



Coordinated Water System Plan
Part IV: Final Executive Summary
Eastern Public Water Supply Management Area
May 31, 2018

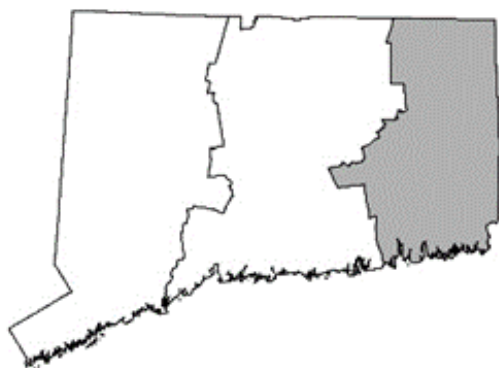


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Eastern Public Water Supply Management Area
May 31, 2018



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NOTICE TO READERS

This document was prepared under a grant from the United States Environmental Protection Agency (EPA) administered by the Connecticut Department of Public Health (DPH). Points of view or opinions expressed in this document are those of the Eastern Water Utility Coordinating Committee and do not necessarily represent the official position or policies of the EPA or the Connecticut DPH.

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Jewett City Water Company	Town of Lisbon
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New London Department of Utilities	Town of Woodstock
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Other Meeting Attendees

The Eastern Connecticut WUCC also appreciates the time and effort of the numerous nonmembers who have attended at least one meeting and/or have contributed valuable insight to this process:

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Connecticut Department of Energy & Environmental Protection	RCAP Solutions
Connecticut Department of Public Health	Rivers Alliance of Connecticut
Connecticut Office of Policy & Management	Town of Bozrah
Connecticut Public Utility Regulatory Authority	Town of North Stonington
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DEFINITIONS

Areawide Supplement – A part of a coordinated water system plan that addresses areawide water system concerns pertaining to the public water supply management area that are not otherwise included in each water company's individual water system plan. The supplement identifies the present and future water system concerns, analyzes alternatives, and sets forth means for meeting those concerns. An areawide supplement consists of a water supply assessment, exclusive service area boundaries, integrated report, and executive summary.

Available Water – Per RCSA Section 25-32d-1a(4), the maximum amount of water a company can dependably supply, taking into account the following reductions applied to safe yield: any limitations imposed by hydraulics, treatment, well pump capabilities, reductions of well yield due to clogging that can be corrected with redevelopment, transmission mains, permit conditions, source construction limitations, approval limitations, or operational considerations; and the safe yield of active sources and water supplied according to contract provided that the contract is not subject to cancellation or suspension, assures the availability of water throughout a period of drought, and that the supply is reliable.

Coordinated Water System Plan – The individual water system plans of each public water system within a public water supply management area, filed pursuant to Section 25-32d of the Connecticut General Statutes, and an areawide supplement to such plans developed pursuant to Connecticut General Statute 25-33h that addresses water system concerns pertaining to the public water supply management area as a whole.

Exclusive Service Area (ESA) – An area where public water is supplied, or will be supplied, by one system. ESA boundaries comprise Part 2 of the areawide supplement. As part of the ESA assignment process, all existing public water systems automatically receive an ESA designation for their existing service area, be it the parcel(s) they serve or the area around their existing water mains. Public water systems and municipalities were also requested to declare for the ESA for areas currently unserved by public water systems; this is described in more detail in the Coordinated Water System Plan, Part II document published in June 2017.

Exclusive Service Area (ESA) Designation – The combination of the ESA holder and associated ESA boundaries.

Exclusive Service Area (ESA) Holder – A utility or municipality who has been assigned or recommended an ESA that includes areas not presently served by its existing system.

Executive Summary – An abbreviated overview of the coordinated water system plan for the public water supply management area that summarizes the major elements of the coordinated water system plan. The Executive Summary comprises Part IV of the areawide supplement.

Integrated Report – An overview of individual public water systems within the management area that addresses areawide water supply issues, concerns, and needs and promotes cooperation among public water systems. The report comprises Part III of the areawide supplement.

DEFINITIONS (CONTINUED)

Public Water Supply Management Area (PWSMA) – An area for coordinated water supply planning determined by the Commissioner of the Department of Public Health to have similar water supply problems and characteristics.

Public Water System (PWS) – Any private, municipal, or regional utility supplying water for human consumption through pipes or other constructed conveyances to at least 15 service connections or serving an average of at least 25 people daily for at least 60 days per year. Types of regulated public water systems are discussed below:

Community Water System (CWS) – A public water system that regularly supplies water to at least 15 service connections or at least 25 of the same population year-round. Examples include residential subdivisions, cluster-housing projects, homeowners associations, municipalities, tax districts, apartment buildings or complexes, residential and office condominium developments, elderly housing projects, convalescent homes, and trailer or mobile home parks.

Non-Community Water System – A public water system that serves at least 25 persons at least 60 days per year and is not a Community or seasonal water system.

Non-Transient Non-Community (NTNC) Water System – A public water system that regularly supplies water to at least 25 of the same people (such as students or employees) over 6 months per year and is not a CWS. Some examples are schools, factories, office buildings, and hospitals that have their own water systems.

Transient Non-Community (TNC) Water System – Any Non-Community Water System that does not meet the definition of a NTNC Water System. It is a public water system that provides water in a place such as a gas station convenience store, small restaurant, or campground where people do not remain for long periods of time.

Seasonal Water System – A public water system that operates on a seasonal basis for 6 months of the year or fewer. These are typically regulated as NTNC Water Systems - unless sufficient service is available to meet the definition of a CWS - and often include campgrounds and shorefront communities.

Safe Yield – The maximum dependable quantity of water per unit of time that may flow or be pumped continuously from a source of supply during a critical dry period without consideration of available water limitations. The safe yield calculation for a source does not take into consideration any potential impacts to the environment.

Satellite Management – Management of a public water supply system by another public water system. Satellite management services may include operation, maintenance, administration, emergency and scheduled repairs, monitoring and reporting, billing, operator training, and the purchase of supplies and equipment.

Satellite System – A non-connected CWS of an existing system. Colloquially, a non-connected community or non-community public water system owned by a public water service provider.

DEFINITIONS (CONTINUED)

Water Supply Assessment (WSA) – An evaluation of water supply conditions and problems within the PWSMA. The evaluation is Part 1 of the areawide supplement.

Water Utility Coordinating Committee (WUCC) – A committee consisting of one representative from each public water system with a source of supply or service area within the PWSMA and one representative from each regional council of government within the PWSMA, elected by majority vote of the chief elected officials of the municipalities that are members of such regional council of government.

ABBREVIATIONS

ADD	Average Daily Demand
AWC	Aquarion Water Company
CAT	Capacity Assessment Tool
cfs	cubic feet per second
CGS	Connecticut General Statute(s)
CIRCA	Connecticut Institute for Resilience and Climate Adaptation
CPCN	Certificate of Public Convenience and Necessity
CT SDC	Connecticut State Data Center
CWC or CTWC	Connecticut Water Company
CWS or CWSs	Community Water System(s)
CWSP	Coordinated Water System Plan
DEEP	Department of Energy & Environmental Protection
DPH	Department of Public Health
DWQMP	Drinking Water Quality Management Plan
EPA	Environmental Protection Agency
ESA or ESAs	Exclusive Service Area(s)
FOIA	Freedom of Information Act
JCWC	Jewett City Water Company
MCL	Maximum Contaminant Level
mgd	million gallons per day
MMADD	Maximum Month Average Day Demand
MMI	Milone & MacBroom, Inc.
MOS	Margin of Safety
MPTN	Mashantucket Pequot Tribal Nation
NDDDB	Natural Diversity Database
NECCOG	Northeastern Connecticut Council of Governments
NPU	Norwich Public Utilities
NTNC	Non-Transient Non-Community
OPM	Office of Policy and Management
POCD or POCDs	Plan(s) of Conservation and Development
PURA	Public Utilities Regulatory Authority
PWS	Public Water System
PWSMA	Public Water Supply Management Area
RCSA	Regulations of Connecticut State Agencies
SCCOG	Southeastern Connecticut Council of Governments
SCWA	Southeastern Connecticut Water Authority
TNC	Transient Non-Community
WPCA	Water Pollution Control Authority
WSA	Water Supply Assessment
WSP or WSPs	Water Supply Plan
WUCC or WUCCs	Water Utility Coordinating Committee
WWW	Windham Water Works



SUMMARY OF MAJOR FINDINGS AND RECOMMENDATIONS

This document presents the Executive Summary of the coordinated public water system planning process in the Eastern Public Water Supply Management Area (PWSMA). The region is comprised of 35 towns (and two tribal governments) within which approximately 139 community public water systems and 474 non-community public water systems currently operate. The Eastern Water Utility Coordinating Committee (the WUCC) convened on June 17, 2016 and has met once per month since that time up to the publication of this document. During this process, the active membership has engaged in discussions involving a variety of topics pertinent to individual public water systems and water supply in the region at large.

In conjunction with the Connecticut Department of Public Health (DPH) and its consultant team, the WUCC completed a Water Supply Assessment (final document published December 2016) and established Recommended Exclusive Service Area Boundaries (final document published June 2017, amendable as necessary). The WUCC has most recently developed a comprehensive *Final Integrated Report* and the subject *Final Executive Summary*. Each document has been formally endorsed and adopted by the WUCC following receipt and consideration of public comments. The table of contents for each of the first three components of the *Coordinated Water System Plan (CWSP)* is included as Appendix A.

Summary of Findings

During the coordinated public water system planning process, the following major findings and recommendations were derived:

Finding #1: Water planning in Connecticut is rapidly advancing through numerous stakeholder efforts. While the changes are expected to be beneficial, utilities will need to make adjustments.

The planning effort for the *State Water Plan* (January 2018) and the CWSP occurred partially concurrently, with the *State Water Plan* benefiting from data collection efforts for the *Water Supply Assessment* (December 2016) and the *Integrated Report* benefiting from the efforts put into the *State Water Plan*. In addition, DPH has commissioned a resiliency study for public water systems being performed by the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) and the University of Connecticut which is expected to be completed later in 2018.

For utilities, participation in these efforts is only the beginning. Many utilities will need to review and make operational changes to their systems (either voluntarily or to comply with regulations) in the near future:

- Public Act 17-211 requires that a large portion of the information in individual water supply plans (WSPs) to be un-redacted for public viewing. DPH is requesting that utilities provide redacted and un-redacted copies of new WSPs that can be made available for public distribution. DPH will request redacted copies of old WSPs as necessary to meet Freedom of Information Act (FOIA) requests;

- A stricter reading of the regulations regarding the calculation of available water for public water systems by DPH has resulted in available water to meet maximum month average day demand (MMADD) for many surface water supplies and for some groundwater supplies and interconnections to be much less than previously recognized, leading to low margin of safety (MOS) being calculated for maximum months “on paper” despite water being available for use. Guidance is necessary to address how the calculation is performed, or certain large systems will need to pursue new source development that may not be necessary;
- The Drinking Water Quality Management Planning (DWQMP) process is an option for several utilities to strengthen watershed protections;
- For certain reservoir systems, compliance with the Streamflow Standards and Regulations will be required in the Eastern PWSMA by 2024;
- For many utilities, a heightened focus on water conservation and water efficiency will be necessary to reduce future demands in order to mitigate the need for development of new sources;
- Several different committees are considering how drought planning and response are considered in Connecticut, with the potential use of reservoir forecasting models gaining traction with some larger utilities to manage drought; and
- Future capital improvement projects may be more focused on resiliency solutions than on new sources and treatment systems.

The DWQMP process is recommended for several utilities to improve source water protection in their public water supply watersheds.

A number of interconnections are proposed to increase source resiliency in the region. The WUCC should continue efforts to encourage the parties involved to implement emergency interconnections to increase the overall resiliency of public water supply in the region.

The WUCC recognizes that most capital improvement efforts will take place at the individual utility level. WUCC meetings will continue to be a place where issues of regional significance may be discussed.

Finding #2: Regionally, sufficient water supply exists to meet existing and projected average day demands (ADD) through 2060 with a MOS of 15% (1.15). However, the water is not always in the location of need. Projections of ADD for the community water systems (CWSs) indicate that significant supplies will be needed for two large systems by the 20-year planning period in order to maintain a MOS of 1.15. Certain individual systems will require new sources even sooner to meet MMADD. Based on existing sources and procedures for calculation of available water, CWSs in the region are projecting a supply need of approximately 4.0 million gallons per day (mgd), 9.4 mgd, and 13.4 mgd respectively over the five-year, 20-year, and 50-year planning horizons, primarily to meet MMADD.

The majority of this water need has been identified by Norwich Public Utilities (NPU), New London Department of Public Utilities, and Noank Fire District in the five-year planning horizon (2023), with Aquarion Water Company (AWC) – Mystic System and East Lyme Water & Sewer Commission potentially needing increased supply in the 20-year planning horizon (2030), and Colchester Water & Sewer Commission and Montville Water Pollution Control Authority (WPCA) projecting significant water need

in the 50-year planning horizon (2060). These needs are based on utility projections and the current method for calculating available water for each system.

New supply sources are almost exclusively needed in the southern portion of the region. The WUCC encourages each individual system to make supply improvements as needed to meet projected demands. For development of new sources to meet regionally significant needs, the WUCC encourages utilities to collaborate with other parties connected to the regionally interconnected water system in southeastern Connecticut. Several of the areas which may need water are located distant from areas where potential new sources have been identified.

Based on a planning-level inventory of regionally significant supply sources (i.e., generally those capable of providing 1.0 mgd or more unless the improvement is part of a source that is currently able to regionally provide water), a total potential yield of 14 mgd may be available if all identified sources are developed. Additional sources capable of providing less than 1.0 mgd will be needed to supply geographically remote systems that are in need of water. When compared to the projected deficits, potential supply is theoretically capable of meeting demands. However, financial, environmental, and regulatory obstacles are significant. The cost, time, and uncertainty of permitting new supply sources are critical issues facing the public water systems in the region.

It is recognized that a regional approach with respect to water supply source development may be necessary in the future to satisfy demands. Accordingly, the WUCC's evaluation of future supply sources has considered the ability of each potential supply to serve regionally significant needs.

Finding #3: The benefits of passive water conservation efforts envisioned by the State Water Plan would significantly reduce projected demands for many larger public water systems. At a minimum, utilities should review their existing rate structures and modify them as appropriate to encourage water conservation while covering the full cost of providing public water supply.

Top-down water conservation measures were enacted in the plumbing code and by water utilities starting in the 1980s, with many utilities believing that water savings from these efforts have been largely exhausted. However, the proliferation of water-saving devices and the general identification of the ability to reduce water consumption by customers in order to pay a smaller utility bill has resulted in declining demand in many water systems over the past decade. Future passive water conservation savings modeled based on Scenario I of the *State Water Plan* suggest that future demand reductions along this downward trend may be possible.

Based on existing sources and procedures for calculation of available water, with adjustment for passive water conservation measures, CWSs in the region are projecting a supply need of approximately 3.9 mgd, 9.1 mgd, and 12.7 mgd over the three planning horizons, primarily to meet MMADD. The use of targeted water conservation and water efficiency measures and programs for these utilities is expected to further reduce the potential need for new supply sources, although it is recognized that such measures may not be necessary for all public water systems. At a minimum, all utilities are encouraged to review their existing rate structures and modify them where appropriate to encourage water conservation while covering the full cost of providing public water supply.

For large utilities projecting significant deficits, re-evaluation of projected demands and development of a targeted water conservation and water efficiency program are recommended to reduce future demands and mitigate the need for development of new supply sources.

Finding #4: A number of methods are available to reduce future water needs, including (in order of implementation) updating projections that may be out of date, authorizing reasonable additive factors to be included in available water when calculating MOS for MMADD, implementing targeted water conservation and water efficiency measures, developing interconnections or new sources to be transferred through interconnections, and developing new sources of supply. The use of targeted water conservation and water efficiency measures could be a primary driver towards reducing projected water demands and water supply deficits in the region. When development of new sources of supply is necessary in the future, the Eastern WUCC has several utilities which can be encouraged to continue evaluating potentially regionally significant source of supply options.

The use of available water guidance for reservoir systems, for supplemental supply wells, and for interconnections that applies a maximum month flow rate that is higher than the annual average flow rate (e.g., Noank Fire District) would be helpful for making the calculation of available water consistent with real-world applications. One example of potential guidance for reservoir systems was promulgated in the *Integrated Report* based on monthly withdrawal ratios used in the safe yield model. The exercise demonstrated that New London Department of Public Utilities and Noank Fire District would no longer have a deficit to meet MMADD in the five-year planning horizon, and the AWC – Mystic system would no longer have a deficit to meet MMADD in the 20-year planning horizon. The projected supply need for CWSs in the region including both passive water conservation measures and potential guidance for calculating available water to meet MMADD resulted in a reduction in supply need to 1.3 mgd, 7.3 mgd, and 11.0 mgd over the three planning horizons.

While the use of the above example of available water guidance would not eliminate the need for new sources entirely (except for Noank Fire District), it does demonstrate how the need for new sources could be deferred to later planning periods. This would allow utilities projecting deficits to reconsider their previous demand projections, develop targeted water conservation and water efficiency programs, and implement short-term supply measures (such as interconnections). Should the CWSP be updated on the 10-year schedule envisioned in the regulations, projected regional needs could be reevaluated prior to the 20-year planning horizon (2030) with such improvements in place.

The WUCC should coordinate with DPH on a methodology for calculation of available water and MOS to meet MMADD that is more reflective of the water actually available to provide more flexibility for the numerous caveats in supply that are unrelated to the potentially most limiting factor in the calculation.

Finding #5: The viability of small CWSs and the density of non-community systems in many areas continue to be concerns. Recent DPH efforts to identify systems with inadequate capacity have been greatly beneficial for both planning and regulatory purposes, and these efforts need to be continued.

The Capacity Assessment Tool (CAT) is being used by DPH to evaluate the technical, managerial, and financial capacity of small CWSs. The vast majority of small CWSs are considered to have overall moderate or high capacity per the CAT. General recommendations were developed for each system considered to have less than an overall high capacity, including conducting internal improvements, selling the system, or interconnecting the system. In particular, DPH has identified small community water systems managed by voluntary associations as being at high risk for having poor managerial and financial capacity, as these systems are often operated by boards or committees with high turnover and limited ability to obtain or maintain funding for capital improvements.

DPH is encouraged to continue updating the CAT for small CWSs and regularly advise ESA holders of low capacity CWSs within their ESA. DPH is encouraged to continue outreach to small CWSs with inadequate capacity, with WUCC meetings as a potential resource. Furthermore, DPH is encouraged to develop Certificate of Public Convenience and Necessity (CPCN) regulations specific to development of non-community water systems. Finally, regular education and development of a reliable funding mechanism for small CWSs are necessary in order to ensure capital improvements can be performed per the schedule for proper asset management.

Many of the smaller CWSs in the region operate with a single source of supply and no backup supply. This leaves these systems vulnerable to interrupted service due to equipment failures, contamination, and other emergencies. Even where these systems have a high CAT score, emergency interconnections would benefit these small systems. However, access to reliable funding is the most critical challenge for improving the capacity of small CWSs.

The numerous non-community systems in the region often lie adjacent to other non-community systems, thereby forming clusters. In many areas, the density of non-community water systems is quite high such that service through a consolidated system is preferred. The WUCC encourages DPH and the Water Planning Council to determine regulations and procedures to support such consolidations, and to secure funding to be distributed to support the required capital expenses for such projects. The WUCC intends to review opportunities for consolidation as new PWS are proposed.

Finding #6: The 2-year planning process has brought together a diverse group of representatives from municipal and state government, public and privately held public water systems, and regional councils of governments. This forum has enabled coordination of planning efforts and an exchange of knowledge and perspectives. Continued regular meetings by the WUCC will continue to encourage regional planning efforts.

Table ES-1 presents the non-capital improvement strategies developed in the *Integrated Report*. Potential capital improvement projects identified for future consideration by WUCC members include the following:

- Consolidation or interconnections of small CWSs near larger utilities where interconnection is found to be the preferred option for daily supply or for emergency purposes (Section 4.3);
- Development of interconnections between CWC systems utilizing a single wellfield (Section 5.4);
- Development of interconnections with SCWA systems utilizing a single wellfield (Section 5.4);
- Development of an interconnection with WWW, which utilizes a single reservoir (Section 5.4);
- Projects to improve the resiliency of the regionally-interconnected water system in the southern part of the region (Section 5.4);
- Interconnecting with or consolidating small CWS or non-community systems along or nearby the installation route of an interconnection project (Section 5.4); and
- Development (or joint development) of potentially regionally-significant sources of supply (Section 6.1 and Section 7.5).

TABLE ES-1: Prioritization and Implementation of Non-Capital Improvement Recommendations

Topic Area	Goal	Recommended Strategies for Eastern WUCC	Lead(s)	Timeframe	
Responsible Planning	Prevent proliferation of water systems when other options are available	1. Encourage WUCC members to petition the WUCC for revision of ESA boundaries where appropriate to prevent creation of unnecessary consecutive water systems across ESA boundaries	WUCC	Ongoing	
		2. As part of the process for providing a recommendation on the development of new water systems, evaluate the proximity of other nearby water systems and the potential for consolidating the proposed water system with an existing water system	WUCC	Ongoing	
		3. Encourage DPH and the Water Planning Council to address, through regulations and/or procedures, the proliferation of multiple water systems in close proximity to one another	WUCC	Immediately	
	Work towards constructive changes to statutes and regulations		4. Explore and provide recommendations regarding appropriate modifications to the definition of available water to allow for reasonable additive factors (contract maximums, supplemental sources, demand ratios from safe yield models, etc.) to be included when calculating MOS for MMADD	WUCC, DPH	Immediately
			5. Explore and provide recommendations to streamline the sale of excess water permit process (such as a minimum threshold requirement) and eliminate the requirement in certain instances to foster regionalization	WUCC, DPH	By 2023
			6. Review the state minimum design criteria for new public water systems every 5 years to ensure the development of reliable water systems with proper technical, managerial, and financial capacity	WUCC, DPH	1st Review By 2023
			7. Support DPH's efforts to develop regulations to ensure the standardized and consistent development of new non-community water systems	DPH, WUCC	Immediately
			8. Consider development of a streamlined CPCN process for small utilities desiring a minimal degree of expansion instead of the 5-percent rule	WUCC, DPH	By 2023
			9. Review data requirements for WSPs, CWSPs, and state water planning needs (e.g. basin-level withdrawal and return flow data) to determine if revisions to the data requirements are necessary to ensure submission of data that is useful for multiple planning purposes	WUCC, DPH, DEEP	By 2030
	Develop and use best-available data		10. Re-evaluate the timing of regional capital improvements as the results of system-specific safe yield revisions accounting for full implementation of the Streamflow Standards and Regulations become available	WUCC, Utilities	By 2023
			11. Update in the CWSP the projected demands as new individual WSPs are completed and incorporate into the regional projections including the refinement of the impacts of the Streamflow Regulations	WUCC, DPH	Ongoing
			12. Provide annual updates to the WUCC on the status of small systems based on the CAT	DPH, WUCC	Ongoing
			13. Keep WUCC informed regarding potentially regionally significant water supply sources	Utilities	Ongoing
			14. Revise water demand projections that may be out of date	Utilities	By 2023
			15. Encourage utilities utilizing local design standards to adopt such standards, provide them in written format to developers at the beginning of the CPCN process, and reference such standards in a development agreement	WUCC	By 2023
			16. Provide Geographic Information System data appropriate for regional planning to COGs, including ESA boundaries and general public water system service locations (such as spatial data presented in the CWSP)	DPH	Immediately, Ongoing
			17. Review and improve accuracy of spatial data regarding the locations of non-community water systems	DPH	By 2023
			18. Consider requiring all public water systems to report water usage on an annual basis	DPH, WUCC	By 2023
			19. Encourage DPH and PURA to develop a risk-based approach to be used to better evaluate the condition of systems and apply projected costs into takeover and ratemaking proceedings	WUCC	By 2030
	Improve education of small system owners		20. Require training in asset management and related recordkeeping for small water system owners	DPH	By 2023
			21. Encourage small system owners to self-evaluate their status and consider implementation of one or more options based on the recommendations in Section 4.3 and have DPH annually report on the status of such actions to the WUCC	DPH, WUCC	Ongoing
			21. Work with small water systems owned and operated by voluntary associations to determine pathways for improving technical, managerial, and financial capacity and have DPH annually report on the status of such actions to the WUCC	DPH, WUCC	Ongoing
			23. Encourage small systems to work with nonprofit organizations such as RCAP solutions or the ASRWVA to increase managerial capacity such as for asset management and have DPH annually report on the status of such actions to the WUCC	DPH, WUCC	Ongoing
			24. Encourage ESA holders to coordinate and work with the small CWSs within their respective ESAs	WUCC, DPH	Ongoing
			25. Provide education and oversight regarding management of non-community systems	DPH	Ongoing
	Foster and support interagency planning between utilities, COGs, municipalities, and state government		26. Develop strategies to involve small CWSs and non-community water systems in the WUCC planning process	WUCC, DPH	Ongoing
			27. Encourage local municipalities to consider the following in POCDs: ESAs, future water service extension potential, desired public water service areas, and water management through zoning regulations	COGs, ESA Holders	Ongoing
Drought Management	Consider methods to improve enforcement of water use restrictions	28. Work with agencies and committees considering drought management to evaluate the model ordinance and consider potential legislative authority for water utilities to enforce restrictions under certain conditions	WUCC	By 2023	
	Consider methods to improve timing of activation of drought triggers and water use restrictions	29. Work with agencies and committees considering drought management to evaluate trigger criteria, forecasting models, and other methods to coordinate drought planning and response	WUCC	By 2023	

TABLE ES-1: Prioritization and Implementation of Non-Capital Improvement Recommendations

Topic Area	Goal	Recommended Strategies for Eastern WUCC	Lead(s)	Timeframe
Source Protection	Encourage prudent development and conservation of existing large, protected watersheds	30. Implement the DWQMP process (potential candidate utilities include NPU, New London Department of Public Utilities, Putnam WPCA, and WWW)	Utilities, DPH	By 2023
		31. Pursue modification of CGS 8-30g to more strongly consider source water protection concerns in reservoir watersheds and APAs	DPH	By 2023
		32. Coordinate with local planners during POCD updates to identify areas of development density that may be incompatible with reservoir watersheds and APAs and to coordinate with other watershed towns regarding source protection planning	Utilities, COGs	Ongoing
	Improve stormwater quality in watersheds and aquifer recharge areas	33. Promote the adoption of best management practices for the use of green infrastructure in stormwater management design and rainwater capture for landscaping	Utilities	By 2023
		34. Improve collaboration with local plowing contractors, public works staff, and the State Department of Transportation to minimize chloride impacts to public water supply sources	Utilities	By 2023
Consider methods to improve enforcement capabilities	35. Evaluate and provide recommendations regarding methods of improving enforcement to prevent activities on private property that may lead to reservoir or aquifer contamination	WUCC	By 2023	
Water Conservation	Consider and encourage methods for water systems to utilize to enhance water efficiency	36. Explore and provide recommendations regarding various methods of reducing unaccounted-for water	WUCC	Ongoing
		37. Explore and provide recommendations regarding the use of alternative methods for tracking water usage, water loss, and waste	WUCC	Ongoing
		38. Explore and provide recommendations regarding the use of outdoor water use restrictions to be applied seasonally	WUCC	Ongoing
		39. Encourage utilities to modify rate structures to encourage water conservation and reduction of seasonal peaks while covering the full cost to provide water	WUCC	Ongoing
		40. Annually identify opportunities for the purchase and joint use of water-saving equipment, such as truck-mounted flushing systems which flush mains without blowing off water to waste	WUCC	Ongoing
		41. Develop and enact targeted water conservation and water efficiency programs	Utilities, DPH	By 2023
	Consider alternative means to supply nonpotable uses	42. Encourage the use of Class B water for nonpotable uses within service area boundaries	WUCC, DPH	Ongoing
		43. Encourage the use of gray water reuse systems in new developments to reduce demands on potable water (e.g. include on local development review checklist)	WUCC, DPH	Ongoing
	Consider legislation to improve water conservation	44. Explore and provide recommendations regarding state and local legislation to further regulate demand-side water conservation	WUCC, DPH	By 2030
Encourage dissemination of water conservation information	45. Encourage local planners to include discussions in POCDs on the importance of water conservation	COGs, Utilities	Ongoing	
Climate Change	Ensure methods of calculating safe yield are consistent with climate change	46. Review safe yield regulations every 10 years to determine if data inputs (e.g. evaporation rate) and assumptions continue to be valid in light of the effects of climate change on rainfall and runoff patterns, and revise regulations if necessary	WUCC	1st Review By 2030
		47. Encourage DEEP/USGS to monitor regional groundwater levels to detect trends that may impact safe yield	WUCC	Ongoing
	Correct disparities in existing regulations	48. Update the public health code to require new wells to be elevated to the 0.2% annual chance flood elevation	DPH	By 2030
	Improve resiliency of public water systems	49. Develop redundant infrastructure, backup power, and increase system storage and conduct more comprehensive emergency response planning to improve resiliency	Utilities	Ongoing
		50. Encourage small systems with the potential to develop emergency interconnections to do so	DPH, WUCC	Ongoing
		51. Initiate planning for development of interconnections for systems with only one source of supply (reservoir or wellfield)	WUCC, Utilities	By 2023
		52. Initiate planning for additional resiliency improvements for the regionally-interconnected water system in southeastern Connecticut, including between NPU and Ledyard WPCA in Preston, between the Ledyard WPCA systems, and others (Section 5.4.1)	WUCC, Utilities	By 2023
Develop and use best-available data	53. Assist systems in conducting asset management planning and developing formal infrastructure replacement programs	DPH	Ongoing	
	54. Re-evaluate reservoir release requirements in light of changing rainfall and runoff patterns as USGS <i>StreamStats</i> is updated	Utilities	Ongoing	
Funding	Improve availability of funding for desirable projects	55. Develop a dedicated source of grant funding to allow for the consolidation of small water systems located in close proximity	DPH	Immediately
		56. Develop a dedicated source of grant funding to allow for infrastructure projects to improve resiliency, such as allowing existing and new interconnections to operate in two directions where appropriate	DPH	Immediately
		57. Provide funding assistance for Councils of Government staff to monitor and inform local land use commissions regarding source water protection, ESA boundaries, and regional water supply challenges	DPH, OPM	Immediately
		58. Conduct regular seminars on financial management and the types of funding available for capital improvement projects	DPH	Ongoing
		59. Develop a dedicated source of grant funding for small system improvements	DPH	Immediately
		60. Develop a dedicated source of grant funding for regional water supply solutions	DPH	Ongoing
		61. Improve the accessibility of DWSRF loans for small water systems, such as through a streamlined process for certain types of improvements	DPH	Immediately
	62. Encourage DPH and the Water Planning Council to develop a dedicated source of funding to support periodic updates to the regional WUCC data to reflect updated safe yield calculations and individual utility projections	WUCC	Immediately	
Encourage joint use arrangements to reduce costs	63. Encourage the use of the Intertown Capital Equipment Purchase Incentive Program (for municipal systems) as well as other arrangements to share equipment, resources, and operational staff and increase purchasing power	WUCC	Ongoing	



1.0 THE COORDINATED WATER SYSTEM PLANNING PROCESS

Connecticut's public water supply planning process was prompted by the state's extended drought in the early 1980s. During the 1985 legislative session, the Connecticut General Assembly passed Public Act 85-535, "An Act Concerning a Connecticut Plan for Public Water Supply Coordination," initiating the first statewide water supply planning program. The DPH in consultation with the Public Utilities Regulatory Authority (PURA), the Connecticut Department of Energy and Environmental Protection (DEEP), and Office of Policy and Management (OPM) was given the charge of developing a coordinated approach to long-range water supply planning to assure future supplies. The legislative finding, as reflected in Connecticut General Statutes (CGS) Section 25-33c, states the following: "In order to maximize efficient and effective development of the state's public water supply systems and to promote public health, safety, and welfare, the DPH shall administer a procedure to coordinate the planning of public water supply systems."

Pursuant to Public Act 85-535 and Section 25-33e of the Connecticut General Statutes (CGS), the boundaries of seven PWSMAs were delineated based upon the similarity of water supply issues, population density and distribution, existing sources of public water supply, service areas or franchise areas, existing interconnections between public water systems, municipal and regional planning agency boundaries, natural drainage basins, and similar topographic and geologic characteristics. The boundaries of the seven PWSMAs originally established in 1986 were consolidated in October 2014 to the three regions in existence today.

The CGS require that the Commissioner of DPH convene a WUCC for each PWSMA to implement the areawide water supply planning process. A WUCC consists of one representative from each public water system with a source of water supply or service area within the PWSMA and one representative from each regional planning agency within such area who is elected by majority vote of the chief elected officials of the municipalities that are members of such regional planning agency.

A Coordinated Water System Plan (CWSP) is comprised of the individual WSPs of the public water systems within the PWSMA that serve over 1,000 people or have 250 or more service connections, and an areawide supplement that includes a *Water Supply Assessment (WSA)*, delineation of Exclusive Service Area (ESA) boundaries, an *Integrated Report*, and an *Executive Summary*. The purpose of the CWSP is to do the following:

1. Identify the present and future water system concerns.
2. Analyze alternatives.
3. Set forth a means for meeting the identified needs.

The major components of the CWSP are described below:

Individual Water Supply Plans – Each CWS that serves more than 1,000 people or 250 service connections is required to prepare an individual WSP under Section 25-32d of the Regulations of Connecticut State Agencies (RCSA). The individual WSPs are in various stages of development and DPH approval as WSPs are generally required to be updated every 5 to 9 years. The principal goals of individual water system planning as defined by the DPH are to do the following:

1. Ensure an adequate quantity of pure drinking water now and in the future.
2. Ensure orderly growth of individual water systems.
3. Make efficient use of available resources.

Water Supply Assessment – The first of the four components of the areawide supplement. The purpose of the WSA is to evaluate existing conditions and deficiencies within the PWSMA. The Final WSA was completed and approved by the WUCC, with the final document published in December 2016.

Exclusive Service Area Boundaries –An ESA is an area where public water is supplied by one system. Numerous factors are considered in determining ESA boundaries, including existing service areas; land use plans, zoning regulations, and growth trends; physical limitations to water service; political boundaries; water company rights as established by statute, special act, or administrative decision; system hydraulics, including potential elevations or pressure zones; and ability of a water system to provide a pure and adequate supply of water now and into the future. The *Final Recommended ESA Boundaries* document was completed and approved by the WUCC in June 2017. This document will be amended as necessary by the WUCC per the procedures in its Work Plan as ESA boundary modifications occur.

Integrated Report – The *Integrated Report* is a long-term planning tool for the PWSMA. Various issues are evaluated in the *Integrated Report*, including existing and future projected populations, existing and alternative water supplies, source protection, water conservation, existing and potential interconnections, system ownership and management, satellite management/ownership issues, minimum design standards, financial considerations, potential impacts on other uses of water resources (including water quality, flood management, recreation, hydropower, and aquatic habitat issues), and land acquisition for proposed wells in stratified glaciofluvial deposits. The *Final Integrated Report* was completed and approved by the WUCC in May 2018.

Executive Summary – The *Final Executive Summary*, the subject document, provides an abbreviated overview of the CWSP for the PWSMA. It is a factual and concise summary of the major elements of the CWSP.



2.0 COMPOSITION OF THE PUBLIC WATER SUPPLY MANAGEMENT AREA

The Eastern PWSMA encompasses all of the towns that are included in the Northeastern Connecticut Council of Governments (NECCOG) and Southeastern Connecticut Council of Governments (SECCOG) regional planning organizations. The boundaries of the PWSMA are generally defined by the Massachusetts state boundary to the north, the Rhode Island state boundary to the east, the boundary of the Central PWSMA to the west, and Long Island Sound to the south. The towns within the Eastern PWSMA are listed in Table 1, with towns along the western boundary called out with an asterisk as these communities may coordinate on water supply issues with towns or utilities in the Central PWSMA. In total, the Eastern PWSMA comprises 35 towns and two tribal governments (Mashantucket Pequot Tribal Nation [MPTN] and the Mohegan Tribe).

TABLE 1
Eastern PWSMA Towns and Tribal Governments

Eastern PWSMA Towns and Tribal Governments			
Ashford*	Groton	New London	Sprague
Bozrah	Hampton	North Stonington	Sterling
Brooklyn	Killingly	Norwich	Stonington
Canterbury	Lebanon*	Plainfield	Thompson
Chaplin*	Ledyard	Pomfret	Union*
Colchester*	Lisbon	Preston	Voluntown
Eastford	Mashantucket Pequot Tribal Nation	Putnam	Waterford
East Lyme*	Mohegan Tribe	Salem*	Windham*
Franklin	Montville	Scotland	Woodstock
Griswold			

*Denotes town that is on the border with the Central PWSMA

The Eastern PWSMA consists of 613 public water systems as of September 20, 2017. Refer to Appended Figure 1 for a map depicting the general locations of these systems. Of these:

- 139 are regulated as CWS.
- 112 are regulated as non-transient non-community (NTNC) water systems.
- 362 are regulated as transient non-community (TNC) water systems.

The vast majority of public water systems in the region are small systems serving less than 50 people per day associated with small residential developments and small businesses. A total of 27 CWSs are considered to be “large” systems required to submit WSPs to DPH.



3.0 SUMMARY OF THE WATER SUPPLY ASSESSMENT

The Final WSA for the Eastern PWSMA was published in December 2016. The document presented an inventory of existing CWSs with respect to historic water quality, system reliability, service and supply adequacy, firefighting capabilities, and major facilities. A brief summary of that document is presented below.

Finished Water Quality

The quality of drinking water supplied by public water systems in Eastern Connecticut to customers is generally excellent. The vast majority of violations are monitoring or reporting violations rather than maximum contaminant level (MCL) violations. Additionally, most violations are one-time occurrences. There are some areas where arsenic, uranium, radon, and other constituents are of concern.

System Reliability

System reliability of large public water systems in the Eastern PWSMA is considered generally good. At the time of the WSA (data through 2015), most public water systems serving greater than 1,000 people have multiple sources of supply and/or emergency/backup supplies. Fifteen out of 25 of these systems currently have interconnections with another system. Additionally, all of the large public systems serving more than 1,000 people had emergency power availability, and all such systems had an average-day margin of safety that was greater than the recommended 1.15. Three systems had a maximum month average-day margin of safety that was less than 1.15. Two systems had a peak-day margin of safety that was less than 1.15.

DPH has recently implemented a program known as the Capacity Assessment Tool (CAT) for small CWSs that serve fewer than 1,000 people. Of the 107 small community systems in the Eastern PWSMA that had been evaluated at the time of the WSA, 4 percent of the systems were rated to be lacking adequate capacity, 58 percent were rated to have moderate capacity, and 38 percent were rated to have adequate capacity. The long-term goal of the CAT program is to enable DPH to target specific types of assistance to individual small CWSs.

Existing and Future Sources of Supply

Seven of the 25 systems serving more than 1,000 people maintain active reservoir supplies. Only three of these rely solely on reservoir supplies. Most of the public water served through these systems comes from groundwater supplies. Five systems that currently supply more than 1,000 people have indicated a potential need for developing additional water supplies within the 5-year planning period as reported in their individual WSPs (dates of publication vary). Nineteen systems identify a potential long-term need (i.e., within the 50-year planning period) which is considered in more detail in the *Integrated Report*. Seven reported no short-term or long-term future supply needs.

Fire Protection

All of the towns and cities in Connecticut maintain some form of fire protection for residents and businesses. Some of these municipalities rely in part on community public water systems in the area.

The majority of larger systems have adequate pressure and system components to provide some form of fire protection to customers within their supply area. Most of the smaller community systems provide little or no fire protection.

Population and Land Use

Population centers within the Eastern PWSMA region include Groton, New London, Norwich, and Windham, with greater than 25,000 people. The lowest population areas within the region include Ashford, Bozrah, Chaplin, Eastford, Franklin, Hampton, Lisbon, North Stonington, Pomfret, Preston, Salem, Scotland, Sprague, Sterling, Union, and Voluntown, with fewer than 5,000 people according to the 2010 Census.

The vast majority of the Eastern PWSMA is considered rural, with concentrations of development along the Shetucket River Valley, the Quinebaug River Valley, the Thames River, and the shoreline. Growth trends in the region reflect the housing boom of the late 1990s and early 2000s, followed by the Great Recession and post-recession recovery in 2006 to 2015.

Status of Planning

Most water utilities have a WSP that has been approved in the last 5 years, and POCDs have been prepared in all member towns. Most were adopted within the last 10 years. Most community plans, such as zoning regulations and POCDs, also include pertinent information that defines allowable and anticipated uses in watershed areas. These plans often designate land uses in critical areas associated with public supply groundwater wells.

Smaller non-municipally owned community public water systems tend to have less opportunity for inclusion in broader planning objectives. Protection of these smaller systems often depends entirely on ownership of the land surrounding the source and state regulations that have established minimum allowable distances between a point source of pollution and a community groundwater supply.

Issues, Needs, and Deficiencies in the Region

Various issues, needs, and deficiencies were identified for the Eastern PWSMA in 2016 via data research, correspondence, and discussions with WUCC members, agency staff, and interested parties. Some of the issues that are currently facing the region include the projected need for future supply sources, the need for water supply planning coordination, the reliable quality of groundwater supplies, source protection, vulnerability of single source suppliers, viability of small community public water systems, discontinuity of service, growth trends and impacts, the impact of existing and future anticipated regulations, the need to balance raw and finished water supplies throughout the region, interconnections, and land use compatibility.



4.0 EXCLUSIVE SERVICE AREA BOUNDARIES

ESA boundaries delineate existing and potential service areas for a water system. The authority to assign franchise areas and authorizations to provide water service to water systems rests with the state legislature. Numerous water companies and utilities were granted charters or otherwise authorized by acts of the state legislature beginning in the late 18th century, resulting over time in areas where water service could be provided by more than one utility in the same area. ESA boundaries are designed to eliminate overlapping franchise and charter service areas, to prevent situations where more than one large public water system serves in the same area, and to identify responsible service providers to meet future service needs.

Establishment of boundaries for ESA holders is intended to ensure that safe and adequate drinking water is available to areas of the state where public water supply is needed. ESA designations are established based on the regulatory criteria and are based upon the agreement by a utility or municipality to serve, as necessary, previously identified unserved areas in accordance with applicable state statutes and regulations. Existing service areas (i.e., areas where service is currently being provided) were maintained and automatically received ESA designations via the delineation process. As part of this process, each public water system and municipality in the Eastern PWSMA was provided the opportunity to request ESA designations beyond their existing system boundaries that cover areas currently unserved by public water supply.

The Eastern PWSMA inherited the ESA boundary delineations established under CGS Section 25-33g for the former Southeastern Connecticut WUCC. These ESA boundary delineations were finalized in March 2001 and ultimately approved by DPH. Several modifications were approved by the former Southeastern WUCC prior to the consolidation of the former Southeastern PWSMA into the Eastern PWSMA in 2014. These modifications are incorporated into this document. Future ESA modifications will be processed by the Eastern WUCC in accordance with the procedures specified in its Work Plan.

Being an ESA holder is a commitment to ownership and service for newly constructed public water supply needs for CWSs (essentially, residential public water supply needs), and, in general, a right of first refusal for non-community water systems (non-residential) public water supply needs. An ESA designation therefore conveys both a right and a responsibility to provide public water service pursuant to applicable state law. Section 3.0 of the *Final Recommended ESA Boundaries* document outlines the rights and responsibilities of ESA holders in more detail.

Although an ESA provider is designated, actual development and service expansion should support the direction set by municipal land use and development goals while being cognizant of the impacts that such land use and development goals have on protecting water resources, timely water service, water quality, economically priced water, and strong professional management of water supplies. Municipalities retain their ability to provide guidance for development within their borders through their local government structure and planning documents, such as municipal plans of development, ordinances, and zoning regulations. When a project is proposed at or near an ESA boundary, such boundary should be modified when such modification is determined to be the appropriate solution for providing public water service to a location.

Table 2 presents the recommended ESA providers by town. Recommended ESA boundaries are delineated in the appended mapping.

TABLE 2
Final Recommended ESA Holders in Eastern PWSMA

Geographic Area	ESA Holders for Unserved Areas
Ashford	Connecticut Water Company, except for state lands owned and maintained by Connecticut DEEP which remained unassigned
Bozrah	Norwich Public Utilities (City of Norwich)
Brooklyn	Connecticut Water Company, except for state lands owned and maintained by Connecticut DEEP which remained unassigned
Canterbury	Connecticut Water Company for unserved areas east of South Canterbury Road and North Canterbury Road (Route 169), except for state lands owned and maintained by Connecticut DEEP which remained unassigned. Jewett City Water Company for all remaining unserved areas in Canterbury, except for state lands owned and maintained by Connecticut DEEP which remained unassigned.
Chaplin	Aquarion Water Company, except for state lands owned and maintained by Connecticut DEEP which remained unassigned
Colchester*	Colchester Water & Sewer Commission (Town of Colchester)
Eastford	Aquarion Water Company, except for state lands owned and maintained by Connecticut DEEP which remained unassigned
East Lyme*	East Lyme Water & Sewer Commission (Town of East Lyme)
Franklin*	Southeastern Connecticut Water Authority (SCWA) except for an area in southeastern Franklin to be served by Norwich Public Utilities (Murphy Road to Route 32 corridor and New Park Avenue) and an adjoining area to the north to be served by the Town of Franklin
Griswold*	Jewett City Water Company in the northern part of town and Connecticut Water Company in the southern part of town
Groton*	Four ESA areas to be served by Groton Utilities (western), Groton Long Point (southern), Noank Fire District (southeastern), and AWC (eastern)
Hampton	Aquarion Water Company, except for state lands owned and maintained by Connecticut DEEP which remained unassigned
Killingly	Connecticut Water Company, except for state lands owned and maintained by Connecticut DEEP which remained unassigned
Lebanon*	Town of Lebanon with the exception of a small area immediately surrounding existing systems and a small area assigned to Norwich Public Utilities in the southern part of town along (within 200 feet of), and south of, Old Route 2
Ledyard*	Ledyard WPCA with the exception of the area immediately surrounding existing systems and a small area around the SCWA Gray Farms Division and SCWA Ledyard Center system assigned to SCWA
Lisbon*	Jewett City Water Company (majority of town) and Norwich Public Utilities (southwestern area)
Montville*	The eastern portion of town east of Interstate 395 and the Route 163 corridor was assigned to Montville WPCA. The majority of the rest of Montville was assigned to SCWA, including areas within 200 feet of all SCWA systems, with the exception of two small areas in northern Montville assigned to Norwich Public Utilities (Holly Hill, Landsdown Estates, Stony Brook transmission right-of-way, and Route 32 corridor south to Crow Hill Road).
New London*	New London Water Department (City of New London)
North Stonington*	Town of North Stonington
Norwich*	Norwich Public Utilities (City of Norwich)

TABLE 2
Final Recommended ESA Holders in Eastern PWSMA

Geographic Area	ESA Holders for Unserved Areas
Plainfield	Connecticut Water Company for the majority of Plainfield, except for state lands owned and maintained by Connecticut DEEP which remained unassigned and those claimed by Jewett City Water Company (JCWC). JCWC for an area near its reservoir generally bounded by Lathrop Road to the west, Kate Downing Road and Flat Rock Road to the north, state lands to the east, and the boundary of Griswold to the south, except for state lands owned and maintained by Connecticut DEEP which remained unassigned.
Pomfret	Connecticut Water Company in the southeastern part of town. Aquarion Water Company for the remainder of town, except for state lands owned and maintained by Connecticut DEEP which remained unassigned
Preston*	Town of Preston, except for the southwestern tip awarded to Norwich Public Utilities
Putnam	Town of Putnam (Putnam WPCA), except for state lands owned and maintained by Connecticut DEEP which remained unassigned
Salem*	SCWA except for a small area in the northwest portion of town near Lake Hayward (Connecticut Water Company), and present and future water systems on land owned by the Town of Salem that serve town-owned property.
Scotland	Jewett City Water Company, except for state lands owned and maintained by Connecticut DEEP which remained unassigned
Sprague*	Sprague Water & Sewer Authority (Town of Sprague)
Sterling	Town of Sterling (Sterling Water Commission), except for state lands owned and maintained by Connecticut DEEP which remained unassigned
Stonington*	Town of Stonington (eastern), AWC (western), and Connecticut Water Company (Mason's Island)
Thompson	Connecticut Water Company, except for state lands owned and maintained by Connecticut DEEP which remained unassigned
Union	Connecticut Water Company, except for state lands owned and maintained by Connecticut DEEP which remained unassigned
Windham	Town of Windham (Windham Water Works), except for state lands owned and maintained by Connecticut DEEP which remained unassigned
Woodstock	Connecticut Water Company for two specific parcels. Aquarion Water Company for the remainder of town, except for state lands owned and maintained by Connecticut DEEP which remained unassigned
Voluntown*	Connecticut Water Company
Waterford*	Waterford Utilities Commission

*Denotes ESA boundaries approved by DPH that were inherited from former Southeastern WUCC



5.0 POPULATION AND WATER SUPPLY DEMAND

Historical population figures are shown in Table 3 and Figure 1. This data shows consistent growth throughout the region until the 1980s and 1990s. At that time, the urban areas began to lose population, while the suburban and rural towns, for the most part, kept increasing. Urban communities began to gain population once more between 2000 and 2010.

TABLE 3
Historical Population by Town for the Eastern PWSMA

Town	Classification	1960	1970	1980	1990	2000	2010
Ashford	Suburban	1,315	2,156	3,221	3,765	4,098	4,317
Bozrah	Suburban	1,590	2,036	2,135	2,297	2,357	2,627
Brooklyn	Suburban	3,312	4,965	5,691	6,681	7,173	8,210
Canterbury	Suburban	1,857	2,673	3,426	4,467	4,692	5,132
Chaplin	Suburban	1,230	1,621	1,793	2,048	2,250	2,305
Colchester	Suburban	4,648	6,603	7,761	10,980	14,551	16,068
East Lyme	Suburban	6,782	11,399	13,870	15,340	18,118	19,159
Eastford	Rural	746	922	1,028	1,314	1,618	1,749
Franklin	Rural	974	1,356	1,592	1,810	1,835	1,922
Griswold	Suburban	6,472	7,763	8,967	10,384	10,807	11,951
Groton	Urban	29,937	38,244	41,062	45,144	39,907	40,115
Hampton	Rural	934	1,129	1,322	1,578	1,758	1,863
Killingly	Suburban	11,298	13,573	14,519	15,889	16,472	17,370
Lebanon	Suburban	2,434	3,804	4,762	6,041	6,907	7,308
Ledyard	Suburban	5,395	14,837	13,735	14,913	14,687	15,051
Lisbon	Suburban	2,019	2,808	3,279	3,790	4,069	4,338
Montville	Suburban	7,759	15,662	16,455	16,673	18,546	19,571
New London	Urban	34,182	31,630	28,842	28,540	25,671	27,620
North Stonington	Rural	1,982	3,748	4,219	4,884	4,991	5,297
Norwich	Urban	38,506	41,739	38,074	37,391	36,117	40,493
Plainfield	Suburban	8,884	11,957	12,774	14,363	14,619	15,405
Pomfret	Suburban	2,136	2,529	2,775	3,102	3,798	4,247
Preston	Suburban	4,992	3,593	4,644	5,006	4,688	4,726
Putnam	Suburban	8,412	8,598	8,580	9,031	9,002	9,584
Salem	Suburban	925	1,453	2,335	3,310	3,858	4,151
Scotland	Rural	684	1,022	1,072	1,215	1,556	1,726
Sprague	Suburban	2,509	2,912	2,996	3,008	2,971	2,984
Sterling	Suburban	1,397	1,853	1,791	2,357	3,099	3,830
Stonington	Suburban	13,969	15,940	16,220	16,919	17,906	18,545
Thompson	Suburban	6,217	7,580	8,141	8,668	8,878	9,458
Union	Rural	383	443	546	612	693	854
Voluntown	Rural	1,028	1,452	1,637	2,113	2,528	2,603
Waterford	Suburban	15,391	17,227	17,843	17,930	19,152	19,517
Windham	Suburban	16,973	19,626	21,062	22,039	22,857	25,268
Woodstock	Suburban	3,177	4,311	5,117	6,008	7,221	7,964

Source: U.S. Census Bureau 1960 through 2010

**Figure 1: Historical Population Growth by Town Classification:
Eastern PWSMA**

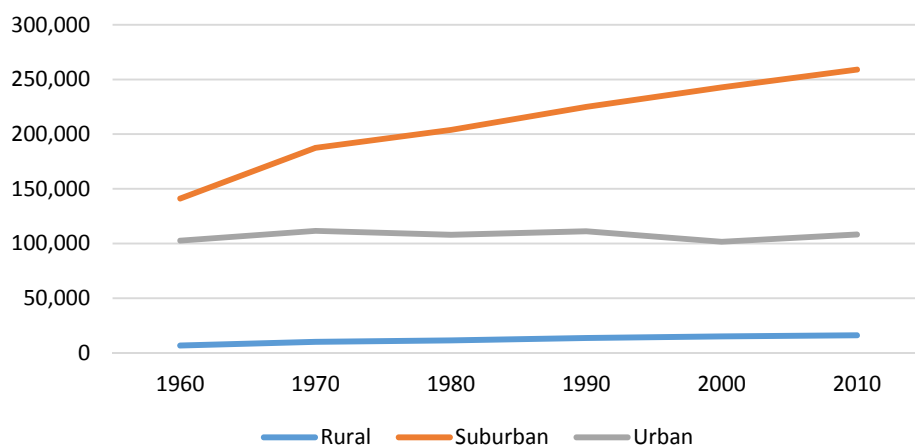


Table 4 presents future projections by town for the Eastern PWSMA. This data has been published by the Connecticut State Data Center (CT SDC) and interpolated where necessary (process described in the *Integrated Report*) to meet the required planning horizons. Note that actual population growth and decline over these planning periods may be more diffuse in some areas and more concentrated in other areas than presented in this report.

**TABLE 4
Population Projections by Town for the Eastern PWSMA**

Town	Classification	2010 Pop.	CT SDC 2015 Pop.	2023 Pop. Proj.	CT SDC 2030 Pop. Proj.	CT SDC 2040 Pop. Proj.	2060 Pop. Proj.
Ashford	Suburban	4,317	4,376	4,399	4,377	4,159	4,159
Bozrah	Suburban	2,627	2,714	2,855	2,983	3,089	3,198
Brooklyn	Suburban	8,210	8,581	9,135	9,562	10,033	10,435
Canterbury	Suburban	5,132	5,225	5,215	5,132	4,835	4,835
Chaplin	Suburban	2,305	2,285	2,175	2,052	1,782	1,782
Colchester	Suburban	16,068	16,195	16,207	16,237	15,925	15,925
East Lyme	Suburban	19,159	19,233	19,069	18,825	18,225	18,225
Eastford	Rural	1,749	1,775	1,787	1,781	1,700	1,700
Franklin	Rural	1,922	1,921	1,870	1,803	1,661	1,661
Griswold	Suburban	11,951	12,381	13,026	13,540	13,900	13,900
Groton	Urban	40,115	39,899	40,325	40,332	38,622	38,622
Hampton	Rural	1,863	1,853	1,782	1,697	1,485	1,485
Killingly	Suburban	17,370	17,695	18,067	18,266	17,948	17,948
Lebanon	Suburban	7,308	7,289	7,057	6,808	6,317	6,317
Ledyard	Suburban	15,051	14,889	14,546	14,167	13,315	13,315
Lisbon	Suburban	4,338	4,302	4,190	4,051	3,730	3,730
Montville	Suburban	19,571	19,576	19,434	19,168	18,356	18,356
New London	Urban	27,620	28,025	29,581	30,885	31,875	32,094
North Stonington	Rural	5,297	5,288	5,097	4,845	4,250	4,250

TABLE 4
Population Projections by Town for the Eastern PWSMA

Town	Classification	2010 Pop.	CT SDC 2015 Pop.	2023 Pop. Proj.	CT SDC 2030 Pop. Proj.	CT SDC 2040 Pop. Proj.	2060 Pop. Proj.
Norwich	Urban	40,493	42,632	46,640	50,312	54,765	63,231
Plainfield	Suburban	15,405	15,440	15,361	15,183	14,645	14,645
Pomfret	Suburban	4,247	4,400	4,604	4,764	4,906	4,949
Preston	Suburban	4,726	4,656	4,456	4,262	3,898	3,898
Putnam	Suburban	9,584	9,917	10,422	10,815	11,038	11,038
Salem	Suburban	4,151	4,157	4,014	3,826	3,454	3,454
Scotland	Rural	1,726	1,767	1,772	1,754	1,642	1,642
Sprague	Suburban	2,984	2,988	2,999	3,007	2,928	2,928
Sterling	Suburban	3,830	4,142	4,568	4,890	5,197	5,285
Stonington	Suburban	18,545	18,301	17,458	16,598	15,224	15,224
Thompson	Suburban	9,458	9,556	9,599	9,595	9,390	9,390
Union	Rural	854	889	921	936	944	944
Voluntown	Rural	2,603	2,586	2,429	2,260	1,875	1,875
Waterford	Suburban	19,517	19,341	18,522	17,621	15,996	15,996
Windham	Suburban	25,268	26,086	29,219	32,463	38,255	45,906
Woodstock	Suburban	7,964	8,125	8,193	8,164	7,860	7,860
Totals	All	383,328	388,485	396,994	402,961	403,224	420,204
	Rural	16,014	16,079	15,657	15,076	13,557	13,557
	Suburban	259,086	261,850	264,791	266,356	264,405	272,699
	Urban	108,228	110,556	116,546	121,529	125,262	133,948

Source: U.S. Census Bureau 2010; Population Projections published in 2017 by CT SDC

Service population and public water supply ADD projections for the region were generated based on information supplied by representatives of the public water systems. Demands were analyzed for existing conditions as well as the 5-, 20- and 50-year planning periods in the *Integrated Report*. Table 5 summarizes the projections by each ESA holder in the PWSMA. The supplies and demands considered in Table 5 include small satellite systems within the outer ESA boundary of each ESA holder which are not owned and operated by each ESA holder. For example, AWC systems in Lebanon are included within the data for the Town of Lebanon’s ESA.

The regional margin of safety for ADD is above 1.15 for all planning horizons. However, available supply is not always in the location of need. Several systems are projecting deficits of supply within their ESAs in each planning period. Fortunately, each system in need is already part of the regionally-interconnected water system in southeastern Connecticut, allowing for collaboration regarding supply development to occur and water to potentially be transferred through the regional system to those systems in need.

Table 5: Existing and Projected ADD, Available Water, and Margin of Safety for Exclusive Service Areas in Eastern PWSMA by ESA Holder (mgd)

ESA Holder	Current Supply and Demand Within Outer ESA Boundary (2015-2016)											Projected Supply and Demand Within Outer ESA Boundary (2023)										
	Residential Service Population	Residential Demand	Non-Residential Demand	Unaccounted-for Water	Water Sold to Other Systems	System ADD	Available Water	Margin of Safety	Potential Regionally Significant Supplies	Potential Available Water	Margin of Safety	Residential Service Population	Residential Demand	Non-Residential Demand	Unaccounted-for Water	Water Sold to Other Systems	System ADD	Available Water	Margin of Safety	Potential Regionally Significant Supplies	Potential Available Water	Margin of Safety
Aquarion Water Company	14,249	0.790	0.697	0.216	0.050	1.653	3.041	1.84	-	3.041	1.84	14,886	0.801	0.714	0.203	0.050	1.668	3.041	1.82	-	3.041	1.82
Colchester Sewer & Water	5,945	0.275	0.131	0.003	-	0.409	0.986	2.41	-	0.986	2.41	6,126	0.287	0.202	0.038	-	0.527	0.986	1.87	-	0.986	1.87
Connecticut Water Company	17,901	1.093	0.957	0.241	0.001	2.290	5.344	2.33	-	5.344	2.33	18,360	1.135	0.917	0.207	-	2.260	5.344	2.36	-	5.344	2.36
East Lyme Water & Sewer	15,245	0.786	0.762	0.272	-	1.819	2.501	1.38	-	2.501	1.38	15,567	0.895	0.762	0.222	-	1.879	2.501	1.33	-	2.501	1.33
ESA Unassigned	-	-	0.005	-	-	0.005	-	-	-	-	-	-	-	0.005	-	-	0.005	-	-	-	-	-
Groton Long Point Association	2,400	0.100	0.020	-	-	0.120	0.345	2.88	-	0.345	2.88	2,400	0.110	0.020	-	-	0.130	0.345	2.65	-	0.345	2.65
Groton Utilities	28,385	0.964	4.791	0.010	1.399	4.366	9.398	2.15	-	9.398	2.15	28,685	0.974	5.073	0.010	1.927	4.130	9.398	2.28	1.400	10.798	2.61
Jewett City Water Company	7,306	0.264	0.190	0.096	-	0.550	1.086	1.97	-	1.086	1.97	7,680	0.292	0.191	0.054	-	0.537	1.086	2.02	-	1.086	2.02
Ledyard WPCA	6,831	0.376	1.189	0.165	0.018	1.713	4.112	2.40	-	4.112	2.40	7,306	0.409	1.278	0.188	0.050	1.826	4.112	2.25	-	4.112	2.25
Montville WPCA	6,215	0.495	1.127	0.099	0.195	1.526	2.784	1.82	-	2.784	1.82	6,348	0.515	1.406	0.107	0.245	1.783	2.784	1.56	-	2.784	1.56
New London Dept. of Public Utilities	28,025	0.676	3.967	0.806	1.900	3.549	5.080	1.43	-	5.080	1.43	29,581	0.887	4.213	0.886	3.100	2.886	3.880	1.34	0.200	4.080	1.41
Noank Fire District	1,947	0.168	0.025	0.005	-	0.198	0.250	1.26	-	0.250	1.26	1,970	0.170	0.025	0.005	-	0.200	0.250	1.25	-	0.250	1.25
Norwich Public Utilities	39,842	2.056	2.227	0.371	0.450	4.205	6.048	1.44	-	6.048	1.44	45,773	2.397	2.749	0.444	0.450	5.140	6.048	1.18	1.500	7.548	1.47
Putnam WPCA	7,444	0.424	0.469	0.074	-	0.967	1.311	1.36	-	1.311	1.36	7,811	0.446	0.473	0.076	-	0.995	1.311	1.32	-	1.311	1.32
Southeastern Conn. Water Authority	5,732	0.277	0.092	0.010	-	0.379	0.833	2.20	-	0.833	2.20	5,771	0.280	0.096	0.011	-	0.387	0.833	2.15	-	0.833	2.15
Sprague Water & Sewer Authority	1,058	0.035	0.025	0.006	-	0.066	0.180	2.71	-	0.180	2.71	1,042	0.048	0.015	0.006	-	0.070	0.180	2.59	-	0.180	2.59
Sterling WPCA	448	0.031	0.179	-	-	0.210	0.441	2.10	-	0.441	2.10	490	0.034	0.150	0.029	-	0.214	0.441	2.06	-	0.441	2.06
Town of Franklin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Town of Lebanon	913	0.030	0.051	0.001	-	0.082	0.102	1.25	-	0.102	1.25	913	0.031	0.051	0.001	-	0.083	0.102	1.23	-	0.102	1.23
Town of North Stonington	2,309	0.046	0.096	0.009	-	0.151	0.257	1.70	-	0.257	1.70	2,309	0.046	0.120	0.011	-	0.177	0.257	1.45	-	0.257	1.45
Town of Preston	1,324	0.090	0.019	0.002	-	0.110	0.149	1.35	-	0.149	1.35	1,334	0.090	0.038	0.004	-	0.132	0.149	1.13	-	0.149	1.13
Town of Stonington	4,872	0.369	0.102	0.046	-	0.517	0.039	0.08	-	0.039	0.08	4,872	0.369	0.102	0.046	-	0.517	0.039	0.08	-	0.039	0.08
Waterford Utilities Commission	17,042	0.995	0.723	0.257	-	1.974	1.919	0.97	-	1.919	0.97	16,980	1.022	1.464	0.429	-	2.915	3.119	1.07	-	3.119	1.07
Windham Water Works	19,224	1.084	0.380	0.252	-	1.715	0.048	0.03	-	0.048	0.03	21,356	1.139	0.721	0.261	-	2.122	0.048	0.02	-	0.048	0.02
TOTAL FOR REGION	234,657	11.425	18.223	2.938	4.013	28.573	46.253	1.62	-	46.253	1.62	247,560	12.379	20.785	3.240	5.822	30.582	46.253	1.51	3.100	49.353	1.61

ESA Holder	Projected Supply and Demand Within Outer ESA Boundary (2030)											Projected Supply and Demand Within Outer ESA Boundary (2060)										
	Residential Service Population	Residential Demand	Non-Residential Demand	Unaccounted-for Water	Water Sold to Other Systems	System ADD	Available Water	Margin of Safety	Potential Regionally Significant Supplies	Potential Available Water	Margin of Safety	Residential Service Population	Residential Demand	Non-Residential Demand	Unaccounted-for Water	Water Sold to Other Systems	System ADD	Available Water	Margin of Safety	Potential Regionally Significant Supplies	Potential Available Water	Margin of Safety
Aquarion Water Company	15,381	0.831	0.734	0.212	0.050	1.727	2.841	1.64	-	2.841	1.64	16,680	0.909	0.786	0.234	0.050	1.879	2.841	1.51	-	2.841	1.51
Colchester Sewer & Water	6,644	0.311	0.279	0.057	-	0.647	0.986	1.52	-	0.986	1.52	7,671	0.357	0.491	0.104	-	0.952	0.986	1.04	-	0.986	1.04
Connecticut Water Company	18,806	1.170	0.936	0.205	-	2.311	5.344	2.31	-	5.344	2.31	19,728	1.227	0.983	0.203	-	2.413	5.344	2.21	-	5.344	2.21
East Lyme Water & Sewer	16,020	1.050	0.972	0.272	-	2.293	2.501	1.09	-	2.501	1.09	20,503	1.333	1.412	0.369	-	3.114	2.501	0.80	-	2.501	0.80
ESA Unassigned	-	-	0.005	-	-	0.005	-	-	-	-	-	-	-	0.005	-	-	0.005	-	-	-	-	-
Groton Long Point Association	2,400	0.115	0.020	-	-	0.135	0.345	2.56	-	0.345	2.56	2,400	0.120	0.020	-	-	0.140	0.345	2.46	-	0.345	2.46
Groton Utilities	29,385	1.004	5.453	0.010	2.268	4.199	8.768	2.09	6.400	15.168	3.61	30,385	1.054	6.163	0.010	2.967	4.260	8.768	2.06	6.400	15.168	3.56
Jewett City Water Company	7,680	0.292	0.192	0.054	-	0.538	1.086	2.02	-	1.086	2.02	7,680	0.292	0.192	0.054	-	0.539	1.086	2.01	-	1.086	2.01
Ledyard WPCA	7,481	0.433	1.582	0.234	0.050	2.200	4.112	1.87	-	4.112	1.87	7,481	0.445	1.582	0.236	0.050	2.213	4.112	1.86	-	4.112	1.86
Montville WPCA	7,015	0.568	1.636	0.134	0.267	2.071	2.784	1.34	-	2.784	1.34	11,952	0.804	1.958	0.270	0.317	2.715	2.784	1.03	-	2.784	1.03
New London Dept. of Public Utilities	30,885	0.927	4.173	0.886	3.320	2.666	2.613	0.98	5.090	7.703	2.89	32,094	0.963	4.587	0.964	3.770	2.744	2.163	0.79	5.090	7.253	2.64
Noank Fire District	1,970	0.170	0.025	0.005	-	0.200	0.250	1.25	-	0.250	1.25	1,970	0.170	0.025	0.005	-	0.200	0.250	1.25	-	0.250	1.25
Norwich Public Utilities	49,006	2.605	4.070	0.568	0.450	6.792	5.098	0.75	2.620	7.718	1.14	55,127	3.034	4.186	0.591	0.450	7.361	5.098	0.69	2.620	7.718	1.05
Putnam WPCA	8,023	0.459	0.489	0.077	-	1.025	1.311	1.28	-	1.311	1.28	8,189	0.450	0.480	0.075	-	1.005	1.311	1.30	-	1.311	1.30
Southeastern Conn. Water Authority	5,852	0.283	0.100	0.012	-	0.395	0.833	2.11	-	0.833	2.11	5,852	0.283	0.100	0.012	-	0.395	0.833	2.11	-	0.833	2.11
Sprague Water & Sewer Authority	1,060	0.049	0.015	0.006	-	0.071	0.180	2.55	-	0.180	2.55	1,114	0.052	0.015	0.006	-	0.074	0.180	2.45	-	0.180	2.45
Sterling WPCA	490	0.034	0.151	0.029	-	0.214	0.441	2.06	-	0.441	2.06	490	0.034	0.152	0.029	-	0.215	0.441	2.05	-	0.441	2.05
Town of Franklin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Town of Lebanon	929	0.032	0.051	0.001	-	0.084	0.102	1.22	-	0.102	1.22	929	0.032	0.051	0.001	-	0.084	0.102	1.22	-	0.102	1.22
Town of North Stonington	2,309	0.046	0.120	0.011	-	0.177	0.257	1.45	-	0.257	1.45	2,309	0.046	0.120	0.011	-	0.177	0.257	1.45	-	0.257	1.45
Town of Preston	1,367	0.092	0.062	0.006	-	0.160	0.149	0.93	-	0.149	0.93	1,367	0.092	0.109	0.010	-	0.211	0.149	0.70	-	0.149	0.70
Town of Stonington	4,872	0.369	0.102	0.046	-	0.517	0.039	0.08	-	0.039	0.08	4,872	0.369	0.102	0.046	-	0.517	0.039	0.08	-	0.039	0.08
Waterford Utilities Commission	17,180	1.034	1.640	0.462	-	3.135	3.339	1.07	-	3.339	1.07	17,180	1.034	2.023	0.528	-	3.585	3.789	1.06	-	3.789	1.06
Windham Water Works	23,726	1.261	0.890	0.306	-	2.456	0.048	0.02	-	0.048	0.02	26,866	1.458	0.894	0.318	-	2.670	0.048	0.02	-	0.048	0.02
TOTAL FOR REGION	258,481	13.134	23.697	3.592	6.405	34.018	43.426	1.28	14.110	57.536	1.69	282,839	14.558	26.436	4.079	7.604	37.468	43.426	1.16	14.110	57.536	1.54

The demands above do not include passive water conservation savings.

Available supply calculations do not include non-community system wells, as this data is largely unavailable. Therefore, the reported MOS above is lower than what is actually occurring in the region (for example, in Preston where there are many non-community water systems).

Available water calculations include reductions in available water to support streamflow releases as calculated in Table 3-10ab of the Integrated Report.

Demands in WWW ESA largely provided from sources outside of the Eastern PWSMA in Mansfield.

Demands in Town of Stonington ESA largely provided from sources outside of the Eastern PWSMA in Rhode Island.

Potentially regionally significant supplies include sources from Tables 7-3 to 7-5 in the Integrated Report.

Table 6 presents the regional deficits to meet MMADD. Three demand scenarios were evaluated in the *Integrated Report*: The projections performed by water utilities for their systems, those projections with passive water conservation applied based on Scenario I in the *State Water Plan*, and the above with available water increased based on potential guidance for meeting MMADD. The majority of new water need has been identified by NPU and New London Department of Public Utilities in the 5-year planning period (by 2023). The implementation of targeted water conservation and water efficiency measures is expected to be the primary method of meeting future deficits for these systems. Several potential regional supply options are evaluated in the *Integrated Report*.

The projected deficits indicate that new supplies will need to be developed within the various planning horizons, even after accounting for the passive benefits of water conservation and potential available water guidance to reduce “on paper” deficits. As discussed in the *Integrated Report*, mitigating available water deficits is relatively straightforward for some systems, particularly those with minimal deficits. However, the benefits of reducing demand to mitigate the need for additional supply are shown by the limited passive water conservation exercise provided in the *Integrated Report*. Therefore, systems projecting deficits are recommended to reevaluate their demand projections and consider development of a targeted water conservation and water efficiency program to reduce unnecessary water usage on both the supply side and demand side of the system.

Table 6: Summary of Available Water Deficits to Meet MMADD for Community Water Systems (mgd)

Community Water System	Scenario A: Utility Projections			Scenario B: Utility Projections with Passive Water Conservation			Scenario C: Utility Projections with Passive Water Conservation and Available		
	Total New Sources Needed to Meet MOS 1.15 in 2023	Total New Sources Needed to Meet MOS 1.15 in 2030	Total New Sources Needed to Meet MOS 1.15 in 2060	Total New Sources Needed to Meet MOS 1.15 in 2023	Total New Sources Needed to Meet MOS 1.15 in 2030	Total New Sources Needed to Meet MOS 1.15 in 2060	Total New Sources Needed to Meet MOS 1.15 in 2023	Total New Sources Needed to Meet MOS 1.15 in 2030	Total New Sources Needed to Meet MOS 1.15 in 2060
Aquarion Water Company - Mystic System	-	0.399	0.648	-	0.329	0.557	-	-	0.361
Classee Water System - Latimer Point	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Colchester Water & Sewer Commission	-	-	0.366	-	-	0.366	-	-	0.366
East Lyme Water & Sewer Commission	-	0.730	1.891	-	0.594	1.601	-	0.594	1.601
Fall Brook Mobile Home Park	0.004	0.004	0.004	0.003	0.003	0.002	0.003	0.003	0.002
Montville WPCA	-	-	0.849	-	-	0.721	-	-	0.721
New London Dept. of Public Utilities & Waterford Utilities Commission	2.038	3.085	3.880	2.038	3.085	3.880	-	2.106	2.902
Noank Fire District	0.166	0.166	0.166	0.158	0.142	0.125	-	-	-
Norwich Public Utilities	1.801	4.993	5.418	1.667	4.850	5.268	1.338	4.570	4.989
Preston Plains Water Company	-	0.045	0.120	-	0.045	0.120	-	0.045	0.120
TOTAL	4.016	9.429	13.351	3.874	9.055	12.650	1.349	7.326	11.069

Total available water need accounts for reduction in available water due to streamflow releases.



6.0 POTENTIAL INTERCONNECTIONS, JOINT USE FACILITIES, AND SATELLITE MANAGEMENT

In the Eastern PWSMA, several public water systems receive all of their water supply from an interconnection with another system. Those consecutive systems that receive water from a neighboring system include the following:

- From AWC – Mystic: Classee Water System – Latimer Point and Connecticut Water Company (CWC) – Masons Island;
- From Groton Utilities: Groton Long Point Association, Ledyard WPCA, Montville WPCA, and Noank Fire District;
- From Groton Utilities (via Montville WPCA) and NPU: Mohegan Tribal Utility Authority; and
- From New London Department of Public Utilities: Waterford Utilities Commission

In particular, the Groton – Ledyard – Montville portion of the regionally interconnected water system in southeastern Connecticut are interconnected and managed to balance supply and demand in a regionally efficient manner. Additional interconnections also exist throughout the region either to provide supplemental supply on an intermittent basis (such as CWC – Crystal to Putnam WPCA) or for emergency purposes.

While it is recognized that the majority of projected deficits in the region are within systems connected to the regionally interconnected water system in southeastern Connecticut, existing supplies within the regionally interconnected system are limited. Groton Utilities has proposed collaborating with other utilities to develop new supply sources near its system to increase its available water supply, with a portion of the new supply allocated to the collaborating utility through the regionally interconnected system. A portion or all of projected deficits may be met through a combination of development of regionally significant sources by Groton Utilities and utilities in need.

As is well known to the utilities who participated in the former Southeastern WUCC, the regulatory and participatory process involved in creating regional interconnections can be costly and time-consuming. It also requires the cooperation of many municipal and private entities for its success. There are currently no mandates for systems to interconnect or for systems to act as a vehicle for pass-through transmission of water. A lack of cooperation on the part of one or more entities could necessitate the installation of parallel transmission piping. Thus, each system projecting a deficit will continue to need to consider potential new sources of supply other than interconnections to address projected deficits.

Many of the smaller community public water systems in the region (and some of the larger systems) operate with a single source of supply (or wellfield), with no backup supply (or wellfield). This leaves these systems vulnerable to interrupted service due to equipment failures, contamination, and the like. Development of interconnections has been proposed for several of these systems in the *Integrated Report*.

The joint use or ownership of facilities for public water systems in the southeast Connecticut region is well documented. Agreements between the regionally interconnected water system for daily, emergency, and maintenance supply needs (the *Intraregional Water Supply Response Plan*) have been

successful at the utility level as well as viewed favorably by State Agencies. In addition, the agreement between New London Department of Utilities and Waterford Utilities Commission allows the systems to cohabitate and operate as a combined system in a manner beneficial to both utilities. However, based on local system knowledge, joint use or ownership of major infrastructure such as supply sources, storage, treatment, or water mains is not currently practiced in the region. The sharing of water is more common than the sharing of infrastructure, which WUCC members generally feel should be assigned to one entity. However, “outside-the-box” ideas such as the East Lyme Water Banking Project should continue to be pursued in the future to meet difficult supply challenges.

Given the forecast water supply deficit in the southeast region, there is a potential for future shared ownership and use of supplies beyond routine interconnections. This type of shared use would require formal agreements among the stakeholders. Large-scale regional interconnections of future water supplies could be fed by a jointly owned supply source although none have been identified to date. This may become more common if water supply development trends towards regional supplies to meet the needs of several systems.

Satellite management can be a cost-effective means of operating a small system because it takes advantage of the "economy of scale" factor that larger water suppliers can offer. This is presented as a potential option in the *Integrated Report* for many of the small CWSs in the region. Table 7 presents a summary of satellite management needs and opportunities of major providers in the region.

TABLE 7
Satellite Management Needs and Opportunities of ESA Holders

ESA Holder	Intend to Operate Their Own Satellite Public Water Systems	Potential Need for Contract Operation by Others	Available to Operate Satellite Water Systems for Others	Satellite Systems Unlikely to Occur in ESA
Aquarion Water Company	X		X	
Colchester Sewer & Water Commission	X			
Connecticut Water Company	X		X	
East Lyme Water & Sewer Commission	X			
ESA Unassigned (Primarily CT DEEP lands)	X			
Groton Long Point Association				X
Groton Utilities	X		X	
Jewett City Water Company	X		X	
Ledyard WPCA		X^		
Montville WPCA	X			
New London Dept. of Public Utilities				X
Noank Fire District				X
Norwich Public Utilities	X			
Putnam WPCA		X*		
Southeastern Connecticut Water Authority	X		X	
Sprague Water & Sewer Authority	X			
Sterling WPCA		X^		
Town of Lebanon		X^		
Town of North Stonington		X		

TABLE 7
Satellite Management Needs and Opportunities of ESA Holders

ESA Holder	Intend to Operate Their Own Satellite Public Water Systems	Potential Need for Contract Operation by Others	Available to Operate Satellite Water Systems for Others	Satellite Systems Unlikely to Occur in ESA
Town of Preston		X [^]		
Town of Stonington		X		
Waterford Utilities Commission		X [^]		
Windham Water Works		X [*]		

*Water main extensions preferred over satellite system operation for these utilities.

[^]Currently has a contract operator for its systems. Waterford’s distribution system is operated by New London per their agreement.



7.0 POTENTIAL WATER SUPPLY SOURCES

A review of individual WSPs was conducted to determine the potential sources of supply being considered by utilities in the region to increase available water in their systems. Most utilities identified one or more options for new supply sources, including potential interconnections, modifications to existing surface water supplies, reactivation of groundwater supplies, reactivation of surface water supplies, development of new surface water diversions, and development of new groundwater wells.

Creation of new supply sources carries a high capital cost and high investment in planning, agreements, permitting, and conceptual design, with successful permitting of a proposed source not guaranteed. As such, the *Integrated Report* recommends the following prioritization of actions regarding new source development:

- For systems demonstrating projected deficits, reevaluate potential demands (particularly for older WSPs);
- Develop a targeted water conservation and efficiency program to further reduce residential, nonresidential, irrigation, unaccounted-for water, and other unnecessary water usage;
- Develop active and/or emergency interconnections between small CWSs in the region; and
- Consolidate resources to develop new supply sources and utilize existing interconnections to transfer new water supplies developed in one area of the regionally interconnected water system to other areas in need.

For the purposes of the CWSP, regionally significant supply sources were identified as new sources or activities with the potential to increase available water by 1.0 mgd or more which are proximal to the system in need, and any infrastructure improvements to enhance safe yield associated with sources which already serve regional needs. Furthermore, regionally significant supplies needed to have been advanced beyond the conceptual level in order to be considered regionally significant. For example, a pledge to collaborate on the development of a new supply sources was only considered regionally significant if a potential supply source was already identified and preliminary testing performed to estimate potential yield.

Potentially regionally significant actions to increase available supply in the region include the following:

- Groton Utilities: Diversion of water from Haley's Brook during high flow periods, diversion of water from Shewville Brook to Ledyard Reservoir, and elevation of Ledyard Reservoir Dam,
- New London Department of Utilities: Sealing Lake Konomoc dam, diversion of water from Hunts Brook & Millers Pond in Waterford to Lake Konomoc, and excavation of Lake Konomoc;
- Norwich Public Utilities: Reactivation of Bog Meadow and Fairview Reservoirs, recycling of filter plant backwash, and utilizing Norwichtown Well for active rather than emergency use;

The majority of these activities have not sufficiently advanced to having detailed cost estimates suitable for comparison of potential projects on a regional scale, or the cost estimates are relatively out of date. Therefore, prioritization of potential projects by cost and potential yield will be pursued by the WUCC over the next 5 to 10 years. Utilities are encouraged to continue development of supply sources which may not be regionally significant as further evaluation may reveal that such actions could be applicable at a regional scale.



8.0 POTENTIAL IMPACTS OF THE COORDINATED WATER SYSTEM PLAN ON OTHER USES OF WATER RESOURCES

The discussion in the *Integrated Report* evaluates the potentially regionally significant sources of supply from a “1,000-foot” view to provide some conceptual details regarding the potential impacts of use of these sources on other uses of water resources. Development of future supply sources can potentially have impacts on water quality, minimum streamflows, flood management, recreation, hydropower, listed species and aquatic habitat, riparian rights, and waste load allocations. Each of these issues will require careful evaluation prior to the development of any new supply source. These issues are typically evaluated as part of diversion permit applications for proposed sources of supply although it is recognized that reactivation of registered supply sources would likely not require a diversion permit.

A summary of this evaluation is provided below:

- **Water Quality:** All of the potential surface supply sources will draw on water which has a surface water quality of Class AA or Class A, indicating its suitability for use as a public water supply. While some proposed activities could impact water quality temporarily during construction, use of best management practices would mitigate this concern. The Norwichtown Well lies in an area where the groundwater quality is mapped as Class GAA-Impaired such that the ongoing cost to treat the water may be of concern to NPU. In addition, as the withdrawal is 20.5% of the 99% duration flow in the river, water quality in the river may be impacted during periods of low flow as treated wastewater comprises a higher percentage of flow.
- **Minimum Streamflow:** Many of the proposed actions involve surface water diversions. As outflow from reservoirs will need to be conducted in accordance with the Streamflow Standards and Regulations, minimum downstream impacts to minimum flow are expected for most potential actions. The potential 80% duration flow for the outflow streams during the rearing and growth bioperiod for the Bog Meadow and Fairview Reservoirs are very low (0.06 cfs) such that very little flow would be expected in these streams during the summer. In addition, many of the stream diversions will need low head dams to facilitate transfers of water, such that the withdrawal points will likely require releases in accordance with the regulations. In some cases, the required streamflow releases have the potential to greatly reduce the potential yield from some sources. This is one reason why diverting water from Haleys Brook during high flow periods (when instream flow conditions are already met) may be an attractive regional option. As noted above, the withdrawal from the Norwichtown Well is 20.5% of the 99% duration flow in the Yantic River, so the proposed withdrawal is unlikely to result in cessation of flow in the river.
- **Flood Management:** Some activities, particularly the creation or elevation of dams may result in increased flood heights along certain streams. A hydraulic analysis will be required for local permitting to demonstrate that any modification of the floodplain will not impact other structures, and DEEP would consider potential downstream impacts as part of its dam safety review.
- **Recreation:** The majority of areas projected for new supplies are privately owned. Only the area surrounding Bog Meadow Reservoir is actively used as a recreation site by the public. The overall

impact to recreation from any individual action is considered to be low, but this would need to be evaluated in more detail for stream diversion actions.

- Hydropower: None of the streams downstream from any of the proposed actions are used for hydropower.
- Natural Diversity Database (NDDB): Several of the proposed actions lie in areas mapped by the NDDB. The potential to impact listed species would need to be evaluated in more detail as projects are considered.
- Aquatic Habitat Concerns: The occurrence of aquatic habitat impacts would be directly related to proposed withdrawal rates. While impacts downstream of reservoirs required to make releases would be mitigated, some actions (such as reactivation of inactive reservoirs) would not need to evaluate such impacts. Instream flow studies or other assessments, such as a Rapid Bioassessment of invertebrates, may be necessary to determine potential downstream impacts.
- Riparian Rights: Other water users likely exist along most of the streams and brooks envisioned for public water supply use. Some utilize stream and pond access from private properties while others may have agricultural operations or other withdrawals. These would need to be investigated in more detail as projects move forward.
- Waste Load Allocation: The potential actions for surface water lie on brooks and streams not utilized for treatment of wastewater. Active use of the Norwichtown Well could impact wasteload allocations along a portion of the Yantic River, as the withdrawal is 20.5% of the 99% duration flow.
- Climate Change: The majority of potential actions are relatively resilient to climate change. Modifications to existing structures are generally the most resilient as the projects will reduce leakage or increase storage. Development of surface water sources with significant storage (e.g. Millers Pond) is considered the next most resilient project, as the increased storage will offset some of the potential losses due to evapotranspiration. Diversion from reservoirs with small watersheds and diversion of water from streams and brooks are at a higher risk of being affected by climate change, although the safe yield methodology will mitigate the potential impact of climate change on these sources.

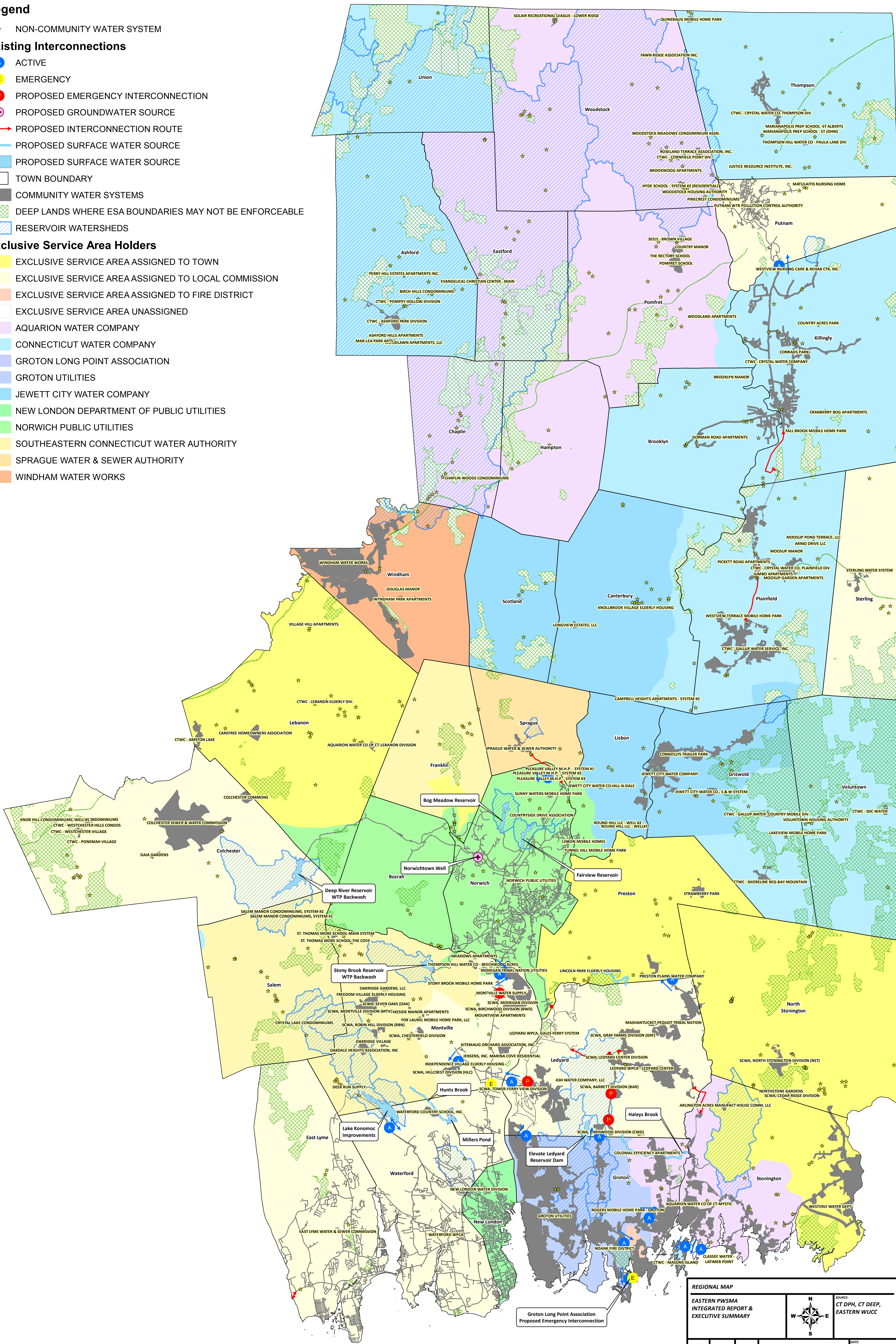
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APPENDED FIGURE

Legend

- ★ NON-COMMUNITY WATER SYSTEM
- Existing Interconnections**
- Ⓐ ACTIVE
- Ⓔ EMERGENCY
- Ⓜ PROPOSED EMERGENCY INTERCONNECTION
- Ⓜ PROPOSED GROUNDWATER SOURCE
- PROPOSED INTERCONNECTION ROUTE
- PROPOSED SURFACE WATER SOURCE
- PROPOSED SURFACE WATER SOURCE
- ▭ TOWN BOUNDARY
- ▭ COMMUNITY WATER SYSTEMS
- ▨ DEEP LANDS WHERE ESA BOUNDARIES MAY NOT BE ENFORCEABLE
- ▨ RESERVOIR WATERSHEDS
- Exclusive Service Area Holders**
- ▭ EXCLUSIVE SERVICE AREA ASSIGNED TO TOWN
- ▭ EXCLUSIVE SERVICE AREA ASSIGNED TO LOCAL COMMISSION
- ▭ EXCLUSIVE SERVICE AREA ASSIGNED TO FIRE DISTRICT
- ▭ EXCLUSIVE SERVICE AREA UNASSIGNED
- ▭ AQUARION WATER COMPANY
- ▭ CONNECTICUT WATER COMPANY
- ▭ GROTON LONG POINT ASSOCIATION
- ▭ GROTON UTILITIES
- ▭ JEWETT CITY WATER COMPANY
- ▭ NEW LONDON DEPARTMENT OF PUBLIC UTILITIES
- ▭ NORWICH PUBLIC UTILITIES
- ▭ SOUTHEASTERN CONNECTICUT WATER AUTHORITY
- ▭ SPRAGUE WATER & SEWER AUTHORITY
- ▭ WINDHAM WATER WORKS





APPENDIX A

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Coordinated Water System Plan

Part I: Final Water Supply Assessment

Eastern Connecticut Public Water Supply Management Area
December 14, 2016



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Coordinated Water System Plan Part II: Final Recommended Exclusive Service Area Boundaries

Eastern Public Water Supply Management Area
June 14, 2017



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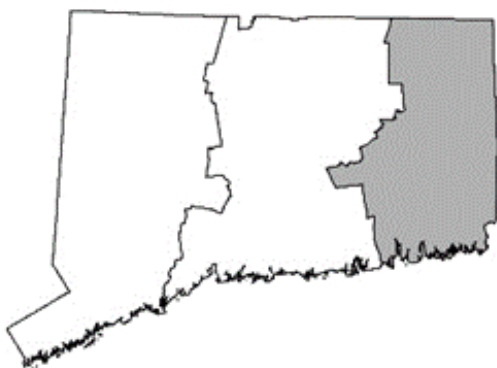
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Coordinated Water System Plan Part III: Final Integrated Report

Eastern Public Water Supply Management Area
May 31, 2018



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