide initiatives address the fundamental goals for development, protection, conservation and use of the water resources of the State. Our Strategic Planning workshops and the primer for this Strategic Planning session identify deficiencies in policies, programs and projects that require action from the WRB.

<b>Initiative 1</b>	<i><b>Water Availability Estimates<sup>18</sup></b></i>
<b>Project Description:</b>	Publish Water Availability Estimates
<b>Overview of the project:</b>	Use WRB's scientific research and estimating techniques along with RIDEM's SDM to provide guidance for municipalities and water suppliers to align land management programs with water resource programs. Publishing the data is a first step. An additional effort is required to develop technical guidance for municipalities by July 2012 to meet the statutory deadline. A subsequent effort will be undertaken to refine the water supply estimates based on annual report data (submission due 2012) and based on refinements to self supply data (consumptive uses v. total withdrawals) as envisioned in strategy #17. This future effort will also include site specific analysis of resource protection goals.
<b>Key milestones:</b>	Present Water Availability Estimates to water suppliers and municipalities in Spring of 2012. Finalize formatting and deliver final estimates of availability of water to Division of Planning by July 2012.
<b>Project budget:</b>	WRB staff time, publishing costs approximately \$500
<b>Existing partners:</b>	Major water suppliers, RIDEM, municipalities
<b>Desired Outcome:</b>	Publish the WRB's Water Availability estimates to include WRB Resource Protection Goals and future use projections. Develop estimates by Water Resource Management Region, sub-regions in areas that currently exceed our goals, and by municipality.
<b>Current Status:</b>	Water Availability estimates are complete by region and sub-region.
<b>Key Challenges/Needs:</b>	WRB budget and staff are reduced. Additional work is required to coordinate basin-level information and demand projections with municipal borders.
<b>Short-Term Actions:</b>	Continue to work with partners to refine data presentation and demand projections and to include new data as it becomes available. More detailed assessments of the Southern Region and sub-regions

<sup>17</sup> Initiatives are numbered to facilitate ease of reference to the business plan, short term and long term plan.

<sup>18</sup> RIGL 46-15.8-5 Duties of state agencies <http://www.rilin.state.ri.us/Statutes/TITLE46/46-15.8/46-15.8-5.HTM> (Appendix D)

	using the DMS submissions, local comprehensive plans and the Pawcatuck model are planned.
<b>Longer-Term Actions:</b>	Continue to monitor Annual Water Supply Data and environmental conditions and provide periodic updates as necessary.
<b>Comments:</b>	

<b>Initiative 2</b>	<b><i>Big River Management Area (BRMA) Land Management Plan<sup>19 20</sup></i></b>
<b>Project Description:</b>	Develop a Land Management Plan for the BRMA
<b>Overview of the project:</b>	Develop a Land Management Plan acknowledging the BRMA as a water supply of Statewide significance reflecting the WRB's strategic planning initiatives, Water Resources Planning Regions, and complimentary uses.
<b>Key milestones:</b>	Resume stakeholder outreach in February 2013. Produce draft Land Management Plan by September 2013. Promulgate revised rule (Land Management Plan) by January 2014.
<b>Project budget:</b>	WRB staff time.
<b>Existing partners:</b>	WRB, Town of West Greenwich, RINEMBA, National Guard, RIDEM, local Fire Departments.
<b>Desired Outcome:</b>	Work with partners to develop a Land Management Plan as referenced in Chapter 46-15.1-19 that reflects the BRMA as a water supply
<b>Current Status:</b>	Existing Management Plan <sup>21</sup> is inadequate as it pertains mostly to the management of tenants leasing property within the BRMA. Plan does not adequately protect BRMA as a water supply. Stakeholder outreach was initiated winter of 2011, but later suspended with the loss of WRB staff.
<b>Key Challenges/Needs:</b>	WRB budget and staff are reduced.
<b>Short-Term Actions:</b>	Reconvene stakeholder meeting February 2012.
<b>Longer-Term Actions:</b>	Ensure integration of WRB strategic planning initiatives into the Land Management Plan.
<b>Comments:</b>	

<sup>19</sup> RIGL 46-15.1-19.1 Big River Reservoir Administration <http://www.rilin.state.ri.us/Statutes/TITLE46/46-15.1/46-15.1-19.1.HTM>

<sup>20</sup> RIGL 37-20-1 Big River Reservoir – Development Prohibited <http://www.rilin.state.ri.us/Statutes/TITLE37/37-20/37-20-1.HTM>

<sup>21</sup> Big River Management Area Policies [http://www.wrb.ri.gov/policy\\_guidelines\\_brmalanduse/BRMA\\_Policies.pdf](http://www.wrb.ri.gov/policy_guidelines_brmalanduse/BRMA_Policies.pdf) (Appendix C)

<b>Initiative 4</b>	<b><i>Water Supply System Management Plan<sup>22</sup> (WSSMP) Rewrite</i></b>
<b>Project Description:</b>	Rewrite the existing WSSMP program
<b>Overview of the project:</b>	Existing WSSMP program must be rewritten to include coordination of strategies by Water Resource Management Regions, Demand Management Strategies, Annual Reporting, and WRB strategic planning initiatives. In addition the effort will be coordinated with the Statewide Planning Program's rewrite of the Community Comprehensive Plan requirements.
<b>Key milestones:</b>	Reconvene WSSMP rewrite workgroup by July 2012 with working draft that reflects WRB strategic plans and objectives. Present draft legislative modifications for WSSMP by December 2012. Hold public hearing on new WSSMP regulations September 2013.
<b>Project budget:</b>	WRB staff time
<b>Existing partners:</b>	Major water suppliers, municipalities, State agencies represented on WRB.
<b>Desired Outcome:</b>	Produce a revised WSSMP outline, draft rule, and corresponding statutory modifications. New WSSMP will reduce overlapping and burdensome requirements for water suppliers and reflect the strategic objectives of the WRB on a Regional and Statewide basis.
<b>Current Status:</b>	Preliminary stakeholder outreach concluded. Program put on hold after reduction of WRB staff and budget. Several WSSMP submissions have been received and are on hold due to loss of staff.
<b>Key Challenges/Needs:</b>	WRB budget and staff are reduced
<b>Short-Term Actions:</b>	Integrate WRB strategic planning initiatives into draft WSSMP rewrite by July 2012.
<b>Longer-Term Actions:</b>	After WSSMP is updated, monitor individual major water supplier programs for congruence with WRB strategic objectives.
<b>Comments:</b>	

<sup>22</sup> RIGL 46-15.3-5.1 Water supply system management plans <http://www.rilin.state.ri.us/Statutes/TITLE46/46-15.3/46-15.3-5.1.HTM>

<b>Initiative 5</b>	<b><i>Annual Water Use Reporting</i></b> <sup>23</sup>
<b>Project Description:</b>	Develop online interface to expedite Major water supplier submission of annual water data.
<b>Overview of the project:</b>	WRB initiated development of an online interface to accept annual reporting of water data from major water suppliers for ease of input and use (by WRB staff).
<b>Key milestones:</b>	Rollout of program May 1, 2012.
<b>Project budget:</b>	WRB operational account, approximately \$100 remaining to be billed (total project \$2,600)
<b>Existing partners:</b>	Major water suppliers, DoIT
<b>Desired Outcome:</b>	This project will simplify the annual collection of water data from major water suppliers so that WRB staff can access the data at a central location for analysis, publication, and distribution.
<b>Current Status:</b>	New website secured, older water use data has been uploaded, interface is in beta testing, and major water suppliers will receive their username and passwords by December 2011.
<b>Key Challenges/Needs:</b>	WRB budget and staff are reduced. Require assistance to perform QA/QC of old data (missing and incorrect data) and assistance to create queries for new data analysis
<b>Short-Term Actions:</b>	Coordinate with major water suppliers to access new website, and begin QA/QC of their old data.
<b>Longer-Term Actions:</b>	Develop queries to analyze corrected and new data submissions, ensure timely submission of all subsequent data entries for use with WRB annual reporting to Governor's Office and General Assembly
<b>Comments:</b>	
Once the online water use reporting tool is operational for major water suppliers, the Board should consider expanding the use of the tool.	

<sup>23</sup> RIGL 46-15-21 Reporting Requirements <http://www.rilin.state.ri.us/Statutes/TITLE46/46-15/46-15-21.HTM>

<b>Initiative 6</b>	<b><i>Demand Management Strategy (DMS)</i></b> <sup>24</sup>
<b>Project Description:</b>	Coordinate with Major Water Suppliers to ensure the efficient use of potable water <sup>25</sup> .
<b>Overview of the project:</b>	Work with all major water suppliers to ensure a coordinated submission of strategies that reflect Statewide, Regional, and local goals for water use and conservation. Efforts will be tailored to the Water Availability Estimates for specific regions and sub-regions.
<b>Key milestones:</b>	Initial submission due August 2012.
<b>Project budget:</b>	WRB staff time, supplier costs TBD
<b>Existing partners:</b>	Major water suppliers, municipalities
<b>Desired Outcome:</b>	Work with major water suppliers to develop DMS's that 1) achieve efficiency goals that are unique to each system and Water Resource Management Regions (WRMR), 2) achieve efficiency goals that are congruent with other suppliers in similar WRMR, 3) develop balance between supply and demand of available water considering current and future demand projections, 4) consider cost impacts to current and future ratepayers.
<b>Current Status:</b>	Rule (Water Use and Efficiency Rule for Major Public Water Suppliers) promulgated, water suppliers working on draft DMS's
<b>Key Challenges/Needs:</b>	WRB budget and staff are reduced. Conservation may defer but cannot replace implementation of long range option(s) for water supply
<b>Short-Term Actions:</b>	Develop guidance for water suppliers by WRMR; WRB staff convenes meetings by WRMR.
<b>Longer-Term Actions:</b>	Integrate WRMR and DMS's into revised WSSMP. Consider financial and water quality impacts resulting from enhanced conservation efforts.
<b>Comments:</b>	

<sup>24</sup> WRB Rule for Water Use and Efficiency Act (**Appendix A**)  
<http://sos.ri.gov/documents/archives/regdocs/released/pdf/WRB/6393.pdf>

<sup>25</sup> RIGL 46-15.8-5 Water Use and Efficiency Act: <http://www.rilin.state.ri.us/Statutes/TITLE46/46-15.8/46-15.8-5.HTM>

<b>Initiative 8</b>	<b><i>WRB Funding Programs</i></b> <sup>26</sup>
<b>Project Description:</b>	Coordinate WRB funding programs to ensure the proper use, development, protection and conservation of the State's water resources
<b>Overview of the project:</b>	This program combines the various operational and financial programs of the WRB and WRBC and ensures that the State is able to fund critically important water resource projects that are not funded by other Federal, state, or local programs.
<b>Key milestones:</b>	Develop an outline of existing WRB and WRB funding programs by September 2012. Prepare draft legislation by December 2012. Re-promulgate Water Facilities Assistance, Water Quality Protection, and Emergency Interconnection programs in 2013, prior to WRBC financial responsibilities being transferred to RICWFA in 2014.
<b>Project budget:</b>	WRB staff time
<b>Existing partners:</b>	Major water suppliers, EPA, RIDEM, RIDOH, RICWFA, Statewide Planning Program
<b>Desired Outcome:</b>	Develop a coordinated and comprehensive funding strategy that is able to fund water resource projects, regardless of funding source, that achieve the strategic objectives of the State.
<b>Current Status:</b>	Existing programs are in place, and are inadequate to achieve strategic objectives of the State.
<b>Key Challenges/Needs:</b>	WRB budget and staff are reduced. Requires cooperation of EPA, RIDEM, RIDOH, and RICWFA
<b>Short-Term Actions:</b>	Develop MOU to address strategic objectives of the WRB by July 2012
<b>Longer-Term Actions:</b>	Integrate the WRB's strategic planning initiatives into the State's funding programs for water resources.
<b>Comments:</b> In the Business Plan phase, completion of emergency interconnections with the existing funds is included under this initiative.	

<sup>26</sup> RIGL 46-15 and 46-15.1, multiple references.

<b>Initiative 9</b>	<b><i>Board Development</i></b> <sup>27</sup>
<b>Project Description:</b>	Update the WRB (and WRBC) bylaws.
<b>Overview of the project:</b>	Update the WRB (and WRBC) bylaws to clarify Board work, staff work, and the fully articulated strategic direction of the Board (immediate, short, and long range strategies).
<b>Key milestones:</b>	Short Range: 2-5 years
<b>Project budget:</b>	WRB staff time
<b>Existing partners:</b>	Board members
<b>Desired Outcome:</b>	Updated bylaws that focus the Board's work on strategy related to water resources use, protection, conservation and development; and staffs focus on implementation of the various programs that ensure proper regulation of the water resources of the State.
<b>Current Status:</b>	Existing WRB and WRBC bylaws are in effect but are outdated and partially inaccurate. Staff initiated bylaw discussion with Board in 2011, but was unsuccessful due to lack of strategic vision.
<b>Key Challenges/Needs:</b>	WRB budget and staff are reduced.
<b>Short-Term Actions:</b>	Develop draft bylaw revisions by December 2012.
<b>Longer-Term Actions:</b>	Re-promulgate rules related to WRB and WRBC by July 2013, prior to transference of financial duties of WRBC to RICWFA in 2014.
<b>Comments:</b>	

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<sup>27</sup> WRB and WRBC bylaws (**Appendix E**)

<b>Initiative 10</b>	<b><i>Water Resources Education</i></b>
<b>Project Description:</b>	Market WRB educational programs and initiatives to advance WRB goals.
<b>Overview of the project:</b>	Continue the Statewide Lawn Maintenance Guideline <sup>28</sup> program, and investigate alternative marketing programs to advance WRB goals.
<b>Key milestones:</b>	Procure vendor by April 2012, update and advance lawn maintenance program marketing and begin promotions by May 2012
<b>Project budget:</b>	WRB operating budget; approximately \$50,000
<b>Existing partners:</b>	RI Nursery and Landscape Association, URI Turf Program, Major water suppliers
<b>Desired Outcome:</b>	Reduce the amount of peak water usage
<b>Current Status:</b>	Summer 2011 program (including website) is complete. New programs have not been initiated.
<b>Key Challenges/Needs:</b>	WRB budget and staff are reduced
<b>Short-Term Actions:</b>	Develop scope of work for marketing based on previous year's program, implement new program before lawn maintenance season begins. Develop additional partnerships to expand outreach.
<b>Longer-Term Actions:</b>	Continue to develop WRB education and marketing programs consistent with our goals
<b>Comments:</b>	

<sup>28</sup> WRB Lawn Maintenance Guidelines: <http://www.wrb.ri.gov/lawnmaintenance/lawnguidelines.html>

<b>Initiative 10.1</b>	<b><i>Watershed Based Water Supply Plans</i></b>
<b>Project Description:</b>	Develop watershed based water supply management plans for specific areas of the state as needs are identified through other initiatives, including the WSSMP, water availability, self supply assessments, water reporting. Plans should consider a broad range of options including but not limited to new well development, alternative storage, wastewater reuse/recharge, enhanced conservation, etc Initially, the focus is expected to be on the Southern Region.
<b>Key milestones:</b>	WSSMP rewrite, water availability estimates, identification of areas that exceed or threaten to exceed their safe yield, new source approval process, identification and availability of new/alternate sources.
<b>Project budget:</b>	
<b>Existing partners:</b>	Water suppliers, state agencies and municipalities.
<b>Desired Outcome:</b>	Water management plans and actions that recognize watersheds and water supply needs at a sub regional level
<b>Current Status:</b>	Initial data indicates the need to coordinate current programs in the “red dot” areas identified in Appendix B.
<b>Key Challenges/Needs:</b>	Administrative(WRB),Data/knowledge, jurisdictional considerations, existing infrastructure and resource availability
<b>Short-Term Actions:</b>	Develop plans and strategies for focus area, prioritize WSSMP submissions.
<b>Longer-Term Actions:</b>	Water management districts and regional water management areas that may reorganize and create water supply districts and may result in new source development, infrastructure realignments, and/or continued coordinated management.
<b>Comments:</b>	

<b>Initiative 10.2</b>	<b><i>Water Supply Regionalization</i></b>
<b>Project Description:</b>	Support regionalization for both small and major water supply systems
<b>Overview of the project:</b>	Develop metrics and supportive programs that identify the benefits and costs to regionalization of large and small water supply systems.
<b>Key milestones:</b>	Short Range
<b>Project budget:</b>	WRB staff time, legal and technical costs TBD
<b>Existing partners:</b>	RIDOH, RIDOP, Water Suppliers, WRB members, general assembly, municipalities.
<b>Desired Outcome:</b>	Develop standardized mechanisms to analyze both small and large water supply systems for regionalization. The outcomes are likely to include draft legislation (for major water suppliers, similar to the existing legislation for small water suppliers in RIGL 46-30), interagency coordination to identify and encourage opportunities for regionalization (or components of regionalization) through discreet projects and permit programs, and future rules, regulations, polices and procedures (including funding) to support appropriate regionalization efforts.
<b>Current Status:</b>	Statutes exist to support small water supply system regionalization on a volunteer basis. WRB has identified water management regions of the State that may provide a logical means of assessing future regionalization opportunities
<b>Key Challenges/Needs:</b>	Fiscal and legal obligations of water supply systems, parochial governance structures, significant water quality and quantity discrepancies between systems, labor and technical capacity of systems, etc.
<b>Short-Term Actions:</b>	Develop stakeholder meetings to develop metrics to analyze effectiveness of regionalization opportunities
<b>Longer-Term Actions:</b>	Develop draft legislation, rules, polices and procedures (including funding) to support appropriate regionalization efforts.
<b>Comments:</b>	

<b>Initiative 13</b>	<b><i>Coordinated Public Water Supply and Source Approval Process</i></b> <sup>29 30</sup>
<b>Project Description:</b>	Coordinate the approval of Public Water Supplies and Sources to align with WRB strategic plans.
<b>Overview of the project:</b>	Develop a coordinated approval process for all new (and existing) public water supplies and sources to ensure that water supplies are properly used, developed, protected and conserved with respect to the WRB's strategic plans.
<b>Key milestones:</b>	Short Range: 2-5 years
<b>Project budget:</b>	WRB staff time, supplier costs TBD
<b>Existing partners:</b>	Major water suppliers, municipalities
<b>Desired Outcome:</b>	A streamlined and coordinated review process between all applicable state agencies for new and expanded water withdrawal projects. Reduce existing overlapping and burdensome requirements regarding approval of public water supplies and sources, and integrate WRB's strategic plans into the process for approval of permits and funding.
<b>Current Status:</b>	MOU exists for coordinating notifications between State agencies.
<b>Key Challenges/Needs:</b>	WRB budget and staff are reduced.
<b>Short-Term Actions:</b>	Develop WRB procedures and protocols for new and expanded water withdrawal projects.
<b>Longer-Term Actions:</b>	Integrate WRB strategic plan consideration into existing funding programs across several federal, state, and local funding programs. Promulgate regulations based on existing statutes to ensure the proper development and use of water resources of the state.
<b>Comments:</b>	

<sup>29</sup> RIGL 46-15-2 Approval of public water supply facilities <http://www.rilin.state.ri.us/Statutes/TITLE46/46-15/46-15-2.HTM>

<sup>30</sup> RIGL 46-15.7-3 Functions of the Water resources board <http://www.rilin.state.ri.us/Statutes/TITLE46/46-15.7/46-15.7-3.HTM>

<b>Initiative 15</b>	<i>Interstate Water Resource Management Compact</i> <sup>31</sup>
<b>Project Description:</b>	Create a compact with the States of Massachusetts and Connecticut regarding existing water quality and quantity issue that are shared between our states
<b>Overview of the project:</b>	Ensure that our existing water resources are protected, conserved, and are able to be used and developed for future uses considering interstate programs and policies.
<b>Key milestones:</b>	Short Term: 2-5 years
<b>Project budget:</b>	WRB staff time
<b>Existing partners:</b>	Major water suppliers, municipalities, States of Massachusetts and Connecticut, BRWCT, RI state agencies.
<b>Desired Outcome:</b>	Interstate compact(s) that enable continued and future use and development of the water resources of our States.
<b>Current Status:</b>	Various agreements between water suppliers and out-of-state entities, no centralized strategic compact exists today.
<b>Key Challenges/Needs:</b>	WRB budget and staff are reduced
<b>Short-Term Actions:</b>	Continue to support individual water suppliers and other partners regarding the use, development, protection and conservation of our water resources.
<b>Longer-Term Actions:</b>	Develop interstate compact(s) to acknowledge shared use of our water resources.
<b>Comments:</b>	

<sup>31</sup> RIGL 46-15-18 Relations with other governmental bodies and agencies  
<http://www.rilin.state.ri.us/Statutes/TITLE46/46-15/46-15-18.HTM>

<b>Initiative 16</b>	<b><i>Drought Planning, Monitoring and Response</i></b> <sup>32</sup>
<b>Project Description:</b>	Streamline existing Drought Steering Committee process to the achieve efficiency considering existing resources.
<b>Overview of the project:</b>	Consider replacing existing Drought Steering Committee with the WRB for all drought planning, monitoring, and response activities.
<b>Key milestones:</b>	Short Range: 2-5 years
<b>Project budget:</b>	WRB staff time
<b>Existing partners:</b>	Major water suppliers, municipalities, RIDOH, RIEMA
<b>Desired Outcome:</b>	Streamline the WRB's existing drought management responsibilities centered on existing WRB program, reducing redundancy in reporting and administrative work.
<b>Current Status:</b>	Drought Steering Committee is currently active, WRB staff continues to perform monitoring as time and resources permit.
<b>Key Challenges/Needs:</b>	WRB budget and staff are reduced
<b>Short-Term Actions:</b>	WRB consideration of municipal and emergency response representation on the Board.
<b>Longer-Term Actions:</b>	Consider reconfiguration to replace Drought Steering Committee with the WRB and amendment to the state drought plan.
<b>Comments:</b> The replacement of the Drought Steering Committee with the WRB will relieve staff of the administrative burden of managing another political subdivision of the WRB. WRB staff will continue to use all existing technical resources in order to effectively assess and communicate drought management issues with all our partners. WRB staff will also work with DOP staff to amend all relevant SGP elements related to drought management.	

<sup>32</sup> RI Drought Management Plan <http://www.planning.ri.gov/landuse/dmp.htm>

<b>Initiative 17</b>	<b><i>Self Supply Water Use Assessment</i></b> <sup>33</sup>
<b>Project Description:</b>	Analyze the areas of the State that are currently self-supplied with water, and future areas of the State.
<b>Overview of the project:</b>	Ensure that the current and future self-supply areas of the State are capable of meeting our Resource Protection Goals and current water quality standards.
<b>Key milestones:</b>	Short Range: 2-5 years
<b>Project budget:</b>	WRB staff time, supplier costs TBD
<b>Existing partners:</b>	Municipalities, RIDEM, RIDOH
<b>Desired Outcome:</b>	Produce a macro-level analysis of the Water Resource Regions and their current and future self-supply areas to ensure that 1) adequate quantities of water are available, and 2) that existing RIDEM and RIDOH programs are accounting for future pollutant loading that will affect the use of these groundwater sources in interim and buildout conditions.
<b>Current Status:</b>	Preliminary analysis completed by WRB staff. WRB staff plan a future effort to fine-tune the existing estimates to analyze consumptive self-supply use by basin and subbasin and municipality.
<b>Key Challenges/Needs:</b>	WRB budget and staff are reduced
<b>Short-Term Actions:</b>	Discuss water quality aspects with RIDOH and RIDEM, plan for future macro-level analysis.
<b>Longer-Term Actions:</b>	Perform macro-level analysis and present results to WRB and partners for inclusion into WRB strategic plan updates. Consider updating self supply estimating and/or establishing water use reporting requirements.
<b>Comments:</b>	

<sup>33</sup> RIGL 46-15.7-3 Functions of the water resources board <http://www.rilin.state.ri.us/Statutes/TITLE46/46-15.7/46-15.7-3.HTM>

<b>Initiative 18</b>	<b><i>Non-potable Water Reuse and Recharge</i></b>
<b>Project Description:</b>	Coordinate with various partners to analyze and support the use of non-potable water for appropriate uses.
<b>Overview of the project:</b>	Continue to coordinate with RIDEM's consultant <sup>34</sup> to explore wastewater reuse and recharge opportunities, quantify the amounts of non-potable groundwater in urban areas, and publish results.
<b>Key milestones:</b>	WRB staff prepares Water Availability Estimates by July 2012. RIDEM Report presentation TBD.
<b>Project budget:</b>	WRB staff time.
<b>Existing partners:</b>	RIDEM, RIDOH, wastewater facility operators, major water users.
<b>Desired Outcome:</b>	Promote the use of non-potable water for appropriate uses wherever technically and financially feasible, considering availability of water.
<b>Current Status:</b>	WRB analysis of Water Availability is complete. RIDEM consultant has developed draft Wastewater Reuse Assessment Report.
<b>Key Challenges/Needs:</b>	Wastewater reuse opportunities are limited to existing (large) WWTF's and are expensive. There are no clear regulations in place to encourage wastewater reuse. WRB budget and staff are reduced
<b>Short-Term Actions:</b>	WRB staff finalizes Water Availability estimates. RIDEM conclude and present findings of Wastewater Reuse Assessment Report.
<b>Longer-Term Actions:</b>	Integrate wastewater, stormwater, and impacted groundwater into water resource management programs.
<b>Comments:</b>	

<sup>34</sup> Draft Horsley Witten Report for RI Wastewater Reuse Assessment (**Appendix B**)

## Northern Region Initiatives

**Summary:** The Northern Region is characterized by extensive systems of reservoirs and interconnectedness with adjacent water systems. The configuration of these water supply systems results in a predictable and secure system of water supply for 80% of the state’s population. Likewise, the seasonal demands of water supply on the environment are regularly mitigated through the use of stored water in reservoirs. The majority of the surface water reservoir systems also have ample undeveloped watershed protection areas, ensuring high raw water quality and corresponding low treatment costs. Our supply and demand analysis indicates that the current and future goals of the State can be met with the current supplies of water. The table below shows that average demands are reasonably within reservoir safe yields through buildout. The current and projected summer demands (deficits) are mitigated by storage in the reservoirs, although we should closely track future demands to ensure that the safe yield of the reservoir systems are maintained and corresponding infrastructure (treatment plants, transmission lines, tanks, etc.) are not compromised. The WRB staff analysis indicates that there are surpluses of supply with some suppliers, and others at risk due to reliance on single sources. The WRB is compelled to resolve regional conflicts to ensure reliable water for current and future demands.

**Public Supply Average Day Demand (ADD)  
with Resource Protection Goal, Northern Region**

<b>Surplus/Deficit (MGD)</b>	<b>2005</b>	<b>2025 65 GPCD</b>	<b>Buildout 65 GPCD</b>
<b>Average</b>	<b>11.4</b>	<b>8.0</b>	<b>-2.0</b>
<b>Summer</b> (Comparisons of summer demand to reservoir safe yields are not applicable due to storage)	<b>-17.5</b>	<b>-21.8</b>	<b>-34.9</b>

**Issues and Concerns:** The Northern Region water suppliers must maintain their existing sources of water to accommodate current and future demands. The interconnectedness of most of the water suppliers to the west of the Narragansett Bay are well connected, and with continued support from the WRB the suppliers will improve this condition by constructing new interconnections. The two major suppliers to the east of Narragansett Bay (East Providence and Bristol County Water Authority) currently have primary sources of supply that are vulnerable. One of the WRB’s Northern Region strategic initiatives will mitigate the vulnerability of these primary connections so that their interconnectedness is enhanced and the reliability of supplies is improved.

The other Northern Region initiative relates to a historic public law that requires the Providence Water Supply Board to deliver 150 gallons per capita per day throughout their franchise area and rural areas throughout Northern RI. This public law was introduced in 1915 and was intended to provide water for significant industrial and commercial uses that were prevalent at that time. The commercial and industrial uses of water have reduced over the decades, and the PWSB now serves a majority of the residential population of the State, directly and through wholesale sales to other water suppliers. The obligation to provide 150 GPCD is several times larger than the WRB’s goal of 65 GPCD and well beyond PWSB’s capacity in their reservoirs and treatment plant.

<b>Initiative 3</b>	<b><i>Northern Region Water Supply Project</i></b> <sup>35</sup>
<b>Project Description:</b>	Develop water source for Bristol County Water Authority (BCWA) and East Providence Water Division (EPWD).
<b>Overview of the project:</b>	The BCWA and EPWD both rely on finished water from the Providence Water Supply Board (PWSB) as their primary sources of water. Both BCWA and EPWD should develop secondary sources of water.
<b>Option 1A – Pawtucket Water Supply (PaWSB) to BCWA</b>	
<b>Option 1A Description:</b>	Connect finished water from Pawtucket Water (PaWSB) to BCWA through East Providence, terminating at the Cross Bay pump station. This connection would provide a secondary source of finished water for both EPWD and BCWA, allowing investigation and repairs to their primary source connections with PWSB, and providing a new revenue source for PaWSB.
<b>Key milestones:</b>	Develop modified legislation to re-appropriate Bristol County Water Supply Act funds by January 2012. Request voter approval for re-appropriation of funds on November 2012 ballot.
<b>Project budget:</b>	\$16.4 million
<b>Existing partners:</b>	BCWA, PaWSB, EPWD
<b>Desired Outcome:</b>	Develop alternate source of water for both BCWA and EPWD. Provide BCWA with a finished source of water, negating the need for immediate investment into the aging Child Street Treatment Facility. Maximize the use of public funds for the benefit of the residents of the East Bay
<b>Current Status:</b>	Option 1A has been discussed with representatives from PaWSB, EPWD, and BCWA. The legal options to implement this option have been discussed in concept with the Budget Office and RIDOA Legal Counsel. The conceptual estimate is being analyzed and refined with BCWA.
<b>Key Challenges/Needs:</b>	The existing funding (\$6.9 million) for the Bristol County Water Supply Act requires the proceeds be used for an alternate project (Option 1B – Shad Factory Pond pipeline). The re-appropriation of funds will require legislative modification and subsequent voter approval. The sale of water from PaWSB would offset existing revenues derived from PWSB (although both connections would remain in service to stay functional). BCWA must also take deliberate

<sup>35</sup> Northern Region Water Supply Project, Options 1A and 1B (**Appendix G**)

	steps to ensure that their existing reservoirs and treatment plant are maintained in the event of emergency or significant (unexpected) increase in demand. WRB and BCWA must consider the implications of reducing (or stopping) use of the existing MA reservoirs as it pertains to future use of these water resources. The WRB must also pursue Initiative 15 (Interstate Water Resource Compact) to protect future uses of the MA reservoirs, if ever required.
<b>Short-Term Actions:</b>	Work with BCWA, EPWD and PaWSB to confirm strategies to implement Option 1A, including support of local elected officials.
<b>Longer-Term Actions:</b>	Develop option 1A pipeline.
<b>Option 1B – Shad Factory Pond to BCWA<sup>36</sup></b>	
<b>Option 1B Description:</b>	Continue to pursue the permitting for the replacement of the existing Shad Factory Pond pipeline on an overland alignment, and pursuit of construction of needed improvements to the Child Street Treatment Facility. This option would provide a secondary source of water for BCWA and EPWD.
<b>Key milestones:</b>	Coordinate with State of Massachusetts and Town of Rehoboth to secure road opening permits (ongoing for past 18 years).
<b>Project budget:</b>	\$23 million including costs to upgrade treatment plant, protect and acquire critical watershed property repair and maintain dams/reservoirs and potentially dredge the Kickemuit Reservoir to improve raw water quality and quantity. Cost of \$32.5 million is projected if a new treatment plant is constructed in lieu of upgrade to present plant
<b>Existing partners:</b>	BCWA, Town of Rehoboth, State of Massachusetts Executive Office of Environmental Affairs, MA DEP.
<b>Desired Outcome:</b>	Secure permits for the replacement of the Shad Factory pipeline to bring raw water into the Child Street Treatment Facility.
<b>Current Status:</b>	The Town of Rehoboth has been unwilling to issue a road opening permit for the BCWA to construct the Shad Factory pipeline. The existing pipeline follows an off-road route, including being submerged in the Palmer River. The existing raw water quality that is intermittently treated at the Child Street Treatment Facility is poor and requires an additional \$2 million in upgrades. The existing Cross Bay pump station in East Providence requires significant coordination in

<sup>36</sup> <http://www.rilin.state.ri.us/Statutes/TITLE46/46-15.5/INDEX.HTM>.

	order to provide an alternate source of water to East Providence in the event of an emergency; a situation that is not improved by Option 1B.
<b>Key Challenges/Needs:</b>	The BCWA needs an alternate source of water. The funding from the Bristol County Water Supply Act is limited and the costs beyond available funding must be absorbed by the BCWA ratepayers and will require additional ongoing operational costs for the treatment facility and repairs to the dams and reservoirs. The Town of Rehoboth MA has not cooperated with the BCWA regarding replacing the Shad Factory Pond pipeline, and the MA DEP has also indicated that they are concerned about streamflow standards and cannot assure that BCWA will be able to draw the same volume of water from the MA reservoirs in the future. Additional concerns have also been raised regarding the watershed protection around the MA reservoirs and the private agreements related to water rights for these reservoirs (particularly the Anawan Reservoir).
<b>Short-Term Actions:</b>	Work with BCWA, the Town of Rehoboth, and the State of Massachusetts to secure permits for the street opening permit.
<b>Longer-Term Actions:</b>	Develop option 1B pipeline and upgrades to the Child Street Treatment Plant. Develop long term arrangement for the use of water from all four MA reservoirs.
<b>Comments:</b>	

<b>Initiative 12</b>	<b><i>Providence Water Supply Board 1915 Water Supply Obligation, as amended<sup>37</sup></i></b>
<b>Project Description:</b>	Repeal 1915 public law Chapter 1278 (as amended).
<b>Overview of the project:</b>	Repeal 1915 public law Chapter 1278 (as amended) obligating Providence Water Supply Board to supply water out of their existing service area at a rate of 150 gallons per capita per day.
<b>Key milestones:</b>	Short Range: 2-5 years
<b>Project budget:</b>	WRB staff time
<b>Existing partners:</b>	Providence Water Supply Board, Northern Region water suppliers, municipalities in Northern Region, General Assembly
<b>Desired Outcome:</b>	Repeal 1915 public law Chapter 1278 (as amended) to disoblige Providence Water Supply Board from supplying more water than their reservoir systems can safely provide. Alternate sources throughout the Northern Region (including areas of self supply) will provide water supply for future (buildout) conditions.
<b>Current Status:</b>	The public law and the WRB statutes are both in effect, creating a conflict.
<b>Key Challenges/Needs:</b>	Working with municipalities in the Northern Region to acknowledge available water estimates (public and self-supply).
<b>Short-Term Actions:</b>	Solicit legal counsel for direction related to assessing remedy for conflicts between WRB statutes and rules and public law.
<b>Longer-Term Actions:</b>	Repeal public law.
<b>Comments:</b>	

<sup>37</sup> 1915 public law, Chapter 1278 “An Act to Furnish the City of Providence with a Supply of Pure Water”, as amended (**Appendix F**)

## Southern Region Initiatives

**Summary:** The Southern Region is characterized by its extensive (and concentrated) use of groundwater, seasonal population peaks, no storage (reservoirs), and important agricultural uses. Groundwater systems are inherently vulnerable as they do not contain storage that mitigates short and long term drought to provide protection for the environment. Our analysis shows that the existing water supplies are not adequate to meet the current average or peak summer demands when the Resource Protection Goal is applied. Intermediate demand projections and build out scenarios demonstrate a clear need for not just conservation, but also new sources of water. The magnitude of the demands is much larger than what we expect to achieve through conservation, therefore while we advance our conservation programs, new sources must be planned and eventually developed. The table below shows the estimated demands compared to the Resource Protection Goal.

The table below shows that average and summer demands are not being met with respect to our Resource Protection Goal. Since there are no reservoirs in the Southern Region, the current and projected summer demands (deficits) cannot be mitigated with storage, further exacerbating the intermittent stress on the environment. A closer look at the basins and sub-basins in the Southern Region also indicates that the stresses are evident where the population and water withdrawals are located, which unfortunately does not make it easy to plan for additional sources where the population and infrastructure already exist. This information compels the WRB to resolve these conflicts to ensure reliable water for current and future demands.

### **Water Supply Average Day Demand (ADD) with Resource Protection Goal, Southern Region**

<b>Surplus/Deficit (MGD)</b>	<b>2005</b>	<b>2025 65 GPCD</b>	<b>Buildout 65 GPCD</b>
<b>Average</b>	<b>-2.0</b>	<b>-6.6</b>	<b>-14.3</b>
<b>Summer</b>	<b>-12.3</b>	<b>-19.8</b>	<b>-32.0</b>

**Issues and Concerns:** The Southern Region water suppliers have developed systems that serve their existing customers with reasonable reliability. The most persistent risk to the overall system of providing water in the Southern Region is the sole reliance on groundwater and corresponding vulnerability to climate variations including drought. In addition, the evolution of the Resource Protection Goal and the future demand analysis has unveiled a significant deficiency in supply in both the short and long term, and both the average and summer conditions. The WRB must address this conflict directly through the implementation of both short and long range strategies.

One of our short range initiatives focuses on the preservation of the limited aquifers and recharge areas along with other water resource partners (RIDEM, local land trusts, municipalities, etc.). The preservation of these limited resources will ensure protection of the quality and quantity of water available for the existing uses and future generations. This initiative cannot overcome the

deficiencies of the Resource Protection Goal and future demand; and sole reliance on groundwater, therefore a long range solution (source) must be simultaneously pursued.

The WRB staff analysis of water availability in some of the sub-basins of the Southern Region have revealed current deficiencies in that may be mitigated by using existing infrastructure and stored water sources. The documented intermittent stresses in the HAP are in close proximity to infrastructure and sources in the Northern Region that have current surpluses of water. One of the WRB staff initiatives looks at tapping into the stored water reserves in the Northern Region and distributing the water to the stressed water supply systems in the HAP as a short range initiative to preemptively resolve intermittent environmental stresses. The WRB staff feels that the short range options we have developed for the HAP are reasonable, but also require consideration of long range solutions (sources) due to the statewide over-reliance of the Northern Region water supplies.

The remaining areas of the Southern Region are not in close proximity to Northern Region infrastructure. These southern and westerly areas must recognize the intermittent limitations of their supplies and the associated risks. The WRB staff has developed several long range options to address these deficiencies, expecting that the short range initiatives will include continued conservation, acquisition of new groundwater sources, and connecting North Kingstown Water and Quonset Development Corporation to the Northern Region supplies. These short range solutions are not substitutes for a reliable source of supply, rather they are intended to supplement the existing efforts of conservation and interconnections until new long range source(s) can be developed. The long range initiatives focus on the opportunity to use the vast volumes of water that are within our State to provide a safe, reliable, and affordable source of water for current and future generations. Each option has unique risks and benefits that must be carefully considered.

<b>Initiative 7</b>	<b><i>South County Groundwater Acquisition Program</i></b> <sup>38</sup>
<b>Project Description:</b>	Acquisition of new groundwater sites and protection of existing groundwater sites throughout South County.
<b>Overview of the project:</b>	WRB staff is investigating high yield groundwater sites throughout South County for acquisition and protection. These sites will be used by local water suppliers or may be held in reserve for future or emergency use. Properties may also be purchased to protect existing groundwater sources.
<b>Key milestones:</b>	Investigations and acquisitions are underway.
<b>Project budget:</b>	WRB staff time, \$8 million in GO bonds
<b>Existing partners:</b>	South County major water suppliers, municipalities, land trusts, RIDEM
<b>Desired Outcome:</b>	Investigate and purchase new high yield groundwater sources throughout South County for current and future uses.
<b>Current Status:</b>	Several properties have been investigated and water quality and quantity have been verified. Two sites are currently under negotiation for acquisition.
<b>Key Challenges/Needs:</b>	WRB staff is reduced. Property owners of high yield sites have been reluctant to sell their properties due to high development value. All new groundwater acquisitions will be subject to RIDEM's SDM requirements, and may yield less water than similar (existing) well sites.
<b>Short-Term Actions:</b>	Continue investigation and acquisition of groundwater sites throughout South County.
<b>Longer-Term Actions:</b>	Coordinate open space acquisitions so that sites within critical water resource areas consider future use as a water supply. Develop new sources of supply that are not vulnerable to drought conditions or increasingly restrictive environmental permit conditions.
<b>Comments:</b>	

<sup>38</sup> South County Groundwater Resources (**Appendix J**)

<b>Initiative 11 (a)</b>	<b><i>Southern Region Water Supply Project HAP – Short Range Options<sup>39</sup></i></b>
<b>Project Description:</b>	Provide alternate and reliable source of supply for Quonset Development Corporation (QDC) and North Kingstown Water Department (NKWD).
<b>Overview of the project:</b>	Connect water from Northern Region via Kent County Water Authority (KCWA) to QDC and NKWD.
<b>Option 1 – KCWA to QDC/NKWD</b>	
<b>Option 1 Description:</b>	Option 1 makes use of existing emergency interconnections between KCWA and QDC and NKWD. The combined interconnections can provide approximately 3 MGD. WRB must work with each supplier, Department of Health, and possibly the PUC in order to activate these interconnections (tentatively during peak season, between May and August). WRB staff suggests a corresponding reduction in pumping in the HAP using a new predictive modeling tool (Decision Support System).
<b>Key milestones:</b>	WRB to declare the HAP as an area that exceeds or threatens to exceed the safe yield <sup>40</sup> of the available water on an intermittent basis. WRB must then engage our partners (water suppliers, RIDOH and possibly PUC) to outline a process to address the regulatory, financial, and management process to facilitate this option. WRB staff may advance this work by negotiating with water suppliers to prepare a pumping optimization plan March 2012, including hydraulic modeling of system pressures and water quality analysis.
<b>Project budget:</b>	\$110,000 for modeling and system preparation
<b>Existing partners:</b>	KCWA, QDC, NKWD
<b>Desired Outcome:</b>	Provide source of finished water to QDC and NKWD, and corresponding reduction of groundwater withdrawals in the HAP to avoid potential environmental degradation during peak times.
<b>Current Status:</b>	Emergency interconnections and verbal agreements to operate them exist. DSS is draft but available for testing.
<b>Key Challenges/Needs:</b>	WRB has no funding available for incidental costs associated for this pilot project. WRB must take action related to the exceedances of the safe yield in the HAP to support the activation of these emergency

<sup>39</sup> Southern Region Water Supply Project HAP – Short Range Options 1, 2, and 3 (**Appendix H**)

<sup>40</sup> RIGL 46-15.7-3 Functions of the water resources board <http://www.rilin.state.ri.us/Statutes/TITLE46/46-15.7/46-15.7-3.HTM>

	interconnections during peak demand. WRB must also negotiate with all suppliers to reduce their peak groundwater withdrawals in order to derive an environmental benefit (increased flows in the Hunt River during summer periods).
<b>Short-Term Actions:</b>	Coordinate pumping scenarios using predictive model, and results with water suppliers.
<b>Longer-Term Actions:</b>	Continue to monitor effectiveness of intermittent use of alternate source of water on the HAP streams.
<b>Option 2 – KCWA to QDC/NKWD</b>	
<b>Option 2 Description:</b>	Option 2 includes the construction of less than 2 miles of new pipeline along Bald Hill Road in Warwick to increase the flow up to 7 MGD, with 2 MGD to supplement KCWA’s existing high service area, and 5 MGD for QDC and NKWD.
<b>Key milestones:</b>	Upon verification of new demand in QDC or NKWD (for economic development), WRB may work with the water suppliers to determine optimum funding strategies for the construction of this option.
<b>Project budget:</b>	\$5.9 million (no funding currently available)
<b>Existing partners:</b>	KCWA, QDC, NKWD
<b>Desired Outcome:</b>	Provide consistent source of finished water to QDC and NKWD for economic development.
<b>Current Status:</b>	Project is conceptual at this point.
<b>Key Challenges/Needs:</b>	WRB has no funding available for this project. The project also continues to extend the Northern Region supplies beyond their current service areas; therefore this should only be considered a short range option and contingent with the selection of a long range solution for water supply in the Southern Region.
<b>Short-Term Actions:</b>	WRB should consider this as a short range strategic option for water supply in the HAP, meant to encourage economic development at QDC and North Kingstown’s Post Road Corridor.
<b>Longer-Term Actions:</b>	WRB must secure an additional source of water in the Southern Region as demand approaches buildout conditions.
<b>Option 3 – KCWA to QDC/NKWD</b>	
<b>Option 3 Description:</b>	Option 3 includes the construction of 6 miles of new pipeline along Bald Hill Road in Warwick to increase the flow up to 12 MGD, with 2 MGD to supplement KCWA’s existing high service area, and 10 MGD for QDC and NKWD.
<b>Key milestones:</b>	Upon verification of regular demand in QDC or NKWD (presumably for economic development), WRB may work with all suppliers to determine optimum funding strategies for construction

<b>Project budget:</b>	\$18.6 million (no funding currently available)
<b>Existing partners:</b>	KCWA, QDC, NKWD
<b>Desired Outcome:</b>	Provide consistent source of finished water to QDC and NKWD for economic development.
<b>Current Status:</b>	Project is conceptual at this point.
<b>Key Challenges/Needs:</b>	WRB has no funding available for this project. The project also continues to extend the Northern Region supplies beyond their current service areas; therefore this should only be considered a short range option and contingent with the selection of a long range solution for water supply in the Southern Region.
<b>Short-Term Actions:</b>	WRB should consider this as a short range strategic option for water supply in the HAP, meant to encourage economic development at QDC and North Kingstown's Post Road Corridor.
<b>Longer-Term Actions:</b>	WRB must secure an additional source of water in the Southern Region as demand approaches buildout conditions.
<b>Comments:</b>	

<b>Initiative 11 (b)</b>	<b><i>Southern Region Water Supply Project :Dispersed Groundwater Option</i></b>
<b>Project Description:</b>	Identify and develop groundwater sources to serve areas where uses exceed or threaten to exceed the safe yield of a water source (HAP, Chipuxet and Lower Wood basins). New groundwater sites will be dispersed so as to minimize local withdrawal impacts
<b>Overview of the project:</b>	WRB staff have identified potential wellfields that would alleviate stressed areas located in the urban Services Boundary (Chipuxet, Mink, HAP, Pawcatuck), support state economic development goals along Rte. 138 and potentially municipal growth centers.
<b>Key milestones:</b>	Continue pursuit of groundwater sources through Initiative 7, South County Groundwater Acquisition Program.
<b>Project budget:</b>	WRB staff time, \$8 million in GO bonds (South County Acquisition Program), potential local funds. The cost to complete all wellfields as shown on the graphic (Appendix H) would be approximately \$155 Million.
<b>Existing partners:</b>	South County major water suppliers, municipalities, land trusts, RIDEM
<b>Desired Outcome:</b>	Disperse groundwater withdrawals to alleviate current resource stresses, address demand, achieve resource protection goals, provide back-up, redundant and/or emergency supplies, and potentially support municipal growth centers.
<b>Current Status:</b>	Several properties have been investigated and water quality and quantity have been verified. Two sites are currently under negotiation for acquisition.
<b>Key Challenges/Needs:</b>	WRB staff is reduced. Property owners of high yield sites have been reluctant to sell their properties due to high development value. All new groundwater acquisitions will be subject to RIDEM's SDM requirements, and may yield less water than similar (existing) well sites. Redundancy and storage are needed to address the general system risks and vulnerabilities. Prime sites/areas of surplus water may not be located within the Urban Services Boundary (USB), though they are targeted to supplement sources located within the USB.
<b>Short-Term Actions:</b>	Identify any areas of surplus water that could be developed. Prioritize existing South County acquisition funds to meet Southern region goals.
<b>Longer-Term Actions:</b>	Develop new sources of supply.
<b>Comments:</b>	

<b>Initiative 11 (c)</b>	<b>Southern Region Water Supply Project: BRMA Groundwater</b>
<u>Project Description:</u>	Development of groundwater sources in the Big River Management Area
<u>Overview of the project:</u>	WRB staff will secure the permit and continue to market the expected 2.1 MGD groundwater withdrawal for the wells off Fish Hill Road (Phase 1) as an alternate source of water for economic development and the needs identified. Future efforts will pursue analysis of additional water at this location and other locations within the BRMA.
<u>Key Milestones:</u>	WRB Staff review of draft permit with RIDEM staff expected mid-February. Submission of permit expected march 2012.
<u>Project Budget:</u>	The cost to finalize the draft withdrawal permit is approximately \$10,000.
<u>Existing Partners:</u>	WRB, RIDEM
<u>Desired Outcomes:</u>	Obtain permit for Phase 1 groundwater withdrawal from the BRMA, thereby demonstrating the BRMA as a water supply for the state and to prohibit inconsistent uses. Obtain information that advances the objective of maximizing use for the BRMA for water supply and help satisfy short term and long term needs and Resource Protection Goals.
<u>Current Status:</u>	Submission of withdrawal permit was delayed as the WRB accounts were transferred to the Division of Planning. Payments to consultant from May 2011 was made in December 2011, and the consultant is now updating the permit narrative and is expected to produce an updated draft by mid February 2012.
<u>Key Challenges/Needs:</u>	. None of the three closest water suppliers (KCWA, QDC, and NK Water) have expressed an interest in purchasing the BRMA groundwater. KCWA recently started construction of their own groundwater treatment facility for their reactivated Mishnock Wells, indicating their preference for their groundwater system versus the BRMA well project.
<u>Short-Term Actions:</u>	Coordinate and secure withdrawal permit with RIDEM. Evaluate options to further explore the groundwater supply potential from the BRMA and initiate action as the budget allows.
<u>Longer-Term Actions:</u>	Market the BRMA groundwater source as a viable option for water supply in the center of the State, and continue to protect the BRMA as a water supply source.

<b>Initiative 19</b>	<b><i>Southern Region Water Supply Project Long Range Options<sup>41</sup></i></b>
<b>Project Description:</b>	Develop new source(s) of supply.
<b>Overview of the project:</b>	Develop new source(s) of supply to mitigate existing deficiencies in supply due to Resource Protection Goals and future deficiencies due to build out demand projections.
<b>Option 1A – Southern Region New Source</b>	
<b>Option 1 Description:</b>	Option 1A includes the construction of the Big River Reservoir (28 MGD reservoir facility) and a 27 mile transmission system to connect the water supplies in Richmond, Kingston, URI, United Water, and South Kingstown. The alignment for the transmission system follows Route 3 into Hope Valley, and then heads east into Kingston via Route 138. There is a future consideration of a connection to PWSB as a redundant source.
<b>Key milestones:</b>	The WRB must acknowledge the need for a future water source through the strategic planning session by January 2012. The WRB staff will then continue to work with our water suppliers to advance our conservation programs to ensure that their customers are using water efficiently. Subsequent efforts of the WRB will include further refinement of staff demand estimating techniques.
<b>Project budget:</b>	\$514 million (original Big River Reservoir engineer’s estimate, adjusted to 2011 dollars)
<b>Existing partners:</b>	WRB, RIDEM, EPA, ACOE, water suppliers, municipalities
<b>Desired Outcome:</b>	Provide a reliable source of water for the Southern Region of the State with sufficient storage capacity for drought conditions, and the ability to provide a connection to Northern Region (via PWSB) as an alternate source.
<b>Current Status:</b>	The State owns the BRMA and completed 80% design plans for the reservoir in 1988.
<b>Key Challenges/Needs:</b>	The 1989 EPA Objection Letter <sup>42</sup> and the 1990 Final Determination <sup>43</sup> regarding the construction of the original Big River Reservoir project clearly required that WRB should pursue conservation measures with our major water suppliers and fully explore

<sup>41</sup> Southern Region Water Supply Project Long Range Options 1A, 1B, 2A, 2B, and 3 (**Appendix I**)

<sup>42</sup> 1989 EPA Objection Letter (summary) (**Appendix J**)

<sup>43</sup> Final determination of the U.S Environmental Protection Agency's Assistant Administrator for Water pursuant to Section 404(c) of the Clean Water Act concerning the proposed Big River water supply impoundment Kent County, Rhode Island, March 1, 1990, p. 10 (Appendix J)

	alternative and supplemental sources of supply. WRB has begun this process with our DMS, supplemental water supply study, continued hydro-geologic studies, and the strategic planning process. WRB must also dutifully manage the BRMA as a future water supply, and monitor demand growth and environmental conditions prior to developing this site.
<b>Short-Term Actions:</b>	Preserve the BRMA as a water supply for the State; develop alternate funding strategies for the eventual design and construction of this facility.
<b>Longer-Term Actions:</b>	Develop BRMA as a source for the Southern Region and a connection to PWSB as a redundant source for the Northern Region.
<b>Option 1B – Southern Region New Source</b>	
<b>Option 1 Description:</b>	Option 1B includes the construction of the Big River Reservoir (28 MGD reservoir facility) and a 28 mile transmission system to connect the water supplies in Kingston, URI, United Water, and South Kingstown. This alternate alignment for the transmission system follows Route 3 to Route 102 in Exeter, heads east to Route 2, south to Route 138, and then heads east into Kingston via Route 138. There is a future consideration of a connection to Richmond and to PWSB as a redundant source.
<b>Key milestones:</b>	The WRB should acknowledge the need for a future water source through the strategic planning session by January 2012.
<b>Project budget:</b>	\$514 million (Big River engineer’s estimate adjusted to 2011 dollars)
<b>Existing partners:</b>	WRB, RIDEM, EPA, ACOE, water suppliers, municipalities
<b>Desired Outcome:</b>	Provide a consistent source of water for the Southern Region of the State with sufficient storage capacity for drought conditions, and the ability to provide a connection to Richmond and PWSB as an alternate source.
<b>Current Status:</b>	The State owns the BRMA and completed 80% design plans for the reservoir in 1988.
<b>Key Challenges/Needs:</b>	WRB must pursue conservation measures with our major water suppliers, dutifully manage the BRMA as a future water supply, and dutifully monitor demand growth and environmental conditions prior to developing this site.
<b>Short-Term Actions:</b>	Preserve the BRMA as a water supply for the State, plan on developing alternate funding strategies for the eventual design and construction of this facility.

<b>Longer-Term Actions:</b>	Develop BRMA as a source for the Southern Region and a connection to PWSB as a redundant source for the Northern Region.
<b>Option 1C – Southern Region New Source</b>	
<b>Option 1C Description:</b>	Option 1C includes the construction of the Big River Reservoir (28 MGD reservoir facility) and a 25 mile transmission system to connect the water supplies in Kingston, URI, United Water, and South Kingstown. This alternate alignment for the transmission system is located within the Urban Services Boundary. There is a future consideration of a connection to PWSB as a redundant source.
<b>Key milestones:</b>	The WRB should acknowledge the need for a future water source through the strategic planning session by January 2012.
<b>Project budget:</b>	\$537 million (Big River engineer’s estimate adjusted to 2011 dollars)
<b>Existing partners:</b>	WRB, RIDEM, EPA, ACOE, water suppliers, municipalities
<b>Desired Outcome:</b>	Provide a consistent source of water for the Southern Region of the State aligned with Urban Services Boundary and with sufficient storage capacity for drought conditions, and the ability to provide a connection to PWSB as an alternate source. The route of this option (1C) also directs the use of water throughout the Urban Services Boundary, emphasizing the desire to direct appropriate development to areas that can support future growth.
<b>Current Status:</b>	The State owns the BRMA and completed 80% design plans for the reservoir in 1988.
<b>Key Challenges/Needs:</b>	WRB must pursue conservation measures with our major water suppliers, dutifully manage the BRMA as a future water supply, and dutifully monitor demand growth and environmental conditions prior to developing this site.
<b>Short-Term Actions:</b>	Preserve the BRMA as a water supply for the State, plan on developing alternate funding strategies for the eventual design and construction of this facility.
<b>Longer-Term Actions:</b>	Develop BRMA as a source for the Southern Region and a connection to PWSB as a redundant source for the Northern Region.
<b>Option 2A – Southern Region New Source</b>	
<b>Option 1 Description:</b>	Option 2A includes the construction of a 28 MGD desalination facility in Quonset, and a 27 mile transmission system to connect the water supplies in Kingston, URI, United Water, and South Kingstown. The alignment for the transmission system follows

	Route 402 to Route 2, and then Route 2 south to Route 138, and east into Kingston via Route 138. There is a future consideration of a connection to Richmond and PWSB as a redundant source.
<b>Key milestones:</b>	The WRB should acknowledge the need for a future water source through the strategic planning session by January 2012.
<b>Project budget:</b>	\$345 million
<b>Existing partners:</b>	WRB, RIDEM, EPA, ACOE, CRMC, suppliers, municipalities
<b>Desired Outcome:</b>	Provide a consistent source of water for the Southern Region of the State.
<b>Current Status:</b>	Current desalination technology requires significant power to separate salts using membranes. The most productive desalination facilities also make use of brackish water to reduce the power requirements for treatment.
<b>Key Challenges/Needs:</b>	A centralized desalination facility can provide a clean source of water for the State, but there are no emergency power generators large enough to keep a facility of this size active during power outages. This is a significant disadvantage for desalination facilities.
<b>Short-Term Actions:</b>	Develop alternate funding strategies for the eventual design and construction of this facility.
<b>Longer-Term Actions:</b>	Develop the Quonset Desalination Facility as a source for the Southern Region, and a connection to Richmond and PWSB as a redundant source.
<b>Option 2B – Southern Region New Source</b>	
<b>Option 1 Description:</b>	Option 2B includes the construction of a four (4) separate desalination facilities in Quonset (10 MGD), Scarborough (8 MGD), Matunuck (3.5 MGD), and Westerly (8 MGD). These facilities are located strategically to connect to existing distribution and transmission system throughout the Southern Region.
<b>Key milestones:</b>	The WRB should acknowledge the need for a future water source through the strategic planning session by January 2012.
<b>Project budget:</b>	\$331 million
<b>Existing partners:</b>	WRB, RIDEM, EPA, ACOE, CRMC, water suppliers, municipalities
<b>Desired Outcome:</b>	Provide a consistent source of water for the Southern Region of the State.
<b>Current Status:</b>	Current desalination technology requires significant power to separate salts using membranes. The most productive desalination facilities also make use of brackish water to reduce the power requirements.

<b>Key Challenges/Needs:</b>	The decentralized desalination facilities can provide a clean source of water for the Southern Region of the State, but there are no emergency power generators large enough to keep these facilities operating during power outages. This is a significant challenge for desalination facilities.
<b>Short-Term Actions:</b>	Develop alternate funding strategies for the eventual design and construction of these facilities.
<b>Longer-Term Actions:</b>	Develop the decentralized desalination facilities as sources throughout the Southern Region.
<b>Option 3A – Southern Region Demand Management</b>	
<b>Option 3 Description:</b>	Option 3 is developed through an “Aggressive Conservation” goal of 45 GPCD throughout the Southern Region.
<b>Key milestones:</b>	Implement Demand Management Plans of Major Water Suppliers at 65 GPCD (August 2012), and incrementally reduce the conservation goal through Administrative Procedures Act in subsequent years to achieve 45 GPCD.
<b>Project budget:</b>	\$0 for WRB, unknown costs for water suppliers and ratepayers.
<b>Existing partners:</b>	WRB, RIDOH, EPA, water suppliers, municipalities
<b>Desired Outcome:</b>	Reduce the demand of all users (residential, commercial, industrial, agriculture, and government) to defer future capital investments.
<b>Current Status:</b>	Major water suppliers are currently close to meeting the 65 GPCD goal. Built infrastructure limits the ability of suppliers to radically reduce sale of water without adverse impacts to rates, water quality, and fire suppression (pressure) issues.
<b>Key Challenges/Needs:</b>	Developing an aggressive conservation goal below 65 GPCD may be difficult if the cost of water is low and the availability of water in the Northern Region remains high. Implementation of an aggressive conservation goal will not achieve any of the Resource Protection goals of the Southern Region (specifically, 2025 and buildout timeframes, average and peak conditions – See Water Supply and Demand Estimating reference). The water quality impacts related to a drastic reduction in flow in our State’s water supply infrastructure are not clearly understood; however it is anticipated that significant health and safety issues will limit the application of this option. This option does not adequately address the vulnerability of the groundwater sources in the Southern Region (does not provide storage for drought or emergency conditions), nor does it

	provide a backup source of supply for the Northern Region. This option (compared to Option 3B) does not provide a connection to the Northern Region whereby an alternate source of water is ready to serve the Southern Region in the event of an emergency.
<b>Short-Term Actions:</b>	Develop and implement the Demand Management Strategies at 65 GPCD and monitor conformance. Prepare amendments to the Water Use and Efficiency Act rule to reduce the conservation goals toward the 45 GPCD value over time. Investigate practical limitations to reductions in flow considering water quality and fire flow requirements.
<b>Longer-Term Actions:</b>	Develop aggressive conservation as an alternative to a new source for the Southern Region. Analyze land use and zoning projections to ensure that all water supplies (major, small, and self supplies) are capable of ensuring adequate protection of health and human needs and economic growth.
<b>Option 3B – Southern Region Demand Management</b>	
<b>Option 3 Description:</b>	Option 3 includes construction of a 30 mile transmission system from PWSB to connect the water supplies in Kingston, URI, United Water, and South Kingstown. The alignment for the transmission system starts at Route 2 in Cranston, and then Route 2 south to Route 138, and east into Kingston via Route 138. There is a future consideration of a connection to Richmond as a supplemental source. The source for Option 3 is developed through an “Aggressive Conservation” goal of 45 GPCD throughout the State.
<b>Key milestones:</b>	The WRB should acknowledge the need for a future water source through the strategic planning session by January 2012.
<b>Project budget:</b>	\$101 million
<b>Existing partners:</b>	WRB, RIDEM, EPA, water suppliers, municipalities
<b>Desired Outcome:</b>	Provide a consistent source of water for the Southern Region of the State and the ability to provide a connection to Richmond as a supplemental source.
<b>Current Status:</b>	Major water suppliers are currently close to meeting the 65 GPCD goal. Built infrastructure limits the ability of suppliers to radically reduce sale of water without adverse impacts to rates, water quality, and fire suppression (pressure) issues.
<b>Key Challenges/Needs:</b>	Developing an aggressive conservation goal below 65 GPCD may be difficult if the cost of water is low and the availability of water in the Northern Region remains high. Implementation of an aggressive

	conservation goal will not achieve the Resource Protection goals of the Southern Region. The water quality impacts related to a drastic reduction in flow in our State's water supply infrastructure are not clearly understood; however it is anticipated that significant health and safety issues will limit the application of this option. This option does not adequately address the vulnerability of the groundwater sources in the Southern Region (does not provide storage for drought or emergency conditions), nor does it provide a backup source of supply for the Northern Region.
<b>Short-Term Actions:</b>	Develop alternate funding strategies for the eventual design and construction of this facility. Investigate practical limitations to reductions in flow considering water quality and fire flow requirements.
<b>Longer-Term Actions:</b>	Develop aggressive conservation as a source for the Southern Region, and a connection to Richmond as a supplemental source.
<p><b>Comments:</b>  WRB staff analyzed a reduced capacity treatment facility and alternate transmission alignments for Big River Reservoir options per the direction of the board. The alternate plant size has been reduced to 5 MGD and the transmission line has been reduced to 16" in the reduced option scenarios. The corresponding cost estimates are \$390,374,400 for Option 1A Alternate, \$390,656,640 Option 1B Alternate, and \$400,569,600, Option 1C Alternate.</p>	

## Aquidneck Region Initiative

**Summary:** The Aquidneck Region is characterized by its extensive system of reservoirs, limited groundwater availability, and interconnectedness with adjacent supplies. The watersheds for these reservoirs are only moderately protected, infringing on the raw water quality that is ultimately treated by the Newport and Stonebridge water utilities. Newport’s southernmost reservoirs are in close proximity to the ocean and therefore vulnerable to climate change (sea level rise) and the occasional hurricane (either through catastrophic loss or saltwater intrusion). The Stafford Pond source in the northern portion of this region is controlled by the City of Fall River and is restricted in its withdrawal quantities and the costs to withdraw water. Our analysis indicates that the current and future goals of this Region can be met with the current supplies of water; however this Region must continue to address the vulnerability of its resources and plan for additional future expenses (due to potential salt water intrusion, lower raw water quality due to development, lack of available groundwater, or increasing costs from wholesale water contracts from Massachusetts).

### **Public Supply Average Day Demand (ADD) Compared to Safe Yields of Surface Water Reservoirs, Aquidneck Region**

<b>Surplus/Deficit (MGD)</b>	<b>2005</b>	<b>2025 65 GPCD</b>	<b>Buildout 65 GPCD</b>
<b>Average</b>	<b>6.1</b>	<b>4.1</b>	<b>1.4</b>
<b>Summer</b> (Comparisons of summer demand to reservoir safe yields are not applicable due to storage)	<b>4.5</b>	<b>2.1</b>	<b>-1.1</b>

**Issues and Concerns:** The Aquidneck Region water suppliers have developed a sophisticated system of reservoirs that are capable of managing existing and future demands that serve their existing customers with reasonable reliability. The main issues related to the Aquidneck Region relate to the vulnerability associated with a few of their key sources of supply (Easton (South) Pond, Nelson Pond, Gardiner Pond, and Stafford Pond). Although the existing supplies are artfully managed, the increasing pressures of land use on the protective areas surrounding the sources, the use of these sources by the public for recreation, and the proximity to the ocean must be closely studied to ensure that these sources (and the remaining ones) are available into the future. The WRB must address this conflict directly through the implementation of a targeting vulnerability assessment of their critical water resources.

<b>Initiative 14</b>	<b><i>Critical Water Supply Vulnerability Assessment</i></b>
<b>Project Description:</b>	Vulnerability assessment of existing supplies and infrastructure related to natural and man-made impacts.
<b>Overview of the project:</b>	Perform assessment of vulnerability of existing supplies and infrastructure related to natural and man-made impacts.
<b>Key milestones:</b>	Short Range: 2-5 years
<b>Project budget:</b>	WRB staff time, consultant contract (\$100,000)
<b>Existing partners:</b>	Newport Water Division, Stonebridge Water, Portsmouth Water, and North Tiverton Water
<b>Desired Outcome:</b>	Ensure that the water supplies are adequately protected for current and future uses.
<b>Current Status:</b>	The southern reservoirs in the Newport Water System are close to the shore and are moderately vulnerable to sea level change. The Stonebridge Water System reservoir (Stafford Pond <sup>44</sup> ) is currently owned by the City of Fall River, and is designed as a backup source for the City of Fall River. The new Sakonnet River Bridge pipeline is capable of transferring moderate amounts of water south toward Newport, but not in adequate quantities as primary alternate source
<b>Key Challenges/Needs:</b>	The existing water supplies in the Aquidneck Region are moderately impacted due to the built up nature of the watershed and urban uses.
<b>Short-Term Actions:</b>	Continue to work with the Aquidneck Region water suppliers to protect and preserve their sources of supply.
<b>Longer-Term Actions:</b>	Perform detailed assessment of critical water supplies
<b>Comments:</b>	

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<sup>44</sup> Stafford Pond Use Agreement (**Appendix K**)

## Island Region Initiative

**Summary:** The Island Region (Prudence Island, Jamestown, and New Shoreham) is characterized by the limited availability of fresh water resources and local adoption of successful water conservation programs. Their water supplies are primarily dependant on precipitation and return flow from consumptive uses such as septic systems. The corresponding land use projections for each of these islands are modest and reflect the limitations for additional water supplies. WRB studied these islands through the USGS Water Use and Availability studies and the University of Rhode Island and has confirmed the limited availability of water on these islands. Our strategic planning analysis indicates that the current and future demands must continue to be carefully managed to mitigate existing and future water supply risks.

<b>Initiative 14</b>	<b><i>Emergency Interconnect Program</i></b>
<b>Project Description:</b>	Enhance existing emergency connection between North Kingstown and Jamestown
<b>Overview of the project:</b>	Ensure that short and long range water source projects for the Southern Region include provisions to deliver water to Jamestown in emergency conditions, including a conventional pipeline over the Jamestown-Verrazano Bridge.
<b>Key milestones:</b>	Short Range: 2-5 years
<b>Project budget:</b>	WRB staff time, supplier costs TBD
<b>Existing partners:</b>	North Kingstown Water, Jamestown Water
<b>Desired Outcome:</b>	Develop secure emergency interconnection across Jamestown Verrazano bridge, and ensure that future sources of water for the Southern Region include sufficient flow for Jamestown's emergency requirements.
<b>Current Status:</b>	Current emergency connection is facilitated by flexible hoses laid across the Jamestown-Verrazano Bridge.
<b>Key Challenges/Needs:</b>	The Jamestown-Verrazano bridge was not designed to transport a permanent water line.
<b>Short-Term Actions:</b>	Include demands for Jamestown in future capacity analysis for new sources for the Southern Region.
<b>Longer-Term Actions:</b>	Jamestown must continue to conserve water and explore alternate sources that are consistent with their limited development capacity.
<b>Comments:</b>	

<b>Initiative 20</b>	<b><i>Water Allocation</i></b> <sup>45</sup>
<b>Project Description:</b>	Allocation of the water resources of the State.
<b>Overview of the project:</b>	Establish a system for allocating the water resources of the state.
<b>Key milestones:</b>	Long Range: 10+ years
<b>Project budget:</b>	WRB staff time, legal and technical costs TBD
<b>Existing partners:</b>	WRB members, general assembly, municipalities.
<b>Desired Outcome:</b>	Develop a technically and legally defensible system of allocating water when/where demand exceeds (or threatens to exceed) supply. The program may include management tools to manage the water resources of the State, tools to ensure efficient uses of water for all users, and legal means to enforce compliance.
<b>Current Status:</b>	Preliminary recommendations from previous WAPAC have been developed, Drought Steering Committee and Emergency Response Plans are in place for major water suppliers, and Demand Management Strategies and new sources of supply are being developed.
<b>Key Challenges/Needs:</b>	WRB budget and staff are reduced. There are significant legal, political and management obstacles and the development of new water sources may negate the need to allocate water in the absence of an emergency. The WRB must successfully implement conservation efforts and water use reporting prior to allocating water.
<b>Short-Term Actions:</b>	Continue to develop the quality and quantity estimates of water resources throughout the State. Develop new sources of water where appropriate.
<b>Longer-Term Actions:</b>	Develop procedures for allocating water resources of the State.
<b>Comments:</b>	

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<sup>45</sup> RIGL 46-15.7-1 Management of the Withdrawal and Use of the Waters of the State

## **Integration and Implementation Matrix**

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The Integration and Implementation of initiatives is divided into three time phases: Business Plan (0-2 years), Short Range (2-10 years), and Long Range (10+ years). The Business Plan will become the “work plan” for the WRB staff and is constrained by current staffing and availability of current funds. The Business Plan will be evaluated and revised as warranted annually and the strategic plan every two years. The initiatives are listed in priority order as ranked by staff. The draft metrics will include reportable elements that continue to integrate the WRB staff with the Board through our monthly meetings.

<b>Business Plan (0-2 Years)</b>		
<b>Initiative</b>	<b>Responsible Party</b>	<b>Description</b>
<b>1.</b> Water Availability Guidance	Kathleen Crawley, Kenneth Burke	Present Water Availability Estimates to water suppliers and municipalities in Spring of 2012. Finalize formatting and deliver final estimates of availability of water to Division of Planning by July 2012.
<b>2.</b> Big River Management Area Land Management Plan	Romeo Mendes, Kenneth Burke	. Resume stakeholder outreach in February 2013. Produce draft Land Management Plan by September 2013. Promulgate revised rule (Land Management Plan) by January 2014.
<b>3.</b> Northern Region Water Supply Project Option 1a Pawtucket to BCWA Option 1 b Shad Pipeline	Kenneth Burke, Romeo Mendes	Identify and assess options for redundant supply for East Providence and Bristol County to address the vulnerability associated with reliance on a single source.
<b>4.</b> Water Supply System Management Plan (WSSMP) Rewrite	Kenneth Burke, Kathleen Crawley, Romeo Mendes	Reconvene workgroup by July 2012. Develop new program language by March 2013 which integrates Water Resource Management Region strategies.
<b>5.</b> Annual Water Reporting	Kenneth Burke, Romeo Mendes	Develop water analysis by September.
<b>6.</b> Demand Management Strategy (DMS)	Kenneth Burke, Kathleen Crawley	Submittal of DMS by August 2012
<b>7.</b> South County Groundwater Acquisition Program	Romeo Mendes, Kenneth Burke	Continue to investigate new sources and negotiate the purchase of newly identified sources in South County.
<b>8.</b> Water Resources Board Funding Programs a. Emergency interconnections	Kenneth Burke, Romeo Mendes, Kathleen Crawley	Develop outline of funding programs by September 2012. Prepare draft legislation and rule changes for 2013. Complete expenditure of current program funds for emergency interconnections.

<b>9.</b> Board Development	Kenneth Burke	Develop revised bylaws for WRB and WRBC by March of 2013 to clarify roles of Board members and WRB staff.
<b>10.</b> Lawn Maintenance and Watering Guidelines	Kathleen Crawley	Coordinate marketing program by April, program starts in May.
<b>11c</b> BRMA Permit for Phase 1 Groundwater Withdrawal	Kenneth Burke, Romeo Mendes	Secure the permit and continue to market wells off Fish Hill Road.

<b>Short Range Plan (2-10 Years)</b>		
<b>Initiative</b>	<b>Responsible Party</b>	<b>Description</b>
<b>10.1</b> Watershed Water Management Plans	WRB Staff and Board	Develop watershed management plans for the Southern Region in the first phase and other areas as identified.
<b>10.2</b> Regionalization of Water Systems	WRB Staff and Board	Encourage regionalization of both small and large water supply systems.
<b>11.</b> Southern Region Water Supply Project (a) HAP Short Range Options (b) and (c) New Groundwater Development Short Range Options	WRB Staff	Develop funding strategies for the eventual implementation of a new water source for the Southern Region and for well development in the BRMA.
<b>12.</b> Providence Water Supply Board Future Demand Obligations	WRB Staff	Introduce legislation to repeal provisions of the public law that compel PWSB to provide 150 GPCD to goals that are consistent with current WRB and Division of Planning Land Use guidelines.
<b>13.</b> Procedure for Approval of Public Water Source and Supply Facilities	WRB Staff	Promulgate regulations based on existing statutes to ensure the proper development and use of the water resources of the State.
<b>14.</b> Vulnerability Assessment of Critical Supplies	WRB Staff	Develop vulnerability assessment of critical supplies in the Aquidneck Region and emergency supply measures for Jamestown
<b>15.</b> Interstate Water Resource Management	WRB Staff	Develop interstate compacts with Massachusetts and Connecticut to ensure the shared use of water resources between our States.
<b>16.</b> Drought Planning, Monitoring, and Response	WRB Staff	Develop updated program outline to create efficiencies in the administration of the program, and to integrate Water Resource Management Region strategies.

<b>17. Self Supply Water Use Analysis</b>	WRB Staff	Update and analyze the current and projected self supplies to ensure sufficient water quality and quantities.
<b>18. Non-Potable Water Reuse and Recharge</b>	WRB Staff	Develop draft policies and budgets for further consideration

<b>Long Range Plan (10+ Years)</b>		
<b>Initiative</b>	<b>Responsible Party</b>	<b>Description</b>
<b>19. Southern Region Water Supply – Long Range Options</b> Option 1 Big River Reservoir Option 2 Desalination Facilities Option 3 Demand Management	WRB Staff	Develop watershed based supply plans and a new water source(s) for the Southern Region. Articulate suite of potential long term supply options.
<b>20. Water Allocation</b>	WRB Staff and Board	Establish a system for allocating the water resources of the state as necessary



## **Appendix A:**

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# **Water Use and Efficiency Act Rule**

**STATE OF RHODE ISLAND WATER RESOURCES BOARD**  
**RULES AND PROCEDURES GOVERNING THE WATER USE AND**  
**EFFICIENCY ACT FOR MAJOR PUBLIC WATER SUPPLIERS**



Adopted May 16, 2011

Authority: This rule is authorized pursuant to R.I. General Laws §46-15-8, as well as §46-15.3-5.1, §46-15.7-3, §46-15.8-5, and has been promulgated pursuant to the procedures set forth in the R.I. Administrative Procedures Act, R.I. General Laws Chapter 42-35.

## TABLE OF CONTENTS

<b>1.0</b>	<b>General Provisions</b>	<b>1</b>
1.1	Purpose	1
1.2	Authority	1
1.3	Construction and Application	1
<b>2.0</b>	<b>Definitions</b>	<b>1</b>
<b>3.0</b>	<b>Water Efficiency and Demand Management Targets for Major Water Suppliers</b>	<b>2</b>
3.1	Residential Annual Average GPCD Target	2
3.2	Efficient Outdoor Water Use	2
3.3	Efficient Indoor Water Use	2
3.4	Accounting for non-billed Water	2
3.5	Leakage	2
3.6	Accurate Metering and Billing	2
<b>4.0</b>	<b>Methods for Achieving Targets</b>	<b>2</b>
4.1	Required Methods	2
4.2	Optional Methods	3
<b>5.0</b>	<b>Water Use and Efficiency Progress Reporting for Major Public Water Suppliers</b>	<b>4</b>
5.1	Reporting Forms	4
5.2	Demand Management Strategy	4
5.3	Annual Reporting	4
<b>6.0</b>	<b>Enforcement</b>	<b>5</b>
6.1	Notice of violations	5
6.2	Issue of orders	5
6.3	Non-compliance	5
6.4	Penalties	5
<b>7.0</b>	<b>Severability</b>	<b>5</b>
7.1	Severability	5
<b>8.0</b>	<b>Effective Date</b>	<b>5</b>
8.1	Effective date	5

# Rhode Island Water Resources Board

## Water Use and Efficiency Rule for Major Public Water Suppliers

### 1.0 General Provisions

#### 1.1 Purpose

The purpose of this rule is to establish targets and methods for efficient water use for major public water suppliers. This rule also establishes reporting requirements.

#### 1.2 Authority

This rule is authorized pursuant to R.I. General Laws §46-15-8, as well as §46-15.3-5.1, §46-15.7-3, §46-15.8-5, and has been promulgated pursuant to the procedures set forth in the R.I. Administrative Procedures Act, R.I. General Laws Chapter 42-35.

#### 1.3 Construction and Application

- 1.3.1 The terms and provisions of this rule shall be liberally construed to authorize the Board to effectuate the purposes of state law, goals, and policies.
- 1.3.2 This rule applies to major public water suppliers, as defined within, and the Rhode Island Water Resources Board.

### 2.0 Definitions

For purposes of these rules the following definitions apply:

Board means the Rhode Island Water Resources Board, pursuant to RI General Laws Chapter 46-15, or, for the administration of these regulations, the staff of the Rhode Island Water Resources Board.

Conservation pricing means a rate structure that is employed by water utilities with the intent of providing a price signal to reduce or minimize wasteful use of water resources and to reduce future costs to customers.

Gallons per capita per day (GPCD) is a residential water use calculation that is determined by dividing the amount water supplied for residential use by the number days in the reporting period and further dividing that figure by the number of residents served in their places of residence.

Increasing (or inclining) block rates refer to charging customers higher unit rates for progressively higher quantities of water used.

Leakage is a component of non-billed water and is water that is lost through the water supply system through leaks in pipes, pumps, services connections, etc. For purposes of this rule leakage is calculated by estimating the difference between total non-billed water and the total of the estimated or measured allowances for fire fighting, meter inaccuracy, theft, system usage, main flushing, sewer cleaning, storm drain cleaning, and other allowances that may be developed by the water resources board.

Non-billed water means the difference between water withdrawn and/or purchased by a supplier and water sold by a supplier. Components of non-billed water include leakage, fire fighting, meter inaccuracy, theft, system usage, main flushing, sewer cleaning, storm drain cleaning, and other allowances that may be developed by the Board.

Major water customer means a water customer of a major public water supplier that uses more than three million gallons/year or more than 750,000 gallons in any consecutive three-month period and is supplied by a public supplier

Major public water supplier is a water supplier that obtains, transports, purchases or sells more than fifty million gallons of water per year. The Department of Defense is not included in this definition.

Residential water use is water used by single and multiunit residences for household purposes.

Seasonal Rates charge customers a lower water rate in the winter when water demand is usually lower and a significantly higher rate in the summer when demand is higher. All unit rates or rate blocks by class can be set so that they reflect higher summer demands for each customer class.

Water Efficiency and Demand Management Strategy (hereinafter referred to as DMS) means a strategic plan and implementation schedule that is developed by a major public water supplier which meets the targets established by this rule and employs a combination of the required methods plus any combination optional methods in order to achieve a high level of efficiency. The schedule lays out a timeline for implementing the strategies and identifies responsible parties.

WaterSense certified means an appliance, product, or fixture certified by the U.S. Environmental Protection Agency as using water efficiently.

Water source is a well, reservoir, pond, lake, and river or stream segment used for potable water supply.

Water Supply System Management Plan (WSSMP) means the plan that is prepared by major public water systems with content prescribed by R.I. General Laws Chapter 46-15.3 and submitted to the Water Resources Board pursuant to the Rules and Procedures for Water Supply System Management Planning

### **3.0 Water Efficiency and Demand Management Targets for Major Public Water Suppliers**

The following targets, pursuant to R.I. General Laws §46-15.3-5.1 (c) and §46-15.8-5, are established by the Board:

- 3.1** Residential average annual water use of 65 gallons per capita per day (GPCD) which takes into consideration;
  - 3.1.1 Fluctuations in the population served.
  - 3.1.2 Multi-unit residences that in some systems may be categorized and billed as commercial.
  - 3.1.3 Other factors as appropriate as determined by the Board.
- 3.2** Efficient outdoor water use.
- 3.3** Efficient indoor water use.
- 3.4** A full accounting of non-billed water.
- 3.5** Leakage of no more than 10% of the withdrawals and/or purchased water measured as an annual average.
- 3.6** Accurate metering and billing to account for all water supplied

### **4.0 Methods for Achieving Targets for Major Public Water Suppliers**

#### **4.1 Required Methods for Achieving Targets**

- 4.1.1 Initiate a program to accomplish 100% metering of all water delivered by December 31, 2012, as specified in R.I. General Laws §46-15.3-22(b). The metering requirement is not applicable to fire suppression systems, such as

fire hydrants and fire sprinkler systems since the high flows of such systems makes metering impractical.

- 4.1.2 Initiate a program for the maintenance and replacement of meters in accordance with the American Water Works Association (AWWA) standards and water supply system management plans by December 31, 2012, as specified in R.I. General Laws §46-15.3-22(b).
- 4.1.3 Initiate a program for installation of radio frequency reading systems not later than December 31, 2012, as specified in R.I. General Laws §46-15.3-22(b)..
- 4.1.4 Record metered usage and bill quarterly or more frequently by December 31, 2013, as specified in R.I. General Laws §46-15.3-22(c).
- 4.1.5 Education to encourage the efficient use of water for all customers, which may be developed and implemented by others.
- 4.1.6 Rate structures that are adequate to pay for all costs associated with water supply, are equitable, sensitive to economic impacts, and encourage the efficient use of water, per R.I. General Laws §39-15.1-3 or §45-39.1.5 as applicable.
- 4.1.7 Implement leak detection programs in accordance with AWWA standards and water supply system management plans. If leakage is more than 10% of the withdrawals and/or purchased water, as reported to the Board pursuant to rule 5.3.5, a system-wide leak detection program shall be initiated during the following fiscal year and progress reported pursuant to rule 5.3.6, per R.I. General Laws § 46-15.3-5.1(c).

**4.2 Optional Methods for Achieving Targets** shall be encouraged and where possible incentivized in combinations appropriate to the water supplier that recognize the differences in supply systems and sources. Optional methods shall include but are not limited to:

- 4.2.1 Residential conservation pricing including inclining block rates and seasonal rates.
- 4.2.2 Reduce non agricultural outdoor water use.
  - 4.2.2.1 Limit landscape irrigation to no more than one inch per week, including natural precipitation.
  - 4.2.2.2 Limit landscape irrigation to evening and/or early morning hours to reduce evaporative loss.
  - 4.2.2.3 Limit the size of landscapes that require irrigation.
  - 4.2.2.4 Establish new plantings during the spring and fall, whenever feasible.
  - 4.2.2.5 Select landscape plantings that, once established, require little or no irrigation.
  - 4.2.2.6 Use soil moisture sensors on in-ground irrigation systems.
  - 4.2.2.7 Use non-potable water (such as rainwater) where appropriate.
- 4.2.3 Improve efficiency of indoor water use.
  - 4.2.3.1 In existing construction, replace water use appliances and fixtures with products that meet current building codes, WaterSense certified standards, or equivalent.
  - 4.2.3.2 In new construction, install appliances and fixtures that meet WaterSense certified standards, or equivalent.

- 4.2.4 Improve efficiency of water use by major water customers.
  - 4.2.4.1 Perform Water Audits (excluding proprietary processes) that determine opportunities for reuse and reduce water use.
  - 4.2.4.2 Install appliances and fixtures that meet WaterSense certified standards, or equivalent.
  - 4.2.4.3 Implement industry-specific best management practices, excluding proprietary processes.
  - 4.2.4.4 Renovations or new construction that utilize architectural and green building design standards such as Leadership in Energy and Environmental Design (LEED) certification, Low Impact Development (LID) and other best management practices.
  - 4.2.4.5 Employee education.
  - 4.2.4.6 Outdoor water use methods as specified in 4.2.2 of this rule.

## **5.0 Water Use and Efficiency Progress Reporting for Major Public Water Suppliers**

- 5.1** Suppliers shall report on forms and/or in a format as established by the Board.
- 5.2** Suppliers shall prepare a Water Efficiency and Demand Management Strategy (DMS) to achieve targets identified in section 3.0 through the application of required methods in section 4.1 and through the application of selected optional methods listed in section 4.2 and or any other methods as appropriate.
  - 5.2.1 The DMS shall be submitted by August 1, 2012, shall constitute an amendment to the Water Supply System Management Plan (WSSMP)
  - 5.2.2 The DMS shall include a description of actions to be taken to address each of the targets outlined in Rule 3.0
  - 5.2.3 The DMS shall include a description of how the methods outlined in Rule 4.0 are to be implemented as part of the DMS.
  - 5.2.4 The DMS shall include a schedule and timeline for completing each of the actions included in the plan.
  - 5.2.5 The DMS is subject to review and approval by the Board.
  - 5.2.6 Subsequent versions of the DMS shall be submitted and reviewed pursuant to the Rules and Procedures of the Water Supply System Management Program.
  - 5.2.7 Progress in achieving the goals and implementing the DMS shall be reported annually pursuant to section 5.3.6.
  - 5.2.8 If progress toward meeting the water efficiency and demand management targets and the supplier specific measurable goals have not been met after implementing the DMS or after 5 years, whichever is sooner, the Board may require the DMS be revised.
- 5.3** All Major Public Suppliers shall report annually to the Board no later than August 1 for the preceding fiscal year, starting July 1 and ending June 30. The first report is due on August 1, 2011 and shall include;
  - 5.3.1 Withdrawals from each water source on a monthly basis;
  - 5.3.2 Wholesale purchases and sales on a monthly basis;
  - 5.3.3 The amount of water used by each category of use (residential, commercial, industrial, agricultural, government);
  - 5.3.4 Estimate of the number of residents served, including seasonal fluctuations, and with a description of the basis of the estimate;

- 5.3.5 Non-billed water and the components of non-billed water (to include leakage);
- 5.3.6 Progress in achieving targets each year commencing one year from the submission of the first Demand Management Strategy.

## **6.0 Enforcement**

- 6.1** The Board may issue a Notice of Violation to any major public water supplier that fails to comply with provisions of these regulations. The major public water supplier shall have twenty (20) days to respond to the Notice of Violation in writing. After an opportunity to be heard before the Board and in accordance with R.I. General Laws §42-35-9, failure to resolve the outstanding Notice of Violation in a manner consistent with the schedule as determined by the Board may result in the issuance of an administrative order. The issuance of an administrative order shall be deemed a final agency order subject to an immediate appeal in the superior court of Providence County or in the superior court in the county in which the cause of action arose. Any appeal taken and subsequent review by a court with jurisdiction shall be in accordance with chapter 35 of title 42.
- 6.2** The Board may issue to any major public water supplier failing to comply with the requirements of rule 5.0 (Water Use and Efficiency Reporting) an order requiring submission of the required information.
- 6.3** Any finding by the Board of non-compliance by a major public water supplier listed in R.I. General Laws § 39-15.1-2(4) with the requirements of R.I. General Laws § 46-15.3-7.5 or § 46-15.3-7.6 shall be forwarded to the Division of Public Utilities and Carriers as required by R.I. Gen. Laws § 46-15.3-20.
- 6.4** Failure to comply with any administrative order issued by the Board may subject a major public water supplier to the penalties set forth in R.I. General Laws § 46-15-11(b).

## **7.0 Severability**

- 7.1** If any provision of this rule or the application thereof to any person or circumstance, is held invalid by a court of competent jurisdiction, the validity of the remainder of the rule shall not be affected thereby.

## **8.0 Effective Date**

- 8.1** This rule takes effect twenty days after filing with the RI Secretary of State.



## **Appendix B:**

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### **Report on RI Wastewater Reuse Assessment**



# Rhode Island Wastewater Reuse Assessment

## Draft Report

September 2, 2011



*Submitted to:*

**The Rhode Island Department of Environmental Management**

235 Promenade St.

Providence, RI 02908-5767

*Submitted by:*

**Horsley Witten Group, Inc.**

**Hazen and Sawyer**

**Loon Environmental LLC.**

**Rhode Island Wastewater Reuse Assessment  
Draft Report**

**Table of Contents**

**1.0 INTRODUCTION..... 1**

    1.1 Goal and Purpose ..... 1

    1.2 Wastewater Reuse Types and Sources ..... 2

    1.3 Methodology ..... 3

**2.0 STATEWIDE SCREENING..... 3**

    2.1 Data Collection..... 3

    2.2 Screening Methodology ..... 4

    2.3 Screening Results ..... 8

**3.0 PRIORITIZATION..... 8**

    3.1 Criteria for Individual Reusers ..... 8

    3.2 Prioritization of WWTFs..... 10

    3.3 High Priority Projects..... 19

**4.0 ENGINEERING FEASIBILITY CRITERIA FOR WWTF PROJECTS ..... 19**

    4.1 Water Use and Water Demand..... 19

    4.2 Wastewater Treatment Infrastructure Modifications and Cost ..... 21

    4.3 Distribution System Engineering and Cost Feasibility ..... 21

    4.4 Constraints..... 22

    4.5 Long-term O&M Costs ..... 24

**5.0 SITE-SPECIFIC ENGINEERING FEASIBILITY ..... 25**

    5.1 East Greenwich ..... 25

    5.2 NBC Bucklin Point..... 30

    5.3 Quonset Point (RIEDC) ..... 34

    5.4 South Kingstown..... 38

    5.5 West Warwick..... 43

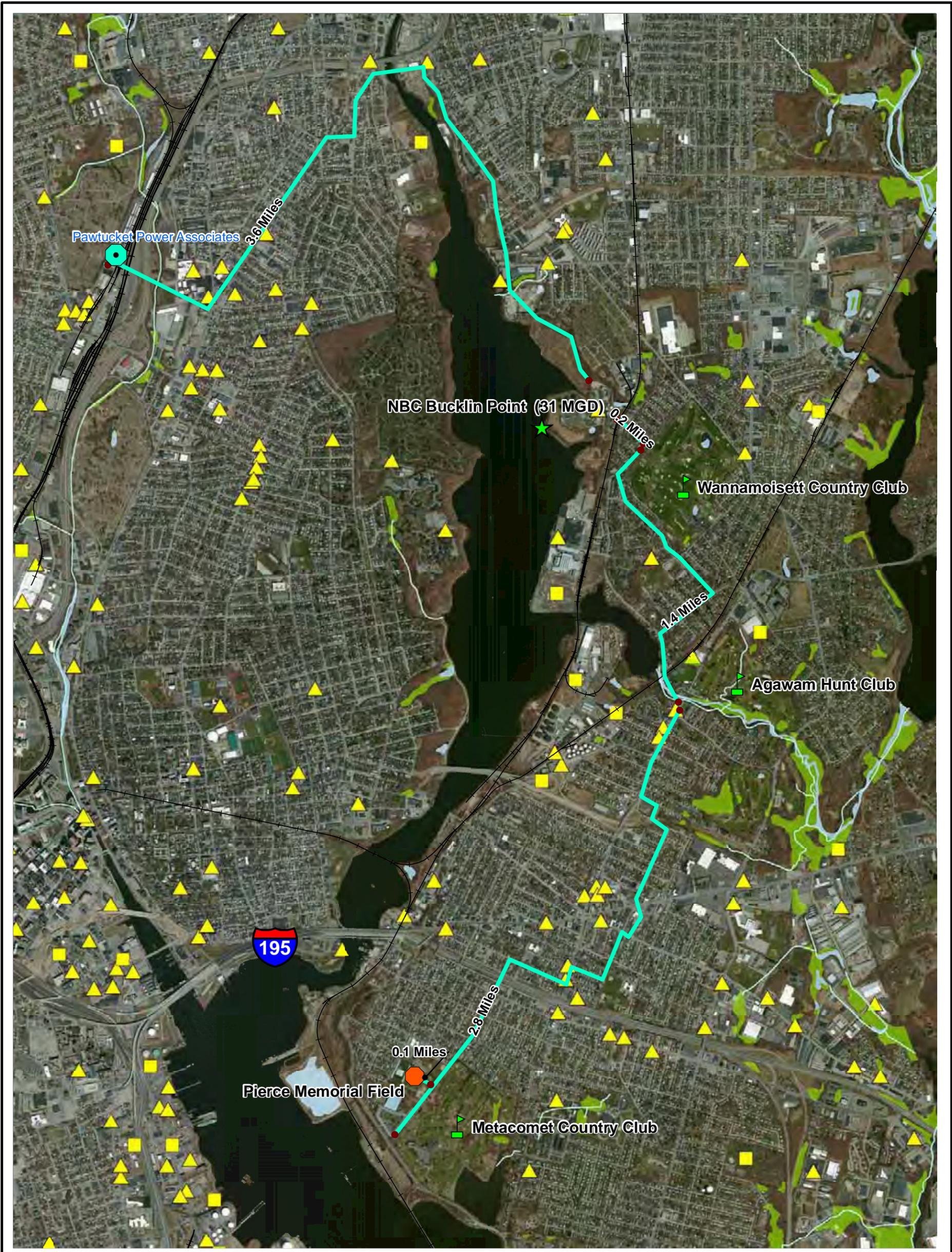
    5.6 Woonsocket..... 47

**6.0 RECOMMENDED PROJECTS FOR CONCEPTUAL DESIGN ..... 51**

**REFERENCES..... 52**

**APPENDICES**

- Appendix A. List of Screened Statewide Wastewater Reuse Opportunities
- Appendix B. High Priority Screened Wastewater Reuse Opportunities
- Appendix C. Detailed Cost Estimates for WWTF Upgrades
- Appendix D. Detailed Cost Estimates for Distribution Systems



**Legend**

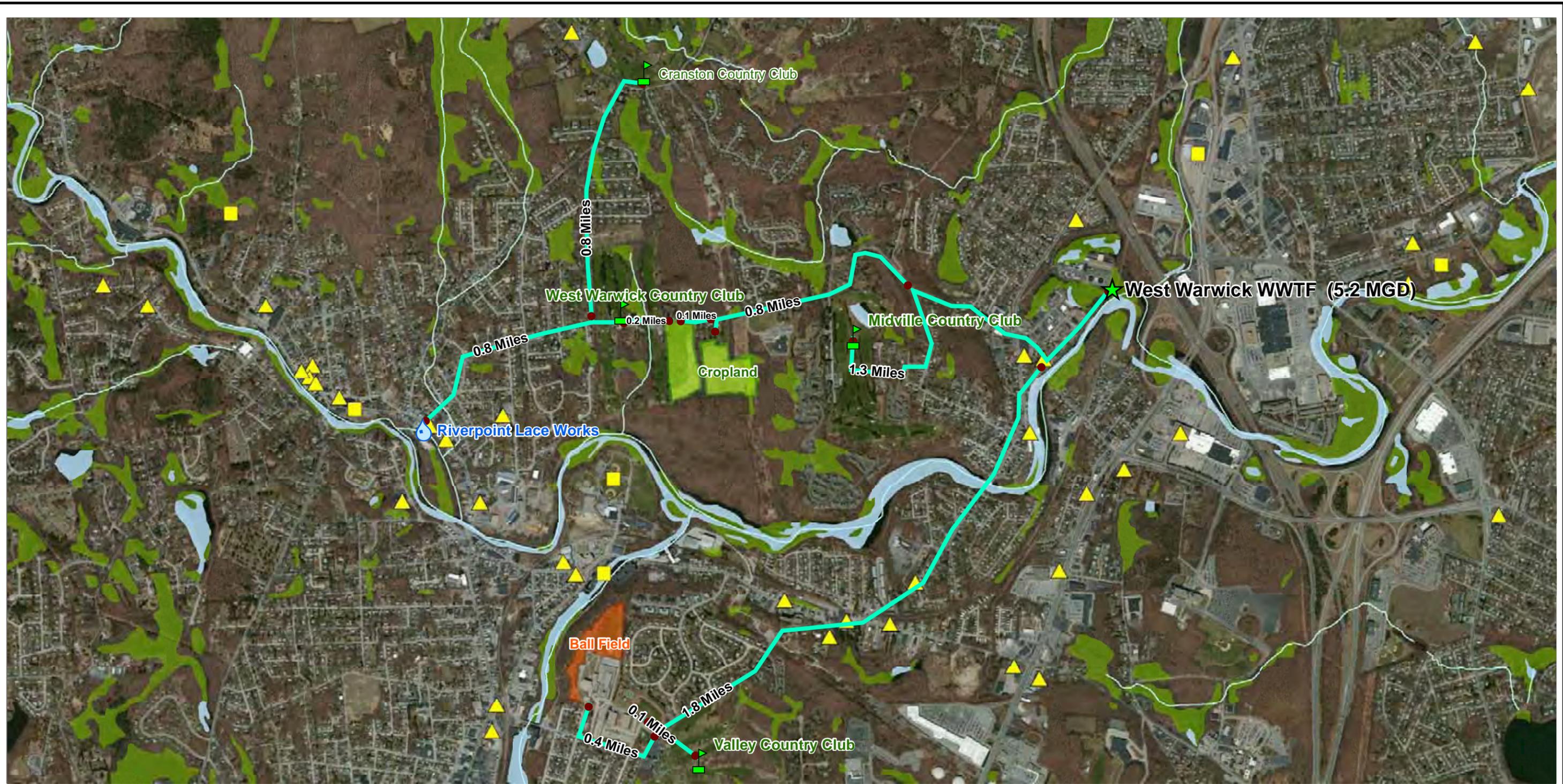
- ★ WWTF (Average Flow in MGD)
- Proposed Water Line
- 🏌️ Golf Courses
- 🏟️ Ball Field
- ⚙️ Power Plant
- 🌊 Riverine and Palustrine Open Water
- 🌊 Stream
- 🌿 Wetlands
- 🟡 Hazardous Material Site (cerclis)
- 🟡 Leaking Underground Storage Tank

  
 phone: 508-833-6600  
 www.horsleywitten.com

**NBC Bucklin Point WWTF Project  
 Pipeline Route and Constraints**

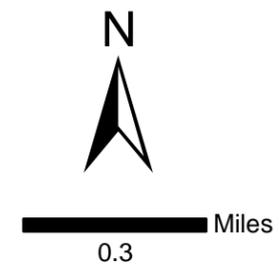
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**Figure 11**



**Legend**

- WWTF (Average flow in MGD)
- Proposed Water Line
- Golf Courses
- Major Water Users
- Cropland (tillable)
- Recreation Areas (non golf)
- Riverine and Palustrine Open Water
- Stream
- Wetlands
- Hazardous Material Site (cerclis)
- Leaking Underground Storage Tank

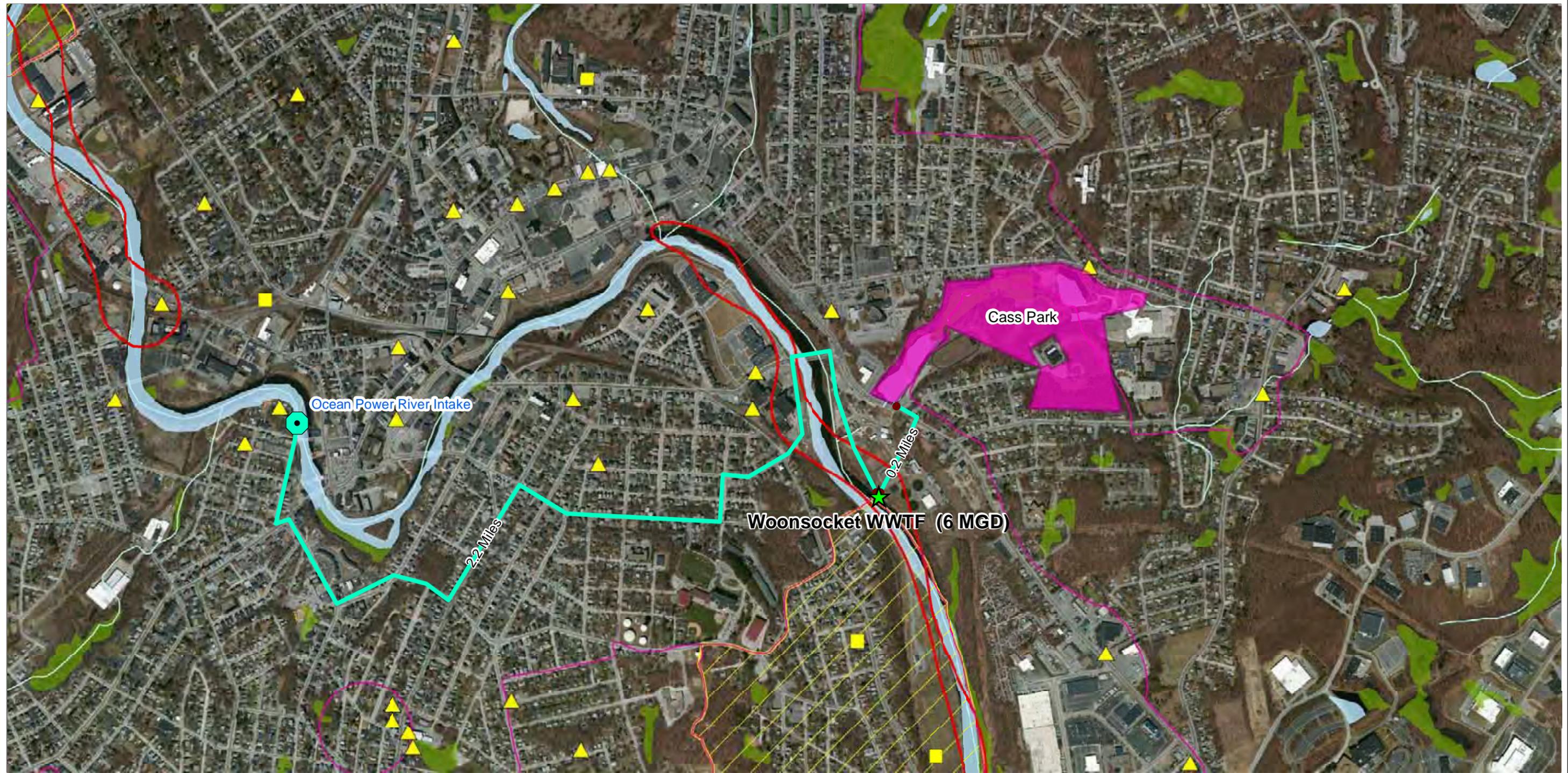


Horsley Witten Group  
 phone: 508-833-6600  
 www.horsleywitten.com

**West Warwick WWTF Project  
 Pipeline Route and Constraints**

8/31/2011 eym H:\Projects\2010\10009 RI DEM WW Reuse\GIS\Maps\IndividualOpportunities

Figure 18



**Legend**

- ★ WWTf (Average flow in MGD)
- Proposed Water Line
- 🍷 Federal/Municipal Conservation Land
- ⬢ Power Plant
- 🌊 Riverine and Palustrine Open Water
- 🌊 Stream
- 🌱 Wetlands
- 🍷 Groundwater of Drinking Water Quality
- 🍷 Groundwater Reservoir
- 🍷 Groundwater Recharge Area
- 🟡 Hazardous Material Site (cerclis)
- 🚩 Leaking Underground Storage Tank



0.2 Miles

Horsley Witten Group  
 phone: 508-833-6600  
 www.horsleywitten.com

**Woonsocket WWTf Project  
 Pipeline Route and Constraints**

8/31/2011 eym H:\Projects\2010\10009 RI DEM WW Reuse\GIS\Maps\IndividualOpportunities

Figure 20

**Table 14. Woonsocket WWTF Project Construction Cost Summary**

<b>Project Phase/Reusers</b>	<b>Construction Cost (Million US\$)</b>
WWTF upgrade	\$8.14
Water storage facility and distribution pumps	\$4.02
Ocean State Power	\$3.25
Cass Park	\$0.36
<b>Construction Project Total</b>	<b>\$15.78</b>

Average annual O&M costs for the Woonsocket WWTF project are estimated at approximately \$257,000.

## 6.0 RECOMMENDED PROJECTS FOR CONCEPTUAL DESIGN

Both the West Warwick and Woonsocket WWTFs face stringent nutrient standards for nitrogen and phosphorous which will require each WWTF to upgrade its system to include a very rigorous filtration system with which it would be very easy for them to meet the reuse standards specified in this assessment. They both provide recharge to stressed watersheds or have the potential to reduce water use from districts withdrawing from stressed watersheds. In addition, the NBC Bucklin Point WWTF would not require an equalization tank because the WWTF flow always exceeds the potential demand for reuse water. These three WWTF projects are good candidates for a conceptual design. This qualitative assessment is also supported by a cost assessment. Table 15 summarizes data for each WWTF, including design flow, the number of potential reusers, the types of reuse, construction costs, and an estimate of cost per flow. The cost per flow is estimated in total construction cost per gallon per day of reuse water, and shows that these three WWTFs have the lowest comparative cost.

**Table 15. Summary of WWTF Projects**

<b>WWTF</b>	<b>Design Flow (MGD)</b>	<b>Reusers</b>	<b>Reuse Types</b>	<b>Construction Cost (Million US\$)</b>	<b>Construction Cost for each Gallon Per Day of Reuse (US\$)</b>
East Greenwich	1	3	Irrigation Recharge	\$13.00	\$13.0
NBC Bucklin Point	3	5	Power plant Irrigation	\$34.45	\$11.5
Quonset Point (RIEDC)	0.5	2	Industrial Irrigation	\$11.78	\$23.6
South Kingstown	0.3 - 2	300 - 2,200 acres	Irrigation (turf farms)	\$11.8 - \$70	\$24-35
West Warwick	2	9	Industrial Irrigation	\$19.17	\$9.6
Woonsocket	2.5	2	Power plant Recharge	\$15.78	\$6.3



## **Appendix C:**

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# **Big River Management Area Policies**

**RI WATER RESOURCES BOARD**

**BIG RIVER MANAGEMENT AREA  
POLICIES**

**July 1997**

AUTHORITY: These regulations are adopted in accordance with Chapter 42-35 pursuant to Chapter 46-8 of the Rhode Island General Laws, as amended.

# TABLE OF CONTENTS

PREFACE.....	1
Administration.....	2
Jurisdiction and Responsibility.....	2
Facilities .....	3
Equipment .....	3
Rules and Regulations .....	3
POLICY CONCERNING USE OF MANAGEMENT AREA.....	4
POLICY CONCERNING FAIR MARKET APPRAISALS.....	4
POLICY ON RENTAL FREEZE FOR ORIGINAL OWNERS & SENIOR CITIZENS ON 1977 LIST.....	4
POLICY CONCERNING SUBLEASING BY ALL TENANTS OTHER THAN ORIGINAL OWNERS.....	5
POLICY CONCERNING TEMPORARY REDUCED RENT FOR LOW INCOME TENANTS.....	5
POLICY CONCERNING INSPECTIONS .....	6
POLICY ON MAINTENANCE RESPONSIBILITIES.....	6
POLICY ON APPLICATION PROCESS .....	7
POLICY ON HAZARDOUS MATERIALS.....	7
POLICY CONCERNING CATASTROPHIC REPAIRS.....	8
Protection.....	8
Historical Sites .....	8
Revenue.....	8

## **PREFACE**

The following policies have been developed to guide the Rhode Island Water Resources Board in its management of the state-owned property in the Big River Management Area. It recognizes the natural resources of the area and those public uses that are compatible with them. The plan addresses administration, operation, maintenance and development requirements as well as the budgetary demands imposed.

The Board further recognizes the present usage of the land by the original owners. Only by joint local and state concern for the natural features of the area can the character of the region be maintained. The Board also acknowledges that all aquifers within the State must be preserved. The Big River Management Area is a water aquifer under State control and the integrity of the water quality can and must be preserved.

Furthermore, the RI Water Resources Board is committed to providing equal opportunity in every aspect of its programs and will not discriminate because of race, sex, national origin, age, religion, sexual orientation, or disability.

## **Acknowledgments**

The RI Water Resources Board wishes to thank all persons who were instrumental in the development of the Big River Policy Book as well as all those who live within, or contribute to the daily operations of the Big River Management Area.

## Administration

The Big River Reservoir concept was initiated in 1928. It was not until 1962 that a Special Governor's Commission recommended acquisition of the property. In 1964, the General Assembly, under the Big River-Wood River Acquisition Act, established a requirement for a bond issue of five million dollars (\$5,000,000) to be placed on the general referendum ballot. Having recently experienced the inconveniences and health hazard associated with several drought seasons, the voters passed the bond referendum.

Under the powers of eminent domain, the state began acquiring property by condemnation beginning in Coventry in 1965, West Greenwich in 1966, and the in the Wood River area in Exeter in 1967. Due to substantial litigation, both the amount of land and the cost of acquisition exceeded desired proportions. In the end, the state obtained a total of 8,600 acres from 351 owners which comprised 444 parcels at a cost of \$7.5 million. Management of the land and the 200 structures thereon, became the responsibility of the Water Resources Coordinating Board, forerunner of the Water Resources Board.

Due to the opposition to the reservoir by the federal government, the US Environmental Protection Agency, and environmental organizations, the state placed the project on indefinite hold in 1990. In 1993, the RI General Assembly passed legislation declaring the Big River Management Area as "Open Space," to be utilized and enjoyed by residents of the State of Rhode Island. To this end, several civic groups engage in activities ranging from sports, hiking, canoeing, military training and other recreational activities.

## JURISDICTION AND RESPONSIBILITY

**RI General Laws 1956, Chapter 46-15-6, Powers and Duties.** In order to implement the plans and programs, the Board shall have the following powers and duties in addition to those powers enumerated under Chapter 46-15.1-5:

- (a) To acquire, with the limitation of funds therefore, the sites, appurtenant marginal lands, dams, waters, water rights, rights-of-way, easements, and other property or interests in property for reservoirs, ground water wells, well sites, and for such pipe lines, aqueducts, pumping stations, filtration plants and auxiliary structures as may be necessary or desirable for the treatment and distribution of water from those reservoirs, ground water wells and well sites. Lands acquired under the provisions of this section shall be acquired with the approval of the governor by purchase, gift device, or otherwise on such terms and conditions as the Board shall determine, or by the exercise of eminent domain, in accordance with the provisions of RIGL Chapter 6 of Title 37, as amended, insofar as the same are consistent with the provisions hereof;

- (b) To enter into contracts and/or agreements with such departments, divisions, agencies, or boards of the state as are directed by the governor to regulate, manage, or perform related functions of any lands or waters acquired under the provisions of the Big River-Wood River Reservoir Site Acquisition Act. (P.L. of 1964, Chapter 133);
- (c) To compensate the departments, divisions, agencies, or Board from the Water Development Fund established in RIGL Chapter 46-15.1-20 in an amount equal to the cost of providing such functions or services as are directed to be performed by the governor. The compensation shall be mandatory and shall be provided according to procedures established by the RI Department of Administration.

**RI Public Law 1964, Chapter 133, Section 7 . . .** the water resources co-ordinating board . . . Said Board is vested with all power and authority necessary or incidental to the purposes of this act. When deemed necessary, the Board reserves the right to authorize the State Police, RI Department of Environmental Management, and the RI National Guard, Air and Ground Divisions to perform duties on behalf of the Board.

### **FACILITIES**

Of the 200 buildings taken at the time of condemnation, there remained 47 residential homes, 79 mobile homes, 3 commercial buildings and a 9-hole golf course. In addition, there is a Field Office, located at 612 Nooseneck Hill Road, West Greenwich, which is the base of operations in the Big River Management Area.

### **EQUIPMENT**

In conjunction with the Memorandum of Understanding with the RI National Guard, the Board has at its disposal the following equipment: front-end loaders, high utility motion vehicles, bulldozers, water tankers, 4x4 trucks, graders, various hand tools and manpower.

### **POLICIES**

In the operation of the Big River Management Area, the Board, having taken into consideration comments voiced at a public hearing, adopted the following policies, which have been filed with the Secretary of State. Specific agreements related to these policies are on file at the Water Resources Board office.

## **POLICY CONCERNING USE OF THE BIG RIVER MANAGEMENT AREA**

Consistent with the General Assembly designation of the Big River Management Area as open space to be utilized and enjoyed by residents of the State of Rhode Island, the Water Resources Board may allow individual and organized recreational and training activities within the area. Groups and/or organizations interested in conducting such activities must submit a Big River Management Area Land Use Request Form to the Board thirty (30) days prior to the activity date. The Board requires verification of general liability insurance coverage in an amount determined by the Board and/or reserves the right to require additional information it deems necessary. Individual activities which do not require Board approval include, but are not limited to, hunting, fishing, hiking, canoeing of Big River and horseback riding. Activities that are forbidden include swimming, trapping, camping, off-road biking, clear-cutting, firewood cutting and canoeing on ponds. Fuel, electric motors and all terrain vehicles are forbidden in the Big River Management Area. The Board will seek the assistance of local and state law enforcement agencies in the removal/detainment of persons found engaging in unauthorized activities within the Big River Management Area. The Board cannot be held liable for any injuries sustained during voluntary recreational use of the Big River Management Area.

## **POLICY CONCERNING FAIR MARKET APPRAISALS**

In order to maintain rental market comparability on the Big River Management Area rental properties, the Water Resources Board will complete an initial fair market rental appraisal, using a comparative approach. The fair market rents established by this appraisal process will be reviewed annually. The housing component of the Consumer Price Index (CPI) for the New England Region, effective the preceding year, will be utilized to determine the annual rental increase. Notification of the rental increase will be provided to the tenants during the month of May with an effective rent increase on July 1 of that year. The Board will conduct subsequent fair market rental appraisals of all residential and commercial Big River Management Area properties on the fifth anniversary year commencing 1995, 2000, 2005, etc.

## **POLICY ON RENTAL FREEZE FOR ORIGINAL OWNERS & SENIOR CITIZENS ON 1977 LIST**

In 1977, the Water Resources Board and State Property Committee met to review and establish the rent for various Big River properties condemned and taken into state ownership. With input from state and local officials, the decision was made to “freeze” the rent charged to those individuals whose property was condemned for the Big River Reservoir but who continued to live there as tenants of the Water Resources Board. These “original owners” are defined as those persons whose names appear on the original deed and lease agreements signed in 1964 at the time of the land condemnation. This rent concession is exclusive to the original owner(s) of the premises while he or she is a tenant of the Water Resources Board in that home which he or she owned at the time of condemnation. The rent concession shall terminate upon the death of the

original owner or if the original owner fails to reside on a continuous and uninterrupted basis at the premises or upon termination of tenancy for breach or nonpayment. This rent concession will not apply to family members of the original owner and cannot be assigned or transferred.

Senior Citizens over sixty-five who resided on Big River properties in 1977 were also granted a “freeze” in rent. This stabilized rent concession is exclusive to the senior citizen tenants who resided on the Big River property in 1977. This rent concession shall terminate upon death of the tenant or if the senior citizen fails to reside on a continuous and uninterrupted basis at the premises or upon the termination of tenancy for breach or nonpayment. This rent concession cannot be assigned or transferred.

### **POLICY CONCERNING SUBLEASING BY ALL TENANTS OTHER THAN ORIGINAL OWNERS**

No tenants of the Big River Management Area are authorized to sublease any portion of the leased property, residences or other buildings located on or about his or her property, with the only exception being the one currently existing sublease for which the Board is presently scheduled to render a formal approval. Failure of the tenant to comply with this policy and the lease agreement is a default of the lease agreement with the Board. Upon default by a tenant, the Board will begin eviction proceedings as set forth under state law.

Original Owners, who currently have Board approval, may extend the sublease to their property only after submitting a request to the Water Resources Board and receiving Board approval. The sublease request will set forth the actual intended sub-lessee’s uses, insurance of the sub-lessee, any financial agreements between the lessee and sub-lessee. The Board reserves the right to request any additional information it deems appropriate prior to the ruling on the lessee’s sublease request.

### **POLICY CONCERNING TEMPORARY REDUCED RENT FOR LOW INCOME TENANTS**

The Big River property is not subsidized housing. However, the Board recognizes that certain existing tenants in the Big River Management Area do not have sufficient financial resources to lease the property they currently occupy at the fair market price. Therefore, in accord with guidelines established by US Housing and Urban Development, the Board will allow qualified existing tenants to remit no more than 30 percent (30%) of their household income for rent, effective on the signing of the new lease agreement. These tenants shall complete income verification forms provided by the Board to substantiate claims of inability to pay fair market rent. Tenants will be required to update household income information on an annual basis and/or upon any change of circumstances in household income or family status. Providing false or incomplete information relative to income will eliminate the tenant from eligibility for this program. Tenants participating in this program shall apply for subsidized housing to the local

housing authority or other housing agency at the time of application to this program and will provide copies of the same to the Board. The concern of the Water Resources Board is to insure that no existing tenant is displaced, due to inability to pay the fair market rent. However this program is temporary in nature and is not intended to supply permanent subsidized housing. Only those persons who are Big River tenants as of December 1, 2000 are eligible to participate in this program. This program shall terminate on December 31, 2005.

### **POLICY CONCERNING INSPECTIONS**

In order to sustain a safe, habitable environment for its tenants, the Water Resources Board shall conduct inspections no less than once a year of the residential and commercial facilities located within the Big River Management Area. Said inspections will be performed by the State Building Code Commission or other state-approved entity which will report any findings of State Building Code violations to the Water Resources Board. The findings of the inspection shall be deemed conclusive to the condition of the property. In the event the dwelling is deemed irreparable and/or condemned by the State Building Code Inspector or other entity, the Water Resources Board reserves the right to terminate the lease and begin eviction proceedings. All buildings so designated will be razed as soon after the vacancy as practicable.

### **POLICY ON MAINTENANCE RESPONSIBILITIES**

Recognizing the responsibility of the tenant to maintain their dwelling as follows: The tenant agrees during the continuance of the lease to keep the interior and exterior of the leased Premises leased in good repair, ordinary wear and tear excepted, including the setting of glass in windows and doors, if any, and in addition thereto, the Tenant covenants and agrees to maintain the heating, plumbing, electrical, and all other mechanical and structural systems and to repair any damage caused by Tenant's misuse of all appliances within the leased Premises, including but without limiting the generality thereof: the plumbing facilities, heating appliances, electrical wires and fixtures, if any. The Tenant will indemnify, defend and save harmless the Landlord from any and all loss or damage which at any time during the continuance of this lease may be caused to anyone or anything by the leakage or escape of any water to the leased Premises which is in any way caused by the Tenant. At the expiration, or sooner termination of this lease, Tenant shall quietly and peacefully surrender up to the Landlord full possession of the leased Premises together with all improvements, alterations and additions made during the term of the lease by either Tenant or Landlord, all in as good order as they now are or may be put in. The tenant agrees to repair any holes in floors, walls and fixtures of the Leased Premises caused by Tenant, and in the event that said Tenant shall leave the leased Premises in such a condition that Landlord shall be required to repair or restore the leased Premises, Tenant agrees, upon demand of Landlord, to pay the cost and expense thereof. The Water Resources Board has reduced the fair market rent value of each dwelling by an amount which reflects the average cost of maintaining the property in good condition in the standard set forth in the State Building Code. The Board will determine the rent reduction amount based upon recommendation of a licensed

appraiser. No structural alterations shall be made unless the Lessee first obtains the permission in writing from the Water Resources Board using the "Request for Maintenance Form." Failure of the tenant to maintain and/or repair the property is a default of the lease agreement with the Board. Upon default by a tenant, the Board will begin eviction proceedings as set forth under state law.

### **POLICY ON APPLICATION PROCESS**

The process for applying for property rental within the Big River Management Area shall be as follows:

1. Application will be made available at the Water Resources Board Field Office, 612 Nooseneck Hill Road, West Greenwich, or other address designated by the Board, and will be provided by mail, upon request;
2. Applicants must complete Application Form and provide verification of employment as well as rent history from a prior/present landlord(s).
3. Board staff will review the application and determine acceptability based on number of occupants, household income and information provided by prior/present landlord(s).
4. Applicants will be notified by mail of determination of acceptance/refusal and in the case of acceptance, the position on the waiting list.

Accepted applicants will be placed on a waiting list based on the official date of application, i.e., the date received by the Big River Management Area Property Manager. Applicants must complete a Notice of Continued Interest in Leasing Property form on an annual basis. Failure to complete this form will result in the applicant's name being removed from the waiting list. Applicants will be placed in available homes based on application date and suitability of home relative to the number of occupants.

### **POLICY ON HAZARDOUS MATERIALS**

The RI Water Resources Board prohibits storage within the Big River Management Area of any listed hazardous substances in a quantity greater than the final reportable quantities as specified in 40 CFR 302.4, Superfund Hazardous Materials List. Furthermore, all commercial tenants are to comply with RIGL 28-21, Hazardous Substance Right-To-Know Law. A copy of both the law and regulation are on file at the Water Resources Board Field Office, 612 Nooseneck Hill Road, West Greenwich. Failure by a tenant to adhere to this policy will be considered a breach of the lease agreement; subsequently the Board may initiate eviction proceedings as set forth under state law.

## **POLICY CONCERNING CATASTROPHIC REPAIRS**

The RI Water Resources Board, on each situation, will determine the requirements and procedures for repair of catastrophic damages. On behalf of the Board, the State Building Inspector or an authorized agent will inspect the property and advise the Board as to the extent of the repair necessary. The Board will approve the actions to be taken consistent with the opinion of the State Building Inspector and in accord with the mandates of the Rhode Island General Laws which may include repair, or demolition of, the building when appropriate.

## **PROTECTION**

The Water Resources Board employs the assistance of local and state emergency personnel. The Mishnock Fire Company provides coverage for the area inclusive of Hopkins Hill Road, Division Road, Burnt Sawmill Road and Nooseneck Hill Road (up to Big River Bridge). The West Greenwich Fire Company supports the remainder of the Big River Management Area. The area is also patrolled by the RI Dept. of Environmental Management's Enforcement Division Conservation officers.

## **HISTORICAL SITES**

The Water Resources Board intends to coordinate with the RI Historical Preservation Society for the possible relocation of several historical homes within the Big River Management Area, prior to demolition, major renovation or initiation of construction of the Big River Reservoir. The Board also intends to relocate several historical cemeteries as part of the reservoir project. With the exception of the Hopkins Cemetery, these cemeteries are no longer functional. On April 24, 1978, the Board granted Ardis Barbour permission to be buried in her family cemetery on Hopkins Hill Road. This particular cemetery is located on high ground and will not be relocated due to the reservoir construction.

## **REVENUE**

**RI General Law 1956, Chapter 46-15.1-20 Water development account fund.** (a) There is hereby created a special fund called "water development fund" from any net proceeds which may be paid to the state as a result of the lease of any reservoir sites or other facilities as may be acquired or constructed by the state in accordance with the provisions of this chapter and chapter 15.1 of this title, as amended, or as otherwise authorized or permitted, or as a result of the sale of surplus property or any interest therein, including without limiting the generality of the foregoing, the sale of excess gravel, timber or tother materials located on the reservoir sites or other facilities. Monies from this fund are hereby appropriated for the purposes authorized by

Chapter 46-15-6 and also hereby made available for borrowing by the board, in accordance with and pursuant to the provisions of Chapter 46-15.1-4, exclusive of acquisition of reservoir sites, and the state controller is hereby authorized and directed to draw his or her orders upon the general treasurer for the payment or loan of such sums or such portions thereof as may be required from time to time upon receipt by him of properly authenticated vouchers; provided, however, that in the event the water development account created by this chapter exceeds the sum of one million dollars (\$1,000,000) such excess over that amount is hereby made available and appropriated for expenditure by the board to implement the plans and programs thereof as are authorized by this chapter and chapter 15.1 of this title, the general laws exclusive of the acquisition of reservoir sites.



# **Appendix D: Water Supply and Demand Estimating**

## Water Supply and Demand Estimating

Throughout the summer of 2011 the WRB staff compiled and analyzed data from multiple WRB projects<sup>1</sup> related to water availability and water supply. Three public presentations (workshops) were held to present our findings. This document summarizes and refines data presented in the three workshops and incorporates comments received during and after our presentation. Four water management regions have been developed that reflect the existing water supply system and facilitate strategic planning to meet the state’s current and future water supply needs. The purpose of this document is to provide technical background on water availability, use and projected demand to the Board for the strategic planning session.

### Water Availability - Hydrologic Systems

Our first presentation discussed the question “How much water is there”? From a hydrologic perspective, “available water” is the amount of water that “flows” through our State to support natural and man made systems. Though variable, the total quantity can be expressed as an estimated average annual long term water budget. This annual long-term water budget is dispensed to support many hydrologic systems like drinking water supply, river flow, hydropower, aquatic life, and recreation. Selected data compiled from the Water Use and Availability Studies is presented below. The largest and most important “input” into the long term water budget is precipitation. It comprises 2.7 Billion gallons a day on average or roughly 83% of the total inflow. Other inputs are detailed in each of the Water Use and Availability studies but not included in the table below.<sup>2</sup> The largest output is evapotranspiration. Total “flow” is presented in the right column:

#### Hydrologic Water Availability: Estimated Long Term Water Budget

Water Use and Availability Study Area	Total Precipitation (MGD)	Evapotranspiration (MGD)	Total Long Term Average Annual Budget (Inflow=Outflow) (MGD)
Blackstone	452.2	199.8	815.8
Woonasquatucket/Moshassuck	171.3	79.7	175.3
Pawtuxet/Quinebaug	692.2	338.2	723.1
East Narragansett Bay	289.5	138.4	292.1
West Narragansett Bay	270.0	113.3	455.3
Pawcatuck	715.2	308.5	723.1
South Coastal	135.2	60.6	136.4
<b>Total Statewide</b>	<b>2,725.6</b>	<b>1,238.5</b>	<b>3,321.1</b>

<sup>1</sup> Sources: Water Use and Availability Studies (seven) commissioned by WRB and conducted by US Geological Survey 2000-2007, plus two studies conducted by University of Rhode Island 2000 and 2005, and the Statewide Supplemental Water Supply Feasibility Assessment, August 2008.

<sup>2</sup> The table shows the most important inflow (precipitation) and outflow (evapotranspiration) components of the water budget. Other components, not shown but part of the total input/output include streamflow, groundwater inflow and underflow, water withdrawals and return flow.

### Summary

- An estimated 3,321 million gallons of water a day (MGD) or **3.3 billion gallons per day** flows through the State on an annual average basis.
- An estimated 1,238 MGD is lost to the system through evapo-transpiration.
- Net water in the aggregate is the difference: 2,083 MGD or **2 billion gallons per day**.

### Water Availability - Public Water Supply System Capacity

From a functional perspective, public water system “available water” is the amount of water that the public systems can pump, store and deliver. Data compiled from WRB’s Water Supply System Management Plans and from individual suppliers and published in the *RI Water Resources Board Statewide Supplemental Water Supply Feasibility Study*, August 2008 is presented below:

#### Statewide Public Water Supply System Capacity

Supplemental Water Studies Water Supply Area	Total Capacity (Sources + Purchased Water) (MGD)
Providence	83.0
Northern Rhode Island	42.5
East Bay Area	28.9
West Bay, Central and Southern	63.9
Richmond Water Supply System	0.9
Westerly Water Division	7.2
Block Island Water Company	0.3
<b>Total</b>	<b>226.6</b>

### Summary

- Total combined water supply “system” capacity is estimated at 227 MGD.
- Surface water system (reservoir) capacity is the calculated safe yield of the source. Groundwater capacity is calculated as the 18 hour pumping capacity of wells and interconnection contract limits.
- Most Rhode Islanders rely on public supply (92%) and nearly all the public water (98%) is supplied by the 30 largest suppliers included in the table above.
- The major public water suppliers currently “use” just over 10% of the available water in the State on an average annual basis (226.6 MGD/2,083 MGD = 10.8%<sup>3</sup>)

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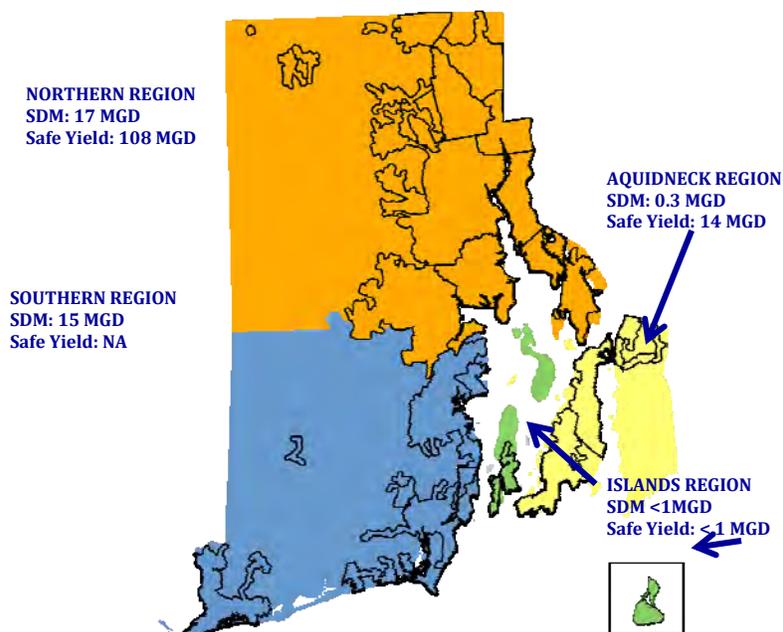
<sup>3</sup> Calculation is net evapotranspiration

## Water Availability - Sustainable Water Supply

WRB assesses statewide water availability for strategic planning purposes with consideration for how much water is needed by the environment during low flow conditions. The State environmental goals related to groundwater availability include ensuring “sufficient flow for healthy aquatic systems”<sup>4</sup>. WRB staff has included this resource protection goal to determine the “safe yield” of both groundwater and surface water systems. The WRB estimates of water availability are therefore compliant with WRB statutes<sup>5</sup>, which define the sustainable yield as the “sustainable withdrawal that can be continuously supplied from a water source *without adverse effects* throughout a critical dry period.....”

WRB estimates Sustainable Water Supply availability as the calculated allowable groundwater depletion (SDM) and the published (engineering calculations) for surface water reservoir safe yields. The groundwater allowable depletion value is derived from the RIDEM Stream Depletion Methodology (SDM), May 2010 Draft. It should be noted that the SDM is intended to be a point withdrawal evaluation tool for groundwater withdrawals. Its representation on a basin and municipal basis and its comparison to current and projected water demands are all subject to further refinement. In part this is due to the draft status of the methodology, the imminent release of *Streamstats* by USGS (WRB funded) and further policy discussions.

It is difficult to quantify the flow that is sufficient for healthy aquatic systems. The natural 7Q10 values that are used as the basis of determining allowable depletions represent low flows that occur in the range of 0.5-2% of the time.<sup>6</sup> The allowable depletions are 10% to 50% of that flow in the summer. The representation of the SDM at the basin level compares the summer allowable depletion values to self supply and public groundwater withdrawals. Storage is considered separately (reservoir safe yields).



For our strategic planning session, WRB staff has estimated the allowable depletion for each basin of the state on at least a HUC 10 basis compiled from the data that is presented in the applicable Water Use and Availability Studies. We have also presented HUC 12 data for the

<sup>4</sup> RIDEM Stream Depletion Methodology (SDM)

<sup>5</sup> RIGL 46-15.7-2 (3): WRB – Management and Withdrawal and Use of the Waters of the State

<sup>6</sup> Verbal communication with Gardiner Bent USGS

Southern and Northern Regions.<sup>7</sup> Water availability is estimated using average and peak summer month withdrawals and demand using the Water Use and Availability studies, the RIDEM SDM, peak agricultural use data, and the Supplemental Water Study. The water withdrawal data used is five year average public and self supply data as published in the Water Use and Availability Studies unless otherwise noted. The drainage areas and reference gages used for the calculation are as published in the corresponding Water Use and Availability studies. The allowable depletion is converted from cubic feet per second (cfs) to million gallons per day (MGD) by multiplying by 0.65. Allowable depletions are calculated but not considered in the totals for the Abbott Run (Pawtucket Water Supply Board source) and Scituate Reservoir Complex sub basins (Providence Water Supply Board source) for purposes of accuracy. The water under the Scituate Reservoir Complex and the water withdrawn and released in Abbott Run should not be considered “available”. In those two basins, the surpluses and deficits are calculated based upon surface water reservoir safe yields only.

### **Summary**

The current sustainable water supply for the State’s Water Management Regions is:

<b><u>Northern Region:</u></b>	<b>125 MGD</b>
<b><u>Southern Region:</u></b>	<b>15 MGD</b>
<b><u>Island Region:</u></b>	<b>1 MGD</b>
<b><u>Aquidneck Region:</u></b>	<b>14 MGD</b>

### **Drought and Emergency Supply**

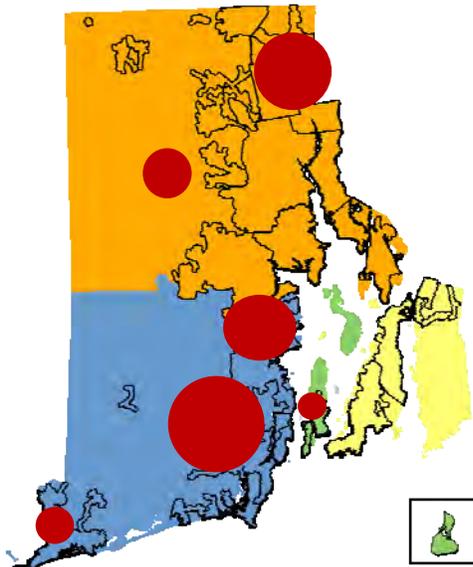
An additional resource protection, public health and public supply consideration is drought and emergency supply. The Supplemental Water Supply Study and individual Water System Supply Management plans identify demand reduction strategies to implement during droughts or emergencies. The Supplemental Study quantifies short term (3-6 months) and long term (1-2) levels of reduction that could be tolerated. They correspond to 30 GPCD and 20% reduction for all other customers for a short term emergency and 45 GPCD and 20% reduction for a longer term emergency. WRB staff analysis reveals that deficits persist in the Southern region at these emergency demand levels (Reference 2).

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<sup>7</sup> See Reference 1 for detailed SDM calculations by region.

## Current and Projected Demand for Water

Projected demands for water were derived using the WRB's *Supplemental Water Supply Study* and were collected for towns that are served by major public suppliers. The public supply data is average day demand data collected from individual water suppliers and "normalized" to our base year used for other analyses (2005). The total statewide demand estimated from the Supplemental Water Supply Study data is 135 MGD average day demand (ADD) for 2005, compared to the average five year water withdrawal data of 132 MGD aggregated from the *Water Use and Availability Studies*. WRB staff also added self supply data from the Water Use and Availability Studies and local *Community Comprehensive Plans* for municipalities to address demand data that was not collected in the Supplemental Water Study. Although the self-supply demand is small compared to the total amount of demand serviced through the major public suppliers, it was important to consider this data for completeness. The Water Use and Availability Studies also present 5 year average summer data for June, July, August and September. WRB staff compiled July withdrawal data for each region and applied the ratio (peak to average) to estimate peak summer demand by region.



During the second and third WRB Strategic Planning workshops ("How much are we using", and "How much do we need"), WRB staff identified several areas of concern (graphically represented as the "red dot" areas) to emphasize the basins of the state that currently exceed our "Resource Protection Goals". In the Northern Region the large red dot indicates that withdrawals exceed allowable depletions and safe yields of the reservoirs in the Peters and Abbott Run subbasins; and the smaller dot indicates occasional exceedances of the safe yield in the summer months in the Scituate Reservoir Complex subbasin. In the Southern Region, the island of Jamestown, HAP, Chipuxet, and Lower Pawcatuck basins are identified for exceedances of their respective allowable depletions (Sustainable Water Supply).<sup>8</sup>

This document provides additional detail to assist in evaluating the "red dot" areas, analyzing the data (by Region), and articulating future efforts to compile and distribute technical information. The WRB staff has refined our analyses since the July 14, 2011 workshop. The additional goals related to economic development, agriculture and land use are not directly estimated in this analysis; rather they are generally acknowledged through our strategic mix of priority initiatives.

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<sup>8</sup> The data also indicates that the West River subbasin exceeds the goal. This is due primarily to the drainage basin size for the Rhode Island portion and self supply withdrawals for Ocean State Power (2.379 MGD) and Seville/Dorado (2.039 MGD) which is no longer in business. An updated analysis should be conducted for this subbasin.

## Northern Region

The Northern region is home to 80% of the state's population and is served predominantly by large public suppliers and surface water reservoirs. The percentage of the total population served by public supply ranges from 89% in Bristol County to 98% in Providence County.<sup>9</sup> Nearly all (97%) of the public supply is derived through surface water systems. Thus, in the Northern region when there are periods of time with little rain, whether summer dry spells or longer term droughts, the majority of water to meet demands is derived from storage in the public water supply reservoirs. As a result, the most important level of analysis for the region is the capacity and safe yield of the sources compared to current and projected demand. An analysis of water use to availability follows. Self supply is compared to the allowable stream depletion and public supply is compared to the safe yield to assess projected water needs for the region.

### Public Supply

The combined surface water safe yield of the region is 107.6 MGD. Current and projected average day demands related to the public supplies total 96 MGD in 2005, 104 MGD in 2025 and 115 MGD at buildout. Average day demands for public supplies fall within the reservoir safe yields for 2005 and 2025 and are projected to exceed the safe yields at buildout. Summer demands exceed safe yield currently and into the future. However, the increased peak demands are met by available storage and capacity which is reflected in the average data.

### **Public Supply Average Day Demand (ADD) Compared to Safe Yields of Surface Water Reservoirs, Northern Region**

Water Supplier	2005 Average Demand (MGD)	2025 Average Demand (MGD)	Buildout Average Demand (MGD)
Bristol County Water Authority (BCWA)	3.7	3.9	7.1
Cumberland Water District	2.7	3.2	4.1
Harrisville & Pascoag	[0.6]	[0.7]	[1.5]
Kent County Water Authority (KCWA)	11.0	13.4	16.7
North Smithfield	0.1	0.6	2.3
Pawtucket	12.3	14.6	15.8
Providence Water Supply Board	60.9	60.9	61.9
Woonsocket	5.6	7.1	7.1
<b>Total Northern Region Demand</b>	<b>96.3</b>	<b>103.7</b>	<b>115.1</b>
<b>Reservoir Safe Yield</b>	107.6	107.6	107.6
<b>Average Demand over/under Safe Yield</b>	<b>11.4</b>	<b>3.9</b>	<b>-7.5</b>
<b>Summer Demand over Safe Yield</b> (Comparisons of summer demand to reservoir safe yields are not applicable due to storage)	<b>-17.5</b>	<b>-27.2</b>	<b>-42.0</b>

<sup>9</sup> USGS 2005 Water Use and Availability Compilation

The following table applies the goal of 65 gallons per capita per day (GPCD) to the current and projected public supply demands. For suppliers whose original projections were based on per capita demands equal to or below 65, there is no change in the estimated demands. The table below shows that average demands are within reservoir safe yields on average through 2025 and that meeting the goal of 65 GPCD through the statewide Demand Management Strategy/WSSMP effort reduces projected demand by an estimated 4MGD in 2025 and 2 MGD over safe yield at buildout. Summer deficits are mitigated by storage which is reflected in the average demand data.

**Public Supply Average Day Demand (ADD)  
Compared to Safe Yields of Surface Water Reservoirs, Northern Region for 65 GPCD Goal**

<i>Water Supplier</i>	<i>2005 Average Demand (MGD)</i>	<i>2025 65 GPCD Average Demand (MGD)</i>	<b>Buildout 65 GPCD Average Demand (MGD)</b>
Bristol County Water Authority (BCWA)	3.7	3.9	6.8
Cumberland Water District	2.7	3.0	3.8
Harrisville & Pascoag	[0.6]	[0.6]	[1.3]
Kent County Water Authority (KCWA)	11.0	13.4	16.4
North Smithfield	0.1	0.6	2.1
Pawtucket	12.3	13.2	14.3
Providence Water Supply Board	60.9	58.4	59.3
Woonsocket	5.6	7.1	7.1
<b>Total Northern Region</b>	<b>96.3</b>	<b>99.6</b>	<b>109.6</b>
<b>Reservoir Safe Yield</b>	<b>107.6</b>	<b>107.6</b>	<b>107.6</b>
<b>Average Over/Under Safe Yield</b>	<b>11.4</b>	<b>8.0</b>	<b>-2.0</b>
<b>Summer Demand Over Safe Yield (Summer ratio 1.3 times average) (Comparisons of summer demand to reservoir safe yields are not applicable due to storage)</b>	<b>-17.5</b>	<b>-21.8</b>	<b>-34.9</b>

Self Supply

There are several opportunities throughout the Northern Region to withdraw groundwater. The above numbers conservatively estimate the surplus. As a rule of thumb, the domestic self supply withdrawals are “consumptive” and estimated at 85/15, meaning that as 100% of a groundwater withdrawal is measured, only 15% is consumed (lost) and the remaining 85% is returned back into the aquifer. For estimating and policy purposes, as we apply the 85/15 consumption factor to areas that propose consumptive uses, the resultant groundwater impact (quantity) is marginal as water is correspondingly replenished in the same area the withdrawal took place. It should also be noted that there is groundwater that is not suitable for drinking water but could serve future industrial and commercial needs within the Urban Services Boundary. For example, the Supplemental Water Study identifies the potential for a 3 MGD well field in the Roger Williams Park area.

The following table summarizes current and projected self supply uses. Self supply estimates assumed 65 GPCD. While the Northern Region is served predominantly by public supply, there are areas that are served entirely by self supply<sup>10</sup>, such as Foster. Self supply is compared to the allowable depletion to assess projected water needs in for the region. Regionally, the data shows that estimated self supply uses generally fall within the allowable depletions.

**Estimated Self Supply Average Day Demand (ADD)  
Compared to Allowable Depletion (SDM), Northern Region <sup>11</sup>**

<b>Municipality</b>	<b>2005 Average Demand (MGD)</b>	<b>2025 Average Demand (MGD)</b>	<b>Buildout Average Demand (MGD)</b>
Barrington	0.1	0.1	0.1
Bristol	0.2	0.2	0.2
Burriville	3.2	4.0	4.9
Central Falls	0.0	0.0	0.0
Coventry <sup>12</sup>	0.6	-	-
Cranston	0.1	0.1	0.1
Cumberland	0.2	0.2	0.2
East Greenwich	0.3	0.3	0.3
East Providence	0.1	0.1	0.1
Foster	0.3	0.3	1.7
Glocester	0.4	0.8	1.1
Harrisville and Pascoag <sup>13</sup>	0.6	0.7	1.5
Johnston	0.3	0.3	0.3
Lincoln	0.1	0.1	0.1
North Smithfield	0.1	0.1	0.1
North Providence	0.0	0.0	0.0
Pawtucket	0.1	0.1	0.1
Providence	0.0	0.0	0.0
Scituate	0.6	0.8	1.4
Smithfield	0.3	0.3	0.3
Warren	0.1	0.1	0.1
Warwick	0.1	0.1	0.1
West Warwick	0.0	0.0	0.0
Woonsocket	2.0	2.0	2.0
<b>Total Self Supply Northern Region</b>	<b>10.0</b>	<b>10.8</b>	<b>14.8</b>
<b>Allowable Depletion (SDM)</b>	<b>16.9</b>	<b>16.9</b>	<b>16.9</b>

<sup>10</sup> Self supply water use estimates were compiled from the Water Use and Availability Studies and are based on 65 gpcd.

<sup>11</sup> Future comparisons that calculate return flows and/or consumptive uses may increase the allowable depletions.

<sup>12</sup> For the Supplemental Water Study, Coventry 2025 and buildout data is included with the KCWA data

<sup>13</sup> Harrisville and Pascoag rely on groundwater withdrawals and are included in this table to compare with the allowable depletions for the region.

<b>Surplus</b>	<b>6.9</b>	<b>6.1</b>	<b>2.1</b>
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## Southern Region

The Southern Region is primarily served by public supply (70%), although it also has the highest percentage of population on private (self) supply. All water supplies come from groundwater or direct stream withdrawals. Storage is minimal as it is limited to the amount of surplus water stored in aquifers, public water supply tanks and distribution systems, and farm ponds. When there are periods of time with little precipitation, water supply is taken from streamflow as intercepted baseflow. In conditions where withdrawals outpace precipitation for extended periods of time, the groundwater withdrawals eventually may impact rivers and streams as the water supply is withdrawn from deeper groundwater storage. The site-specific impacts are functionally limited by the physical configuration and operation of each groundwater well, and the hydrologic configuration of the aquifer(s).

### Public and Self Supply

The following three tables present the public supply projections, public supply with the 65 GPCD goal included and self supply data.<sup>14</sup> The fourth table summarizes all demand for the region compared to the allowable depletion (SDM) to assess water availability.

**Public Supply Average Day Demand (ADD), Southern Region**

<b>Water Supplier</b>	<b>2005 Average Demand (MGD)</b>	<b>2025 Average Demand (MGD)</b>	<b>Buildout Average Demand (MGD)</b>
North Kingstown	4.0	4.2	5.1
Richmond	0.1	0.1	0.2
QDC (NK)	0.7	2.5	2.5
Kingston Water District	0.4	0.8	0.9
United Water <sup>15</sup>	2.8	3.6	4.4
URI	0.7	0.7	0.7
Westerly	3.3	4.0	4.4
<b>Southern Region ADD Total</b>	<b>12.0</b>	<b>15.9</b>	<b>18.0</b>
<b>Increase Over Current</b>		<b>3.9</b>	<b>6.1</b>

The table below provides the same public supply data with the goal of 65 GPCD applied to the projected data. As stated earlier, self supply estimates assumed 65 GPCD, so there is no change to that data. For suppliers whose original projections were based on per capita demands equal to or below 65, there is no change in the estimated demands. Achieving the goal of 65 GPCD through the statewide Demand Management Strategy/WSSMP effort will result in an estimated reduction of 1 MGD on average and nearly 2 MGD in the summer but deficits of nearly 7 MGD on average and 20 MGD in the summer remain.

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<sup>14</sup>Source: WRB Compilation from Water Use and Availability Studies, Supplemental Water Study, Comprehensive Plans

<sup>15</sup> Includes Narragansett and South Kingstown (Middlebridge and South Shore).

**Public Supply Average Day Demand (ADD), Southern Region with 65 GPCD Goal**

<i>Water Supplier</i>	<i>2005 Average Demand (MGD)</i>	<i>2025 65 GPCD Average Demand (MGD)</i>	<b>Buildout 65 GPCD Average Demand (MGD)</b>
North Kingstown	4.0	3.5	4.2
Richmond	0.1	0.1	0.2
QDC (NK)	0.7	2.5	2.5
Kingston Water District	0.4	0.8	0.9
United Water <sup>16</sup>	2.8	3.6	4.3
URI	0.7	0.6	0.6
Westerly	3.3	3.7	4.1
<b>Southern Region Total</b>	<b>12.0</b>	<b>14.8</b>	<b>16.7</b>
<b>Increase Over Current</b>		<b>2.9</b>	<b>4.8</b>

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<sup>16</sup> Includes Narragansett and South Kingstown (Middlebridge and South Shore).

## Self-Supply Average Day Demand (ADD), Southern Region

Municipality	2005 Average Demand (MGD)	2025 Average Demand (MGD)	Buildout Average Demand (MGD)
Charlestown	0.5	0.7	1.7
Exeter	0.7	0.7	1.7
Hopkinton	0.8	0.8	1.7
Narragansett	0.1	0.1	0.1
North Kingstown	0.4	0.4	0.4
Richmond	1.0	1.6	3.0
South Kingstown	0.9	1.8	2.4
West Greenwich	0.4	0.5	1.3
Westerly	0.4	0.5	0.5
<b>Southern Region Total</b>	<b>5.3</b>	<b>7.1</b>	<b>12.8</b>
<b>Increase Over Current</b>		<b>1.8</b>	<b>7.5</b>

### Southern Region - Assessment of Water Availability

The five year average withdrawals<sup>17</sup> in the Southern Region exceed the Resource Protection Goal during periods of average demand by an estimated 1.4 MGD and during the summer by an estimated 12 MGD. Deficits are more pronounced in certain areas and there is very little “surplus” water available above the Resource Protection Goal (ranging from 0.3-0.7 MGD) in those basins that have “surplus” water. Summer demand is more important for analyzing the Southern region because the direct stream and groundwater withdrawals impact the basin at the time of the withdrawal (with slight adjustments to account for lag due to distance of the withdrawal point to the nearest stream). The impacts to the environment in the Southern Region are markedly different than the Northern Region because there is no significant storage (reservoir) to mitigate the withdrawal impacts to local rivers and streams. A more detailed analysis is presented for several subbasins (the “red dot” areas) and for the areas associated with the Land Use 2025 Urban Services Boundary in order to evaluate current and future water demands and availability. Additional tables are included in the body of this document for 65 GPCD, Reference 2 for Drought and Emergency levels and in Reference 3 for a complete range of GPCD reduction scenarios.

The following table shows the allowable depletion compared to total demand by water supplier. The summer ratio is derived from the Water Use and Availability Study data. The studies present data for the summer months. The ratio of the July average demand data was compared to the annual average demand data and then applied as the ratio for projected summer demand.

<sup>17</sup> WRB Water Use and Availability Studies, USGS 1995-1999 and Supplemental Water Study 2008

**Total Average Day Demand (ADD)  
Compared to SDM, Southern Region**

<i>Public and Self Supply Southern Region</i>	<i>2005 Average Demand (ADD)</i>	<i>2025 Average Demand (ADD)</i>	<b>Buildout Average Demand (ADD)</b>
Charlestown self	0.5	0.7	1.7
Exeter self	0.7	0.7	1.7
Hopkinton self	0.8	0.8	1.7
Narragansett self	0.1	0.1	0.1
North Kingstown self	0.4	0.4	0.4
Richmond self	1.0	1.6	3.0
South Kingstown self	0.9	1.8	2.4
West Greenwich self	0.4	0.5	1.3
Westerly self	0.4	0.5	0.5
North Kingstown	4.0	4.2	5.1
Richmond	0.1	0.1	0.2
QDC (NK)	0.7	2.5	2.5
Kingston Water District	0.4	0.8	0.9
United Water <sup>18</sup>	2.8	3.6	4.4
URI	0.7	0.7	0.7
Westerly	3.3	4.0	4.4
<b>Southern Region Total</b>	<b>17.3</b>	<b>23.0</b>	<b>30.8</b>
<b>Allowable Depletion (SDM)</b>	<b>15.3</b>	<b>15.3</b>	<b>15.3</b>
<b>Average Surplus/Deficit</b>	<b>-2.0</b>	<b>-7.7</b>	<b>-15.5</b>
<b>Summer Surplus/Deficit (Ratio 1.6 times average)</b>	<b>-12.3</b>	<b>-21.4</b>	<b>-34.0</b>

<sup>18</sup> Includes Narragansett and South Kingstown (Middlebridge and South Shore).

**Total Average Day Demand (ADD)  
Compared to SDM, Southern Region with 65 GPCD Goal**

<i>Public and Self Supply Southern Region</i>	<i>2005 Average Demand (MGD)</i>	<i>2025 65 GPCD Average Demand (MGD)</i>	<b>Buildout 65 GPCD Average Demand (MGD)</b>
Charlestown self	0.5	0.7	1.7
Exeter self	0.7	0.7	1.7
Hopkinton self	0.8	0.8	1.7
Narragansett self	0.1	0.1	0.1
North Kingstown self	0.4	0.4	0.4
Richmond self	1.0	1.6	3.0
South Kingstown self	0.9	1.8	2.4
West Greenwich self	0.4	0.5	1.3
Westerly self	0.4	0.5	0.5
North Kingstown	4.0	3.5	4.2
Richmond	0.1	0.1	0.2
QDC (NK)	0.7	2.5	2.5
Kingston Water District	0.4	0.8	0.9
United Water <sup>19</sup>	2.8	3.6	4.3
URI	0.7	0.6	0.6
Westerly	3.3	3.7	4.1
<b>Southern Region Total</b>	<b>17.3</b>	<b>21.9</b>	<b>29.6</b>
<b>Allowable Depletion</b>	<b>15.3</b>	<b>15.3</b>	<b>15.3</b>
<b>Average Surplus/Deficit</b>	<b>-2.0</b>	<b>-6.6</b>	<b>-14.3</b>
<b>Summer Surplus/Deficit (Ratio 1.6 times average)</b>	<b>-12.3</b>	<b>-19.8</b>	<b>-32.0</b>

The following pages analyze the Southern Region withdrawal data in terms of the Urban Services Boundary.

<sup>19</sup> Includes Narragansett and South Kingstown (Middlebridge and South Shore)

Supply and Demand outside the Southern Region Urban Services Boundary<sup>20</sup>

The table below compares the self-supplied communities to the basin allowable depletions (Usquepaug-Queen, Beaver-Pasquisset, Upper Wood, and Lower Wood). Preliminary calculations indicate that self supplied areas located predominantly outside of the Urban Services Boundary meet the Resource Protection Goal in 2005 and 2025, and may exceed the goal by nearly **3.7 MGD** at buildout. However; careful planning and accounting of return flows and consumptive uses is likely to reveal that future buildout demands can also be met.

WRB staff has identified self-supply areas where there is available water (through the local analysis of the “allowable depletion”); however, the areas are located upstream of other areas that currently do not meet the Resource Protection Goal (this is the case in the Lower Pawcatuck basin for the Towns of Richmond, Hopkinton, and Westerly). Our analysis of these areas refines our water availability estimates and so that our estimates of water availability may be integrated into their local water supply and comprehensive plans and the state guide plans.

**Self-Supplied Average Day Demand (ADD) outside the Urban Services Boundary Compared to SDM, Southern Region**

<b>Municipality</b>	<b>2005 Average Demand (MGD)</b>	<b>2025 Average Demand (MGD)</b>	<b>Buildout Average Demand (MGD)</b>
Charlestown	0.5	0.7	1.7
Exeter	0.7	0.7	1.7
Hopkinton	0.8	0.8	1.7
Richmond	1.1	1.7	3.2
<b>Total</b>	<b>3.1</b>	<b>3.9</b>	<b>8.3</b>
<b>Allowable Depletion (SDM)</b>	<b>4.6</b>	<b>4.6</b>	<b>4.6</b>
<b>Average Self-Supply Surplus/Deficit</b>	<b>1.5</b>	<b>0.7</b>	<b>-3.7</b>

Supplies and Demand within the Urban Services Boundary

“*Land Use 2025* identifies an Urban Services Boundary, based upon a detailed land capability and suitability analysis that demonstrates the capacity of this area to accommodate future growth. The Plan directs the State and communities to concentrate growth inside the Urban Services Boundary and within locally designated centers in rural areas, and to pursue significantly different land use and development approaches for urban and rural areas.”<sup>21</sup> The Urban Services Boundary includes the service areas of the major water suppliers. The table below shows water demand for supplies within the Urban Services Boundary. Though all boundaries (watersheds, municipalities, water districts) do not align exactly, **the Chipuxet, HAP, South Coastal, and**

<sup>20</sup> Public supply withdrawals are included for Richmond (0.1 for 2005 and 2025 and 0.2 for buildout). West Greenwich withdrawals (0.17 MGD) and South Kingstown withdrawals (0.133) within those basins are a relatively small proportion of the Town’s total and are not included.

<sup>21</sup> Land Use 2025: Rhode Island State Land Use Policies and Plan (April 2006), p. vi.

**Lower Pawcatuck basins support most of the Southern Region’s water demand (83%) and nearly all the public supply.**

WRB staff analysis reveals that within the Southern Region Urban Services Boundary, **current demand exceeds the Resource Protection Goal by nearly 4 MGD on average and by 12 MGD in the summer.** The Southern Region Resource Protection Goal and our lack of storage drives our need to secure new source(s), at a magnitude that cannot be achieved through conservation alone.

**Urban Service Boundary Average Day Demand (ADD)  
Compared to SDM, Southern Region**

<b>Municipality and/or Water Supplier</b>	<b>2005 Average Demand (MGD)</b>	<b>2025 Average Demand (MGD)</b>	<b>Buildout Average Demand (MGD)</b>
Narragansett self	0.1	0.1	0.1
South Kingstown self	0.9	1.8	2.4
Kingston Water District	0.4	0.8	0.9
United Water <sup>22</sup>	2.8	3.6	4.4
URI	0.7	0.7	0.7
North Kingstown self	0.4	0.4	0.4
North Kingstown	4.0	4.2	5.1
QDC (NK)	0.7	2.5	2.5
West Greenwich self	0.4	0.5	1.3
Westerly self	0.4	0.5	0.5
Westerly	3.3	4.0	4.4
Hopkinton self <sup>23</sup>	0.4	0.4	0.9
Charlestown self <sup>24</sup>	<0.1	<0.1	<0.1
<b>Total</b>	<b>14.5</b>	<b>19.5</b>	<b>23.5</b>
<b>Allowable Depletion (SDM)</b>	<b>10.7</b>	<b>10.7</b>	<b>10.7</b>
<b>Average Deficit</b>	<b>-3.8</b>	<b>-8.8</b>	<b>-12.8</b>
<b>Summer Deficit (Ratio 1.6 times average)</b>	<b>-12.5</b>	<b>-20.5</b>	<b>-26.9</b>

<sup>22</sup> Includes Narragansett and South Kingstown (Middlebridge and South Shore).

<sup>23</sup> This table recognizes that a portion of the self supply withdrawals in Hopkinton and Charlestown fall within the Urban Services Boundary. The values are taken from the pertinent Water Use and Availability Study

<sup>24</sup> IBID.

**Urban Service Boundary Average Day Demand (ADD)  
Compared to SDM, Southern Region with 65 GPCD Goal**

<i>Water Supplier and/or Municipality</i>	<i>2005 Average Demand (MGD)</i>	<i>2025 65 GPCD Average Demand (MGD)</i>	<i>Buildout 65 GPCD Average Demand (MGD)</i>
Narragansett self	0.1	0.1	0.1
South Kingstown self	0.9	1.8	2.4
Kingston Water District	0.4	0.8	0.8
United Water <sup>25</sup>	2.8	3.6	3.9
URI	0.7	0.6	0.6
North Kingstown self	0.4	0.4	0.4
North Kingstown	4.0	3.5	4.2
QDC (NK)	0.7	2.5	2.5
West Greenwich self	0.4	0.5	1.3
Westerly self	0.4	0.5	0.5
Westerly	3.3	3.7	4.1
Hopkinton self	0.4	0.4	0.9
Charlestown self	<0.1	<0.1	<0.1
<b>Total</b>	<b>14.5</b>	<b>18.5</b>	<b>21.8</b>
<b>Allowable Depletion</b>	<b>10.7</b>	<b>10.7</b>	<b>10.7</b>
<b>Average Surplus/Deficit</b>	<b>-3.8</b>	<b>-7.8</b>	<b>-11.1</b>
<b>Summer Surplus/Deficit (Ratio 1.6 times average)</b>	<b>-12.5</b>	<b>-18.8</b>	<b>-24.1</b>

<sup>25</sup> Includes Narragansett and South Kingstown (Middlebridge and South Shore).

Subbasins within the Urban Services Boundary

In the Hunt, Annaquatucket, and Pettaquamscutt (HAP) aquifer, **demand exceeds the goal in the basin on average by 2 MGD and by 5 MGD in the summer.**

**Hunt, Annaquatucket, and Pettaquamscutt (HAP) Average Day Demand (ADD)  
Compared to SDM, Southern Region**

<b>Municipality and/or Water Supplier</b>	<b>2005 Average Demand (MGD)</b>	<b>2025 Average Demand (MGD)</b>	<b>Buildout Average Demand (MGD)</b>
North Kingstown self	0.4	0.4	0.4
North Kingstown	4.0	4.2	5.1
QDC (NK)	0.7	2.5	2.5
West Greenwich self	0.4	0.5	1.3
<b>Total</b>	<b>5.5</b>	<b>7.6</b>	<b>9.3</b>
<b>Allowable Depletion (SDM)</b>	<b>3.5</b>	<b>3.5</b>	<b>3.5</b>
<b>Average Deficit</b>	<b>-2.0</b>	<b>-4.1</b>	<b>-5.8</b>
<b>Summer Deficit (Ratio 1.6 times average)</b>	<b>-5.3</b>	<b>-8.7</b>	<b>-11.4</b>

The following table recalculates the 2025 and buildout projections using the demand management goal of 65 gallons per capita per day (GPCD). While there is a difference in projected demands of nearly 1 MGD on average and slightly more than 1 MGD in the summer for the 2025, deficits remain and increase over time.

**Hunt, Annaquatucket, and Pettaquamscutt (HAP) Average Day Demand (ADD)  
Compared to SDM, Southern Region with 65 GPCD**

<i><b>Municipality and/or Water Supplier</b></i>	<i><b>2005 Average Demand (MGD)</b></i>	<i><b>2025 65 GPCD Average Demand (MGD)</b></i>	<i><b>Buildout 65 GPCD Average Demand (MGD)</b></i>
North Kingstown self	0.4	0.4	0.4
North Kingstown	4.0	3.5	4.2
QDC (NK)	0.7	2.5	2.5
West Greenwich self	0.4	0.5	1.3
<b>Total</b>	<b>5.5</b>	<b>6.9</b>	<b>8.4</b>
<b>Allowable Depletion</b>	<b>3.5</b>	<b>3.5</b>	<b>3.5</b>
<b>Average Surplus/Deficit</b>	<b>-2.0</b>	<b>-3.4</b>	<b>-4.9</b>
<b>Summer Surplus/Deficit (Ratio 1.6 times average)</b>	<b>-5.3</b>	<b>-7.5</b>	<b>-10.0</b>

Chipuxet/South Coastal

In the Chipuxet the estimated allowable depletion is an estimated 1.9 MGD. When compared to average conditions during the Water Use and Availability study years (1995-1999) there is a deficit of roughly 2.3 MGD on average and 6.2 MGD in the summer. In order to review the impacts moving forward the allowable depletions are used for the Chipuxet (1.9 MGD) and the Southwestern Coastal (1.4 MGD) basins in order to line up the data with the municipal boundaries. The Southwestern Coastal subbasin captures all of the public withdrawals and most of the self supply withdrawals for the South Coastal study area.<sup>26</sup> Water Use and Availability withdrawal data by basin was used to evaluate these relationships. For 2005, **the deficits are an estimated 1.7 MGD on average and 4.6 MGD in the summer. For 2025 those deficits grow to nearly 6 MGD on average and 11 MGD in the summer.**

**Chipuxet and Southwestern Coastal Study Area Average Day Demand (ADD)  
Compared to SDM, Southern Region**

<b>Water Supplier</b>	<b>2005 Average Demand (MGD)</b>	<b>2025 Average Demand (MGD)</b>	<b>Buildout Average Demand (MGD)</b>
Narragansett self	0.1	0.1	0.1
South Kingstown self	0.9	1.8	2.4
Kingston Water District	0.4	0.8	0.9
United Water <sup>27</sup>	2.8	3.6	4.4
URI	0.7	0.7	0.7
<b>Total</b>	<b>5.0</b>	<b>7.0</b>	<b>8.4</b>
<b>Allowable Depletion (SDM)</b>	<b>3.3</b>	<b>3.3</b>	<b>3.3</b>
<b>Average Deficit</b>	<b>-1.7</b>	<b>-3.7</b>	<b>-5.1</b>
<b>Summer Deficit (Ratio 1.6 times average)</b>	<b>-4.6</b>	<b>-7.9</b>	<b>-10.2</b>

The following table applies the goal of 65 GPCD to the projected demands. There is very little difference in the estimated demands since the per capita use inherent in the estimated Average day demands was at or below 65 GPCD in most cases. The only change is an estimated reduction of roughly 1MGD at buildout.

<sup>26</sup> The Saugatucket subbasin includes 0.141 MGD self supply withdrawals from the Towns of North Kingstown and South Kingstown. The Point Judith subbasin includes 0.089 self supply withdrawals from the Towns of Narragansett and South Kingstown (p. 21, South Coastal Water Use and Availability Study)

<sup>27</sup> Includes Narragansett and South Kingstown (Middlebridge and South Shore)

**Chipuxet and Southwestern Coastal Study Area Average Day Demand (ADD)  
Compared to SDM, Southern Region with 65 GPCD Goal**

<i>Water Supplier</i>	<i>2005 Average Demand (MGD)</i>	<i>2025 65 GPCD Average Demand (MGD)</i>	<b>Buildout 65 GPCD Average Demand (MGD)</b>
Narragansett self	0.1	0.1	0.1
South Kingstown self	0.9	1.8	2.4
Kingston Water District	0.4	0.8	0.9
United Water <sup>28</sup>	2.8	3.6	4.3
URI	0.7	0.6	0.6
<b>Total</b>	<b>5.0</b>	<b>7.0</b>	<b>8.3</b>
<b>Allowable Depletion</b>	<b>3.3</b>	<b>3.3</b>	<b>3.3</b>
<b>Average Surplus/Deficit</b>	<b>-1.7</b>	<b>-3.7</b>	<b>-5.0</b>
<b>Summer Surplus/Deficit (Ratio 1.6 times average)</b>	<b>-4.6</b>	<b>-7.8</b>	<b>-9.9</b>

Lower Pawcatuck

The five year average withdrawals (1995-1999) exceed the Resource Protection Goal by 1.5 MGD under average conditions and 3.2 MGD in the summer. **In 2005, demand exceeds the goal 1.2 MGD on average and 3.4 MGD in the summer;** and at buildout by 2.8 MGD on average and 5.9 MGD in the summer (see chart below).

Because the major withdrawals are situated in the lower part of the basin, this deficit is mitigated by small surpluses upstream (in Hopkinton and Charlestown). However, when Hopkinton and portions of Charlestown require additional water in the future, this will impact the ability of this subbasin to meet the Resource Protection Goal.

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<sup>28</sup> Includes Narragansett and South Kingstown (Middlebridge and South Shore).

**Lower Pawcatuck Average Day Demand (ADD)  
Compared to SDM, Southern Region<sup>29</sup>**

<b>Water Supplier</b>	<b>2005 Average Demand (MGD)</b>	<b>2025 Average Demand (MGD)</b>	<b>Buildout Average Demand (MGD)</b>
Westerly self	0.4	0.5	0.5
Westerly	3.3	4.0	4.4
Hopkinton self	0.4	0.4	0.9
Charlestown self	<0.1	<0.1	<0.1
<b>Total</b>	<b>3.7</b>	<b>4.4</b>	<b>5.3</b>
<b>Allowable Depletion (SDM)</b>	<b>2.5</b>	<b>2.5</b>	<b>2.5</b>
<b>Average Deficit</b>	<b>-1.2</b>	<b>-1.9</b>	<b>-2.8</b>
<b>Summer Deficit (Ratio 1.6 times average)</b>	<b>-3.4</b>	<b>-4.5</b>	<b>-5.9</b>

**Lower Pawcatuck Average Day Demand (ADD)  
Compared to SDM, Southern Region with 65 GPCD Goal**

<b><i>Municipality and/or Water Supplier</i></b>	<b><i>2005 65 GPCD Average Demand (MGD)</i></b>	<b><i>2025 65 GPCD Average Demand (MGD)</i></b>	<b><i>Buildout 65 GPCD Average Demand (MGD)</i></b>
Westerly self	0.4	0.5	0.5
Westerly	3.3	3.7	4.1
Hopkinton self	0.4	0.4	0.9
Charlestown self	<0.1	<0.1	<0.1
<b>Total</b>	<b>3.7</b>	<b>4.1</b>	<b>5.0</b>
<b>Allowable Depletion</b>	<b>2.5</b>	<b>2.5</b>	<b>2.5</b>
<b>Average Surplus/Deficit</b>	<b>-1.2</b>	<b>-1.6</b>	<b>-2.5</b>
<b>Summer Surplus/Deficit (Ratio 1.6 times average)</b>	<b>-3.4</b>	<b>-4.1</b>	<b>-5.5</b>

<sup>29</sup> Hopkinton and Charlestown demand for the subbasin was calculated from the proportionate share of withdrawals as published in the Water Use and Availability Study for the Pawcatuck basin. Connecticut data is not included in the calculations.

## Aquidneck Region

The Aquidneck Region includes the municipalities of Newport, Middletown, Portsmouth, Tiverton and Little Compton. The East Narragansett Bay Water Use and Availability Study divides the area into three drainage areas; two of which align with the Aquidneck Region and one which is part of the Northern Region (see Reference 1). The Southeastern area consists of Tiverton and Little Compton and the East Narragansett Islands area includes Portsmouth (including Prudence Island), Middletown and Newport. The City of Newport includes Goat Island, Rose Island and Coasters Harbor Island and the service area includes the US Navy on Coasters Highway Island. The areas are predominantly flat with thin glacial deposits. The Aquidneck Region’s population relies primarily on public supply (82%)<sup>30</sup> mostly from surface water supplies (78%)<sup>31</sup> with the surface water safe yield of 14.1 MGD.<sup>32</sup>

Self-supply uses exceed the allowable depletions on a regional basis by 1.1 MGD in 2005, 1.5 MGD in 2025 and 1.6 MGD at buildout. The magnitude of the exceeded allowable depletions is relatively small, compared to WRB’s previous analysis for the Southern Region. As stated earlier if 15% of the self supply is consumptive with the remainder being returned to the basin, then the region’s self supply withdrawals are more in line with the allowable depletions.<sup>33</sup> The self-supply ADD for the Aquidneck Region is described in the table below:

**Self-Supply Average Day Demand (ADD), Aquidneck Region**

Municipality	2005 Average Demand (MGD)	2025 Average Demand (MGD)	Buildout Average Demand (MGD)
Little Compton	0.3	0.3	0.6
Middletown	0.3	0.3	0.3
Newport	0.1	0.1	0.1
Portsmouth	0.3	0.3	0.3
Tiverton	0.4	0.8	0.9
<b>Total Aquidneck Region Self Supply</b>	<b>1.4</b>	<b>1.8</b>	<b>2.2</b>
<b>Increase over Current</b>		<b>0.4</b>	<b>0.8</b>
<b>Allowable Depletion (SDM)</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>
<b>Average Deficit</b>	<b>-1.1</b>	<b>-1.5</b>	<b>-1.9</b>
<b>Summer Deficit (1.2 times average)</b>	<b>-1.4</b>	<b>-1.8</b>	<b>-2.3</b>

<sup>30</sup> USGS 2005 National Water Use Compilation.

<sup>31</sup> USGS 2005 National Water Use Compilation.

<sup>32</sup> The safe yield total includes 1.9 MGD for Stonebridge Fire District (Stafford Pond) and 12.2 MGD for the Newport Water Division.

<sup>33</sup> Solley, W.B, Pierce, R.R., Perlman, H.A., 1998, Estimated water use in the United States in 1995, U.S. Geological Survey Circular 1200, 71 p.

**Projected Public Water Average Day Demand (ADD), Aquidneck Region**

<b>Water Supplier</b>	<b>2005 Average Demand (MGD)</b>	<b>2025 Average Demand (MGD)</b>	<b>Buildout Average Demand (MGD)</b>
Newport Water	7.2	8.1	11.1
Stone Bridge & North Tiverton	0.8	1.9	1.8
<b>Total Aquidneck Region Public Supply</b>	<b>8.0</b>	<b>9.9</b>	<b>12.9</b>
<b>Safe Yield</b>	<b>14.1</b>	<b>14.1</b>	<b>14.1</b>
<b>Surplus</b>	<b>6.1</b>	<b>4.2</b>	<b>1.2</b>
<b>Summer Surplus/Deficit (ratio 1.2 times average)</b>	<b>4.5</b>	<b>2.2</b>	<b>-1.4</b>

**Projected Public Water Average Day Demand (ADD), Aquidneck Region  
with 65 GPCD Goal**

<i>Water Supplier</i>	<i>2005 65 GPCD Average Demand (MGD)</i>	<i>2025 65 GPCD Average Demand (MGD)</i>	<b>Buildout 65 GPCD Average Demand (MGD)</b>
Newport WD	7.2	8.1	10.8
Stone Bridge & NT	0.8	1.9	1.8
<b>Total Aquidneck Region Public Supply</b>	<b>8.0</b>	<b>10.0</b>	<b>12.7</b>
<b>Safe Yield</b>	<b>14.1</b>	<b>14.1</b>	<b>14.1</b>
<b>Surplus/Deficit</b>	<b>6.1</b>	<b>4.1</b>	<b>1.4</b>
<b>Summer Surplus/Deficit (Ratio 1.2 times average)</b>	<b>4.5</b>	<b>2.1</b>	<b>-1.1</b>

Generally, the regional demands are within the safe yields of the water sources for average and summer uses through 2025. There is a minor concern regarding buildout peak demand that may be adequately managed through the capacity of the reservoirs. Planning considerations for the Aquidneck Region include:

- Limited options for new source development due to geography and land use.
- Newport Water District depends on a nine shallow reservoirs, two of which are located in very close proximity to the ocean and are relatively susceptible to hurricanes and climate change (sea level rise).
- Stonebridge Fire District and North Tiverton Fire District rely on a surface water source (Stafford Pond) and wholesale water imported from Fall River. Stafford Pond is “owned” and its use is regulated by the City of Fall River. The agreement limits Stonebridge withdrawals to 1.9 MGD and the agreement expires in April 2025.

## Islands Region

Several islands in Rhode Island are aggregated into the Islands Region to acknowledge their unique characteristics and challenges related to water supply and water resource management. WRB contracted with URI for separate studies for Block Island and Jamestown. Jamestown data was subsequently added to the West Bay Narragansett Study and Prudence Island data is included in the East Narragansett Bay Water Use and Availability Study. Patience, Hope and Hog Islands are part of the Town of Portsmouth along with Prudence Island. Estimated data was available for Prudence Island and the Prudence Island Utility is classified as a minor supplier. The series of tables below summarize demand and availability data for the islands compiled from the Water Use and Availability studies and the Supplemental Study.

### Projected Public and Self-Supply Average Day Demand (ADD), Islands Region

Municipality and/or Water Supplier	2005 Average Demand (MGD)	2025 Average Demand (MGD)	Buildout Average Demand (MGD)
Jamestown Public	0.2	0.3	0.5
Jamestown Self	0.2	0.2	0.2
New Shoreham Public	0.1	0.1	0.1
New Shoreham Self	0.2	0.2	0.2
Prudence Island Public <sup>34</sup>	< 0.1	< 0.1	< 0.1
<b>Subtotal</b>	<b>0.8</b>	<b>0.9</b>	<b>1.1</b>

### Block Island

Total island-wide withdrawals on Block Island for 2000<sup>35</sup> were estimated at 81.33 million gallons (see below). Self-supply withdrawals are the dominant source of withdrawals accounting for 79% of total estimated withdrawals during 2000.

### Summary of Estimated Withdrawals (in million gallons)

Withdrawals (in million gallons)	Q1	Q2	Q3	Q4	Total
Public-Supply (BIWC) withdrawals	2.1	4.3	8.0	2.8	17.2
Estimated self-supply withdrawals	6.4	15.0	32.7	10.0	64.2
<b>Total Withdrawals</b>	<b>8.5</b>	<b>19.3</b>	<b>40.6</b>	<b>12.9</b>	<b>81.3</b>
<b>Total Withdrawals (MGD)</b>	<b>0.1</b>	<b>0.2</b>	<b>0.4</b>	<b>0.1</b>	<b>0.2</b>

<sup>34</sup> Prudence Island water data includes only the public supply as published in the East Narragansett Bay Water Use and Availability Study. The self supply data was not available separately at the time of this study. The data is also included in data for Portsmouth.

<sup>35</sup> The study is based on year 2000 data due to data availability issues.

For both the Block Island and Jamestown studies, withdrawals were evaluated in relation to recharge. According to the Block Island study:

*Ground-water recharge on Block Island is estimated at 2.6 to 3.6 billion gallons per year. Current withdrawals represent only 2 to 3% of this total. Because much of the ground water withdrawn is returned to the flow system through septic systems, the net withdrawal is approximately 1% of the total recharge volume. This suggests that additional ground-water withdrawals are possible. The magnitude of possible withdrawals, however, is dependent on well placement and pumping rate.*

Regarding water use trends:

*A comparison of Block Island Water Company (BIWC) withdrawals and self-supply domestic withdrawals during 1990 and 2000 show that although BIWC withdrawals have remained relatively constant, self-supply domestic withdrawals increased by approximately 8 million gallons. BIWC withdrawals remained constant despite a larger customer base in 2000 because per household use rates declined from 266 gallons/household/day in 1990 to 165 gallons/household/day in 2000. The increase in self-supply domestic withdrawals reflects an increase in the number of self-supplied residential units on the island.*

#### Jamestown

The Town of Jamestown is situated on Conanicut Island, a 9 mi<sup>2</sup> bedrock island located at the mouth of the Narragansett Bay. Regarding water availability the study provides the following summary:

*Average annual precipitation on 9 mi<sup>2</sup> Jamestown is 43.4 inches resulting in total precipitation of 6.79 billion gallons per year or 18.59 MGD. Of that total 45% is lost to evapotranspiration, 40% to surface runoff and 15% infiltrates as groundwater recharge. This results in recharge to groundwater of 1.02 billion gallons per year. Current withdrawals represent 15% of this total. Because much of the ground water withdrawn is returned to the flow system through septic systems, the net withdrawal is approximately 8% of the total recharge volume. This suggests that additional ground-water withdrawals are possible. The magnitude of possible withdrawals, however, is dependent on well placement and pumping rate due to the potential for salt water intrusion in this island setting and the potential adverse impact of septic system return flow on water quality.*

In relation to water supply issues, the study states:

*Water-use is a significant concern in Jamestown, particularly following a water-supply crisis in June 1995. A significant change in precipitation patterns and record drought conditions in the summer months led to low levels in the reservoir. As a result Jamestown has had to purchase water from North Kingstown in order to meet the demands of its customers (Goslee, 2004). These low water levels are an annual concern for the town.*

The northern end of Jamestown relies on private wells that tap the freshwater lens, while the southern part of the island is served predominantly by the public supply system with only a limited number of private wells (Veeger, 2005). Total water use for Jamestown is estimated at

152.17 million gallons per year, or 0.42 million gallons per day (MGD). Public-supply is the dominant type of supply accounting for 79.79 million gallons per year (MGD) or 52% of total withdrawals.

**Jamestown Summary of Estimated 2001 Withdrawals (MGD)**

<b>Withdrawals (in million gallons)</b>	<b>Q1</b>	<b>Q2</b>	<b>Q3</b>	<b>Q4</b>	<b>Total</b>
Public-Supply (JWC)	17.5	20.7	23.8	17.8	<b>79.8</b>
Estimated self-supply	18.6	18.5	18.0	17.3	<b>72.4</b>
<b>Total Withdrawals</b>	<b>36.0</b>	<b>39.2</b>	<b>41.8</b>	<b>35.1</b>	<b>152.2</b>
<b>Total Withdrawals (MGD)</b>	<b>0.4</b>	<b>0.4</b>	<b>0.5</b>	<b>0.4</b>	<b>0.4</b>

### REFERENCE 1: Allowable Depletion (SDM) Calculations, Safe Yields and Withdrawals by Region

(Source: RI Water Resources Board compiled from Water Use and Availability Studies, HAP Optimization Model Report, and the *Streamflow Depletion Methodology*, RI Department of Environmental Management Office of Water Resources, Draft, May 13, 2010)

#### Northern Region: Allowable Depletion, Safe Yield and Five-Year Average and Summer Withdrawals (MGD)

Basin (HUC 10)	Subbasin (HUC 12)	RI Drainage Area (mi <sup>2</sup> )	Est. Basin Natural 7Q10 (MGD)	SDM Allowable Depletion (MGD) <sup>36</sup>	Reservoir Safe Yields	Estimated Water Withdrawals	Estimated Summer Water Withdrawals	Estimated Surplus/Deficit Average	Estimated Surplus/Deficit Summer
Lower Blackstone	Chepachet River	21.3	1.8	0.5		0.4	0.5	0.1	0.0
	Clear River	34.1	2.9	0.9		1.0	1.3	-0.2	-0.5
	Branch River	25.6	2.2	0.6		0.9	1.0	-0.2	-0.3
	West River	10.1	0.9	0.3		4.8	5.0	-4.4	-4.7
	Peters River	32.1	2.7	0.8	4.2	6.3	8.8	-1.3	-3.8
	Abbott Run	15.7	1.3	[0.7]	16.0	15.2	19.2	.0.8	-3.2
Pawtuxet	Scituate Reservoir Complex	94.1	8.0	[3.2]	83.0	71.9	97.2	11.1	-14.2
	North Branch Pawtuxet	14.1	1.2	0.4		0.1	0.2	0.2	0.1
	South Branch Pawtuxet	72.7	7.6	3.0		1.7	2.1	1.3	0.9
	Northeastern Pawtuxet	50.7	5.3	2.6		0.3	0.7	2.3	1.9
Quinebaug		61.0	5.2	1.5		0.4	0.5	1.1	1.1
Woonasquatucket		51.0	4.3	1.7		0.6	0.6	1.1	1.1
Moshassuck		23.8	2.0	0.8		0.1	0.1	0.7	0.7
Northeastern Narragansett Region		35.6	0.2	0.1		1.1	1.4	-1.0	-1.3
	Greenwich Bay	20.6	3.5	1.4		0.3	0.3	1.1	1.1
	Providence Seekonk Rivers	25.4	4.3	2.2		0.1	0.1	2.1	2.1
Other: Harris Pond	Mill River				4.4				
<b>Total Northern</b>		<b>588</b>		<b>17</b>	<b>108</b>	<b>105</b>	<b>139</b>	<b>15</b>	<b>-19</b>

<sup>36</sup> Abbott Run and the Scituate Reservoir Complex subbasin calculations are not included in the total allowable depletion for the region. They are not considered available due to surface water reservoirs.

**Southern Region: Allowable Depletion, Safe Yield and Five-Year Average and Summer Withdrawals (MGD)**

<b>Basin (HUC 10)</b>	<b>Subbasin (HUC 12)</b>	<b>RI Drainage Area (mi<sup>2</sup>)</b>	<b>Est. Basin Natural 7Q10 (MGD)</b>	<b>SDM Allowable Depletion (MGD)</b>	<b>Reservoir Safe Yields</b>	<b>Estimated Water Withdrawals</b>	<b>Estimated Summer Water Withdrawals</b>	<b>Estimated Surplus/Deficit Average</b>	<b>Estimated Surplus/Deficit Summer</b>
HAP <sup>37</sup>	Hunt	24.47	4.13	1.2		2.9	4.4	-1.4	-2.6
	Annaquatucket	26.63	4.50	1.4		1.5	2.6	-0.2	-0.9
	Pettaquamscutt	12.94	2.19	0.9		0.4	0.6	0.5	0.5
South Coastal	Saugatucket	17.08	2.89	0.9		0.1	0.2	0.7	0.6
	Point Judith Pond	10.54	1.78	0.5		0.1	0.2	0.4	0.3
	Southwestern Coastal Waters	27.46	4.64	1.4		0.8	1.5	0.6	-0.1
Pawcatuck	Chipuxet <sup>38</sup>	36.93	6.24	1.9		4.2	8.1	-2.3	-6.2
	Usquepaug- Queen	36.10	6.10	1.2		0.7	1.1	0.5	0.1
	Beaver- Pasquiset	22.47	3.80	1.1		0.5	0.7	0.7	0.4
	Upper Wood	63.80	10.78	1.1		0.7	1.0	0.3	0.1
	Lower Wood	36.40	6.15	1.2		0.8	1.2	0.4	0.1
	Lower Pawcatuck	49.50	8.37	2.5		4.0	5.7	-1.5	-3.2
<b>Southern Region Total</b>		<b>364.32</b>		<b>15.3</b>	<b>0.0</b>	<b>16.7</b>	<b>27.3</b>	<b>-1.4</b>	<b>-12.0</b>

<sup>37</sup> HAP public withdrawal data was retrieved and data was revised due to an issue with subbasin assignment in the Water Use and Availability Study. Values and well assignments were compared to the HAP Model Report 1993-1998 Average, p.44 for accuracy. The self supply withdrawals are as published in the Water Use and Availability Study.

<sup>38</sup> The Chipuxet summer withdrawal data is 2 MGD higher than the Water Use and Availability study summer peak average per verbal communication with A. Richardson, RIDEM.  
WRB Strategic Plan March, 2012

**Aquidneck Region: Allowable Depletion, Safe Yield and Five-Year Average and Summer Withdrawals (MGD)**

<b>Basin (HUC 10)</b>	<b>RI Drainage Area (mi<sup>2</sup>)</b>	<b>Est. Basin Natural 7Q10 (MGD)</b>	<b>SDM Allowable Depletion (MGD)</b>	<b>Reservoir Safe Yields</b>	<b>Estimated Water Withdrawals</b>	<b>Estimated Summer Water Withdrawals</b>	<b>Estimated Surplus/Deficit Average</b>
Southeastern Narragansett Region	27.80	0.11	1.90	1.69	2.06	0.32	-0.05
East Narragansett Islands <sup>39</sup>	63.07	0.19	12.20	7.53	10.12	4.86	2.27
<b>Total</b>	<b>90.86</b>	<b>0.30</b>	<b>14.10</b>	<b>9.22</b>	<b>12.18</b>	<b>5.18</b>	<b>2.22</b>

<sup>39</sup> The Newport pumping data used as the basis for the WUA study includes two years (1997 and 1998) of 0 pumping in the Newport intake. Research by WRB staff and consultation with RIDOH and NWD staff indicates that the facility was closed from Dec. 1996-April 1997 but not for two years. The data was recalculated for the three year average (1995, 96 and 99) for both Newport and Lawton Valley for data accuracy/comparability.

## REFERENCE 2: Drought and Emergency Supply

*The Statewide Supplemental Water Supply Feasibility Assessment, 2008* uses two emergency levels of service based on hardships that customers might be expected to endure for a short term (3-6 months) emergency or a longer term (1-2 years) emergency. The following tables evaluate these two reduced levels of service to offer the final and most aggressive data that is available regarding demand projections. The levels are defined and charts follow that show current demand and LOS C and D at 2025 and buildout by region. The demands are then compared to safe yield in the Northern Region and allowable depletions (SDM) in the Southern region.

### **Short Term Emergency Supply Reductions**

**Level of Service C – LOS C** imposes a minimum hardship level to the water supplier’s customers over a duration period of approximately one to two years. It is assumed a reduction in per capita water usage to approximately 45 gallons used per capita per day (GPCD) would meet this definition. In addition to residential water use reductions, commercial, industrial and government usage would assume a water use reduction of approximately 20 percent. **An “aggressive” water usage restriction is required to achieve this reduction** (Supplemental Study, p. 8).

### **Short Term Emergency Supply Reductions**

**Level of Service D – LOS D** is defined as that quantity of service at which the water supplier’s customers would reach their hardship threshold limit after approximately three to six months. It is assumed a reduction in per capita water usage to approximately 30 GPCD would meet this definition. The industrial, commercial and government restrictions remain the same as in LOS C at 20 percent reduction. LOS D is assumed to be the minimal LOS that is required to maintain public health and safety. **This level represents a catastrophic event and only essential water service would be provided for a short-term duration** (Supplemental Study, p. 8).

### **Northern Region Scenario: Public Average Day Demand (ADD) Compared to Safe Yield**

<i>Water Supplier</i>	<i>2005 (MGD)</i>	<i>2025 LOSC (MGD)</i>	<i>Buildout LOS C (MGD)</i>	<i>2025 LOS D (MGD)</i>	<i>Buildout LOS D (MGD)</i>
Bristol County Water Authority (BCWA)	3.7	3.64	4.9	2.81	3.85
Cumberland Water District	2.7	2.32	2.96	1.96	2.5
Harrisville & Pascoag <sup>40</sup>	[0.6]	[0.4]	[0.96]	[0.31]	[0.71]
Kent County Water Authority (KCWA)	11.0	7.78	11.29	6.79	10.05
North Smithfield	0.1	0.4	1.36	0.34	0.91
Pawtucket	12.3	8.39	8.98	6.62	7.21
Providence Water Supply Board	60.9	32.47	32.47	32.47	32.47
Woonsocket	5.6	5.84	6.14	5.02	5.3
<b>Total Northern Region</b>	<b>96.3</b>	<b>60.8</b>	<b>68.1</b>	<b>56.0</b>	<b>62.3</b>
<b>Reservoir Safe Yield</b>	<b>107.6</b>	<b>107.6</b>	<b>107.6</b>	<b>107.6</b>	<b>107.6</b>
<b>Average Over/Under Safe Yield</b>	<b>11.4</b>	<b>46.8</b>	<b>39.5</b>	<b>51.6</b>	<b>45.3</b>
<b>Summer Demand Over Safe Yield (Summer ratio 1.3 times average)</b>	<b>-17.5</b>	<b>28.5</b>	<b>19.1</b>	<b>34.8</b>	<b>26.6</b>

<sup>40</sup>Harrisville and Pascoag are included as public suppliers but not counted in the total as their demand does not impact the overall safe yield of the region.

Source: Supplemental Water Supply Study, August 2008 and Water Use and Availability Studies.

**Southern Region Scenario: Public and Self Supply Average Day Demand (ADD) Compared to the Resource Protection Goal (SDM)**

<i>Public and Self Supply Southern Region</i>	<i>2005 Average (MGD)</i>	<i>2025 LOS C (MGD)</i>	<i>Buildout LOS C (MGD)</i>	<i>2025 LOS D (MGD)</i>	<i>Buildout LOS D (MGD)</i>
Charlestown self	0.5	0.5	0.5	0.5	0.5
Exeter self	0.7	0.5	0.5	0.5	0.5
Hopkinton self	0.8	0.6	0.6	0.6	0.6
Narragansett self	0.1	0.1	0.1	0.1	0.1
North Kingstown self	0.4	0.3	0.3	0.3	0.3
Richmond self	1.0	1.1	1.1	1.1	1.1
South Kingstown self	0.9	1.2	1.2	1.2	1.2
West Greenwich self	0.4	0.3	0.3	0.3	0.3
Westerly self	0.4	0.3	0.3	0.3	0.3
North Kingstown	4.0	3.7	4.0	3.2	3.4
Richmond	0.1	0.1	0.1	0.1	0.1
QDC (NK)	0.7	2.0	2.0	2.0	2.0
Kingston Water District	0.4	0.7	0.7	0.6	0.6
United Water <sup>41</sup>	2.8	2.4	3.2	2.1	2.7
URI	0.7	0.23	0.2	0.2	0.2
Westerly	3.3	2.47	3.01	1.95	2.43
<b>Southern Region Total</b>	<b>17.3</b>	<b>16.6</b>	<b>18.1</b>	<b>15.0</b>	<b>16.4</b>
<b>Allowable Depletion</b>	<b>15.3</b>	<b>15.3</b>	<b>15.3</b>	<b>15.3</b>	<b>15.3</b>
<b>Average Surplus/Deficit</b>	<b>-2.0</b>	<b>-1.3</b>	<b>-2.8</b>	<b>0.3</b>	<b>-1.1</b>
<b>Summer Surplus/Deficit (Ratio 1.6 times average)</b>	<b>-12.3</b>	<b>-11.2</b>	<b>-13.7</b>	<b>-8.7</b>	<b>-10.9</b>

<sup>41</sup> Includes Narragansett and South Kingstown (Middlebridge and South Shore).

**REFERENCE 3: ADDITIONAL GPCD DEMAND REDUCTION SCENARIOS**

**Northern Region Public Supply**

<i>Water Supplier</i>	<i>2005 Public Supply ADD (MGD)</i>	<i>2025 Public Supply ADD (MGD)</i>	<i>Buildout Public Supply ADD (MGD)</i>	<i>2025 65 GPCD Public Supply ADD (MGD)</i>	<i>Buildout 65 GPCD Public Supply ADD (MGD)</i>	<i>2025 60 GPCD Public Supply ADD (MGD)</i>	<i>Buildout 60 GPCD Public Supply ADD (MGD)</i>	<i>2025 55 GPCD Public Supply ADD (MGD)</i>	<i>Buildout 55 GPCD Public Supply ADD (MGD)</i>	<i>2025 45 GPCD Public Supply ADD (MGD)</i>	<i>Buildout 45 GPCD Public Supply ADD (MGD)</i>
Bristol County Water Authority (BCWA)	3.7	3.9	7.1	3.9	6.8	3.9	6.6	3.9	6.5	3.8	6.1
Cumberland Water District	2.7	3.2	4.1	3.0	3.8	2.8	3.6	2.7	3.4	2.4	3.1
Harrisville & Pascoag	[0.6]	[0.7]	[1.5]	[0.6]	[1.3]	[0.5]	[1.2]	[0.5]	[1.1]	[0.4]	[1.0]
Kent County Water Authority (KCWA)	11.0	13.4	16.7	13.4	16.4	13.4	16.2	13.4	16.1	13.4	15.9
North Smithfield	0.1	0.6	2.3	0.6	2.1	0.6	2.0	0.6	1.9	0.5	1.7
Pawtucket	12.3	14.6	15.8	13.2	14.3	12.6	13.6	12.0	12.9	10.7	11.6
Providence Water Supply Board	60.9	60.9	61.9	58.4	59.3	55.5	56.4	52.7	53.5	47.0	47.7
Woonsocket	5.6	7.1	7.1	7.1	7.1	7.0	7.1	6.7	6.8	6.1	6.1
<b>Total Northern Region</b>	<b>96.3</b>	<b>103.7</b>	<b>115.1</b>	<b>99.6</b>	<b>109.6</b>	<b>95.9</b>	<b>105.5</b>	<b>92.0</b>	<b>101.2</b>	<b>84.0</b>	<b>92.3</b>
<b>Reservoir Safe Yield</b>	<b>107.6</b>	<b>107.6</b>	<b>107.6</b>	<b>107.6</b>	<b>107.6</b>	<b>107.6</b>	<b>107.6</b>	<b>107.6</b>	<b>107.6</b>	<b>107.6</b>	<b>107.6</b>
<b>Average Over/Under Safe Yield</b>	<b>11.4</b>	<b>3.9</b>	<b>-7.5</b>	<b>8.0</b>	<b>-2.0</b>	<b>11.7</b>	<b>2.1</b>	<b>15.6</b>	<b>6.4</b>	<b>23.6</b>	<b>15.3</b>
<b>Summer Demand Over Safe Yield (Summer ratio 1.3 times average)</b>	<b>-17.5</b>	<b>-27.2</b>	<b>-42.0</b>	<b>-21.8</b>	<b>-34.9</b>	<b>-17.1</b>	<b>-29.6</b>	<b>-12.0</b>	<b>-23.9</b>	<b>-1.5</b>	<b>-12.3</b>

Source: Supplemental Water Supply Study

Notes: Harrisville and Pascoag are included as public suppliers but not counted in the total as their demand does not impact the overall safe yield of the region.

### Northern Region Self Supply

<i>Municipality</i>	<i>2005 Average (MGD)</i>	<i>2025 Average (MGD)</i>	<b>Buildout Average (MGD)</b>
Barrington	0.1	0.1	0.1
Bristol	0.2	0.2	0.2
Burrilville	3.2	4.0	4.9
Central Falls	0.0	0.0	0.0
Coventry*	0.6		
Cranston	0.1	0.1	0.1
Cumberland	0.2	0.2	0.2
East Greenwich	0.3	0.3	0.3
East Providence	0.1	0.1	0.1
FOSTER	0.3	0.3	1.7
Glocester	0.4	0.8	1.1
Harrisville and Pascoag**	0.6	0.7	1.5
Johnston	0.3	0.3	0.3
Lincoln	0.1	0.1	0.1
North Smithfield	0.1	0.1	0.1
North Providence	0.0	0.0	0.0
Pawtucket	0.1	0.1	0.1
Providence	0.0	0.0	0.0
Scituate	0.6	0.8	1.4
Smithfield	0.3	0.3	0.3
Warren	0.1	0.1	0.1
Warwick	0.1	0.1	0.1
West Warwick	0.0	0.0	0.0
Woonsocket	2.0	2.0	2.0
<b>Total Self Supply Northern Region</b>	<b>10.0</b>	<b>10.8</b>	<b>14.8</b>
<b>Allowable Depletion (SDM)</b>	<b>16.9</b>	<b>16.9</b>	<b>16.9</b>
<b>Surplus</b>	<b>6.9</b>	<b>6.1</b>	<b>2.1</b>

### Self Supply Southern Region

Municipality	2005 Average (MGD)	2025 Average (MGD)	Buildout Average (MGD)
Charlestown	0.5	0.7	1.7
Exeter	0.7	0.7	1.7
Hopkinton	0.8	0.8	1.7
Narragansett	0.1	0.1	0.1
North Kingstown	0.4	0.4	0.4
Richmond	1.0	1.6	3.0
South Kingstown	0.9	1.8	2.4
West Greenwich	0.4	0.5	1.3
Westerly	0.4	0.5	0.5
<b>Southern Region Total Self Supply</b>	<b>5.3</b>	<b>7.1</b>	<b>12.8</b>
<b>Increase Over Current</b>		<b>1.8</b>	<b>7.5</b>

### Public Supply Southern Region

Water Supplier	2005 Public Supply ADD (MGD)	2025 Public Supply ADD (MGD)	Buildout Public Supply ADD (MGD)	2025 65 GPCD Public Supply ADD (MGD)	Buildout 65 GPCD Public Supply ADD (MGD)	2025 60 GPCD Public Supply ADD (MGD)	Buildout 60 GPCD Public Supply ADD (MGD)	2025 55 GPCD Public Supply ADD (MGD)	Buildout 55 GPCD Public Supply ADD (MGD)	2025 45 GPCD Public Supply ADD (MGD)	Buildout 45 GPCD Public Supply ADD (MGD)
North Kingstown	4.0	4.2	5.1	3.5	4.2	3.3	4.0	3.1	3.8	2.8	3.4
Richmond	0.1	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1
QDC (NK)	0.7	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Kingston Water District	0.4	0.8	0.9	0.8	0.9	0.8	0.9	0.8	0.9	0.7	0.8
United Water <sup>42</sup>	2.8	3.6	4.4	3.6	4.3	3.6	4.3	3.5	4.1	3.1	3.7
URI	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Westerly	3.3	4.0	4.4	3.7	4.1	3.6	3.9	3.4	3.7	3.1	3.4
<b>Southern Region Total</b>	<b>12.0</b>	<b>15.9</b>	<b>18.0</b>	<b>14.8</b>	<b>16.7</b>	<b>14.5</b>	<b>16.3</b>	<b>13.9</b>	<b>15.7</b>	<b>12.8</b>	<b>14.4</b>
<b>Increase Over Current</b>		<b>3.9</b>	<b>6.1</b>	<b>2.9</b>	<b>4.8</b>	<b>2.5</b>	<b>4.4</b>	<b>2.0</b>	<b>3.7</b>	<b>0.9</b>	<b>2.4</b>

<sup>42</sup> Includes Narragansett and South Kingstown (Middlebridge and South Shore).

### Total Public and Self Supply Southern Region

<i>Public and Self Supply Southern Region</i>	<i>2005 ADD (MGD)</i>	<i>2025 ADD (MGD)</i>	<i>Buildout ADD (MGD)</i>	<i>2025 65 GPCD ADD (MGD)</i>	<i>Buildout 65 GPCD ADD (MGD)</i>	<i>2025 60 GPCD ADD (MGD)</i>	<i>Buildout 60 GPCD ADD (MGD)</i>	<i>2025 55 GPCD ADD (MGD)</i>	<i>Buildout 55 GPCD ADD (MGD)</i>	<i>2025 45 GPCD ADD (MGD)</i>	<i>Buildout 45 GPCD ADD (MGD)</i>
Charlestown self	0.5	0.7	1.7	0.7	1.7	0.6	1.6	0.6	1.4	0.5	1.2
Exeter self	0.7	0.7	1.7	0.7	1.7	0.6	1.6	0.6	1.4	0.5	1.2
Hopkinton self	0.8	0.8	1.7	0.8	1.7	0.7	1.6	0.7	1.4	0.6	1.2
Narragansett self	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
North Kingstown self	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3
Richmond self	1.0	1.6	3.0	1.6	3.0	1.5	2.8	1.4	2.5	1.1	2.1
South Kingstown self	0.9	1.8	2.4	1.8	2.4	1.7	2.2	1.5	2.0	1.2	1.7
West Greenwich self	0.4	0.5	1.3	0.5	1.3	0.5	1.2	0.4	1.1	0.3	0.9
Westerly self	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.3	0.3
North Kingstown	4.0	4.2	5.1	3.5	4.2	3.3	4.0	3.1	3.8	2.8	3.4
Richmond	0.1	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1
QDC (NK)	0.7	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Kingston Water District	0.4	0.8	0.9	0.8	0.9	0.8	0.9	0.8	0.9	0.7	0.8
United Water <sup>43</sup>	2.8	3.6	4.4	3.6	4.3	3.6	4.3	3.5	4.1	3.1	3.7
URI	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Westerly	3.3	4.0	4.4	3.7	4.1	3.6	3.9	3.4	3.7	3.1	3.4
<b>Southern Region Total</b>	<b>17.3</b>	<b>23.0</b>	<b>30.8</b>	<b>21.9</b>	<b>29.6</b>	<b>21.1</b>	<b>28.1</b>	<b>20.0</b>	<b>26.5</b>	<b>17.8</b>	<b>23.3</b>
<b>Allowable Depletion</b>	<b>15.3</b>	<b>15.3</b>	<b>15.3</b>	<b>15.3</b>	<b>15.3</b>	<b>15.3</b>	<b>15.3</b>	<b>15.3</b>	<b>15.3</b>	<b>15.3</b>	<b>15.3</b>
<b>Average Surplus/Deficit</b>	<b>-2.0</b>	<b>-7.7</b>	<b>-15.5</b>	<b>-6.6</b>	<b>-14.3</b>	<b>-5.8</b>	<b>-12.8</b>	<b>-4.7</b>	<b>-11.2</b>	<b>-2.5</b>	<b>-8.0</b>
<b>Summer Surplus/Deficit (Ratio 1.6 times average)</b>	<b>-12.3</b>	<b>-21.4</b>	<b>-34.0</b>	<b>-19.8</b>	<b>-32.0</b>	<b>-18.4</b>	<b>-29.7</b>	<b>-16.6</b>	<b>-27.1</b>	<b>-13.1</b>	<b>-21.9</b>

<sup>43</sup> Includes Narragansett and South Kingstown (Middlebridge and South Shore).

### Withdrawals outside the Urban Services Boundary\*

<i>Municipality</i>	<i>2005 Average (MGD)</i>	<i>2025 Average (MGD)</i>	<b>Buildout Average (MGD)</b>
Charlestown	0.5	0.7	1.7
Exeter	0.7	0.7	1.7
Hopkinton	0.8	0.8	1.7
Richmond	1.0	1.6	3.0
<b>Total Outside Urban Services Boundary</b>	<b>3.1</b>	<b>3.9</b>	<b>8.3</b>
<b>Allowable Depletion (SDM)</b>	<b>4.6</b>	<b>4.6</b>	<b>4.6</b>
<b>Surplus/Deficit</b>	<b>1.5</b>	<b>0.7</b>	<b>-3.7</b>

\*Note: West Greenwich withdrawals (0.17 MGD) and South Kingstown withdrawals (0.133) within those basins are a relatively small proportion of the Town's total and are not included above.  
Public supply withdrawals are included for Richmond.

**Public and Self Supply Urban Services Boundary Southern Region  
SDM for the Chipuxet, Hap, South Coastal, Lower Pawcatuck**

<i>Water Supplier and/or Municipality</i>	<i>2005 ADD (MGD)</i>	<i>2025 ADD (MGD)</i>	<i>Buildout ADD (MGD)</i>	<i>2025 65 GPCD ADD (MGD)</i>	<i>Buildout 65 GPCD ADD (MGD)</i>	<i>2025 60 GPCD ADD (MGD)</i>	<i>Buildout 60 GPCD ADD (MGD)</i>	<i>2025 55 GPCD ADD (MGD)</i>	<i>Buildout 55 GPCD ADD (MGD)</i>	<i>2025 45 GPCD ADD (MGD)</i>	<i>Buildout 45 GPCD ADD (MGD)</i>
Narragansett self	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
South Kingstown self	0.9	1.8	2.4	1.8	2.4	1.7	2.2	1.5	2.0	1.2	1.7
Kingston Water District	0.4	0.8	0.9	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7
United Water <sup>44</sup>	2.8	3.6	4.4	3.6	3.9	3.6	3.7	3.5	3.6	3.1	3.2
URI	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
North Kingstown self	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3
North Kingstown	4.0	4.2	5.1	3.5	4.2	3.3	4.0	3.1	3.8	2.8	3.4
QDC (NK)	0.7	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
West Greenwich self	0.4	0.5	1.3	0.5	1.3	0.5	1.2	0.4	1.1	0.3	0.9
Westerly self	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.3	0.3
Westerly	3.3	4.0	4.4	3.7	4.1	3.6	3.9	3.4	3.7	3.1	3.4
Hopkinton self	0.4	0.4	0.9	0.4	0.9	0.4	0.8	0.3	0.8	0.3	0.6
Charlestown self	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
<b>Total</b>	<b>14.5</b>	<b>19.5</b>	<b>23.5</b>	<b>18.5</b>	<b>21.8</b>	<b>17.8</b>	<b>20.7</b>	<b>17.0</b>	<b>19.7</b>	<b>15.3</b>	<b>17.7</b>
<b>Allowable Depletion</b>	<b>10.7</b>	<b>10.7</b>	<b>10.7</b>	<b>10.7</b>	<b>10.7</b>	<b>10.7</b>	<b>10.7</b>	<b>10.7</b>	<b>10.7</b>	<b>10.7</b>	<b>10.7</b>
<b>Average Surplus/Deficit</b>	<b>-3.8</b>	<b>-8.8</b>	<b>-12.8</b>	<b>-7.8</b>	<b>-11.1</b>	<b>-7.1</b>	<b>-10.0</b>	<b>-6.3</b>	<b>-9.0</b>	<b>-4.6</b>	<b>-7.0</b>
<b>Summer Surplus/Deficit (Ratio 1.6 times average)</b>	<b>-12.5</b>	<b>-20.5</b>	<b>-26.9</b>	<b>-18.8</b>	<b>-24.1</b>	<b>-17.8</b>	<b>-22.5</b>	<b>-16.5</b>	<b>-20.9</b>	<b>-13.8</b>	<b>-17.6</b>

<sup>44</sup> Includes and Narragansett and South Kingstown (Middlebridge and South Shore).

## HAP

<i>Municipality and Water Supplier</i>	<b>2005 ADD (MGD)</b>	<b>2025 ADD (MGD)</b>	<b>Buildout ADD (MGD)</b>	<b>2025 65 GPCD ADD (MGD)</b>	<b>Buildout 65 GPCD ADD (MGD)</b>	<b>2025 60 GPCD ADD (MGD)</b>	<b>Buildout 60 GPCD ADD (MGD)</b>	<b>2025 55 GPCD ADD (MGD)</b>	<b>Buildout 55 GPCD ADD (MGD)</b>	<b>2025 45 GPCD ADD (MGD)</b>	<b>Buildout 45 GPCD ADD (MGD)</b>
North Kingstown self	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3
North Kingstown	4.0	4.2	5.1	3.5	4.2	3.3	4.0	3.1	3.8	2.8	3.4
QDC (NK)	0.7	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
West Greenwich self	0.4	0.5	1.3	0.5	1.3	0.5	1.2	0.4	1.1	0.3	0.9
<b>Total</b>	<b>5.4</b>	<b>7.6</b>	<b>9.3</b>	<b>6.9</b>	<b>8.4</b>	<b>6.3</b>	<b>7.7</b>	<b>6.0</b>	<b>7.4</b>	<b>5.6</b>	<b>6.8</b>
<b>Allowable Depletion</b>	<b>3.5</b>	<b>3.5</b>	<b>3.5</b>	<b>3.5</b>	<b>3.5</b>	<b>3.5</b>	<b>3.5</b>	<b>3.5</b>	<b>3.5</b>	<b>3.5</b>	<b>3.5</b>
<b>Average Surplus/Deficit</b>	<b>-1.9</b>	<b>-4.1</b>	<b>-5.8</b>	<b>-3.4</b>	<b>-4.9</b>	<b>-2.8</b>	<b>-4.2</b>	<b>-2.5</b>	<b>-3.9</b>	<b>-2.1</b>	<b>-3.3</b>
<b>Summer Surplus/Deficit (Ratio 1.6 times average)</b>	<b>-5.2</b>	<b>-8.7</b>	<b>-11.3</b>	<b>-7.5</b>	<b>-10.0</b>	<b>-6.5</b>	<b>-8.8</b>	<b>-6.2</b>	<b>-8.3</b>	<b>-5.5</b>	<b>-7.3</b>

## Chipuxet and Southwestern Coastal

<i>Water Supplier</i>	<b>2005 ADD (MGD)</b>	<b>2025 ADD (MGD)</b>	<b>Buildout ADD (MGD)</b>	<b>2025 65 GPCD ADD (MGD)</b>	<b>Buildout 65 GPCD ADD (MGD)</b>	<b>2025 60 GPCD ADD (MGD)</b>	<b>Buildout 60 GPCD ADD (MGD)</b>	<b>2025 55 GPCD ADD (MGD)</b>	<b>Buildout 55 GPCD ADD (MGD)</b>	<b>2025 45 GPCD ADD (MGD)</b>	<b>Buildout 45 GPCD ADD (MGD)</b>
Narragansett self	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
South Kingstown self	0.9	1.8	2.4	1.8	2.4	1.7	2.2	1.5	2.0	1.2	1.7
Kingston Water District	0.4	0.8	0.9	0.8	0.9	0.8	0.9	0.8	0.9	0.7	0.8
United Water and Narragansett and South Kingstown (Middlebridge and South Shore)	2.8	3.6	4.4	3.6	4.3	3.6	4.3	3.5	4.1	3.1	3.7
URI	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
<b>Total</b>	<b>5.0</b>	<b>7.0</b>	<b>8.4</b>	<b>7.0</b>	<b>8.3</b>	<b>6.8</b>	<b>8.0</b>	<b>6.4</b>	<b>7.6</b>	<b>5.7</b>	<b>6.7</b>
<b>Allowable Depletion</b>	<b>3.3</b>	<b>3.3</b>	<b>3.3</b>	<b>3.3</b>	<b>3.3</b>	<b>3.3</b>	<b>3.3</b>	<b>3.3</b>	<b>3.3</b>	<b>3.3</b>	<b>3.3</b>
<b>Average Surplus/Deficit</b>	<b>-1.7</b>	<b>-3.7</b>	<b>-5.1</b>	<b>-3.7</b>	<b>-5.0</b>	<b>-3.5</b>	<b>-4.7</b>	<b>-3.1</b>	<b>-4.3</b>	<b>-2.4</b>	<b>-3.4</b>
<b>Summer Surplus/Deficit (Ratio 1.6 times average)</b>	<b>-4.6</b>	<b>-7.9</b>	<b>-10.2</b>	<b>-7.8</b>	<b>-9.9</b>	<b>-7.6</b>	<b>-9.6</b>	<b>-7.0</b>	<b>-8.9</b>	<b>-5.9</b>	<b>-7.5</b>

### Lower Pawcatuck

<i>Municipality and Water Supplier</i>	<i>2005 ADD (MGD)</i>	<i>2025 ADD (MGD)</i>	<i>Buildout ADD (MGD)</i>	<i>2025 65 GPCD ADD (MGD)</i>	<i>Buildout 65 GPCD ADD (MGD)</i>	<i>2025 60 GPCD ADD (MGD)</i>	<i>Buildout 60 GPCD ADD (MGD)</i>	<i>2025 55 GPCD ADD (MGD)</i>	<i>Buildout 55 GPCD ADD (MGD)</i>	<i>2025 45 GPCD ADD (MGD)</i>	<i>Buildout 45 GPCD ADD (MGD)</i>
Westerly self	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.3	0.3
Westerly	3.3	4.0	4.4	3.7	4.1	3.6	3.9	3.4	3.7	3.1	3.4
Hopkinton self	0.4	0.4	0.9	0.4	0.9	0.4	0.8	0.3	0.8	0.3	0.6
Charlestown self	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
<b>Total</b>	<b>3.7</b>	<b>4.4</b>	<b>5.3</b>	<b>4.1</b>	<b>5.0</b>	<b>3.9</b>	<b>4.7</b>	<b>3.7</b>	<b>4.5</b>	<b>3.4</b>	<b>4.0</b>
<b>Allowable Depletion</b>	<b>2.5</b>	<b>2.5</b>	<b>2.5</b>	<b>2.5</b>	<b>2.5</b>	<b>2.5</b>	<b>2.5</b>	<b>2.5</b>	<b>2.5</b>	<b>2.5</b>	<b>2.5</b>
<b>Average Surplus/Deficit</b>	<b>-1.2</b>	<b>-1.9</b>	<b>-2.8</b>	<b>-1.6</b>	<b>-2.5</b>	<b>-1.4</b>	<b>-2.2</b>	<b>-1.2</b>	<b>-2.0</b>	<b>-0.9</b>	<b>-1.5</b>
<b>Summer Surplus/Deficit (Ratio 1.6 times average)</b>	<b>-3.4</b>	<b>-4.5</b>	<b>-5.9</b>	<b>-4.1</b>	<b>-5.5</b>	<b>-3.8</b>	<b>-5.1</b>	<b>-3.5</b>	<b>-4.7</b>	<b>-2.9</b>	<b>-3.9</b>

### Aquidneck Region Self Supply

<i>Municipality</i>	<i>2005 Self Supply ADD (MGD)</i>	<i>2025 Self Supply (MGD)</i>	<i>Buildout Self Supply (MGD)</i>
Little Compton	0.3	0.3	0.6
Middletown	0.3	0.3	0.3
Newport	0.1	0.1	0.1
Portsmouth	0.3	0.3	0.3
Tiverton	0.4	0.8	0.9
<b>Total Aquidneck Region Self Supply</b>	<b>1.4</b>	<b>1.8</b>	<b>2.2</b>
<b>Increase Over Current</b>	<b>0.3</b>	<b>0.4</b>	<b>0.8</b>
<b>Allowable Depletion</b>		<b>0.3</b>	<b>0.3</b>
<b>Average Surplus/Deficit</b>	<b>-1.1</b>	<b>-1.5</b>	<b>-1.9</b>
<b>Summer Surplus/Deficit (Ratio 1.2 times average)</b>	<b>-1.4</b>	<b>-1.8</b>	<b>-2.3</b>

### Aquidneck Region Public Supply

<i>Water Supplier</i>	<i>2005 Public Supply ADD (MGD)</i>	<i>2025 Public Supply ADD (MGD)</i>	<i>Buildout Public Supply ADD (MGD)</i>
Newport WD	7.2	8.1	11.1
Stone Bridge & NT	0.8	1.9	1.8
<b>Total Aquidneck Region Public Supply</b>	<b>8.0</b>	<b>9.9</b>	<b>12.9</b>
Safe Yield	14.1	14.1	14.1
<b>Surplus/Deficit</b>	<b>6.1</b>	<b>4.2</b>	<b>1.2</b>
summer 1.2	9.6	11.9	15.5
<b>Summer Surplus/Deficit (Ratio 1.2 times average)</b>	<b>4.5</b>	<b>2.2</b>	<b>-1.4</b>

### Islands Region

<i>Public and Self Supply</i>	<i>2005 ADD (MGD)</i>	<i>2025 ADD (MGD)</i>	<i>Buildout ADD (MGD)</i>
Jamestown Public	0.2	0.3	0.5
Jamestown self	0.2	0.2	0.2
New Shoreham Public	0.1	0.1	0.1
New Shoreham self	0.2	0.2	0.2
Prudence Island Public	0.1	0.1	0.1
<b>Total</b>	<b>0.8</b>	<b>0.8</b>	<b>1.0</b>

## REFERENCE 4: Calculations and Methodology for Current and Projected Demand Data

### Estimate of Residential, Commercial, Government and Industrial Usages and Need

Total water consumed and produced, including all four groups (residential, commercial, industrial, and government) of retail and wholesale customers were estimated for each water supplier. Current conditions were normalized to the year 2005, while future conditions were projected to the year 2025. The data used for these calculations was compiled using numerous data worksheets contained in each water supplier's Water Supply System Management Plan (WSSMP). Since each water supplier's WSSMPs were completed in various years, the most current data presented was extrapolated to reflect the year 2005. This was computed using linear relationships between a water supplier's current values versus project values. See Equation 1 below.

#### *Equation 1 – 2005 Extrapolation Calculation*

$$\left( \frac{pv - cv}{py - cy} \right) * (2005 - cy) + cv$$

where:

*pv* = *projected value*: projected values of service area population, district water use, and water use by land category obtained from various data worksheets within each water supplier's WSSMP.

*py* = *projected year*: projected year corresponding to the projected value obtained from water supplier's WSSMP.

*cv* = *current value*: current values of service area population, district water use, and water use by land category, obtained from various data worksheets with each water supplier's WSSMP at the time of publication.

*cy* = *current year*: year in which the most current actual values were recorded within each water supplier's WSSMP. Years will vary depending of publication dates.

In the event that a water supplier's WSSMP had already projected demand or water usage values for 2005, those projections were used and the normalization calculation was not performed.

Projected water demands, production rates and population served for the year 2025 were calculated using a similar method as the 2005 normalization calculation. All water supplier's WSSMP's presented projected water demands, population served, and usage by category for various years depending on the date of publication. If projections were made for the year 2025, then values were taken directly from data sheets. If the values represented a different projected year, then these values were normalized to 2025 using equation 2 below:

#### *Equation 2 – 2025 Projection Extrapolation*

$$\left( \frac{pv - cv}{py - cy} \right) * (2025 - py) + pv$$

All available data for service area population, district water use, and water use by land category for each water supplier was compiled and adjusted to reflect the current year of 2005 and the projected year of 2025 in order to achieve consistency within the report. The data was utilized to calculate emergency water demands for each water supplier.

## REFERENCE 5

### Buildout Assumptions

- 1) Data provided in the Supplemental Water Supply Study were used for all municipalities in that study, served in whole, or in part by public suppliers.
- 2) For Self Supply, 2005 ADD was obtained from the Water Use and Availability Studies.
- 3) Communities that were mostly served by public suppliers, had a small population that was self supply, and/or were close to being built out according to their comprehensive plans: the 2005 self supply MGD was carried through to 2025 and buildout.

Barrington	Newport
Bristol	North Kingstown
Central Falls	North Providence
Cranston	North Smithfield
Cumberland	Pawtucket
East Greenwich	Portsmouth
East Providence	Providence
Jamestown	Smithfield
Johnston	Warren
Lincoln	Warwick
Middletown	West Warwick
Narragansett	Woonsocket
New Shoreham	

- 4) Statewide Planning Program's (SPP) population projections for 2025 were used for self supply communities to calculate water usage. It is assumed that these communities are dominated by residential uses and commercial and industrial uses would have minimal impact.

Little Compton	Foster
Glocester	Charlestown
Scituate	Hopkinton
Exeter	

- 5) Municipalities that were served by a public supplier but also had a portion self-served, if the supplier only serviced that town, the 2025 ADD for the supplier, as calculated in the Supplemental Study, was subtracted from calculated water usage based on SPP projections. The difference was assumed to be self supply ADD.

Tiverton

If the water usage based on SPP projections was less than the ADD provided in the Water Use and Availability Studies, then the proportional growth of the public supplier was applied to the self supply in that municipality.

South Kingstown	Richmond
Westerly	

Coventry is completely within the KCWA franchise area, therefore, Coventry 2025 and buildout data is included with KCWA, as calculated in the Supplemental Water Supply Study.

## REFERENCE 6

### Bibliography

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Department of Geosciences University of Rhode Island, RIGS Report 05-01, 2005

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Rhode Island Water Resources Board Statewide Supplemental Water Supply Feasibility Assessment, Maguire Group, Inc., August 2008.



## **Appendix E:**

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# **Water Resources Board and Board Corporate Bylaws**

## BY-LAWS

### WATER RESOURCES BOARD

The following are the By-Laws for organization and operation of the RI Water Resources Board as authorized by Title 46, Chapter 15, Section 1 through 3 of the General Laws of Rhode Island (hereinafter referred to as "RIGL"), as amended.

#### Section 1. Name

The name of this Body is the Rhode Island Water Resources Board (hereafter referred to as the "Board"), as established by the General Assembly in RIGL Title 46, Chapter 15, as amended.

The state's water resources are essential to the health, safety and welfare of the general public and to the continued growth and economic development of the state and the Board is responsible for the proper development, conservation and use of such resources.

The Board consists of thirteen (13) members as follows: Five (5) members shall represent the public and shall be appointed by the Governor as herein provided, at least two (2) of whom shall be affiliated with public water systems in Rhode Island; one (1) member appointed by the Agricultural Council; one (1) member shall be from the House of Representatives who shall be appointed by the Speaker of the House of Representatives and one (1) member shall be from the Senate who shall be appointed by the Majority Leader of the Senate; the remaining five (5) members shall be the Director of the Department of Environmental Management, the Director of the Department of Administration, the Director of the Department of Health, Director of the Economic Development Corporation and the Chairman of the Joint Committee on Water Resources, all of whom shall serve ex officio.

#### Section 2. Organization and Purpose

The Board was established to address the issues of water resources development, utilization and control, and the varied interest these affect. Title 46-15-1 through 23 establishes the legal framework in which the Board operates. The Board's Committees are required to

function in accordance with all laws specifically the Open Meetings Law, RIGL 42-46, and in a manner which is consistent with the Board's Policy of Public Participation.

The Board has the power to acquire, construct, purchase, lease, sell, enter contracts, review plans, make loans and grants, borrow, and compensate other State departments for any and all water supply facilities within its limitation of funds.

The Board has regulatory authority over public water supply systems for developing new source, pipe-sizing between systems and/or communities, servicing outside of a system's corporate limits, taking additional supply from an existing source, constructing extensions of transmission mains, extending boundaries, supply water in another municipality or civil division which owns and operates a water system, and supplying water outside the State of Rhode Island

The General Manager is charged with the responsibility of executing the policies adopted by the Board and for managing the business affairs of the Board, consistent with said policies. Board Committees may be found and function as required by the Board.

The Board has the general powers and duties, together with all powers incidental thereto, or necessary for the performance of its duties as set for in RIGL Title 46, Chapter 15.

### Section 3. Officers and Employees of the Board: Powers and Duties

Pursuant to RIGL Title 46, Chapter 15.1-2.3, the Board shall elect one (1) of its public members Chairperson, one (1) of its public members Vice Chairperson, and one (1) Secretary-Treasurer. Said election shall be held annually in the month of March. The Chairperson shall be the Chief Executive Officer of the Board and shall have the powers to perform the duties customarily appurtenant to such office, and shall have further powers and shall perform such further duties as shall from time to time be assigned by the Board. In the Chairperson's absence, the Vice Chairperson shall preside.

The Vice Chairperson shall perform the duties and exercise the powers of the Chairperson in the absence or incapacity of the Chairperson. In case of resignation or death of the Chairperson, the Vice Chairperson shall perform the duties and exercise the powers of the Chairperson until such time as a new Chairperson is elected.

The Treasurer shall be responsible for reporting to the Board the accounting for all expenditures and revenues made by the Board in the discharge of its duties. This report by the Treasurer shall be at the request of the Chairperson or any member of the Board.

The Secretary shall keep a record of the proceedings of the Board and shall be custodian of all books, documents and papers filed with the Board, and of its minutes, books and seal. He or she shall have authority to make copies of all minutes and other records and documents of the Board, and to give certificates under the seal of the Board that such copies are true copies and all persons dealing with the Board may rely upon such certifications. The Secretary shall be responsible for written minutes of the Board.

The Board shall employ a General Manager to administer, manage and direct the affairs and the business of the Board subject to the policies, control and direction of the Board.

The General Manager shall be the Chief Operating Officer of the Board, shall keep records of the business of the Board.

The General Manager shall arrange all meeting of the Board when called pursuant to these By-Laws. The General Manager shall notify all members of the Board of the call of each meeting and shall prepare an agenda for each meeting.

The Board may employ technical experts and other such officers, agents and attorneys, and fix their qualifications, duties and compensation.

#### Section 4. Attendance

Members are expected to attend all scheduled meetings of the Board. Members who are unable to attend regularly scheduled meetings, for any reason, should submit to the Board's Secretary in advance of said meeting, notice for such absence. In the event of repeated and continued absences on the part of any member of the Board, after notification of the Chairperson to the member, the Chairperson may then decide to bring this matter before the Board, and by majority vote of the Board, send a recommendation to the appointing authority requesting that the appointment be reconsidered.

#### Section 5. Meetings

The Board shall meet at regular intervals to conduct its business. Meetings shall be conducted pursuant to RIGL Title 42 Chapter 46, entitled "Open Meetings." A yearly schedule of meetings shall be prepared by the Secretary during the month of December and shall be forwarded to all Board members. Special meetings of the full Board may be called at the direction of the Chairperson. In the event of the absence or incapacity of the Chairperson, the

Vice Chairperson may call a special meeting. A special meeting may also be called by five (5) members of the Board. Request for a special meeting by members of the Board shall be made in writing to the full Board by the Secretary. The Secretary shall then advise the Chairperson of such request and shall cause notice of such meeting to be sent to all Board members.

#### Section 6. Notice

Written notice of each special meeting shall be given at least five (5) days previous thereto delivered personally or mailed to each member of the Board at his/her place of residence or employment, or, in the alternative, by facsimile or telegram. The notice shall contain a brief statement of the matters to be discussed. The attendance of a member at a meeting shall constitute a waiver of notice of such meeting, except where a member attends a meeting for the express purpose of objecting to the transaction of any business because the meeting is not lawfully called or convened in accordance with RIGL or these By-Laws.

#### Section 7. Emergency Meetings

Subject to the requirements of RIGL Title 46, Chapter 15, the Board may hold emergency meetings to address matters of an emergency nature. All the steps reasonably necessary shall be taken to notify all Board members of the scheduling of such meetings.

#### Section 8. Agenda

Prior to each meeting of the Board, the Secretary shall prepare an agenda, which shall be approved by the Chairperson. The agenda for each regular meeting shall include, but not be limited to, the following:

1. Approval of the minutes of the previous meeting;
2. Items for action or discussion;
3. Staff reports, committee reports;
4. Other business.

Any member of the Board may place an item on the agenda of any regular meeting under the heading "Other Business." Federal or State agencies, local governments, members of the staff, and the general public, may request that an item be placed on the agenda. Such request shall be submitted to the Secretary in writing no later than seven (7) days prior to a regularly

scheduled meeting. Copies of the agenda shall be sent to each Board member and any other parties requesting such agenda at least three (3) days before a regular Board meeting. All persons appearing before the Board, either on their own behalf, or in a representative capacity shall conform to standards to reasonable orderly conduct. If any person does not conform to such standards, the Chairperson may decline to permit such persons to address the Board.

#### Section 9. Quorum and Voting

A quorum for any Board meeting shall be as set forth in RIGL Title 46, Chapter 15.

Each Board member appointed pursuant to RIGL Title 46, Chapter 15, shall be entitled to one (1) vote. No member shall delegate his or her vote to anyone else except as provided by statute. If any Board member or his/her designee is not present at a meeting, said Board member cannot cast a vote. While Department Directors may have ex-officios, there is no provision for public members to have ex-officios. Any action taken by the Board may be authorized by a resolution approved by the majority of the members present at any meeting at which a quorum is present.

#### Section 10. Vacancy

No vacancy in the membership of the Board shall impair the right of a quorum to exercise all rights and perform all duties of the Board. The General Manager and/or Secretary shall promptly notify the appointing authority of any vacancy on the Board.

#### Section 11. Meeting Records and Voting

The Secretary of the Board shall be responsible for minutes of all Board and Committee meetings. All votes taken at any Board meeting or Committee meeting shall be noted in the minutes.

#### Section 12. Compensation

Board members shall not be compensated for their services as per gubernatorial Executive Order. Travel expenses may be paid to Board Members in accordance with current state travel regulations.

### Section 13. Public Hearings

Public hearings shall be conducted in accordance with the Administrative Procedures Act and the rules for public hearings as adopted from time to time by the Board. Public hearings may be scheduled as part of a regular or special meetings or at other times as directed by the Board. When appropriated, a public hearing shall be held in the general locale particularly affected by the action or document under consideration.

### Section 14. Committees

The Chairperson may appoint, from time to time, as deemed necessary, members of the Board to form committees that will report to the full Board. The Chairperson shall further appoint Committee Chairs who shall call committee meetings as needed, and who shall be responsible to report to the Chairperson and the Board, the findings, conclusions and consensus of the Committee. Nothing herein shall be construed to prevent the Chairperson of the Board from appointing himself or herself Chair of the Committee. The Board Chairperson may attend and speak at all committee meetings as a non-voting member, but not be counted for purposes of a quorum. Committee meetings shall be conducted in accordance with the provisions of RIGL Title 42, Chapter 46, entitled "Open Meetings."

A majority of each committee so appointed shall constitute a quorum.

Prior to each committee meeting, the Secretary, after consultation with the Chairperson, shall prepare an agenda. Members of the Board, General Manager, any interested Federal, State or local agencies, or the general public may request to have an item placed on the agenda as set forth in Section 8 above. Copies of the agenda shall be sent to each Board and Committee member at least three (3) days prior to the meeting.

The Secretary of the Board shall record minutes of each committee meeting. The Chairperson of each committee shall record the names of all members of that committee present at each regular meeting or special meeting of the committee.

Should a vacancy occur on the committee, either through resignation or inability of any member to serve on said committee, the Chairperson of the Board may appoint a replacement from the remaining membership of the Board. All members of the committee shall serve at the discretion of the Chairperson, unless otherwise appointed by the Board.

The Chairperson, at his or her discretion, may appoint Board members and non-member advisory committees for the sole purpose of rendering advice to the Board. Members of advisory committees who are not otherwise members of this Board shall not be paid for their services and shall act only in a capacity of advisors to the Board and shall not be able to act on behalf of the Board, speak for the Board or otherwise bind the Board in any manner.

#### Section 15. Access to Files and Records

It is the policy of the Board that its files and records shall be available for inspection by the public to the fullest possible extent consistent with the Board's ability to fulfill its responsibilities, with the rights of individuals to privacy and confidentiality, and with the need for frank policy deliberations by the Board. The Board may promulgate procedural rules and regulations as needed in accordance with appropriate sections of the RIGL to further this policy.

#### Section 16. Contracts, Loans and Deposits

The Board is authorized to enter into contracts and the execute and deliver any instrument in the name of and on behalf of the Board in accordance with the provisions of RIGL Title 46, Chapter 15. Upon approval by the Board, contracts, documents or other legal instruments shall be executed on behalf of the Board by the Chairperson or Vice Chairperson, unless other provisions shall be made by a vote of the Board or shall otherwise be required by law.

Nothing herein shall be construed to require Board approval for contracts, agreements and documents necessary for the daily affairs of the Board. All contracts and other documents necessary for the day to day affairs of the Board shall be executed by the General Manager or any other designee hereinafter authorized by the Board. For the purposes of this section, any contract for monetary value of less than the sum of One Thousand Dollars (\$1,000) shall be considered necessary to carry out the day to day affairs of the Board.

No loans shall be contracted on behalf of the Board and no evidence of indebtedness shall be issued in its name unless authorized by members of the Board in accordance with RIGL and other rules and regulations that this Board may from time to time adopt.

### Section 17. Indemnification

This Board shall indemnify and reimburse each member (and his or her heirs, executors and administrators) who at any time serves or shall have served as a member of the Board duly appointed under RIGL Title 46, Chapter 15, against and for any and all claims and liabilities to which he or she may be or become subject by reason of his or her being or having been a member of the Board, and against and for any and all expenses (including attorneys fees) necessarily incurred in connection with the defense or reasonable settlement of any legal or administrative proceedings to which he or she is made a party by reason of his or her being or having been a member of the Board, except in relation to matters as to which he or she shall finally be adjudged to be liable for gross negligence or misconduct in the performance of his or her official duties. The provisions hereof shall not be deemed to exclude any other rights or privileges to which such member may be entitled as a matter of law or otherwise. Members and former members of this Board shall be further indemnified to the extent as provided for in RIGL Title 7, Chapter 1.1, Section 4.2, entitled "Rhode Island Business Corporation Act."

### Section 18. Fiscal Year

The fiscal year of the Board shall commence July 1 and terminate June 30.

### Section 19. Seal

The members of the Board shall provide a corporate seal which shall have inscribed thereon the name of the Board.

### Section 20. Amendments

The members of the Board shall have the power to amend, repeal or adopt by-laws at any regular or special meeting of the Board. Said power to amend, repeal or adopt these by-laws shall be by a two-thirds (2/3) vote of the members of the Board.

### Section 21. Procedures

When not inconsistent with these By-Laws or other provisions of the RIGL, the Board shall, to the extent practicable, follow *Robert's Rules of Order*. This section of the By-Laws shall not apply to public hearings. This section of the By-Laws may be suspended from time to

time at any meeting, hearing or proceeding, wherein there is a quorum present, by a vote of two-thirds (2/3) of members present. This suspension, however, shall only be for the duration of the meeting, hearing or other proceeding in which such vote was taken.

Section 22. Effect/Enabling Legislation

These By-Laws will take effect upon approval by the Board. Nothing herein shall be construed to void any action of the Board prior to the effective date of these By-Laws.

NEW

**BY-LAWS  
OF  
RHODE ISLAND WATER RESOURCES BOARD  
CORPORATE**

WRBCL

BY-LAWS  
OF  
RHODE ISLAND WATER RESOURCES BOARD CORPORATE

The By-Laws, the powers of the Rhode Island Water Resources Board Corporate (hereinafter referred to as the "Corporate Board") and of its members and officers, and all matters concerning the conduct and regulation of the business of the Corporate Board shall be subject to the provisions set forth in Title 46, Chapter 15.1, of the General Laws of Rhode Island, as from time to time may be amended (hereinafter referred to as the "Act").

ARTICLE II  
MEMBERSHIP

Members of the Rhode Island Water Resources Board, as established under R.I.G.L. SS46-15-1 are designated as the members of the Corporate Board, in accordance with the provisions of the Act. A member of the board who is affiliated with a public water system in Rhode Island as provided in SS46-15-2 shall not thereby be disqualified from acting as a member of the Corporate Board on a transaction under R.I.G.L. SS46-15.1-1 et seq. with such public water system.

Annually in the month of March, the Corporate Board shall choose a treasurer. Said person need not be a member of the Water Resources Board as established under R.I.G.L. SS46-15-1 et seq. or of its staff and shall serve until his or her successor is chosen and takes office, unless sooner removed by the Corporate Board with or without cause. In the event of a vacancy in the office of treasurer, the Corporate Board shall fill the vacancy for the unexpired term.

### ARTICLE III

#### OFFICES

The principal office of the Corporate Board shall be located in the City of Providence, State of Rhode Island. The Corporate Board may also have such offices at such other places within or without the State as the Corporate Board may from time to time determine.

### ARTICLE IV

#### BOOKS AND RECORDS

The Corporate Board shall keep at its principal office complete and correct records and books of account and shall keep minutes of the proceedings of the Corporate Board and a list containing the names and addresses of all members.

### ARTICLE V

#### MEETINGS

Section 1. The Board shall hold monthly meetings on the first Tuesday of each month at the principal offices of the Corporate Board following the regular monthly meeting of the Water Resources Board or at such other time as the Corporate Board shall specify.

Section 2. Special meetings of the Corporate Board may be called by or at the request of the Chairman or any two (2) members. Such meetings may be held at the principal office of the Corporate Board or at any other place which may be designated.

Section 3. Written notice of any meeting of the Corporate Board shall be given to each member delivered or sent to the address given by him to the Corporate Board. Said notice shall be given at least twenty-four (24) hours previous to the meeting if delivered personally or sent by telegram, and shall be given at least two (2) business days previous to the meeting if sent by mail.

Section 4. The transactions of any meeting of the Corporate Board, however called and noticed or wherever held, shall be as valid as though transacted at the meeting duly held upon notice, if a quorum is present and if either before or after the meeting, each of the members not present signs a written waiver of notice or a consent to holding such meeting or an approval of the minutes thereof. All such waivers, consents and approvals shall be filed with the minutes of the proceedings of the Corporate Board.

Section 5. Five (5) members of the Corporate Board shall be necessary and sufficient to constitute a quorum for the transaction of business at all meetings of the Authority. Each member shall have one vote and the vote of five (5) members present at any meeting at which there is a quorum present shall be the act of the Corporate Board.

ARTICLE VI

OFFICERS

Section 1. The officers of the Corporate Board shall be a Chairman, a Vice Chairman, a Secretary, and a Treasurer. The Chairman, Vice Chairman and Secretary shall be those persons who hold the same office simultaneously in the Water Resources Board under R.I.G.L. §46-15-1 et seq. The Treasurer shall be chosen in accordance with the provisions of Article II hereof.

Section 2. Each member of the Corporate Board chosen as an officer shall serve his or her term as designated in R.I.G.L. §46-15-1 et seq. When any vacancy occurs or at the expiration of an officer's term, it shall be filled in accordance with R.I.G.L. §46-15-1 et seq.; however, if a vacancy occurs in the office of treasurer, the Corporate Board shall fill said vacancy for the unexpired term.

Section 3. The Chairman shall preside at all meetings of the Corporate Board and shall have general supervision of the affairs of the Corporate Board. The Chairman may appoint, subject to the approval of the Corporate Board, such standing or temporary committees as may from time to time be deemed suitable, necessary or convenient to aid in accomplishing the purposes of the Corporate Board. The powers and duties of, and the length of terms of, the members of such committees shall be as prescribed by the Corporate Board.

Section 4. In the event of the absence from any meeting or the incapacity of the Chairman, the Vice Chairman shall perform all of the duties of the Chairman and when so acting shall have all the powers of and be subject to all the restrictions upon the Chairman. The Vice Chairman shall have such other powers and perform such other duties as from time to time may be prescribed for him, respectively, by the Corporate Board or the By-Laws.

Section 5. The secretary shall issue notices for and keep minutes of all meetings, shall have charge of the Corporate Board's seal and Corporate Board's books, and shall make such reports and perform such other duties as are incident to his office or required of him by the Corporate Board.

Section 6. The treasurer shall give such bond for the faithful performance of his duties as the Corporate Board may demand. He shall receive and keep in his custody all monies, bonds, deeds, and other securities and all personal property belonging to the Corporate Board except as otherwise provided in these By-Laws, and shall manage them under the direction and control of the Corporate Board. He shall open an account or accounts in the name of the Corporate Board with such depositories as the Corporate Board shall designate and shall deposit all monies in such depositories. He shall keep such books and records as may be required by the Corporate Board, and at the expiration of his term of office, he shall turn over to this successor or to the

Corporate Board all books, papers, monies, or other property of the Corporate Board in his possession. He shall make a report annually to the Corporate Board of the income and expenditures and of the condition of the treasury and funds of the Corporate Board up to the end of the fiscal year. He shall perform all acts incident to the office of treasurer and shall have such other powers and perform such other duties as may be prescribed by these By-Laws or by the Corporate Board.

Section 7. Each officer shall, subject to these By-Laws, have in addition to the duties and powers herein set forth, such duties and powers as are commonly incident to his office, and such duties and powers as the Corporate Board shall from time to time designate.

## ARTICLE VII

### SIGNATURES

Section 1. All bonds, notes or other obligations or evidence of indebtedness, deeds, leases, mortgages, indentures, bills of sale, conveyances, endorsements, assignments, transfers, stock powers, or other instruments of transfer, contracts, agreements, powers of attorney, waivers, consents, returns, reports, certificates, demands, notice or documents, and other instruments or rights of any nature shall be executed by the Chairman, or in his absence, the Vice Chairman, a facsimile signature may be used.

ARTICLE VIII  
INDEMNIFICATION

The Corporate Board shall in its discretion indemnify any person (or the personal representative of any person) who at any time serves or shall have served as a member, officer, agent, servant, or employee of the Corporate Board, whether or not in office at the time, against expenses (including reasonable attorney's fee), judgments, fines and amounts paid in settlement, actually and reasonably incurred by any such person in connection with any threatened, pending or completed action, suit or proceeding, of whatever nature, to the same extent and upon the same conditions as a Rhode Island business corporation would be authorized in each case upon a determination by the Corporate Board that indemnification is proper in the circumstances of that case. Such authorization and determination shall be made by a majority of the members of the Corporate Board. No such determination shall be effective until approved in writing by legal counsel to the Corporate Board.

ARTICLE IX

FISCAL YEAR

The fiscal year of the Corporate Board shall commence on July 1 of each year and end on June 30 of the following year.

ARTICLE X

AMENDMENTS

These by-laws may be altered, amended, or repealed by the members of the Corporate Board at any annual or special meeting of the Corporate Board provided that notice is given to members of the Corporate Board containing the exact language of the proposed amendment.

ARTICLE XI

PURCHASING PROCEDURES

Section I. Application of Article. This article shall apply to every expenditure of public funds except as otherwise provided by law, by the Corporate Board under any contract or like business agreement, excepting only those contracts or like business agreements between the Corporate Board and the state or its political subdivisions or other governments. It shall apply to the disposal of Corporate Board supplies. Nothing in the article shall prevent the Corporate Board from complying with the terms and conditions of any grant, gift, bequest, or cooperative agreement.

Section II. Supplemental general principles of law. Obligation of good faith.

(1) Unless displaced by the particular provision of this article, the principles of law and equity, including the uniform commercial code, the law merchant, and the law of contracts, including, but not limited to, agency, fraud, misrepresentation, duress, coercion, mistake, and bankruptcy, shall supplement these provisions.

(2) Every contract or duty under this article shall impose upon both parts the obligation of good faith in its performance and or, enforcement. "Good faith" shall mean honesty in fact in the conduct or transaction concerned and the observance of reasonable commercial standards of fair dealing.

Section III. Determinations. Every determination required by this article shall be in writing and based upon written findings of fact by the public official making the determination. The determinations and written findings shall be retained in the official contract file at the office of the Corporate Board.

Section IV. Definitions. The words defined in this section shall have the meanings set forth below whenever they appear in this article, unless the context in which they are used clearly requires a different meaning or a different definition is prescribed for a particular section, group of sections or provisions.

(1) "Business" shall mean any corporation, partnership, individual, sole proprietorship, joint stock company, joint venture, or any other legal entity through which business is conducted.

(2) "Change Order" shall mean a written order signed by the purchasing agent, or contractor directing or allowing the contractor to make changes which the changes clause of the contract authorizes the purchasing agent or contractor to order without the consent of the contractor or the purchasing agent.

(3) "Purchasing agent" shall mean the executive director or chief operational officer of the agency and is authorized by the Corporate Board in accordance with procedures prescribed by regulation to enter into contracts and make written determinations and findings thereto.

(4) "Construction" shall mean the process of building, altering, repairing, improving or demolishing any public structures or building, or other public improvements of any kind to any public real property. It does not include routine maintenance or repair of existing structures, buildings, or real property performed by salaried employees of the Corporate Board in the usual course of their job.

(5) "Contracts" shall mean all types of agreements, including grants and orders, for the purchase or disposal of supplies, services, construction, or any other item. It shall include awards; contracts of a fixed price, cost, cost plus a fixed fee, or incentive type; contracts providing for the issuance of job or task orders; leases; letter contracts, purchase orders and construction management contracts. It also includes supplemental agreements with respect to any of the foregoing. "Contract" does not include labor contracts with the employees of the Corporate Board.

(6) "Contract modification" shall mean any written alteration in the specifications, delivery point, rate of delivery, contract period, price, quantity, or other contract provisions of any existing contract, whether accomplished by unilateral action in accordance with contract provision, or by mutual action of the

parties to the contract. It shall include bilateral actions, such as supplemental agreements, and unilateral actions, such as change orders, administrative changers, notice of termination, and notices of the exercise of a contract option.

(7) "Contractor" shall mean any person having a contract with the Corporate Board.

(8) "Data" shall mean recorded information, regardless of form or characteristic.

(9) "Designee" shall mean a duly authorized representative of a person holding a superior position.

(10) "Employee" shall mean an individual drawing a salary from the Corporate Board, whether elected or not, and any non-salaried individual performing personal services for the Corporate Board.

(11) "May" shall mean permissive.

(12) "Negotiation" shall mean contracting by either method set forth in Sections X, XI, and XIV of this article.

(13) "Person" shall mean any business, individual, organization or group of individuals.

(14) "Procurement" shall mean the purchasing, buying, renting, leasing or otherwise obtaining of any supplies, services, or construction. It shall also include all functions that pertains to the obtaining of any supply, service or construction item, including description of requirements, election and solicitation of sources, preparation and award of contract, and all phases of contract administration.

(15) "Services" shall mean the rendering by a contractor, of its time and effort rather than the furnishing of a specific end product other than reports which are merely incidental to the required performing services. "Services" does not include labor contracts with employees of the Corporate Board.

(16) "Shall" shall mean imperative.

(17) "Supplies" shall mean all property, including but not limited to leases of real property, printing and insurance, except land and interest therein.

(18) "Using Agency shall mean the Corporate Board which utilizes any supplies, services, or construction purchased under this article.

(19) As used in Section XLIV of this article, "architect" or "engineer" services shall mean those professional services within the scope of practice of architecture, professional engineering, or registered land surveying, pertaining to construction, as defined in this article, "consultant" means any person with whom the Corporate Board has a contract which contract provides for a person to give direction or information as regards a particular area of knowledge in which a person is a specialist and/or has expertise. For the purpose of Sections XLIV through L, "directors" shall mean those members of the Corporate Board, appointed pursuant to statute, who comprise the governing body of the Board.

Section V. Authority and duties of the Corporate Board.

(1) The Corporate Board shall have the power and authority over, and may, except as otherwise expressly provided in this article, adopt regulations consistent with this article, governing the purchasing, management, and control of any and all supplies, services, and construction, and other items required to be purchased by the Corporate Board.

(2) Regulations shall be adopted governing the following: (a) Prequalification, suspension, debarment, and reinstatement of prospective bidders.

(b) Small purchase procedures.

(c) Conditions and procedures for the use of source selection methods authorized by this article including emergency purchases;

(d) Opening and rejection of bids or offers, consideration of alternate bids, and waiver of informalities in offers;

(e) Confidentiality of technical data and trade secrets information submitted by actual or prospective bidders or offerors;

(f) Partial, progressive, and multiple awards;

(g) Management, transfer, sale, or other disposal of Corporate Board property;

(h) To develop a program which involves and/or utilizes small business and small disadvantage business as contractors.

(i) The Corporate Board may adopt such other regulations as deemed advisable to carry out the purpose of this article.

Section VI. Authorities and duties of the purchasing agent.

The purchasing agent shall have the following authorities and responsibilities:

(1) To serve as the central procurement and contracting agency of the Corporate Board.

(2) To recommend regulations, rules, and procedures to the Corporate Board;

(3) To purchase or otherwise acquire, or, with the approval of the Corporate Board to delegate the purchase and acquisition of all supplies, services, and construction for the Corporate Board;

(4) Supervision of storerooms and inventories, including determination of appropriate stock levels;

5) To exercise general supervision and control over all warehouses, storerooms, and stores and of all inventories of supplies, services, and construction belonging to the Corporate Board;

(6) To establish and maintain programs for the development and use of purchasing specifications, and for the inspection, testing, and acceptance of supplies, services, and construction.

Section VII. Source selection and contract formation statutory provisions - As used in Sections VIII through XXIV of this article unless the context in which they are used clearly requires a different meaning.

(1) "Cost reimbursement contract" shall mean a contract under which the state reimburses the contractor for those contract costs within the stated ceiling, which are allowable and allocable in accordance with cost principles (as provided in Section XXXIII of this article) and a fixed fee, if any;

(2) "Established catalogue price" shall mean the price included in the most current catalogue, price list, schedule or other form that:

(a) Is regularly maintained by a manufacturer or vendor of an item; and

(b) Is either published or otherwise available for inspection by customers; and

(c) States prices at which sales are currently or were last made to a significant number of buyers constituting the general buying public for that item; and

(d) States prices which are obtained from the most recent industry wide publications and informational journals, if any.

(3) "Evaluated bid price" shall mean the dollar amount of a bid after bid prices adjustments are made pursuant to objective measurable criteria, set forth in the invitation to bids, which affect the economy and effectiveness in the operation or use of the product, such as reliability, maintainability, useful life, and residual value.

(4) "Invitation for bids" shall mean all documents, whether attached or incorporated by reference, utilized for soliciting bids in accordance with the procedures set forth in Section IX of the article.

(5) "Request for proposals" shall mean all documents whether attached or incorporated by reference, utilized for soliciting proposals in accordance with the procedures set forth in Sections V, XII, XIII, or XIV of this article.

(6) "Responsible bidder of offeror" shall mean a qualified bidder who has the capability in all respects including financial responsibility to perform fully the contract requirements and the integrity and reliability which will show good faith performance.

(7) "Responsible bidder" shall mean a person who has submitted a bid under Section IX of this article which conforms in all material respects to the invitation for bids, so that all bidders may stand an equal footing with respect to the method and timeliness of submission and as to substance of any resulting contract.

Section VIII. Method of Source Selection. Except as otherwise authorized by law, all Corporate Board contracts shall be awarded by: (1) Competitive sealed bidding, pursuant to Section IX of this article, or

(2) Competitive negotiations, pursuant to Sections X and XI of this article, or

(3) Non-competitive negotiations pursuant to Section XII of this article, or

(4) Small purchase procedures, pursuant to Section XIII of this article.

Section IX. Competitive sealed bidding.

(1) Contracts exceeding the amount provided by Section XIII of this article shall be awarded by competitive sealed bidding unless it is determined in writing that this method is not practicable. Factors to be considered in determining whether competitive sealed bidding is practicable shall include whether:

(a) Specifications can be prepared that permit award on basis of either the lowest bid price or the lowest evaluated bid price; and

(b) The available sources, the time and place of performance, and other relevant circumstances as are appropriate for the use of competitive sealed bidding.

(2) The invitation for bids shall be made on the basis of the lowest bid price or the lowest evaluated or responsive bid price. If the latter basis is used, the objective measurable criteria to be utilized shall be set forth in the invitation for bids if available.

(3) Adequate public notice of the invitation for bids shall be given a sufficient time prior to the date set forth therein for the opening of bids. Such notice may include publication in a newspaper of general circulation in the state as determined by the Corporate Board not less than seven (7) days nor more than twenty-

one (21) days before the date set for the opening of bids. The Corporate Board may make a written determination that the twenty-one (21) day limitation needs to be waived. The written determination shall state the reason why the twenty-one (21) day limitation is being waived and shall state the number of days, giving a minimum and maximum before the date set for the opening of bids when public notice is to be given.

(4) Bids shall be opened publicly at the time and place designated in the invitation for bids. Each bid, together with the name of the bidder, shall be recorded and an abstract made available for public inspection. Subsequent to the awarding of the bid, all documents pertinent to the awarding of the bid shall be made available and open to public inspection and retained in the bid file.

(5) The contract shall be awarded with reasonable promptness by written notice to the responsive and responsible bidder whose bid is either the lowest bid price or lowest evaluated or responsive bid price.

(6) Correction or withdrawal of bids may be allowed only to the extent permitted by regulation issued by the Corporate Board.

#### Section X. Competitive Negotiation

(1) When, under regulations issued by the Corporate Board, the purchasing agent determines in writing that the use of competitive sealed bidding is not practicable, and except as provided in Sections XII and XIII of this article, a contract may be awarded by competitive negotiation.

(2) Adequate public notice of the request for proposals shall be given in the same manner as provided in Section IX of this article.

(3) Contracts may be competitively negotiated when it is determined in writing by the purchasing agent that the bid prices received by competitive sealed bidding either are unreasonable as to all or part of the requirements, or were not independently reached in open competition, and for which:

(a) Each competitive bidder has been notified of the intention to negotiate and is given a reasonable opportunity to negotiate; and

(b) The negotiated price is lower than the lowest rejected bid by a competitive bidder; and

(c) The negotiated price is the lowest negotiated price offered by a competitive offeror.

(4) The request for proposals shall indicate the relative importance of price and other evaluation factors.

(5) Award shall be made to the responsible offeror whose proposal is determined in writing to be the most advantageous to the Corporate Board taking into consideration price and the evaluation factors set forth in the request for proposals.

(6) Written or oral discussions shall be conducted with all responsible offerors who submit proposals determined in writing to be reasonably susceptible of being selected for award. Discussions shall not disclose any information derived from proposals submitted by competing offerors. Discussions need not be conducted:

(a) With respect to prices, where such prices are fixed by law or regulation, except that consideration shall be given to competitive terms and conditions, or

(b) Where time of delivery or performance will not permit discussions; or

(c) Where it can be clearly demonstrated and documented from the existence of adequate competition or accurate prior cost experience with the particular supply, service, or construction item, that acceptance of an initial offer without discussion would result in fair and reasonable prices, and the request for proposals notifies all offerors of the possibility that award may be made on the basis of the initial offers.

Section XI. Negotiations after unsuccessful competitive sealed bidding. -

(1) In the event that all bids submitted pursuant to competitive sealed bidding under Section IX of this article result in bid prices in excess of funds available for the purchase, and the Corporate Board determines in writing:

(a) That there are no additional funds available from any source so as to permit an award to the lowest responsive and a responsible bidder, and the Corporate Board taking into consideration price and the evaluation factors set forth in the request for proposals.

(b) The best interest of the Corporate Board will not permit the delay attendant to re-solicitation under revised specifications, or for revised quantities, under Competitive sealed

bidding, as provided in Section IX of this article, then a negotiated award may be made as set forth in subsection (2) or (3) of this section.

(2) Where there is more than one bidder, competitive negotiations pursuant to Section X of this article, shall be conducted with the three (two if only two) bidders determined in writing to be the lowest responsive and responsible bidders to the competitive sealed bid invitation. Such competitive negotiations shall be conducted under the following restrictions:

(a) If discussions pertaining to the revision of the specifications or quantities are held with any potential offeror, all other potential offerors shall be afforded an opportunity to take part in such discussions; and

(b) A request for proposals, based upon revised specifications or quantities, shall be issued as promptly as possible, shall provide for an expeditious response to the revised requirements, and shall be awarded upon the basis of the lowest bid price or lowest evaluated bid price submitted by any responsive and responsible offeror.

(3) When, after competitive sealed bidding, it is determined in writing that there is only one responsive and responsible bidder, a noncompetitive negotiated award may be made with such bidder in accordance with Section XII of this article.

Section XII. Set supply procurement and emergency procurement

(1) A contract may be awarded for a supply, service, or

construction item without competition when under published regulations, the Corporate Board determines, in writing, that there is only one source of the required supply, service or construction item.

(2) Notwithstanding any other provision of this article, the purchasing agent may make or authorize others to make emergency procurement when there exists a threat to public health, welfare or safety under emergency conditions as defined in regulations; provided, that such emergency procurement shall be made with such competition as is practicable under the circumstances. A written determination of the basis for the emergency and for the selection of the particular contractor shall be included in the contract file.

Section XIII. Small purchases. - Procurement, not to exceed an aggregate amount of five thousand dollars (\$5,000) for construction and two thousand five hundred dollars (\$2,500) for all other purchases may be made in accordance with small purchase regulations promulgated by the Corporate Board. Procurement requirements shall not be artificially divided so as to constitute a small purchase under this section.

Section XIV. Cancellation of invitation for bids and requests for proposals. - An invitation for bids, a request for proposals, or other solicitation may be cancelled, or all bids or proposals may be rejected, if it is determined in writing that

such action is taken in the best interest of the Corporate Board by

the Corporate Board.

Section XV. Responsibilities of bidders and offerors. -

(1) A written determination or responsibility of a bidder or offeror shall be written determination of responsibility of a bidder or offeror shall be made and it shall be made in accordance with regulations issued by the Corporate Board.

A reasonable inquiry to determine the responsibility of a bidder or offeror may be conducted. The failure of a bidder or offeror to promptly supply information in connection with such an inquiry may be grounds for a determination of non-responsibility with respect to such a bidder or offeror.

(2) Except as otherwise provided, by law, information furnished by a bidder or offeror pursuant to this section may not be disclosed outside the purchasing agency administering the contract without prior written consent of the bidder or offeror.

Section XVI. Prequalification of contracts. - General. The Corporate Board may provide for prequalification of suppliers as responsible prospective contractors for particular types of supplies, services, and construction. Solicitation mailing lists of potential contractors of such supplies, services, and construction shall include but need not be limited to such prequalified contractors. Prequalification shall not foreclose a written determination:

(1) Between the time of the bid opening or receipt of offers and the making of an award, that a prequalified supplier is not responsible; or

(2) That a supplier who is not prequalified at the time of bid opening or receipt of offers is responsible.

Section XVII. Prequalification - Construction management. -

A person who bids on a construction management contract shall provide the following information, which information shall constitute the prequalifications for a construction management contract.

(1) Firm history.

(a) Name of the firm.

(b) Location of principal and branch offices.

(c) Length of time in business.

(d) Firm ownership structure.

(e) Annual construction management volume for each of the past five (5) years including number of projects and total construction volume.

(2) Personnel.

(a) Total number of the firm's personnel, other than secretarial/clerical, by professional or skill group.

(b) Outside firms which will be used to provide such services as estimating, value engineering analysis, scheduling or computer services.

(3) Experience.

(a) Projects which the firm has constructed during the past five (5) years, including those where the firm has served as construction manager including the project name and address, year completed, type of project, construction cost and reference.

(4) Project Staffing.

(a) The firm's proposed management staff for the project including an organizational chart identifying the firm's key staff members and showing how each staff member interacts with other staff members assigned to the project.

(b) Detailed resume for each key staff member which summarizes education, professional registration, professional society membership, construction experience, and construction management project experience.

(5) Services.

(a) Scope of preconstruction phase services, including how such services they are provided with specific attention to the first budget estimate, methods of cost control, scheduling, value engineering and the method of reporting project status and schedule position.

(b) Scope of construction phase services and how such services are to be provided.

(c) The firm's method of working with the project architects, engineers, consultants and other planning team members.

(d) The firm's method of coordinating the efforts of the

various trade contractors.

Section XVIII. Cost or pricing data.

(1) A contractor shall submit cost or pricing data and shall certify that, to the best of his knowledge and belief, the cost of pricing data submitted was accurate, complete, and current as of a mutually determined specified date prior to the date of:

(a) The pricing of any negotiated contract where the total contract price is expected to exceed fifty thousand dollars (\$50,000); or

(b) The pricing of any change order or contract modification which is expected to exceed twenty-five thousand dollars (\$25,000), or such lesser amount in either instance as may be prescribed by the purchasing agent.

(2) Any contract, change or modification thereto under which a certificate is required shall contain a provision that the price to the Corporate Board, including profit or fee, shall be adjusted to exclude any significant sums by which the purchasing agent finds that such price was increased because the contractor furnished cost or pricing data, as of the date agreed upon between the parties, was inaccurate, incomplete, or not current.

(3) The requirements of this section need not be applied to contracts where the price negotiated is based on adequate price competition, established catalogue or market prices of commercial items sold in substantial quantities to the general public, prices set by law or regulation or in exceptional cases where it is determined in writing by the Corporate Board that the requirements

of this section may be waived, and the reasons for such waiver are stated in writing.

Section XIX. Cost plus a percentage of cost. - The cost plus a percentage of cost type of contract shall not be used.

(3) When, after competitive sealed bidding, it is determined in writing that there is only one responsive and responsible bidder, a noncompetitive negotiated award may be made with such bidder in accordance with Section XII of this article.

Section XX. Cost Reimbursement Contracts.

(1) No contract providing for the reimbursement of the contractor's cost plus a fixed fee, hereinafter referred to as a cost reimbursement contract may be made under Sections X, XI, or XII of this article unless it is determined in writing by the Corporate Board that such contract is likely to be less costly to the Corporate Board than any other type of contract, or that it is impracticable to obtain supplies or services of the kind or quality required except under such a contract.

(2) Each contractor under a cost reimbursement type contract shall obtain consent, as provided for in the contract, before entering into:

- (a) A cost reimbursement type subcontract; or
- (b) Any other type of subcontract involving more than ten thousand dollars (\$10,000) or ten percent (10%) of the estimated cost of the prime contract.

(3) All cost reimbursement type contracts shall;1 contain a

provision that only costs recognized as allowable, in accordance with cost principles set forth in regulations issues pursuant to Section XXXIII of this article.

Section XXI. Use of other types of contracts. - Subject to the limitations of Sections XIX and XX of this article, any type of contract which will promote the best interests of the Corp. Board may be used.

Section XXII. Approval of accounting system. - Except with respect to firm fixed price type contracts, no contract type shall be used unless it has been determined in writing that the proposed contractor's accounting system will permit timely development of all necessary cost data in the form required by the specific contract type contemplated and that the contractor's accounting system is adequate to allocate costs in accordance with generally accepted accounting principles.

Section XXIII. Right to inspect facilities.

(1) The Corporate Board may inspect the plant or place of business of a contractor or any subcontractor under any contract awarded or to be awarded by the Corporate Board.

(2) The Corporate Board may audit the books and records of any person who has submitted cost or pricing data under Section XVIII of this article at any time until the period of record retention as set forth in subsection (3) of this section shall have expired. The right to audit hereunder shall only extend to those books and records reasonably connected with costs or pricing data submitted under Section XVIII of this article and such books and

records shall be maintained by the contractor or subcontractor for the period specified in subsection (3) of this section.

(3) The Corporate Board shall be entitled to audit the books and records of a contractor or any subcontractor under any negotiated contract or subcontract other than a firm fixed-price type contract, provided however, that this subsection enable the Corporate Board to effect desired changes and modifications to such contracts.

(2) The Corporate Board shall issue regulations relating to the termination of contracts for the procurement of supplies or services for the convenience of the contractor and/or the Corporate Board.

Section XXXIII. Cost and pricing principles - Regulations required. The Corporate Board shall issue regulations setting forth cost principles which shall be used:

(1) As guidelines in the negotiation of:

(a) Estimated costs of fixed prices when the absence of open market competition precludes the use of competitive sealed bidding.

(b) Adjustments for Corporate Board directed changes or modifications in contract performances; and

(c) Settlements of contracts which have been terminated.

(2) To determine the allowability of incurred costs for the purpose of reimbursing costs under contract provisions which provide for the reimbursement of costs; and

(3) As appropriate in any other situation where the

determination of the estimated or the incurred costs of performing contracts may be required.

Section XXXIV. Supply disposition process. - The Corporate Board shall sell or otherwise dispose of all property (including any interest in real property) of the Corporate Board which is not needed or has become unsuitable for public use, or would be more final decision, or within such longer period as might be established by the parties to the contract in writing, then the contractor may proceed as if an adverse decision had been received.

Section XXXVII. Arbitration. - The provisions of chapter 16 of title 37 of the general laws of Rhode Island, as amended, shall apply to all contracts awarded under this article.

Section XXXVIII. Disputes and appeals procedure. -

(1) This section shall apply only to contracts that are not arbitrable under the provisions of chapter 16 of title 37 of the general laws of Rhode Island, as amended.

(2) Any person, firm or corporation having a lawfully authorized written contract with the Corporate Board at the time of or after January 1, 1990 may bring an action against the Corporate Board on the contract, including but not limited to actions either for breach of contracts or for enforcement of contracts or for both. Any such claim shall be commenced in superior court within three (3) years from the date of completion specified in the contract and shall be tried by the court sitting without a jury. Such case shall receive a priority position on the calendar. All defenses in law or equity, except the defense of governmental

immunity, shall be preserved to the Corporate Board.

(3) The court shall enter its findings as a judgment of the court, and such judgment shall have the same effect and be enforceable as any other judgment of the court in civil cases, subject to the provisions of chapter 2, Title 37 of the general laws of Rhode Island, as amended.

(4) Appeals may be taken to the supreme court under the same conditions and under the same practice as appeals are taken from judgments in civil cases rendered by the superior court.

(5) If damages awarded on any contract claim under this section exceed the original amount of the contract, such excess shall be limited to an amount which is equal to the amount of the original contract.

(5) If damages awarded on any contract claim under this section exceed the original amount of the contract, such excess shall be limited to an amount which is equal to the amount of the original contract.

(6) No person, firm or corporation shall be permitted more than one (1) money recovery upon a claim for the enforcement of or for breach of contract with the Corporate Board.

Section XXXIX. Decision presumed to be correct. - The decision of any official, board, agent, or other person appointed by the Corporate Board concerning any controversy arising under, or in connection with, the solicitation or award of a contract, shall be entitled to presumption of correctness and shall not be disturbed unless the decision was procured by fraud; in violation of

constitutional or statutory provisions; in excess of the statutory authority of the Corporate Board, made upon unlawful procedure; affected by other error or law; clearly erroneous in view of the reliable, probative, and substantial evidence on the whole record; or arbitrary or capricious or characterized by abuse of discretion or clearly unwarranted exercise of discretion.

Section XL. Authority to resolve protests.

(1) The Corporate Board or his or her designee shall have authority to determine protests and other controversies of actual or prospective bidders or offerors in connection with the solicitation or selection for award of a contract.

(2) Any actual or prospective bidder, offeror, or contractor who is aggrieved in connection with the solicitation or selection for award of a contract may file a protest with the Corporate Board. A protest or notice of other controversy must be filed promptly and in any event within two (2) calendar weeks after such aggrieved person knows or should have known of the facts giving rise thereto. All protests or notices of other controversies must be in writing.

(3) The Corporate Board shall promptly issue a decision in writing. A copy of that decision shall be mailed or otherwise furnished to the aggrieved party and shall state the reasons for the action taken.

Section XLI. Written determination for continuation of the

procurement. In the event of a protest timely filed under Section XL(2), the Water Resources Board shall not proceed further with the solicitation or award involved, until the Corporate Board makes a written and adequately supported determination that continuation of the procurement is necessary to protect substantial interest of the Corporate Board.

Section XLII. Corporate Board - Purchases. - The Corporate Board, except as otherwise provided by law, shall purchase, or all delegate and control the purchase of, the combined requirements of all spending including, but not limited to, interests in real property, contractual services, rentals of all types, supplies, materials, equipment, and services, except that competitive bids may not be required.

(a) For contractual services where no competition exists such as telephone service, electrical energy, and other public utility services;

(b) When in the judgment of the Corporate Board, food, clothing, equipment, supplies, or other materials to be used in laboratory and experimental studies can be purchased otherwise to the best advantage of the Corporate Board; and instructional materials available from only one (1) source:

(c) Where rates are fixed by law or ordinance;

(d) For library books;

(e) For commercial items that are purchased for resale;

(f) For all other commodities, equipment and services

which, in the reasonable discretion of the Corporate Board, are

available from only one (1) source; and

(g) Interests in real property.

(2) Nothing in this section shall deprive the Corporate Board from negotiating with vendors who maintain a general service administration price agreement with the United States of America or any agency thereof, provided, however, that no contract executed under this provision shall authorize a price higher than is contained in the contract between general service administration and the vendor affected.

(3) The Corporate Board shall adopt regulations to take and maintain inventories of plant and equipment. The purchasing agent shall conduct periodic physical audits of inventories.

(4) Subject to the provisions of this article, the Corporate Board shall purchase or otherwise acquire all real property determined to be needed for Corporate Board use, upon the approval of the state properties committee as to the determination of need and as to the action of purchase or other acquisition, provided that the amount paid shall not exceed the appraised value or value set by eminent domain procedure.

(5) The Corporate Board shall attempt in every practicable way to insure the Corporate Board's supplying its real needs at the lowest possible cost.

Section XLIII. Goods produced in the Republic of South Africa.

- In conformity with the policy of divestment established in SS 35-10-12, the State of Rhode Island, including all of its departments, agencies, authorities, and instrumentalities, shall refrain from

the purchase of any goods which are known to be wholly produced in the Republic of South Africa. Such goods are those which are in their final form for use or consumption without additional processing, assembly, or manufacturing. Further, the Corporate Board will give preference in its purchasing to companies not doing business in, or promulgate such rules and regulations as are necessary and proper to carry out the purpose of this section.

Section XLIV. - Professional services - Architectural engineering and consultant services - Corporate Board.

(1) It shall be the policy of the Corporate Board to publicly announce requirements for architectural and engineering services, which are reasonably estimated to exceed twenty thousand dollars (\$20,000), and to negotiate contracts for such professional services on the basis of demonstrated competence and qualifications and at fair and reasonable prices.

(2) The Corporate Board may appoint a selection committee which shall select persons or firms to render professional services. A quorum consisting of a majority of the selection committee must be present to conduct business.

(3) Procurement of auditing and accounting services shall continue to be subject to the provisions of Title 22, Chapter 13, paragraph 6 and Title 35, Chapter 7, paragraph 13 of the General Laws of Rhode Island, as amended.

Section XLV. Public announcement of needed architectural engineering or consultant services - Corporate Board. - The purchasing officer of the public agency shall give public notice of

the need for architectural engineering or consultant services which are reasonably estimated to exceed twenty thousand (\$20,000). Such public notice shall be published sufficiently in advance of the date when responses must be received in order that interested parties have an adequate opportunity to submit a statement of qualifications and performance data. The notice shall contain a brief statement of the services required, describe the project and specify how a solicitation containing specific information on the project may be obtained. The notice shall be published in a newspaper of general circulation in the state and in such other publications as in the judgment of the purchasing agent shall be desirable.

Section XLVI. Solicitation - Corporate Board. -

(a) A solicitation shall be prepared which describes the Corporate Board requirements and sets forth the evaluation criteria. It shall be distributed to interested persons.

(b) For services reasonably estimated to exceed twenty thousand dollars (\$10,000) a bidder's conference shall be held which describes the criteria to be used in evaluating the statement of qualification and performance data and selection of firms. Criteria shall include, but are not limited to:

(1) Competence to perform the services as reflected by technical training and education; general experience; experience in providing the required services; and the qualifications and competence of persons who would be assigned to perform the

services;

(2) Ability to perform the services as reflected by workload and the availability of adequate personnel, equipment, and facilities to perform the services expeditiously; and

(3) Past performance as reflected by the evaluation of private persons and officials of other governmental entities that have retained the services of the firm with respect to such factors as control of costs, quality of work, and an ability to meet deadlines.

(c) The scope of work shall be discussed and further defined at such conference, including on-site visits, if appropriate.

Section XLVII. Evaluation of qualifications and performance data. - The Corporate Board shall evaluate:

(a) Statements that may be submitted in response to the solicitation of architectural/engineering services; and

(b) Statements of qualifications and performance data, if their submission was required.

All statements and statements of qualifications and performance data shall be evaluated in light of the criteria set forth in the solicitation for architectural/engineering consultant services.

Section XLVIII. Final selection - Corporate Board - Directors. 1- The Corporate Board or the Selection Committee shall select no more than (3) firms (or two (2) if only two (2) apply)

evaluated as being professionally and technically qualified. The firms selected, if still interested in providing the services, shall make a representative available to the directors of the Corporate Board at such time and place as they shall determine, to provide such further information as they may require.

The directors of the Corporate Board shall negotiate with the highest qualified firm for a contract for architectural engineering or consultant services for the public agency at a compensation which said directors determine to be fair and reasonable to the Corporate Board. In making such determination, the directors shall take into account the professional competency of the offerors, the technical merits of the offerors, and the price for which the services are to be rendered. The directors of the Corporate Board shall be responsible for the final selection of the providers of architectural, engineering or consultant services.

Section XLIX. Provision of architectural engineering or consultant services not exceeding twenty thousand dollars. For every Corporate Board project requiring architectural/engineering/consultant services, the fees for which are not reasonably expected to exceed twenty thousand dollars (\$120,000), the Corporate Board's chief operating officer shall be responsible for the final selection of a qualified architectural or engineering or consultant firm for such project. The Corporate Board's chief operating officer shall notify the Corporate Board of such selection.

The Corporate Board chief operating officer shall use the criteria set forth in Section XLIV of this article in making such determination. Such determinations shall be justified in writing.

Section XLIX. Provision of architectural engineering or consultant services not exceeding twenty thousand dollars. For every Corporate Board project requiring architectural/engineering/consultant services, the fees for which are not reasonably expected to exceed twenty thousand dollars (\$20,000), the Corporate Board's chief operating officer shall be responsible for the final selection of a qualified architectural or engineering or consultant firm for such project. The Corporate Board's chief operating officer shall notify the Corporate Board of such selection.

The Corporate Board's chief operating officer shall use the criteria set forth in Section XLIV of this article in making such determination. Such determinations shall be justified in writing.

Section L. Professional services - Legal - Corporate Board. Before the Corporate Board procures the services of an attorney, it shall demonstrate to the satisfaction of the directors of the Corporate Board the following:

- (1) The need for the services required including the scope of services to be performed;
- (2) That no legal personnel employed by the state on a full-time basis is available to perform such services;
- (3) That funding is available, indicating from which sources such funding is to be provided;

(4) That attorneys to be engaged meet the following minimum requirements:

(a) Appropriate professional licensing and;

(b) Competence to perform such services as reflected by formal training and education, general experience and experience in providing the required services and the qualifications and competence of persons who would be assigned to perform the services;

(c) The ability to perform the services as reflected by workload and availability of adequate personnel, equipment and facilities to perform the services expeditiously.

(2) The attorney shall enter into a letter of engagement with the agency. The letter of engagement shall state the rate of compensation, the scope of the services to be performed for the compensation and provision for the payment of expenses incurred in connection with legal services. The letter of engagement shall certify that the rate of compensation does not exceed the rate of compensation charged by counsel to his or her preferred public or private clients. A letter of engagement shall not be for more than one (1) year.

Section LI. Equal Employment Opportunity.

For all contracts for supplies and services exceeding ten thousand dollars (\$10,000), vendors must comply with the requirements of Federal Executive Order 112466, and amended, and Section 22.5.2-10 of the General Laws of Rhode Island, as amended.

Failure to comply will be considered a substantial breach of the contract subject to penalties prescribed on regulations administered by the Department of Administration of the State of Rhode Island.

Section LIII. Conflict of Interest.

No member or employee of the Corporate Board shall have any interest, financial or otherwise, direct or indirect, or engage in any activity which is in substantial conflict with the proper discharge of his or her duties as a member or employee of the Corporate Board.



## **Appendix F:**

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# **1915 Public Law Chapter 1278 for Providence Water Supply Board**

CHAPTER 1277.

Approved April 8, 1915.

AN ACT AUTHORIZING THE CITY OF PROVIDENCE TO PAY TO INCORPORATED ASSOCIATIONS NOT MORE THAN FIVE HUNDRED DOLLARS A YEAR TO DEFRAY THE EXPENSES OF MAKING PROPER DISPOSITION OF HOMELESS STRAY CATS.

*It is enacted by the General Assembly as follows:*

City council of city of Providence authorized to appropriate for disposition of homeless stray cats.

SECTION 1. The city council of the city of Providence is hereby authorized annually to appropriate and pay to any incorporated association or associations located in said city not exceeding five hundred dollars in all in any year, to be used exclusively to defray the expenses incident to making proper disposition of homeless stray cats.

SEC. 2. This act shall take effect upon its passage.

CHAPTER 1278.

Approved April 21, 1915.

AN ACT TO FURNISH THE CITY OF PROVIDENCE WITH A SUPPLY OF PURE WATER.

*It is enacted by the General Assembly as follows:*

"Water Supply, Board of the city of Providence," establishment of, authorized.

SECTION 1. A board of commissioners, to be known as the water supply board of the city of Providence, is hereby established in and for the city of Providence, consisting of the seven persons who are now the members of the committee relative to increased water supply in the city, appointed by the city council of said city under resolution number 19, approved January 7, 1913, and resolution number 423, approved December 6, 1913, and Chapter 69 of the ordinances, approved December 9, 1914. Such persons shall hold their respective offices as members

Term of office of members.

of said board until the duties of said board hereunder are completed, and such of said persons as are *ex officio* members of said committee shall not cease to be members of said board by reason of their ceasing to hold their other respective offices. When any vacancy in said board shall be filled, the person appointed or elected to fill such vacancy shall hold such office until said duties of said board are completed. Each member of said board shall duly qualify before acting as such member. If any member of said board shall at any time cease to be a citizen and resident of said city, his office therein shall thereupon be vacant. Whenever any vacancy in said board shall occur for any cause, within fourteen days and not earlier than seven days thereafter the city council of said city shall meet in convention, and if the city council or either branch thereof is not to be in session during said period at such time that such meeting in convention may be held, the mayor of said city shall call a special meeting of the city council or either branch thereof so that such meeting in convention may be held during said period. At such meeting in convention, said mayor shall appoint, subject to the approval of said city council in convention some person to fill such vacancy. Whenever said mayor shall not make or announce any such appointment to said city council at the beginning of such meeting, said city council in convention shall proceed at such meeting to elect some person to fill such vacancy. Whenever said mayor shall make and announce any such appointment to said city council at such meeting, and said city council by vote at such meeting shall not approve any such appointment, said city council in convention shall proceed at such meeting to elect some person to fill such vacancy. In case of any failure to so elect, said meeting in convention

Vacancy, qualification, etc.

Vacancy, how filled.

Increase to 150 gpcd

termine whether it shall sell water directly to prospective water users or consumers at retail or to the city or town or water or fire district therein at wholesale rates. Proper connections with said water supply source or sources, including the installation of proper meters or other devices for ascertaining the quantity of water so received, shall be made at such suitable location or locations as shall be determined and approved by the Water Supply Board of the city of Providence or such other officer or officers as may for the time being shall have charge of the water works, and at the expense of the town, city, district or water users desiring to receive such water, and subject to such reasonable rules and regulations as from time to time may be made by the Water Supply Board of said city of Providence or its duly authorized officer or officers as may for the time being shall have charge of the water works. Such town, city or water or fire district or water users or consumers shall have the right to take such water as aforesaid to any extent each month not exceeding an average per day of one hundred fifty gallons per capita of the number of inhabitants of such parts of its territory or territories as are served from such water supply source or sources, as such number of inhabitants was shown by the last preceding census of the United States or of the state of Rhode Island, unless and to the extent and for the time only that said officer or officers of said city of Providence shall consent to the taking by such town, city or water or fire district or water users of a greater quantity of such water. Whenever any such town, city or water or fire district receives water wholesale, such town, city or water or fire dis-

trict shall pay to said city of Providence such fair wholesale rates or charges for the quantity of water taken by it as aforesaid, and at such times, and the rates fixed to continue during such periods, as may be mutually agreed upon, or in default of agreement as shall be determined by three arbitrators, one to be chosen by it, one by said city of Providence and the third by the two so chosen, or in case either party should refuse or neglect to appoint such arbitrator, or in case the two arbitrators chosen by the parties should refuse or neglect to appoint the third arbitrator, said superior court for Providence county, upon petition of either party and after giving the other party opportunity to be heard, shall appoint such arbitrator or such third arbitrator as the case may be. And it is provided, further, that in case the city of Providence as hereinbefore provided elects to sell water directly to water users or consumers, the Water Supply Board of the city of Providence or such other officer or officers as may for the time being shall have charge of water works, shall have the right to determine the rate at which said water shall be sold. Said city of Providence may furnish water from such water supply source or sources to any incorporated water company for use as aforesaid in either of said drainage districts or in the towns of North Providence, Johnston, Smithfield and the city of East Providence or in any part of the territory that is supplied by such water company.

The city of Providence shall not be required to serve structures in any city or town at elevations higher than the head characteristics of the present Neutaconkanut pumping station. The city of East Provi- Exception.



## **Appendix G:**

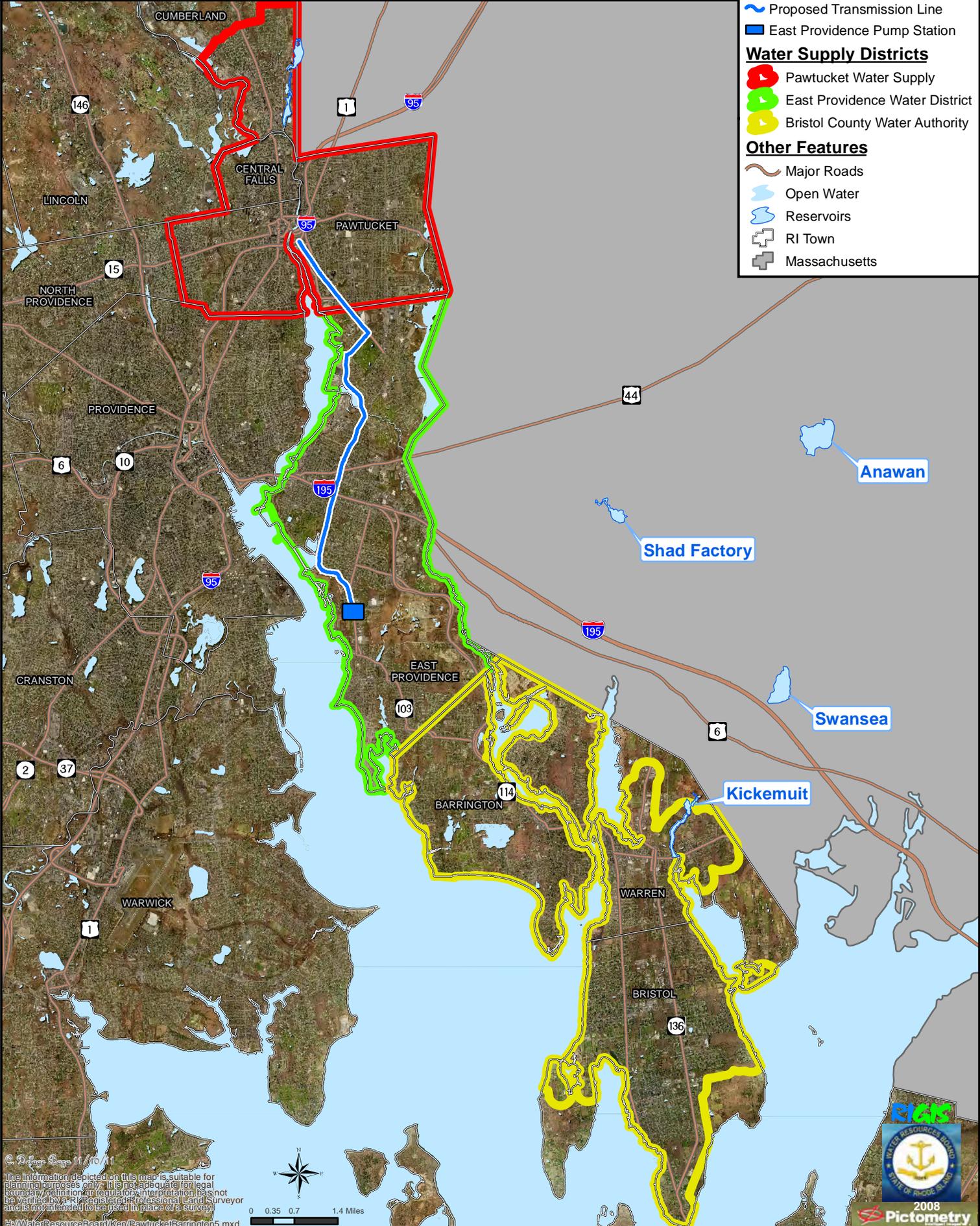
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# **Northern Region Supply - Long Range Options**

# Pawtucket Water Supply to BCWA - Option 1A

## Map Legend

-  Proposed Transmission Line
-  East Providence Pump Station
- Water Supply Districts**
-  Pawtucket Water Supply
-  East Providence Water District
-  Bristol County Water Authority
- Other Features**
-  Major Roads
-  Open Water
-  Reservoirs
-  RI Town
-  Massachusetts



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 The information depicted on this map is suitable for planning purposes only. It is not adequate for legal boundary definition or regulatory interpretation. It has not been verified by a RI Registered Professional Land Surveyor and is not intended to be used in place of a survey.  
 H:\Water Resources\Boards\Ken\PawtucketBarrington5.mxd



## **Preliminary Estimate – Pawtucket Water Supply to BCWA Connection**

Summary - Installation of approximately 6.9 miles of 24 inch diameter cast iron pipe at an estimated cost of \$16,400,000. Line would begin on Prospect Street in Pawtucket and generally follow Pawtucket Avenue (Route114) alignment passing in close proximity to East Providence high and low service finished water storage tanks then terminating at existing East Bay pipeline pump station on Veterans Memorial Parkway.

### Assumptions:

Pipe sized to deliver approximately 5MGD to BCWA and 5MGD to East Providence via gravity flow (HGL of 331 feet in Pawtucket to HGL 215 feet in East Providence)

Solve for pipe diameter:

$$Q = 10\text{MGD} = 15.472 \text{ ft}^3/\text{s}$$

$$V_{\text{avg}} = 7 \text{ ft/s}$$

$$R^2 = Q/V(3.14)$$

$$= (15.472\text{ft}^3/\text{s}) / (7\text{ft/s})(3.14)$$

$$= .70\text{ft}^2$$

$$R = .84\text{ft} (12\text{in}/\text{ft}) = 10.04 \text{ in}$$

$$D = 2R = 2(10.04) = 20.08 \text{ in}$$

Minimum pipe diameter approximately 20in; however, hydraulic analysis will require larger diameter, say 24 in

Transmission:

Diameter of pipe = 24in

Length of pipe = 36,400ft

Project work (complete) - \$450/ft

Cost = 36,400ft x 450/ft = \$16,380,000

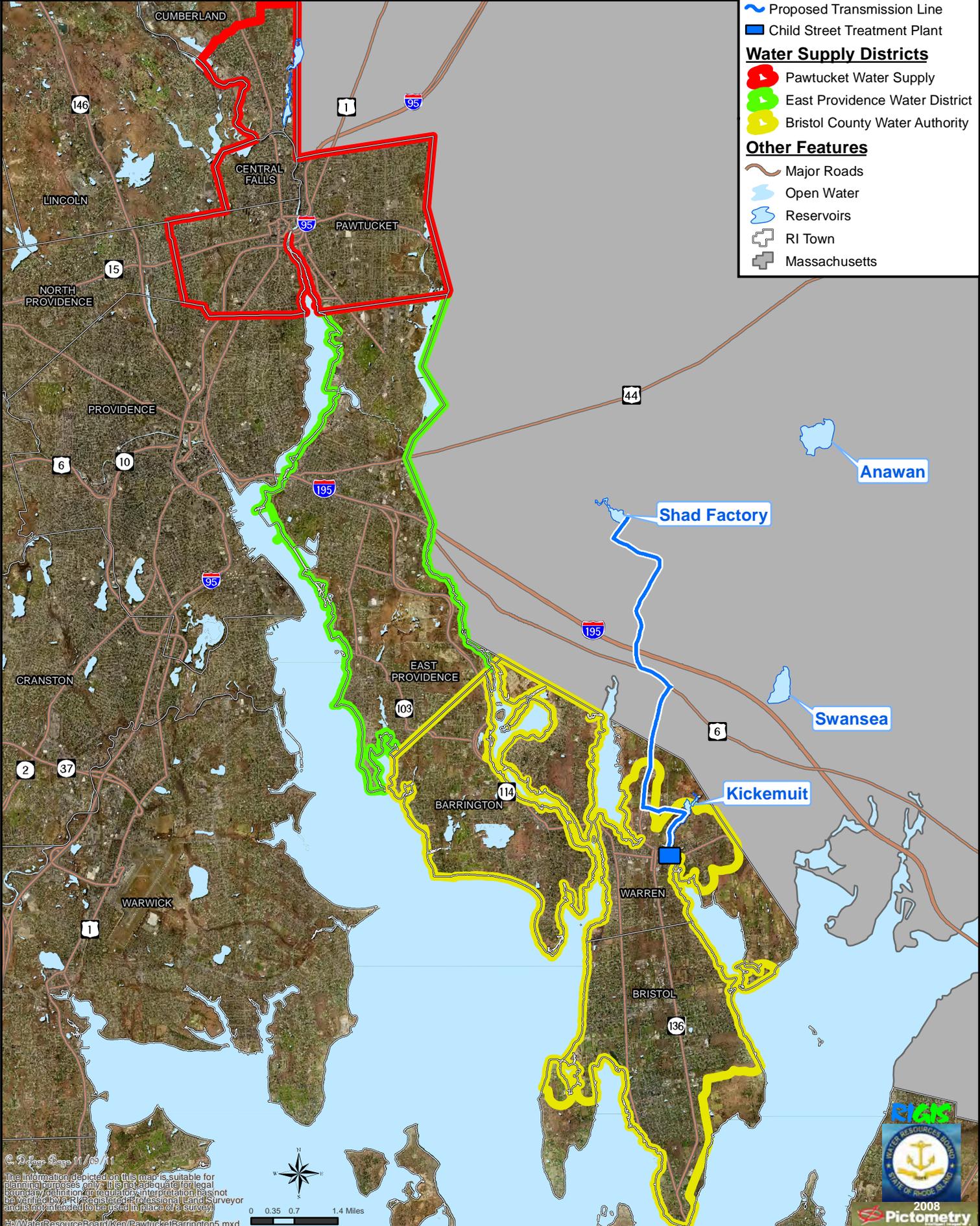
**Total = \$16,380,000**

\*Using unit costs of \$450 - \$480 per foot for recently completed projects and factoring in work in urban area most likely requiring extensive utility relocation, the cost of \$450/ft initially used by BCWA Director Pasquale Delise was considered reasonable.

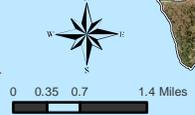
# Shad Factory Pond to BCWA - Option 1B

## Map Legend

-  Proposed Transmission Line
-  Child Street Treatment Plant
- Water Supply Districts**
-  Pawtucket Water Supply
-  East Providence Water District
-  Bristol County Water Authority
- Other Features**
-  Major Roads
-  Open Water
-  Reservoirs
-  RI Town
-  Massachusetts



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## Preliminary Estimate – New Shad Factory Water Transmission Pipeline

Summary - Installation of approximately 7 miles of ductile iron (DI) diameter pipe at an estimated cost of \$7,800,000. The proposed line would begin at the location of the new Shad factory pump station and travel along Rehoboth and Swansea, MA roads until reaching the Kickimuit Reservoir at the site of BCWA's Child Street treatment facility. Additionally construction of new Shad Factory pump station at an estimated cost of \$200,000 and treatment facility upgrades totaling approximately \$2,000,000 or construction of a new treatment facility at approximately \$12,000,000 are required to be implemented in order to transport and ultimately treat Shad Factory raw water. Lastly dam/impoundment improvements of approximately \$700,000, potential dredging of the Kickimuit Reservoir totaling \$10,800,000 and watershed protection/acquisition at an estimated cost of \$1,500,000 will need to be considered to protect both quality and quantity of water into the future.

### Assumptions:

BCWA consultant Dewberry has determined that 16" diameter pipe will provide anticipated flows either directly to the WTP or the Kickimuit Reservoir

Shad Transmission:      Diameter of pipe = 16in  
                                 Length of pipe = 37,800ft  
                                 Project work (complete) - \$205.87/ft\*  
                                 Cost = 38,500ft x \$200/ft = \$7,782,000  
                                 New Shad Pump Station = \$200,000  
                                 **Subtotal = \$7,982,000**

WTP:                              Recommended improvements–CDM May 2010 = \$1,700,000  
                                 Contingency and Code Compliance = \$300,000  
                                 **Subtotal = \$2,000,000**  
                                 (New 3.5 MGD treatment facility option = \$11,550,000)

Watersheds:                      Continued protection/acquisition of strategically  
                                 located watershed lands = \$1,500,000  
                                 **Subtotal = \$1,500,000**

Dams:                              Address physical condition of reservoirs, dams, spillways  
                                 and intake structures = \$700,000  
                                 **Subtotal = \$700,000**

Kickimuit Dredging:              Implement Weston & Sampson recommendation  
                                 to improve water quality/quantity = \$10,800,000  
                                 **Subtotal = \$10,800,000**

**Total=\$22,982,000**  
**(New WTP option \$32,532,000)**

**\*Per foot and new Shad Pump Station costs derived from most recent construction estimates by Dewberry Engineers dated January 25, 2012.**



## **Appendix H:**

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### **Southern Region Supply – Short Range Options**

**HAP**

**New Groundwater Development**

# KCWA to QDC/NK Connection - Option 1

## Map Legend

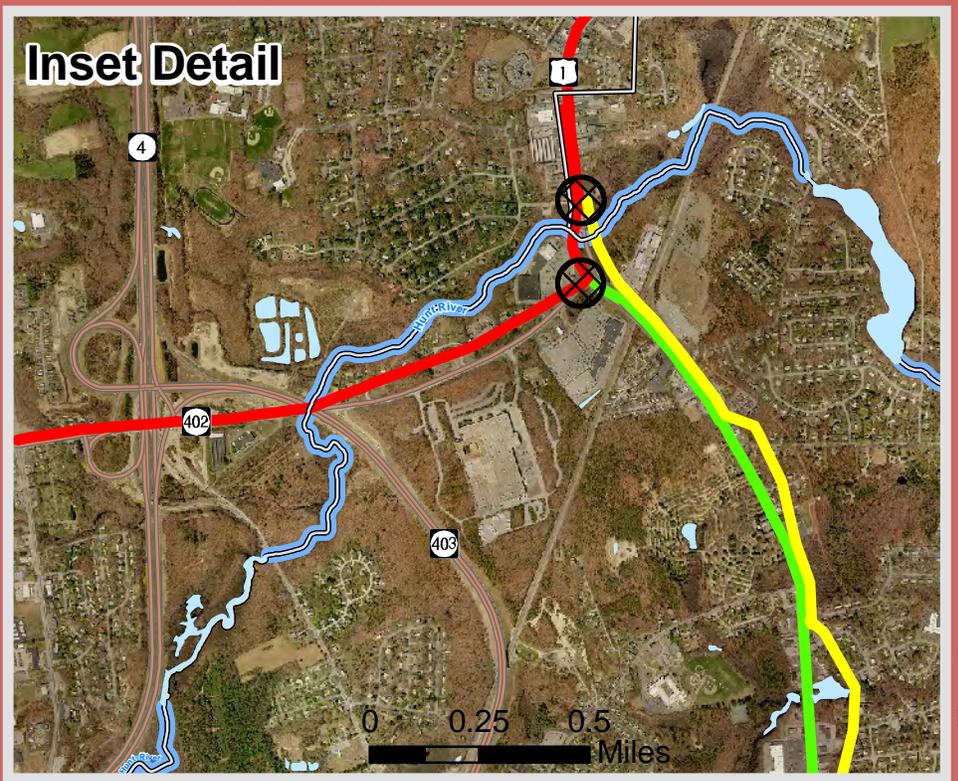
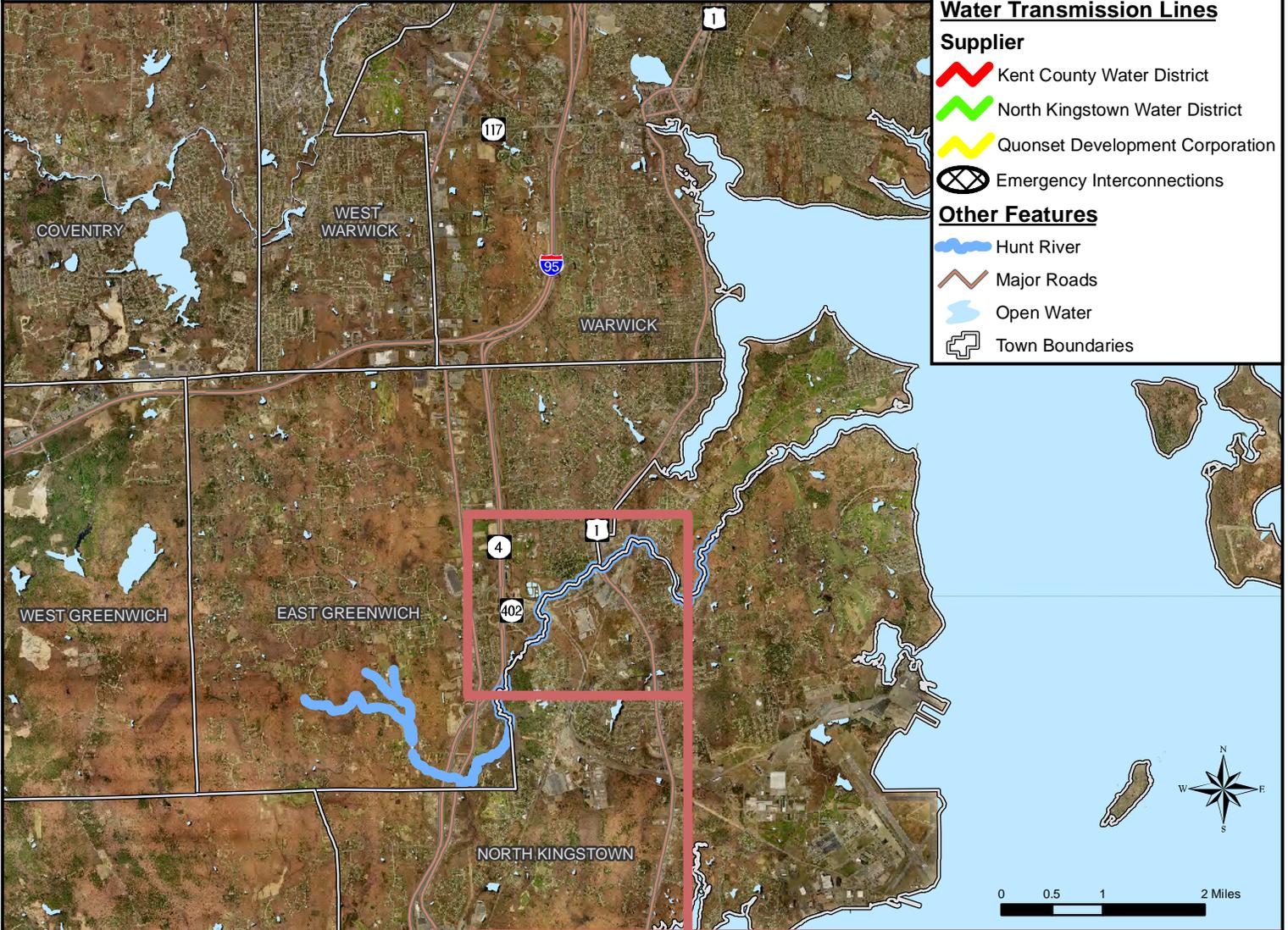
### Water Transmission Lines

#### Supplier

-  Kent County Water District
-  North Kingstown Water District
-  Quonset Development Corporation
-  Emergency Interconnections

### Other Features

-  Hunt River
-  Major Roads
-  Open Water
-  Town Boundaries



**RIGIS**

**Pictometry**  
2008

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## **Preliminary Estimate – KCWA to QDC/NK Water: Option 1**

Summary - Utilize existing Emergency Interconnections from KCWA to both QDC and North Kingstown located at the intersection of Frenchtown and Post Roads to resource protection goals stemming from deficits of water in the HAP.

### Assumptions:

- Concept is for Water Resources Board to implement proactive measures to avoid emergency potentially created by HAP pumping.
- Total current peak deficit in HAP of 5MGD
- Discuss ongoing operations, rates etc with KCWA, NK and QDC
- Discuss with PUC
- Replace current agreements for use of emergency interconnections with revised agreements dictating specified flow over fixed duration for state declared emergencies in the HAP
- Coordinate use of supply through USGS Decision Support System (DSS) to establish reduced pumping protocol in HAP. Monitor results of same.

### Present Capacities:

KCWA to North Kingstown located on Post Road at Franklin from KCWA 20in line to NK 12in line. Limited to 1000GPM (1.44 MGD) per verbal agreement

KCWA to QDC located easterly side of Post Road near Frenchtown Road from KCWA 20in line to QDC 30in line (connection is 12in). Limited to 1000GPM (1.44 MGD) per verbal agreement. Transmission main capacity is 2.5 MGD ±

### Costs:

Upgrade/test KCWA/NK connection - \$50,000  
Upgrade/test KCWA/QDC connection - \$50,000  
Contingency 10% = \$5,000  
Engineering 10% = \$5,000

**Total = \$110,000**

# KCWA to QDC/NK Connection - Option 2

## Map Legend

-  Proposed Transmission Line
- Other Features**
-  Major Roads
-  Open Water
-  Town Boundaries



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## Preliminary Estimate– KCWA to QDC/NK Water: Option 2

Summary - Modify existing emergency interconnections from KCWA to both QDC and North Kingstown located at the confluence of Frenchtown and Post Road to provide either emergency (to address HAP deficits) or supplemental supply to North Kingstown and QDC. Projected available capacity of approximately 7 MGD through implementation of KCWA proposed high service upgrade consisting of installation of 20 inch main from upgraded Quaker Lane pumping station approximately 9500 feet directly to high service (2MGD) and providing additional capacity of 5 MGD to points south

### Assumptions:

- Concept is for Water Resources Board to implement proactive measures to avoid emergency potentially created by HAP pumping.
- Total current peak deficit in HAP of 5MGD
- Discuss ongoing operations, rates etc with KCWA, NK and QDC
- Discuss with PUC
- Replace current agreements for use of emergency interconnections with revised agreements dictating specified flow over fixed duration
- Coordinate use of supply through USGS Decision Support System (DSS) to establish reducing pumping protocol in HAP. Monitor results of same.
- Increase economic development potential at QDC and North Kingstown Post Road corridor.

Solve for pipe diameter:

$$\begin{aligned} Q &= 7\text{MGD} = 10.8304 \text{ ft}^3/\text{s} & R^2 &= Q/V(3.14) & R &= .92\text{ft}(12\text{in}/\text{ft}) = 11.02\text{in} \\ V_{\text{avg}} &= 7 \text{ ft/s} & &= (10.8304\text{ft}^3/\text{s})/(7\text{ft/s})(3.14) & D_{\text{min}} &= 2R = 2(8.4) = 16.8 \text{ in} \\ & & &= .493\text{ft}^2 & & \end{aligned}$$

Minimum pipe diameter approximately 17in; however, hydraulic analysis will require larger diameter, say 20in

Costs:	Pump station upgrade = \$500,000
	Emergency interconnections to permanent = \$300,000
	Transmission = \$3,800,000
	Diameter of pipe = 20in
	Length of pipe = 9,500ft
	Materials and installation (complete) - \$400/ft*
	Cost = 9,500ft x 400/ft = \$3,800,000
	Subtotal = <u>\$4,600,000</u>
	Contingency 10% = \$460,000
	Permits, studies, engineering 10% = 460,000
	Valves and appurtenances 5% = \$205,000
	Utility relocation 5% = \$205,000

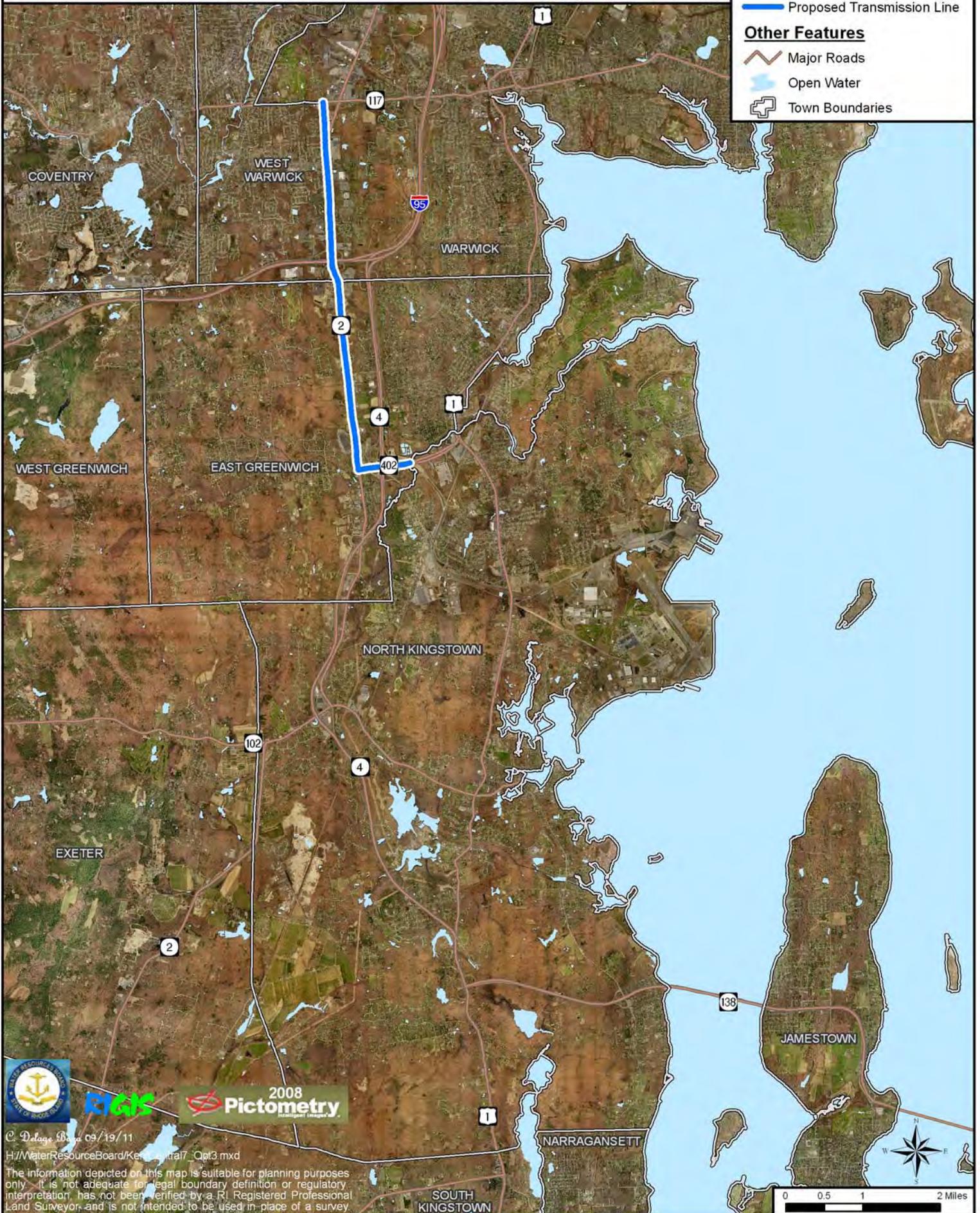
**Total = \$ 5,930,000**

**\*Cost per foot derived from most recent conversations with QDC Engineering Staff**

# KCWA to QDC/NK Connection - Option 3

## Map Legend

- Proposed Transmission Line
- Other Features
  - Major Roads
  - Open Water
  - Town Boundaries



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### **Preliminary Estimate– KCWA to QDC/NK Water: Option 3**

Summary - Utilize existing emergency interconnections from KCWA to both QDC and North Kingstown located at the confluence of Frenchtown and Post Road to provide either emergency (to address HAP deficits) or supplemental supply to North Kingstown and QDC. The projected available capacity is approximately 12 MGD and would be facilitated through implementation of a modified KCWA proposal. Work would consist of completing an additional connection to PWSB as well as upgrade of Quaker Lane pumping station and installation of 36 inch diameter cast Iron or prestressed concrete cylinder pipe approximately 6.2 miles to NK/QDC connections. Project would provide water to KCWA high service (2mgd) and additional capacity of 10 MGD to points south.

#### Assumptions:

- Concept is for Water Resources Board to implement proactive measures to avoid emergency potentially created by HAP pumping.
- Total current peak deficit in HAP of 5MGD
- Discuss ongoing operations, rates etc with KCWA, NK and QDC
- Discuss with PUC
- Replace current agreements for use of emergency interconnections with revised agreements dictating specified flow over fixed duration
- Coordinate use of supply through USGS Decision Support System (DSS) to establish reducing pumping protocol in HAP. Monitor results of same.
- Increase economic development potential at QDC and North Kingstown Post Road corridor.

Solve for pipe diameter –

$$\begin{aligned} Q &= 12 \text{ MGD} = 18.5664 \text{ ft}^3/\text{s} & R^2 &= Q/V(3.14) & R &= .92\text{ft} (12\text{in}/\text{ft}) = 11.02 \text{ in} \\ V_{\text{avg}} &= 7 \text{ ft/s} & &= (18.5664\text{ft}^3/\text{s})/(7\text{ft/s})(3.14) & D &= 2R = 2(11.02) = 22.05 \text{ in} \\ & & &= .8447\text{ft}^2 & & \end{aligned}$$

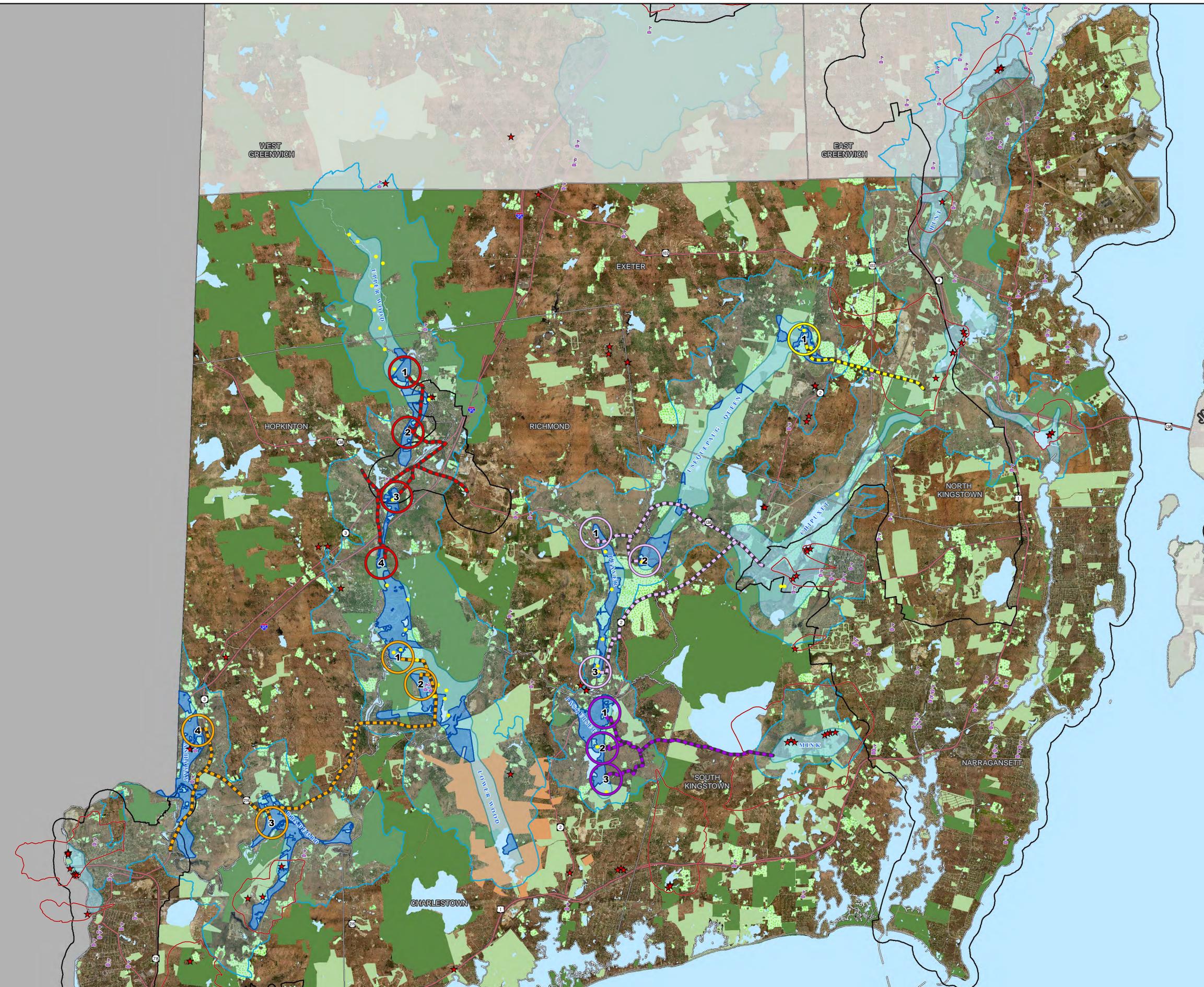
Minimum pipe diameter approximately 24in; Say 36in after hydraulic analysis

Costs:

- New Connection = \$500,000
- Pump station upgrade = \$500,000
- Emergency interconnections to permanent = \$300,000
- Transmission = \$13,094,000
- Diameter of pipe = 36in
- Length of pipe = 32,735ft
- Materials and installation (complete) - \$400/ft
- Cost = 32,735ft x 400/ft = \$13,094,000
- Subtotal = \$14,394,000
- Contingency 10% = \$1,439,400
- Permits, studies, engineering 10% = 1,439,400
- Valves and appurtenances 5% = \$694,700
- Utility relocation 5% = \$694,700

**Total = \$18,662,200**

# Southern Region New Groundwater Sources Option



Supplement Well Fields (1700 ft Buffer)	Wells and WHPAs	Other Features
<ul style="list-style-type: none"> <li>Chipuxet Supplement</li> <li>Hap Supplement</li> <li>Lower Pawcatuck Supplement</li> <li>Mink Supplement</li> <li>RT 138 Growth Corridor</li> </ul>	<ul style="list-style-type: none"> <li>WRB Test Wells</li> <li>Community Wells</li> <li>Large Supplier WHPAs</li> </ul>	<ul style="list-style-type: none"> <li>Schools</li> <li>Major Roads</li> <li>Surface Water</li> <li>Urban Service Boundary</li> <li>Agricultural Lands</li> <li>Town Boundaries</li> <li>Other Counties</li> <li>Connecticut</li> </ul>
Supplement Well Field Lines	Groundwater	Conservation Lands
<ul style="list-style-type: none"> <li>Chipuxet Supplement</li> <li>Hap Supplement</li> <li>Lower Pawcatuck Supplement</li> <li>Mink Supplement</li> <li>RT 138 Growth Corridor</li> </ul>	<ul style="list-style-type: none"> <li>Reservoir Priority Areas*</li> <li>Reservoir Non-Priority</li> <li>Recharge Area</li> </ul>	<ul style="list-style-type: none"> <li>State</li> <li>Local</li> <li>Tribal Lands</li> </ul>

**Map Legend**

**Supplement Well Fields (1700 ft Buffer)**

- Chipuxet Supplement
- Hap Supplement
- Lower Pawcatuck Supplement
- Mink Supplement
- RT 138 Growth Corridor

**Supplement Well Field Lines**

- Chipuxet Supplement
- Hap Supplement
- Lower Pawcatuck Supplement
- Mink Supplement
- RT 138 Growth Corridor

**Wells and WHPAs**

- WRB Test Wells
- Community Wells
- Large Supplier WHPAs

**Groundwater**

- Reservoir Priority Areas\*
- Reservoir Non-Priority
- Recharge Area

**Conservation Lands**

- State
- Local
- Tribal Lands

**Other Features**

- Schools
- Major Roads
- Surface Water
- Urban Service Boundary
- Agricultural Lands
- Town Boundaries
- Other Counties
- Connecticut

**NOTE:** Groundwater Reservoir Priority Areas are areas greater than 5 acres which are not within state/local conservation, tribal, and agricultural lands.

0 0.75 1.5 3 Miles



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## Preliminary Estimate – Southern Region New Groundwater Sources Option

Summary – The WRB has identified potential groundwater sources which would serve the purpose of dispersing current impacts of withdrawals particularly for areas where uses exceed or threaten to exceed the safe yield of a water source (HAP, Chipuxet and Lower Wood basins). Hydro-geologic information and various studies were consulted and potential wellfield locations identified to address strategic objectives.

### Assumptions:

Based upon earlier USGS work conducted for the Board that identified high yield areas and extensive modeling and field work for the Big River Management Area well development program, sites would be roughly 200 acres in size to capture wellhead and recharge areas. For the purpose of estimating costs, the wellfield areas are assumed to contain 10 (ten) individual wellheads to disperse local environmental impacts and produce various volumes. Sites were selected based upon USGS published data, aquifer boundaries, proximity to stressed areas and proximity to undeveloped/protected areas to ensure water quality.

### HAP Supplement

Land Acquisition = 200 acres x 1 million/100acres = \$2,000,000

Wellfield Construction = \$3,400,000

Pipe sized to deliver approximately 3 MGD to North Kingstown

Solve for pipe diameter:

$$\begin{aligned} Q &= 3\text{MGD} = 4.64 \text{ ft}^3/\text{s} & R^2 &= Q/V(3.14) \\ V_{\text{avg}} &= 7 \text{ ft/s} & &= (4.64\text{ft}^3/\text{s})/(7\text{ft/s})(3.14) \\ & & &= .21\text{ft}^2 \\ R &= .46\text{ft} \text{ (12in/ft)} = 5.51\text{in} \\ D &= 2R = 2(5.51) = 11.03 \text{ in} \end{aligned}$$

Minimum pipe diameter approximately 11in; however, hydraulic analysis will require larger diameter, say 12 in

Transmission – Wellfield to North Kingstown

Diameter of pipe = 12 inch

Length of pipe = 15,354ft

Material & installation (complete) - \$400/ft

Preliminary cost = 15,354ft x 400/ft = \$6,141,600

Contingency 10% = \$614,160

Permits, studies, engineering 10% = \$614,160

Valves and appurtenances 5% = \$307,080

Utility relocation 5% = \$307,080

Subtotal: Transmission = \$ 7,984,080

**Total HAP Supplement = \$13,384,080**

### Chipuxet Supplement

Land Acquisition = 600 acres x 1 million/100acres = \$6,000,000

Wellfield Construction = \$3,400,000

Pipe sized to deliver approximately 5 MGD to Kingston area

Solve for pipe diameter:

$$Q = 5\text{MGD} = 7.74 \text{ ft}^3/\text{s}$$

$$V_{\text{avg}} = 7 \text{ ft/s}$$

$$R^2 = Q/V(3.14)$$

$$= (7.74\text{ft}^3/\text{s})/(7\text{ft/s})(3.14)$$

$$= .35\text{ft}^2$$

$$R = .59\text{ft} (12\text{in}/\text{ft}) = 7.12 \text{ in}$$

$$D = 2R = 2(7.12) = 14.24 \text{ in}$$

Minimum pipe diameter approximately 14in; however, hydraulic analysis will require larger diameter, say 16 in

Transmission –Wellfield to Kingston/South Kingstown

Diameter of pipe = 16 inch

Length of pipe = 51,285ft

Material & installation (complete) - \$400/ft

Preliminary cost = 51,285ft x 400/ft = \$20,514,000

Contingency 10% = \$2,051,400

Permits, studies, engineering 10% = \$2,051,400

Valves and appurtenances 5% = \$1,025,700

Utility relocation 5% = \$1,025,700

Subtotal:Transmission = \$ 26,668,200

**Total Chipuxet Supplement = \$36,068,820**

## Mink Supplement

Land Acquisition = 600 acres x 1 million/100acres = \$6,000,000

Wellfield Construction = \$3,400,000

Pipe sized to deliver approximately 2 MGD to South Kingstown/Wakefield area

Solve for pipe diameter:

$$Q = 2\text{MGD} = 3.09 \text{ ft}^3/\text{s}$$

$$V_{\text{avg}} = 7 \text{ ft/s}$$

$$R^2 = Q/V(3.14)$$

$$= (3.09\text{ft}^3/\text{s})/(7\text{ft/s})(3.14)$$

$$= .14\text{ft}^2$$

$$R = .38\text{ft} \text{ (12in/ft)} = 4.5 \text{ in}$$

$$D = 2R = 2(4.5) = 9 \text{ in}$$

Minimum pipe diameter approximately 9in; however, hydraulic analysis will require larger diameter, say 10 in

Transmission –Wellfield to South Kingstown/Wakefield

Diameter of pipe = 10 inch

Length of pipe = 32,170ft

Material & installation (complete) - \$325/ft

Preliminary cost = 32,170ft x 325/ft = \$10,455,250

Contingency 10% = \$1,045,525

Permits, studies, engineering 10% = \$1,045,525

Valves and appurtenances 5% = \$522,760

Utility relocation 5% = \$522,760

Subtotal:Transmission = \$ 13,591,820

**Total Mink Supplement = \$22,991,820**

### Lower Pawcatuck Supplement

Land Acquisition = 800 acres x 1 million/100acres = \$8,000,000

Wellfield Construction = \$3,400,000

Pipe sized to deliver approximately 10MGD to Westerly

Solve for pipe diameter:

$$\begin{aligned} Q &= 10\text{MGD} = 15.472 \text{ ft}^3/\text{s} & R^2 &= Q/V(3.14) \\ V_{\text{avg}} &= 7 \text{ ft/s} & &= (15.472\text{ft}^3/\text{s})/(7\text{ft/s})(3.14) \\ & & &= .70\text{ft}^2 \\ & & R &= .84\text{ft} (12\text{in}/\text{ft}) = 10.04 \text{ in} \\ & & D &= 2R = 2(10.04) = 20.08 \text{ in} \end{aligned}$$

Minimum pipe diameter approximately 20in; however, hydraulic analysis will require larger diameter, say 24 in

Transmission – Wellfield to Westerly

Diameter of pipe = 24 inch

Length of pipe = 61,850ft

Material & installation (complete) - \$475/ft

Preliminary cost = 61,850ft x 475/ft = \$29,378,750

Contingency 10% = \$2,937,875

Permits, studies, engineering 10% = \$2,937,875

Valves and appurtenances 5% = \$1,468,937

Utility relocation 5% = \$1,468,937

Subtotal: Transmission = \$38,192,374

**Total Lower Pawcatuck Supplement = \$49,592,374**

**Rt.138 Corridor Supplement**

Land Acquisition = 800 acres x 1 million/100acres = \$8,000,000

Wellfield Construction = \$3,400,000

Pipe sized to deliver approximately 10MGD to Westerly

Solve for pipe diameter:

$$\begin{aligned}
 Q &= 7\text{MGD} = 10.83 \text{ ft}^3/\text{s} & R^2 &= Q/V(3.14) \\
 V_{\text{avg}} &= 7 \text{ ft/s} & &= (10.83\text{ft}^3/\text{s})/(7\text{ft/s})(3.14) \\
 & & &= .49\text{ft}^2 \\
 & & R &= .70\text{ft} \text{ (12in/ft)} = 8.42 \text{ in} \\
 & & D &= 2R = 2(8.42) = 16.85 \text{ in}
 \end{aligned}$$

Minimum pipe diameter approximately 17in; however, hydraulic analysis will require larger diameter, say 20 in

Transmission –Wellfield to Rt. 138 Corridor

Diameter of pipe = 20 inch

Length of pipe = 44,330ft

Material & installation (complete) - \$4425/ft

Preliminary cost = 44,330ft x 425/ft = \$18,840,250

Contingency 10% = \$1,884,025

Permits, studies, engineering 10% = \$1,884,025

Valves and appurtenances 5% = \$942,012

Utility relocation 5% = \$942,012

Subtotal:Transmission = \$24,492,324

**Total Rt. 138 Corridor Supplement = \$35,892,324**

**Southern Region New Groundwater Sources Option**

**Cost summary**

Wellfield	Cost
HAP Supplement	\$13,384,080
Chipuxet Supplement	\$36,068,820
Mink Supplement	\$22,991,820
Lower Pawcatuck Supplement	\$49,592,374
Rt. 138 Corridor Supplement	\$35,892,324
	<b><u>\$157,929,418</u></b>



## **Appendix I:**

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# **Southern Region Water Supply – Long Range Options**

# Southern Region New Source and Northern Region Alternate Source - Option 1A

### Map Legend

**Water Supply Lines**

- Proposed Transmission Line
- Future Transmission Line

**Water Supply Connection**

**Supplier**

- Kingston Water
- Providence Water
- Richmond Water
- URI
- United Water

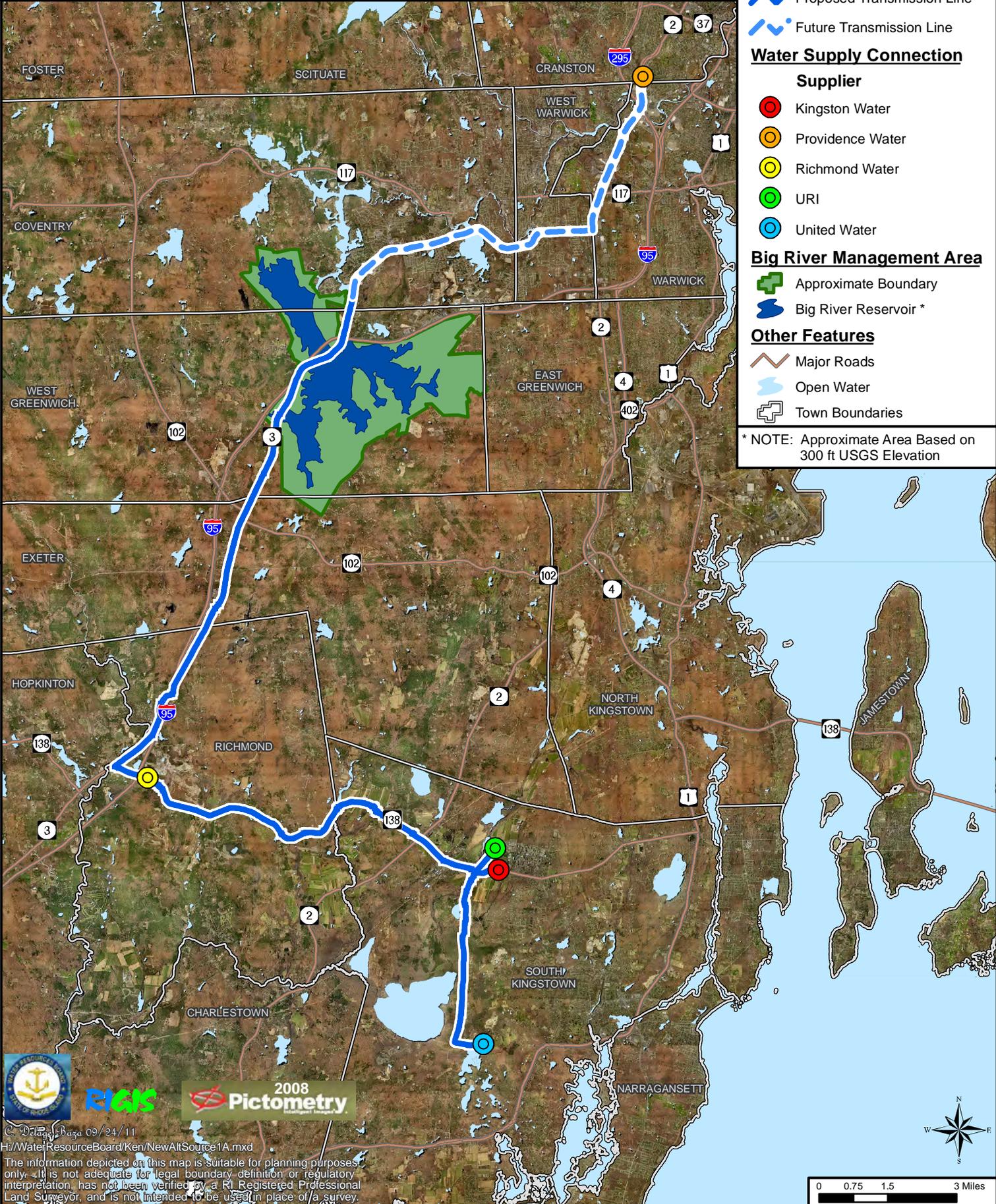
**Big River Management Area**

- Approximate Boundary
- Big River Reservoir \*

**Other Features**

- Major Roads
- Open Water
- Town Boundaries

\* NOTE: Approximate Area Based on 300 ft USGS Elevation






  
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## **Preliminary Estimate – Southern Region New Source Option 1A**

Summary – Construction of Big River Reservoir and treatment facility (60MGD capacity capable of being scaled to 90, 120 and eventually 180MGD) initially providing 35 MGD average flow as a primary supply to South Kingstown and alternate supply to PWSB. A total deficit of 34 MGD is projected in the Southern Region of the State and therefore, 60 inch diameter pre-stressed concrete cylinder pipe would be routed from the completed Big River Treatment Facility southward along Route 3 to Route 138, Richmond then easterly along 138 to 110 in Kingston. From Route 138/110 intersection connections are possible to URI (16 inch cast iron), United Water (24 inch cast iron) and directly to Kingston Water (24 inch cast iron). Transmission northward (potential connection to structure E) can also be accomplished at some point in the future through originally contemplated 96 inch diameter conduit/pipe to provide an alternate source for the Providence Water Supply Board. Cost to construct Big River Reservoir impoundment and treatment facility in 2011 dollars has been computed as \$394,732,000.

Assumptions:

Construction of Big River Reservoir and Treatment Facility

Q=60MGD

**Total reservoir and treatment construction = \$394,732,000**

Pipe sized to deliver approximately 35MGD to Richmond/Kingston area

Solve for pipe diameter:

$$Q = 35\text{MGD} = 54.15 \text{ ft}^3/\text{s}$$

$$V_{\text{avg}} = 7 \text{ ft/s}$$

$$R^2 = Q/V(3.14)$$

$$= (54.15 \text{ ft}^3/\text{s}) / (7 \text{ ft/s})(3.14)$$

$$= 2.46 \text{ ft}^2$$

$$R = 1.57 \text{ ft} (12 \text{ in/ft}) = 18.84 \text{ in}$$

$$D = 2R = 2(18.84) = 37.67 \text{ in}$$

Minimum pipe diameter approximately 40in, use next standard diameter of 48in; however, hydraulic analysis will require larger diameter, say final pipe diameter 60in

Transmission – Big River Treatment Plant to Route 138/110

Diameter of pipe = 60 inch

Length of pipe = 113,520ft

Material & installation (complete) - \$740/ft\*

Preliminary cost = 113,520ft x 740/ft = \$84,004,800

Contingency 10% = \$8,400,480

Permits, studies, engineering 10% = \$8,400,480

Valves and appurtenances 5% = \$4,200,240

Utility relocation 5% = \$4,200,240

Subtotal: Transmission = \$ 109,206,240

Transmission -Route 138/Route 110 to URI (Plains Road Wells)

Diameter of Pipe = 16 inch

Length of pipe = 3,700ft

Material & installation (complete) - \$250/ft

Preliminary cost = 3,700ft x 250/ft = \$925,000

Contingency 10% = \$92,500

Permits, studies, engineering 10% = \$92,500

Valves and appurtenances 5% = \$46,250

Utility relocation 5% = \$46,250

Subtotal:Transmission = \$ 1,202,500

Transmission -Rt. 138/Rt.110 to United Water (110 E to Tuckertown Road)

Diameter of Pipe = 24 inch

Length of pipe = 26,400ft

Material & installation (complete) - \$250/ft

Preliminary cost = 26,400ft x 250/ft = \$6,600,000

Contingency 10% = \$660,000

Permits, studies, engineering 10% = \$660,000

Valves and appurtenances 5% = \$330,000

Utility relocation 5% = \$330,000

Subtotal:Transmission = \$8,580,000

Transmission -Route 138/Route 110 to Kingston Water

Diameter of Pipe = 24 inch

Length of pipe = 1760ft

Material & installation (complete) - \$250/ft

Preliminary cost = 1760ft x 250/ft = \$440,000

Contingency 10% = \$44,000

Permits, studies, engineering 10% = \$44,000

Valves and appurtenances 5% = \$22,000

Utility relocation 5% = \$22,000

Subtotal:Transmission = \$572,000

**Total transmission = \$119,560,740**

**Note:** Transmission - Big River Treatment Plant to Structure E

Diameter of pipe = 96 inch (from original reservoir design)

Length of pipe = 51,480ft

Material & installation (complete) - \$1270/ft

Preliminary cost = 51,480ft x 1270/ft = \$65,379,600

Contingency 10% = \$6,537,960

Permits, studies, engineering 10% = \$6,537,960

Valves and appurtenances 5% = \$3,268,980

Utility relocation 5% = \$3,268,980

**Total Backup Connection to PWSB= \$84,993,480**

## Preliminary Estimate –Southern Region New Source Option 1A Alternate

Summary – Construction of Big River Reservoir and treatment facility (5 MGD capable of being scaled to greater capacity) initially providing 5 MGD average flow as a supplemental supply to Kingston and South Kingstown to alleviate stresses in the Chipuxet and Mink Aquifers. A 16 inch diameter prestressed concrete cylinder pipe would be routed from the completed Big River Treatment Facility southward along Route 3 to Route 138, Richmond then easterly along 138 to 110 in Kingston. From Route 138/110 intersection connections are possible to URI (6 inch cast iron), United Water (8 inch cast iron) and directly to Kingston Water (8 inch cast iron).

Assumptions:

Construction of Big River Reservoir and treatment facility  
Q=5MGD

Reservoir construction= \$298,790,000  
Treatment construction = \$22,000,000  
**Total \$320,790,000**

Pipe sized to deliver approximately 5 MGD to Kingston/South Kingstown area

Solve for pipe diameter:

$$Q = 5\text{MGD} = 7.74 \text{ ft}^3/\text{s}$$

$$V_{\text{avg}} = 7 \text{ ft/s}$$

$$\begin{aligned} R^2 &= Q/V(3.14) \\ &= (7.74\text{ft}^3/\text{s})/(7\text{ft/s})(3.14) \\ &= .35\text{ft}^2 \end{aligned}$$

$$R = .59\text{ft} (12\text{in}/\text{ft}) = 7.12 \text{ in}$$

$$D = 2R = 2(7.12) = 14.24 \text{ in}$$

Minimum pipe diameter approximately 14in; however, hydraulic analysis will require larger diameter, say 16 in

Transmission –Big River Treatment Plant to Route 138/110

Diameter of pipe = 16 inch

Length of pipe = 113,520ft

Material & installation (complete) - \$400/ft

Preliminary cost = 113,520ft x 400/ft = \$45,408,000

Contingency 10% = \$4,540,800

Permits, studies, engineering 10% = \$4,540,800

Valves and appurtenances 5% = \$2,270,400

Utility relocation 10% = \$4,540,800

Subtotal:Transmission = \$ 61,300,800

Transmission -Route 138/Route 110 to URI (Plains Road Wells)  
Diameter of Pipe = 6 inch  
Length of pipe = 3,700ft  
Material & installation (complete) - \$200/ft  
Preliminary cost = 3,700ft x 200/ft = \$740,000  
Contingency 10% = \$74,000  
Permits, studies, engineering 10% = \$74,000  
Valves and appurtenances 5% = \$37,000  
Utility relocation 5% = \$37,000  
Subtotal:Transmission = \$962,000

Transmission -Rt. 138/Rt.110 to United Water (110 E to Tuckertown Road)  
Diameter of Pipe = 8 inch  
Length of pipe = 26,400ft  
Material & installation (complete) - \$200/ft  
Preliminary cost = 26,400ft x 200/ft = \$5,280,000  
Contingency 10% = \$528,000  
Permits, studies, engineering 10% = \$528,000  
Valves and appurtenances 5% = \$264,000  
Utility relocation 5% = \$264,000  
Subtotal:Transmission = \$6,864,000

Transmission -Route 138/Route 110 to Kingston Water  
Diameter of Pipe = 8 inch  
Length of pipe = 1760ft  
Material & installation (complete) - \$200/ft  
Preliminary cost = 1760ft x 200/ft = \$352,000  
Contingency 10% = \$35,200  
Permits, studies, engineering 10% = \$35,200  
Valves and appurtenances 5% = \$17,600  
Utility relocation 5% = \$17,600  
Subtotal:Transmission = \$457,600

**Total transmission = \$69,584,400**

# Southern Region New Source and Northern Region Alternate Source - Option 1B

### Map Legend

**Water Supply Lines**

- Proposed Transmission Line
- Future Transmission Line

**Water Supply Connection**

**Supplier**

- Kingston Water
- Providence Water
- Richmond Water
- URI
- United Water

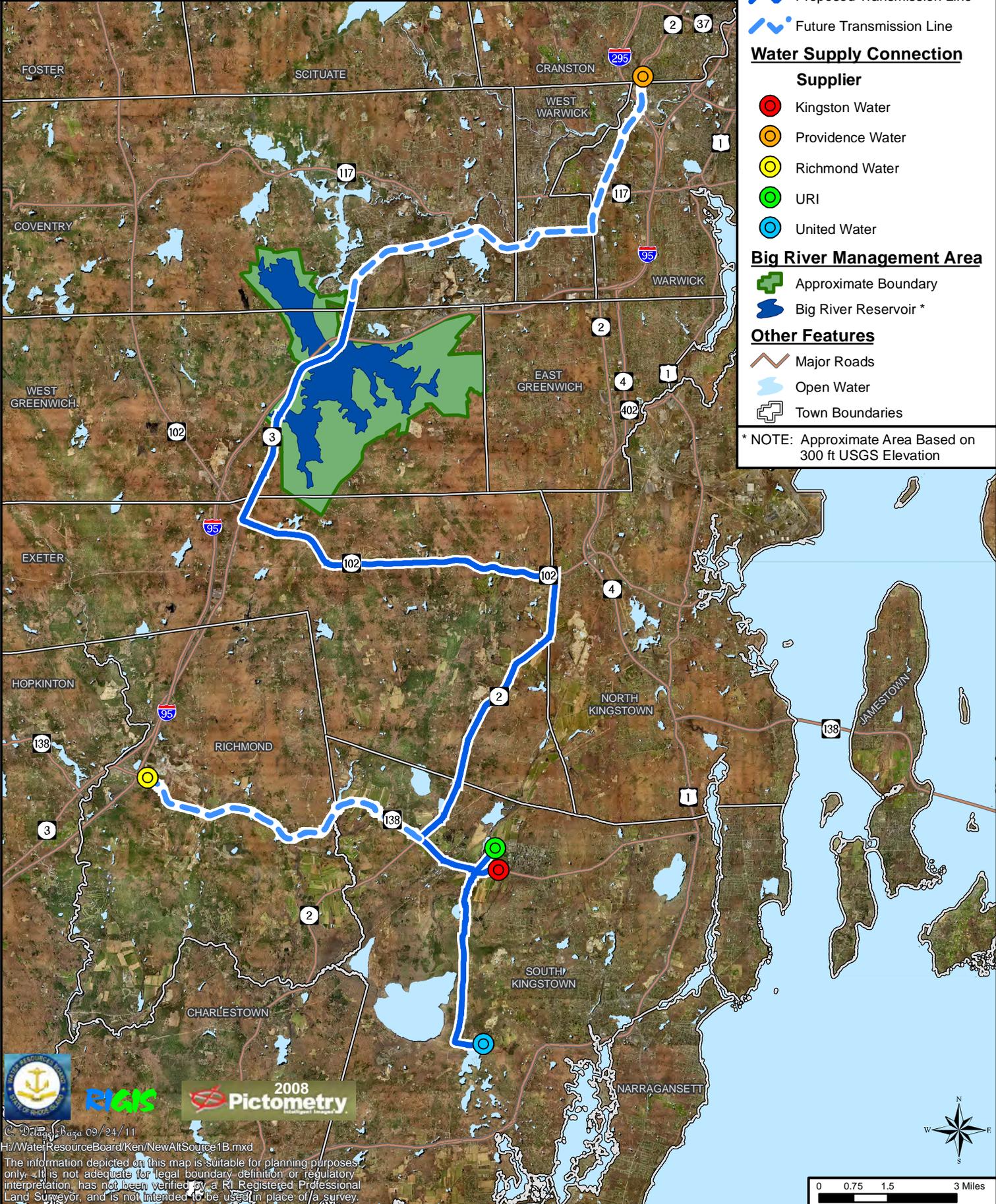
**Big River Management Area**

- Approximate Boundary
- Big River Reservoir \*

**Other Features**

- Major Roads
- Open Water
- Town Boundaries

\* NOTE: Approximate Area Based on 300 ft USGS Elevation



## **Preliminary Estimate–Southern Region New Source Option 1B**

Summary – Construction of Big River Reservoir and treatment facility (60MGD capacity capable of being scaled to 90, 120 and eventually 180MGD) initially providing 35 MGD average flow as a primary supply to South Kingstown and alternate supply to PWSB. A total deficit of 34 MGD is projected in the Southern Region of the State and therefore, 60 inch diameter prestressed concrete cylinder pipe would be routed from the completed Big River Treatment Facility southward along Route 3 to Route 102 then Route 2 to Route 138, South Kingstown to Route 110. From Route 138/110 intersection, connections are possible to URI (16 inch cast iron), United Water (24 inch cast iron) and directly to Kingston Water (24 inch cast iron). Transmission northward (potential connection to structure E) can also be accomplished at some point in the future through originally contemplated 96 inch diameter conduit/pipe to provide an alternate source for the Providence Water Supply Board. Additionally, transmission westward along Route 138 to Richmond can also be accomplished.

Assumptions:

Construction of Big River Reservoir and treatment facility  
Q=60MGD

**Total reservoir and treatment construction = \$394,732,000**

Pipe sized to deliver approximately 35MGD to Richmond/Kingston area  
Solve for pipe diameter:

$$Q = 35\text{MGD} = 54.15 \text{ ft}^3/\text{s}$$

$$V_{\text{avg}} = 7 \text{ ft/s}$$

$$\begin{aligned} R^2 &= Q/V(3.14) \\ &= (54.15\text{ft}^3/\text{s})/(7\text{ft/s})(3.14) \\ &= 2.46\text{ft}^2 \end{aligned}$$

$$R = 1.57\text{ft} (12\text{in}/\text{ft}) = 18.84 \text{ in}$$

$$D = 2R = 2(18.84) = 37.67 \text{ in}$$

Minimum pipe diameter approximately 40in, use next standard diameter of 48in; however, hydraulic analysis will require larger diameter, say final pipe diameter 60in

Transmission –Big River Treatment Plant to Rt.138/110

Diameter of pipe = 60 inch

Length of pipe = 114,048ft

Material & installation (complete) - \$740/ft

Preliminary cost = 114,048ft x 740/ft = \$84,395,520

Contingency 10% = \$8,439,552

Permits, studies, engineering 10% = \$8,439,552

Valves and appurtenances 5% = \$4,219,776

Utility relocation 5% = \$4,219,776

Subtotal:Transmission = \$ 109,714,176

Transmission –Rt.138/Rt.110 to URI (Plains Road Wells)

Diameter of Pipe = 16 inch

Length of pipe = 3,700ft

Material & installation (complete) - \$250/ft

Preliminary cost = 3,700ft x 250/ft = \$925,000

Contingency 10% = \$92,500

Permits, studies, engineering 10% = \$92,500

Valves and appurtenances 5% = \$46,250

Utility relocation 5% = \$46,250

Subtotal:Transmission = \$ 1,202,500

Transmission -Rt.138/Rt.110 to United Water (110 E to Tuckertown Road)

Diameter of Pipe = 24 inch

Length of pipe = 26,400ft

Material & installation (complete) - \$250/ft

Preliminary cost = 26,400ft x 250/ft = \$6,600,000

Contingency 10% = \$660,000

Permits, studies, engineering 10% = \$660,000

Valves and appurtenances 5% = \$330,000

Utility relocation 5% = \$330,000

Subtotal:Transmission = \$8,580,000

Transmission –Rt. 138/Route 110 to Kingston Water

Diameter of Pipe = 24 inch

Length of pipe = 1760ft

Material & installation (complete) - \$250/ft

Preliminary cost = 1760ft x 250/ft = \$440,000

Contingency 10% = \$44,000

Permits, studies, engineering 10% = \$44,000

Valves and appurtenances 5% = \$22,000

Utility relocation 5% = \$22,000

Subtotal:Transmission = \$572,000

**Total Transmission = \$120,068,676**

**Note:** Transmission - Big River Treatment Plant to Structure E

Diameter of pipe = 96 inch (from original reservoir design)

Length of pipe = 51,480ft

Material & installation (complete) - \$1270/ft

Preliminary cost = 51,480ft x 1270/ft = \$65,379,600

Contingency 10% = \$6,537,960

Permits, studies, engineering 10% = \$6,537,960

Valves and appurtenances 5% = \$3,268,980

Utility relocation 5% = \$3,268,980

**Total Backup Connection to PWSB= \$84,993,480**

**Note:** Transmission – Route 138 to Richmond  
Diameter of pipe = 60 inch  
Length of pipe = 40,200ft  
Material & installation (complete) - \$740/ft  
Preliminary cost = 40,200ft x 740/ft = \$29,748,000  
Contingency 10% = \$2,974,800  
Permits, studies, engineering 10% = \$2,974,800  
Valves and appurtenances 5% = \$1,487,400  
Utility relocation 5% = \$1,487,400

**Total Future Transmission = \$38,672,400**

## Preliminary Estimate–Southern Region New Source Option 1B Alternate

Summary – Construction of Big River Reservoir and treatment facility (5 MGD capable of being scaled to greater capacity) initially providing 5 MGD average flow as a supplemental supply to Kingston and South Kingstown to alleviate stresses in the Chipuxet and Mink Aquifers. A 16 inch diameter prestressed concrete cylinder pipe would be routed from the completed Big River Treatment Facility southward along Route 3 to Route 102 then Route 2 to Route 138, South Kingstown to Route 110. From Route 138/110 intersection, connections are possible to URI (6 inch cast iron), United Water (8 inch cast iron) and directly to Kingston Water (8 inch cast iron).

Assumptions:

Construction of Big River Reservoir and treatment facility  
Q=5MGD

Reservoir construction= \$298,790,000

Treatment construction = \$22,000,000

**Total \$320,790,000**

Pipe sized to deliver approximately 5 MGD to Kingston/South Kingstown area  
Solve for pipe diameter:

$$Q = 5\text{MGD} = 7.74 \text{ ft}^3/\text{s}$$

$$V_{\text{avg}} = 7 \text{ ft/s}$$

$$R^2 = Q/V(3.14)$$

$$= (7.74 \text{ ft}^3/\text{s}) / (7 \text{ ft/s})(3.14)$$

$$= .35 \text{ ft}^2$$

$$R = .59 \text{ ft} (12 \text{ in/ft}) = 7.12 \text{ in}$$

$$D = 2R = 2(7.12) = 14.24 \text{ in}$$

Minimum pipe diameter approximately 14in; however, hydraulic analysis will require larger diameter, say 16 in

Transmission –Big River Treatment Plant to Rt.138/110

Diameter of pipe = 16 inch

Length of pipe = 114,048ft

Material & installation (complete) - \$400/ft

Preliminary cost = 114,048ft x 400/ft = \$45,619,200

Contingency 10% = \$4,561,920

Permits, studies, engineering 10% = \$4,561,920

Valves and appurtenances 5% = \$2,280,000

Utility relocation 10% = \$4,561,920

Subtotal:Transmission = \$61,583,040

Transmission -Route 138/Route 110 to URI (Plains Road Wells)

Diameter of Pipe = 6 inch

Length of pipe = 3,700ft

Material & installation (complete) - \$200/ft

Preliminary cost = 3,700ft x 200/ft = \$740,000

Contingency 10% = \$74,000

Permits, studies, engineering 10% = \$74,000

Valves and appurtenances 5% = \$37,000

Utility relocation 5% = \$37,000

Subtotal:Transmission = \$962,000

Transmission -Rt. 138/Rt.110 to United Water (110 E to Tuckertown Road)

Diameter of Pipe = 8 inch

Length of pipe = 26,400ft

Material & installation (complete) - \$200/ft

Preliminary cost = 26,400ft x 200/ft = \$5,280,000

Contingency 10% = \$528,000

Permits, studies, engineering 10% = \$528,000

Valves and appurtenances 5% = \$264,000

Utility relocation 5% = \$264,000

Subtotal:Transmission = \$6,864,000

Transmission -Route 138/Route 110 to Kingston Water

Diameter of Pipe = 8 inch

Length of pipe = 1760ft

Material & installation (complete) - \$200/ft

Preliminary cost = 1760ft x 200/ft = \$352,000

Contingency 10% = \$35,200

Permits, studies, engineering 10% = \$35,200

Valves and appurtenances 5% = \$17,600

Utility relocation 5% = \$17,600

Subtotal:Transmission = \$457,600

**Total Transmission = \$69,866,640**

# Southern Region New Source and Northern Region Alternate Source - Option 1C

## Map Legend

- Water Supply Lines**
- Proposed Transmission Line
  - Future Transmission Line
- Water Supply Connection**
- Supplier**
- Kingston Water
  - Providence Water
  - Richmond Water
  - URI
  - United Water
- Big River Management Area**
- Approximate Boundary
  - Big River Reservoir \*
- Other Features**
- Major Roads
  - Open Water
  - Town Boundaries

\* NOTE: Approximate Area Based on 300 ft USGS Elevation



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## Preliminary Estimate– Southern Region New Source Option 1C

Summary – Construction of Big River Reservoir and treatment facility (60MGD capacity capable of being scaled to 90, 120 and eventually 180MGD) initially providing 35 MGD average flow as a primary supply to South Kingstown and alternate supply to PWSB. A total deficit of 34 MGD is projected in the Southern Region of the State and therefore, 60 inch diameter prestressed concrete cylinder pipe would be routed from the completed Big River Treatment Facility along Division Road, West Greenwich to Route 2/Route 402 then southward along Route 1 to Route 138/110. From Route 138/110 intersection, connections are possible to URI United Water and directly to Kingston Water. Transmission northward (potential connection to structure E) can also be accomplished at some point in the future through originally contemplated 96 inch diameter conduit/pipe to provide an alternate source for the Providence Water Supply Board. Additionally, transmission westward along Route 138 to Richmond can also be accomplished.

### Assumptions:

Construction of Big River Reservoir and treatment facility  
Q=60MGD

**Total reservoir and treatment construction = \$394,732,000**

Pipe sized to deliver approximately 35MGD to Richmond/Kingston area  
Solve for pipe diameter:

$$Q = 35\text{MGD} = 54.15 \text{ ft}^3/\text{s}$$
$$V_{\text{avg}} = 7 \text{ ft/s}$$

$$R^2 = Q/V(3.14)$$
$$= (54.15 \text{ ft}^3/\text{s}) / (7 \text{ ft/s})(3.14)$$
$$= 2.46 \text{ ft}^2$$

$$R = 1.57 \text{ ft} \text{ (12in/ft)} = 18.84 \text{ in}$$
$$D = 2R = 2(18.84) = 37.67 \text{ in}$$

Minimum pipe diameter approximately 40in, use next standard diameter of 48in; however, hydraulic analysis will require larger diameter, say final pipe diameter 60in

Transmission –Big River Treatment Plant to Rt.138/110

Diameter of pipe = 60 inch

Length of pipe = 132,400ft

Material & installation (complete) - \$740/ft

Preliminary cost = 132,400ft x 740/ft = \$97,976,000

Contingency 10% = \$9,797,600

Permits, studies, engineering 10% = \$9,797,600

Valves and appurtenances 5% = \$4,898,800

Utility relocation 10% = \$9,797,600

Subtotal Transmission = \$132,267,600

Transmission -Route 138/Route 110 to URI (Plains Road Wells)

Diameter of Pipe = 16 inch

Length of pipe = 3,700ft

Material & installation (complete) - \$250/ft

Preliminary cost = 3,700ft x 250/ft = \$925,000

Contingency 10% = \$92,500

Permits, studies, engineering 10% = \$92,500

Valves and appurtenances 5% = \$46,250

Utility relocation 5% = \$46,250

Subtotal:Transmission = \$1,202,500

Transmission -Rt. 138/Rt.110 to United Water (110 E to Tuckertown Road)

Diameter of Pipe = 24 inch

Length of pipe = 26,400ft

Material & installation (complete) - \$250/ft

Preliminary cost = 26,400ft x 250/ft = \$6,600,000

Contingency 10% = \$660,000

Permits, studies, engineering 10% = \$660,000

Valves and appurtenances 5% = \$330,000

Utility relocation 5% = \$330,000

Subtotal:Transmission = \$8,580,000

Transmission -Route 138/Route 110 to Kingston Water

Diameter of Pipe = 24 inch

Length of pipe = 1760ft

Material & installation (complete) - \$250/ft

Preliminary cost = 1760ft x 250/ft = \$440,000

Contingency 10% = \$44,000

Permits, studies, engineering 10% = \$44,000

Valves and appurtenances 5% = \$22,000

Utility relocation 5% = \$22,000

Subtotal:Transmission = \$572,000

**Total Transmission = \$142,622,100**

**Note:** Transmission - Big River Treatment Plant to Structure E  
Diameter of pipe = 96 inch (from original reservoir design)  
Length of pipe = 51,480ft  
Material & installation (complete) - \$1270/ft  
Preliminary cost = 51,480ft x 1270/ft = \$65,379,600  
Contingency 10% = \$6,537,960  
Permits, studies, engineering 10% = \$6,537,960  
Valves and appurtenances 5% = \$3,268,980  
Utility relocation 5% = \$3,268,980

**Total Backup Connection to PWSB= \$84,993,480**

**Note:** Transmission – Route 138 to Richmond  
Diameter of pipe = 60 inch  
Length of pipe = 40,200ft  
Material & installation (complete) - \$740/ft  
Preliminary cost = 40,200ft x 740/ft = \$29,748,000  
Contingency 10% = \$2,974,800  
Permits, studies, engineering 10% = \$2,974,800  
Valves and appurtenances 5% = \$1,487,400  
Utility relocation 5% = \$1,487,400

**Total Future Transmission = \$38,672,400**

## Preliminary Estimate–Southern Region New Source Option 1C Alternate

Summary – Construction of Big River Reservoir and treatment facility (5 MGD capable of being scaled to greater capacity) initially providing 5 MGD average flow as a supplemental supply to Kingston and South Kingstown to alleviate stresses in the Chipuxet and Mink Aquifers. A 16 inch diameter prestressed concrete cylinder pipe would be routed from the completed Big River Treatment Facility along Division Road, West Greenwich to Route 2/Route 402 then southward along Route 1 to Route 138/110. From Route 138/110 intersection, connections are possible to URI, United Water and directly to Kingston Water.

Assumptions:

Construction of Big River Reservoir and treatment facility  
Q=5MGD

Reservoir construction= \$298,790,000

Treatment construction = \$22,000,000

**Total \$320,790,000**

Pipe sized to deliver approximately 5 MGD to Kingston/South Kingstown area  
Solve for pipe diameter:

$$Q = 5\text{MGD} = 7.74 \text{ ft}^3/\text{s}$$

$$V_{\text{avg}} = 7 \text{ ft/s}$$

$$R^2 = Q/V(3.14)$$

$$= (7.74 \text{ ft}^3/\text{s}) / (7 \text{ ft/s})(3.14)$$

$$= .35 \text{ ft}^2$$

$$R = .59 \text{ ft} (12 \text{ in/ft}) = 7.12 \text{ in}$$

$$D = 2R = 2(7.12) = 14.24 \text{ in}$$

Minimum pipe diameter approximately 14in; however, hydraulic analysis will require larger diameter, say 16 in

Transmission –Big River Treatment Plant to Rt.138

Diameter of pipe = 16 inch

Length of pipe = 132,400ft

Material & installation (complete) - \$400/ft

Preliminary cost = 132,400ft x 400/ft = \$52,960,000

Contingency 10% = \$5,296,000

Permits, studies, engineering 10% = 5,296,000

Valves and appurtenances 5% = \$2,648,000

Utility relocation 10% = \$5,296,000

Subtotal Transmission = \$71,496,000

Transmission -Route 138/Route 110 to URI (Plains Road Wells)

Diameter of Pipe = 6 inch

Length of pipe = 3,700ft

Material & installation (complete) - \$200/ft

Preliminary cost = 3,700ft x 200/ft = \$740,000

Contingency 10% = \$74,000

Permits, studies, engineering 10% = \$74,000

Valves and appurtenances 5% = \$37,000

Utility relocation 5% = \$37,000

Subtotal:Transmission = \$962,000

Transmission -Rt. 138/Rt.110 to United Water (110 E to Tuckertown Road)

Diameter of Pipe = 8 inch

Length of pipe = 26,400ft

Material & installation (complete) - \$200/ft

Preliminary cost = 26,400ft x 200/ft = \$5,280,000

Contingency 10% = \$528,000

Permits, studies, engineering 10% = \$528,000

Valves and appurtenances 5% = \$264,000

Utility relocation 5% = \$264,000

Subtotal:Transmission = \$6,864,000

Transmission -Route 138/Route 110 to Kingston Water

Diameter of Pipe = 8 inch

Length of pipe = 1760ft

Material & installation (complete) - \$200/ft

Preliminary cost = 1760ft x 200/ft = \$352,000

Contingency 10% = \$35,200

Permits, studies, engineering 10% = \$35,200

Valves and appurtenances 5% = \$17,600

Utility relocation 5% = \$17,600

Subtotal:Transmission = \$457,600

**Total Transmission = \$79,779,600**

### **BRMA Treatment and Transmission Options Summary**

Plant Size	Option 1A Total Reservoir, Treatment and Transmission	Option 1B - Total Reservoir, Treatment and Transmission	Option 1C - Total Reservoir, Treatment and Transmission
5MGD	\$390,374,400	\$390,656,640	\$400,569,600
30MGD	\$514,292,740	\$514,800,676	\$537,354,100

Note: Costs do not include transmission to Providence Water Structure E.

# Southern Region New Source and Northern Region Alternate Source - Option 2A

## Map Legend

### Desalination Facility

 Quonset (28 MGD)

### Water Supply Lines

 Proposed Transmission Line

 Future Transmission Line

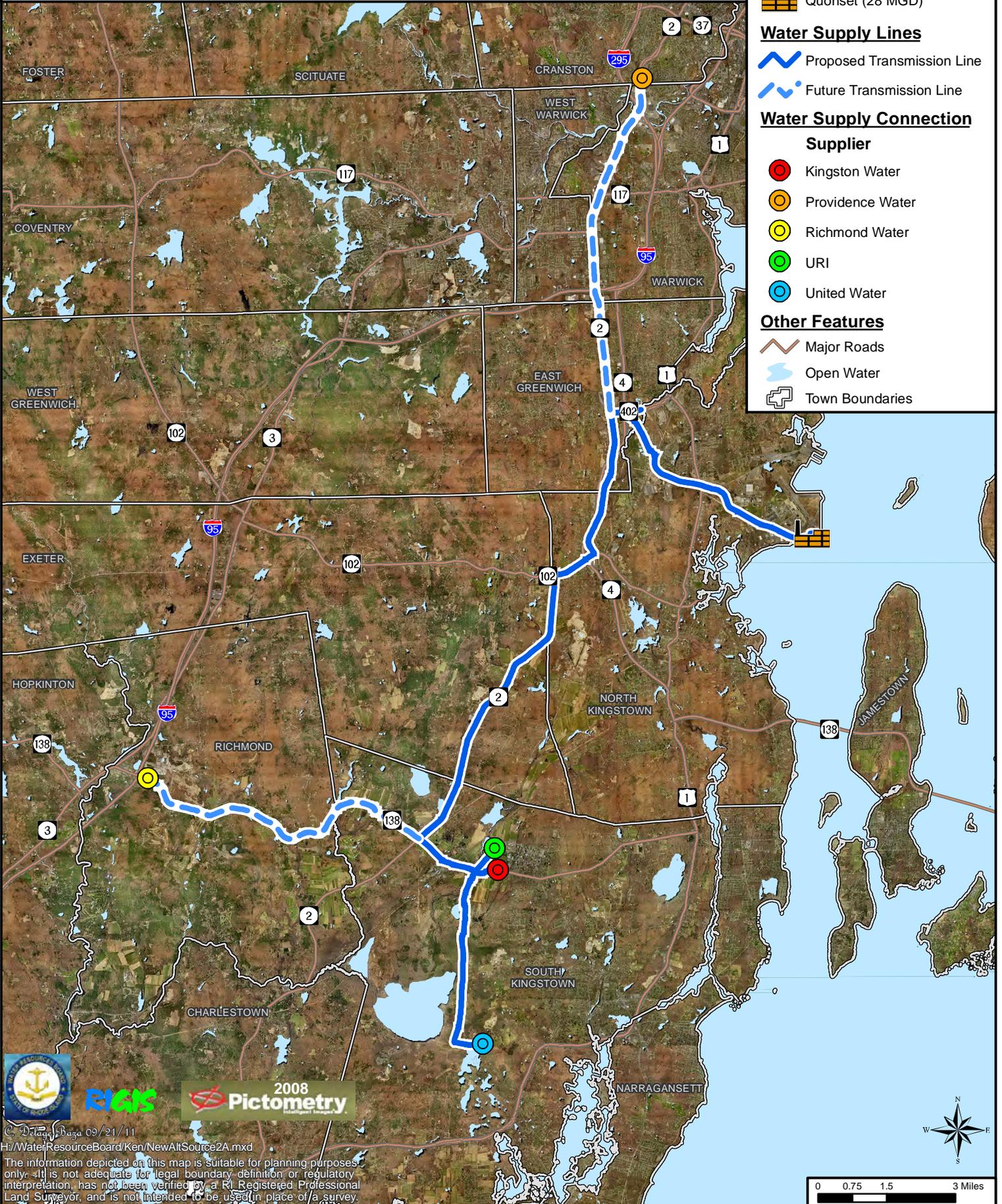
### Water Supply Connection

#### Supplier

-  Kingston Water
-  Providence Water
-  Richmond Water
-  URI
-  United Water

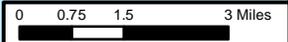
### Other Features

-  Major Roads
-  Open Water
-  Town Boundaries



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## Preliminary Estimate– Southern Region New Source: Option 2A

Summary – Construction of Centralized desalination treatment facility at QDC producing 35MGD peak flow as a primary supply to South Kingstown and alternate supply to PWSB. In addition to completion of a desalination facility, the project would require installation of 60 inch diameter pre-stressed concrete cylinder pipe from QDC along route 402 both southward along Route 2 to Route 138/Route110 intersection, South Kingstown. From route 138/110 connections are possible to URI (16 inch cast iron), United Water (24 inch cast iron) and directly to Kingston Water (24 inch cast iron). Transmission northward along Route 2 to provide an alternate source for the Providence Water Supply Board can also be accomplished at some point in the future via installation of originally contemplated 96 inch diameter conduit/pipe connecting to structure E. Additionally, transmission westward along Route 138 to Richmond can also be accomplished.

### Assumptions:

Centralized Desalination Facility at QDC

Q=35 MGD

**Total construction cost = \$275,900,000\***

\*Florida Department of Environmental Protection Report on Desalination in Florida

Pipe sized to deliver approximately 35MGD to Richmond/Kingston area

Solve for pipe diameter:

$$Q = 35\text{MGD} = 54.15 \text{ ft}^3/\text{s}$$

$$V_{\text{avg}} = 7 \text{ ft/s}$$

$$R^2 = Q/V(3.14)$$

$$= (54.15 \text{ ft}^3/\text{s}) / (7 \text{ ft/s})(3.14)$$

$$= 2.46 \text{ ft}^2$$

$$R = 1.57 \text{ ft} (12 \text{ in/ft}) = 18.84 \text{ in}$$

$$D = 2R = 2(18.84) = 37.67 \text{ in}$$

Minimum pipe diameter approximately 40in, use next standard diameter of 48in; however, hydraulic analysis will require larger diameter, say final pipe diameter 60in

Transmission – QDC Desalination Plant to Rt.138/110

Diameter of pipe = 60 inch

Length of pipe = 72,960ft

Material & installation (complete) - \$740/ft

Preliminary cost = 72,960ft x 740/ft = \$53,990,400

Contingency 10% = \$5,399,040

Permits, studies, engineering 10% = \$5,399,040

Valves and appurtenances 5% = \$2,699,520

Utility relocation 5% = \$2,699,520

Subtotal:Transmission = \$70,187,520

Transmission – Rt.138/Rt.110 to URI (Plains Road Wells)

Diameter of Pipe = 16 inch

Length of pipe = 3,700ft

Material & installation (complete) - \$250/ft

Preliminary cost = 3,700ft x 250/ft = \$925,000

Contingency 10% = \$92,500

Permits, studies, engineering 10% = \$92,500

Valves and appurtenances 5% = \$46,250

Utility relocation 5% = \$46,250

Subtotal:Transmission = \$ 1,202,500

Transmission – Rt.138/Rt.110 to United Water (110 E to Tuckertown Road)

Diameter of Pipe = 24 inch

Length of pipe = 26,400ft

Material & installation (complete) - \$250/ft

Preliminary cost = 26,400ft x 250/ft = \$6,600,000

Contingency 10% = \$660,000

Permits, studies, engineering 10% = \$660,000

Valves and appurtenances 5% = \$330,000

Utility relocation 5% = \$330,000

Subtotal:Transmission = \$8,580,000

Diameter of Pipe = 24 inch

Length of pipe = 1760ft

Material & installation (complete) - \$250/ft

Preliminary cost = 1760ft x 250/ft = \$440,000

Contingency 10% = \$44,000

Permits, studies, engineering 10% = \$44,000

Valves and appurtenances 5% = \$22,000

Utility relocation 5% = \$22,000

Subtotal:Transmission = \$572,000

**Total Transmission = \$80,542,020**

**Note:** Transmission-QDC Desalination Plant to PWSB Structure E

Diameter of pipe = 96 inch

Length of pipe = 37,600ft

Material & installation (complete) - \$1270/ft

Preliminary cost = 37,600ft x 1270/ft = \$47,752,000

Contingency 10% = \$4,775,200

Permits, studies, engineering 10% = \$4,775,200

Valves and appurtenances 5% = \$2,387,600

Utility relocation 5% = \$2,387,600

**Total Backup Connection to PWSB= \$62,077,600**

**Note:** Transmission – Route 138 to Richmond

Diameter of pipe = 60 inch

Length of pipe = 40,200ft

Material & installation (complete) - \$740/ft

Preliminary cost = 40,200ft x 740/ft = \$29,748,000

Contingency 10% = \$2,974,800

Permits, studies, engineering 10% = \$2,974,800

Valves and appurtenances 5% = \$1,487,400

Utility relocation 5% = \$1,487,400

**Total Future Transmission = \$38,672,400**

# Southern Region New Source - Option 2B

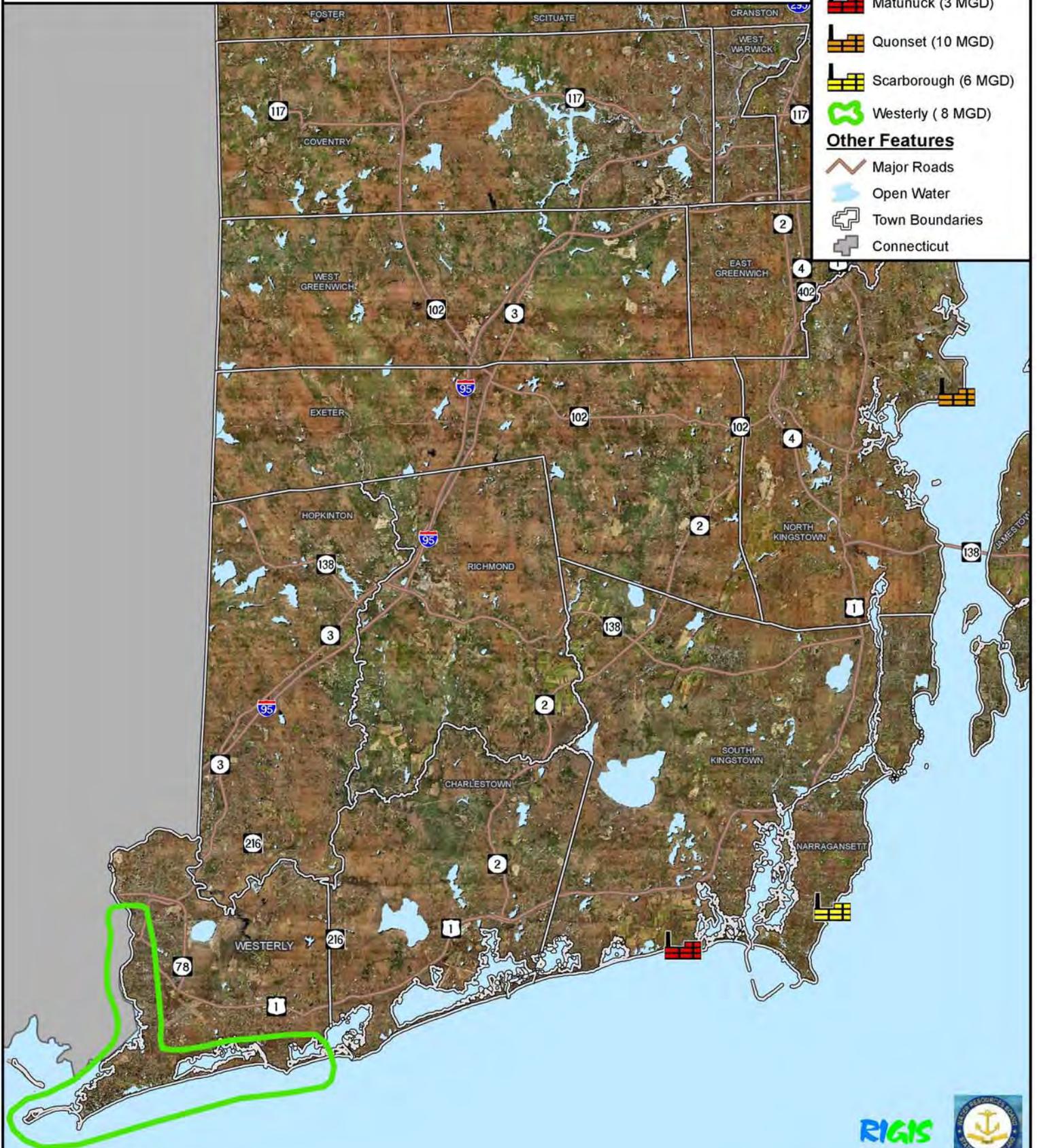
## Map Legend

### Desalination Facilities

-  Matunuck (3 MGD)
-  Quonset (10 MGD)
-  Scarborough (6 MGD)
-  Westerly (8 MGD)

### Other Features

-  Major Roads
-  Open Water
-  Town Boundaries
-  Connecticut



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**RIGIS** 

2008 **Pictometry**  
 Intelligent Imagery

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## **Preliminary Estimate– Southern Region New Source Option 2B**

Summary – Construction of Decentralized desalination treatment facilities at QDC (10MGD), Scarborough (8MGD), Matunuck (3.5MGD) and Misquamicut in Westerly (8MGD) producing required primary flow for area public water systems.

Assumptions:

QDC Desalination Facility, Q = 10MGD  
Scarborough Desalination Facility, Q = 8MGD  
Matunuck Desalination Facility, Q = 3.5MGD  
Misquamicut Desalination Facility, Q = 8MGD

Costs:

Facility	Q (MGD)	Construction Cost
Matunuck	3.5	\$47,305,000
Scarborough, Misquamicut	8*	\$90,322,000
QDC	10	\$104,407,000

\* 8 MGD for both Scarborough and Misquamicut, 16 MGD total.  
Data compiled from Statewide Supplemental Water  
Supply Feasibility Assessment: Phase II

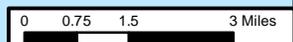
# Southern Region New Source and Northern Region Alternate Source - Option 3

## Map Legend

- Water Supply Lines**
- Proposed Transmission Line
  - Future Transmission Line
- Water Supply Connection**
- Supplier**
- Kingston Water
  - Providence Water
  - Richmond Water
  - URI
  - United Water
- Other Features**
- Major Roads
  - Open Water
  - Town Boundaries



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## **Preliminary Estimate– Southern Region New Source Options 3A and 3B**

Summary – The supply for these options is derived from the implementation of conservation measures to achieve 45 GPCD. This is an aggressive conservation goal that must be implemented statewide in order for excess water from the Northern Region to be made available to the Southern Region (see “Water Supply and Demand Estimating” reference document). Option 3A assumes conservation and the use of existing infrastructure. Option 3B proposes new infrastructure and estimates are provided below. The Southern Region would be fed from Providence Water Supply Board along Route 2 to Route 138 Exeter. The project would require installation of 60 inch diameter pre-stressed concrete cylinder pipe from PWSB structure E to Route 138/Route110 intersection, South Kingstown. From Route 138/110 connections are possible to URI (16 inch cast iron), United Water (24 inch cast iron) and directly to Kingston Water (24 inch cast iron). Additionally, the line may eventually be taken west from the Rt. 2/Rt.138 intersection to Richmond.

### Assumptions:

Pipe sized to deliver approximately 35MGD to Richmond/Kingston area  
Solve for pipe diameter:

$$Q = 35\text{MGD} = 54.15 \text{ ft}^3/\text{s}$$

$$V_{\text{avg}} = 7 \text{ ft/s}$$

$$R^2 = Q/V(3.14)$$

$$= (54.15\text{ft}^3/\text{s})/(7\text{ft/s})(3.14)$$

$$= 2.46\text{ft}^2$$

$$R = 1.57\text{ft} (12\text{in}/\text{ft}) = 18.84 \text{ in}$$

$$D = 2R = 2(18.84) = 37.67 \text{ in}$$

Minimum pipe diameter approximately 40in, use next standard diameter of 48in; however, hydraulic analysis will require larger diameter, say final pipe diameter 60in

Transmission –PWSB Structure E to Route 138/Route 110

Diameter of pipe = 60 inch

Length of pipe = 107,420ft

Material & installation (complete) - \$740/ft

Preliminary cost = 107,420ft x 740/ft = \$70,722,540

Contingency 10% = \$7,072,254

Permits, studies, engineering 10% = \$7,072,254

Valves and appurtenances 5% = \$3,536,127

Utility relocation 5% = \$3,536,127

Subtotal:Transmission = \$91,939,302

Transmission -Route 138/Route 110 to URI (Plains Road Wells)

Diameter of Pipe = 16 inch

Length of pipe = 3,700ft

Material & installation (complete) - \$250/ft

Preliminary cost = 3,700ft x 250/ft = \$925,000

Contingency 10% = \$92,500

Permits, studies, engineering 10% = \$92,500

Valves and appurtenances 5% = \$46,250

Utility relocation 5% = \$46,250

Subtotal:Transmission = \$ 1,202,500

Transmission -Rt. 138/Rt.110 to United Water (110 E to Tuckertown Road)

Diameter of Pipe = 24 inch

Length of pipe = 26,400ft

Material & installation (complete) - \$250/ft

Preliminary cost = 26,400ft x 250/ft = \$6,600,000

Contingency 10% = \$660,000

Permits, studies, engineering 10% = \$660,000

Valves and appurtenances 5% = \$330,000

Utility relocation 5% = \$330,000

Subtotal:Transmission = \$8,580,000

Diameter of Pipe = 24 inch

Length of pipe = 1760ft

Material & installation (complete) - \$250/ft

Preliminary cost = 1760ft x 250/ft = \$440,000

Contingency 10% = \$44,000

Permits, studies, engineering 10% = \$44,000

Valves and appurtenances 5% = \$22,000

Utility relocation 5% = \$22,000

Subtotal:Transmission = \$572,000

**Total transmission = \$102,293,802**

**Note:** Transmission – Route 138 to Richmond

Diameter of pipe = 60 inch

Length of pipe = 40,200ft

Material & installation (complete) - \$740/ft

Preliminary cost = 40,200ft x 740/ft = \$29,748,000

Contingency 10% = \$2,974,800

Permits, studies, engineering 10% = \$2,974,800

Valves and appurtenances 5% = \$1,487,400

Utility relocation 5% = \$1,487,400

**Total future transmission = \$38,672,400**

## Financial Analysis for Southern Region - Long Range Options

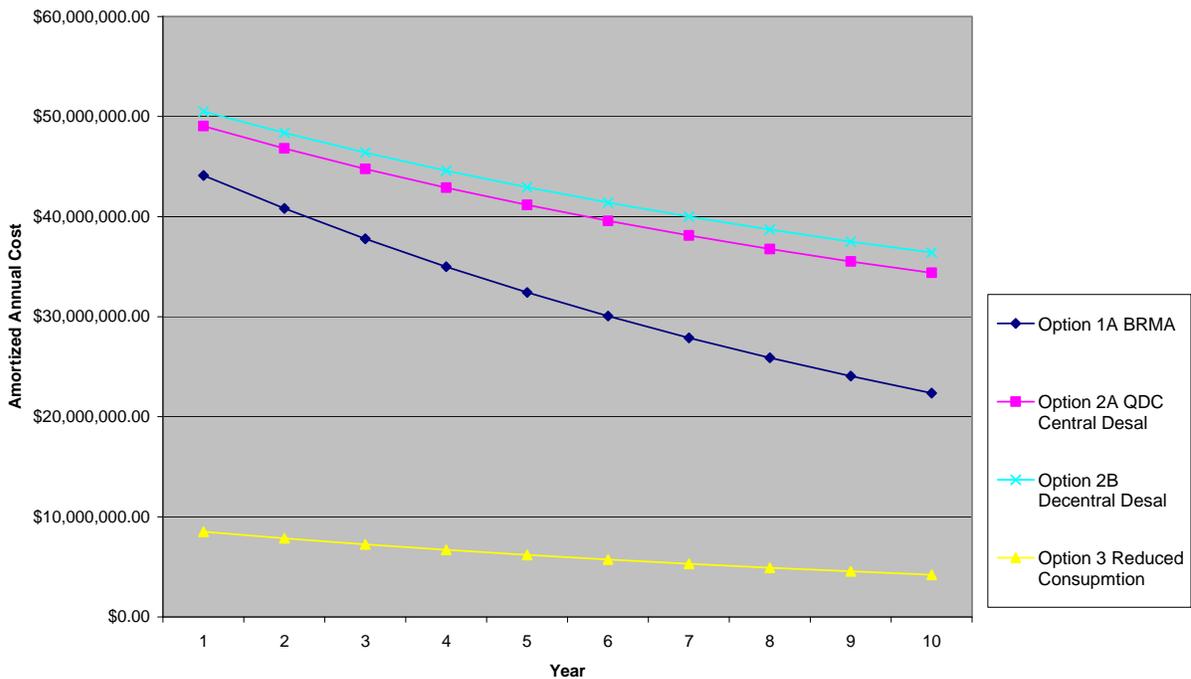
Long Range Option	Q (MGD)	Construction Cost	Amortized construction Cost	Annual O & M Cost	Cost per 1000/Gal
Option 1A – Big River Reservoir	35	\$514,292,740	\$41,246,277	\$2,970,000	\$3.85
Option 2A – QDC Desal	35	\$356,442,020	\$28,586,650	\$21,300,000*	\$4.34
Option 2B- Decentralized Desal	30	\$332,356,000	\$26,654,951	\$23,859,000*	5.36
Option 3 – Demand Reduction	35	\$102,293,802	\$8,203,962	\$400,000	\$2.45**

Data compiled from Statewide supplemental Water Supply Feasibility Assessment: Phase II, QDC Desalination Feasibility Study Report, Swansea Desalination Facility Construction data, Florida Department of Environmental Protection Report on Desalination in Florida and Big River Water Supply Project Phase II – Design Development Report 1989

\*Annual operating cost assumes power, chemicals and membrane replacement of facility treating high salinity raw water. Treating med or low salinity raw water such as could be done at QDC and Westerly results in the reduction of these cost components in turn leading to lower cost/1000 figures at that capacity. Total energy costs, a component of annual O &M are expected to rise annually over the 20 year amortization period.

\*\*Includes current PUC approved wholesale rate for water produced by Providence

**Comparison of Options**





## **Appendix J:**

**1989 EPA Objection Letter for  
Big River Reservoir**

**1990 EPA Final Determination for Big  
River Reservoir**

**RECOMMENDATION TO PROHIBIT  
CONSTRUCTION OF THE BIG RIVER RESERVOIR  
PURSUANT TO SECTION 404 (c) OF THE CLEAN WATER ACT**

**U.S. Environmental Protection Agency  
Region I**

**October 1989**

reservoirs, and possibly at other downstream dams, in a way that would not cause extensive environmental damage. These efforts, coupled with serious urban flood control and floodplain management by the communities along the Pawtuxet River, could achieve whatever limited flood control benefits may be available from building the Big River dam, with less environmental damage.

**F) Summary**

Based on the administrative record, I conclude that the impacts from the Big River reservoir are avoidable. As stated above, the record shows no demonstrable need for new supplies of drinking water before the year 2030. Even if the Corps' most generous predictions were to prove true, however, or if unforeseen needs develop in the future, ample information in the record shows that there are numerous alternatives to building the proposed Big River reservoir which are practicable and less environmentally damaging. These options include demand management alternatives, such as pricing changes, drought management and conservation; supply alternatives, such as groundwater and increasing yields on existing surface water supplies; or a combination of both demand and supply alternatives. These alternatives appear to be less costly than the proposed project, and would be far less environmentally damaging.

## VI. CONCLUSIONS AND RECOMMENDATION

The Big River impoundment area contains some of the finest wetlands in Rhode Island. Numerous studies conducted at the site over the past 13 years by a number of experts all confirm that the aquatic habitats at the site support a rich array of wildlife including mammals, birds, reptiles, amphibians and fish. Largely unspoiled and comprised of a diverse mixture of habitat types, the Big River watershed provides refuge for wildlife in a heavily developed region of New England. In addition to being outstanding wildlife habitat, the project site provides valuable recreational opportunities uncommon in the area. The wetlands of the Big River watershed also function to store floodwaters, recharge and discharge groundwater, maintain water quality, and provide open space.

The adverse impacts of the proposed reservoir would be indisputably significant. If constructed, the reservoir would profoundly alter the hydrology and biology of the watershed and drastically reduce its value for wildlife and recreation. The immediate loss of 575 acres of wetlands and 17 miles of free flowing streams would be unprecedented in New England. Moreover, the project could have far-reaching indirect and secondary impacts including the possible degradation of 700-800 additional acres of wetlands in Mishnock swamp and downstream of the dam by reduced groundwater and surface water flows. If operated as proposed by the State and Corps, the dam would worsen downstream water quality and impede efforts underway to clean up the Pawtuxet River. Many of those commenting on EPA's proposal to prohibit this project spoke of their frequent use and enjoyment of the Big River area for fishing, canoeing, hiking and observing wildlife. Under existing state law and policies, the project would completely deprive the public of these important recreational opportunities. Even if the law and policies change, the extent and diversity of recreation would be substantially reduced.

To determine whether the significant adverse impacts to wildlife and recreation could be avoided, I examined potential alternatives to the Big River project. This in turn led me to review the underlying assumptions and rationale on which the project rests. Based on that analysis, I conclude that the need for the project has not been established. Under very conservative assumptions, a new water supply would not be needed until well into the next century. However, even if a need for a new 30 mgd water supply materialized sooner, I conclude that less environmentally damaging practicable alternatives or combinations of alternatives are available which would satisfy that need. Demand management alternatives include modifying pricing policies, leak detection and repair, plumbing code changes, drought planning and other conservation measures. Increasing the proportion of non-potable water used for power cooling, irrigation, and industrial purposes can also increase potable water supplies. If implemented in

combination these demand alternatives would provide more water than the Big River reservoir would supply. Other alternatives which are either practicable or warrant investigation include exploitation of groundwater supplies (possibly with treatment as needed), increasing the yield of existing surface water dams, avoiding abandonment of existing water supplies and desalination. Most if not all of these alternatives would cost less than the Big River reservoir from both an environmental and economic standpoint.

The regulations implementing §404(c) define an unacceptable impact to include "significant loss or damage to fisheries...or wildlife or recreation areas" or as an impact which the "aquatic and wetland ecosystem cannot afford." The §404(c) regulations direct me to consider the relevant portions of the §404(b)(1) guidelines in evaluating whether an adverse impact would be unacceptable. As explained earlier in this document, I have concluded that the Big River proposal does not comply with the §404(b)(1) guidelines on two counts. First, the project would cause or contribute to significant degradation of the aquatic environment in violation of the guidelines. The Corps of Engineers and the U.S. Fish and Wildlife Service agree. The 1981 EIS concedes that the project would cause a significant disruption to the biological integrity of the aquatic ecosystem and food chain. In 1988, the Corps confirmed that the project could not comply with the §404(b)(1) guidelines because of these significant impacts. Second, the Big River proposal does not pass the "alternatives test" in the guidelines since less environmentally damaging practicable alternatives exist.

After fully considering the record in this case, I conclude that these significant and avoidable impacts to wildlife and recreation would be unacceptable under §404(c). The direct loss of 575 acres of valuable wetlands and 17 miles of free flowing streams is in itself unacceptable. Indeed, after considering the outstanding value of the aquatic habitat at the site and the severity of the adverse impacts, I do not believe the record could support any other finding. The numerous indirect impacts the project could cause, including the possible degradation of another 700-800 acres of wetlands, reinforces my conclusion. As described above, the impacts to wildlife are unnecessary and avoidable and I conclude that the proposed reservoir is environmentally unacceptable on that basis as well. With respect to recreation, I have examined both the extent of the impacts and whether they are avoidable. Because the project would cause substantial and avoidable adverse impacts to recreation, I conclude they are unacceptable. Therefore, I recommend that the discharge of dredged and fill material be prohibited in Big River, Mishnock River, their tributaries and adjacent wetlands for construction of the proposed Big River reservoir and its ancillary facilities.

In formulating this recommendation, I carefully evaluated the environmental values of the Big River system, its sensitivity to

disruption and the adverse impacts a reservoir would cause. The U.S. Fish and Wildlife Service and others submitted convincing and well documented evidence of the value of the Big River project area to wildlife, and the devastating impacts the project would cause are undisputed in the record. I have also examined the need for and alternatives to the project. While there has been some debate about Rhode Island's present and future requirements for water, I am satisfied that any need that does exist can be met at far less environmental and economic cost than the proposed project. By preventing significant and avoidable impacts to wildlife and recreation, a final §404(c) action would enforce the requirements of the §404(b)(1) guidelines, a function envisioned by the §404(c) regulations.



Paul G. Keough  
Acting Regional Administrator



Date

**FINAL DETERMINATION OF THE  
U.S. ENVIRONMENTAL PROTECTION AGENCY'S  
ASSISTANT ADMINISTRATOR FOR WATER  
PURSUANT TO SECTION 404(c) OF THE CLEAN WATER ACT  
CONCERNING THE PROPOSED BIG RIVER  
WATER SUPPLY IMPOUNDMENT  
KENT COUNTY, RHODE ISLAND**

**March 1, 1990**

## I. INTRODUCTION

Section 404(c) of the Clean Water Act (33 U.S.C. Section 1251 et seq.) provides that, if the Administrator of the U.S. Environmental Protection Agency (EPA) determines, after notice and opportunity for public hearing, that unacceptable adverse effects on municipal water supplies, shellfish beds, fishery areas (including spawning and breeding areas), wildlife, or recreational areas will result from the discharge of dredged or fill material, he may exercise his authority to withdraw or prohibit the specification, or deny, restrict or withdraw the use for specification, of any defined area as a disposal site for dredged or fill material. The Section 404(c) regulations state that, before making such a determination, the Administrator must consult with the Chief of the Army Corps of Engineers (Corps), the property owner(s), and the applicant where there has been an application for a Section 404 permit. The procedures for implementation of Section 404(c) are set forth in the Code of Federal Regulations, 40 CFR Part 231.

EPA's regulations for implementing Section 404(c) establish procedures to be followed in exercising the Administrator's authority pursuant to that Section. Three major steps in the process are: 1) the Regional Administrator's proposed decision to withdraw, deny, restrict or prohibit the use of a site (Proposed Determination); 2) the Regional Administrator's recommendation to the Administrator to withdraw, deny, restrict or prohibit the use of a site (Recommended Determination); and 3) the Administrator's final decision to affirm, modify, or rescind the Regional recommendation (Final Determination). The Administrator has delegated the authority to make final decisions under Section 404(c) to the Assistant Administrator for Water, who is EPA's national Clean Water Act Section 404 program manager.

In the instant case, this Final Determination concerns the placement of dredged or fill material for the purpose of creating a water supply impoundment on Big River in Kent County, Rhode Island as proposed by the Corps of Engineers and the State of Rhode Island. The project involves construction of a dam approximately 2300 feet long and 70 feet high to create a 3,400 acre impoundment, with an average depth of 25 feet. The project also involves the construction of an impermeable slurry wall down to bedrock in the Northeast portion of the proposed reservoir. The wall would be necessary to prevent the natural flow of groundwater out of the Big River area. Figure 1 of the Regional Recommended Determination shows the location of the proposed project relative to the South Branch Pawtuxet River Basin and the remainder of the State. Figure 2 shows the project on a regional scale relative to the Pawtuxet River Basin and central Rhode Island. Figure 4 shows the location of the proposed dam with respect to the proposed impoundment area, management area and the Big River watershed.

As stated in the Regional Recommended Determination, the basic purpose of the Big River reservoir is to satisfy future needs for drinking water in the Greater Providence area. The Corps of Engineers evaluated the potential flood control and

recreation benefits of the project in an Environmental Impact Statement completed in 1981 in response to a 1978 request from the State of Rhode Island. However, in its subsequent permit application in 1986, the State of Rhode Island stated that the purpose of the project is to provide municipal water supply.

EPA Region I's Acting Regional Administrator has recommended that EPA prohibit the discharge of dredged or fill material into Big River, Mishnock River and their tributaries and adjacent wetlands for the purpose of constructing the proposed Big River Reservoir and its ancillary facilities. Region I's Acting Regional Administrator based this recommendation upon a conclusion that the project will cause unacceptable adverse effects to wildlife habitat and recreation areas. In reaching this conclusion, the Acting Regional Administrator found that the adverse impacts associated with the proposed impoundment are avoidable and unnecessary.

This Final Determination is based on consideration of the administrative record developed in this case, including public comment submitted in response to the Regional Proposed Determination and comment received at the public hearing. This Final Determination also reflects review and consideration of additional relevant information that subsequently was submitted and made part of the record.

The Section 404(c) regulations authorize the prohibition or other restriction of the discharge of dredged or fill material at sites where it is found that "unacceptable adverse effects on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife, or recreational areas" would result. The administrative record fully supports the Regional conclusion that construction of the proposed Big River impoundment would result in the destruction and loss of diverse and productive wetland and free flowing stream habitat that provides profound and critical ecological support to wildlife in the Big River watershed and Management Area. Further, the administrative record supports the conclusion that the proposed impoundment could adversely impact aquatic resources and water quality outside of both the impoundment area and the Big River watershed by impairing groundwater movement and reducing the amount of water discharged into the south branch and main stem of the Pawtuxet River. In addition, Regional findings concerning the overall project purpose and need and practicable alternatives to satisfy that need are supported by the administrative record. Accordingly, Section II, PROJECT DESCRIPTION AND HISTORY (pages 3-9), Section III, SITE DESCRIPTION (pages 10-27), Section IV, ADVERSE ENVIRONMENTAL IMPACTS, Sections A-D (pages 29-48), and Section V, ALTERNATIVES (pages 49-64) of the Recommended Determination are hereby adopted as part of this Final Determination.

In consideration of the Recommended Determination, the administrative record and other material information obtained by EPA subsequent to the Recommended Determination, EPA has determined that the discharge of dredged or fill material in

connection with the proposed Big River water supply reservoir would result in unacceptable adverse effects on wildlife habitat and recreation areas. This Final Determination therefore affirms the Regional Recommended Determination and prohibits the designation of Big River, Mishnock River and their tributaries and adjacent wetlands as discharge sites for dredged or fill material for the purpose of creating a reservoir or impoundment as proposed by the Corps of Engineers 1981 Environmental Impact Statement and as proposed by the Rhode Island Water Resources Board.

## II. EPA HEADQUARTERS ACTIONS

Pursuant to the Section 404(c) regulations, after considering public comment on the Proposed Determination, EPA Region I submitted the Regional Recommended Determination to EPA Headquarters. The Recommended Determination document was signed October 10, 1989, and the full administrative record was received by EPA Headquarters on October 30, 1989. Pursuant to Section 231.6 of the Section 404(c) regulations, the initial deadline for issuing the Final Determination for the proposed action was December 29, 1989. Due to the magnitude of the record for this case and the importance of the recommended actions under consideration, EPA determined that there was good cause for extending the period for affirming, modifying, or denying the Regional Recommended Determination until March 1, 1990. Notice of the extension of time was published in the *Federal Register* on January 3, 1990 (55 FR 171).

In accordance with the Section 404(c) regulations at Section 231.6, EPA offered final consultation with the Director of Civil Works of the Army Corps of Engineers (Corps) and the Chairman of the Rhode Island Water Resources Board by letters dated November 7, 1989. The letters provided the Corps and the Water Resources Board the opportunity to present information which reflects an intent to take corrective action to prevent unacceptable adverse effects from the subject activities. Further, the letters offered an opportunity to meet with EPA representatives and discuss any issues related to the Section 404(c) action.

The Corps responded in a letter from Brigadier General Patrick Kelly, Director of Civil Works, dated November 29, 1989, which stated that the Corps had no comments on the Recommended Determination at that time. The Rhode Island Water Resources Board responded in a letter dated November 20, 1989, from A. Joseph Mattera, Chairman. Mr. Mattera's letter suggested that because there was no permit application pending on the project (the Board had withdrawn the Section 404 permit application subsequent to EPA Region I's initiation of the Section 404(c) action), and that because the State had commissioned a State-wide water supply analysis due to be completed by mid-1990, final action on the project would be premature and EPA should therefore defer final action on the Recommended Determination; the letter did not indicate a specific timeframe for the deferral. Mr. Mattera's letter also raised

issues concerning EPA's jurisdiction over the proposed Big River project and adequacy of the proposed consultation timeframe. Mr. Mattera's letter did not request a meeting or any other further consultation with EPA regarding the Regional Recommended Determination or final decision.

Mr. Mattera's letter stated that there was no need for EPA Headquarters to proceed with the Final Determination because there is no permit application pending for the project, and the State does not intend to proceed with the application until such time that there is a demonstrable need for additional water supplies. Moreover, Mr. Mattera's letter also indicated that the State would consider construction of the Big River project only if a project could be constructed without unacceptable environmental risk. EPA notes, however, that when this Section 404(c) action was initiated, the Rhode Island Water Resources Board had pending a Section 404 permit application proposing the discharge of dredged or fill material in waters of the United States for the purpose of constructing this project. On April 3, 1987, the Water Resources Board applied for a Section 404 permit for the Big River Reservoir; that application was still pending on August 24, 1988, when EPA Region I initiated the Section 404(c) action. The Section 404 permit application was withdrawn by the Water Resources Board on September 8, 1988. Because specific projects have been proposed in the past, both by the State and the Corps, EPA determined that it would be appropriate to complete this Section 404(c) action rather than leave unresolved the acceptability of the adverse effects of the proposed projects. Moreover, the Clean Water Act does not preclude EPA from completing the Section 404(c) process under these circumstances. In fact, the Section 404(c) regulations explicitly recognize EPA's authority to take actions pursuant to Section 404(c) in advance of and/or in the absence of a permit application (40 CFR §231.1(a)).

Mr. Mattera's response included discussion of an ongoing analysis of water supply issues. The letter stated that the study would focus on the long-range need for the Big River project and that State decisions regarding the proposed impoundment would be assessed in light of the findings of the study. As presented in the administrative record, the water supply analysis mentioned in Mr. Mattera's letter is designed to address State-wide water supply issues and will not specifically address the Big River proposal.

Preliminary review of the information in the Regional administrative record, the draft reports available from the State water supply study at that time (which have been included in the administrative record), and the overall scope of work of that study, led EPA to conclude that a deferral was not necessary and would not provide significantly better information on which to base this Final Determination. EPA further determined that the Agency had a responsibility to review the Regional Recommended Determination and render a final Agency decision in as brief a period as reasonable.

Based on these findings, EPA decided that deferral of final action on the Recommended Determination would be inappropriate.

Therefore, review of Mr. Mattera's letter, in light of preliminary evaluation of the Recommended Determination, convinced EPA Headquarters that the issues raised by Mr. Mattera which were relevant to a Final Determination under Section 404(c) could be adequately addressed during review of the Recommended Determination and administrative record for the Big River project.

The Conservation Law Foundation (CLF), the Audubon Society of Rhode Island (Audubon) and the National Wildlife Federation (NWF) requested a meeting with the Assistant Administrator for Water to discuss their concerns over EPA Headquarters' review of the Regional Recommended Determination. This meeting was held on December 22, 1989. Issues raised by the representatives of NWF, Audubon and CLF included: their support for the Regional Recommended Determination; their support for prompt completion of the Final Determination; their belief in the adequacy of the Recommended Determination and administrative record; their doubt regarding the project's compliance with the Section 404(b)(1) Guidelines; and consideration of the State-wide water supply study.

### III. NEW INFORMATION

Subsequent to transmittal of the Regional Recommended Determination to EPA Headquarters, information which EPA believes is relevant to the Final Determination on the Big River project became available to Region I and was forwarded to EPA Headquarters. The information contained in these reports was not available for comment during the public review period for the Proposed Determination. However, as discussed below, this information merely confirms the accuracy of the administrative record supporting the Region's conclusions regarding the environmental impacts of the Big River project, its need and the availability of alternatives. Since the new information is not being relied upon to alter the Agency's determination but is corroborative of other information that was subject to public review and comment during the Regional stages of the Section 404(c) process, EPA determined that additional public input was not necessary. The information includes: interim results of a study reviewing measurements of the safe yield of Scituate Reservoir; new measurements of the total wetland acreage within the area outlined by the proposed Big River impoundment; and draft reports developed in the State's review of water supply. A brief description of the information and its relevance to this Final Determination is presented below.

#### **A. Safe yield of the Scituate Reservoir.**

In evaluating the water supply capacity of existing sources in the region of Rhode Island to be served by the proposed Big River Reservoir, previous analyses have incorporated various estimates of the available safe yield of existing supplies in Scituate Reservoir. In reaching particular findings contained in the Recommended Determination, EPA Region I relied upon approximations of safe yield for Scituate Reservoir based on estimates determined by the Providence Water Supply Board (pages 51-53 of the Recommended Determination and pages 7-9 of Appendix III of the Recommended Determination). The safe yield figure for the Scituate Reservoir system used in the Recommended Determination is 89.3 million gallons per day.

Preliminary review and analysis of the safe yield measurements for the Scituate Reservoir prepared by consultants for the Providence Water Supply Board and obtained by EPA Region I since transmittal of the Recommended Determination to EPA Headquarters confirms previous estimates of the Board. While inquiries by EPA Region I found that the contractor's review has not yet been finalized, the preliminary safe yield figure agrees with estimates in the administrative record and supports the relevant sections of the Recommended Determination.

#### **B. Updated information on wetland acreage.**

In the preparation of the Recommended Determination, EPA Region I utilized measurement data on general wetland acreage and type within the Big River watershed and proposed impoundment area, concluding that 575 acres of wetlands exist within the proposed impoundment boundaries. The data for this figure are based on evaluation of aerial photography and field checking, both performed at the University of Rhode Island by students under the direction of Dr. Frank Golet, Associate Professor of Natural Resource Science, Department of Forestry and Wildlife. The acreage of wetlands predicted by the University of Rhode Island study to be impacted by the proposed impoundment coincides closely with earlier estimates by the Corps of Engineers of wetlands within the impoundment area. Wetland acreage and type within the subject area are summarized in Figure 5 of the Recommended Determination.

For the purposes of this Final Determination, EPA Headquarters relied upon the acreage of wetland loss used in the Recommended Determination. It should be noted, however, that in January of 1990, EPA Region I received a student report, prepared for a class taught at the University of Rhode Island, which estimates that construction of the proposed Big River impoundment would result in the direct loss of approximately 794 acres of wetlands. Preliminary review by EPA Region I of the data used in this analysis predicted that the wetland loss would be somewhat larger, approximately 820 acres. The baseline acreage data used in the analysis was not available for review in this Final Determination and as such, conclusions regarding the validity of these new

figures would be premature and are not considered applicable for the purposes of this Final Determination.

**C. Draft Reports: Water Supply Analysis for the State of Rhode Island.**

In addition to reviewing the environmental impacts of the proposed Big River impoundment, EPA Region I examined the avoidability of those impacts based upon the overall project purpose and need, as well as practicable alternatives which satisfy the basic project purpose and need. As noted previously, the project as proposed by the Corps had as one of its purposes construction of an impoundment which could serve as a water supply reservoir. As proposed by the State, the Big River project would have as its sole purpose creation of a water supply for a given region of Rhode Island. In reviewing the avoidability of the project impacts, the Recommended Determination evaluates factors such as legitimate need for water supply based upon population projections and per capita consumption of water for the subject area (pages 50-53 of the Recommended Determination and Appendix III of the Recommended Determination). As noted in the Recommended Determination, EPA Region I concluded that previous predictions of water supply deficits in the area which would be served by the proposed Big River impoundment were imprecise and did not reflect available information.

As noted in the Recommended Determination, the Governor of Rhode Island has formed a special task force known as the Water Resources Coordinating Council (WRCC) and has charged this group with reviewing Rhode Island's State-wide water supply needs and assessing various structural and non-structural alternatives which could satisfy anticipated unmet need. In order to respond to this charge, the task force contracted with Arthur D. Little, Inc., to prepare reports addressing baseline water use, water demand management, water supply and supply management, forecast of water use and unmet needs, and identification and analysis of alternatives. After consideration of these reports the WRCC will prepare recommendations for State actions regarding water supply. Currently, draft reports are publicly available on all topics except alternatives. It should be noted that the reports are in draft and subject to further review and revision. Additionally, the reports are designed to address water supply needs State-wide and therefore do not, at least in their present draft format, specifically consider the proposed Big River impoundment.

Although the available water supply analysis reports are currently in draft form, EPA determined that it would be useful to review the information presented in the reports for consistency with assumptions used in preparing the findings contained in the Recommended Determination. To help accomplish this task, EPA contracted with Dr. John Boland to examine the Arthur D. Little reports and compare them to results of the EPA Regional analysis. Dr. Boland's February 9, 1990, letter concluded that

overall, the draft water supply analyses available as of that date did not contradict EPA Region I analysis or refute conclusions in the Recommended Determination.

EPA Headquarters also reviewed the draft reports independently in preparation of this Final Determination and concluded that the draft water supply analyses were consistent with the bases for findings presented in the Recommended Determination. In many instances, such as population projections and water use projections, the new analysis indicated that the Recommended Determination may have even over-estimated the need for additional water supply.

#### **IV. FINDINGS AND CONCLUSIONS**

This Final Determination under Section 404(c) of the Clean Water Act addresses unacceptable adverse effects to wildlife habitat and recreation areas. The Section 404(c) regulations define an unacceptable adverse effect as an impact on an aquatic or wetland ecosystem that is likely to result in significant degradation of municipal water supplies or significant loss of or damage to fisheries, shellfishing, or wildlife habitat or recreation areas. Section 231.2(e) of the Section 404(c) regulations states that the evaluation of the unacceptability of such impacts should consider relevant portions of the Section 404(b)(1) Guidelines. The relevant portions of the Guidelines include consideration of practicable alternatives to the proposed project which would have less adverse impact on the aquatic ecosystem (40 CFR §230.10(a)). Based upon the substantial environmental effects of the proposed project and the availability of less damaging practicable alternatives, EPA finds that the project as proposed would result in significant loss of wildlife habitat and recreation areas.

The Recommended Determination and the administrative record form the basis for EPA Headquarters' conclusion that the area which would be directly impacted by completion of the proposed Big River Dam and Reservoir contains exceptional and diverse natural wetland and free flowing aquatic systems. The large, relatively undisturbed area provides habitat for an abundant and complex assemblage of wildlife species. The administrative record supports the findings of the Recommended Determination that the subject area currently supports important habitat for a range of resident and transient species of wildlife which depend upon the area's natural aquatic systems for all or significant portions of their life cycle or which thrive in a natural habitat composed of upland-terrestrial, open water, and emergent, scrub-shrub and forested wetland ecosystems.

In addition to direct loss of wildlife habitat associated with implementation and operation of the proposed impoundment, the administrative record confirms that the proposed project would alter both surface and groundwater flow out of the Big River system. The administrative record supports the conclusion that the Big River water supply impoundment, if operated as proposed, would reduce substantially the quantity

of water that currently flows into the Flat River Reservoir and South Pawtuxet River and thus would adversely impact downstream aquatic habitats. Additionally, proposed placement of a slurry wall in the area of Division Road to prevent groundwater leakage from the proposed reservoir would interrupt normal groundwater flows that contribute to the water levels in Mishnock lake and maintain forested wetlands in Mishnock swamp. While these secondary, indirect impacts would adversely affect aquatic habitats outside of the impoundment site, the effects are predicted to be of similar magnitude to losses within the impoundment area. Finally, it should be noted that changes in downstream flow resulting from implementation of the proposed Big River project would have a clear potential for adversely affecting water quality in downstream areas of Flat River Reservoir and the South Pawtuxet River.

The administrative record indicates that the Big River management area, including the site of the proposed impoundment, is utilized by the public for a range of consumptive recreational activities such as fishing and hunting as well as non-consumptive uses such as hiking, bird watching, swimming and canoeing. Although the area does not experience significant recreational use compared to some areas which actively encourage recreational activities, such as Flat River Reservoir, the area provides relatively unique opportunities for cold water fishing and other activities dependent upon free flowing stream systems as well as activities dependent upon accessible large scale environments. The proposed reservoir's area along with the remainder of the Big River management area comprise a substantial portion of the natural open space in the State of Rhode Island.

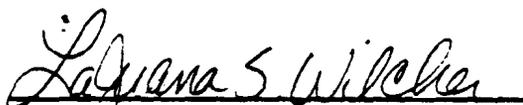
Under both the Corps and State proposals, the primary purpose of the Big River project is potable water supply. Because of current State policies limiting the type of use for water supply facilities, and the restricted access that usually accompanies a water supply reservoir, it is likely that many if not all recreational opportunities currently available in the proposed reservoir area would be prohibited both in the reservoir pool and in areas surrounding the impoundment. Even if restrictions were changed to allow particular recreational activities, as proposed, construction of the Big River Reservoir would significantly alter the present recreational environment in the proposed impoundment area. Because terrestrial and relatively shallow wetland and flowing stream environments would be replaced with deeper, static reservoir waters, recreational activities, such as stream fishing or bird watching, which are carried out on foot, would be lost within the impoundment area. Other recreational activities within the impoundment would be limited to those which can be accomplished from a boat or from the reservoir shore. In addition, loss of the terrestrial and wetland wildlife habitat would destroy or reduce the area's current capacity to support those species which are the object of activities such as bird watching and hunting.

EPA also evaluated the avoidability of impacts associated with the proposed project through examination of the underlying assumptions and rationale on which the project rests. The administrative record indicates that should the need arise for additional water supply in the area which would be served by the Big River proposal, practicable alternatives which are less damaging to the environment are available to satisfy that need. The administrative record suggests that significant potential sources of potable water, from both conventional and non-conventional sources, have not been adequately explored. Alternatives such as improved yield of present surface water supplies and proper use of available groundwater reserves are potential additional sources of potable water supply which could supplement available sources. However, the administrative record supports the conclusion that projected water demand is highly unlikely to exceed supply in the near future and, with reasonable demand management mechanisms, it is unlikely to exceed supply over the long term. As stated previously, this finding is supported by preliminary reports prepared by consultants for the State Water Resources Coordinating Council. The administrative record suggests that population growth has stayed significantly below levels previously predicted and both residential and industrial water consumption have exhibited declines over the recent past. In addition, the administrative record establishes that non-structural alternatives to construction of an impoundment, such as altered pricing policies, long-term water conservation strategies and drought management, hold substantial promise in terms of demand management capable of further reducing the need for large scale impoundment projects.

Review of the Recommended Determination and the administrative record confirms that construction of the proposed water supply dam and reservoir on Big River would result in the direct and significant loss of an area that provides important wildlife habitat and recreational opportunity. Additionally, implementation of the proposed reservoir project would adversely impact valuable aquatic systems associated with surface and groundwater flow from the subject area and could exacerbate water quality problems downstream of the Big River area. Further, the record confirms that these adverse impacts are avoidable. The administrative record supports the finding in the Recommended Determination that there are practicable, less environmentally damaging alternatives that would address projected water supply deficits, if any, for the area which would be served by the proposed Big River Reservoir. The record also demonstrates that the basis for previous estimates of water supply deficit for the region which would be served by the Big River proposal were incorrect and that water supply deficits are not likely to occur over the long term. EPA concludes that the direct and indirect environmental impacts associated with the proposed Big River project would be

profound and are avoidable and constitute unacceptable adverse effects to wildlife habitat and recreation areas within the meaning of Section 404(c).<sup>1</sup>

This Section 404(c) Final Determination therefore affirms the Regional Recommended Determination and prohibits the designation of waters of the United States including Big River, Mishnock River and their tributaries and adjacent wetlands as discharge sites for dredged or fill material for the purpose of creating the Big River reservoir as proposed by the Corps of Engineers 1981 Environmental Impact Statement and as proposed by the Rhode Island Water Resources Board. EPA's Section 404(c) action is based upon the adverse impacts associated with construction of the Big River dam and reservoir and the avoidability of those impacts. Accordingly, this Final Determination does not pertain to filling activities for purposes other than the project as proposed, or to proposed filling activities in other waters of the United States within the described area. Other proposals involving the discharge of dredged or fill material in the waters of the United States at issue will be evaluated on their merits within the Section 404 regulatory program.

  
Lajuana S. Wilcher, Assistant  
Administrator for Water

March 1, 1990

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<sup>1</sup> EPA Headquarters' conclusion that the adverse impacts of this project are unacceptable rests on consideration of the significance of the impacts in the context of their avoidability. Therefore, this decision need not, and does not, reach the question of whether such impacts would still be unacceptable if there were no other practicable, environmentally less damaging alternatives to meet legitimate public water supply needs.



## **Appendix K:**

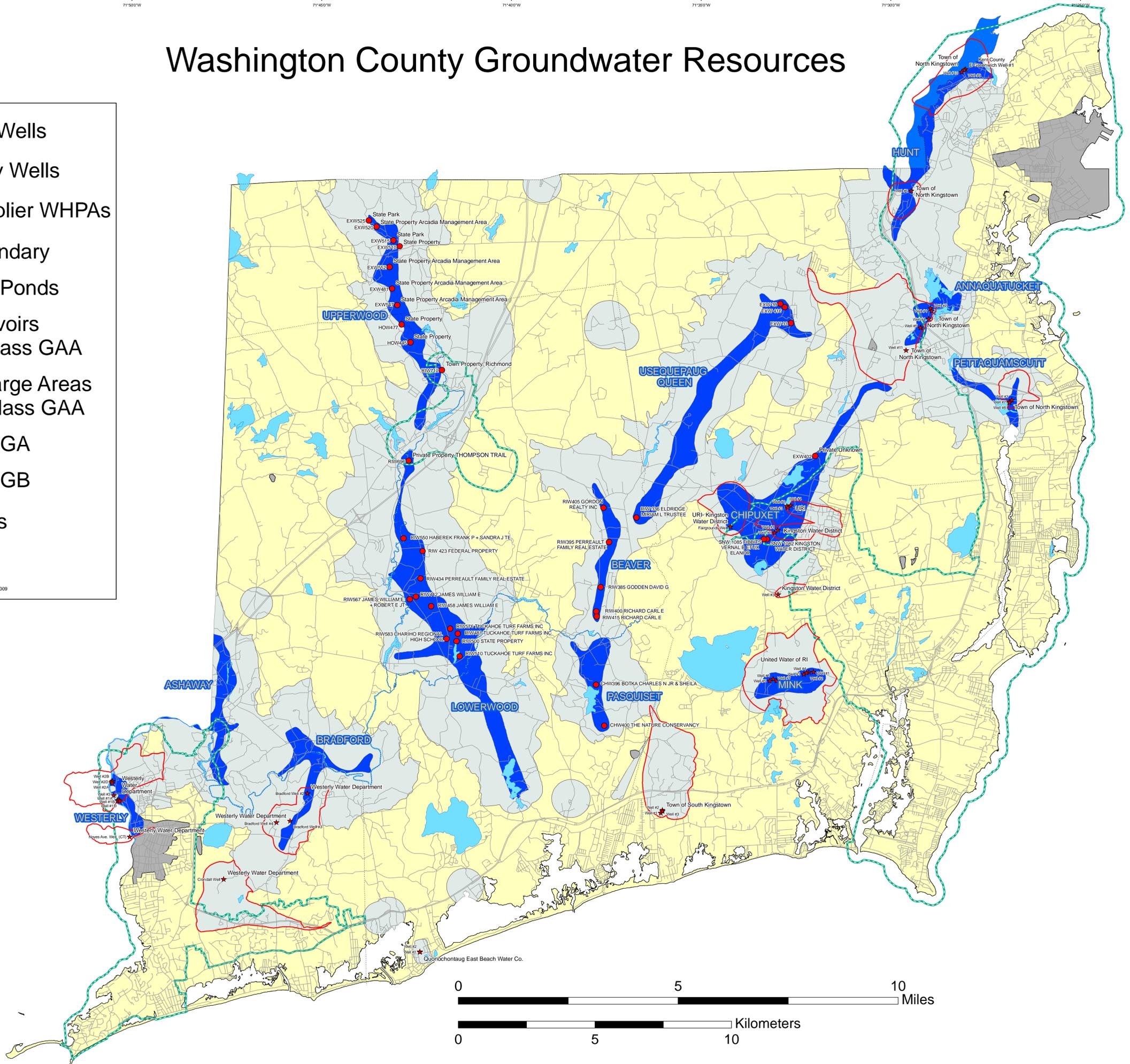
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# **South County Groundwater Resources**

# Washington County Groundwater Resources

- WRB Test Wells
- ★ Community Wells
- Large Supplier WHPAs
- Urban Boundary
- Lakes and Ponds
- GW Reservoirs and GW Class GAA
- GW Recharge Areas and GW Class GAA
- GW Class GA
- GW Class GB
- Town Lines
- Roads

Map by Theodore Peters June 2009





## **Appendix L:**

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# **Stafford Pond Use Agreement for Stonebridge Water District**

COMPROMISE OF CLAIMS AND SETTLEMENT AGREEMENT  
TOGETHER WITH  
THE DAM MANAGEMENT AGREEMENT  
BY AND AMONG THE CITY OF FALL RIVER,  
WATUPPA RESERVOIR COMPANY AND  
THE STONE BRIDGE FIRE DISTRICT  
EXECUTED ON SEPTEMBER 26, 1990

INDEX

1. Compromise of Claims and Settlement Agreement by and among the City of Fall River, Watuppa Reservoir Company and the Stone Bridge Water District dated September 26, 1990
2. Dam Management Agreement by and among the City of Fall River, Watuppa Reservoir Company and the Stone Bridge Fire District dated September 26, 1990.

COMPROMISE OF CLAIMS AND SETTLEMENT AGREEMENT

This Compromise of Claims and Settlement Agreement (the "Compromise") is made as of September 26, 1990 by and among the City of Fall River, Massachusetts, a Massachusetts municipal corporation (the "City"), Watuppa Reservoir Company, a Massachusetts corporation created by special Act of the Massachusetts General Court in 1826 (hereafter "Watuppa"), and the Stone Bridge Fire District, a Rhode Island corporation created by Chapter 2320 of the Acts of 1936, a special Act of the Rhode Island General Assembly, as amended ("Stone Bridge").

W I T N E S S E T H:

WHEREAS, the City and Watuppa are plaintiffs, and Stone Bridge is a defendant in the action entitled City of Fall River and Watuppa Reservoir Company v. Stone Bridge Fire District, et al originally filed in the U.S. District Court for the District of Massachusetts (CA No. 88-2542-C), later transferred to the United States District Court for the District of Rhode Island as CA No. 90-0155-B (the "1988 litigation"); and

WHEREAS, the City, Watuppa and Stone Bridge are riparian owners on one or more of Stafford Pond, Sucker Brook, South Watuppa Pond and the Quequechan River and have conflicting views on their respective rights as riparian owners, with the City and Watuppa believing that no water may be diverted from the Stafford Pond watershed so as to divert from the natural outflow

from, or to diminish the storage of water in Stafford Pond, on the one hand, and Stone Bridge, on the other hand believing that it has rights to divert water from Stafford Pond; and

WHEREAS, the City, Watuppa and Stone Bridge are parties to an agreement beginning in 1948, together with certain other riparian owners, which regulated the rights of flowage from Stafford Pond (the "Pond") in Tiverton, Rhode Island, which agreement was subsequently amended by the parties on January 19, 1953 and on October 19, 1954 (together with all amendments, the "1948 Agreement"); and

WHEREAS, the litigation between the parties hereto concerns alleged breaches of the 1948 Agreement, which allegations, Stone Bridge denies; and

WHEREAS, the parties desire (i) to settle the 1988 litigation, and (ii) to execute a stipulation of dismissal and resolve the claims and counterclaims stated in the 1988 litigation by compromise and settlement, and (iii) to compromise and settle their competing riparian claims and to obtain forbearance each from the other from the assertion and litigation of those claims by way of compromise and settlement.

NOW, THEREFORE, the parties for good and valuable consideration do hereby agree as follows:

1. Dismissal of Suit. The parties hereto agree that the case of City of Fall River and Watuppa Reservoir Company v. Stone Bridge Fire District, C.A. No. 88-2542-C is hereby dismissed with prejudice. A copy of the stipulation of

dismissal is attached hereto as Exhibit A.

2. Right to Divert. Subject to the provisions herein contained, Stone Bridge may divert from the Pond up to 1.9 million gallons per day for distribution and sale to its present and future customers as herein provided, and otherwise in accordance with its purposes, without objection from the City or Watuppa, but no representations are given hereby that all persons who may have riparian rights in Stafford Pond or the waters flowing therefrom consent to this Compromise.

3. Management Contract. The City and Stone Bridge shall execute a Dam Management Agreement for the operation of the Stafford Pond dam in the form attached hereto as Exhibit B (the "Management Contract"). The attached Management Contract and this Compromise are considered as one document. Accordingly, Sections 2 through 12 inclusive of this Compromise shall apply to the Management Contract as if expressly set forth therein.

4. No Waiver. This Compromise is entered into without prejudice to any rights of the respective parties following the termination date hereof. Thus after the termination hereof for example Stone Bridge may argue that it has a claim of right to take and divert waters from the Pond, and Fall River and Watuppa may argue that they are entitled to all of the natural outflow of the Pond without diversion by Stone Bridge. No party, by the execution of this Compromise or otherwise, shall, during the term of this Compromise, obtain any rights by prescription against any other party hereto.

5. Payment. In consideration of the agreements herein contained, Stone Bridge shall pay to the City \$0.19 per thousand gallons for each thousand gallons of water in excess of 300,000 gallons per day which Stone Bridge pumps from the Pond and treats in its plant. Stone Bridge shall pay for such treated water as measured at the meter which measures the amount of water after treatment and before it reaches the stand pipe less (1) treated water used for backwash (the difference hereafter referred to as "Net Effluent"), and (2) Stone Bridge's then current percentage of unaccounted water (the difference between Net Effluent and the total of metered sales and deliveries) or by a 10% allowance for water loss, whichever is less. The product of this calculation shall be known as "Net Sales". In the event of changes which make this method of calculation inapt or impossible, the parties shall agree on a modified method of calculation to duplicate this method as closely as possible. This shall not include any water that is backwashed to the Pond or consumed by Stone Bridge in its treatment plant. The computation under this paragraph shall be done on a monthly basis. Stone Bridge shall pay to Fall River on the tenth (10th) day following the end of each month during the term of this Compromise, the first such month to begin on May 1, 1991, the amount of money owed the City for the pumpage of water during the immediately preceding month. Accordingly, the first payment due Fall River under this Compromise shall be on the tenth (10th) day of June, 1991 and the first CPI adjustment, if any,

shall occur starting May 1, 1992 on the basis of the percentage of CPI change between November 1990 and November 1991. Payment to Fall River shall be computed as follows: Stone Bridge shall first determine the Net Sales pumped during the preceding month and from that amount there shall be deducted an amount which is obtained by multiplying the sum of 300,000 by the number of days in such preceding month. The resulting amount shall be multiplied by \$.00019 to determine the payment in dollars that Stone Bridge owes Fall River. A calculation setting forth the method for calculating the payment to Fall River is attached as Exhibit C.

The amount of such per thousand gallons payment shall be adjusted annually on May 1st, to be effective during the year immediately following such adjustment date, to reflect the percentage increase or decrease between the November 1990 Revised Consumer Price Index for Urban Wage Earners and Clerical Workers published by the Bureau of Labor Statistics of the United States Department of Labor for Boston-Lawrence-Salem, MA-NH, All Items, (1982-84=100) (the "CPI-W") and the CPI-W for November in the year preceding each May's adjustment provided however that in no event will such payment ever be less than \$0.19 per thousand gallons. The payment to Fall River in each year shall be increased to an amount obtained by multiplying \$.00019 by a fraction in which the numerator is the then applicable CPI index for the measuring period and the denominator is the CPI index for November, 1990. In the event

Bridge contemporaneously with the payments to be made under Section 5 hereof. Stone Bridge also, during the term of this Compromise, will give to the City's authorized representatives access (during normal business hours and upon reasonable prior notice) to all records and meters relating to the pumpage and sales of water pumped by Stone Bridge from the Pond.

7. Notices. All notices, reports or other communications hereunder shall be in writing and shall be deemed to have been duly given when mailed by registered or certified mail, return receipt requested, postage prepaid,

(a) if to the City of Fall River and Watuppa:

Administrator of Public Utilities  
Government Center  
Fall River, MA 02722

with a copy to Corporation Counsel  
Fall River, MA 02722;

(b) if to Stone Bridge Fire District:

Moderator  
Stone Bridge Water District  
1765-1/2 Main Street  
Tiverton, RI 02878

with a copy to Jeremiah A. Leary, Esq.  
Leary & Holland  
1340 Main Street  
Tiverton, RI 02878.

Each party may alter the nominated recipient of notice hereunder by a writing sent by registered or certified mail to the other party specifying the persons who are to receive notice under this paragraph.

8. Arbitration. All claims, disputes and other matters

in question between the parties to this Compromise, arising out of or relating to the correct metering of water, the amounts of water pumped, the amount due Fall River as calculated hereunder and the subject matter of the Management Contract or the breach thereof, shall be decided by arbitration by qualified water works engineers nominated by the City and Stone Bridge in accordance with the Commercial Arbitration Rules of the American Arbitration Association then existing unless the parties mutually agree otherwise. Notice of the demand for arbitration shall be filed in writing with the other party to this Compromise. The demand shall be made within six (6) years after the claim, dispute or other matter in question has arisen. The award rendered by the arbitrator shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof. The parties retain their right to seek judicial redress for any other breaches of this Compromise, including equitable relief.

9. Assignment. This Compromise shall be binding upon and shall inure to the benefit of the parties and their respective successors and assigns and shall run with the land. None of the parties hereto may assign any of their rights, title, interest in and the obligations thereof to this Compromise to a third party without consent of the other parties, except that Stone Bridge may assign the Compromise to any public or municipal corporation organized under the laws of the State of Rhode Island whose net worth is at least equal to that of Stone Bridge

and except that the City and Watuppa may assign the Compromise to any public or municipal body corporate organized under the laws of Massachusetts, and that the City and Watuppa may assign monies due hereunder as security for any debt of the City. In the event Stone Bridge or any successor or assignee thereof transfers all or substantially all of its assets without also assigning this Compromise to the same transferee, the City may, in its sole discretion, declare this Compromise terminated and so notify the parties thereto.

10. Merger. All understandings and agreements heretofore made are merged into this Compromise which fully and completely sets forth the agreement of the parties. After the date hereof, no party shall have any obligations hereunder or under the 1948 Agreement with respect to Lake Noquochoke or pumpage therefrom.

11. Compromise under Seal. This Compromise shall be a contract made under seal of the parties, except that the parties agree that no suit or action regarding any matter not arbitrable under Section 8, above, may be brought under this Compromise more than eleven and one-half years from any alleged violation hereof.

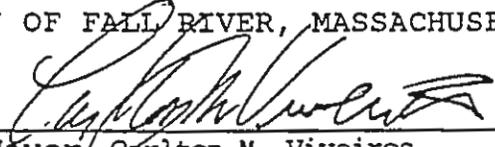
12. Term of the Compromise. This Compromise shall become effective as of September 26, 1990 except Stone Bridge's obligations under Paragraph 5 shall commence as of May 1, 1991 and shall terminate upon the earlier of (i) April 30, 2025 or (ii) the date of a notice of termination which the City of Fall River may, at its discretion, send to Stone Bridge if Stone

Bridge or the State of Rhode Island or any political subdivision, authority, department, agency, district or municipality of the State of Rhode Island should at any time commence condemnation proceedings with respect to the flowage rights claimed by the City and Watuppa in the Pond, or the City and/or Watuppa's riparian ownerships adjacent to the Pond or the dam site or any of them, singly or in combination.

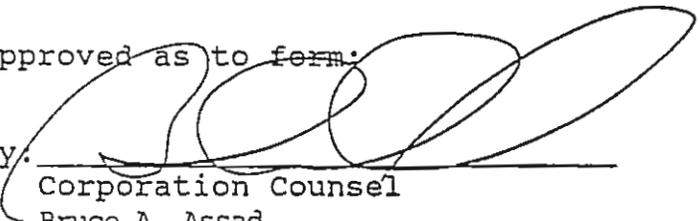
IN WITNESS WHEREOF, the parties hereto have caused this Compromise to be duly executed by their authorized and proper officers as of the date set forth above.

(Seal)

CITY OF FALL RIVER, MASSACHUSETTS

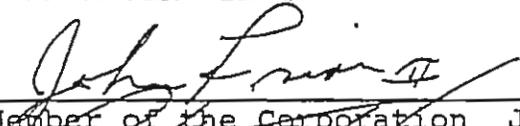
By:   
Mayor Carlton M. Viveiros

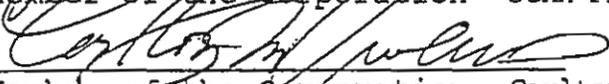
Approved as to form:

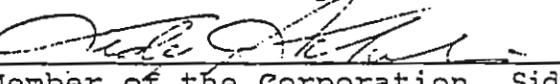
By:   
Corporation Counsel  
Bruce A. Assad

(Seal)

WATUPPA RESERVOIR CO.

By:   
Member of the Corporation John Friar, II

By:   
Member of the Corporation Carlton M. Viveiros

By:   
Member of the Corporation Sidney Schenker

(Seal)

STONE BRIDGE FIRE DISTRICT

By: Roger L. Roussel  
Moderator

Roger L. Roussel

By: Peter M. Forrest  
Clerk of the District

Peter M. Forrest

COMMONWEALTH OF MASSACHUSETTS

Bristol, ss.

September 26, 1990

Then personally appeared the above named Carlton M. Viveiros, Mayor, as aforesaid and acknowledged the foregoing instrument to be his free act and deed, and the free act and deed of the City of Fall River, before me

Claire Latkowski  
Notary Public

My Commission Expires: 12-12-91

COMMONWEALTH OF MASSACHUSETTS

Bristol, ss.

September 26, 1990

Then personally appeared the above named \_\_\_\_\_ and \_\_\_\_\_, Members of the Corporation as aforesaid and acknowledged the foregoing instrument to be their free act and deed, and the free act and deed of the Watuppa Reservoir Company, before me,

Claire Latkowski  
Notary Public

My Commission Expires: 12-12-91

STATE OF RHODE ISLAND  
COUNTY OF NEWPORT

In Tiverton in the County of Newport in the State of Rhode Island on this 24th day of September, 1990, then personally appeared the before-named Roger L. Roussell and Peter M. Forrest, to me personally known and personally know to me to be the Moderator and Clerk respectively of the Stone Bridge Fire District, and by me personally known to be the parties who executed the foregoing instrument; and they acknowledged the same to be their free act and deed and the free act and deed of said Stone Bridge Fire District, before me,



Notary Public

My commission expires: 6/30/91

UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF RHODE ISLAND

CITY OF FALL RIVER and WATUPPA  
RESERVOIR COMPANY,

Plaintiffs,

v.

STONE BRIDGE FIRE DISTRICT and  
TIVERTON WATER AUTHORITY,

Defendants.

Civil Action No. 90-0155B

STIPULATION OF DISMISSAL

Now come the parties herein and stipulate to the dismissal of this action on the following terms:

1. All claims are dismissed with prejudice as to the defendant Tiverton Water Authority;
2. All claims arising in contract and for injunctive and declaratory relief are dismissed with prejudice, except as to any claim which may arise hereafter under the terms of the "Compromise of Claims and Settlement Agreement" referred to below;
3. The parties forbear absolutely from the assertion of all claims in the nature of riparian rights until after the termination of the "Compromise of Claims and Settlement Agreement" entered into between the City of Fall River, the Watuppa Reservoir Company and the Stone Bridge Fire District and dated as of September 26, 1990, a copy of which is attached hereto.

4. The parties also forbear absolutely after the termination of said Compromise of Claims and Settlement Agreement, from the assertion of any claims in the nature of riparian rights which may have arisen from 1948 till September 25, 1990, or which may arise during the term of the Compromise of Claims and Settlement Agreement.

Respectfully submitted,

CITY OF FALL RIVER AND WATUPPA  
RESERVOIR COMPANY, plaintiffs,

By their attorneys,

---

Eric W. Wodlinger  
Laurence Pierce  
CHOATE, HALL & STEWART  
Exchange Place  
53 State Street  
Boston, Massachusetts 02109  
(617) 227-5020

---

Peter Bogle  
BOGLE & DE ASCENTIS  
57 North Main Street  
Box 711  
Fall River, Massachusetts 02722  
(508) 677-2800

---

David P. Whitman  
Hanson, Curran, Parks & Whitman  
146 Westminster Street  
Providence, Rhode Island  
02903-2218  
(401) 421-2154

STONE BRIDGE FIRE DISTRICT

By its attorneys,

---

John Voorhees  
Fran Robins-Liben  
Tillinghast, Collins & Graham  
One Old Stone Square  
Providence, Rhode Island 02903

TIVERTON WATER AUTHORITY

By it attorneys,

---

Quentin Anthony  
Sheffield & Harvey  
47 Long Wharf Mall  
P.O. Box 339  
Newport, Rhode Island 02840

Dated: September 26, 1990

4029W

## DAM MANAGEMENT AGREEMENT

This Dam Management Agreement (the "Dam Agreement") is made as of September \_\_\_\_\_, 1990 by and among the City of Fall River, Massachusetts, a Massachusetts municipal corporation, and Watuppa Reservoir Company, a Massachusetts corporation created by special Act of the Massachusetts General Court in 1826 (hereafter jointly called the "City"), and the Stone Bridge Fire District, a Rhode Island corporation created by a special Act of the Rhode Island General Assembly in 1936 (the "District").

### PREFACE

1. The City owns land (the "Land") described as Map 3-12, Block 113, Lot 49, on the records of the Tax Assessors of Tiverton, Rhode Island, as presently constituted, the Land being located approximately at the north end of Stafford Pond (the "Pond") in Tiverton, Rhode Island and more particularly described as part of a Deed from Firestone Tire & Rubber Company to Watuppa Reservoir Company, dated August 8, 1950 and recorded in Book 76, Page 458, Land Evidence Records of Tiverton, Rhode Island.

2. A dam (the "Dam") owned and maintained by the City, is located on the Land.

3. The parties have, this day, executed a Compromise of Claims and Settlement Agreement ("Settlement Agreement") to set forth their respective understandings with regard to the use of the waters in the Pond and the rights of the City to the water overflowing the Dam during the term of the Settlement Agreement.

4. The purpose of this Dam Agreement is to specify the rights and obligations of the parties with respect to the use of the Dam from May 1, 1991 through April 30, 2025.

#### RECITALS

In consideration of mutual promises and for other good and valuable consideration, the parties hereto agree as follows:

1. This Dam Agreement shall govern the management and use of the Dam from May 1, 1991 through April 30, 2025.

2. The parties will, as soon as practicable after the execution of this Dam Agreement, establish a certain Interim Mark which will be placed seven (7") inches below the top of the angle iron presently at the top of the Dam. This Interim Mark will serve until a survey reasonably satisfactory to the City and the District has been performed by the District to establish the accurate Full Pond Level in accordance with physical monuments referred to in the Deeds in the City's chain of title. If these monuments can no longer be located, the accurate Full Pond Level shall be established in accordance

with appropriate scientific principles. Said survey shall be performed within six (6) months of the date of this Dam Agreement. When the establishment of the accurate Full Pond Level is complete, a Permanent Mark shall be established and engraved or affixed physically, at the District's expense, in a manner designed to last at least through the term of this Dam Agreement. The Permanent Mark shall be accurately described in a written Memorandum ("Memorandum") signed by the President of the Watuppa Water Board and the Moderator of the District.

3. The City shall be responsible for the ordinary maintenance of the Dam in good working order.

4. Except in emergency situations, as hereinafter defined, during the period in which the Interim Mark is in use the City shall have the discretion, in accordance with sound water management principles, to raise the level of the Pond to a height no greater than two (2") inches over the Interim Mark and to lower the level of the Pond to a height no lower than seven (7") inches below the level of the Interim Mark.

5. Except in emergency situations, as hereinafter defined, once the Permanent Mark is established the City shall have the discretion to raise and lower the level of the Pond within a range of inches (the "Range") above and below the Permanent Mark. The Range shall be set forth in the Memorandum and the Range shall be fixed in accordance with sound water management principles in such a manner that the yield of the waters in the

Pond to the District is maximized while the City is able to prudently avoid exceeding the Full Pond Level.

6. The City shall give notice to the District at the earliest practicable time after a decision is made by the City to lower the level of the Dam. Said notice shall be given to the District by the City by telephone at a number to be provided by the District.

7. In the event that any one or more of the hereinafter described emergencies occurs, the City may reduce the level of the Pond to a level lower than seven (7") inches below the level of the Interim Mark or to a level below the Range after the Permanent Mark is established. In such emergency, the level of the Pond shall be lowered only to the level necessary to meet the emergency or as close as possible to that level as the dam structure allows.

A. When, in accordance with sound water engineering principles, it is determined that failure to lower the level will result in a flooding condition downstream of the Dam.

B. When South Watuppa Pond is thirty-six inches or more below its full pond level and when Sawdy Pond and Devol Pond are both two feet or more below their respective full pond levels.

C. When, in accordance with said principles, it is determined that failure to lower the level will cause flooding for riparian owners directly on the Pond.

8. As soon as practicable after the termination of the

emergency condition or conditions, as determined in accordance with said principles, the Dam level shall be raised so that the Pond level is within the measurements described in Paragraphs 4 or 5 of this Dam Agreement, whichever Paragraph is then in force.

9. Each party's rights and obligations under this Dam Agreement may be assigned in the same manner provided for in the Water Settlement Agreement.

10. When executed, the Memorandum shall be incorporated as a part of this Agreement.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be duly executed by their authorized and proper officers as of the date set forth above.

CITY OF FALL RIVER,  
MASSACHUSETTS

BY: \_\_\_\_\_

Approved as to form:

By: \_\_\_\_\_  
Corporation Counsel

WATUPPA RESERVIOR CO.

BY: \_\_\_\_\_  
Member of the Corporation

BY: \_\_\_\_\_  
Member of the Corporation

BY: \_\_\_\_\_  
Member of the Corporation

STONE BRIDGE FIRE DISTRICT

BY: Roger L. Quam  
Moderator

BY: Peter M. Jones  
Clerk of the District

COMMONWEALTH OF MASSACHUSETTS

, ss.

, 19

Then personally appeared the above named Carlton M. Viveiros, Mayor, as aforesaid and acknowledged the foregoing instrument to be the free act and deed of the City of Fall River, before me,

\_\_\_\_\_  
Notary Public  
My Commission Expires:

COMMONWEALTH OF MASSACHUSETTS

, ss.

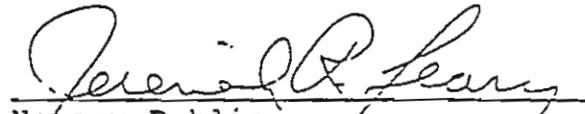
, 19

Then personally appeared the above named \_\_\_\_\_  
\_\_\_\_\_ and \_\_\_\_\_, Members of the Corporation  
as aforesaid and acknowledged the foregoing instrument to be  
the free act and deed of the Watuppa Reservoir Company, before  
me,

\_\_\_\_\_  
Notary Public  
My Commission Expires:

STATE OF RHODE ISLAND  
COUNTY OF NEWPORT

In Tiverton in the County of Newport in the State of Rhode  
Island on this 24th day of September, 1990, then personally  
appeared the before-named Roger L. Roussell and  
Peter M. Forrest, to me personally known and personally known  
to me to be the Moderator and Clerk respectively of the Stone  
Bridge Fire District, and by me personally known to be the  
parties who executed the foregoing instrument; and they  
acknowledged the same to be their free act and deed and the  
free act and deed of said Stone Bridge Fire District, before me,

  
\_\_\_\_\_  
Notary Public  
My commission expires: 6/30/91

WD# 6856M

EXHIBIT C

1. Gallons of Treated Effluent for month (metered) less Treated Effluent used for backwash (metered) = Net Effluent.

2. Monthly Net Effluent less monthly metered sales and deliveries of water = Unaccounted Water.

3. Monthly Net Effluent less the smaller of monthly Unaccounted Water or 10% of Net Effluent = Net Sales.

4. Net Sales for month less Free Water (300,000 gallons times number of days in month) times \$.00019 = Monthly Payment Due.

## DAM MANAGEMENT AGREEMENT

This Dam Management Agreement (the "Dam Agreement") is made as of September 26, 1990 by and among the City of Fall River, Massachusetts, a Massachusetts municipal corporation, and Watuppa Reservoir Company, a Massachusetts corporation created by special Act of the Massachusetts General Court in 1826 (hereafter jointly called the "City"), and the Stone Bridge Fire District, a Rhode Island corporation created by a special Act of the Rhode Island General Assembly in 1936 (the "District").

### PREFACE

1. The City owns land (the "Land") described as Map 3-12, Block 113, Lot 49, on the records of the Tax Assessors of Tiverton, Rhode Island, as presently constituted, the Land being located approximately at the north end of Stafford Pond (the "Pond") in Tiverton, Rhode Island and more particularly described as part of a Deed from Firestone Tire & Rubber Company to Watuppa Reservoir Company, dated August 8, 1950 and recorded in Book 76, Page 458, Land Evidence Records of Tiverton, Rhode Island.

2. A dam (the "Dam") owned and maintained by the City, is located on the Land.

3. The parties have, this day, executed a Compromise of Claims and Settlement Agreement ("Settlement Agreement") to set forth their respective understandings with regard to the use of the waters in the Pond and the rights of the City to the water overflowing the Dam during the term of the Settlement Agreement.

4. The purpose of this Dam Agreement is to specify the rights and obligations of the parties with respect to the use of the Dam from May 1, 1991 through April 30, 2025.

#### RECITALS

In consideration of mutual promises and for other good and valuable consideration, the parties hereto agree as follows:

1. This Dam Agreement shall govern the management and use of the Dam from May 1, 1991 through April 30, 2025.

2. The parties will, as soon as practicable after the execution of this Dam Agreement, establish a certain Interim Mark which will be placed seven (7") inches below the top of the angle iron presently at the top of the Dam. This Interim Mark will serve until a survey reasonably satisfactory to the City and the District has been performed by the District to establish the accurate Full Pond Level in accordance with physical monuments referred to in the Deeds in the City's chain of title. If these monuments can no longer be located, the accurate Full Pond Level shall be established in accordance

with appropriate scientific principles. Said survey shall be performed within six (6) months of the date of this Dam Agreement. When the establishment of the accurate Full Pond Level is complete, a Permanent Mark shall be established and engraved or affixed physically, at the District's expense, in a manner designed to last at least through the term of this Dam Agreement. The Permanent Mark shall be accurately described in a written Memorandum ("Memorandum") signed by the President of the Watuppa Water Board and the Moderator of the District.

3. The City shall be responsible for the ordinary maintenance of the Dam in good working order.

4. Except in emergency situations, as hereinafter defined, during the period in which the Interim Mark is in use the City shall have the discretion, in accordance with sound water management principles, to raise the level of the Pond to a height no greater than two (2") inches over the Interim Mark and to lower the level of the Pond to a height no lower than seven (7") inches below the level of the Interim Mark.

5. Except in emergency situations, as hereinafter defined, once the Permanent Mark is established the City shall have the discretion to raise and lower the level of the Pond within a range of inches (the "Range") above and below the Permanent Mark. The Range shall be set forth in the Memorandum and the Range shall be fixed in accordance with sound water management principles in such a manner that the yield of the waters in the

Pond to the District is maximized while the City is able to prudently avoid exceeding the Full Pond Level.

6. The City shall give notice to the District at the earliest practicable time after a decision is made by the City to lower the level of the Dam. Said notice shall be given to the District by the City by telephone at a number to be provided by the District.

7. In the event that any one or more of the hereinafter described emergencies occurs, the City may reduce the level of the Pond to a level lower than seven (7") inches below the level of the Interim Mark or to a level below the Range after the Permanent Mark is established. In such emergency, the level of the Pond shall be lowered only to the level necessary to meet the emergency or as close as possible to that level as the dam structure allows.

A. When, in accordance with sound water engineering principles, it is determined that failure to lower the level will result in a flooding condition downstream of the Dam.

B. When South Watuppa Pond is thirty-six inches or more below its full pond level and when Sawdy Pond and Devol Pond are both two feet or more below their respective full pond levels.

C. When, in accordance with said principles, it is determined that failure to lower the level will cause flooding for riparian owners directly on the Pond.

8. As soon as practicable after the termination of the

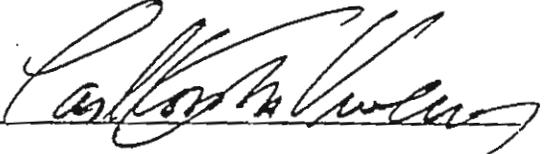
emergency condition or conditions, as determined in accordance with said principles, the Dam level shall be raised so that the Pond level is within the measurements described in Paragraphs 4 or 5 of this Dam Agreement, whichever Paragraph is then in force.

9. Each party's rights and obligations under this Dam Agreement may be assigned in the same manner provided for in the Water Settlement Agreement.

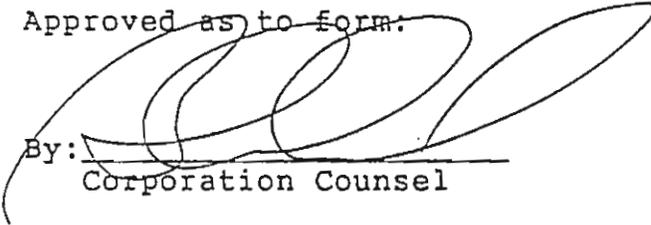
10. When executed, the Memorandum shall be incorporated as a part of this Agreement.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be duly executed by their authorized and proper officers as of the date set forth above.

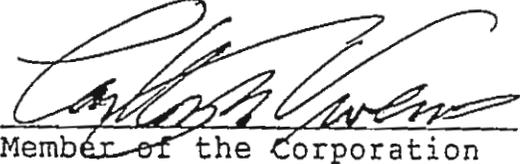
CITY OF FALL RIVER,  
MASSACHUSETTS

BY: 

Approved as to form:

  
BY: \_\_\_\_\_  
Corporation Counsel

WATUPPA RESERVIOR CO.

BY:   
Member of the Corporation

BY: *Arley A. A. A.*  
Member of the Corporation

BY: *John F. F.*  
Member of the Corporation

STONE BRIDGE FIRE DISTRICT

BY: *Roger L. R.*  
Moderator

BY: *Peter M. P.*  
Clerk of the District

COMMONWEALTH OF MASSACHUSETTS

*Bristol*, ss.

*September 26*, 1990

Then personally appeared the above named Carlton M. Viveiros, Mayor, as aforesaid and acknowledged the foregoing instrument to be the free act and deed of the City of Fall River, before me,

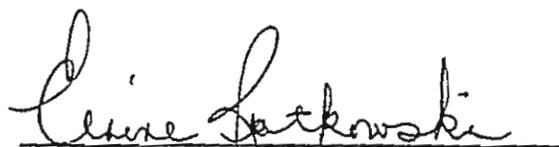
*Elaine Lutkowski*  
Notary Public  
My Commission Expires: *12-12-91*

COMMONWEALTH OF MASSACHUSETTS

Bristol, ss.

September 26, 1990

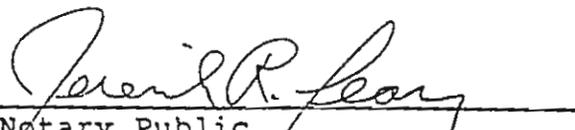
Then personally appeared the above named \_\_\_\_\_  
\_\_\_\_\_ and \_\_\_\_\_, Members of the Corporation  
as aforesaid and acknowledged the foregoing instrument to be  
the free act and deed of the Watuppa Reservoir Company, before  
me,



Notary Public  
My Commission Expires: 12-12-91

STATE OF RHODE ISLAND  
COUNTY OF NEWPORT

In Tiverton in the County of Newport in the State of Rhode  
Island on this 24th day of September, 1990, then personally  
appeared the before-named Roger L. Roussell and  
Peter M. Forrest, to me personally known and personally known  
to me to be the Moderator and Clerk respectively of the Stone  
Bridge Fire District, and by me personally known to be the  
parties who executed the foregoing instrument; and they  
acknowledged the same to be their free act and deed and the  
free act and deed of said Stone Bridge Fire District, before me,



Notary Public  
My commission expires: 6/30/91

WD# 6866M