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Greater Leicester Water Resource Project Report



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1.0 BACKGROUND

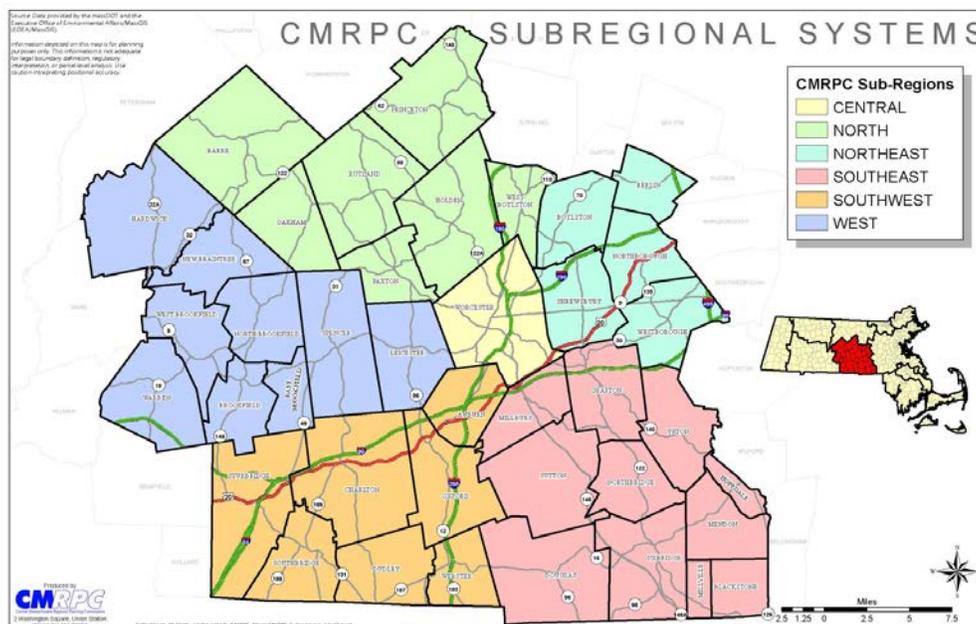
1.1 CENTRAL MASSACHUSETTS REGIONAL PLANNING COMMISSION (CMRPC)

The Central Massachusetts Regional Planning Commission (CMRPC) is the designated regional planning entity for the Central Massachusetts region, which includes the City of Worcester and the surrounding 39 communities. This region encompasses the southern two-thirds of Worcester County. CMRPC provides municipal and regional planning for the following:

- Land Use and Transportation,
- Community Development services,
- Transit Planning for the region's transit authority, and
- Geographic Information Services (GIS).

CMRPC collaborates with local, regional, state and federal officials, as well as with legislators, in order to bring a regional perspective and a coordinated approach to the planning and development that occurs in this region. The ultimate goal of this agency is to improve the quality of life for those who work and live in the Central Massachusetts region.

CMRPC is pleased to have completed this work with the support of the Legislature's District Local Technical Assistance (DLTA) funding program. District Local Technical Assistance from the state budget was made available to promote inter-municipal cooperation/problem solving. We remain grateful to our local Senators and Representatives for their continued support of this program.



1.2 THE GREATER LEICESTER WATER RESOURCE GROUP

Leicester, concerned about the implications of new Environmental Protection Agency (EPA) Municipal Separate Storm Sewer Systems (MS4) regulations, gathered representatives from surrounding towns - Worcester, Paxton, Spencer, Charlton, Oxford, and Auburn. There are multiple public drinking water suppliers in these towns, as well as drinking water supplies serving other communities. For example, the Town of Leicester is the site of a well serving the City of Worcester. In addition, Leicester has three different water utility providers, utilizing numerous groundwater and surface water sources. Leicester's water utilities are somewhat interconnected with surrounding communities, in some cases providing water beyond municipal borders. This dynamic nature of drinking water supplies creates unusual alliances and competition among and between the affected communities vying for what is ultimately a limited resource.

This particular portion of a region-wide study is fairly technical in nature. Due to the amount of possible synergies, an emphasis is placed on information gathering and depicting the information in both narrative and graphic form. Additionally, this project relies heavily on information provided by local government entities and local utility providers.

2.0 SCOPE OF WORK

2.1 PROJECT SUMMARY

The Central Massachusetts Regional Planning Commission (CMRPC) provided assistance to the Working Group that includes water district personnel and other municipal representatives from Leicester and the towns immediately adjacent – Spencer, Paxton, Worcester, Auburn, Oxford, and Charlton. The goal of this effort was to support the Working Group as it determines the best avenues to collectively address the **regional provision of interrelated** water and sewer services and stormwater management.

Since this is a recent initiative, the first phase was initial data gathering to support future planning and decision making. In addition to data gathering and research, CMRPC also assisted the Working Group with development of its goals and objectives. This phase ideally provided useful information that would inform and guide future phases.

The effort will likely serve as a learning experience for other regional or inter-municipal collaborative efforts, particularly as they relate to water resources.

2.2 PROJECT ACTIVITIES

This project consisted of data gathering from each of the involved municipalities. The Working Group developed a listing of desired information that CMRPC staff researched further. The initial list of data needs that were considered included the following:

- Water sources, wells, location and capacity of each
- Infrastructure summary
- Watersheds
- Water treatment and discharge amounts
- Current compliance with applicable regulations, NPDES, etc.
- Applicable zoning protections
- Existing agreement with other water related entities
- Any challenges particular to each district
- Excess capacity
- Number of connections
- Water use restrictions
- Land use

- Interbasin transfers
- Priority development sites or areas of concentrated development likely to impact stormwater management
- Source water protection areas

The level of success of this project was in part dependent on the cooperation of the participants in attending meetings and providing requested and available information in a timely manner. CMRPC staff gathered information from the internet and other common research methods, as well as interviews with municipal or other water/sewer/highway department personnel. As needed, questions were distributed to collect information from Working Group participants.

The CMRPC team met monthly with the Working Group (approximately once each month from August through December) for five meetings. To the degree possible, deliverables were designed in a manner to assist the towns with their response to the Municipal Separate Storm Sewer Systems (MS4s) permits and other resource development efforts. This project provided each participating municipality the following:

- A summary of gathered research provided to each participant in digital format;
- A set of maps displaying watershed locations, well locations, infrastructure, etc.; and
- A draft goal statement and set of objectives for the working group.

In this same time frame, the Working Group began efforts to obtain assistance from the Regional Office of Homeland Security for the purchase of emergency generators. In the event of a disruption in the supply of water, these generators would be needed to restore needed potable water.

Funding for this effort was derived from 2010 Massachusetts District Local Technical Assistance. Recommendations to the Working Group include exploring funding to ensure continued efforts toward regional collaboration.

3.0 RESEARCH AND DATA COLLECTION

3.1 LAND USE REGULATIONS AND WATER BYLAWS

3.1.1 LAND USE REGULATIONS AND STORMWATER BYLAWS OVERVIEW

Stormwater is currently regulated under the Federal Clean Water Act (National Pollution Discharge Elimination System (NPDES)) which applies to municipal stormwater systems and construction areas over an acre; and under the Massachusetts Wetlands Protection Act (MA Stormwater Policy), enforced by local conservation commissions in and near jurisdictional wetlands.

In many communities, a patchwork of local codes (zoning bylaws, subdivision rules and regulations, and Board of Health regulations) may provide overlapping and sometimes conflicting regulation of stormwater discharges; a municipal stormwater bylaw can replace this patchwork with a single set of standards, resulting in environmentally sensitive development throughout the community. The bylaw should provide developers with more predictability, efficiency, and rapid review due to the consistency of site design standards in all permitting processes. These standards should be reflected in all applicable local regulations such as subdivision regulations, wetland regulations, site plan regulations, etc.

A local stormwater bylaw is a good way for communities to promote Low Impact Development (LID) techniques. Numerous communities in the Commonwealth have developed stormwater bylaws that incorporate LID, and the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA) has included a model stormwater/LID bylaw in the Massachusetts Smart Growth Toolkit (Appendix 1). The Stormwater Management Bylaws for the Towns of Spencer and Leicester are also included in Appendix 1 as examples of stormwater bylaws.

In 1999, the EOEEA began a statewide effort to prepare a build-out analysis for each community in the Commonwealth. In short, a build-out analysis attempts to estimate the number of developable potential building lots and a community's total population at full build-out, that is, if the community were to be completely developed under the standards of its current zoning. Existing developed lands, protected lands and lands with environmental constraints such as water bodies, wetlands, floodplains, steep slope are removed from the equation and the remaining developable land is divided by the standards of the local zoning bylaw. A build-out analysis does not attempt to estimate *when or if* a community will reach

full build-out – it simply attempts to describe what the community would look like if it were fully built out according to the town’s current zoning policies. A build-out analysis was completed for each of the communities participating in the GLWRP. Table 1 shows some key data that will affect water resources for each town, including amount of developable land, total residential lots, commercial/industrial floor area, the number of residents, and most importantly, the amount of residential and commercial/industrial water use.

Table 1 – Build-Out Analysis Summary

	Developable Land (acres)	Total Res. Lots (4)	Commercial Industrial Floor Area (square feet)	Residential Water Use (gallons per day/gpd) (1)	Commercial Industrial Water Use (gpd) (2)	Total Yearly Water Needs (gallons)	1990 Census pop.	2000 Census pop.	Build Out pop. (3)
Spencer	3,815	2,053	2,448,783	452,125	183,659	232,061,160	15,005	11,691	21,089
Charlton	17,754	7,401	4,760,641	1,543,322	357,048	693,635,050	9,576	11,263	30,154
Leicester	9,045	4,929	1,630,523	1,042,275	122,289	425,065,860	10,191	11,619	24,088
Oxford	9,594	5,052	6,553,320	1,093,084	491,499	578,372,795	12,588	13,352	27,162
Paxton	4,235	2,842	12,700	639,472	953	233,755,125	4,047	4,386	12,573
Auburn	12,164	6,602	1,921,958	1,208,170	144,147	493,595,705	11,645	15,901	27,815
Worcester	3,055	10,993	20,758,268	19,886,534	1,556,870	7,826,842,460	169,738	172,648	196,225
Total	59,662	39,872	38,086,193	25,864,982	2,856,465	10,483,328,155	232,790	229,169	339,106

1. Residential Water Use is based on 75 gallons per day per person.
2. Commercial/Industrial Water Use is based on 75 gallons per 1,000 square feet of floor space.
3. The number of "Residents" at build-out is based on the persons per household figure derived from the 1990 US Census.
4. Lot total is less than units.

Though only indirectly related to water resources, each build-out analysis also calculates the amount of municipal solid waste that will be generated. This is typically based on 1,206 pounds of waste per person for residential use. The number of “students” at build-out is based on a students-per-household ratio taken from the 1990 US Census. And, finally, an estimate of the miles of new residential

subdivision roads is based on the assumption that 60% of the new residential lots will have the required frontage on new subdivision roads. Each of these aspects has an indirect affect on a municipality's management of its water resources.

3.1.2 LEICESTER

Population: 11,619, (2000 US Census)

Leicester's build-out analysis was completed by CMRPC in the summer of 2000. Under its 2000 zoning, Leicester had 9,045 developable acres of land with 4,929 potential residential lots and more than 1.6 million square feet of potential commercial or industrial floor area. If and when build out occurs, residential water use will be an estimated 1,042,275 gallons/day and commercial or industrial water use will be an estimated 122,289 gallons/day. This brings the estimated water need at build-out to 425,065,860 gallons per year.

Water Facilities

There are three existing water districts that service different portions of Leicester: Cherry Valley and Rochdale Water District, Hillcrest Water District, and the Leicester Water Supply District. Each of these districts is separately administered and maintains and operates their own facilities for water service. In addition, the Moose Hill Reservoir is a potential future source of water, and is overseen by the Moose Hill Water Commission, also based in Leicester.

Cherry Valley and Rochdale Water District

The Cherry Valley and Rochdale Water District (CVRWD) was formed in 1910 under the authority of Chapter 381 of the Acts of 1910 of Massachusetts Legislature. The original enabling Acts were amended in 1996 under the authority of Chapter 105 of the Acts of 1996. The District's service area includes the sections of Cherry Valley and Rochdale located in the Town of Leicester and approximately 200 households located in North Oxford. The CVRWD obtains its drinking water from Henshaw Pond, a natural pond located in the French River Basin and mentioned in records as far back as the early 18th Century. Henshaw Pond serves as the District's sole source supply for approximately 40% of Leicester's population. A second source, the Grindstone Well, was activated in June 2005 and is primarily used to augment the supply from Henshaw Pond. CVRWD is currently rehabbing its three storage tanks,

upgrading the Supervisory Control and Data Acquisition (SCADA) system, upgrading the chemical feed systems, and replacing key components at the Henshaw Water Treatment Facility. A water feasibility and rate study will be conducted in 2010 to determine the best method to address the pending US EPA and Mass DEP Drinking Water Regulations.

Hillcrest Water District

The Hillcrest Water District supplies water service to approximately 350 homes and the Memorial School. The water source for the Hillcrest Water District is two wells (Rock Well # 1 and #2). Rock Well # 1 is a drilled well located approximately 200 feet west of the intersection of Pleasant Street and Route 56 in Leicester. The well can provide more than 60 gallons of water per minute. The active well is located in an aquifer with a high vulnerability to contamination due to the absence of hydrogeologic barriers (i.e. clay) that can prevent contaminant migration. Approximately 4 million gallons of water per year are purchased from the Leicester Water Supply District in the summer months.

Leicester Water Supply District

The Leicester Water Supply District (LWSD) provides water to about 3,300 residents in the central area of Leicester. The District was originally established in 1888 and, in the 1990's, expanded service boundaries and added services. The LWSD recently installed 15,000 feet of new water transmission main along the Route 9 corridor which the Town hopes will help to attract commercial development.

Water supply comes from four wells located in the Town of Paxton and two wells in Leicester located on Whittemore Street and Rawson Street. The Paxton wells original groundwater source is the Blackstone River Basin and Leicester's source is the French River Basin. The wells are located in an aquifer with a high vulnerability to contamination due to the absence of hydrogeologic barriers (ie. clay) that can prevent contaminant migration. The Whittemore Street well was removed from service in 2002 because of issues with arsenic and radionuclides.

Moose Hill Water Commission

A fourth potential water district is overseen by the Moose Hill Water Commission. The Moose Hill Reservoir Dam is located on the municipal border with the Town of Spencer. The Dam impounds water along Shaw Brook and has a maximum storage capacity of approximately 2,140 acre feet or 785 million gallons. The Moose Hill Reservoir Dam is owned by the Massachusetts Department of Conservation and Recreation (DCR). It was constructed in late 1960s and early 1970s to provide flood control capacity, water supply, and low flow augmentation.

The Moose Hill Water Commission has as its primary objective the construction of a 16-inch water transmission main line from the Moose Hill Reservoir to Route 9 (connecting to Leicester Water Supply District water lines). The 2008 Moose Hill Reservoir Feasibility Evaluation determined the cost and feasibility of creating a public water supply, and indicated that creation of a public water supply would require: 1) a new water treatment plant; 2) a transmission line along Moose Hill road, Watson Street and Rte. 9; and 3) a water storage tank off Route 9. The Moose Hill Reservoir has a designated average daily yield of 1.5 million gallons per day (MGD).

The 2008 study concluded that it is feasible to develop Moose Hill Reservoir as a public water supply with a collaborative effort between the Town and the water and sewer districts. However, development would involve considerable expense, ranging from \$6.5± million for a 0.5 MGD water treatment plant to \$8.9± million for a 1.5 MGD water treatment plant. If approved as a public water supply, the Moose Hill Reservoir would have the potential to serve as a supply to the Leicester Water Supply District, Hillcrest Water District, and Cherry Valley Rochdale Water District. In addition, the reservoir could serve as a primary or secondary water source for communities bordering Leicester.

Sewer Facilities

There are four existing sewer districts within the Town boundaries of Leicester: Cherry Valley Sewer District, Hillcrest Sewer District, Leicester Water Supply District, and Oxford/Rochdale Sewer District.

Cherry Valley Sewer District

The Cherry Valley Sewer District (CVSD) was established in 1963. In 1995 the Route 9 Interceptor Sewer Main was incorporated into the reconstruction of Route 9. In 1998 the District boundaries were revised reducing the size of the District of CVSD to what it is today. In 1999, the District began a construction of a three-phase full build-out of the sewer system providing sanitary sewer service to 573 households. The District entered into an Inter-municipal agreement with the City of Worcester enabling sewer flows from the District to the Upper Blackstone Regional Water Pollution Abatement District's Wastewater Treatment facility located in Worcester. To this end CVSD does not operate its own wastewater treatment facility. CVSD is currently in the second year of a five year Inflow and Infiltration Study.

Hillcrest Sewer District

The Hillcrest Sewer District (HSD) has no treatment plant and has entered into inter-municipal agreements with both Oxford Rochdale Sewer District (ORSD) and Leicester Water Supply District

(LWSD) to process the effluent from HSD users. HSD prepaid for capacity to these districts based on the number of homes and empty house lots with street frontage at the time of design. Currently, there is no additional capacity for additional connections from HSD to either OSRD or LWSD.

Leicester Water Supply District (Sewer)

Most of the Leicester Water Supply District (LWSD) is sewerred. The District has an informal policy that it will provide service as needed, and therefore considers all requests for annexation based on petitioners' desires, land use and impact on available capacity. The LWSD has limited single-family connections available and has a self-imposed moratorium to reserve capacity for development on Route 9. The LWSD is completing a comprehensive analysis to update the treatment facility.

Oxford-Rochdale Sewer District

The Oxford-Rochdale Sewer District serves over 800 homes and several commercial/industrial properties in southern Leicester and in a small part of northern Oxford. The District, established in 1957, completed a major rehabilitation of treatment facilities in 1995, added a pump station in 1998 for the aforementioned sewer extension, and has upgraded at least 60% of its sewer lines. Upgrades to the wastewater treatment plant to increase capacity are anticipated to be completed by 2010. Since the last Master Plan, service has been extended to Millbrook Distributors and a senior housing development called Grandview Estates.

Stormwater Management Bylaws

The Town of Leicester's Stormwater Management Bylaws were adopted in May 2008 and establish requirements to better manage stormwater runoff from new development and redevelopment. This bylaw seeks to meet that purpose through the following objectives:

1. Establish Stormwater management standards and design criteria that will prevent or reduce sedimentation, flooding, stream erosion, pollution, property damage, harm to aquatic life, and overloading or clogging of municipal drainage systems.
2. Encourage the use of "low-impact development practices", such as reducing the amount of impervious area and preserving existing vegetation.
3. Ensure that stormwater management practices will be well-maintained and will continue to function as intended.
4. Establish procedures for issuance of stormwater management permits and for the Town's inspection of approval stormwater treatment practices.

Water Resource Overlay District

Leicester's Water Resource Overlay District consists of aquifers, recharge areas and watersheds, which are delineated on a map and considered as overlying other zoning districts. The purpose of the overlay district is to prevent the contamination of those areas within Leicester that contribute ground or surface water to existing or planned public water supplies.

Any area within the overlay district is subject to the more restrictive designation of either the overlay district or the underlying district. Within the overlay section of the town zoning bylaws are permitted, special permit, and prohibited use regulations.

3.1.3 SPENCER

Population: 11,691, (2000 US Census)

Spencer's build-out analysis was completed by CMRPC in the winter of 2001. Under its 2001 zoning, the Town of Spencer had 12,164 developable acres of land with 6,602 potential residential lots and almost 2 million square feet of potential commercial or industrial floor area. If and when build out occurs, residential water use will be an estimated 1,208,170 gallons/day and commercial or industrial water use will be an estimated 144,147 gallons/day. This brings the estimated water need at build-out to 493,595,705 gallons per year.

In 2009, the Town of Spencer adopted a Stormwater Management Bylaw (Appendix 1). The bylaw establishes minimum requirements and procedures to control the adverse effects of land conversion activities.

Spencer has an Aquifer Protection Overlay Zoning District. Its provisions apply to all new construction, reconstruction, or expansion of existing buildings and new or expanded uses. The Aquifer Protection District includes all areas designated as a Zone II and approved by the DEP. A Zone II is a wellhead protection area that has been determined by hydro-geologic modeling and approved by the DEP Drinking Water Program (DWP). The overlay district regulations delineate permitted and prohibited uses, and uses permitted by special permit.

3.1.4 PAXTON

Population: 4,386, (2000 US Census)

Paxton's build-out analysis was completed by CMRPC in the spring of 2001. Under its 2001 zoning, the Town of Paxton had 4,235 developable acres of land with 2,842 potential residential lots and 12,700 square feet of potential commercial or industrial floor area. If and when build out occurs, residential water use will be an estimated 639,472 gallons/day and commercial or industrial water use will be an estimated 953 gallons/day. This brings the estimated water need at build out to 233,755,125 gallons per year. This is less than any other town in the study area.

Paxton's bylaws include a Stormwater Management and Land Disturbance Bylaw. The purposes of the bylaw are:

1. To protect water resources;
2. To require practices that eliminate soil erosion and sedimentation and control the volume and rate of stormwater runoff resulting from land disturbance activities.;
3. To promote infiltration and the recharge of groundwater;
4. To ensure that soil erosion and sedimentation control measures and stormwater runoff control practices are incorporated into the site planning and design process and are implemented and maintained;
5. To require practices to control waste such as discarded building materials; concrete truck washout, chemicals, litter, and sanitary waste at construction sites;
6. To comply with state and federal statutes and regulations relating to stormwater discharges; and
7. To establish the town's legal authority to ensure compliance with the provisions of this By-Law through inspection, monitoring, and enforcement.

In addition to the Stormwater Management and Land Disturbance Bylaw, the town regulates stormwater through an Open Space Residential Development Bylaw (OSRD, Paxton Zoning Bylaw - Section 10). The OSRD bylaw encourages permanent preservation of water sources and more economical forms of development that conforms to natural features; and minimizes the total amount of disturbance on the site. Applicants for a Major Residential Development must submit an OSRD plan containing existing conditions/site analysis plans addressing water protection districts. Additionally, a conventional yield plan must take into consideration the location and extent of parking, landscaping, stormwater management, water supply, wastewater management service areas that would be required

to accommodate the use. The OSRD requires sketch plans to show the approximate location of any stormwater management detention/retention basins accompanied by a conceptual landscaping plan.

Paxton has a Watershed Protection Overlay District consisting of an area which impacts the reservoirs owned and/or controlled by the Town of Paxton and/or the City of Worcester, which are located within the Town boundaries. The District includes portions of the watersheds of Asnebumskit Pond, Pine Hill Reservoir, Kettle Brook Reservoirs Numbers 2, 3, and 4, Lynde Brook Reservoir, and Holden Reservoirs Numbers 1 and 2 (the "Protected Areas"). The land within the Watershed Protection District hydrologically flows to the Protected Areas and is the basis of the need for the zoning protections.

3.1.5 WORCESTER

Population: 172,648, (2000 US Census)

Worcester's build-out analysis was completed by CMRPC with the City of Worcester in the summer of 2002. Under its 2002 zoning, at complete build-out, the City would have 3,055 developable acres of land with 10,993 potential residential lots/housing units and almost 21 million square feet of potential commercial or industrial floor area. If and when build out occurs, residential water use will be an estimated 19,886,534 gallons/day and commercial or industrial water use will be an estimated 1,556,870 gallons/day. This brings the estimated water need at build-out to almost 8 billion gallons per year, and represents almost 75% of the water needs of the study area.

Sewer and Stormwater Management Ordinance

Worcester has a sewer and stormwater management ordinance containing design regulations, use restrictions, and enforcement protocol. The ordinance's provisions are intended to address the following 2008 findings of fact:

- The capacity of the public sewers of the City is inadequate due to the extensive infiltration and inflow invasions of stormwaters, groundwaters, and drain waters;
- Said lack of capacity results in the discharge of pollutants into the waters of the City and the Commonwealth and creates a danger to public health and public nuisance;
- Further connections to the public sewer would exacerbate the danger to the public health; and
- A total moratorium on sewer connections would not serve the public interest or the citizens of the city, particularly with respect to the shortage of public sewer must bear a portion of the expense of reducing infiltration and/or inflow."

Wetlands protection ordinance

The City has adopted a local wetlands protection ordinance designed to protect the wetlands, related water resources, and adjoining land areas in the City by controlling activities deemed by the Conservation Commission likely to have a significant or cumulative effect upon wetland values. Such wetland values include public or private water supply and protection, groundwater protection, flood control, erosion and sedimentation control, storm damage prevention, water pollution, fisheries, and wildlife habitat (Revised Ordinances of 2009, 76).

3.1.6 AUBURN

Population: 15,901, (2000 US Census)

Auburn's build-out analysis was completed by CMRPC in the spring of 2001. Under the 2001 zoning, at build-out, the Town of Auburn would have 3,815 developable acres of land with 2,053 potential residential lots (and slightly more units) and almost 2.5 million square feet of potential commercial or industrial floor area. If and when build-out occurs, residential water use will be an estimated 452,125 gallons/day and commercial or industrial water use will be an estimated 183,659 gallons/day. This brings the estimated water need at build-out to more than 232 million gallons per year.

The Town of Auburn receives 80% of its water service from the Auburn Water District. The other 20% comes from Elm Water District and Woodland Park Water District. All three water districts in Auburn purchase water from the City of Worcester. Daily consumption from the Auburn Water District is approximately 1.4 MGD during the winter and 1.8 MGD during the summer. There are approximately 4,200 service connections exist between the Town of Auburn and the Auburn Water District..

The Town of Auburn does not have a separate stormwater bylaw written into their zoning bylaws. However, elements of a stormwater bylaw are scattered throughout the zoning bylaws. For example, Section 4.3.6.2.2 of the town Zoning Bylaw states that recharging shall be done by using underground chambers with the necessary pretreatment to meet both EPA and Massachusetts DEP stormwater quality regulations.

Auburn's zoning bylaws include site plan requirements (Section 4.5.8.1) addressing drainage system design. The drainage system shall be designed to convey a twenty-five (25) year storm. Additionally,

the applicant must (a) assess and mitigate downstream impacts of peak flow and volume increases and on water quality caused by stormwater runoff from the Regional Mall site, and (b) mitigate those increases in the peak flow, volume, and on degradation of quality of stormwater discharge resulting from any net expansion of impervious surfaces. Mitigation may involve installation of (a) catch basins which contain oil, grease and sediment traps designed as part of a closed drainage system and placed on the site to effectively function to remove oil, grease and sediment, (b) sedimentation tanks to collect additional stormwater pollutants not collected by the catch basin system, e.g., baffled with sections that remove grit and debris, and such other contaminant removal facilities, and (c) detention and/or retention facilities designed to withstand the increases in the volume of stormwater discharge resulting from expansion of impervious surfaces caused by a 100-year storm. In furtherance of such mitigation efforts, any discharge to adjacent waterways and wetlands shall be set back to the maximum extent practicable and shall be designed to minimize runoff velocity.

The Auburn Zoning Bylaw includes an Aquifer and Watershed Protection Overlay District. Any uses permitted in the portion of the district so overlaid are permitted subject to all the provisions of this overlay district.

3.1.7 OXFORD

Population: 13,352 (2000 US Census)

Oxford's build-out analysis was completed by CMRPC in the fall of 2000. Under its 2000 zoning, Oxford will have 9,594 developable acres of land with 5,052 potential residential lots (slightly more units) and over 6.5 million square feet of potential commercial or industrial floor area at complete build-out. If and when build out occurs, residential water use will be an estimated 1,093,084 gallons/day and commercial or industrial water use will be an estimated 491,499 gallons/day. This brings the estimated water need at build-out to 578,372,795 gallons per year.

Oxford does not have a stormwater bylaw. Like many of the towns in this region, stormwater regulations are loosely included in site plan review requirements. Section 3.1.7 of the Zoning Bylaw requires that plans must contain graphic information including "provisions for sewage, solid waste,

disposal and drainage, measures proposed to prevent pollution of surface ground water levels and flooding.”

Oxford’s drinking water supply and distribution system is owned privately by Aquarion Water Supply Company of Massachusetts. At the Town Meeting on May 6, 2010 voters appropriated \$6.7 million to purchase the local water system from Aquarion, which has owned the local system since 2002. Acquisition procedures are being contested by Aquarion in court.

Waste Water Management Plan

The Town of Oxford has started implementation of its Comprehensive Wastewater Management Plan (CWMP). The CWMP is a 20-year sewer master plan to determine where there are needs for sewer and to determine the best way to meet the needs. The first two phases of the four-phase plan have been completed. Funding has not yet been identified for parts three and four.

3.1.8 CHARLTON

Population: 11,263, (2000 US Census)

Charlton’s build-out analysis was completed by CMRPC in the spring of 2001. Under its 2001 zoning, the Town of Charlton will have 17,754 developable acres of land with 7,401 potential residential lots and almost 5 million square feet of potential commercial or industrial floor area at full build-out. If and when build-out occurs, residential water use will be an estimated 1,543,322 gallons/day and commercial or industrial water use will be an estimated 357,048 gallons/day. This brings the estimated water need at build-out to almost 700 million gallons per year.

Charlton’s Master Plan cited narrow commercial zones and the lack of water and sewer along portions of Route 20 as characteristics that have discouraged the kinds of large, campus-like ventures that would have contributed to the tax base and local employment rate. In a study of the Route 169 corridor, CMRPC found there is limited potential to create a new high-end office or research park. The study concluded that topography in the area substantially limits new development and fragments parcels. Additionally, the study found that the lack of water and sewer services and cost of constructing extensions to this part of Charlton is another reason not to establish new districts for economic development purposes.

Adequate land area is zoned for new businesses to locate along Route 20 and 169. However, until public utilities such as water and sewer are established in these areas, choice business development is unlikely.

Stormwater Regulations

The Town of Charlton does not have a stormwater bylaw. The extent of their regulation comes from Zoning Bylaw Section 4.5.8.1 stating, Stormwater Management shall be consistent with the requirements for subdivisions set forth in the Rules and Regulations of the Planning Board and the DEP's Stormwater Management Policy (4.5.8.1, 2008 Zoning Bylaw).

3.2 DRINKING WATER PROTECTION

According to the US EPA, protecting water at the source is the first critical step in a multiple-faceted approach to ensuring high quality drinking water that includes treatment for contaminants, monitoring to ensure that health-based standards are met, and maintaining adequate infrastructure, especially distribution pipes that carry water from the treatment plant to customers.

The towns of Leicester, Spencer, Paxton, Auburn, Oxford, and Charlton have no Safe Drinking Water bylaws, although some elements of the SDW Act may be found scattered through their bylaws. For example, Charlton requires all developers to adhere to Massachusetts General Laws and Regulations of the State Department of Public Health. Additionally, the bylaws require site plan approval. This remains the case in the majority of the region.

The City of Worcester has a Safe Drinking Water Ordinance establishing care and control over all ponds, streams, waters, reservoirs, aqueducts and other property acquired or held by the City for the purpose of obtaining or furnishing a supply of pure water for the use of its inhabitants.

3.3 SUMMARY

The majority of towns in the GLWRP region contain elements of stormwater and drinking water bylaws throughout their zoning bylaws. In addition, Leicester, Paxton, and Worcester have specific sections of their zoning bylaws dedicated to stormwater regulation.

Municipalities in the study region, with the exception of Charlton, also have resource protection districts protecting valuable resources in their towns.

Table 2 - Water Resource Regulations Summary Table

Town	Stormwater Ordinance or Bylaw	Safe Drinking Water Ordinance	LID Ordinance or Bylaw	Resource Protection Overlay District
Auburn				x
Charlton				
Leicester	x			x
Oxford	x			x
Paxton	x			x
Spencer				x
Worcester	x	x		

X = the town has the specified element

4.0 GEOGRAPHIC ANALYSIS

4.1 INFRASTRUCTURE

All water systems leak. They leak both through pipes and at joints. Depending on their condition, drinking water systems can lose 6 to 25 percent of their water through leaks and breaks. Two major factors determining leakage are length and system pressure. Longer systems leak more than shorter ones; systems that operate at higher pressures leak more than systems that operate at lower pressures. (EPA)

Table 3 represents the length of water lines in miles throughout the study region. The data was collected by CMRPC from members of the Greater Leicester Water Resource Group. The data is an approximation and does not reflect exact mileage of the study group region. Additionally, the 233.3 miles of water lines does not include Worcester data, which was not available. Among the communities for which data was available, Auburn has the greatest length of water line infrastructure (71.45 miles) in the study group. Leicester (38.94 miles), Oxford (36.94 miles), Spencer (28 miles), and Paxton (27.47 miles) have significantly less water line infrastructure.

Table 3 – Length of Water Lines in Miles by Town

Town	Total Length of Water Lines (in Miles)
Auburn	
AWD	71.45
Elm Hill	11.71
Woodland	2.48
Charlton	
Existing water line	5.49
Present Southbridge line	9.75
Proposed line IMA	1.07
Leicester	38.94
Oxford	36.94
Paxton	27.47
Spencer	28.00
Worcester	Not available
Total (excluding Worcester)	233.3

A graphic display of this data is shown on Map 1 – Source Water Infrastructure Map.

4.2 WATERSHEDS

The Watershed Map (Map 2) displays watersheds of the study region. A watershed, also referred to as a catchment or drainage basin, is an area of land where all of the water that is under it or drains off of it goes into the same place. Watersheds come in all shapes and sizes. They cross municipal, state, and national boundaries and are crucial to improvement and maintenance of water quality. Key functions include collection of rainfall, water storage, and groundwater and aquifer recharge, provision of habitats for flora and fauna, and provision of conditions and sites for various bio-chemical reactions to take place. Topography is a key element affecting the performance of a watershed and solutions often require cross-jurisdictional efforts from affected municipalities and organizations.

Table 4, below, is a watershed acreage share spatial analysis of data extracted from the Mass GIS database for the study region and shows the interconnectedness of the watersheds among the seven municipalities.

Table 4 - Watershed by Town

Town	Watershed/s	Acres	% of Town in Watershed	% of Watershed in Town
Auburn	Blackstone	9,800.04	93.29%	22.98%
	Quinebaug	705.10	6.71%	1.20%
Charlton	Chicopee	255.08	0.91%	1.04%
	Quinebaug	27,769.65	99.09%	47.09%
Leicester	Blackstone	5,166.63	32.77%	12.12%
	Chicopee	1,686.10	10.70%	6.91%
	Quinebaug	8,912.42	56.53%	15.11%
Oxford	Blackstone	844.13	4.81%	1.98%
	Quinebaug	16,706.26	95.19%	28.33%
Paxton	Blackstone	2,391.33	24.18%	5.61%
	Chicopee	5,585.46	56.48%	22.88%
	Nashua	1,912.49	19.34%	92.18%
Spencer	Chicopee	16,889.26	77.60%	69.17%
	Quinebaug	4,874.62	22.40%	8.27%
Worcester	Blackstone	24,440.17	99.34%	57.31%
	Nashua	162.21	0.66%	7.82%

As shown, the Towns of Leicester and Paxton both contribute acreage to three watersheds within their community. The watersheds of the study area all have multiple communities contributing acreage. The Blackstone and Quinebaug Watersheds have five communities contributing; the Chicopee Watershed has four communities contributing; and the Nashua Watershed has only two communities contributing.

4.3 LAND USE

Population growth and economic growth inevitably create more demand for water. How that growth takes place affects how much additional water is needed and how much it will cost to deliver the water to the residential and commercial end-users. Low density land use results in more leakage and increases both demand and cost. Low density, dispersed development requires longer pipes, which lose more water through leakage and raise transmission costs. Additionally, systems in low-density areas must use higher pressures to push water through longer mains. Because low-density areas tend to have higher demand for watering lawns, water pressures must be increased even more during dry months.

Appendix 2 of this report displays a Land Use Table in acres for the study region, with 37 standard land use classifications interpreted from aerial photography. From that data, we determined the residential density levels of the study region broken down by town/city. This information is shown in Table 5, below. Predictably, the community with the highest level of High Density Residential land use is Worcester. The surrounding communities have significantly lower levels of high density residential areas.

Table 5 – Residential Density by Town

Town/ City	High Density Residential		Medium Density Residential		Low Density Residential		Very Low Density Residential	
	Acres	%	Acres	%	Acres	%	Acres	%
Auburn	736.27	29.34%	869.42	34.65%	743.90	29.65%	159.53	6.36%
Charlton	167.43	4.92%	134.74	3.96%	2288.00	67.20%	814.36	23.92%
Leicester	115.89	5.37%	554.71	25.71%	1181.38	54.75%	305.65	14.17%
Oxford	257.91	9.60%	730.82	27.20%	1349.70	50.23%	348.60	12.97%
Paxton	42.40	3.41%	179.47	14.44%	697.04	56.09%	323.72	26.05%
Spencer	358.25	14.56%	173.49	7.05%	1191.55	48.42%	737.40	29.97%
Worcester	5040.76	74.10%	1239.52	18.22%	334.20	4.91%	188.55	2.77%
Total Acres	6718.91	31.60%	3882.16	18.26%	7785.76	36.61%	2877.80	13.53%

As noted previously, Low and Very Low Residential density areas can be vulnerable to higher potential water loss through leakage. Table 5 shows that the residential area described as low to very low density for Charlton is 91.12%, for Paxton is 82.14%, and for Spencer (78.39%). The other communities have less than 70% low or very low residential densities. Other than Worcester, therefore, the risk of losing valuable water through leakage is relatively high and must be considered in any resource and infrastructure planning.

4.4 OPEN SPACE

Undeveloped or preserved open space can reduce impervious cover, stormwater pollutants, construction costs, grading, and the loss of natural areas. For example, properties along stream corridors and shorelines act as a vegetated buffer that filters-out pollutants from stormwater runoff.

The open space table (Table 6) summarizes data collected through spatial analysis of the Mass GIS data layer, Protected and Recreational Open Space (Map 4). The protected and recreational open space data layer contains the boundaries of conservation lands and outdoor recreational facilities in Massachusetts. The associated database contains relevant information about each parcel, including ownership, level of protection, public accessibility, assessor's map and lot numbers, and related legal interests held on the land, including conservation restrictions. Conservation and outdoor recreational facilities owned by federal, state, county, municipal, and nonprofit enterprises are included in this datalayer. Not all lands in the layer are protected in perpetuity, though nearly all have at least some level of protection.

Table 6 - Open Space by Town in Acres

Type	Auburn	Charlton	Leicester	Oxford	Paxton	Spencer	Worcester
Federal	0	461.35	0	861.06	0	0	0
State	34.54	290.43	194.43	238.58	991.75	1519.53	36.53
Municipal	815.17	399.01	1951.82	0	1690.37	337.99	1907.44
Private Non-Profit	0	439.06	45.96	0	87.96	2075.28	200.32
Private For Profit	135.96	1210.84	357.4	113.41	500.15	1149.03	217.74
Land Trust	0	93.29	80.79	3.61	31.23	188.9	245.12
Total	985.67	2893.98	2630.4	1216.66	3301.46	5270.73	2607.15

The study region contains 18,906 total acres of designated open space. Two of the seven communities (Charlton and Oxford) have federally-owned open space and all have state-owned open space. Municipally-owned open space accounts for 37% of the total open space, the majority of which is located in Leicester, Spencer, and Worcester. Six out of seven communities in the study region contain acreage held by a land trust. Neither Auburn nor Oxford has private non-profit land, although all communities have some level of private for-profit open space.

4.5 IMPERVIOUS SURFACES

An impervious surface is any surface through which rainfall cannot pass or be effectively absorbed (roads, buildings, paved parking lots, sidewalks etc.) Impervious Surfaces for the study area are shown on Map 5. Among the seven towns, 48.8% of the 17,974 acres of impervious surface within the study region is located in Worcester. The remaining 6 towns contain less than 10% impervious surface.

Table 7 - Impervious Surface Area by Town

Town	Total Acres Impervious	Percent of Total Acres Impervious
Auburn	1787.43	9.94%
Charlton	1853.82	10.31%
Leicester	902.39	5.02%
Oxford	1622.49	9.03%
Paxton	462.51	2.57%
Spencer	1293.05	7.19%
Worcester	8786.92	48.88%
Unknown	1266.12	7.04%

There are a total of four watersheds in the study region, shown on Map 2. Two watersheds, Blackstone and Quinebaug, have the majority of impervious surface. These two combine for 83% of the study region's impervious surface acreage. The remaining two, Chicopee (7.91%) and Nashua (0.64%) have a significantly smaller portion of the study area's impervious surfaces.

Table 8 - Impervious Surface by Watershed

Watershed	Total Acres	Percent of Total
Blackstone	10,898.17	60.63%
Chicopee	1,421.30	7.91%
Nashua	115.56	0.64%
Quinebaug	4,273.56	23.78%
Unknown	1,266.13	7.04%

The Blackstone Watershed, connected to five communities in the region, accounts for the most impervious surface in the study region. Additionally, it contains 3 of the 4 communities contributing the highest impervious surface in the study region.

4.6 TOPOGRAPHY

Typically, water flows down hill. As a resource to help the towns improve their efforts to manage stormwater runoff, topography maps (Maps 6 through 12) were produced for each town depicting each town's topography as well as the topography along the boundary with the adjacent towns. Participating municipalities indicated concerns regarding management of stormwater draining to their town from neighboring towns; these maps can assist in the identification of those areas where elevation gradients might indicate flow from one town to another. With this information, each town can work to prioritize

areas where surface water flows are beneficial or a concern, and plan, mitigate and attenuate accordingly.

5.0 GOALS, OBJECTIVES, AND PRIORTIES

5.1 GOALS AND OBJECTIVES

The Greater Leicester Water Resource Group held multiple meetings in conjunction with CMRPC to draft language stating goals and objectives. There was a single over-arching goal which drove this effort and which will guide the work group in its future efforts.

GOAL

To efficiently manage the water resources (water, wastewater, and stormwater) in the seven-town region through management, mitigation, and protection.

Five objectives were established as a means to move toward the stated goal.

1. Establish a line of communication with peers in the other towns,
2. Exchange information on a regular basis,
3. Identify resources that may be accessed both by individual towns but also possibly regionally,
4. Prepare for alternative scenarios, and
5. Identify town and region strengths, weaknesses, opportunities and threats.

5.2 PRIORITIES

With the goal and articulated objectives in mind, each member of the Greater Leicester Water Resource group was asked to identify its individual planning priorities. That information is reflected in the sections below.

5.2.1 LEICESTER

The Cherry Valley Water District has completed a water feasibility study and is pursuing development of a new treatment system to replace the existing, aging, system. The Town is nearing completion of a five-year stormwater management plan, consistent with NPDES requirements and are currently in the second phase.

The Town considers the acquisition of permanent generators for some of the stations to be a top priority. Additionally, they are looking to mitigate contaminated stormwater runoff.

5.2.2 WORCESTER

The City of Worcester has made it a priority to identify stormwater impacts on surrounding reservoirs. Additionally, the City is working to locate physical resources and emergency interconnections through cooperative efforts.

5.2.3 AUBURN

The Town of Auburn has identified the need for a new water source. In order to achieve this, some type of land acquisition will be required. Funding is a large obstacle. The water district has previously been unable to supply water to proposed developments and would greatly benefit from additional water to supply priority development areas and other planned projects.

5.2.4 OXFORD

The Town of Oxford has completed a large portion of its Comprehensive Wastewater Management Plan and is currently seeking additional funding to complete it. Also, pending a court decision on the acquisition of the water system, the Town will need a new water master plan by July 1st, 2012.

5.2.5 SPENCER

Stormwater regulations for the Town of Spencer are currently in the development process. Spencer is exploring streamlined permitting for the stormwater regulations. Additionally, the Town of Spencer has a goal to “smoke test” the water systems and explore the opportunity to use revolving funds for remediation of issues found by such testing. Smoke testing is a common practice in plumbing that forces non-toxic smoke through a pipe to find leaks or potential locations of groundwater or stormwater release.

5.2.6 PAXTON AND CHARLTON

Though Work Group representatives from Paxton and Charlton did not formally indicate town water resource priorities, it is assumed that their town priorities are consistent with those listed by the entire Work Group and include provision of safe drinking water, protection of drinking water supplies, and cost effective distribution.

5.2.7 GROUP PRIORITIES

The Working Group indicated the following collective priorities:

- Improve consistency of water resource protection bylaws across town boundaries
- Gather updated demographic information pending release of 2010 Census Data
- Address inter-basin data collection to thoroughly plan for growth in the region

6.0 RECOMMENDATIONS/NEXT STEPS

1. Seek Homeland Security or other funding for backup generators and new pump stations.
2. Gather updated demographic information pending release of 2010 Census Data
3. Located and correct leaks in order to improve water delivery efficiency. Systems in low-density areas must use higher pressures to push water through longer mains. Because low-density areas tend to have higher demand for water for lawns, water pressures must be increased even more during dry months.
4. Address issues of capacity within the water infrastructure. Gather data regarding capacity for each town and have a map created going forward.
5. Explore Imperviousness Overlay Zoning as an additional form of regulation. Environmental aspects of future imperviousness are estimated based on the future build-out conditions. Estimated impacts are compared with environmental protection goals to determine the limit for total impervious surfaces in the watershed. Imperviousness overlay zoning areas are then used to define subdivision layout options that conform to the total imperviousness limit.
6. Collectively review and revise bylaws in order to collaboratively implement effective and consistent stormwater management bylaws and regulations in each community and throughout the region. Stormwater management bylaws and regulations are an important tool used to protect water quality in a region.
7. Locate all inter-basin transfers in the study region and compose a summary map of the results.
8. Map all waterline pipes for the study region in GIS by age. Overlay this with water main breaks on an annual basis and identify trends.

SPENCER STORMWATER MANAGEMENT BYLAW

Article 14: Stormwater Management Bylaw (Added 5/7/2009, Art. 5)

Section 1. Purpose

A. The purpose of this Bylaw is to protect the public health, safety, environment and general welfare by establishing minimum requirements and procedures to control the adverse effects of land conversion activities. Increased and contaminated stormwater runoff associated with these activities may impair the water quality and flow in lakes, ponds, streams, rivers, wetlands, and groundwater. The objectives of the Bylaw are to:

1. Establish an authority and controls for land conversion activities to protect and preserve water resources;
2. Regulate land conversion activities to minimize changes to the natural hydrologic characteristics of the land;
3. Require that the quality and quantity of stormwater runoff from land conversion activities is maintained;
4. Prevent erosion and sedimentation from land conversion activities;
5. Establish procedures for review, inspection, maintenance, and enforcement of this Bylaw;
6. Comply with Federal and State laws relating to stormwater.

Section 2. Definitions

The following definitions shall apply in the interpretation and implementation of this Bylaw. Additional definitions may be adopted by separate regulation.

CLEARING: Any activity that removes or disturbs the vegetative surface cover.

DEVELOPMENT: The modification of land to accommodate a new use or expansion of use, usually involving construction.

DISTURBANCE OF LAND: Any action, including clearing, that causes a change in the position, location, or arrangement of soil, sand, rock, gravel or similar earth material.

IMPACT: Effect of a change in the quality or quantity of water at a particular location, system, or resource area.

LAND CONVERSION ACTIVITY: Any new development, redevelopment, clearing, or disturbance of land.

NEW DEVELOPMENT: Any construction or land disturbance of a parcel of land that is currently in a natural vegetated state and does not contain alteration by man-made activities.

PERSON: Any individual, group of individuals, association, partnership, corporation, company, business organization, trust, estate, the Commonwealth or political subdivision thereof to the extent subject to Town Bylaws, administrative agency, public or quasi-public corporation or body, and any other legal entity, its legal representatives, agents, or assigns.

REDEVELOPMENT: Any construction, alteration, or improvement that disturbs the ground surface (either natural or man-made materials) or increases the impervious area on previously developed sites.

RESOURCE AREA: Any area protected under, including without limitation, the Massachusetts Wetlands Protection Act, Massachusetts Rivers Act, or Town of Spencer Wetlands Protection Bylaw.

RUNOFF: Rainfall, snowmelt, or irrigation water flowing over the ground surface.

SEDIMENTATION: A process of depositing material that has been suspended and transported in water.

SITE: The parcel of land being developed, or a designated planning area in which the land conversion act is located.

STORMWATER AUTHORITY: The Town of Spencer Planning Board. The Stormwater Authority is responsible for coordinating the review, approval, permit, and processes as defined in this Bylaw. Other Boards and/or departments may act for the Stormwater Authority as defined in the Stormwater Regulations adopted by the Planning Board.

STORMWATER MANAGEMENT: The use of structural or non-structural practices that are designed to reduce stormwater runoff pollutant loads, discharge volumes, and/or peak flow discharge rates.

STORMWATER MANAGEMENT PERMIT: A permit issued by the Stormwater Authority, after review of an application, plans, calculations, and other supporting documents, which is designed to protect the environment of the Town from the adverse affects of uncontrolled and untreated stormwater runoff.

Section 3. Authority

This Bylaw is adopted under authority granted by the Home Rule Amendment of the Massachusetts Constitution, and pursuant to the regulations of the Federal Clean Water Act, and as authorized by the residents of the Town of Spencer at Town Meeting, dated May 7, 2009.

Section 4. Applicability

A. No person shall discharge anything other than runoff into the Town's stormwater collection system or roads. This Bylaw applies to any land conversion activity that disturbs greater than 1 acre in area. This Bylaw applies to any land conversion activity that is less than 1 acre in area if it meets 2 of the following 3 conditions: (1) located within 100 feet of any existing or proposed inlet to any storm drain, catch basin, or other storm drain system component discharging to any lake, pond, river, stream, or wetland; (2) will occur on or result in a slope of 15% or greater; or (3) disturbs greater than 10,000 square feet in area.

Section 5. Exemptions

A. Normal maintenance and improvement of land in agricultural use as defined by the Wetlands Protection Act Regulations 310 CMR 10.04.

B. Any emergency activity that is immediately necessary for the protection of life, property, or the environment, as determined by the Stormwater Authority; including emergency repairs to any stormwater management facility, or condition that poses a threat to public health or safety, or as deemed necessary by the Stormwater Authority.

C. Any work or projects for which all necessary approvals and permits have been issued before the effective date of this Bylaw.

D. Non-stormwater discharges such as:

1. Flushing of lines that contain water.
2. Landscape and lawn irrigation.
3. Diverted flows from streams or wetlands.
4. Rising ground waters.
5. Uncontaminated ground water infiltration [as defined at 40 CFR 35.2005(20)].
6. Uncontaminated pumped ground water.
7. Discharge from potable water sources except noncontact cooling water.
8. Foundation perimeter and footing drains.
9. Air conditioning condensation.
10. Uncontaminated water from crawl space pumps.
11. Individual resident car washing.
12. De-chlorinated swimming pool discharges.
13. Street wash water.
14. Residential building wash waters, without detergents.
15. Discharges or flows from fire fighting activities.

Section 6. Administration

A. Stormwater Authority. The Spencer Planning Board is designated as the Stormwater Authority. The Stormwater Authority shall administer, implement and enforce this Bylaw. The Stormwater Authority may designate Town Boards, including the Conservation Commission and the Board of Health, as its authorized agent.

B. Stormwater Management Regulations. For the administration of the Bylaw, the Stormwater Authority may adopt and amend regulations relating to the procedures, terms, conditions, definitions, fees, surety, and enforcement.

C. Waivers. The Stormwater Authority may waive strict compliance with this Bylaw if such action is allowed by Federal, State and local statutes, bylaws, and/or regulations; is in the public interest; and is consistent with the purposes of this Bylaw.

D. Actions by the Stormwater Authority. The Stormwater Authority may take any of the following actions as a result of an application for a Stormwater Management Permit: Approval, Approval with Conditions, or Disapproval.

E. Appeals. Appeals made under this Bylaw shall be reviewable in a court of competent jurisdiction in an action filed within sixty (60) days thereof, in accordance with M.G.L. Ch 249 § 4.

Section 7. Enforcement

The Planning Board or its authorized agent shall enforce this Bylaw, regulations, orders, violation notices, and enforcement orders, and may pursue all civil and criminal remedies for such violations. Enforcement shall be further defined and included as part of any Stormwater Regulations promulgated as permitted under Section 6 of this Bylaw.

Section 8. Severability

The invalidity of any section, provision, paragraph, sentence, or clause of this Bylaw shall not invalidate any section, provision, paragraph, sentence, or clause thereof, nor shall it invalidate any permit or determination that previously has been issued.

5.9 Stormwater Management

5.9.01 All drainage systems shall be designed in compliance with Massachusetts DEP Stormwater Management policy.

5.10. Adaptive Reuse Overlay District (AROD).

A. The purpose of the Adaptive Reuse Overlay District (AROD) is to:

(1) Provide specific regulations allowing for the reuse of municipal, religious, and historic mill buildings in a way that promotes public health, safety and welfare and is in keeping with the adjacent character of the neighborhood.

(2) Provide regulatory flexibility and intensification of use in municipal, religious, and historic mill buildings to prevent disinvestment or deterioration of buildings that have become obsolete for their original purposes.

(3) Allow for the reuse of municipal, religious, and historic mill buildings as a means to increase the town's overall tax base, create employment opportunities and ensure efficient use of municipal services so as to not create a burden on these services.

(4) Encourage the adaptive reuse of historic buildings where such reuse would more effectively promote, preserve and enhance the architectural character of the surrounding neighborhood than would the redevelopment of the site following the demolition of these landmark structures.

B. Eligibility for Conversion

The following shall be eligible for conversion to those uses listed in Section D of this bylaw:

(1) A municipal building located in any zoning district if it was used for not less than fifteen (15) years for municipal use.

(2) Any existing structure having not less than 10,000 square feet constructed more than sixty (60) years ago and historically part of a mill complex.

(3) Any existing structure used for one or more of the following religious uses for not less than fifteen (15) years: churches, convents, schools, rectories, and parish halls.

C. Scope of Authority

The AROD is superimposed over all the underlying zoning districts in the Town. Except as specified in this Section 5.10, the provisions of the underlying zoning districts shall remain in effect. The regulations of this overlay district shall govern reuse, reconstruction or expansion of those buildings eligible for conversion as describe in Subsection B above. The Special Permit Granting Authority for an Adaptive Reuse Development (ARD) under this section shall be the Planning Board. Adaptive Reuse Developments which utilize any of the provisions of this Section 5.10 relative to use, parking, and/or dimensional controls shall require a special permit from the Planning Board. Applicants for Special Permits under this section shall submit plans in compliance with the Leicester Planning Board Rules & Regulations for Special Permit Applications.

D. Uses Permitted

(1) Uses allowed by the right

The following uses be allowed by-right:

- a) Any uses permitted by right in the underlying zoning district in which the structure is located.
- b) Conversion of former municipal buildings to private medical or professional offices.

(2) Uses allowed by Special Permit

The following uses are allowed by special permit and subject to site plan review:

- a) Senior Village Development residential uses, Adult Day Care Facilities, and Senior Village Community Centers as defined under Section 5.7.03
 - b) Multi-family
 - c) Professional or administrative offices
 - d) Community recreational center or personal training centers
 - e) Medical Clinic, Dental Office, Veterinarian Office, and Ancillary Offices and Facilities
 - f) Community center or conference center with meeting rooms
 - g) Studios for art, drama, speech, dance, or music
 - h) Retail
 - i) Indoor commercial recreation or health club
 - j) Research and Development uses including ancillary office use and electronic and computer laboratories, but not including ancillary manufacturing, assembly, sale or resale or storage for sale or resale of any goods, items, or material
- (3) Multiple or Mixed Uses: Any combination of uses allowed by right in D (1), and uses allowed by special permit in D(2), may be allowed provided they are compatible with each other and maintain the public health, safety and welfare of the community. (4) Uses required by MGL c40A, Section 3, such as public and private

non-profit religious and educational institutions are allowed in the AROD by right subject to Site Plan Review.

E. Parking Requirements

(1) For all new buildings and structures and for reuse or substantial restoration of existing buildings or structures within the Adaptive Reuse Overlay District, the parking requirement of Section 5.1 of the Zoning Bylaw shall apply.

(2) The Planning Board shall be authorized to modify parking, loading requirements, dimensional requirements for off-street parking and loading areas; layout requirements and the number of required spaces in conjunction with the grant of a special permit pursuant to this Section 5.10. This provision shall only apply to uses in the Adaptive Reuse Overlay District which are located in buildings or structures in existence as of the date of the adoption of this Section of the Leicester Zoning Bylaw. In determining the appropriate reduction, the Planning Board may give consideration to the hours of operation and/or usage of the proposed uses within the development, the opinions of merchants, residents and municipal officials as to the adequacy or inadequacy of parking spaces within the surrounding area, as well as other relevant information. The decrease in number of required spaces shall not create undue congestion, traffic hazards, or a substantial detriment to the neighborhood, and shall not derogate the intent and purpose of this Bylaw.

F. Dimensional and Other Requirements

(1) The Planning Board, by Special Permit, shall have the authority to waive or modify dimensional controls set forth in Section 4 of the Zoning Bylaw.

(2) The Site Development Standards for the underlying district are applicable. Where the underlying district does not have Site Development Standards, the standards for the Business (B) District shall apply. The Board, through the ARD special permit, may allow for modifications of Site Development Standards where not feasible due to existing site constraints.

(3) For multi-family projects, the maximum number of dwelling units shall be established by the Planning Board after reviewing the following criteria:

- a) Existing structures
- b) Proposed method and efficacy of stormwater disposal
- c) Availability of water and sewer
- d) Trip generation, traffic safety and internal site traffic
- e) Character of the proposed ARP and its relation to the surrounding neighborhood(s)

- f) Character of the existing buildings and the potential for reuse thereof
- g) Applicability of the Water Resource Protection Overlay District
- h) Reports of the technical consultants of the Planning Board and all other reviewing boards

(4) Existing Buildings may be expanded provided that such expansion is consistent with the building's historic character and scale and does not cause substantial detriment.

(5) New Buildings may be constructed on the ARD site provided that the number, type, scale, architectural scale, and uses within such new buildings shall be subject to Planning Board approval. For all new structures or buildings, the dimensional requirements of the underlying zoning district shall apply and, if applicable, to the extent that the dimensional requirements vary dependent upon the use of the building, the predominant use based upon gross floor area utilized shall govern.

(6) All proposed signs shall comply with Section 3.2.07 of the Bylaw, except that if the building and land on which situated are located in a single family district (SA, R1, R2), the Planning Board may permit a sign of no larger than 10 square feet which identifies only the building and its occupants.

G. Standards for Approval

(1) As a condition of any special permit for the an Adaptive Reuse Project that proposes multi-family dwelling units, a minimum of ten (10%) of the total number of dwelling units shall be required, in perpetuity, to be restricted to persons qualifying as moderate income in accordance with the Massachusetts Department of Housing and Community Development definitions of low and moderate incomes.

(2) The proposed project preserves or enhances the historic significance of existing buildings on or eligible to be on the State or National Register of Historic Places and, where applicable, the eligibility of the same for listing on the State or National Register of Historic Places as an individual property or a contributing property to an area.

(3) Any expansion of existing buildings on or eligible to be on the State or National Register of Historic Places is consistent with the U.S. Secretary of the Interior's Standards for Rehabilitation, as determined by the Leicester Historical Commission.

(4) The project shall have sufficient local infrastructure to accommodate the proposed development

(5) The proposed ARD does not cause substantial detriment to the neighborhood after considering the following potential consequences

- a) noise, during the construction and operational phases,
- b) pedestrian and vehicular traffic,
- c) environmental harm,
- d) visual impact caused by the character and scale of the proposed structure(s), and the SPGA may attach such additional conditions and limitations to a Special Permit granted under this Section as may be necessary to protect the neighborhood surrounding the property, and as may be necessary to encourage the most appropriate use of the land and building to be converted.

MODEL STORMWATER/LID BYLAW - MASSACHUSETTS SMART GROWTH TOOLKIT

Localities in the Commonwealth of Massachusetts are required to comply with a number of both State and Federal laws, bylaws and permits which require a locality to address the impacts of post-development stormwater runoff quality and nonpoint source pollution. As a means to assist municipalities with the development of bylaws that address these impacts, the Executive Office of Energy and the Environment (EOEEA) has developed a Smart Growth Toolkit that provides, among others, model low impact development (LID) bylaws. The link to the Massachusetts Smart Growth Toolkit is http://www.mass.gov/envir/smart_growth_toolkit/pages/SG-bylaws-lid.html.

An excerpt from the model bylaw reads as follows:

Therefore, the [LID Authority] has established this LID bylaw to provide reasonable guidance for site planning and for the Bylaw of post-development stormwater runoff for the purpose of protecting local water resources from degradation. This bylaw regulates the post-construction stormwater controls for both new and re-development projects.

It has been determined that it is in the public interest to minimize the impacts associated with land development and to regulate post-development stormwater runoff discharges in order to control and minimize increases in stormwater runoff rates and volumes, post-construction soil erosion and sedimentation, stream channel erosion, and nonpoint source pollution associated with post-development stormwater runoff.

APPENDIX 2 – 2005 LAND USE

This information shows a Land Use Table in acres for the study region. The land use data was drawn from the MassGIS Land Use data layer, which has 37 land use classifications, interpreted from 1:25,000 aerial photography. MassGIS extracted the surfaces using semi-automated techniques by Sanborn Map Company from 50-cm Vexcel UltraCam near infrared orthoimagery that was acquired in April 2005 as part of the Color Ortho Imagery project. The pixel size for the impervious surface data is 1-meter.

2005 Land Use for Study Area

2005 Land Use Category	Acres							Total by Type	
	Auburn	Charlton	Leicester	Oxford	Paxton	Spencer	Worcester	Acres	Percent
Brushland/Successional	16.73	29.72	58.83	135.03		21.67	18.45	280.43	0.22%
Cemetery	41.64	19.78	26.11	36.88	52.35	38.64	384.11	599.52	0.47%
Commercial	424.76	165.09	79.06	201.00	15.13	141.37	1,506.66	2,533.06	1.98%
Cropland	261.44	1,192.36	358.78	460.92	394.64	1,611.69	29.70	4,309.53	3.36%
Forest	4,522.51	17,627.42	9,457.52	9,770.61	5,897.05	13,044.55	5,690.67	66,010.33	51.53%
Forested Wetland	319.71	1,365.47	897.35	889.48	864.38	912.30	251.76	5,500.44	4.29%
Golf Course	51.25	74.58	129.31	100.03	133.45		296.29	784.91	0.61%
High Density Residential	736.27	167.43	115.89	257.91	42.40	358.25	5,040.76	6,718.91	5.25%
Industrial	257.92	99.73	51.12	200.82	1.96	104.70	1,192.72	1,908.96	1.49%
Junkyard	4.84	70.36	9.09	36.62	1.66		88.81	211.37	0.17%
Low Density Residential	743.90	2,288.00	1,181.38	1,349.70	697.04	1,191.55	334.20	7,785.76	6.08%
Marina							10.73	10.73	0.01%
Medium Density Residential	869.42	134.74	554.71	730.82	179.47	173.49	1,239.52	3,882.16	3.03%
Mining		157.72	10.84	172.96		86.67		428.18	0.33%
Multi-Family Residential	195.84	39.34	50.20	222.49	20.85	257.20	3,386.68	4,172.59	3.26%
Non-Forested Wetland	223.31	710.21	372.15	574.08	407.24	783.67	250.11	3,320.78	2.59%
Nursery	12.91	8.83	17.90	6.37	3.93	20.66	6.55	77.16	0.06%
Open Land	239.43	292.65	185.55	263.00	60.52	262.68	288.93	1,592.76	1.24%
Orchard		87.56	13.50	73.92	1.78	23.57		200.33	0.16%
Participation Recreation	77.40	73.72	71.56	86.45	48.42	91.59	627.09	1,076.24	0.84%
Pasture	122.12	768.72	415.30	491.57	195.30	758.17	18.80	2,769.98	2.16%

2005 Land Use Category	Acres							Total by Type	
	Auburn	Charlton	Leicester	Oxford	Paxton	Spencer	Worcester	Acres	Percent
Powerline/Utility	76.51	319.78	94.76	145.43	34.49	83.77	63.67	818.41	0.64%
Spectator Recreation			12.20					12.20	0.01%
Transitional	49.13	109.04	61.72	34.06	8.51	56.96	127.40	446.82	0.35%
Transportation	375.11	258.10	207.45	358.89		85.07	1,133.99	2,418.60	1.89%
Urban Public/Institutional	109.37	121.34	113.02	114.53	56.53	78.41	1,712.16	2,305.36	1.80%
Very Low Density Residential	159.53	814.36	305.65	348.60	323.72	737.40	188.55	2,877.80	2.25%
Waste Disposal		1.10	5.90	10.59		17.15	29.19	63.92	0.05%
Water	612.60	1,019.12	905.41	475.26	448.44	820.21	668.65	4,949.69	3.86%
Water-Based Recreation	1.50	8.51	2.89	2.37		2.49	16.25	34.02	0.03%
Total By Town	10,505.14	28,024.73	15,765.14	17,550.39	9,889.29	21,763.88	24,602.38		100.00%
Grand Total	128,100.95								

Source: MassGIS

MAPS

A large format version of each of the following study area maps was provided for each municipality. In addition, topographic maps by town were provided to each town.

Map 1 – Source Water Infrastructure

Map 2 – Watersheds

Map 3 – Land Use

Map 4 – Open Space

Map 5 – Impervious Surfaces

Map 6 – Topography – Auburn

Map 7 – Topography – Charlton

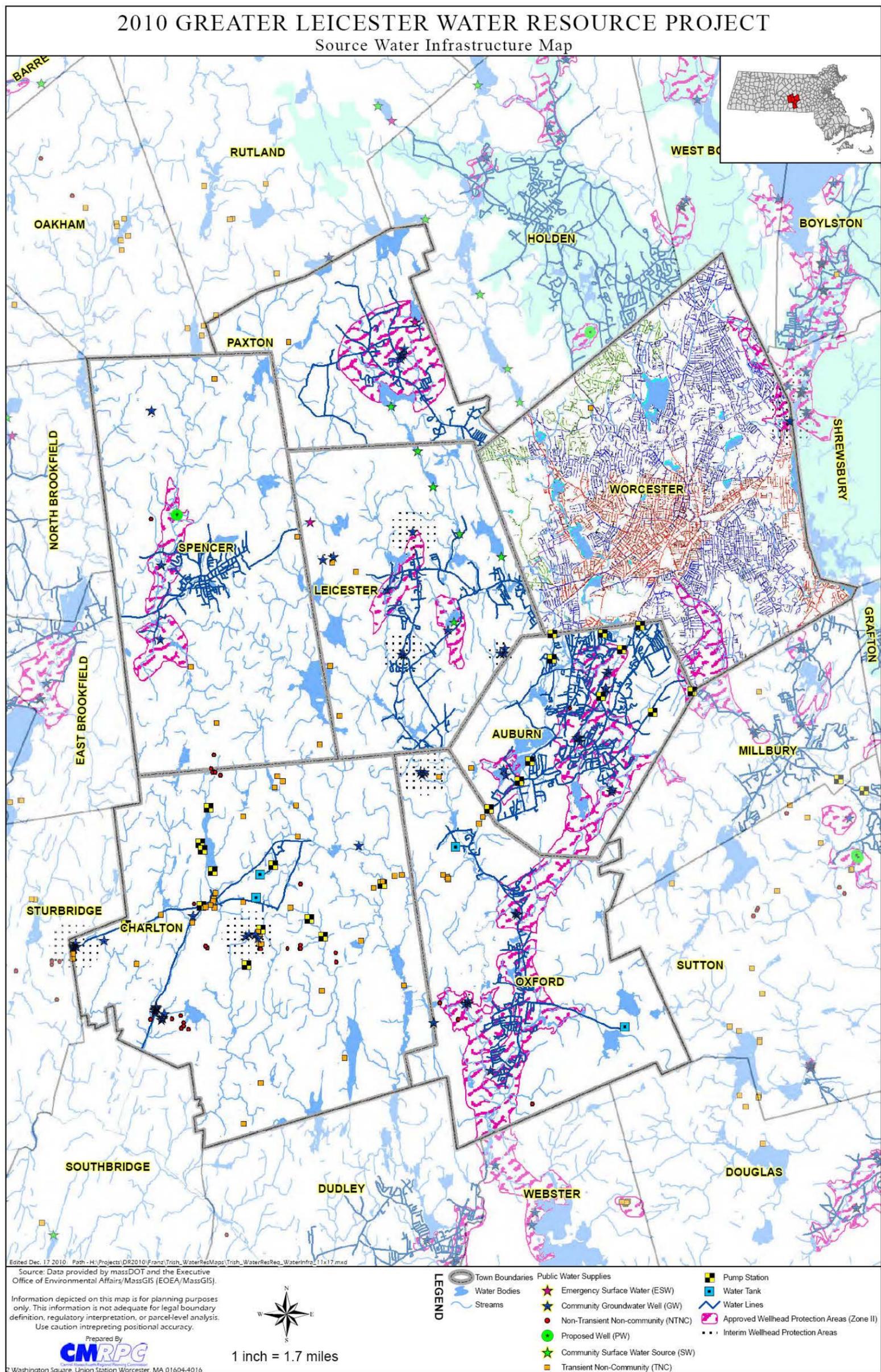
Map 8 – Topography – Leicester

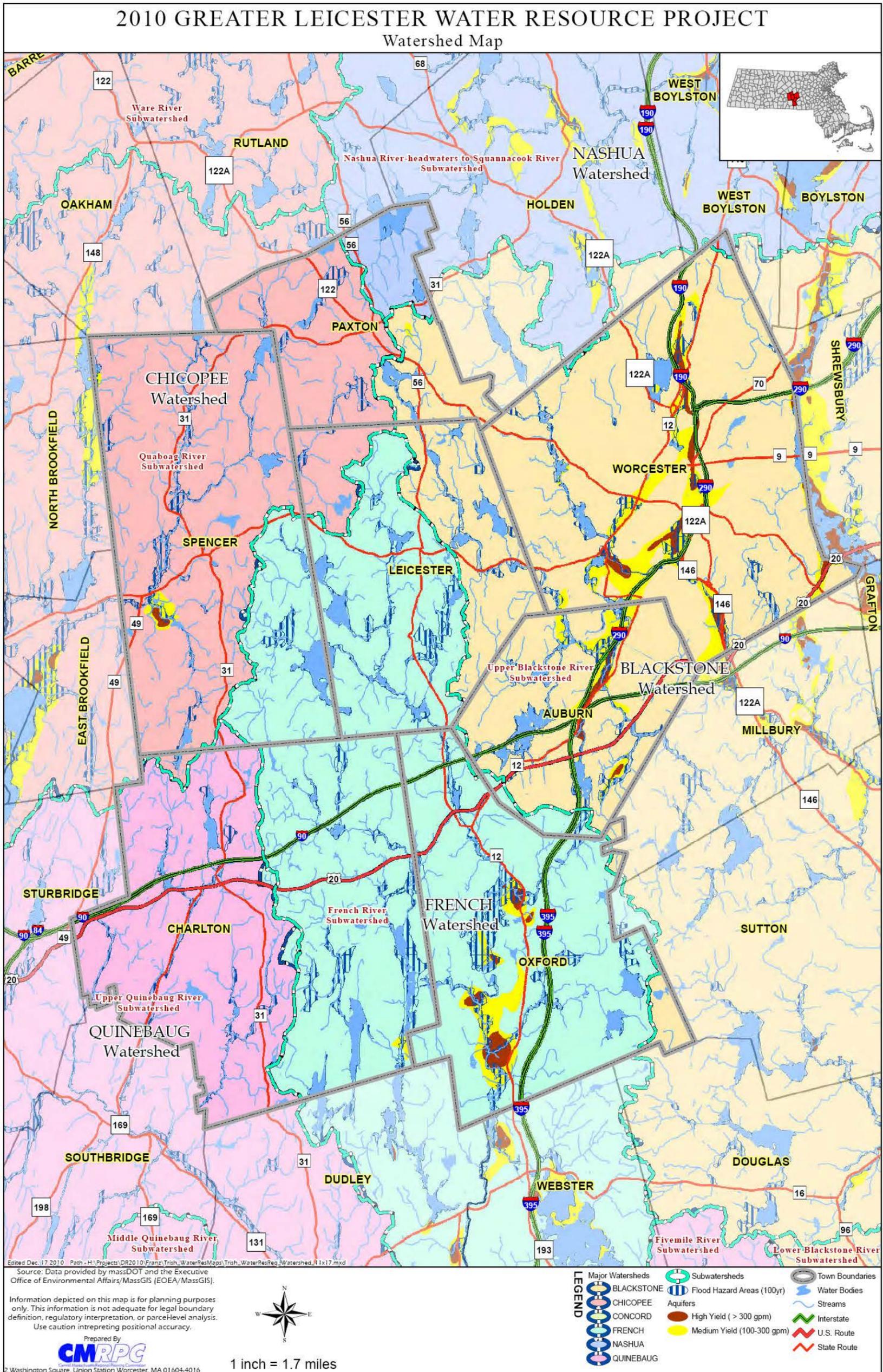
Map 9 – Topography – Oxford

Map 10 – Topography – Paxton

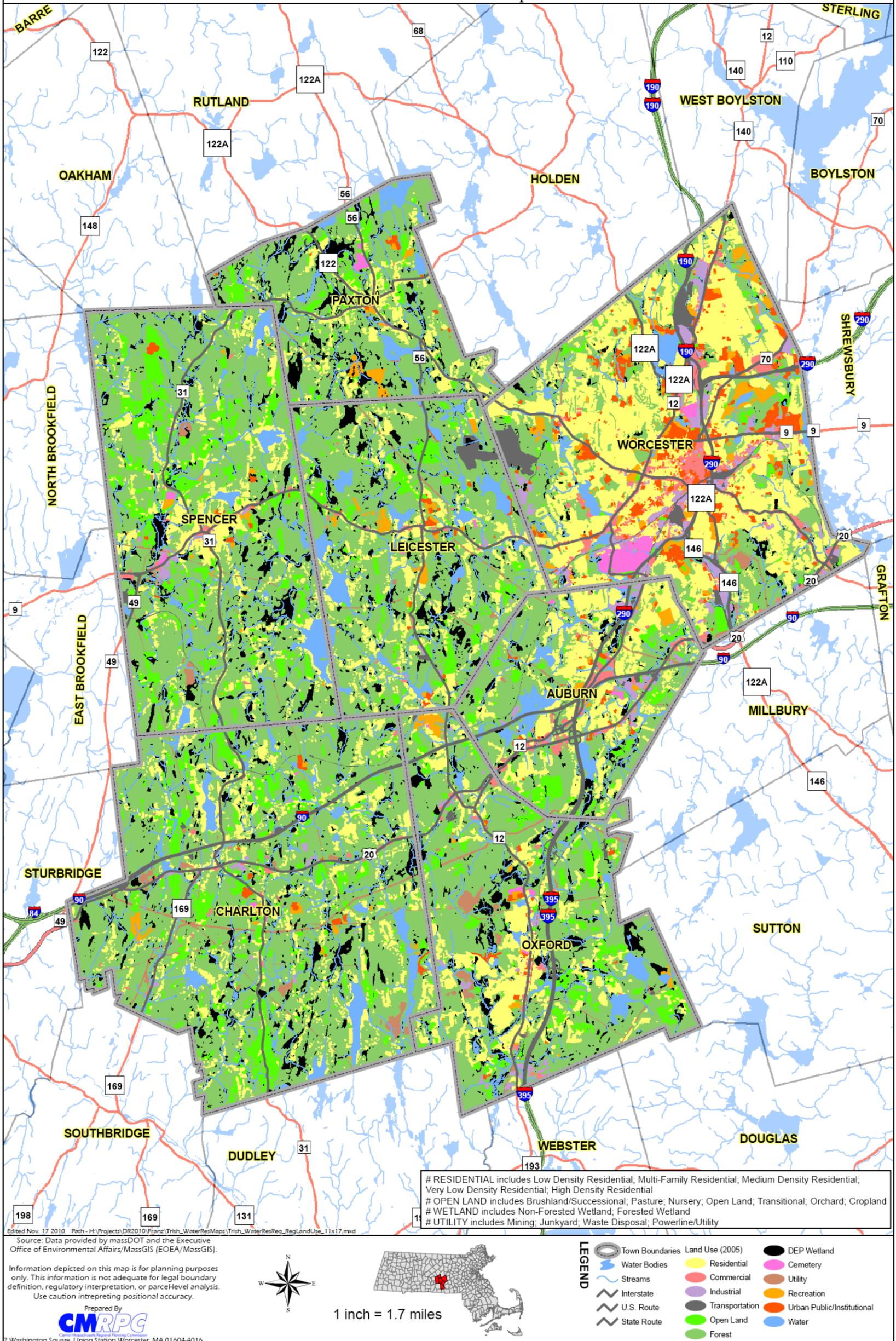
Map 11- Topography – Spencer

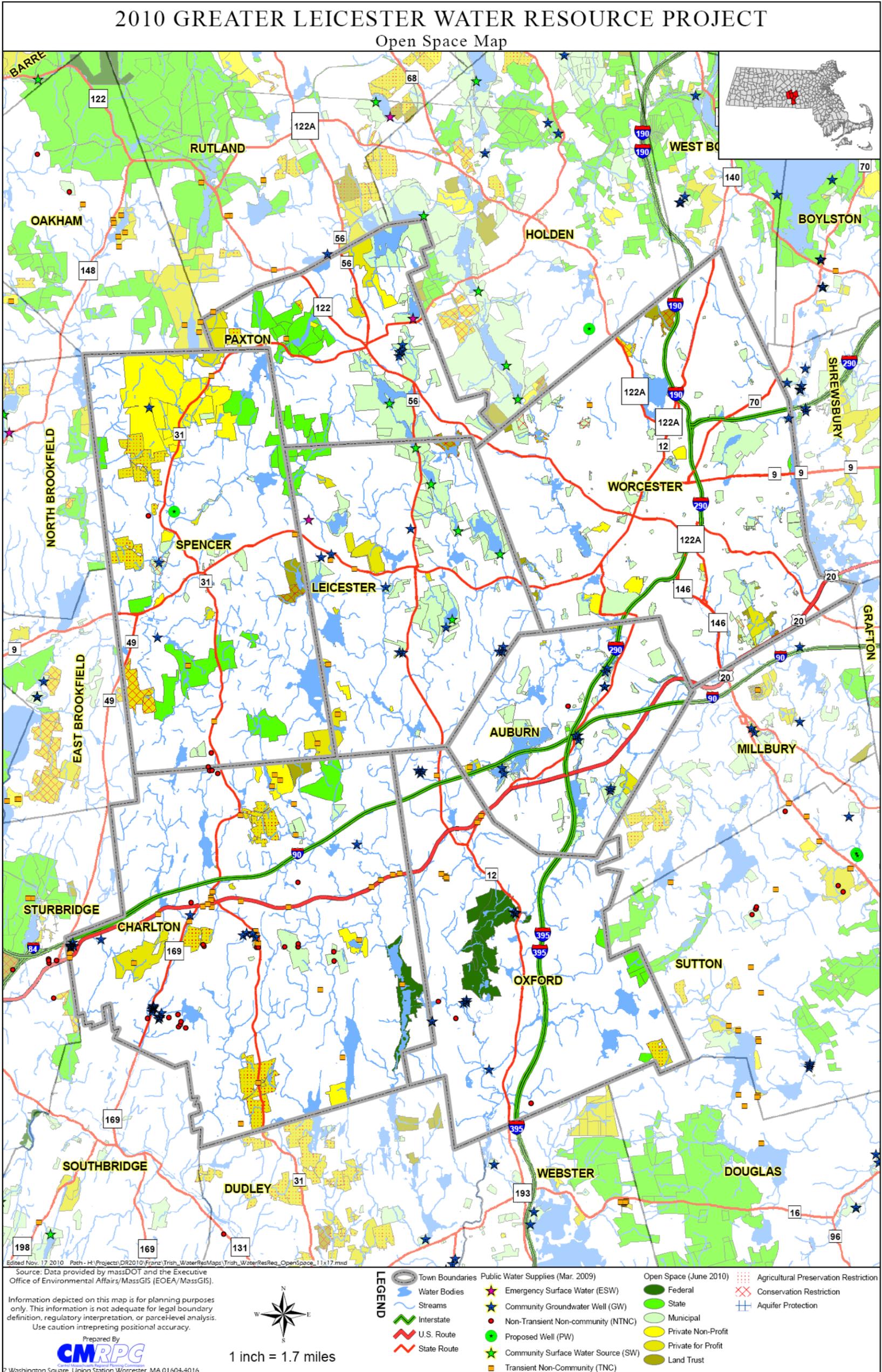
Map 12 – Topography – Worcester





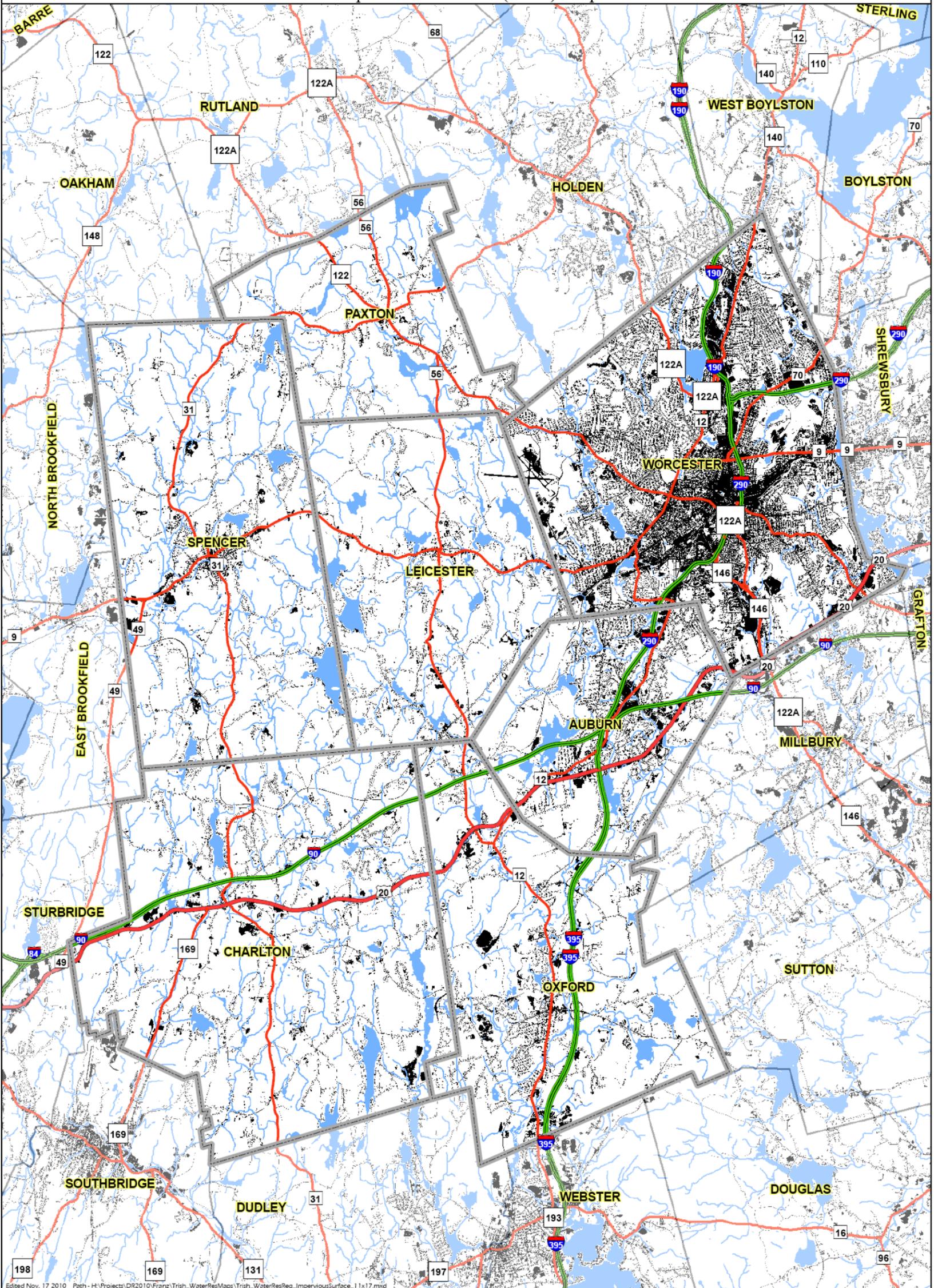
2010 GREATER LEICESTER WATER RESOURCE PROJECT 2005 Land Use Map





2010 GREATER LEICESTER WATER RESOURCE PROJECT

Impervious Surface (2005) Map



Edited Nov. 17 2010 Path: H:\Projects\DR2010\Franz\Trish_WaterRes\Maps\Trish_WaterRes\ImperviousSurface_11x17.mxd
 Source: Data provided by massDOT and the Executive Office of Environmental Affairs/MassGIS (EOEA/MassGIS).

Information depicted on this map is for planning purposes only. This information is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis. Use caution interpreting positional accuracy.

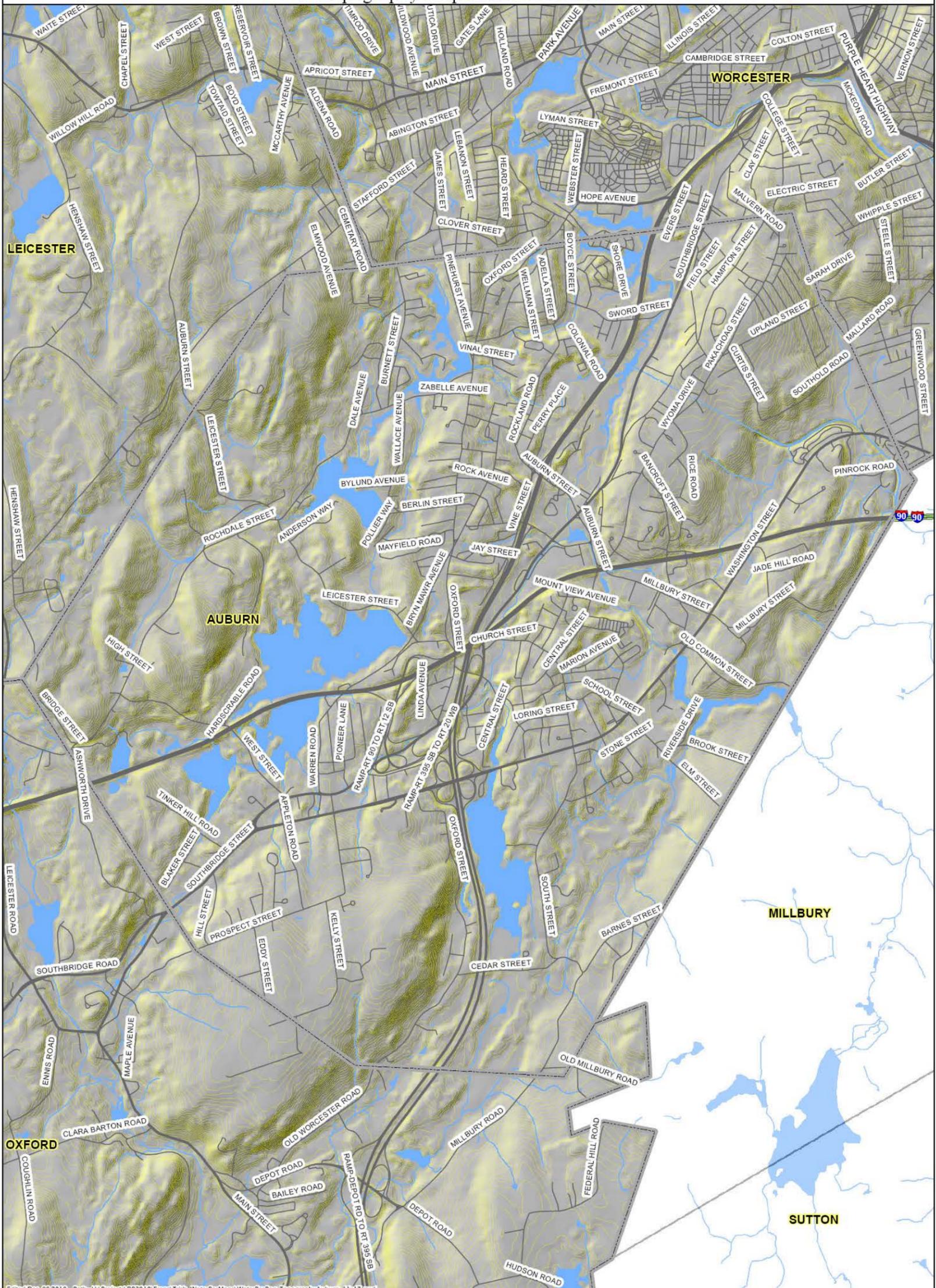


1 inch = 1.7 miles

- LEGEND**
- Town Boundaries
 - Water Bodies
 - Streams
 - Interstate
 - U.S. Route
 - State Route
 - Impervious Surface

2010 GREATER LEICESTER WATER RESOURCE PROJECT

Topography Map - Town of Auburn



Edited Dec. 08 2010 | Path: H:\Projects\DR2010\Franz\Trish\WaterResMaps\WaterResReq_TopographyAuburn_11x17.mxd

Source: Data provided by massDOT and the Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division.

Information depicted on this map is for planning purposes only. This information is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis. Use caution interpreting positional accuracy.

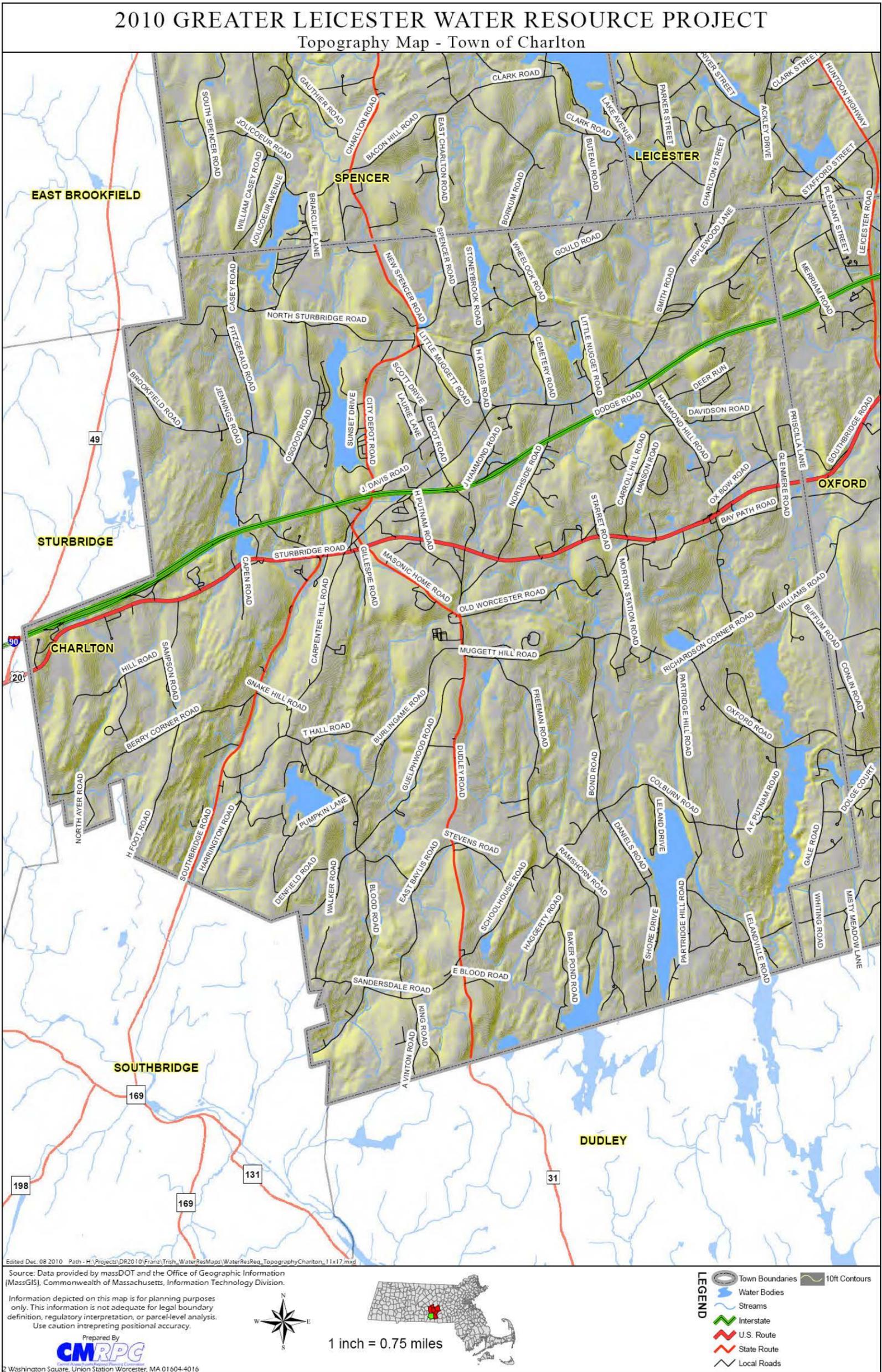


2 Washington Square, Union Station Worcester, MA 01604-4016

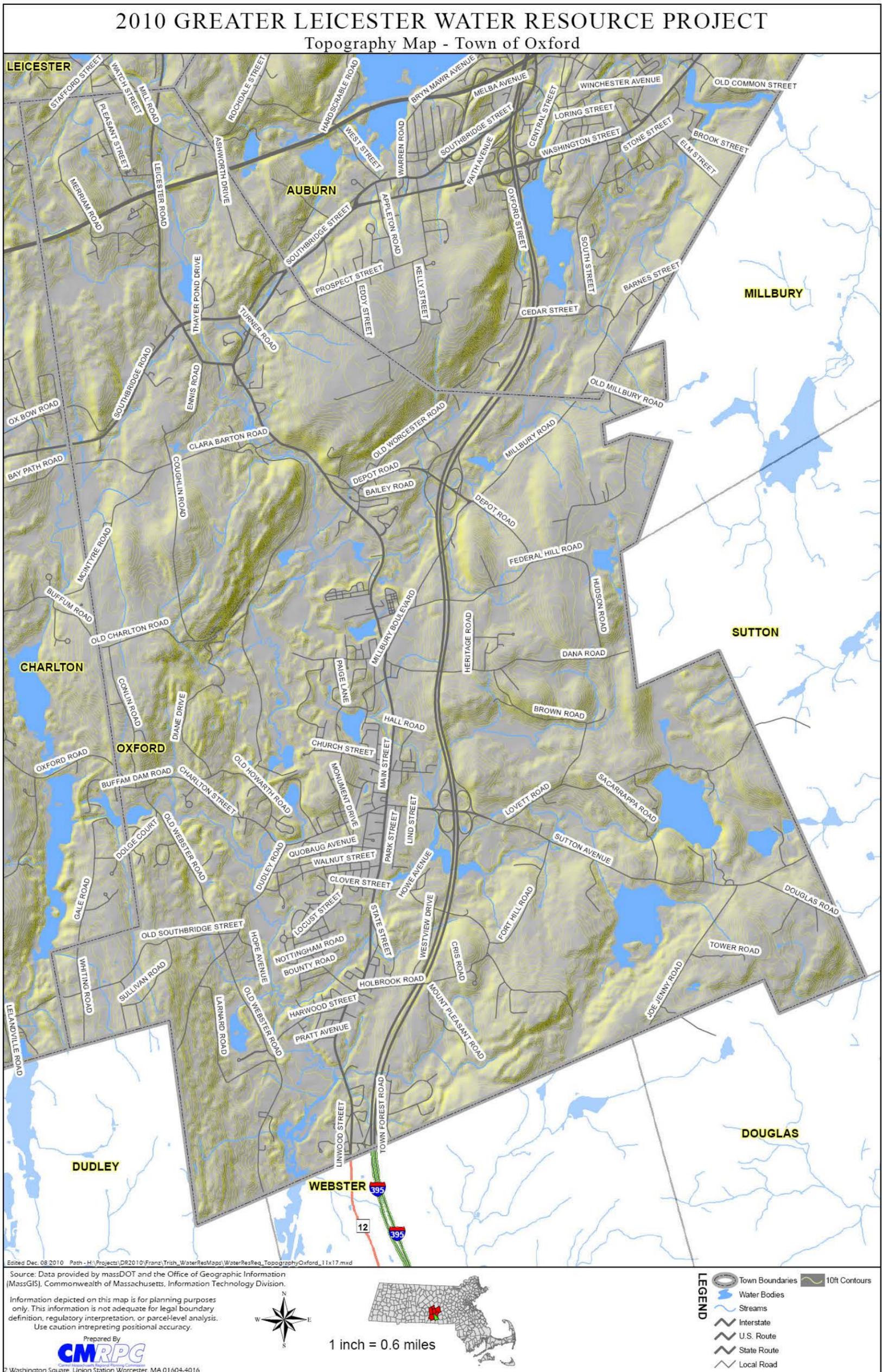


1 inch = 0.5 miles

- LEGEND**
- Town Boundaries
 - Water Bodies
 - Streams
 - Interstate
 - U.S. Route
 - State Route
 - Local Road
 - 10ft Contours

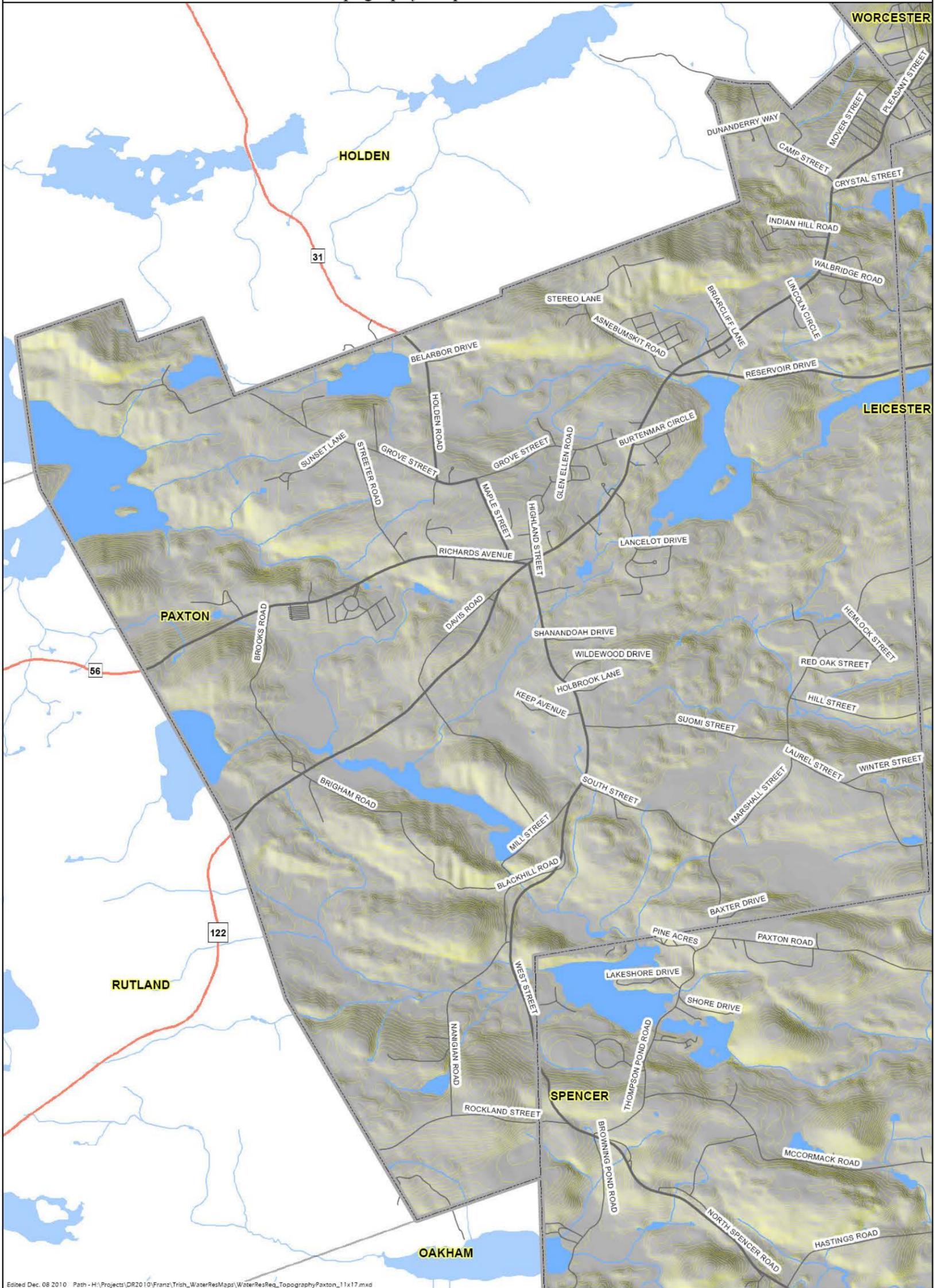






2010 GREATER LEICESTER WATER RESOURCE PROJECT

Topography Map - Town of Paxton



Edited Dec. 08 2010 Path - H:\Projects\DR2010\Franz\Trish_WaterResMaps\WaterResReg_TopographyPaxton_11x17.mxd

Source: Data provided by massDOT and the Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division.

Information depicted on this map is for planning purposes only. This information is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis. Use caution interpreting positional accuracy.



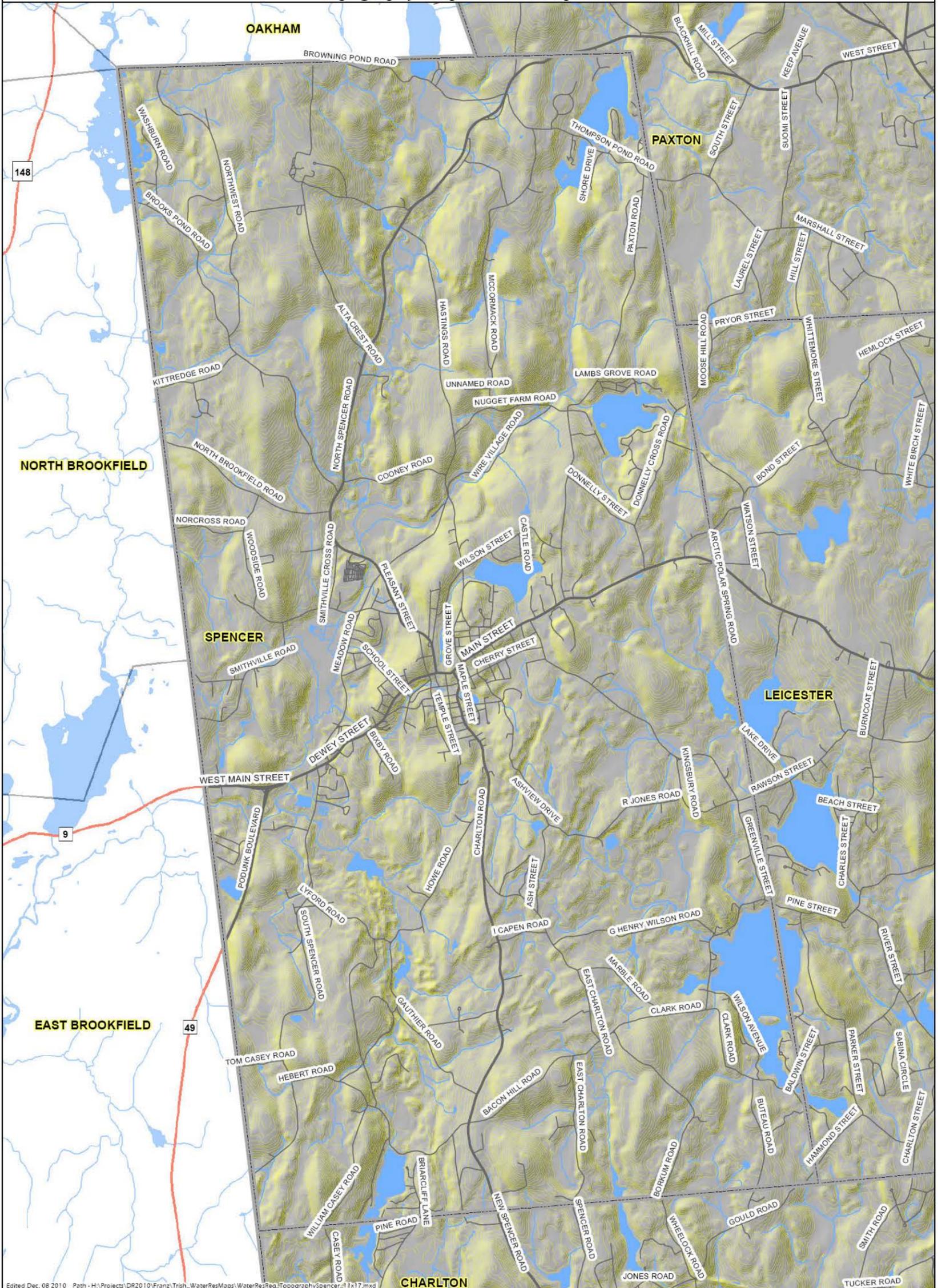
Prepared By
2 Washington Square, Union Station Worcester, MA 01604-4016



1 inch = 0.45 miles

- LEGEND**
- Town Boundaries
 - Water Bodies
 - Streams
 - Interstate
 - U.S. Route
 - State Route
 - Local Road
 - 10ft Contours

2010 GREATER LEICESTER WATER RESOURCE PROJECT Topography Map - Town of Spencer



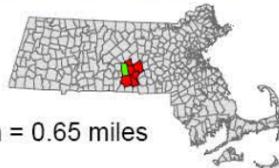
Edited Dec. 08 2010 Path - H:\Projects\DR2010\Franz,Trish_WaterResMaps\WaterResReq_Topography\Spencer-11x17.mxd

Source: Data provided by massDOT and the Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division.

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Prepared By
Washington Square, Union Station Worcester, MA 01604-4016

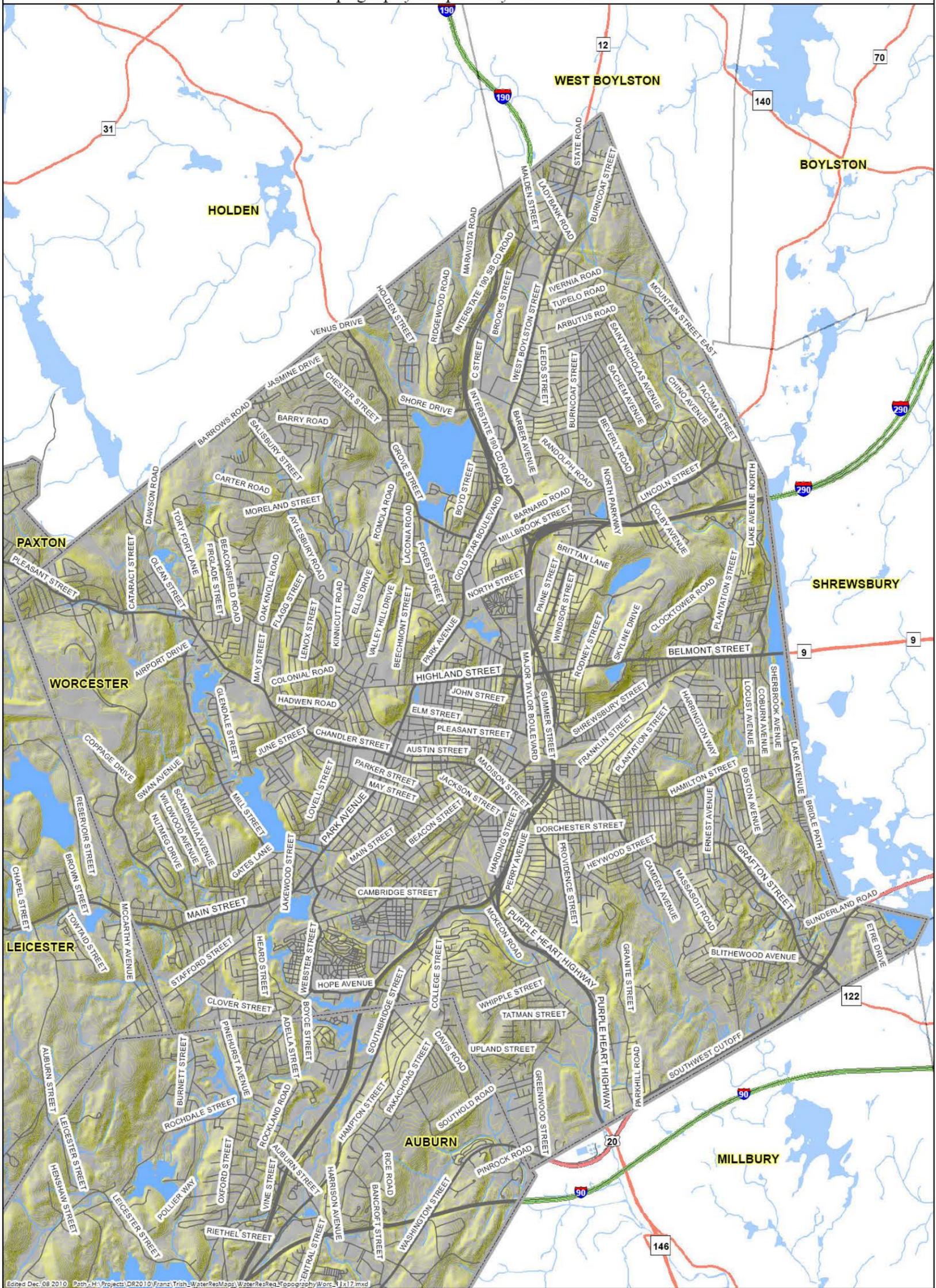


1 inch = 0.65 miles

- LEGEND**
- Town Boundaries
 - Water Bodies
 - Streams
 - Interstate
 - U.S. Route
 - State Route
 - Local Road
 - 10ft Contours

2010 GREATER LEICESTER WATER RESOURCE PROJECT

Topography Map - City of Worcester

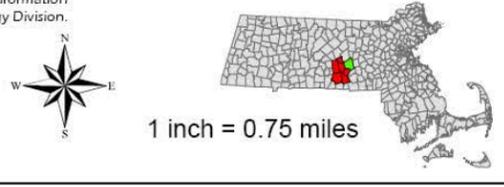


Edited Dec. 08 2010 Path: H:\Projects\DR2010\Franz, Trish_WaterRes\Map\WaterResReq_TopographyWorc_11x17.mxd
 Source: Data provided by massDOT and the Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division.

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2 Washington Square, Union Station Worcester, MA 01604-4016



- LEGEND**
- Town Boundaries
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