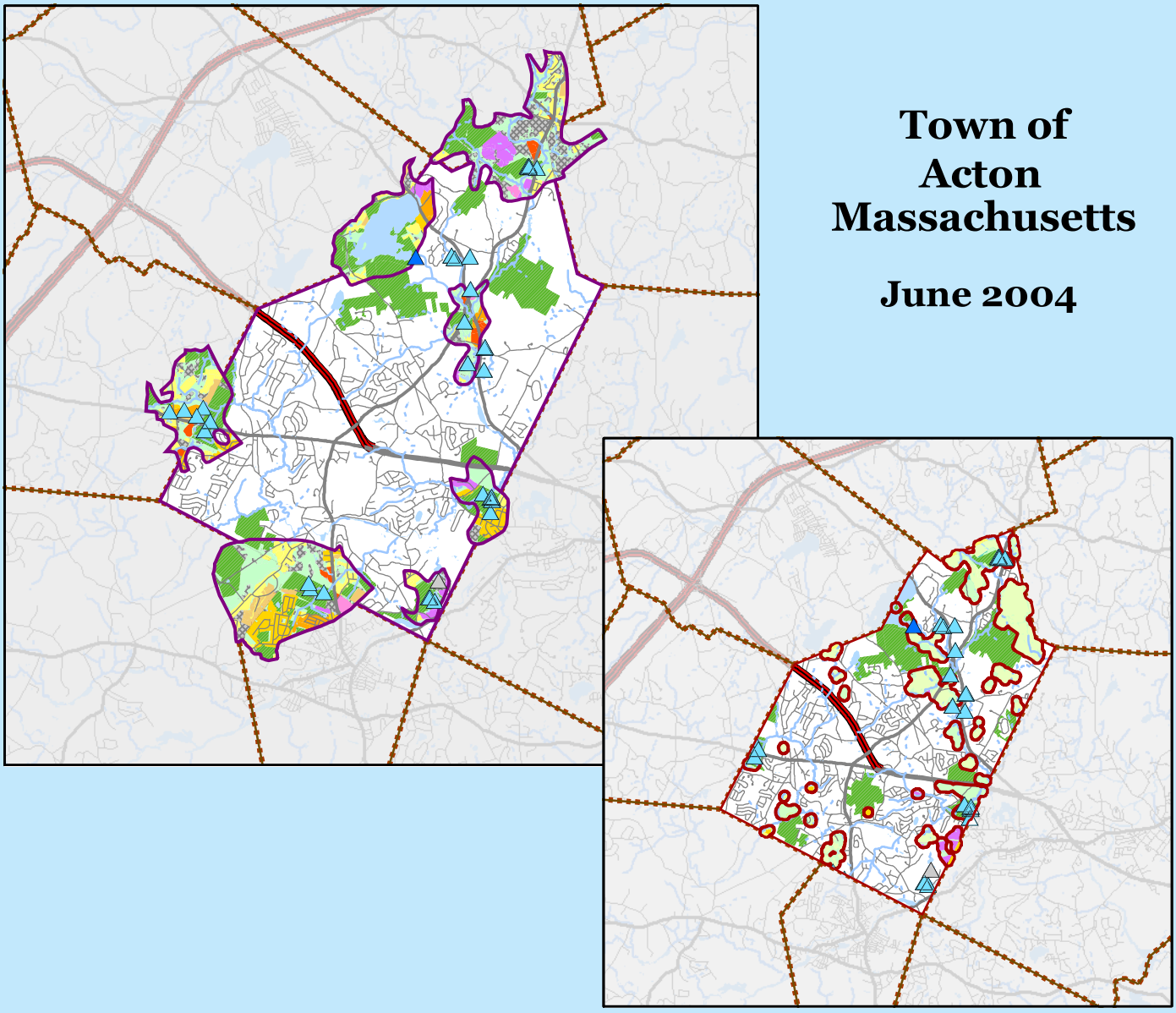
EOEA Water Assets Study
Community Report



Town of Acton Massachusetts

June 2004

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This project is funded by the
Executive Office of Environmental Affairs (EOEA).

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and

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The Executive Office of Environmental Affairs and Earth Tech would like to gratefully acknowledge the assistance of Jim Deming of the Acton Water Supply District in preparing this report.

Table of Contents

1. Project Background and Goals

The Massachusetts Executive Office of Environmental Affairs (EOEA) has, as a primary mission, the enhancement, preservation and protection of the Commonwealth's natural resources and its scenic, historic and aesthetic qualities. Water is one of the state's most important natural resources, as it sustains human and all other life, and careful planning is required to ensure that our water resources are protected for existing and future generations. Along the Interstate 495 beltway, water resources are under considerable pressure from growth that has occurred over the last 30 to 40 years and accelerated during the last ten years. As a reflection of the increasing strains on water supplies and ecological resources statewide, communities are facing increasing regulatory constraints in water supply permitting. If adequate water supplies are to be available to support new development and preserve existing ecosystems, water resources assessment and planning are essential.

Through this Water Assets Study, EOEA is taking an important step toward assessing the water resources in the communities along the I495 beltway, and helping these communities plan for the sustainable management of these resources. EOEA's town-by-town Buildout Analyses, which were completed in 2001, identified the developable land remaining in each community, as defined by existing zoning, and some of the infrastructure and services that would be needed to support potential development. Through the buildout analyses, the additional water demand for each community was estimated for full buildout conditions. While these conditions are neither inevitable, nor necessarily desirable, they represent a worst-case scenario of sorts, with respect to pressure on resources. The water demand projections were intended to raise community awareness about potential future water demands and encourage communities to plan future development in accordance with available water resources. The Water Assets Study is the next step in this analysis, helping communities more specifically assess their water supply capacity, sustain their current sources, and protect land that may be valuable for future groundwater supplies. Ultimately, the data from this study will be used along with an assessment of the ecological impact of withdrawals to identify the need for additional sources to meet existing and proposed demand, potential sources of supply, and as a means to help sustain the Commonwealth's fresh water resources.

The overall goal of the Water Assets Study is to assess the current and potential water supply capacity and the current and potential water demands in communities in the highest growth area of the Commonwealth. The assessment is intended to provide a framework for long-term public water supply planning, and protection of essential ecosystems. In particular, attention is paid to the role water conservation and water supply protection can play, as critical to managing and sustaining the water resources of the region.

The Water Assets Study is expected to benefit municipalities by:

- Helping communities protect existing water supplies and identify land that may be critical for future supplies
- Raising public awareness of current and future pressures on water resources
- Fostering intra-municipal communication on water resources issues
- Raising local support to conserve water and protect water-supply areas (Zone II's and Zone B's)
- Helping determine whether each community has sufficient supply – both current and future – to meet its long-term demand.

For the Commonwealth, the Water Assets Study is expected to:

- Assess whether the existing water-supply infrastructure in the study area is adequate to meet current and future demands
- Identify critical "hot spots" where demand might exceed sustainable supplies
- Identify potential water-conservation and regional cooperation strategies that would help protect essential ecosystems, while still meeting human water demands.

2. Overview of Acton and its Water Supply

Watershed Location

Acton, with a total area of 20.3 square miles, lies entirely in the SuAsCo (Sudbury-Assabet-Concord) River Watershed. 8% of the town's area, representing 1.5 square miles, is in a high stress portion of the SuAsCo River Watershed. 92% of the town's area, representing 18.7 square miles, is in a medium stress portion of the SuAsCo Watershed. In general terms, the EOEA "stressed watershed" designations refer to broad regions, and reflect the relative quantity of stream flow in these watersheds or sub-watersheds in comparison to other watersheds in the state. [1]

Note that in addition to the "flow-stress" designations described above, which were approved by the Massachusetts Water Resources Commission in 2001, research recently completed by the U.S. Geological Survey (USGS) further assesses water quantity stresses in the Assabet sub-basin of the SuAsCo watershed. The report, which is in press at the time of this writing, will be available through the following reference and may provide additional information bearing on the sustainability of Acton's water resources: *DeSimone, L.A., 2004, Simulation of Ground-Water Flow and Evaluation of Water-Management Alternatives in the Assabet River Basin, Eastern Massachusetts: U.S. Geological Survey, Scientific Investigations Report 2004-5114.*

Growth and Development

Acton is home to about 21,100 people.[2] Approximately 46% of the town's area is developed, and 17% can still be developed.[3] The remaining 37% of the town's area is protected or constrained from development. In terms of area, therefore, the town is 73% built-out. The population went from 17,872 to 20,331 in the decade between 1990 and 2000, a gain of 12%. [4] The population projected for the town under build-out conditions is 22,859. In terms of population, therefore, the town was 89% built-out in 2000. The EOEA buildout also projects an additional 928,543 square feet of commercial/industrial growth. Of course, the rate of growth will probably not remain constant, and various factors including land protection, zoning changes, infill development and/or denser development than what is allowed as-of-right by zoning could push the ultimate build-out population and commercial development numbers up or down.

Water Supply

67% of Acton's area is served by two suppliers: Acton Water Supply District and Concord Water Department. Acton Water Supply District obtains water from 20 groundwater sources in Acton. Concord Water Department obtains water from one surface water source in Acton, and six groundwater sources in Concord. The analysis in this report focuses on the Acton Water Supply District, which is Acton's primary public water supplier.

Regulatory Programs

The public water supply system described above and analyzed below is subject to regulation through the Department of Environmental Protection (DEP) **Drinking Water Program**. This program ensures that

[1] Statistics used to rank basin stress included median annual 7-day low flow, median annual 30-day low flow, and median annual low pulse duration. The more flow-stressed a basin is, the more extensively stream flow may be investigated when establishing new sources of water supply within the region, and the more emphasis will be placed by the regulatory community on conservation for the purposes of restoring flows to the stream system. However, site-by-site analysis would be required to determine the specific impact of a water supply source on nearby stream flow, as well as the extent of flow stress that exists in a localized area.

[2] This figure is a linear interpolation from decennial Census figures.

[3] These figures are from the 2000 Census, photointerpretation of land use in 1999, and protected open space.

[4] U.S. Census Data

the drinking water delivered by public water systems in Massachusetts meets all national and state standards. As the U.S. Environmental Protection Agency's (EPA) Primacy Agent for the federal Safe Drinking Water Act in Massachusetts, the DEP Drinking Water Program regulates water quality monitoring, new source approvals, water supply treatment, distribution protection, and reporting of water quality data.

The Drinking Water Program also coordinates with the Massachusetts Water Resources Commission and the Department of Conservation and Recreation in regulating the *quantity* of water used for drinking water supplies and in requiring water conservation. Much of the regulation of drinking water withdrawals, and the promotion of water conservation, is administered under the **Water Management Act**[5]. As the emphasis of this report is on water supply quantity and capacity, the analysis will consider the specific regulatory constraints imposed on Acton's public water suppliers under the Water Management Act.

Water Supply Analysis

The analysis of Acton's water supply resources that follows uses data from the Department of Environmental Protection (DEP) and data collected in interviews with the one major public water supplier in Acton. Specifically, the report addresses the following questions:

- In meeting average daily demands over the course of a year, how close does Acton's public water supplier come to its annual withdrawal limits as regulated under the Water Management Act (WMA)?
- In meeting demands during the month with the most water use, how close does Acton's public water supplier come to exceeding its pumping capacity and its daily withdrawal limits (Zone II limits for wells and treatment capacity for some surface sources), as regulated under the Water Management Act?
- How well could Acton's projected average daily demands under full buildout conditions be met with existing (and potential future) physical and regulatory supply capacity?
- What, if any, additional significant demand is being placed cumulatively on Acton's water resources by non-public supply systems, such as industry and agriculture, and very small public systems?
- What are the infrastructural or physical limitations facing Acton's public water supply system, and what system improvements are currently proposed?

Following the analysis of Acton's existing supply capacity, the report addresses several questions concerning the potential impact of future land development on Acton's existing supplies and on areas that Acton may hope to develop into groundwater supplies in the future. This analysis may guide communities in land protection strategies around existing or potential future water supplies. A series of maps and accompanying analyses address the following questions, specifically:

- What are the existing land uses within Acton's water-supply protection areas (WSPA's) (Zone II's for wells and Zone B's for surface sources), and how much land within these areas is still "developable"?
- What are the likely future land uses of these "developable" areas, according to existing zoning?
- What areas of Acton are currently far enough away from developed land or otherwise restricted areas to *potentially* meet "new source approval" siting requirements for new groundwater supplies?

[5] M.G.L. c. 21G, with regulations under the Massachusetts Water Resources Management Program, 310 CMR 36.00

- At a broad brush scale, where do these areas appear to coincide with sand and gravel aquifers, and where do they appear to coincide with sensitive environmental areas, *both* of which are likely to impact an area's suitability as a new well site?
- What are the existing land uses within these potential well sites and their associated Zone I protection areas, and what are the likely future land uses in these areas, according to existing zoning laws?

Lastly, the report addresses how well Acton's water supplier currently conforms to water conservation guidelines and performance standards defined by the Massachusetts Water Resources Commission, and what potential water savings could be achieved by meeting certain guidelines and performance standards.

3. Water Assets Analysis for Acton

3.1: Supply and Demand

3.1.1. Average Daily Demand versus Water Management Act (WMA) Regulated Annual Withdrawal Capacity:

In meeting average daily demands over the course of a year, how close does Acton's public water supplier come to its annual withdrawal limits as regulated under the Water Management Act (WMA)?

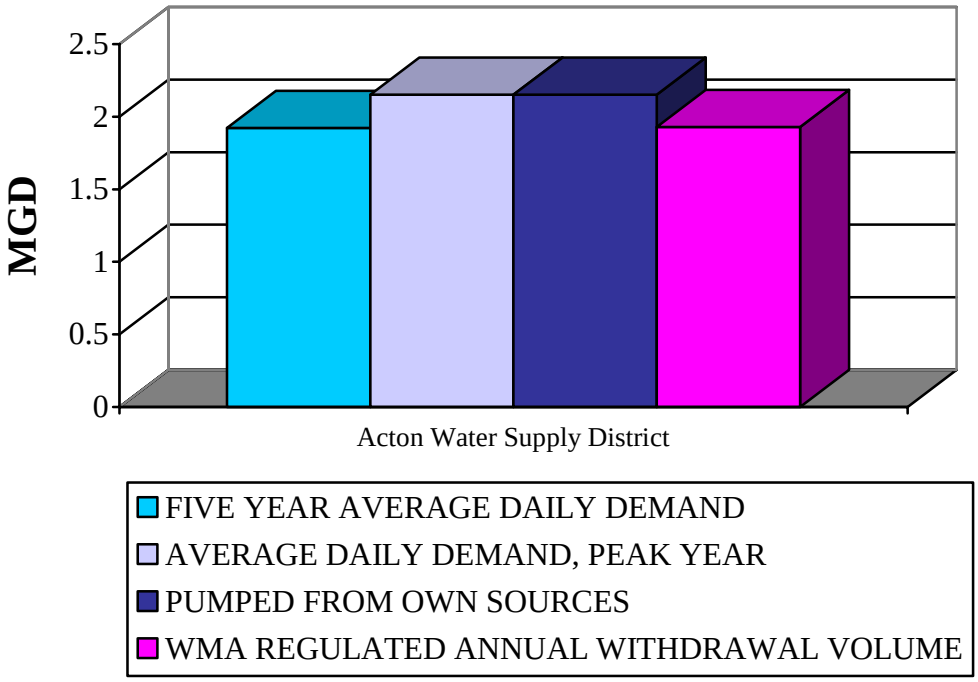
Under the Water Management Act (WMA), each supplier has a total annual withdrawal limit for the system as a whole – that is, all its sources combined. This may be a *registered volume* or a *permitted volume*, or some combination of the two. In 1985, when the WMA was passed, existing suppliers were given the opportunity to "register" their existing use by 1988, and this volume then became allowable under the WMA as the *registered volume*. Suppliers that failed to register by that time, constructed new withdrawal points since the passage of the WMA, or have needed to increase withdrawal volumes above the registered volume, need a permit under the WMA. These volumes are referred to as *permitted volumes*. The total regulated withdrawal volume for a given supply system under the WMA includes any *registered volumes*, plus any additional *permitted volumes* above the registered amount. This total is referred to below as the **WMA regulated annual withdrawal volume**, and is expressed as an average daily demand (millions of gallons per day (mgd)). It represents the total annual capacity of a supply system from the existing regulatory perspective.

In this section, we look at average daily demands over the five-year period from 1998 through 2002, and in the single year during that period in which there was the greatest consumption of water. As some of this demand may have been met through water purchased from other systems, and additional water may have been pumped to sell to other systems, we subtract purchased water and add sold water to total demand to determine actual volume pumped. We compare both the total demand and the total pumped volume to the WMA regulated annual withdrawal volume.

ACTON WATER SUPPLY DISTRICT

In the five years between 1998 and 2002, the Acton Water Supply District customers consumed 3,508.4 million gallons of water, which translates to an average daily demand of 1.92 mgd over the five-year period. During these five years, the greatest annual consumption for the Acton Water Supply District occurred in 2001. In that year, the Acton Water Supply District customers consumed 786 million gallons of water, which translates to an average daily demand of 2.15 mgd, all of which was met by Acton Water Supply District's own sources and no additional water was pumped for sale. This represents 112% of the regulated annual withdrawal volume of 1.93 mgd allowed under the WMA. (See Figure 1)

Figure 1: Average Daily Demand versus Water Management Act (WMA) Regulated Annual Withdrawal Capacity



3.1.2. Average Daily Demand in Peak Month versus DEP Approved Daily Volumes and Pumping Capacity

In meeting demands during the month with the most water use, how close does Acton's public water supplier come to exceeding its pumping capacity and its daily withdrawal limits (Zone II limits for wells and treatment capacity for some surface sources), as regulated under the Water Management Act?

In addition to comparing demand versus regulatory capacity on an annual basis, communities must also address whether they are able to meet sharp spikes in demand over short periods of time. Through DEP's Drinking Water Program, including regulation under the WMA, most groundwater sources have individual daily volume limits. These are based on DEP's determination of the volume of water that can safely be extracted from a given source during a single day without depleting the aquifer or resource, without imperiling drinking water quality, or in some cases, without imperiling sensitive environmental resources. These are referred to as *Zone II limits or DEP Approved Daily Volumes* and are expressed in millions of gallons per day (mgd). DEP has historically not assigned a *maximum* daily limit for surface water source withdrawals, but has instead identified the *firm yield* of the source(s), which is an *annual average* daily limit. However, some permits for surface water source withdrawals have identified the treatment plant capacity as the Approved Daily Volume and this serves as a daily regulatory limit. If all sources in a system have DEP Approved Daily Volumes, these volumes by source are summed to provide the **total DEP Approved Daily Volume** by system, which represents the daily capacity of a supply system from the existing regulatory perspective.

Additionally, suppliers may feel that they have limits to the volumes they are able to safely pump during a single day, due to treatment capacity, pumping infrastructure, and/or operational limitations which may not be sufficiently reflected in the DEP Approved Daily Volume. Volumes intended to reflect these

limits are referred to collectively as the **physical pumping capacity**. *This capacity relies on several assumptions and may vary from year to year, so communities may find it useful to tailor the analysis below to look at physical capacity from a variety of perspectives, according to different sets of assumptions and circumstances. Additionally, this number does not reflect any potential storage in a system, which may be able to supplement yield on a very short-term basis.*

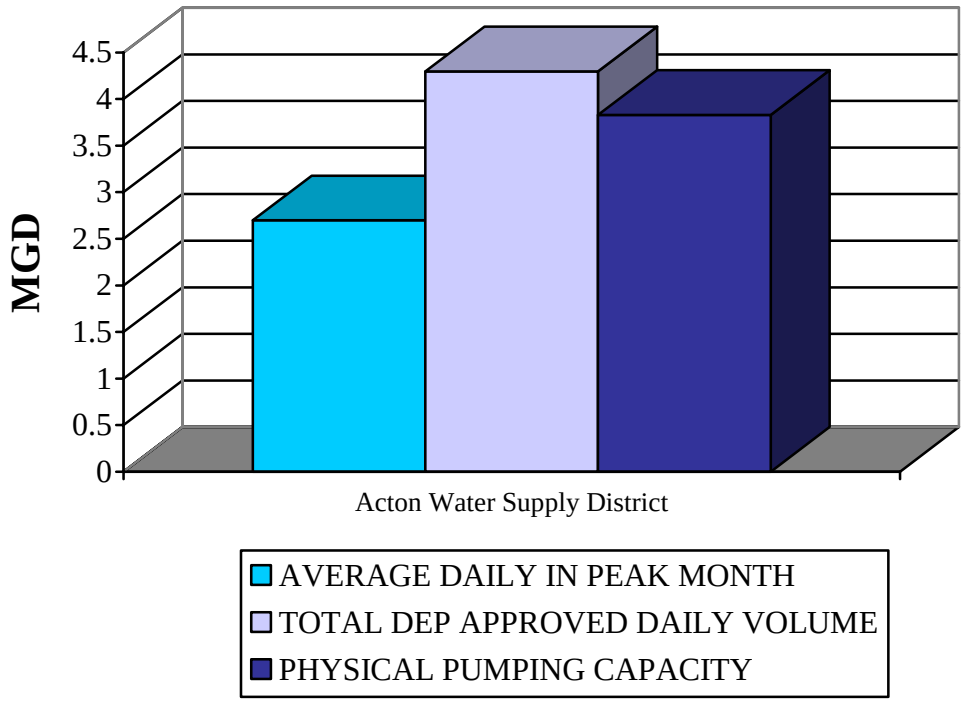
In this section, we look at daily demands during the single month of greatest water consumption between 1998 and 2002. From a planning perspective, daily use over the course of a peak month, rather than during a single peak day, better reflects sustained demand over short periods of time and avoids reacting to distorted demands that result from isolated events, such as large fires. We compare this daily demand in the peak month to the total DEP Approved Daily Volume and the physical pumping capacity. Note, however, that the physical pumping capacity may not be able to be sustained over a full month.

ACTON WATER SUPPLY DISTRICT

In the five years between 1998 and 2002, the Acton Water Supply District's peak month consumption occurred in 1999. The average daily demand in that peak month was 2.70 mgd, which is 70% of the total physical pumping capacity of 3.83 mgd available from the existing Acton Water Supply District supplies and 63% of the total DEP Approved Daily Volumes of 4.30 mgd for all sources. (See Figure 2)

Note that while the daily maximum volumes (Zone II's) were summed by source or group of sources to produce the Total DEP Approved Daily Volume shown on the chart below, the actual regulatory daily limit for this system is less than the volume shown due to a special condition in the Water Management Act Permit, which restricts the Conant II Wellfield to a lower volume than this wellfield's Zone II volume. (*See below)*

Figure 2: Average Daily Demand in Peak Month versus DEP Approved Daily Volumes and Pumping Capacity



Water Management Act Conditions

In addition to regulating total annual withdrawal volumes and daily maximum volumes, under the WMA DEP may also place special restrictions or conditions on specific sources, groups of sources, or whole systems based on site-specific environmental concerns. In some cases these conditions place further regulatory limits on withdrawal volumes, beyond the baseline WMA regulated annual withdrawal volume referenced above, particularly during specified times of year or when environmental conditions drop below a certain threshold – for example, when nearby stream flows drop below volumes determined to be necessary to sustain critical habitat. From a planning perspective, these special conditions under the WMA may be an additional important consideration for a supplier, especially in planning to meet peak demands, as peak demands most frequently coincide with the dry summer season, when special conditions are most likely to come into effect.

The following summarizes the WMA conditions placed on the operation of the Acton Water Supply District water-supply source(s):

Water Supplier:	Number of Sources with WMA Conditions
ACTON WATER SUPPLY DISTRICT	10

The Conant II Wellfield #1-5 (14G-18G) is allowed to pump up to 216,000 gpd; the Kennedy Wells (10G - 13G) are allowed to pump up to 540,000 gpd; and the Marshall Wellfield (09G) can pump no more than 300,000 gpd.

According to the Acton Water District, the Scribner Wells (20G to 23G) are allowed to operate only one well at a time.

Wetland monitoring is required at the Conant II Wellfield (14G-18G).

3.1.3. EOEA Projected Buildout Demand versus WMA Regulated Annual Withdrawal Capacity and DEP Approved Daily Volumes

How well could Acton's projected average daily demands under full buildout conditions be met with existing regulatory supply capacity?

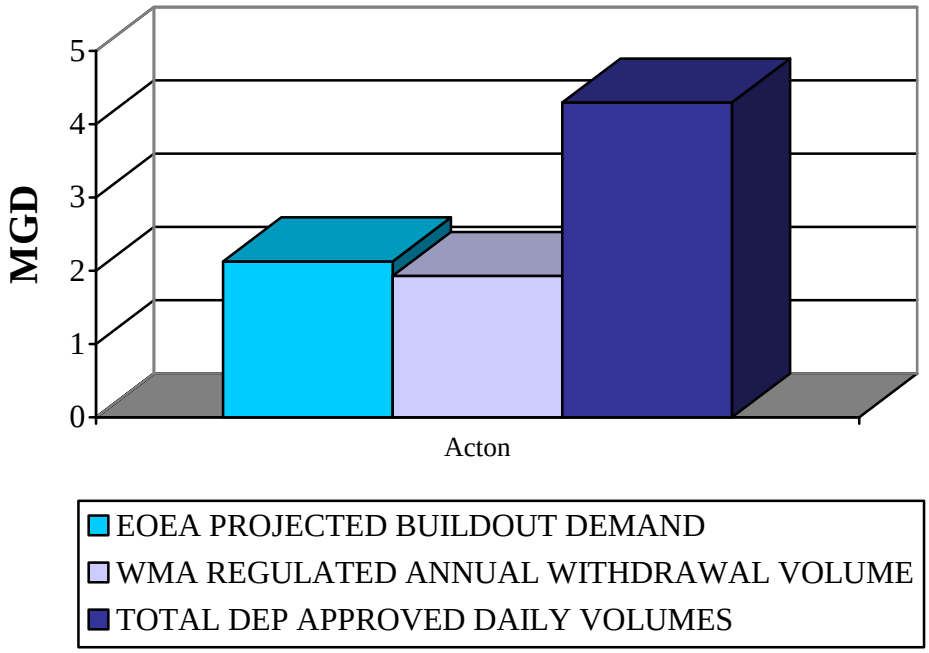
EOEA's town-by-town Buildout Analyses, completed in 2001, identified the developable land remaining in each community, as defined by existing zoning, and some of the infrastructure and services that would be needed to support potential development. One analysis estimated the additional water demand associated with "full buildout conditions" for each community – that is, the condition of having all land fully developed according to existing zoning. This demand is referred to below as **projected buildout demand**. As described above, these conditions are neither inevitable, nor necessarily desirable, but they represent an extreme-case scenario, with respect to pressure on resources.

In this section, we look at projected buildout demand for the whole town of Acton and compare this demand to the WMA regulated annual withdrawal Volumes and the total DEP Approved Daily Volumes for the water supply system in Acton. Note that the buildout demand discussed below assumes that at buildout, all water users in Acton – that is, all homes, all industry, all businesses – would be connected to public water supply. Due to physical, financial, political or other reasons, this condition may never come to pass. Some water users currently supported by private wells will remain so, while others may convert to public water supply. Therefore, the buildout demand represents a conservative figure for planning purposes.

Town of Acton Buildout Water Demand

The EOEA projected buildout demand for Acton, as a daily average, is 2.13 mgd. This represents 110% of the total WMA regulated annual withdrawal volumes for the Acton Water Supply District (1.93 mgd) and 50% of the total DEP Approved Daily Volumes for the system (4.30 mgd). Again, note that the effective daily regulatory limit for this system is somewhat less than the volume shown, due to a special condition in the Water Management Act permit, which is described above. *(See Figure 3)*

Figure 3: EOEA Projected Buildout Demand versus WMA Regulated Annual Withdrawal Capacity and DEP Approved Daily Volumes



3.1.4. EOEA Projected Buildout Demand versus Possible Future Capacity

How well could Acton's projected average daily demands under full buildout conditions be met with potential future physical supply capacity?

Some communities have already identified potential new sources of water supply. These sources may add supply capacity, or – in cases where regulatory constraints would prevent increasing volumes system wide – they may simply increase operation flexibility. In the latter case, the new source could potentially still effectively bolster supply capacity, by providing redundancy for sources that suffer operational failures, water quality contamination, or limitations triggered by source-specific environmental concerns.

In this section, we report any potential new sources currently under development or sufficiently far along in investigation that they may factor into planning. Note that any potential yields described below are estimates that may not reflect actual volumes attainable if the source were to be developed.

ACTON WATER SUPPLY DISTRICT

The Acton Water Supply District has identified no potential well sites.

3.1.5. MINOR PUBLIC WATER SUPPLIES AND NON-COMMUNITY WATER SUPPLIES

What, if any, additional significant demand is being placed cumulatively on Acton's water resources by non-public supply systems, such as industry and agriculture, and small public systems?

Minor public water supplies (PWS) are defined, for the purposes of this study, as those whose demands do not meet the Water Management Act reporting threshold of 100,000 gallons per day (gpd). Non-community supplies that meet the Water Management Act threshold include systems permitted individually for uses such as agriculture, industry, golf courses, etc. Table 1 shows the total annual demand in 2002 from each source, in million gallons (MG), for both the minor PWS's and non-community systems in Acton.

While these systems do not currently rely on the major public water supplier analyzed above to meet their demand, they may be withdrawing water from some of the same hydrologic resources. These systems are not analyzed in depth for the purposes of this study, but the tabulation of their cumulative annual withdrawal volumes is meant to provide communities with a general sense of additional demand being placed on the water resources of Acton. Note that some of these supply systems may operate seasonally, so their total annual demand may not be spread evenly throughout the year.

Table 1: 2002 Demands of Minor Public Water Suppliers and Large Non-Community Water Users

SourceID	2002 Annual Total, MG	Supplier Name
2002002-01G	0.27	Planet Gymnastics/Four Seasons
2002005-01G	0.00	Wampus Avenue Apartments
2002007-01G	0.00	Woodvale Condominium
2002009-01G	0.25	Richmond House Condominium
2002009-02G	0.25	Richmond House Condominium
2002010-01G	0.95	Pine Hill Condominium
2002011-01G	0.00	Deck House Inc
2002014-01G	0.00	Strawberry Hill Apartments
2002014-02G	0.00	Strawberry Hill Apartments
2002017-01G	0.08	Acton Indoor Tennis Association
Not Applicable	2.76	Idylwilde Farm Inc.
Not Applicable	36.72	Assabet Sand & Gravel Co Inc.
Total:	41.27	

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3.1.6. WATER SYSTEM LIMITATIONS AND PLANNED IMPROVEMENTS

What are the infrastructural or physical limitations facing Acton's public water supply system, and what system improvements are currently proposed?

Table 2:Water-System Limitations

ACTON WATER SUPPLY DISTRICT

Component	Limitation
Supply:	Low supply in summer months requires purchase
Storage:	None Reported
Distribution:	Complaints of low pressure due to elevation change
Pressure Zones:	None Reported
Inter-municipal Connections:	None Reported
Water Quality:	Lead and Copper
DEP Permit	River level restrictions
Other:	None Reported

Table 3: Water System Planned Improvements

ACTON WATER SUPPLY DISTRICT

Proposed Improvement	Description
New Well:	New source investigations underway
New Tank:	None Reported
Water Main:	Extension to improve distribution
Booster Station:	None Reported
Inter-municipal Connections:	None Reported
Treatment Plant:	None Reported
Other:	None Reported

3.2: Land Use Around Existing and Potential Water Supplies

Note the following analysis refers to five maps, which were produced and given to each community in large format for planning and presentation purposes. Duplicates of these maps are also included in this report as an appendix, in small format. For best image clarity, refer to the presentation size maps.

3.2.1. Current Land Use in Existing Water-Supply Protection Areas (Map 1)

What are the existing land uses within Acton's WSPA's (Zone II's for wells and Zone B's for surface sources), and how much land within these areas is still "developable"?

Surface and groundwater sources for drinking water may be affected by adjacent or nearby land use activities, which can threaten drinking water quality. The Department of Environmental Protection (DEP) uses hydrogeologic modeling to determine areas of potential impact to drinking water sources, to help communities and regulators protect such sources. For the purposes of analysis in this report, we focus on two such designated areas for existing public water supplies, Zone II's for groundwater sources and Zone B's for surface sources.

The Code of Massachusetts Regulations (CMR) defines a Zone II as land overlaying that area of an aquifer which contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated (180 days of pumping at safe yield, with no recharge from precipitation)[1]. A Zone B represents the land area within one-half mile of the upper boundary of the bank of the surface water source, or the edge of its watershed, whichever is less, but must automatically include all land area within a 400 ft lateral distance from the upper boundary of the surface water source[2]. This report refers to both Zone II's and Zone B's as **Water-Supply Protection Areas (WSPA)**.

The goal of Map 1 is to identify land within existing WSPA's that is currently *undeveloped* and at risk of becoming developed, as well as to display the land uses of the areas already *developed* within these WSPA's. For the areas already developed, communities can regulate activities that might pose threats to drinking water through general town by-laws and Board of Health regulations. Through its Source Water Assessment Program (SWAP), DEP has been working with communities across Massachusetts to identify specific threats to drinking water associated with the developed land within their WSPA's and to implement protections against such threats. As described in the next section, communities can use zoning by-laws or other measures to protect the *undeveloped* areas within WSPA's from *future* activities that may pose a threat to drinking water. In Acton, existing WSPA's constitute 2,050 acres, or 16% of the town; 10% of the land within these WSPA's is "developable," based on existing town zoning. Note that some of the WSPA territory in Acton protects supplies that serve communities outside Acton. Cooperation between Acton and those served by such sources may be helpful in ensuring their adequate protection. *(See Map 1)*

3.2.2. Potential Land Use Development in Existing Water-Supply Protection Areas (Map 2)

What are the likely future land uses of these "developable" areas, according to existing zoning laws?

[1] 310 CMR 22.02
[2] 310 CMR 22.00

The goal of Map 2 is to depict potential future land use in the currently undeveloped areas of WSPA's, based on existing zoning[3], including development that might not be compatible with existing water supplies. Communities may protect against incompatible future uses or activities through zoning by-laws, ordinances, and health regulations. Communities may also be able to restrict land from becoming developed, directly, through such means as land purchases or conservation restrictions for the purpose of water supply protection. Where Acton currently has water supply overlay protection districts in place, which use zoning by-laws to restrict activities most threatening to water supply sources, such districts are shown on Map 2. Table 4 shows the breakdown of potential future land uses within the currently undeveloped portions of WSPA's in Acton *(See Map 2)*:

Table 4: Potential Future Land Uses in Undeveloped Portions of Existing WSPA's

Land Use	Total Acres	Percent of all WSPAs within Town Boundary
Potential Industrial	35	2%
Potential Commercial	3	<1%
Potential Mixed	0	0%
Potential Residential	162	8%
Potential Agricultural/Natural	1	<1%
Currently Developed	617	30%
Protected or Otherwise Constrained Land*	1,233	60%
Other	0	0%

* Certain categories of protected or constrained land may contain existing development.

3.2.3. POTENTIAL FUTURE WELL SITES (MAP 3)

What areas of Acton are currently far enough away from developed land or otherwise restricted areas to *potentially* meet "new source approval" siting requirements for new groundwater supplies? – NOTE: These areas are not evaluated in this report for their potential to yield water, nor have they been individually assessed for conformance with all New Source Approval siting considerations.

The goal of Map 3 is to identify land that might warrant protection, as potential future groundwater supplies[4]. The map depicts areas that might be suitable for future groundwater supplies based strictly on relevant land use criteria. Public water suppliers cannot place new well supplies in areas that are currently developed (built on), nor can they place new wells in wetlands, under most circumstances. In addition, under current policy and practice, public water suppliers cannot – except under rare circumstances – place new wells in state or federal parks, on privately-owned protected open space, or on land that is under the jurisdiction of a municipal conservation commission. Additionally, Tier 1A and 1B Chapter 21E sites, which represent known oil and hazardous material contamination sites, are determined for the purposes of this project to be unsuitable for water supply development[5]. These restricted land uses

[3] Interpreted through the EOEA Buildout Analyses

[4] It was beyond the scope of this project to investigate siting requirements for potential new surface water sources, and the environmental, economic, and regulatory complexities around new reservoir development make the possibility of such future sources very unlikely for most communities.

[5] The GIS dataset of Oil and Hazardous Material Sites, also called Tier Classified Chapter 21E sites, contains only points; the location of these points is the approximate center of the site, the center of a building on the property where the release occurred, the source of contamination, or the location of an on-site monitoring well. The Tier classification scoring is based on factors outlined in the Massachusetts Contingency Plan, including the site's

were cumulatively subtracted from a map of the whole town. *(See series of inset maps immediately below the large frame, on Map 3)* In addition, because current DEP policy requires that a water supplier own or control all land within 400 feet (Zone I) around new public water supply wells, all land less than 400 feet from permanently protected open space and currently developed land is also excluded for consideration as a new well site. Finally, land less than 100 feet from wetlands is excluded, to reflect conservation commission jurisdiction under the Wetlands Protection Act.

The area remaining after applying the above cumulative restrictions is displayed in gold on an enhanced photo image ("orthophoto") of the town. *(See Map 3)* These gold-colored areas represent land that is most likely to be available for water supply development, based solely on land use and land cover new source approval siting requirements. Contact DEP for a full description of the New Source Approval process. A paler 400-foot yellow buffer around these potential well areas shows the potential Zone I WSPA's, associated with the potential well areas. Sand and gravel aquifers are also displayed on this map, to help identify where the above potential well areas occur above aquifer material. However, the reader is advised that the USGS aquifer mapping was intended to show only glacially derived stratified-drift aquifers (sand-and-gravel aquifers). Furthermore, the mapping was done coarsely and therefore does not necessarily represent all sand-and-gravel aquifer areas that would be suitable for public water supply wells, nor are the boundaries of the aquifer areas exact. Lastly, bedrock aquifers, which may exist in Acton, are not shown. ***For these reasons, Map 3 is not intended to direct water suppliers to where to develop new supplies. Site-by-site hydrogeologic analysis by trained professionals and assessment for full conformance with DEP New Source Approval Siting requirements is always required before developing new wells.***

Based strictly on the land use criteria, 523 acres, or 4% of the land area in Acton could be suitable for future well sites.

3.2.4. Potential Future Well Sites and Areas of Ecological Concern (Map 3 insets)

At a broad-brush scale, where do potential future supply areas appear to coincide with sensitive environmental areas, which are likely to impact an area's suitability as a new well site?

Inset maps on Map 3 depict core terrestrial and aquatic habitat areas identified through the Natural Heritage and Endangered Species Program, as well as wetlands and riparian corridors. These areas of ecological concern may affect the suitability of a given area for water supply development, based both on the value of ecologically significant areas to the communities within Acton and on the value of such resources to regulators. For example, the development of a well adjacent to a stream supporting core aquatic habitat may deplete the stream of the necessary flows to sustain threatened species. Or, alternatively, the development of a well in an area of core terrestrial habitat could ensure the ongoing preservation of the area as viable habitat. ***Similar to the site-by-site analysis required to determine the hydrogeologic suitability of an area for water supply development, site-by-site analysis by trained professionals is necessary to determine the ecological suitability of an area for water supply development.***

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complexity, the type of contamination, and the potential for human or environmental exposure to the contamination. In addition, some sites are automatically given a Tier I classification if they pose an imminent hazard or affect public water supplies. The Water Assets project will use sites classified as Tier IA or IB, which have a score equal to or greater than 450. These sites are buffered 400 feet to better represent the geographic footprint of the site, although contamination plumes may extend beyond this area and should be considered individually, where extent is known.

Based on the Map 3 analysis, areas for potential future well sites and areas of ecological concern coincide to a moderate degree. *(See Map 3 insets)*

Table 5: Potential Future Well Sites and Sensitive Environments

Potential Future Well Sites Coinciding with:	**Total Acres**	**Percent of Total Area (# acres) Potentially Suitable for Future Well Sites***
Terrestrial Core Habitat	3	0.5%
Aquatic Core Habitat	0	0%
Wetlands and Riparian Corridors	89	16%

* Areas of ecological concern may overlap, so percents are not necessarily additive.

3.2.5. Potential Future Zone I Water-Supply Protection Areas (Map 4)

What are the existing land uses within these potential well sites and their associated Zone I protection areas?

As mentioned above, the lighter yellow shading around the gold potential well sites on Map 3 represent the area around the potential well sites that would constitute the associated Zone I WSPA's for these wells.

Map 4 depicts the current land use within these potential Zone I WSPA's. Potential Zone I areas constitute 2,248 acres, or 17% of the land area in Acton.

3.2.6. Future Land Use in Potential Zone I Water-Supply Protection Areas (Map 5)

What are the likely future land uses within these potential well sites and their associated Zone I protection areas, according to existing zoning laws?

Map 5 depicts potential future land uses in the potential Zone I WSPA's, based on zoning. As with undeveloped land within existing WSPA's (Zone II's and Zone B's), if a community determines that any of the potential well sites is suitable for water supply development, they may use zoning by-laws, ordinances, and health regulations to protect against future development and activities in these areas that are incompatible with a drinking water source. As some of these approaches may prove logistically or legally difficult prior to the development of the site as a drinking water source and prior to the delineation of an actual Zone II, communities may also be able to restrict land from becoming developed, directly, through land purchases or conservation restrictions, for the purpose of water supply protection.

Note that for planning purposes, communities may find it useful to look at existing and zoned land use within a wider area around the potential future well site, as such adjacent land may impact the drinking water source. For example, in the absence of a developed Zone II, communities could actively engage in land use planning within a ½ mile radius around the future wellhead – the equivalent of an "interim wellhead protection area" – for sites determined through further investigation to be suitable for water supply development.

Table 6 shows a breakdown of potential future land uses in potential future Zone I areas. ***The development of potential water supply areas into many of the zoned land uses below would eliminate their potential as supply areas. In order to retain the viability of these sites for potential future water supply development, proactive planning may be required.***

Table 6: Potential Land Use in Potential Future Zone I WSPA's

Potential Land Use	Total Acres	Percent of all Potential Future Zone I's
Industrial	87	4%
Commercial	1	<1%
Mixed	0	0%
Residential	978	43%
Agricultural/Natural Land	1	<1%
Protected or Otherwise Constrained Land*	1,138	51%
Other	44	2%

* As most categories of permanently protected open space were used as restrictions in determining potential Zone I areas, these permanently protected lands appearing within the potential Zone I areas displayed on Map 5 are most likely municipal water department land or land owned by the Army Corps of Engineers.

3.3: Demand Management Strategies

In almost all cases, the most reliable and cost-effective means to increase the capacity of water supplies is to retain more water in the aquifers and reservoirs through reduced demand. In this sense, water saved through conservation and reduced demand can be thought of as a future supply.

In 1992, the Massachusetts Water Resources Commission (MWRC) published "Water Conservation Standards" designed for all Massachusetts communities with public water supply systems. These standards address: public education; leak detection and repair; metering and accounting for distributed water; water pricing; demand reduction strategies within the residential, municipal, and industrial/commercial/institutional sectors; and long-range demand management planning. Lawn and Landscape Conservation Standards were added in 2002, as an amendment to the Standards. For community supply systems subject to permitting under the Water Management Act (WMA), the Water Conservation Standards are incorporated into the WMA permit.

In 1999, the MWRC adopted Interbasin Transfer Act (ITA) Performance Standards, which communities must meet in order to be approved by the MWRC for an "interbasin transfer" – the intermunicipal transport of drinking water or wastewater across watershed boundaries, at volumes meeting thresholds for "significance." The ITA Performance Standards for drinking water transfers address similar demand management strategies as the 1992 Water Conservation Standards, but include some additional measures and some more stringent targets.

While not all communities are subject to the Water Conservation Standards or ITA Performance Standards from a regulatory perspective, both sets of standards can be helpful guidelines to communities in setting demand management targets to maximize the efficiency of existing supplies.

Table 7 includes targets established either under the 1992 Conservation Standards or the 1999 ITA Performance Standards for Water Supplies. Not all targets within these sets of guidelines are included in the analysis below, but the table is designed to provide a few useful metrics for measuring existing demand management performance within Acton's water supply systems and identifying areas where more concerted conservation and demand management strategies could lessen the strain on existing supplies. For a more complete set of conservation recommendations and guidelines, see Table 8 "Standards and Recommendations Selected from the Water Resources Commission's 1992 Conservation Standards for the Commonwealth of Massachusetts" and the "Summary of Lawn and Landscape Standards and Recommendations," both at the end of this section.

Table 7: Water Conservation Status in 2002/2003
ACTON WATER SUPPLY DISTRICT

Criterion	Conservation Standard	Current (2002/2003) Public Water Supplier
Residential Water Usage	65 gpd/capita*	75 gpd/capita**
Unaccounted-for Water	10%*	20%
Municipal Metering of Public Buildings	100%	100%
Leak Detection Survey frequency/last completed	Every 2 yrs	2003
Water Audit frequency/last completed	Every 3-5 yrs	2003
Municipal Bldgs fitted with Water Saving Devices	All	100%
Water Conservation Education Plan	Yes	Yes
Written Drought Plan	Yes	Yes
Customer Metering	100%	100%

*Standards designated with (*) represent Interbasin Transfer Act Performance Standards that are additions to, or more stringent than, the 1992 Conservation Standards. All others are identical in the two sets of standards.
**-GPCD based on PWS Data - Average (Weighted) Population Served

ACTON WATER SUPPLY DISTRICT
As shown in the table above, the Acton Water Supply District reported 20% unaccounted-for water in 2002. This does not meet the goal for unaccounted-for water of 10%. A reduction in the unaccounted-for water from 20% in 2002 to the goal of 10% represents 79 million gallons per year, or 215,207 gallons per day.

Residential use represents 67% of total demand. A reduction in the per capita consumption from the existing 75 gallons per capita per day (gpcd) to the goal of 65 gpcd would have reduced the demand by 70 million gallons in 2002 or 193,050 gallons per day on average.

Both commercial and industrial/agricultural use are reported as representing 0% of demand.

Older water meters tend to under-record, resulting in the user not paying for the full cost of the water. Therefore, strict enforcement of Acton's meter replacement plan may make users more accountable for their water and reduce overall demand.

Water Resources Commission Standards and Recommendations for Water Conservation

Table 8 provides an overview of the Massachusetts Water Resouces Commission's (MWRC) 1992 Water Conservation Standards followed by the Lawn and Landscape Conservation Standards that were added as an amendment in 2002. These standards and recommendations may be helpful to communities in determining how additional conservation and demand management measures may help further reduce pressures on existing supplies. For the complete guidance, please see the complete documents: *Water Conservation Standards for the Commonwealth of Massachusetts*, and *Guide to Lawn and Landscape Water Conservation*, available on the Water Resources Commission website, at http://www.state.ma.us/envir/mwrc/default.htm.

TABLE 8: STANDARDS AND RECOMMENDATIONS SELECTED FROM MWRC'S 1992 WATER CONSERVATION STANDARDS FOR THE COMMONWEALTH OF MASSACHUSETTS

Category	Standard	Recommendations
Public Education	Development of an education plan with the following emphases: 1) Explain all costs involved in providing water. 2) Show how conservation will provide long-term savings. 3) Highlight environmental benefits of reducing water demands.	Choose appropriate combination of programs to: • target the largest users early • use schools and media to involve children • help customers track water use • advertise successes/(failures) • utilize conservation information centers • have informational speakers at community organizations • use public service announcements and local media to educate on supply sources and status • promote conservation devices and water-conserving landscape practices • use civic and professional organization resources and hold special events and educational contests
Leak Detection and Repair	(1) A full leak detection survey of the distribution system should be completed every two years. (2) Leak detection and repair should be recognized as expenses of the water supply system and included in a full-cost pricing structure.	(1) Because leak detection requires substantial skill, regularly trained, in-house teams are recommended; communities should investigate the advantages of sharing leak detection equipment and personnel to reduce costs. (2) There should be consideration given to assuring the penalty for water theft.
Metering	(1) Each public water supplier should develop a program to implement 100% metering of all public sector and private users with meters. (2) The metering program should include regular meter maintenance. (3) The metering program should include regular meter reading of all public sector users and regular accounting of their use. (4) Meter reading and billing for domestic accounts should be done quarterly. (5) Master meters should be calibrated annually.	(1) Meter reading, billing, and meter maintenance for the largest users should be done more frequently than domestic accounts. (2) Exterior meter reading devices should be installed. (3) Meter reading and billing frequency would be most effective if done on a monthly basis. (4) Suppliers should consider replacing meters every 10 – 15 years.
Pricing	(1) Water pricing structure should include the full-cost of operating the water supply system. (2) Water supply system operations should be fully funded by water supply system revenues. (3) Each water supplier should regularly evaluate existing rate structures, including any peak demand and seasonal pricing components. In addition, the water supplier should consider all possible pricing options, such as increasing block rates. (4) Water and sewer rates, where applicable, should be billed so as to inform customers of their actual use and cost of each.	(1) Each water supplier should establish an enterprise account for water. (2) Water suppliers should consider adopting increased seasonal rates to moderated peak demands and/or to protect/maintain supply levels.

STANDARDS AND RECOMMENDATIONS SELECTED FROM THE MWRC'S 1992 WATER CONSERVATION STANDARDS FOR THE COMMONWEALTH OF MASSACHUSETTS (Cont.)

Category	Standard	Recommendations
Residential Water Use	(1) Water suppliers, in cooperation with manufacturers and professional organizations, should make available to residential users at least the following water saving devices: low-flow shower heads; faucet aerators, toilet displacement devices and/or low-flow toilets, toilet leak detection kits; and educational literature about installation and water conservation savings (in gallons and dollars), including outdoor watering and xeriscaping. (2) The state plumbing code should be strictly and consistently enforced at the local level.	(1) In order to ensure proper installation and greater payoff of retrofit devices, professional installation is recommended. (2) Statewide efficiency standards should be legislatively set for appliances. (3) The decision to use gray water, small irrigation wells, and rain water from roof catchment systems should be consistent with existing state laws and should be made at the local and regional levels. Xeriscaping or use of native vegetation should be encouraged. (4) Water audits should be made available to residential customers.
Public Sector Water Use	(1) Government facilities, including school departments and hospitals should account their full use of water, based on full metering of public buildings, parks and other facilities. (2) Public buildings should be built or retrofitted with equipment that reduces water use. (3) Water use by contractors using fire hydrants for pipe flushing and construction should be metered and they should be charged, including service fees. (4) Irrigation of municipal property should be sensitive to soil moisture. (5) Strictly apply plumbing codes and incorporate other conservation measures in new and renovated buildings.	(1) Encourage manufacturers to provide water saving devices to municipalities for demonstration projects for free or at reduced cost; master water temperature regulation should be considered for public buildings (2) Encourage xeriscaping or use of native vegetation to reduce outdoor watering; emphasize the advantages of drip irrigation over broadcast watering, and promote these measures in educational campaigns. (3) Investigate the potential uses of non-potable water supplies and small irrigation wells for landscaping, street cleaning and building washing, within public health considerations, existing connection programs, and plumbing board decisions.
Industrial, Commercial, and Institutional Water Use	(1) All industrial, commercial, and institutional water users should develop and implement a written water policy. (2) All industrial and commercial water users should carry out a water audit. (3) In new and renovated buildings, comply with plumbing codes and use the best available technologies for water conservation.	(1) All industrial, commercial, and institutional users should install/retrofit water saving sanitary devices. (2) Industrial and commercial users should work with code officials, standards committees, state programs, manufacturers, and legislators to promote water conservation. (3) Develop a system to reward employees for water savings suggestions.
Water Supply System Management	(1) Municipalities should develop regulations, by-laws or ordinances that can be imposed in the event of water supply emergency. (2) Water suppliers should develop strategies to reduce daily and seasonal peak demands and should develop contingency plans for seasonal shortages. (3) Water suppliers should carry out water supply system audits every 3 to 5 years. (4) Water suppliers should develop a plan to identify all uses of water and identify how to recover unaccounted-for water. (5) Water suppliers should investigate and develop plans for interconnections with other systems for emergency supplies.	(1) Communities should develop a local water resources management plan. (2) Water suppliers should keep local officials regularly informed of water consumption and supply availability. (3) Communities should adopt municipal by-laws requiring commercial, industrial and institutional water users to carry out regular water audits.

SUMMARY OF THE LAWN AND LANDSCAPE WATER CONSERVATION ADDENDUM - added to the Water Conservation Standards for the Commonwealth of Massachusetts by MWRC as of October 10, 2002

Standards

1. Communities and public and private water suppliers should develop drought management plans that identify water supply and environmental indicators to serve as drought stage triggers and that outline a set of increasingly stringent water use restrictions that are designed to protect public health and the environment and that can be implemented through bylaw, ordinance or regulation.

2. Communities and public and private water suppliers should implement a water use restriction bylaw, ordinance or regulation that provides the community or water supplier with the ability to implement mandatory water use restrictions. These restrictions should be tied to environmental and water supply indicators as outlined in a drought management plan.

   [NOTE: As used here "drought management plans" are not restricted to periods of officially designated drought - water shortages and environmental impacts from water withdrawals are not only the result of droughts but may occur on a regular basis during dry months. The term drought is used to reflect situations where the water shortage or environmental impact is the result of dry conditions or other natural stresses. Water shortages refer to system capacity issues, which may be the result of dry conditions or other factors such as system problems or large uses such as fighting a large fire. In either case, drought plans need to establish the levels of dry, drought, or low water supply conditions that are likely to lead to a water supply shortage or emergency. Communities that have insufficient water supplies may implement parts of their plan during non-drought years to help reduce peak demands that threaten the water supply system or the environment.]

Recommendations

The Guide to Lawn and Landscape Water Conservation, approved by the Water Resources Commission in 2002, contains detailed recommendations and suggestions for a wide range of potential users. Those most relevant to the analysis in this report are briefly summarized here. Please refer to the Guide for more detailed discussion of each recommendation.

Recommendations for municipalities and other public water suppliers

- Raise public awareness
- Develop a bylaw requiring water conservation equipment for automatic irrigation systems
- Develop a bylaw minimizing high water use landscape areas
- Implement conservation rate structures
- Adopt and implement a leak detection and repair program
- Promote alternatives to traditional lawn watering and to automatic irrigation systems.
- Promote automatic irrigation system audits
- Develop bylaws related to the use of automatic irrigation systems.
- Develop bylaws related to land clearing and lawn size

Recommendations for Property Owners and Managers

- Minimize lawn size.
- Choose drought tolerant native plant species
- Water only when necessary
- Abide by water restrictions and other conservation measures implemented by your municipality or water supplier
- Ensure adequate depth and type of soil
- Do not water lawns and do not install automatic lawn irrigation systems in water short communities
- Install water conservation equipment and properly maintain automatic irrigation systems
- Collect and reuse water for landscaping needs
- Mow lawns at the highest recommended height

Recommendations for property owners and managers responsible for recreational fields

- Design facilities to minimize water use
- Maintain facilities to minimize water use
- Use automatic irrigation systems to reduce water use
- Use reused water where possible
- Reduce water use during dry and drought conditions
- Raise public awareness.

Appendix A

Maps
(see back pocket)

Appendix B

Federal and State Funding Programs for Water Supply Improvements

Two Federal and State Funding Programs

The following summarizes two state and federal funding programs available to water suppliers for water system improvements.

Federal Funding Programs

Program:	Rural Water and Waste Disposal Grants and Loans
Sponsor:	U.S. Department of Agriculture (USDA), Rural Development (RD)
Type:	Guaranteed (pay back up to 40 years) loans and grants on a federal fiscal year (FY) basis (October 1 –September 30). As of the current federal quarter (FY04 – 2nd Quarter), loan rates can range from 4.5 – 4.625% and grants can be for up to 75% (35-40% usual maximum) of eligible project costs (no planning).
Competition:	Loans – moderate; extremely high for grant funds.
Eligible Projects:	Those in communities (and/or special purpose districts) with a population under 10,000 and with a median household income under $43,000 based on 1990 U.S. Census Data that provide new or upgraded water and waste disposal facilities/services for rural residents and businesses, especially those that alleviate public health issues.
Eligible Costs:	Design and construction phase project costs.
Ease of Application Filing:	User-friendly agency with relatively simple application requirements. Submittals do require technical and financial expertise. Not a regulatory agency.
Program Contacts:	Diane King, Rural Development Specialist USDA/RD Area Office Holden, MA 508-829-4477 ext. 4 Ronald Koontz, Rural Development Specialist USDA/RD Area Office West Wareham, MA 508-295-5151 ext. 3
Calendar:	

Year 1 – File application in late winter to early summer prior to congressional appropriation of funds for the next fiscal year.
- Federal appropriation by October 1.

Year 2 – Approval of project as soon as federal appropriation available after October 1, and RD/RUS issues commitment letter.

Summary of Available State Funding Program

Program:	Massachusetts Drinking Water State Revolving (Loan) Fund (DWSRF)
Sponsor:	Massachusetts Department of Environmental Protection (DEP)/Massachusetts Water Pollution Abatement Trust (MWPAT)
Type:	Low Interest Loan Program distributed on a calendar year (CY) basis (January 1 – December 31). CY 2004 program legislation provides for a subsidized 2% loan (fixed).
Competition:	High. In DWSRF Program, funds are only available for construction phase project costs (no planning or design).
Eligible Projects:	Construction Phase project costs (planning and design currently not eligible).
Ease of Application Filing:	Multiple/Difficult – requires both a preliminary (Project Evaluation Form) and final application (SRF Application) and both technical and administrative/financial expertise.
Note:	Program administration handled by DEP Boston office (Division of Municipal Services). Regional offices responsible for permitting and technical approvals. Boston office recently reorganized staff and functions.
Program Contacts:	Boston – Department of Environmental Protection Division of Municipal Services One Winter Street, 5th Floor Boston, MA 02108 Steven J. McCurdy, Acting Director 617-292-5779 Thomas Mahin, Acting Deputy Director 617-654-6521 Donald St. Marie, Northeast/Metro Boston and Western Region Program Manager 617-292-5709 Jack Hamm, Central/Southeast Region Program Manager 617-292-5883 www.magnet.state.ma.us/dep

Regions –

Northeast – One Winter Street, Boston, MA 02108
Kevin Brander, 617-654-6519

Southeast – 20 Riverside Drive, Lakeville
Dick Keith, 508-946-2784

Central – 627 Main Street, Worcester
Paul Anderson, 508-767-2802

Calendar (same cycle each year):

Year 1 – State/Federal Appropriations – by October 1

Year 2 – DEP Request for Projects – June 1 ±
- Submission of Project Evaluation Forms – August 15
DEP Priority List finalized – by December 31

Year 3 – Local Funding Authorization – by June 30
- File full application – by October 15
- DEP approval of project and issuance of Project Approval Certificate – by December 31
- Project must start within 6 months of PAC issuance

Appendix C

Methodology

Methodology

To complete the analysis for the Water Assets Study, Earth Tech collected and evaluated statistical data on public water supplies, general information on water systems, and geographic data.

Water Supply Statistics

Earth Tech collected statistical data on individual water supply sources, including pumping capacities, approved yields, and annual, average-day, and peak yields. One goal of this study was to resolve well yield inconsistencies in the Department of Environmental Protection (DEP) databases, primarily the Water Quality Testing System (WQTS) and Water Management Act (WMA) databases. Both DEP and the Executive Office of Environmental Affairs (EOEA) were concerned that well yields might be counted twice or under-counted in the DEP databases, especially where multiple wells are manifolded together or grouped before being pumped into the water-distribution system.

Resolving these database concerns fits into the larger goal of obtaining an accurate count of the total physical pumping capacity and regulatory capacity in each community. For the purposes of this study, the "physical pumping capacity" represents the amount of water a supplier believes a well or surface water source can supply based on physical constraints, such as pump size, soils, operational limitations, and size of watershed. This was initially determined by assigning each groundwater source a daily capacity of that source's highest single daily yield between 1998 and 2002, or that source's approved Zone II limit, whichever was greater. Any surface source was assigned its associated treatment plant capacity. All capacities by source or group of sources were summed by system, and if they converged on treatment plants, they were limited by treatment capacity where appropriate. Finally, suppliers were asked to refine the number if necessary to reflect well deterioration, interference between sources, or other operational limitations.

"Regulatory capacity" represents the authorized withdrawal volume as regulated through DEP's New Source Approval program and the WMA. DEP authorizes maximum daily withdrawals for individual sources, termed "DEP Approved Daily Volumes". The DEP Approved Daily Volume, in many instances, may be equal or nearly equal to the "physical pumping capacity" of the source. DEP also regulates a water supplier's total system-wide withdrawals under the WMA. In contrast to the DEP Approved Daily Volumes, which are driven by the goal of water-supply protection, the WMA approved withdrawals are aimed at equitable and wise use of water. Accordingly, the WMA program considers ecological impacts and effects of withdrawals on other water users in determining the WMA approved withdrawals. The WMA regulatory capacity that applies to any water system is normally less than the sum of the physical capacities of the individual sources. Further, the WMA program may place "special conditions" in permits that restrict withdrawals from individual sources or groups of sources seasonally, or based on environmental triggers, to reduce impacts to nearby streams, wetlands, or other sensitive ecological areas.

Earth Tech collected and verified data on system-wide consumption, such as annual and maximum day volumes, annual purchase/sales, as well as total pumping capacity. We also gathered statistics on water consumption broken out by customer type (residential, commercial, etc.), which was helpful in estimating average per capita consumption. Additionally, we tabulated data related to conservation efforts in each community to identify the regional extent of these efforts, and to help communities identify where such efforts could potentially help sustain their existing supplies.

The original source of much of the statistical data was the Public Water Supply Annual Statistical Report, which each water supplier submits to DEP each year. Earth Tech also obtained data from DEP's Zone II and WMA databases. Data relevant to this project were obtained from electronic databases, in the cases for which DEP enters responses into an electronic database, and manually from paper files or microfilm in other cases.

Water System General Information

Earth Tech made a considerable effort to obtain non-statistical information on each of the major municipal water systems directly from the water suppliers. These included perceived limitations in the water-system infrastructure, planned water-system improvements, locations and estimated yields of potential new supplies, information on conservation efforts, billing and water rates. WMA restrictions on individual water-supply sources were obtained from the individual WMA Permits.

Geographic Data

The overall purpose of the mapping effort was to show existing and potential future land uses in existing Water Supply Protection Areas (WSPA) and to identify areas that potentially meet new source approval siting requirements for water supply development. The potential future land use was based on the municipal zoning layers gathered during the EOEA buildout analyses. Using GIS, potential future areas for supply wells were identified by cutting away areas that would likely *not* be available for new well development under current policy, such as land within 400 feet of developed areas and federally or state owned open space or land within 100 feet of wetlands.

The map analysis utilized the following datasets available from MassGIS: public water supplies, WSPA's, and wetlands developed by DEP, land use developed by the University of Massachusetts, open space developed by MassGIS, and zoning data collected for the EOEA Buildout analyses and compiled by MassGIS.

A series of five maps was prepared for each community:

Map 1 Current Land Uses in Existing Public Water-Supply Protection Areas
Map 2 Potential Land Uses in Existing Public Water-Supply Protection Areas
Map 3 Land Potentially Available for Future Groundwater Supply
Map 4 Current Land Use in Potential Public Water-Supply Protection Areas
Map 5 Potential Land Use in Potential Public Water-Supply Protection Areas

The first two maps display Zone II groundwater protection areas and Zone B surface water protection areas. Map 1 shows existing developed land uses within the WSPA's. For the purposes of this study, developed land uses include residential (high, medium and low density), commercial, industrial, transportation, mining, urban open and recreation using the land use 21 category classification (codes 5, 7-13 and 15-19). The analysis used the most recent land use layer available for the state, which was interpreted from 1999 aerial photography as part of the University of Massachusetts Department of Forestry Resource Mapping project. The remaining land areas within the WSPA's were displayed on Map 1 as developable land, protected open space, and land otherwise constrained from development, as defined in the EOEA buildout analysis. Criteria that might constrain land from development varied for each municipality and included such factors as slope, River Protection Act buffers, certain zoning overlays, rights-of-way including transmission lines, and restrictions from an existing development plan and the 100-year flood zone (no build areas). Wetlands were also displayed as constrained from development. Map 2 displays potential future land uses within the areas that appear in Map 1 as developable land. These potential land uses were derived from zoning by-laws, interpreted through the EOEA buildout analysis. Map 2 is the "negative" or reverse of Map 1 with regard to developed/undeveloped areas. The purpose of Map 1 is to show existing land uses in WSPA's, while Map 2 displays what the land use could look like in the future in WSPA's.

By subtracting from the town area a series of restricted land uses and land covers, potential areas for future public groundwater supply were identified for each community and shown on Map 3. The first restriction removed developed land uses, solid waste facilities, and Tier1A and true Tier1B 21E sites, with a 400-foot buffer. Neither mining, nor agriculture, nor urban open/recreation was considered a developed land use for the purposes of this analysis. In the second restriction, wetlands were removed with a 100-foot buffer, using the DEP conservancy wetlands for the majority of towns. In some areas the

DEP conservancy wetlands layers were not yet completed; for these locations the hydrography layer developed from the USGS 1:24,000 quadrangles was used. In the third restriction, federally-owned or permanently protected state- or privately-owned open space was removed, as well as land under the control of the municipal conservation commission. To reflect current DEP policy that requires a water supplier to own or control all land within 400 feet (Zone I) around new public water supply wells, a 400-foot buffer around these open space lands was also removed. These restricted uses and land covers were subtracted cumulatively over the total area of the municipality. The remaining areas were displayed as potential new public water supply wells. It should be noted that the restrictions are based on existing land uses only, without regard to the locations of aquifers or certain sensitive environmental areas. Therefore, Map 3 shows areas that would be suitable for future well sites only from a land-use standpoint and are not meant to imply suitability on the basis of hydrogeologic and environmental criteria, nor conformance with all possible New Source Approval siting considerations. Suitability from the perspective of these criteria would need to be evaluated through detailed on-the-ground testing and assessment.

The largest data frame in the Map 3 layout shows the potential future water supply areas – both potential well locations, as described above, and a 400 foot buffer around these areas to represent all the potential Zone I area that might be associated with these potential well sites – overlaid on a MassGIS 2001 aerial photo. Aquifers are also shown. The purpose of this frame is to show where the potential future water supply areas may coincide with known sand-and-gravel aquifers, as mapped by the U.S. Geological Survey (USGS). Additional insets show where the potential future water supply areas may coincide with environmentally sensitive areas, including wetlands, riparian corridors, and terrestrial and aquatic core habitat developed by the Natural Heritage and Endangered Species Program as part of the BioMap Project and Living Waters Project.

Maps 4 and 5 display current land use and potential future land use within the "Potential Public Water-Supply Protection Areas" defined in Map 3 – that is, within the potential well sites and the Zone 1 areas that would be associated with them. These two land use depictions for *potential future Zone I* areas are analogous to the two land use depictions for *existing Zone II and Zone B areas* displayed in Maps 1 and 2.

A sixth map, the "Working Map" was provided to each community supplier during the data collection phase of this project. Each supplier was asked to mark up the "Working Map" to show the locations of potential future sources of supply, the major water-system components and the service area.

Water Supplier Involvement

Both Earth Tech and EOEA recognized that accuracy of data and the reports' usefulness to communities were key to the success of this project. Accordingly, Earth Tech sought to maximize opportunities for direct face-to-face contact with water suppliers to verify data, resolve data discrepancies and to fully understand the details and unique aspects of each water system. Water suppliers were requested to:

- Verify the accuracy of previously reported yield data, by source
- Clarify whether multiple sources are manifolded together before entering the water system
- Verify the accuracy of previously reported system-wide consumption data, purchases and sales
- Verify previously reported consumption data by customer class (residential, commercial, etc.)
- Provide information on conservation efforts, water rates and billing
- Map the major water-system components and service area
- Identify the major water-system limitations and proposed water-system improvement projects
- Provide information on future sources of water

Appendix D

Overview of Existing Water System(s)

Overview of Existing Water System

Acton Water Supply District

Major System Components

Water Supply Wells:	Acton Water District has 25 sources of ground water supply (source IDs 01G to 25G).
Storage Tanks:	Acton WD owns 4 water storage tanks. They are Flagg Hill Tank (2.0 MG), Great Hill Tank (0.5 MG), Nagog Hill (3.0 MG), and Wampus Hill (3.0 MG).These 4 tanks provide 8.5 MG of water storage in total.
Miles of Pipe:	110
Treatment Facilities:	Acton has 5 aeration plants, Kennedy WTP (450 gpm), Conant II WTP (300 gpm), Assabet WTP (600 gpm), School St. WTP (650 gpm), and Whitcomb/Clapp WTP (450 gpm). These plants are capable of providing 3.528 MGD of treated water.
Inter-municipal Connections:	There are 4 intermunicipal connections: one to Littleton, two to Maynard, and one to Concord.
Pressure Zones:	One

Water System Demands

5-year Consumption Statistics	*1998*	*1999*	*2000*	*2001*	*2002*
Annual Volume (Net), MG	688.90	676.23	677.02	785.50	680.72
Maximum Daily Volume, MGD	3.14	3.14	2.72	3.10	2.90
Average Daily Volume (Net), MGD (365 days)	1.89	1.85	1.85	2.15	1.86
Average Daily in Maximum Month (Net), MGD	2.24	2.70	0.00	2.56	2.51
Total Pumping Capacity (all sources), GPM	0.00	0.00	0.00	2,960.00	2,960.00
Total Purchases, MG	0.00	0.00	0.00	0.00	0.00
Total Sales, MG	0.00	0.00	0.00	0.00	0.00

Water Purchase from Sales to other suppliers in 2002:

PWS ID	Buyer/Supplier	Purchase/Sale	Annual Volume MG

Regulatory Constraints

Basin	Registration Number	Reg. Daily Vol. MGD	Permit Number	Perm. Daily Vol. MGD
SuAsCo	21400203	1.56	9P421400201	0.37

Water Rate Structure and Billing:

1. Pricing (Flat/Increasing/Decreasing/Seasonal): Increasing
2. Billing Frequency: Residential 2 x YR Large Water Users 2 x YR
3. Bills Based on Meter Readings (Yes/No) Yes
4. Residential Base Rate ($/unit): Up to 500 cf for $10.00 in summer & winter; 501 to 5,000 cf for $0.029/cf in summer * $0.024/cf in winter; 5,001 to 10,000 cf for $0.031/cf in summer & $0.026/cf in winter; over 10,000 cf for $0.042/cf in summer & $0.035/cf in winter.
5. Large Water Users Base Rate ($/unit):fixed rate $0.027 both in sumer and in winter.

Water Conservation Programs:	
1. Customer Metering (%)	100
2. Meter Repair/Replacement Program (yes, no)	Yes
3. Most Recent Leak Detection and Repair Program (year)	2003
4. Most Recent Water Audit (year)	2003
5. Enterprise System (yes, no)	Yes
6. Public Buildings (municipal/state)	
a. Retrofitted with Water Savings Devices (%)	100
b. Metered (%)	100
7. Water-saving Devices available to customers (yes, no)	Yes
8. Water Conservation Bylaw (yes, no)	Yes
a. Outdoor Water Use Restriction (yes, no)	Yes
Briefly describe terms:	
No information provided	
9. Drought/Emergency Plan (yes, no)	Yes
10. Other Regulations Promoting Aquifer Recharge (yes, no)	
a. Wellhead Protection bylaws (yes, no)	Yes
b. Subdivision Regulations/Alternative Zoning (yes, no)	Yes
c. Site Plan Review (yes, no)	Yes
d. Conservation Commission (yes, no)	Yes
e. Other (specify)	
11. Water Bank (yes, no)	No
12. Education Programs (yes, no)	Yes
a. Target Largest Customers (yes, no)	Yes
b. Bill Stuffers (yes, no)	Yes
c. School Programs (yes, no)	Yes
d. Press Releases (yes, no)	Yes
13. Other (specify):	

2002 Consumption by Customer	Number of Connections	2002 Annual Volume (MG)	Percent of 2002 Demand
Residential	5592	468.79	69
Commercial	0	69.15	10
Industrial/Agricultural	0	0.00	0
Institutional	0	0.00	0
Other	0	56.35	8
Unaccounted-for Water	0	85.03	13
Total	5592	679.32	100

Residential Population Served and Corresponding Average Residential Consumption, GPCD (Town Data)

Summer Population: 19,305 Winter Population: 19,305

Average (Weighted) Population = 0.2 * Summer Population + 0.8 * Winter Population =19,305

Summer GPCD: 66.5 Winter GPCD: 66.5 Average GPCD: 66.5

Residential Population Served and Corresponding Average Residential Consumption, GPCD (U.S. Census Data)

Population Per Household (U.S. Census Data for Town): 2.69

Population = U.S. Census Bureau Population per Household * # of Residential Connections = 15,042

(Assumes 1 Residential Connection = 1 Household)

GPCD (U.S. Census Bureau): 85.4

GPCD used in this report: 66.5

Based on: PWS Data - Average (Weighted) Population Served

Water Supplies

Well Supplies:

Source Name: Whitcomb Well

DEP Source ID: 2002000-01G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD 0.35

DEP approved daily volume shown above covers multiple sources (Y/N): N

Status (Active/Inactive/Emergency/Abandoned): Active

Pump Capacity, gpm: 300

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): N

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	45.97	55.79	54.76	33.96	35.71
Avg. Day, MGD (365 days)	0.13	0.15	0.15	0.09	0.1
Peak Day, MGD				0.35	0.3

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Conant Well #1

DEP Source ID: 2002000-02G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD 0.47

DEP approved daily volume shown above covers multiple sources (Y/N): N

Status (Active/Inactive/Emergency/Abandoned): Active

Pump Capacity, gpm: 210

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): N

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	71.92	34.07	38.05	68.86	29.72
Avg. Day, MGD (365 days)	0.2	0.09	0.1	0.19	0.08
Peak Day, MGD				0.48	0.34

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Lawsbrook Low Lift Well

DEP Source ID: 2002000-03G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD 0.15

DEP approved daily volume shown above covers multiple sources (Y/N): N

Status (Active/Inactive/Emergency/Abandoned): Active

Pump Capacity, gpm: 200

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): N

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	59.72	56.01	48.22	45.37
Avg. Day, MGD (365 days)	0	0.16	0.15	0.13	0.12
Peak Day, MGD				0.39	0.2

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Christofferson Well Low Lift Station

DEP Source ID: 2002000-04G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD 0.40

DEP approved daily volume shown above covers multiple sources (Y/N): N

Status (Active/Inactive/Emergency/Abandoned): Active

Pump Capacity, gpm: 300

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): N

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	194.37	52.11	63.44	100.43	69.74
Avg. Day, MGD (365 days)	0.53	0.14	0.17	0.28	0.19
Peak Day, MGD				0.41	0.36

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Assabet # 1 Well Low Lift Station

DEP Source ID: 2002000-05G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD 0.50

DEP approved daily volume shown above covers multiple sources (Y/N): N

Status (Active/Inactive/Emergency/Abandoned): Active

Pump Capacity, gpm: 150

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): N

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	206.98	130.15	110.57	107.98	54.49
Avg. Day, MGD (365 days)	0.57	0.36	0.3	0.3	0.15
Peak Day, MGD				0.46	0.33

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Assabet # 2 Well Low Lift Station

DEP Source ID: 2002000-06G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD 0.50

DEP approved daily volume shown above covers multiple sources (Y/N): N

Status (Active/Inactive/Emergency/Abandoned): Inactive

Pump Capacity, gpm:

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): N

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	133.08	138.53	189.1	0
Avg. Day, MGD (365 days)	0	0.36	0.38	0.52	0
Peak Day, MGD				0.85	0

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Clapp Well

DEP Source ID: 2002000-07G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD 0.35

DEP approved daily volume shown above covers multiple sources (Y/N): N

Status (Active/Inactive/Emergency/Abandoned): Active

Pump Capacity, gpm: 250

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): N

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	11.65	25.96	31.3	15.82
Avg. Day, MGD (365 days)	0	0.03	0.07	0.09	0.04
Peak Day, MGD				0.37	0.31

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Scribner Well Low Lift Station

DEP Source ID: 2002000-08G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD 0.15

DEP approved daily volume shown above covers multiple sources (Y/N): N

Status (Active/Inactive/Emergency/Abandoned): Active

Pump Capacity, gpm: 200

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): N

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	32.1	19.47	0	13.33
Avg. Day, MGD (365 days)	0	0.09	0.05	0	0.04
Peak Day, MGD				0	0.19

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Marshall Well

DEP Source ID: 2002000-09G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD 0.30

DEP approved daily volume shown above covers multiple sources (Y/N): N

Status (Active/Inactive/Emergency/Abandoned): Active

Pump Capacity, gpm: 300

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): N

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	27.84	6.58	0	10.17	2.3
Avg. Day, MGD (365 days)	0.08	0.02	0	0.03	0.01
Peak Day, MGD				0.26	0.23

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Kennedy GP Well #1

DEP Source ID: 2002000-10G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD 0.54

DEP approved daily volume shown above covers multiple sources (Y/N): Y

Status (Active/Inactive/Emergency/Abandoned): Active

Other Source IDs
2002000-11G
2002000-12G
2002000-13G

Pump Capacity, gpm: 450

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): Y

Other Source IDs
2002000-11G
2002000-12G
2002000-13G

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	127.1	137.88	134.08	138.06	147.8
Avg. Day, MGD (365 days)	0.35	0.38	0.37	0.38	0.4
Peak Day, MGD				0.91	0.64

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Kennedy GP Well #2

DEP Source ID: 2002000-11G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD

DEP approved daily volume shown above covers multiple sources (Y/N): Y

Status (Active/Inactive/Emergency/Abandoned): Active

Other Source IDs
2002000-10G
2002000-12G
2002000-13G

Pump Capacity, gpm:

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): Y

Other Source IDs
2002000-10G
2002000-12G
2002000-13G

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	0	0	0	0
Avg. Day, MGD (365 days)	0	0	0	0	0
Peak Day, MGD				0	0

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Kennedy GP Well #3

DEP Source ID: 2002000-12G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD

DEP approved daily volume shown above covers multiple sources (Y/N): Y

Status (Active/Inactive/Emergency/Abandoned): Active

Other Source IDs
2002000-10G
2002000-11G
2002000-13G

Pump Capacity, gpm:

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): Y

Other Source IDs
2002000-10G
2002000-11G
2002000-13G

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	0	0	0	0
Avg. Day, MGD (365 days)	0	0	0	0	0
Peak Day, MGD				0	0

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Kennedy GP Well #4

DEP Source ID: 2002000-13G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD

DEP approved daily volume shown above covers multiple sources (Y/N): Y

Status (Active/Inactive/Emergency/Abandoned): Active

Other Source IDs
2002000-10G
2002000-11G
2002000-12G

Pump Capacity, gpm:

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): Y

Other Source IDs
2002000-10G
2002000-11G
2002000-12G

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	0	0	0	0
Avg. Day, MGD (365 days)	0	0	0	0	0
Peak Day, MGD				0	0

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Conant II GP Well #1

DEP Source ID: 2002000-14G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD 0.43

DEP approved daily volume shown above covers multiple sources (Y/N): Y

Status (Active/Inactive/Emergency/Abandoned): Active

Other Source IDs
2002000-15G
2002000-16G
2002000-17G
2002000-18G

Pump Capacity, gpm: 300

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): Y

Other Source IDs
2002000-15G
2002000-16G
2002000-17G
2002000-18G

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	47.99	56.82	57.43	40.99
Avg. Day, MGD (365 days)	0	0.13	0.16	0.16	0.11
Peak Day, MGD				0.41	0.28

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Conant II GP Well #2

DEP Source ID: 2002000-15G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD

DEP approved daily volume shown above covers multiple sources (Y/N): Y

Status (Active/Inactive/Emergency/Abandoned): Active

Other Source IDs
2002000-14G
2002000-16G
2002000-17G
2002000-18G

Pump Capacity, gpm:

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): Y

Other Source IDs
2002000-14G
2002000-16G
2002000-17G
2002000-18G

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	0	0	0	0
Avg. Day, MGD (365 days)	0	0	0	0	0
Peak Day, MGD	0	0	0	0	0

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Conant II GP Well #3

DEP Source ID: 2002000-16G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD

DEP approved daily volume shown above covers multiple sources (Y/N): Y

Status (Active/Inactive/Emergency/Abandoned): Active

Other Source IDs
2002000-14G
2002000-15G
2002000-17G
2002000-18G

Pump Capacity, gpm:

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): Y

Other Source IDs
2002000-14G
2002000-15G
2002000-17G
2002000-18G

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	0	0	0	0
Avg. Day, MGD (365 days)	0	0	0	0	0
Peak Day, MGD	0	0	0	0	0

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Conant II GP Well #4

DEP Source ID: 2002000-17G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD

DEP approved daily volume shown above covers multiple sources (Y/N): Y

Status (Active/Inactive/Emergency/Abandoned): Active

Other Source IDs
2002000-14G
2002000-15G
2002000-16G
2002000-18G

Pump Capacity, gpm:

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): Y

Other Source IDs
2002000-14G
2002000-15G
2002000-16G
2002000-18G

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	0	0	0	0
Avg. Day, MGD (365 days)	0	0	0	0	0
Peak Day, MGD	0	0	0	0	0

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Conant II GP Well #5

DEP Source ID: 2002000-18G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD

DEP approved daily volume shown above covers multiple sources (Y/N): Y

Status (Active/Inactive/Emergency/Abandoned): Active

Other Source IDs
2002000-14G
2002000-15G
2002000-16G
2002000-17G

Pump Capacity, gpm:

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): Y

Other Source IDs
2002000-14G
2002000-15G
2002000-16G
2002000-17G

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	0	0	0	0
Avg. Day, MGD (365 days)	0	0	0	0	0
Peak Day, MGD	0	0	0	0	0

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Assabet Well #2A Replacement Well

DEP Source ID: 2002000-19G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD

DEP approved daily volume shown above covers multiple sources (Y/N): N

Status (Active/Inactive/Emergency/Abandoned): Active

Pump Capacity, gpm: 350

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): N

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	0	0	0	151.49
Avg. Day, MGD (365 days)	0	0	0	0	0.42
Peak Day, MGD	0	0	0	0	0.56

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Scribner GP Well #79:1

DEP Source ID: 2002000-20G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD 0.15

DEP approved daily volume shown above covers multiple sources (Y/N): Y

Status (Active/Inactive/Emergency/Abandoned): Active

Other Source IDs
2002000-21G
2002000-22G
2002000-23G

Pump Capacity, gpm: 300

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): Y

Other Source IDs
2002000-21G
2002000-22G
2002000-23G

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	0	0	0	0
Avg. Day, MGD (365 days)	0	0	0	0	0
Peak Day, MGD	0	0	0	0	0

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Scribner GP Well #12

DEP Source ID: 2002000-21G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD

DEP approved daily volume shown above covers multiple sources (Y/N): Y

Status (Active/Inactive/Emergency/Abandoned): Active

Other Source IDs
2002000-20G
2002000-22G
2002000-23G

Pump Capacity, gpm:

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): Y

Other Source IDs
2002000-20G
2002000-22G
2002000-23G

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	0	0	0	0
Avg. Day, MGD (365 days)	0	0	0	0	0
Peak Day, MGD	0	0	0	0	0

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Scribner GP Well #23

DEP Source ID: 2002000-22G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD

DEP approved daily volume shown above covers multiple sources (Y/N): Y

Status (Active/Inactive/Emergency/Abandoned): Active

Other Source IDs
2002000-20G
2002000-21G
2002000-23G

Pump Capacity, gpm:

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): Y

Other Source IDs
2002000-20G
2002000-21G
2002000-23G

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	0	0	0	0
Avg. Day, MGD (365 days)	0	0	0	0	0
Peak Day, MGD	0	0	0	0	0

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Scribner GP Well #5

DEP Source ID: 2002000-23G

Basin: CONCORD

DEP Zone II Approved Daily Volume, MGD

DEP approved daily volume shown above covers multiple sources (Y/N): Y

Status (Active/Inactive/Emergency/Abandoned): Active

Other Source IDs
2002000-20G
2002000-21G
2002000-22G

Pump Capacity, gpm:

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): Y

Other Source IDs
2002000-20G
2002000-21G
2002000-22G

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	0	0	0	0
Avg. Day, MGD (365 days)	0	0	0	0	0
Peak Day, MGD	0	0	0	0	0

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Clapp GP Well# 1:02

DEP Source ID: 2002000-24G

Basin: CONCORD-ASS

DEP Zone II Approved Daily Volume, MGD

DEP approved daily volume shown above covers multiple sources (Y/N): N

Status (Active/Inactive/Emergency/Abandoned): Inactive

Pump Capacity, gpm:

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): Y

Other Source IDs
2002000-25G

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	0	0	0	0
Avg. Day, MGD (365 days)	0	0	0	0	0
Peak Day, MGD	0	0	0	0	0

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Source Name: Clapp GP Well# 3:02

DEP Source ID: 2002000-25G

Basin: CONCORD-ASS

DEP Zone II Approved Daily Volume, MGD

DEP approved daily volume shown above covers multiple sources (Y/N): N

Status (Active/Inactive/Emergency/Abandoned): Inactive

Pump Capacity, gpm:

Manifolded/Grouped with Other Sources for Metering Purposes (Y/N): Y

Other Source IDs
2002000-24G

Total Annual, Average Day and Peak Day Flows from Section E of DEP Annual Statistical Report:*

	1998	1999	2000	2001	2002
Total Annual, MG	0	0	0	0	0
Avg. Day, MGD (365 days)	0	0	0	0	0
Peak Day, MGD	0	0	0	0	0

*-If Manifolded/Grouped with other sources - Volumes are Shown in the first source, and are shown as 0 for the remaining sources.

Appendix E

Overview of Future Water Supplies

Overview of Future Water Supplies
Town of Acton

Current Demand

Supplier PWS ID	Supplier Name	1998-2002 Avg. Day Demand, MGD
2002000	Acton Water Supply District	1.92
	Acton Total:	1.92

Future Demands

EOEA Buildout Average Day Demand, MGD: 2.13

EOEA Buildout Additional Average Day Demand, MGD: 0.26

Potential New Supplies

Supplier PWS ID	Source	Pumping Rate, gpm	Avg. Daily Vol., MGD