UNIVERSITY OF CONNECTICUT

WATER SUPPLY PLAN

MAY 2011

MMI #1958-31

Prepared for:

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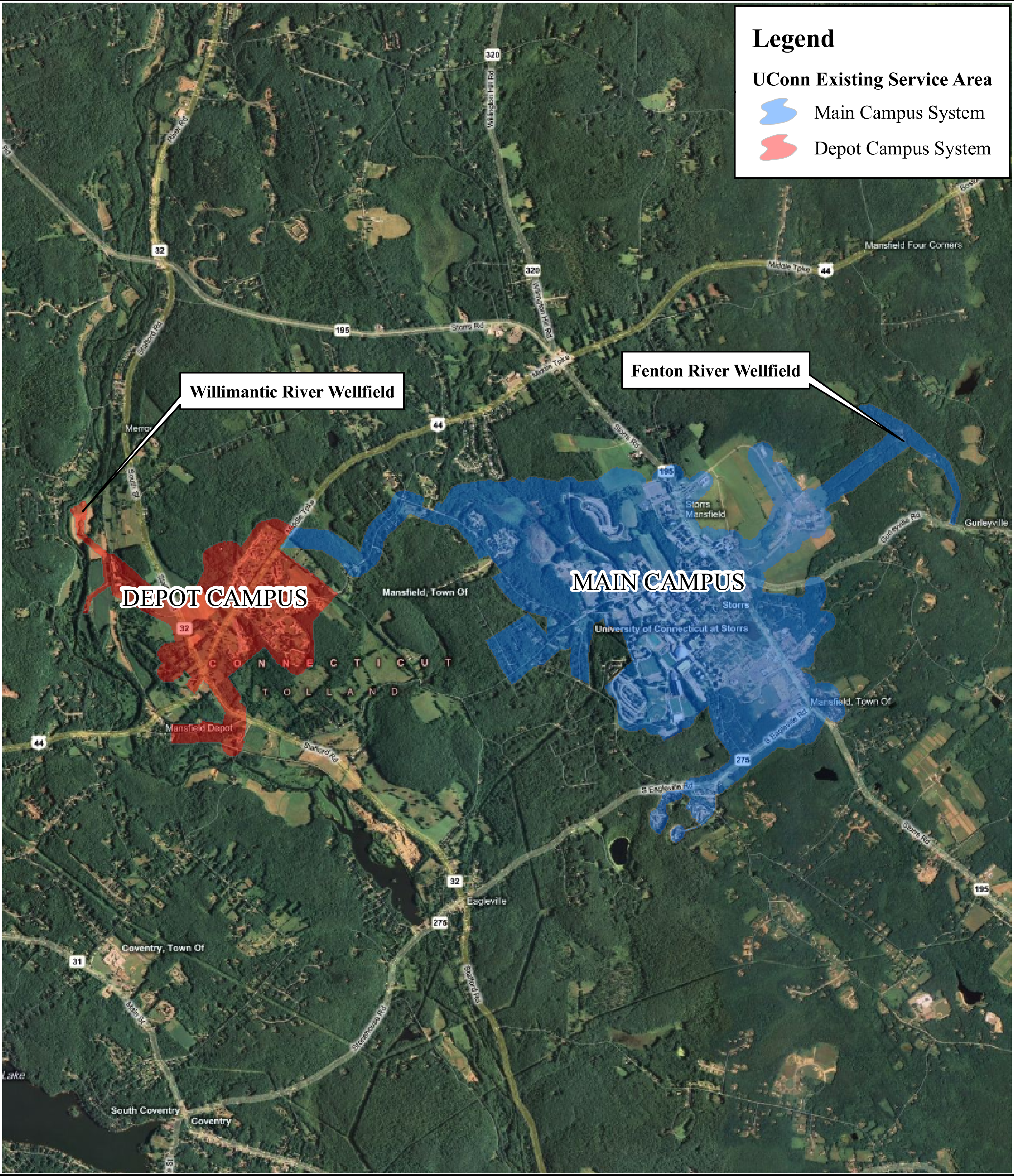
INTRODUCTION

1.0 INTRODUCTION

The University of Connecticut currently provides potable water to the area of Storrs, Connecticut and portions of the surrounding Town of Mansfield. This water supply plan is an update of the University of Connecticut ("University") *Water Supply Plan* dated November 2004, revised January 2006, and approved by the Connecticut Department of Public Health (DPH) on May 23, 2006. The subject water supply plan addresses both the Main Campus water system (public water system #CT0780021) and the Depot Campus water system (public water system #CT0780011) that are identified separately by the DPH[1]. Figure 1-1 depicts the area served by the University of Connecticut.

Certain regulated water utilities in Connecticut must complete water supply plans in accordance with Section 25-32d of the Connecticut General Statutes, Section 25-32d of the Regulations of Connecticut State Agencies, and the updated Water Supply Plan regulations[2] adopted in the year 2005. The Water Supply Plan regulations and the supporting statutes recognize that planning is a critical management activity of all water utilities. The principal goals of water system planning as defined by the DPH are to: (1) ensure an adequate quantity of pure drinking water, now and in the future; (2) ensure orderly growth of the system; and (3) make efficient use of available resources.

Although the University is not considered a "water company" as set forth in Connecticut General Statute (CGS) Section 25-32a, they view the *Water Supply Plan* as an integral device in planning for a safe and adequate water supply system through the foreseeable future. Thus, this plan addresses (when possible) the requirements of CGS Section 25-32d and the University will distribute the plan to reviewing agencies and interested parties for review and comment.



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University Water System

LOCATION: **Mansfield, CT**

MMI#: 1958-31
MXD: H:\Figure1-1.mxd
SOURCE: Microsoft

University of Connecticut Water Supply Plan

Map By: SJB
Date: 5/9/2011
Scale: 1"=3,500'

SHEET: **Figure 1-1**

The University is fortunate to have access to high quality drinking water through its Fenton River and Willimantic River wellfields. These resources have served the University for decades and will continue to serve the University for years to come. The supply and distribution system also includes a water treatment facility at each wellfield, three booster pumping stations, six water storage tanks, and 36 miles of water transmission and distribution mains.

Currently, the University withdraws water from eight production wells, with four production wells located at each wellfield. Seven of the eight wells are gravel packed wells, and all eight wells are constructed as high-capacity wells in stratified drift. Recent environmental studies, namely the "Fenton River Study" of 2006[3] and the "Willimantic River Study" of 2010[4], have demonstrated that operating the wells results in diminution of river flows. Under certain low river flow conditions, extended pumping may result in adverse environmental impacts. As such, both wellfields have been recently operated in accordance with individual management plans that have been consolidated in the *Wellfield Management Plan* developed in association with this Plan.

The University also has a considerable amount of water storage capacity with over eight million gallons (MG) available. This storage volume, in combination with the University's booster pump capacity and well production capacity, enables the University to accommodate all of its system demands, including peak day demands. The University could turn off its wellfields and be able to meet average day demand from storage alone for several days.

Average daily demand was 1.29 million gallons per day (mgd) in 2010. The construction and development of the "UConn 2000" and "21st Century UConn" initiatives have not adversely stressed the University's water system. In fact, the University is using less water today than it did back in the 1980s and early-to-mid 1990s. This is due to water conservation efforts and capital improvement programs aimed at reducing water leakage and overall consumption. The University continues to be committed to conserving water and installing water efficient devices in new construction.

This Water Supply Plan evaluates various components of the University's water system for the 5-, 20-, and 50-year planning periods. The five-year planning period is projected from the year of the plan preparation (2010). The 20- and 50-year planning periods are projected from the most recent decennial census (2010). Accordingly, these planning periods correspond to the years 2015, 2030 and 2060.

This Plan assesses the ability of the University to meet the intended goals of the Statutes and Regulations of the DPH, and outlines capital improvements and operations necessary to meet those goals in the future. The information contained in this Plan was obtained from a variety of sources, including a review of University files and written and verbal information obtained from University staff. Additional information was obtained from a review of reports and records relative to the water supply system that were formulated since the previous Plan. Where appropriate, portions of these documents have been incorporated.

Budgetary estimates are referenced in this document. These are preliminary estimates and are intended to be used for planning purposes only. Opinions of probable capital and operational costs are based on best estimates. Actual costs may substantially vary from the costs reported in this planning document.

Special thanks is given to the following individuals from the University, the Town of Mansfield, and The Connecticut Water Company for their time, effort, and input throughout the preparation of this plan:

- Mr. Thomas Callahan, Vice President, University of Connecticut
- Mr. Eugene Roberts, Facilities Operators Director, University of Connecticut
- Mr. Michael Pacholski, University of Connecticut (retired)

- Mr. Richard Miller, University of Connecticut Office of Environmental Policy
- Mr. Timothy Tussing, Facilities Manager, Water & Sewer, University of Connecticut
- Mr. Jason Coite, University of Connecticut Office of Environmental Policy
- Mr. Peter Puhlick, Utility Maintenance Engineer, University of Connecticut
- Mr. Stanley Nolan, Energy Engineer, University of Connecticut
- Mr. Lon Hultgren, Town of Mansfield Department of Public Works
- Mr. Gregory Padick, Town of Mansfield Planning Department
- Mr. Peter Pezanko, Contract Operator, Connecticut Water Company
- Mr. Robert Wittenzellner, Contract Operator, Connecticut Water Company

SECTION 2.0
WATER UTILITY STRUCTURE AND ASSETS

2.0 WATER UTILITY STRUCTURE AND ASSETS

2.1 HISTORICAL PERSPECTIVE

The water system at the University of Connecticut consists of wells and infrastructure developed by the University as well as those developed by the former Mansfield Training School (MTS). As such, the chronology of water system development is of interest and importance. The following excerpts are reprinted in part from the 1999 Water Supply Plan, the 2004 Water Supply Plan, and information contained in a variety of other sources.

1880 – 1910:

- The Connecticut General Assembly established the Storrs Agricultural School in 1881 after accepting 170 acres of land, several buildings, and money from Charles and Augustus Storrs. The Storrs Agricultural School opened on September 28, 1881 with 12 students.
- The name of the agricultural school was changed to Storrs Agricultural College in 1893, and the name was again changed to the Connecticut Agricultural College in 1899.
- It is speculated that the source of water during this time was a shallow dug well on the main campus.
- In 1905 or 1906, the College's annual report recommended elimination of an eastward sewage outfall to avoid a possible typhoid infection of the City of Willimantic water supply.

1910 – 1920:

- The College's biennial report for 1912-1914 quoted the president as saying "The sewage from the eastern side of campus, the drainage from which is toward the Fenton River, the source of the City of Willimantic water supply, is now diverted and filtered, the effluent finding its way to the Willimantic River on the opposite side of the watershed."

- The first MTS buildings were constructed on the site of the present Depot Campus from 1913 to 1919. This facility was a self-sufficient residential hospital complex and its lands included the present site of the Willimantic River Wellfield.
- According to a 1960s hydrogeologic report[5] prepared by the United States Geological Survey (USGS), the water source was a 240-inch diameter dug well at the Willimantic River Wellfield installed to a depth of 16.5 feet. The well was installed around the year 1913. This dug well is known as MTS Well #1.
- In 1914, the University erected a 0.3 MG standpipe for water storage at what is now the Towers site. The source of water is not known.

<u>1920 – 1930:</u>

- In 1921, the Town of Mansfield constructed a water treatment plant at Pink Ravine at the intersection of Bonemill Road and Ravine Road. The plant treated water from Cedar Swamp Brook using rapid sand filtration and utilized a pump station to supply to both MTS and the University. The demand at this facility was reportedly 100,000 gallons per day (gpd).
- A six-inch pipeline is believed to have extended from MTS through Pink Ravine and to the University. Portions of this old main served the former poultry facility on Bonemill Road and a nearby pasture. The line was capped off beyond the poultry facility in June of 1999, and recently capped again at Meadowood Road.
- With State funds awarded to the College and the Town of Mansfield, the College developed Well A at the Fenton River in 1926-1927 to replace the Pink Ravine Facility. A ten-inch pipeline connected Well A to the College, with water stored in two water tanks on campus. The first tank was the 0.3 MG installed in 1914 at the current Towers site. The location of the second water tank is unknown.

- The Pink Ravine facility reportedly was disconnected from the University in 1927 after the development of Well A, although it is possible that the facility continued to serve MTS and may have been considered an emergency source by the University.

1930 – 1940:

- In 1933, the Connecticut Agricultural College became the Connecticut State College, and in 1939 became known as the University of Connecticut.
- 1934 aerial photographs[6] show three water storage tanks at MTS near the present location of a 0.75 MG tank. Two appear to be of a similar size and are installed adjacent to each other while a third smaller tank sits to the southwest. The photographs also depict the recently-replaced chemical treatment building at the Willimantic River Wellfield, suggesting that this building was in place prior to 1934.
- The 1934 aerial photographs[6] show two water storage tanks at the present-day Towers site.
- The graduate school was established in 1940.
- The 1940 USGS topographic map[6] also shows three storage tanks at MTS in the same area as the 1934 aerial photographs. The Towers tanks are shown as a single structure (black square).

1940 – 1950:

- MTS performed investigations in the early 1940s culminating in a 1945 report on water supply facilities and a yield test of MTS Well #1. MTS Well #1 was supplemented by MTS Well #2 in 1948.
- In 1949, the University developed Well B and Well C at the Fenton River Wellfield. The University also constructed a 50,000 gallon (twin 25,000 gallon) clearwell basin at the wellfield in 1949.

1950 – 1960:

- The 1951-1952 aerial photographs[6] show three water storage tanks at MTS and two water storage tanks at Towers as in the 1930s.
- The University constructed a 1,000 gallon per minute (gpm) pump station and a 12-inch pipeline from the Fenton River Wellfield to the campus in 1954.
- The present-day 1.0 MG storage tank at Towers was constructed in 1954.
- MTS constructed a 0.5 MG storage tank in 1954 on the east side of the school and in 1958 constructed a 0.75 MG water storage tank near the existing tanks at the school. The residential population of MTS was nearing its peak at that time.
- MTS also constructed MTS Well #3 at the Willimantic River Wellfield in 1958. This well supplemented MTS Well #2 and MTS Well #1 became an emergency source.
- The University constructed Well D at the Fenton River Wellfield in 1958.

1960 – 1970:

- MTS Well #1 was disconnected in 1961 due to insufficient yield.
- The MTS water system was reportedly "interconnected" with the University system in 1964 to provide redundancy to both systems. This interconnection likely utilized the existing six-inch main along Bone Mill Road that had been in place since the 1920s and had technically interconnected the two systems since that time, although transfer pumps to move water from one system to another may not have been in place prior to the 1960s.
- The 1965 aerial photographs[7] show the recently constructed water tanks at MTS and the main campus. The 0.75 MG tank installed in 1958 at MTS appears to have replaced the "twin" tank that was located between the smaller tank and the other "twin" tank.
- In 1969, the University reached an agreement with MTS where the University would be granted exclusive use of the land at the Willimantic River Wellfield and certain parcels surrounding MTS.

  - This agreement included MTS Well #1, MTS Well #3, the treatment building, and the water storage towers northwest of Route 44. The University would provide MTS with potable water.
  - MTS retained the usage of MTS Well #2 as an emergency source and the Bone Mill Road 0.5 MG storage tank. MTS Well #2 was typically run for a few months each year through 1990 to supplement the water supply as a back-up well.
  - The University renamed MTS Well #3 to Well #3.
- The 1970 aerial photographs[6] show the water storage tanks in a similar layout to the 1965 aerial photographs.

1970 – 1980:

- The University installed Well #1 in 1970 and installed Well #2 in 1974 at the Willimantic River Wellfield.
- A 1971 report noted that fire flows were inadequate on the edges of the distribution system. Mains were reportedly cleaned to increase pressure.
- A 5.4 MG underground storage reservoir was built at W-lot in 1972, with a water treatment facility and a pumping station to the storage tanks at the Towers site. The Willimantic River Wellfield was connected to the new reservoir with a 4.5-mile 16-inch transmission main.
- The 0.6 MG tank and the 1.0 MG tank at Towers were overhauled in 1980.

1980 – 1990:

- The University registered its seven wells with the Connecticut Department of Environmental Protection in 1982. MTS registered MTS Well #2 separately.
- The University extended its system to 11 homes on Hunting Lodge Road where owners were concerned about potential well contamination. These were the first non-MTS off-campus customers.

- A propane emergency generator was installed at Well #3 in 1986. Two 1,000 gallon underground propane tanks were located at the wellfield; these have since been replaced with above-grade tanks.
- Cracks in the 5.4 MG reservoir were filled and the top of the tank was resealed in 1987.
- In 1988, 15 additional homes, the Storrs Friends Meeting House, and Celeron Square Apartments were connected to the system on Hunting Lodge Road.
- The Town of Mansfield and the University entered into a "Sewer & Water Service Agreement" in January 1989. The University agreed to provide services in the South Eagleville Road and Maple Road area to various Town-owned buildings.
- The University submitted its first Water Supply Plan to the Department of Health Services (now DPH) in 1989. Water usage peaked in 1989.
- The University commissioned an inspection of the 0.3 MG storage tank at Towers in 1989.
- The University installed a diesel generator for emergency power at Well #1 in 1990.
- The University commissioned an inspection of the 0.6 MG storage tank at Towers in 1990.

<u>1990 – 1995:</u>

- The University commissioned an inspection of the 5.4 MG reservoir in 1991. Cracks in the tank were filled and the top of the tank was resealed that year.
- The University commissioned an inspection of the 1.0 MG storage tank at Towers in 1991.
- The University conducted leak detection surveys at MTS and corrected deficiencies in 1991 and 1993.
- The University removed the propane tank next to MTS Well #2 in June 1993.
- MTS was closed and officially transferred to the University on July 1, 1993. As such, MTS Well #2 came under the control of the University. MTS became known as the Depot Campus.

- The University submitted a revision of its first water supply plan in 1993 with updates in 1994 to reflect the closure of MTS.
- Well #2 was redeveloped in 1993-1994.
- The University commissioned an inspection of the 0.75 MG storage tank in 1993 and the 0.5 MG storage tank in 1994 at the Depot campus.
- The University conducted a "Ground Water Under the Direct Influence of Surface Water" study from 1993 to 1994. It was subsequently determined that neither wellfield was under the direct influence of surface water.
- The University constructed a generator building and installed an emergency generator at the Fenton Wellfield in 1994. This structure provides emergency power to all four Fenton wells and the pump house.
- The UConn 2000 legislation (Public Act 95-230) passed in 1995, providing $96 million in funding to rebuild and renew the University. This amount was later increased to one billion dollars in a ten-year program.
- The registration for MTS Well #2 was transferred to the University in August 1995.
- Water treatment facilities were replaced in 1995.

<u>1996 – 2000:</u>

- In 1996, the University contracted a firm to conduct a leak detection survey at the Depot Campus and at problem areas associated with the main campus. Noted deficiencies were repaired.
- The levels of lead and copper in the Depot Campus system exceeded the action level in 1996. This issue was subsequently corrected by adjusting the pH at the Depot Campus treatment plant.
- The University constructed Well #4 at the Willimantic River Wellfield in 1998 to replace the function of MTS Well #2. This well was installed nearby MTS Well #2, which is now inactive.
- The University officially abandoned MTS Well #1 in December 1998 and dismantled the associated pump house.

- Most of the residences on Hunting Lodge Road were connected to the water system by the end of 1998.
- Two booster pumps were constructed in 1998 to address fire protection pressure problems. The first was installed in the Central Utility Plant (CUP) and the other was installed in the new South Campus Chiller Plant. New and renovated buildings in the UConn 2000 program also installed sprinkler systems to provide more efficient fire protection.
- The University submitted its second water supply plan in 1999.
- Meters were installed on each Fenton well in 1999. Prior to this time, only the total flow from the wellfield was metered.
- The storage tanks at the Depot campus were rehabilitated and repainted in 1999 and 2000.

2000 – 2005:

- The University revised its third water supply plan for approval in 2001.
- Level A Mapping of the Fenton River Wellfield was completed in 2001.
- The Town of Mansfield prepared its own water supply plan in 2002.
- The maximum contaminant level of total coliform bacteria was exceeded in October 2001 and September 2003 in the main campus system. No *E. Coli* bacteria were found in any of the samples. Mechanical problems at the chlorinators were believed to have caused these incidents. Repairs were made and the public was notified.
- An elevated level of fluoride was detected in a sample at the Fenton River pump station in December 2002. Subsequent samples were within the normal range. Public notification was made.
- The University had a monitoring and reporting violation in its December 2002 water samples. The sample submitted for cyanide was considered "unsatisfactory for examination" by the laboratory. The University re-sampled for cyanide in January 2003 (none was detected) and issued public notification regarding the violation.

- The Towers Loop Pump Station was activated in 2003. This facility services the Charter Oak Apartments/Suites and the Husky Village (Greek Housing) complexes.
- Based on the success of the UConn 2000 program, the Connecticut General Assembly enacted the "21st Century UConn" legislation in 2003 that committed an additional $1.3 billion dollars for the continuation of capital improvement programs.
- Approximately seven residential dwellings on Meadowood Road and North Eagleville Road were connected to the water system in 2004.
- The University submitted its third water supply plan in 2004 (approved in 2006).

2005 – 2010:

- A series of events in summer 2005 lead to the desiccation of a section of the Fenton River. These events included drought conditions and low river flows, high demands for potable water upon the return of students in August-September, high nonpotable water demands at the Central Utility Plant, and a water management scheme that caused more water to be withdrawn from the Fenton River Wells than current practice tends to allow.
- The "Fenton River Study" was completed in 2006. This report suggested successive cutbacks in the pumping rate of the Fenton River Wellfield during low-flow periods, with wellfield shutdown occurring when the Fenton River is flowing below 3.0 cubic feet per second (cfs). In the summer of 2006, the University began operating the Fenton River Wellfield as suggested by the study.
- Level A Mapping of the Willimantic River Wellfield was completed in 2007 and subsequently approved by DEP.
- The University's Water and Wastewater Advisory Committee convened in 2007. The committee includes University and Town of Mansfield officials. These officials continue to meet on a quarterly basis to discuss growth and usage of the water and wastewater systems.
- The University prepared a *Water and Wastewater Master Plan* in 2007 that was subsequently approved by DPH. The Water and Wastewater Master Plan provided a

comprehensive review of the existing water and wastewater infrastructure as well as the operations and management of both systems; an inventory of future infrastructure needs; and a discussion of potential future water supplies.

- The University prepared a draft *Drought Response Plan* in 2008 that tied projected available supply to projected water usage and set five stages of water conservation measures.
- The "Willimantic River Study" was completed in 2010. This report suggested successive levels of voluntary and mandatory conservation measures be instituted by water users to reduce production at the Willimantic River Wellfield during low-flow periods.
- The University began operating the Willimantic River Wellfield as suggested by the Willimantic River Study in the summer of 2010, with the understanding that a *Wellfield Management Plan* would be included as part of the subject Water Supply Plan to formalize the operations involving the two wellfields.

Recent Improvements:

- The two smaller Towers water storage tanks were replaced with one new 1.0 MG tank in 2010-2011.
- The Willimantic River Wellfield chemical treatment facility was replaced in 2010-2011.

2.2 ORGANIZATIONAL STRUCTURE

The University's water systems are owned and controlled by the University. The Board of Trustees serves as the governing body on all drinking water matters concerning these systems. University administration related to the water systems include:

- Dr. Philip Austin is the interim President of the University and oversees the day-to-day operation of the University.
- Mr. Richard Gray is Vice President and Chief Financial Officer.
- Mr. Barry M. Feldman is Vice President and Chief Operating Officer.
- Mr. Eugene Roberts is the Director of Facilities Operations and he is responsible for oversight of construction contracts, operation contracts, cross-connection control improvements, oversight of all utilities, and billing. Assistance is provided by the following individuals:
  - Mr. Pete Puhlick is the Utility Maintenance Engineer.
  - Mr. Tim Tussing is the Water & Sewer Facilities Manager.
  - Mr. Dick Brand is the maintenance supervisor for plumbing and mechanical utilities.
  - Ms. Wendy Salisbury is the Facilities Operations Accountant.
- Mr. Kenneth Egeberg is the Director of Architectural, Engineering, and Building Services. He is responsible for architectural and engineering mattes, including "UConn 2000" and "21st Century UConn" projects. His office also oversees contracts pertaining to construction and water system infrastructure projects.
- Mr. Richard Miller is Director of the Office of Environmental Policy. He is responsible for ensuring environmental accountability and compliance in planning, construction, permitting, and operational decisions, as well as working on environmental sustainability initiatives including water conservation.
- Mr. Jason Coite of the Office of Environmental Policy assists Mr. Miller on matters related to water supply.

An organizational chart related to water system management is included as Figure 2-1.

Figure 2-1 Water System Management

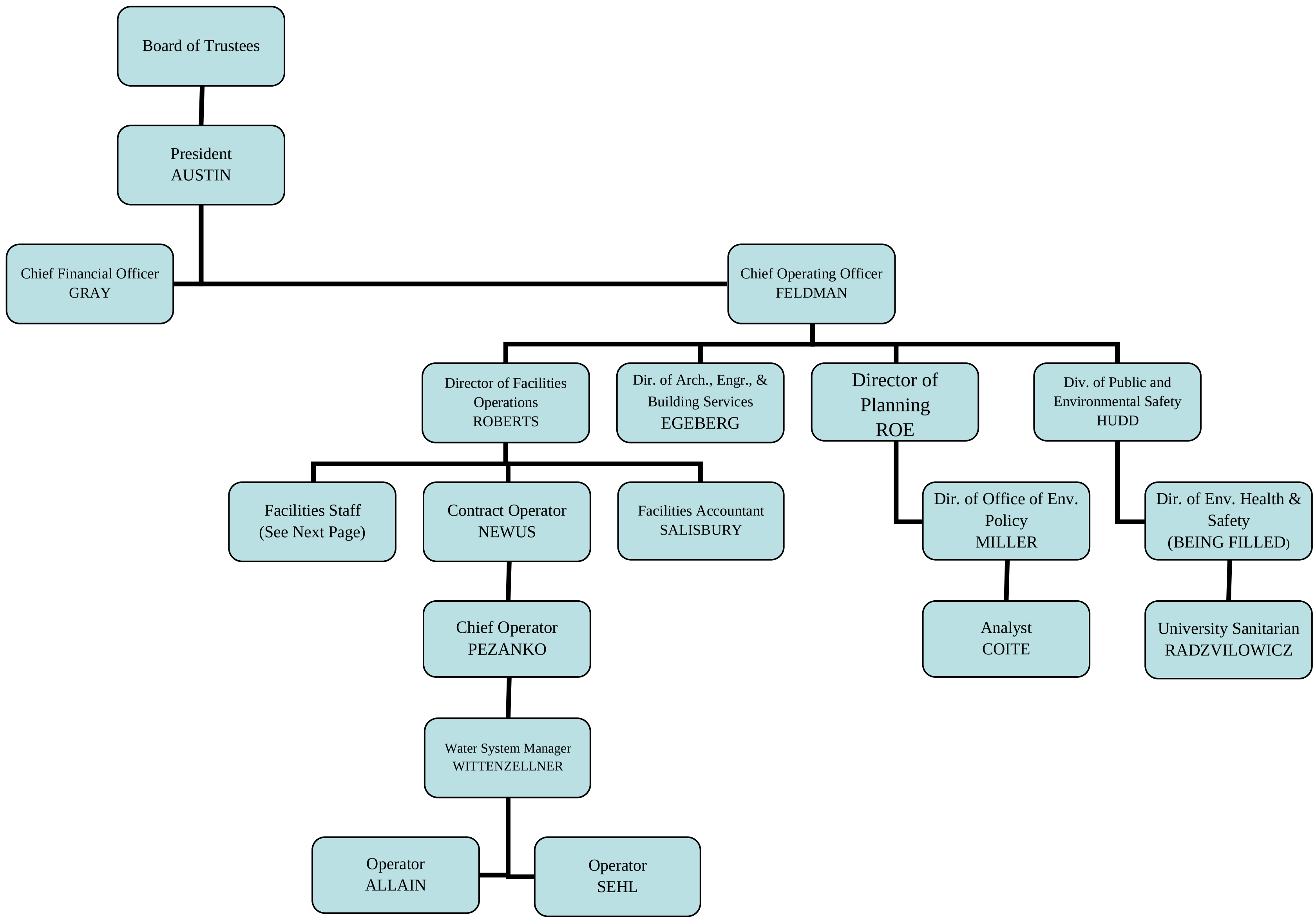
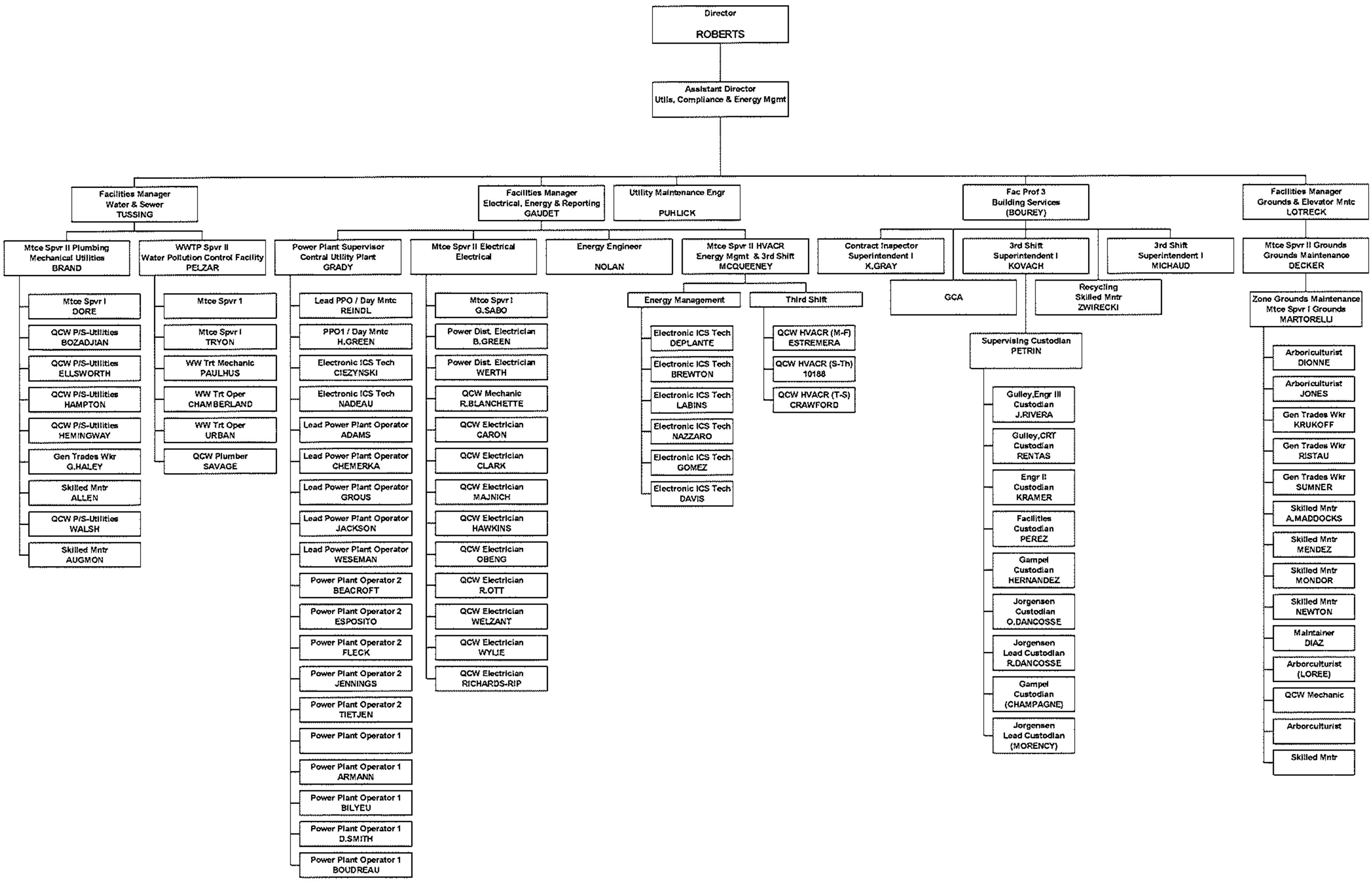


FIGURE 2-1

STORRS FACILITIES OPERATIONS
July 2010



The contract operator for the water system is the Connecticut Water Company (CWC) through its subsidiary, New England Water Utility Services (NEWUS). NEWUS staff are responsible for the day-to-day operation of the water system and for ensuring that water quality meets state and federal drinking water standards. NEWUS is also responsible for providing 24-hour response to water system emergencies. NEWUS staff includes a water system manager, water system backup manager, and a water system operator.

- Mr. Robert Wittenzellner is the water system manager. His responsibilities include:
  - Scheduling and supervising the water system operators;
  - Preparing regular management reports to University personnel;
  - Preparing and updating Standard Operating Procedures for all water system stations;
  - Preparing and implementing a Preventative Maintenance Program for all water system equipment;
  - Supervising purchasing of supplies and equipment;
  - Supervising the preparation of regulatory reports and Consumer Confidence Reports;
  - Providing direction to the University's on-site primary and/or backup managers to direct the water system staff in the operation of the water systems; and
  - Is primary contact for the media with regard to operational issues with the water system.
- Mr. Peter Pezanko is the backup manager and chief operator. His responsibilities are similar to those listed above.
- Mr. Raymond Allain is the assigned water system operator. His responsibilities include:
  - Performing system checks of the Depot and Main Campus treatment and pumping stations;
  - Collecting Connecticut DPH required water quality samples and delivering the samples to a DPH-approved laboratory for analysis;

- Logging production and/or distribution meter readings;
- Monitoring equipment;
- Maintaining appropriate station logs; and
- Monitoring the treatment processes and providing for batch treatment chemicals as needed.

Additional water system operators are assigned from the Mansfield office of CWC as needed for on-site operation and maintenance of water systems on weekends, holidays, after-hours emergencies, and special tasks such as flushing and cross-connections.

2.3 OPERATOR CERTIFICATION

Section 25-32-9 of the Connecticut Public Health Code (PHC) requires all regulated community water systems with treatment to employ at least one operator who is a certified treatment plant operator. Section 25-32-11 of the PHC requires that a certified distribution system operator is required for regulated systems serving 1,000 or more people. A cross connection inspector and backflow prevention tester must be certified as well.

The University has contracted day-to-day operations of the water systems to CWC to operate its water system consistent with PHC requirements. CWC personnel who hold treatment plant operator, distribution system operator, and cross connection certifications and are involved in the operation of the University's water system are listed on Table 2-1. Copies of individual certificates are included in Appendix A.

TABLE 2-1
Summary of State Certifications

Individual	Certification Type	Certification Number
Raymond Allain	Class II Distribution System Operator	204218
Robert Sehl	Class II Distribution System Operator	203185
Robert Wittenzellner	Class III Distribution System Operator	201148
Robert Sehl	Class I Water Treatment Plant Operator	204197
Robert Wittenzellner	Class II Water Treatment Plant Operator	191179
Raymond Allain	Class V Water Treatment Plant Operator	203137
Robert Wittenzellner	General Tester/Inspector	204190
Raymond Allain	General Tester/Inspector	204179
Robert Bell	General Tester/Inspector	204198

2.4 LEGAL AUTHORITY AND CONTRACTUAL AGREEMENTS

The primary function of the University water supply system is to provide the University with an adequate water supply. State legislation was passed in 1949 authorizing the University to supply water, sewer, garbage, and waste disposal services. That legislation was amended in 1967 via Section 10-143 of the Connecticut General Statutes (GGS), which was transferred to CGS Section 10a-138 in 1983. This statute reads that *"The University of Connecticut is authorized to furnish, for compensation, running water and sewage, garbage, and waste disposal service for any property owned or occupied by it or in which it has an interest by reason of a possibility or reverter or of a restriction on alienation in its favor."*

A number of informal and formal commitments and agreements are in place for the University of Connecticut water system. These are described below:

- An agreement was reached in 1969 between the MTS and the University that transferred ownership of the Willimantic River Wellfield to the University. This agreement provided the University with the necessary infrastructure and potential well locations to service the University in the 1970s. The agreement stipulated that the University would serve MTS. A second agreement was reached in 1993 that transferred the ownership of lands and water system infrastructure held by MTS to the University after MTS closed. Thus, MTS became part of the University and known as the Depot Campus. Some of the MTS lands were transferred to the Connecticut Department of Corrections and remained connected to the water system. Homes on Old Colony Road and Spring Manor Lane remained on the system as well. These agreements document the formation of the current water system but do not commemorate arrangements with separate water systems and/or municipalities; therefore, copies are not included in this plan.

- In the mid-1980s and then again in 2003-2004, the University reached a series of agreements to serve residential properties on and near Hunting Lodge Road where owners were concerned about potential contamination of their private water supply by the former University landfill. Legal agreements are believed to be in place for some of these commitments. Because these are agreements with individual customers, copies are not included in this plan.

- In May 1989, the University and the Town of Mansfield reached an agreement to provide water and sewer service to Town-owned properties on and near South Eagleville Road. A copy of the agreement is included in Appendix B. The agreement specifies which Town-owned properties were to be served by the University water system. Although the agreement sets a few parameters such as occupancy of 500 people in Glen Ridge and 120 beds for a health care facility, it does not provide for any set quantities of water. The agreement expired after five years but provides for a year-to-year renewal until termination by either party. To date, renewals have not been pursued by either party. Likewise, neither party has terminated the agreement.

- The University contracted NEWUS to operate its water system in 2006. The water system management contract was rebid, and NEWUS was awarded a new contract in 2010. Copies of operational contracts are maintained in University files and are not appended to this plan.

- The University's two water systems are not currently interconnected with any other public water systems. As such, the University does not maintain any legal contracts or agreements with other water utilities.

- The University has committed to serving four areas of future development and corresponding water service. These are: (1) the "Storrs Center" development; (2) future development in the North Campus area (part of the main campus); (3) future development at the Depot Campus; and (4) future development in the King Hill Road area adjacent to North Eagleville Road. Section 6.2.5 of this plan includes a detailed discussion of these future committed demands. Legal agreements are not in place for these four commitments.

The process for entering into a new agreement with the University for water service has been formalized. If any party is interested in securing a commitment for future water supply, he or she must submit a request to the University's Water and Wastewater Advisory Committee. The committee includes University and Town of Mansfield officials. These officials meet on a quarterly basis to discuss growth and usage of the water and wastewater systems. Specific charges of the committee include the following:

- Review operational and environmental performance;
- Review maintenance and improvement plans;
- Review requests for new connections;
- Review water supply plans and other significant assessments;
- Review annual consumer confidence reports;
- Provide and notice at least two public opportunities for comment per year;

- Report annually to the University's Board of Trustees and Mansfield Town Council; and
- Review Town of Mansfield and University source protection and aquifer protection activities

2.5 FINANCIAL PROGRAM

The water supply system that serves the Main Campus and the Depot Campus is owned by the University. The University is funded through operating and capital funds. Recent major water system improvements have come through two major sources of capital funding. These funding initiatives are known as "UConn 2000" and "21st Century UConn." The following is a brief overview of these programs:

- Public Act 95-230 was passed by the Connecticut General Assembly in 1995. More commonly known as the "UConn 2000" Act, this act became a ten-year, $1 billion program, with over 100 capital improvement projects completed.
- The success of the "UConn 2000" program led the Connecticut General Assembly to enact "21st Century UConn" legislation in 2003 that committed an additional $1.3 billion for continuation of the capital improvement projects began under the "UConn 2000" program.

In addition to these initiatives, the University also receives operating funds from the State of Connecticut and revenue from the sale of water to private and commercial customers. The University's water rate schedule over the past 25 years for private single-family homes and commercial establishments is shown in Table 2-2. The University charges a flat consumption rate for single-family connections that are not yet metered. A flat rate meter charge is levied to all customers with meters to cover the cost of reading meters. Metered customers are also charged for actual consumption of water. A declining block rate structure for commercial users was utilized through 2006, but the University currently uses a flat rate for commercial customers.

TABLE 2-2
Summary of Water Rates

Year	Residential	Commercial		
	Single-Family Unmetered	***First 1,200 cf***	***Next 10,000 cf***	***Over 11,200 cf***
1985-1986	$25.00	$25.00	$1.50/hcf	$1.00/hcf
1987-1988	$150.00	$25.00	$1.50/hcf	$1.00/hcf
1989	$160.00	$50.00	$1.75/hcf	$1.35/hcf
1990	$176.00	$55.00	$1.93/hcf	$1.48/hcf
1991	$185.00	$60.00	$2.03/hcf	$1.56/hcf
1992-1993	$185.00	$60.00	$2.03/hcf	$1.56/hcf
1994	$195.00	$63.00	$2.13/hcf	$1.64/hcf
1995	$225.00	$72.00	$2.45/hcf	$1.89/hcf
1996-1998	$270.00	$108.00	$2.54/hcf	$2.03/hcf
1999-2003	$300.00	$108.00	$2.54/hcf	$2.03/hcf
2003-2006	$315.00	$113.00	$2.54/hcf	$2.03/hcf
2006-2010	$340.00	$3.05/hcf		

Notes: "cf" = cubic feet; "hcf" = hundreds of cubic feet.
The University currently has a quarterly meter charge of $25.00 per quarter or $100 annually. Metered residential customers are also currently charged $3.05/hcf.

The amount of revenue collected for water and sewer service from private and commercial users for each year since 1999 is shown in Table 2-3. Total revenue is also shown. The amount of revenue generated from the sale of water is estimated to be approximately 50% of the figures shown.

TABLE 2-3
Water & Sewer Annual Revenues

Year	Single Family Residential	Commercial Accounts	Total
1999	$47,750	$201,336	$249,086
2000	$54,030	$284,295	$338,325
2001	$54,150	$175,959	$230,109
2002	$54,900	$302,356	$357,256
2003	$80,175	$412,572	$492,747
2004	$27,075	$576,736	$603,811
2005	$56,382	$473,601	$529,983
2006	$57,638	$458,193	$515,831
2007	$96,684	$443,050	$539,734
2008	$92,700	$490,836	$583,536
2009	$114,012	$747,890	$861,902

The income from the charges made to non-University users would not support a water company with a system the size of the University's. This revenue is not considered to be a main source of income. State funding remains the primary source of income for the water supply system. The total operating costs are spread over several University departments such that it is difficult to differentiate water system operating funds from each budget.

The University has made several financial commitments to the improvement of its water supply system over the past few years totaling over $14.6 million. The following is a list of projects performed in relation to the water supply system outlined in the "University of Connecticut Comprehensive Water Supply Strategy for 2007-2009."

TABLE 2-4
Recent Water Supply System Upgrades and Initiatives

Description	Cost
Fenton River Instream Flow study	$564,000
Fenton River invertebrate study	$87,000
Water Supply Master Planning	$115,000
Water Conservation Study	$78,000
Willimantic River Level A Study	$9,700
Water System Hydraulic Study	$45,000
Reclaimed Water Feasibility Study	$25,000
Willimantic River Instream Flow Study	$173,000
NEWUS Operation and Management (2006-2009)	$667,000
Streamflow gauge operation (by USGS, per year)	$30,000
Compliance and Sustainability	$300,000
Total Initiatives	**$2,093,700**

TABLE 2-4 (Continued)
Recent Water Supply System Upgrades and Initiatives

Description	Cost
Production meter cleaning and calibration[1]	$5,605
Repair Depot water treatment meter and replace flow chart recorder	$2,965
Troubleshoot Fenton well pacing	$2,090
Install High Head level with chart recorder	$4,650
Repair Willimantic transmission line	$677,000
Complete distribution mapping	$600
Replace pumps on Willimantic Wells 1 & 3	$146,975
Install Willimantic pump controls / protection – Wells 1 & 3	$1,520
Replace Fenton production meters	$14,720
Flow test Fenton booster pumps	$620
Repair Fenton chemical flow meter/pacing	$15,250
Install temporary pump/motor Willimantic Well 3	$8,065
Replace pump on Willimantic Well 4	$78,265
Install Willimantic pump controls/protection – Well 4	$2,265
Re-drill Well 3 – Screen collapse	$48,100
Install Bone Mill Road tank level control	$18,580
Horsebarn Hill leak detection	$1,520
Install Willimantic wellfield radio controls	$30,075
Replace Fenton caustic storage	$90,500
Integrate Fenton controls	$1,520
Repair Depot clay valve and replace control	$2,840
Repair Fenton Well D	$85,500
Install Towers tank controls	$18,300
Repair 550 gpm Clearwater tank booster	$62,230
Replace six-inch pipe to Central Utility Plant	$110,000
Four-year sub-metering program	$2,400,000
Fenton/Willimantic River USGS streamflow gages	$22,000
South Campus express line modifications	$360,000
New 16" water main – Towers to Glenbrook and North Eagleville Road	$2,300,000
Replacement of two smaller Towers tanks with new 1 MG tank	$2,500,000
New Well Water Treatment Facility – Willimantic River Wellfield	$3,500,000
Total Capital Upgrades:	**$12,511,755**
TOTAL UPGRADES AND INITIATIVES	**$14,575,455**

[1]Now performed annually under NEWUS contract.

2.6 WATER UTILITY ASSETS

The assets of the University water supply system consist of the following major components:

- Fenton River Wellfield
  - Wells A, B, C, and D
  - Pump house/Lift Station
  - Fenton Wellfield Chemical Facility
  - Underground clearwell basin at Fenton River Wellfield

- Willimantic River Wellfield
  - Wells #1, #2, #3, and #4
  - Willimantic River Wellfield Chemical Facility

- Transmission Mains
  - Willimantic River Wellfield to Depot Campus
  - Willimantic River Wellfield to Main Campus
  - Fenton River Wellfield to Main Campus (Towers standpipes)
  - Fenton River Wellfield to Main Campus (reservoir)

- Storage
  - Main Campus Reservoir and Pump house
  - Towers Standpipes
  - Depot Campus storage tanks

- Distribution Mains
  - Main and branch lines, valves and hydrants for the distribution of water to the buildings and facilities of the University as well as to non-University buildings and areas covered by current agreements.

The estimated replacement cost for the University's water system, excluding land, was estimated at $26 million in the 1999 Water Supply Plan. A 2006 infrastructure report[8] prepared for the University in September 2006 placed the facility replacement cost of the water system at approximately $23.5 million. This cost is believed to include all infrastructure, including mains, pumps, and storage.

The 2007 *Water and Wastewater Master Plan* provided more in-depth estimates of the value of water system components. The overall replacement costs presented in that plan are outlined in Table 2-5. Costs are valued in 2007 dollars.

TABLE 2-5
Probable System Replacement Costs

Item	Cost
Wellfield Replacement	$6,200,000
Pump and Emergency Generator Replacement	$1,236,100
Treatment and Storage Facilities	$12,025,000
On-Campus Water Mains	$7,330,245
Off-Campus Water Mains	$10,392,295
Total	**$37,183,640**

While Table 2-5 presents a replacement cost for the two wellfields, it is important to note that these facilities are invaluable given the current regulatory environment. It is uncertain that permits for similar supply sources and volumes could be obtained in the same locations in the future.

2.7 UNIVERSITY-OWNED LAND

The University of Connecticut at Storrs consists of two campus areas. The Main Campus is located off Route 195 in Storrs, and the Depot Campus is located near the intersection of Route 44 and Route 32 in Mansfield.

The Main Campus was established in 1881 with a gift of land and money from Charles and Augustus Storrs. Additional land was granted by the State of Connecticut in 1893 when the institution became Connecticut's land grant college[9]. Over the years, the University has expanded through the purchases of additional land surrounding the initial grants.

The Depot Campus consists of land that was originally part of the now defunct MTS. This State-owned facility opened in 1917 with the merger of the Connecticut Colony for Epileptics, which opened at the site of MTS in 1910, and the Connecticut Training School for the Feebleminded at Lakeville which originally opened in 1860[10]. MTS was managed under State Department of Mental Retardation.

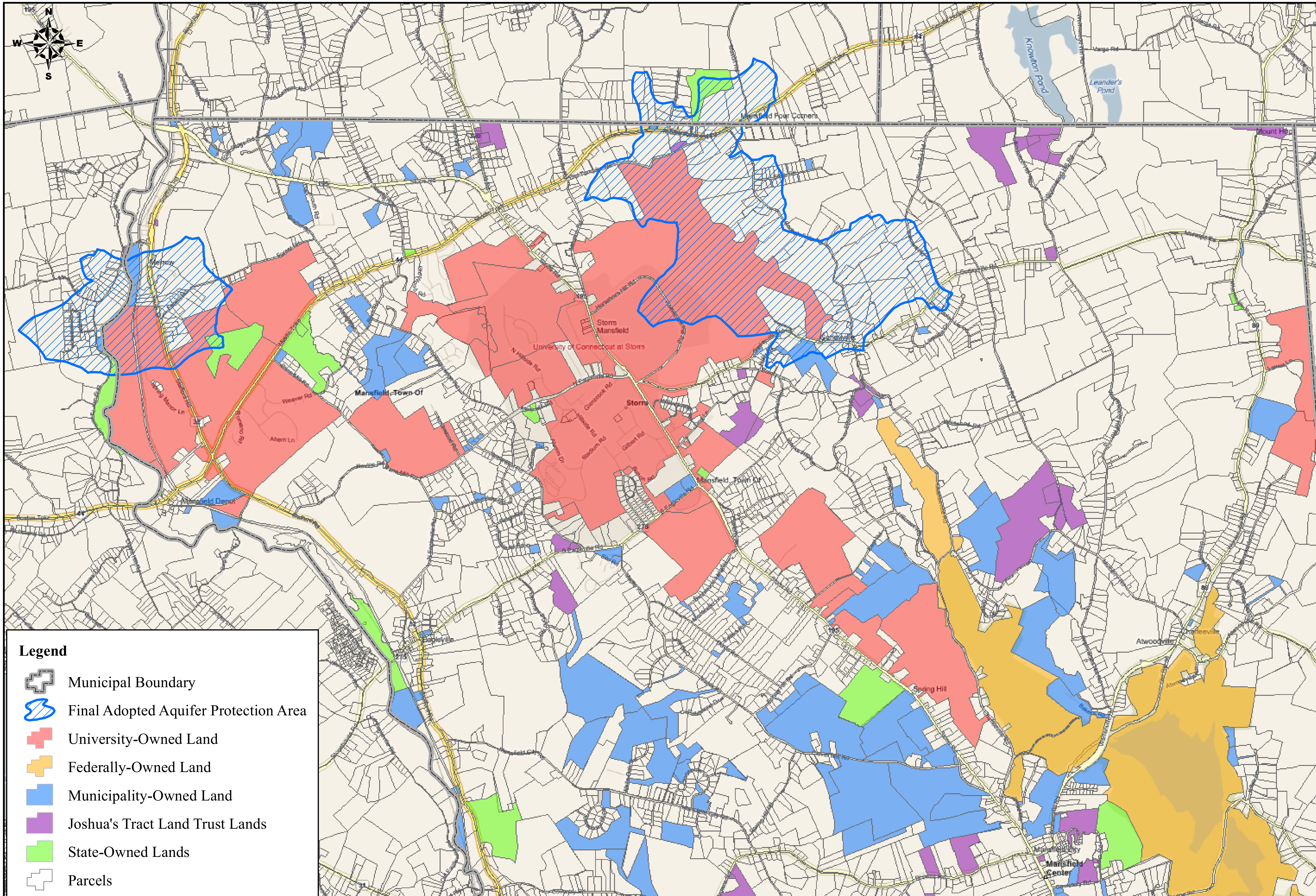
In May 1969, an agreement was reached between numerous State agencies that perpetually granted the University exclusive use of MTS land, buildings, and equipment on four parcels of land associated with the MTS farm operation. This included water infrastructure such as the Willimantic River Wellfield, piping, pumping stations, and the water storage tanks north of Middle Turnpike (now Route 44).

The MTS facility was gradually phased out and finally closed in July 1993. The State Legislature transferred the remaining MTS property to the University under Public Act 93-80. In November 1993, a special Memorandum of Understanding was signed between the State Department of Public Works, the University, the Department of Mental Retardation, and the Office of Policy and Management regarding the transfer. This document transferred a portion of the MTS property north of Route 44 to the Connecticut Department of Corrections that now houses the Bergin Correctional Institution. The University acquired the remaining property and all water system infrastructure.

In total, the University owns approximately 3,550 acres of land in Mansfield. Approximately 861 acres (24%) of this land is associated with the Depot Campus, and much of the overall land is undeveloped. Parcels associated with the University are presented in Table 2-6. A map showing this land is displayed as Figure 2-2.

TABLE 2-6
University-Owned Land in Mansfield

Map.Block.Lot	Location	Comment	Acres
10.41.1	Bundy Ln	UConn Foundation	4.79
13.12.12-1	1279 Stafford Rd		5.33
13.12.9	Old Colony Rd		3.49
13.13.1	1340 Stafford Rd	Bergin Correctional Facility	181.50
13.16.14	30 Plains Rd	Former Depot Campus WPCF	10.85
13.17.1	Middle Turnpike		5.09
14.18.19	Middle Turnpike	Depot Campus	233.64
14.21.2	Bone Mill Rd / Northwood Rd	Includes Northwood Apartments	139.47
15.21.34	Northwood Rd	Northwood Apartments	6.34
15.32.15	Storrs Rd / N Eagleville Rd	Main Campus	371.64
15.32.18-1	Separatist Rd		7.90
16.32.UC314	Hillside Circle		0.85
16.36.UC227	Eastwood Rd		0.46
16.36.UC424	Hillside Circle		1.51
16.38.1	Storrs Rd / Gurleyville Rd	Holcomb, Whitney, Sprague Halls	14.50
16.38.UC243	Dog Ln		4.94
16.39.UC219	Storrs Rd / Willowbrook Rd		5.39
16.40.10	Storrs Rd	Buckley & Shippee Halls	14.03
16.41.10	Storrs Rd		2.05
16.41.13	Storrs Rd / Dog Ln	Storrs Center Project	42.00
16.41.17	14 Dog Ln		0.70
16.57.6	1 South Eagleville Rd		134.63
16.57.UC179	1 South Eagleville Rd	Mansfield Apartments	16.80
16.62.6	Agronomy Rd	Agronomy Research Farm	156.64
19.73.36	Laurel Ln		148.94
23.63.10	Storrs Rd	Agronomy Research Farm	41.04
23.63.18	Storrs Rd	Agronomy Research Farm	9.70
23.63.22	986 Storrs Rd	Agronomy Research Farm	21.05
23.64.7	Storrs Rd / Chaffeeville Rd	UConn Research Forest	208.13
3.25.10	Gurleyville Rd / Old Turnpike Rd	UConn Forest / Fenton Wellfield	679.05
7.12.5	Spring Manor Ln	Spring Manor Farm	156.26
7.12.6	Spring Manor Ln	Spring Manor Farm / Willimantic River Wellfield	114.19
7.13.11	246 Middle Turnpike		150.63
8.23.11	Storrs Rd / N Hillside Rd	Charter Oak Apartments / North Campus	207.64
8.23.16	Hunting Lodge Rd		63.46
9.23.15-1	Storrs Rd	W-lot, Husky Village, Towers, Floriculture	57.14
9.23.27	N Eagleville Rd / N Hillside Rd	North, Northwest, Facilities, WPCF	84.28
9.23.9	N Hillside Rd	North Campus Development	77.33
9.24.8	1590 Storrs Rd		3.02
9.25.1	Storrs Rd	Horsebarn Hill	163.20
		Total:	**3549.59**



Sources:
-Land ownership defined within Mansfield and within Level A Aquifer Protection Areas in Coventry and Willington. Ownership of parcels based on best-available online assessor's data in April 2011. Delineations may not be exact.
-Base map provided by Microsoft via ESRI subscription service.
-Aquifer Protection Areas courtesy of CT DEP.

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University, State, Federal, Municipality-Owned, and Land Trust Lands

University of Connecticut Water Supply Plan

Storrs, Connecticut

SJB	SJB	DM
DESIGNED	DRAWN	CHECKED

SCALE: 1" = 3000'

DATE: 5/5/2011

PROJECT NO: 1958-31

MXD NAME: P:\Figure2-2.MXD

FIGURE 2-2

SHEET NO.

SECTION 3.0
EXISTING WATER SUPPLY SYSTEM

3.0 EXISTING WATER SUPPLY SYSTEM

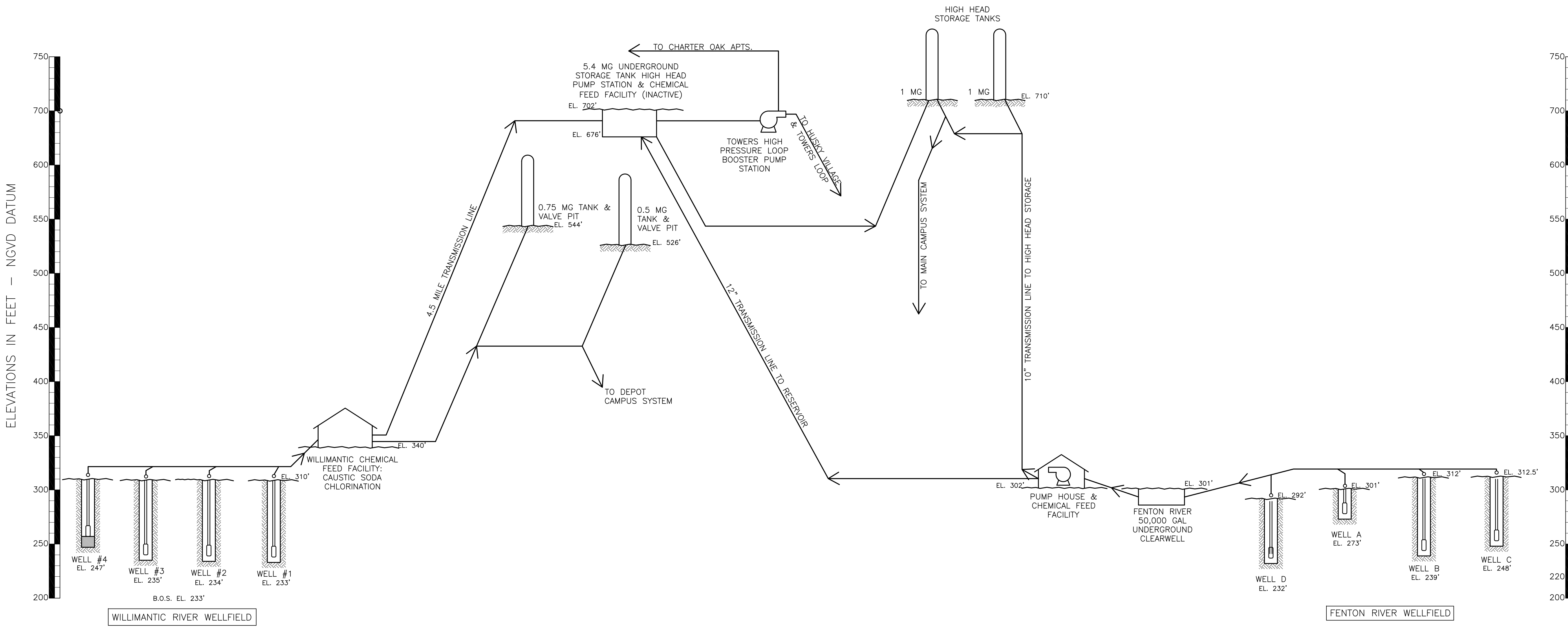
3.1 OVERALL SYSTEM DESCRIPTION

The University water system was originally installed to provide potable water to the University, but it has expanded through a variety of contractual agreements to provide water to off-campus users as well. The water system serves on-campus buildings, residence halls, and apartments; commercial and institutional buildings in the Town of Mansfield, and residential properties in the Town of Mansfield. Average day demand in 2010 was 1.29 mgd. Peak day demand in 2010 was 2.23 mgd, occurring in the month of March.

The University water system includes eight wells, six water storage tanks, and 36 miles of water transmission and distribution mains. The system also includes 170 hydrants, two treatment facilities, and numerous transfer pumps located at three pumping stations. Appended Figure I depicts major system components. Figure 3-1 is a schematic diagram of the water supply system. Ground water sources are discussed in detail in the ensuing text. Other system components are discussed in Section 4.0 of this Plan.

As the University is a state-wide entity, it operates facilities in other locations that are served by other water systems as well as two smaller University-operated water systems. A detailed description of these separate systems is beyond the scope of this document, but they are summarized below. Note that for the purposes of this document, the term "system" refers to the interconnected water system of the Main Campus and the Depot Campus in Storrs and Mansfield and not to any of the regional campus systems.

- The Torrington regional campus is classified as a Non-Transient Non-Community Water System (public water system #CT1435053) by the Connecticut DPH. It services approximately 400 commuting students and 40 faculty.



NOTES:
1. DIAGRAM IS FOR SCHEMATIC PURPOSES ONLY. BUILDINGS, TANKS, PUMPS AND DISTANCE BETWEEN STRUCTURES NOT TO SCALE.
2. B.O.S.: BOTTOM OF SCREEN

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SCHEMATIC DIAGRAM
UNIVERSITY OF CONNECTICUT
WATER SUPPLY PLAN
MAIN AND DEPOT CAMPUSES
MANSFIELD, CONNECTICUT

SJB	BAM	DM
DESIGNED	DRAWN	CHECKED

SCALE NONE

DATE DEC 2010

PROJECT NO. 1958-31

Fig. 3-1

- The UConn Plant Science Research and Education Facility on Agronomy Road off Route 195 in Mansfield is classified as a Transient Non-Community Water System (public water system #CT0780444) by the Connecticut DPH.

The following regional campuses and the UConn Health Center are served by public water provided by others as listed below.

- Avery Point (Groton): Groton Utilities
- Greater Hartford (West Hartford): Metropolitan District Commission
- Stamford: Aquarion Water Company
- UConn Health Center (Farmington): Metropolitan District Commission
- UConn MBA Shop (Hartford): Metropolitan District Commission
- UConn School of Law (Hartford): Metropolitan District Commission
- Waterbury: City of Waterbury Water Department

3.2 WATER SUPPLY SOURCES

The University utilizes eight active wells located in two wellfields as supply for the main campus and Depot Campus system. Four of the wells are located in the stratified drift aquifer beneath the Fenton River (drainage basin #3207)[11], a tributary to the Natchaug River. The remaining four wells are located in the stratified drift aquifer beneath the Willimantic River (drainage basin #3100)[11], a tributary to the Shetucket River. The University is not currently interconnected with any other water system.

Fenton River Wellfield

The Fenton River Wellfield consists of four wells (Well A, Well B, Well C, and Well D) located along the Fenton River north of Gurleyville Road in Mansfield, Connecticut. Figure 3-2 is a location plan of the Fenton River Wellfield. Well specifications are provided in Table 3-1. In the year 2009, the Fenton River Wellfield provided 19% of the water used by the University.

TABLE 3-1
Fenton River Wellfield Specifications

	Well A	Well B	Well C	Well D
Year Drilled	1926	1949	1949	1958
Type	Caisson	Gravel Packed	Gravel Packed	Gravel Packed
Depth	28 feet	70 feet	63 feet	59 feet
Diameter	24 feet	18" x 12"	18" x 12"	18" x 12"
Well Yield	400 gpm[1]	675 gpm[2]	520 gpm[2]	400 gpm[3]
Design Pump Capacity	400 gpm @ 38' TDH	700 gpm @ 45' TDH	500 gpm @ 40' TDH	500 gpm @ 159' TDH
Average Pumping Rate with Other Wells Pumping	327 gpm	532 gpm	271 gpm	360 gpm
Maximum Known Pumping Rate	352 gpm	560 gpm	406 gpm	448 gpm
Status	Active	Active	Active	Active

Notes: [1]Estimated during pumping test in the 1940s as discussed in 2004 Water Supply Plan. This yield test may not have met current safe yield guidelines.
[2]Determined during 1949 yield test during which Wells A, B, and C were simultaneously pumped.
[3]Wells A, B, and C were likely concurrently pumping to meet system demand during the 1958 yield test of Well D. Well stabilized and at times showed recovery at 400 gpm.

Well A was the first well developed in the Fenton River Wellfield. It was drilled in 1926 by the University to replace the Pink Ravine surface water supply provided by the Town of Mansfield. It was the University's sole source of water supply until Wells B and C were developed in 1949. Well D was added in 1959 to provide an additional water supply source to the University system.

Engineering, Landscape Architecture and Environmental Science MILONE & MACBROOM® 99 Realty Drive Cheshire, Connecticut 06410 (203) 271-1773 Fax: (203) 272-9733 www.miloneandmacbroom.com	**Fenton River Wellfield**	**LOCATION:** **Mansfield, CT**	
	MMI#: 1958-31 **MXD:** H:\Figure3-2.mxd **SOURCE:** ESRI	N **University of Connecticut Water Supply Plan**	**Map By:** SJB **Date:** 12/3/2010 **Scale:** 1"=400'	**SHEET:** **Figure 3-2**

Water from the four Fenton wells is directed into a 50,000 gallon clearwell located near Well A. Water leaving this tank is treated with sodium hypochlorite (chlorine) for disinfection and sodium hydroxide (25% caustic soda) for pH adjustment and corrosion control after it passes the flow meter. The treatment system for the Fenton River Wellfield is located on Pump House Road. The pump house was constructed in 1993. The chemical dosages are paced to flow from a 4-20 milliamp signal. An automatic chlorine residual analyzer continuously measures and records the chlorine residuals.

Water in the clearwell is typically transferred to the "high head" system by two booster pumps rated at 550 gpm and 1,000 gpm. This water is directed into the two 1.0 MG water storage tanks near the Towers Residence Halls where it mixes with finished water from the Willimantic River Wellfield. A new transmission main was installed in 1998 that can instead direct water from the Fenton River Wellfield to the 5.4 MG underground reservoir at W-Lot.

Activation of the wellfield is normally dictated by a timer schedule or by the water level within the 50,000 gallon clearwell. Currently the wells are on a "first start – second start" system. Wells B and C are "first start" and Well D is the "second start." Well A is shut down at the present time but can be added to the operational schedule as needed. The pumps that transfer the water from the clearwell to the campus operate on a timer. A 400 kW diesel powered generator provides emergency power to the entire facility, including power to all wells, the high lift pumps, chemical feed pumps, and lighting.

Willimantic River Wellfield

The Willimantic River Wellfield consists of four active wells (Well #1, Well #2, Well #3, and Well #4) located along the Willimantic River west of Spring Manor Farm (and Route 32) and north of Route 44 in Mansfield, Connecticut. Figure 3-3 is a location plan of the Willimantic River Wellfield.

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Willimantic River Wellfield

LOCATION: Mansfield, CT

MMI#: 1958-31
MXD: H:\Figure3-3.mxd
SOURCE: Microsoft

N

University of Connecticut Water Supply Plan

Map By: SJB
Date: 12/3/2010
Scale: 1"=200'

SHEET: Figure 3-3

Each well has an above-grade pump house equipped with a vertical turbine pump and motor, motor drive, valves, and ancillary equipment. Well specifications are provided in Table 3-2. Each well has variable frequency drive (VFD) controls. In 2009, the Willimantic River Wellfield provided 81% of the water used by the University.

TABLE 3-2
Willimantic River Wellfield Specifications

	Well #1	Well #2	Well #3	Well #4	MTS Well #2
Year Drilled	1970	1974	1958	1998	1948
Type	Gravel Packed	Gravel Packed	Gravel Packed	Gravel Packed	Gravel Packed
Depth	69 feet	68 feet	68 feet	53 feet[5]	60 feet
Diameter	30" x 16"	24" x 14"	24" x 18"	20" x 12"	12 inches
Well Yield	750 gpm[1]	361 gpm[2]	725 gpm[3]	560 gpm[6]	525 gpm[4]
Design Pump Capacity	400 gpm @ 555' TDH	200 gpm @ 460' TDH	210 gpm @ 520' TDH	540 gpm @ 484' TDH	N/A
Maximum Known Pumping Rate	750 gpm	361 gpm	725 gpm	414 gpm	N/A
Status	Active	Active	Active	Active	Inactive

Notes: [1]Well #3 was pumping at a constant 500 gpm during the eight day yield test in 1970.
[2]1974 yield test was only 48 hours long.
[3]Well #3 was yield tested at 500 gpm alone for three days and then at 725 gpm with MTS Well #2 pumping at a constant 500 gpm for nine days.
[4]As reported in *Hydrogeologic Data for the Shetucket River Basin* (1967).
[5]Well #4 was drilled to 63 feet, but was screened to 53'. The bottom 10 feet of the well was plugged and not used as it has a lower hydraulic conductivity.
[6]Set by the reporting engineer based on the drought conditions during the test. Well #4 was yield tested alone at 490 gpm for three days and then pumped at 414 gpm for five days while Well #1 and Well #3 concurrently pumped at constant rates of 287 gpm and 282 gpm, respectively.

The first well utilized at the Willimantic River Wellfield was installed around 1913. It was a 24-foot diameter, 16.5-foot deep dug well. This well (known as MTS Well #1) had insufficient yield to supply MTS in the 1940s and was supplemented by MTS Well #2. It was taken offline in 1961 after the activation of MTS Well #3 (now Well #3). MTS Well #1 was abandoned in 1998; the pump house was dismantled and the cavity was filled per Connecticut DPH well abandonment guidelines.

MTS Well #2 was the first gravel-packed well developed at the Willimantic River Wellfield. It was drilled in 1948 to supplement MTS Well #1. MTS Well #3 was constructed in 1958 to replace the function of MTS Well #1. It was around this time that the residential population (and water demand) of MTS was reportedly reaching its peak.

Similarly, the water demand in the 1960s in the University system was such that the University began looking for an additional source of water to supplement the Fenton River Wellfield. In 1969, the University and MTS reached an agreement where MTS transferred the Willimantic River Wellfield to the University, and in return the University would provide potable water to MTS. MTS retained MTS Well #2 as a backup well, and the University renamed MTS Well #3 to Well #3.

The University commissioned several hydrogeologic studies in the late 1960s that suggested the Willimantic River Wellfield could support a total of six wells in addition to the MTS Well #2 as a backup well. Only two of the four proposed wells were actually drilled: Well #1 was drilled in 1970 and Well #2 was drilled in 1974. MTS Well #2 was transferred to the University in 1993 after the closure of MTS. The University installed Well #4 in 1998 to replace the function of MTS Well #2. MTS Well #2 is currently inactive; it is disconnected from the system and is only used as a water level monitoring point when necessary.

The University commissioned a detailed assessment of the four Willimantic River wells in 2007. Pertinent information from the evaluation is presented below, with updates where applicable.

- ***Well 1*** is reported to be approximately 70 feet below original grade and has a 20.5-foot screen from approximate depth 47 feet to 68 feet. The well was drilled to the bottom of the aquifer, 70 feet below grade, with the screen intersecting the deepest part of the aquifer. In-well drawdowns during the original yield test in 1970 were not reported. Therefore, the specific capacity is not known. During the 1970 test, Well 1 was pumped at 750 gallons per minute (gpm) for eight days while Well 3 was pumping at 500 gpm.

Measurements were also taken during a 1999 yield test in conjunction with the development of Well 4. At that time, Well 1 was pumped at 287 gpm with a drawdown of 11 feet. Neglecting the drawdown caused by the other pumping wells (Well 3 pumping at 282 gpm and Well 4 pumping at 414 gpm), this indicates a specific capacity of 26 gpm/ft. The approved diversion rate of this well is 450 gpm, which was sustainable through a notably dry season that occurred in 2007. No limitations have been identified for this well that would limit pumping to registered capacity.

- ***Well 2*** is reported to be 67.5 to 70 feet below original grade and has a screen of length nine feet, eight inches. The well was drilled to the bottom of the aquifer. The depth to the screen is 60 feet, thus it appears that the screen intersects the deepest part of the aquifer at the bottom of the well.

  In-well drawdown during the original yield test in 1974 was 40.5 feet. At that time, Well 2 was pumped at 361 gpm for two days. Thus, the specific capacity was calculated to be 8.9 gpm/ft. The registered diversion rate for this well is 300 gpm. Well 2 has the lowest specific capacity of all the wells in the wellfield. Even after redevelopment in 1993, the specific capacity could not be increased above the original 8.9 gpm/ft. This lends some credence to the belief that this well has some confining layers. Well 2 was not pumped during the 1999 yield test performed in conjunction with the development of Well 4.

  During the dry season of 2007, Well 2 reliably produced only 100 gpm, significantly below the registered diversion rate of 300 gpm. This well suffers from low specific capacity that is likely due to the well's surrounding geology and the relatively short screen. Well 2 was redeveloped by S.B. Church in September 2009. At the same time, the pump was replaced. According to the redevelopment report, the yield was increased to 126 gpm.

- ***Well 3*** is reported to be 70 feet below original grade and has a 20-foot screen from depth 48 feet to depth 68 feet. The bottom of the aquifer was encountered at 76 feet at the glacial till boundary (eight feet below the bottom of the well screen). Bedrock was encountered at 79 feet. Sand and gravel was encountered from 37 to 76 feet. Thus, although the screen does not intersect the deepest part of the aquifer, it coincides with the coarsest material.

  In-well drawdowns during the original yield test in 1959 were reported in the 1967 USGS bulletin for the Shetucket River basin from which the specific capacity was estimated to be 46 gpm/ft (418 gpm with a drawdown of nine feet). During two subsequent tests, the well was pumped at 500 gpm and 725 gpm. The registered diversion rate is 450 gpm.

  Measurements were also taken during a 1999 yield test in conjunction with the development of Well 4. Well 3 was pumped at a lower rate of 282 gpm, with a drawdown of less than 10 feet. Neglecting the drawdown caused by the other pumping wells (Well 1 @ 287 gpm and Well 4 @ 414 gpm), this indicates a specific capacity of at least 28 gpm/ft. No limitations have been identified for this well that would limit pumping to its permitted capacity. During the dry season of 2007, Well 3 reliably produced its diversion rate of 450 gpm.

- ***Well 4*** is reported to be 63 feet deep from mounded grade and has a 15-foot screen from depth 38 feet to depth 53 feet. Bedrock was encountered at 71 feet. Sand and gravel was encountered throughout most of the hole, with fine sand reported below

61 feet. Thus, although the screen may intersect the coarsest material of the aquifer, it is set higher than the bottom of the saturated thickness of the aquifer, at least 18 feet above the bedrock surface.

When it was initially developed and tested in 1999, this well was pumped at 414 gpm, although the yield is reported to be higher at 560 gpm. The specific capacity is reported at 21.7 gpm/ft. The registered diversion pumping rate is 500 gpm.

Well 4 was designed to have a screened interval adjacent to the coarsest materials in the aquifer, similar to Well 3, but the screen is set relatively higher, with at least 18 feet between the bottom of the screen and the bottom of the aquifer. The screen is also shorter as compared to the other wells. Recent work on Well 4 included refurbishment and resetting of the pump in 2005-2006. This well only produced 200 gpm, on average, during the dry season of 2007.

While all of the wells at the Willimantic Wellfield have achieved higher production rates during previous yield testing (750 gpm, 361 gpm, 725 gpm, and 414 gpm at Wells 1 through 4 respectively), prior to 2008 the wellfield had not been tested concurrently at these rates, or at the registered diversion rates, coincident with stressed hydrologic conditions or for prolonged periods of time. The majority of the previous yield tests were conducted without the balance of the wells pumping. The Willimantic River study conducted in 2008 and 2009 offered an opportunity to evaluate pumping the wells concurrently. Results of this testing are described in Section 3.8.

Water from the four Willimantic wells is currently directed to the new chemical feed building near the railroad crossing at the west end of Spring Manor Lane. The building consists of a 65-foot by 45-foot concrete structure constructed in 2010. Treatment includes sodium hypochlorite (chlorine) for disinfection and sodium hydroxide (25% caustic soda) for pH adjustment and corrosion control.

Each chemical feed system consists of one bulk tank and one day tank, two chemical metering pumps (one active and one spare), and associated chemical appurtenances. The chemical feed system is flow paced, using an on-site raw water magnetic flow meter. Alarm, status, and initiation signals (on/off) are transmitted to the existing SCADA system using the existing remote telemetry system located at the facility. The treatment system is capable of delivering a maximum capacity of 2.3 mgd of treated water. An automatic chlorine residual analyzer continuously measures and records chlorine residuals. Refer to Section 4.1 for more information about treatment.

After leaving the chemical feed building, flow is directed into the 16-inch diameter transmission main running to the 5.4 MG reservoir on the main campus, as well as the main leading to the Depot Campus. The transmission split occurs inside the building.

A new transformer pad at the chemical feed facility provides a step down from the existing 13.8 kilovolt (kV) service to 480 volt (V) service for the wellfield. The facility houses a 600 kW generator to provide emergency power to the chemical facility and the four wells. Normal and emergency 480V service is provided through an underground electrical distribution system.

3.3 SOURCE WATER ASSESSMENT

The Connecticut DPH, in conjunction with the Department of Environmental Protection (DEP), completed the *Source Water Assessment Report – An Evaluation of the Susceptibility of Public Drinking Water Sources to Potential Contamination*, for the Fenton River Wellfield and the Willimantic River Wellfield in 2003[12]. Appendix C contains copies of the reports.

Both assessments were completed in accordance with the requirements of the 1996 amendment to the Safe Drinking Water Act. As stated in the reports, an assessment can be used to target and implement enhanced source water protection measures such as inspections, land use regulations, land acquisitions, septic system maintenance, and education.

Fenton River Wellfield

The Fenton River Wellfield has a "low" rating for environmental sensitivity (indicating that the source water area is not sensitive), a "low" rating for potential risk factors (indicating that the source water area has low risk), and a "low" rating for source protection needs. The overall susceptibility is "low."

Listed strengths of the source water area are the adoption of local aquifer protection regulations, a Public Water System Source Protection Program, and the fact that less than 10% of the source water area is currently developed for commercial or industrial use. Recommendations of the source water assessment report include maintaining monitoring levels, working with local officials to ensure that only low-risk development occurs in the source water area, and acquisition of open space in the source water area.

Willimantic River Wellfield

The Willimantic River Wellfield also has a "low" rating for environmental sensitivity (indicating that the source water area is not sensitive), a "low" rating for potential risk factors (indicating that the source water area has low risk), and a "moderate" rating for source protection needs. The overall susceptibility is "low."

Listed strengths of the source water area are the adoption of local aquifer protection regulations, a Public Water System Source Protection Program, and the fact that less than 10% of the source water area is currently developed for commercial or industrial use. Recommendations of the source water assessment report include maintaining monitoring levels around known contaminant release points, working with local officials to ensure that only low-risk development occurs in the source water area, the completion of Level A mapping (completed in 2007) and acquisition of open space in the source water area.

3.4 SOURCE WATER PROTECTION

The University and the Town of Mansfield understand the importance and significance of the Fenton River and Willimantic River aquifers, and are proactive in their efforts to protect these ground water resources. Furthermore, it is the duty of the University to ensure the protection and quality of drinking water by following source water protection strategies. The University has taken steps to implement some of the recommendations of the Source Water Assessment Report, balancing these actions with the desire to develop land in an environmentally friendly manner. The following is a list of efforts, assessments, and oversight being given to source and aquifer protection.

- The University owns the 200-foot sanitary radius around each of its wells.
- The University has completed Level A mapping delineating the areas of contribution and recharge to both its wellfields.
- The Towns of Mansfield, Willington, and Coventry administer local aquifer protection regulations for the two wellfields. Refer to Section 3.5 below for additional information.
- The University and/or its contract operator visit both wellfields each day to ensure that everything is in order and that there are no activities taking place that would be of concern.
- The University directly interacts with the staff of the Windham Water Works regarding watershed protection in the Fenton River watershed, which is a subset of the watershed above Windham Water Works' Willimantic Reservoir.
- The University follows the requirements of the Connecticut Environmental Policy Act (CEPA) before any major project is constructed. The environmental review process is overseen by the Connecticut Office of Policy and Management and

provides an opportunity for all state agencies and interested parties to review and comment on a project before it is allowed to be constructed.

- The University has developed a close working relationship with the Town of Mansfield regarding development projects occurring both on and off-campus. Representatives of the Town of Mansfield were part of the Technical Advisory Group for the Fenton River Study and the Willimantic River Study, and serve on the Water and Wastewater Advisory Committee.
- The University encourages input from the public during its quarterly Water and Wastewater Advisory Committee meetings, particularly from watershed advocates such as the Naubesatuck Watershed Council and the Willimantic River Alliance.
- The Water and Wastewater Advisory Committee is charged with reviewing the Town of Mansfield and University source protection and aquifer protection activities.

The Town of Mansfield has been encouraging watershed protection along the Willimantic River and Fenton River and near their respective wellfields for decades through its Zoning Regulations and Inland Wetland Regulations. Additional protections are enforced through these regulations for land in the public water supply watershed of Windham Water Works, which overlaps with the Fenton River aquifer protection area.

Figure 2-2 illustrates University, State, and Municipally-owned, and Land Trust lands in the aquifer protection areas associated with the Fenton River and Willimantic River Wellfields:

- The central and southeast portions of the Willimantic River aquifer protection area are owned by the University. The Town owns a tract of land to the north along the river, Joshua's Trust owns a parcel directly across the river to the west of the Town-owned land, the State owns a landlocked parcel at the southeast corner of the aquifer protection area, and the remainder is privately-owned.

- The western portion of the Fenton River aquifer protection area is largely University-owned land, with a small parcel owned by Joshua's Trust and another owned by the Town of Mansfield. The remainder of the land in the aquifer protection area is privately owned.

The University-owned land in the Willimantic River aquifer protection area is coincident with a portion of the University's Spring Manor Farm. The University is committed to managing these lands as the Spring Manor Farm for the foreseeable future. Development is not planned. Furthermore, any development that could be proposed in the future would need to be reviewed per CEPA and authorized by the Town's aquifer protection regulations.

The University's plans for its land holdings in the Fenton River aquifer protection area are articulated in the East Campus Plan of Conservation and Development (2004). The East Campus Plan of Conservation and Development states that *"New structural development is discouraged in this area."* Additionally, the Fenton Forest Tract is located within the University-owned land in the Fenton aquifer protection area. The Fenton Forest tract is identified as "preserved land" in the East Campus plan. The University has prepared a separate Plan of Conservation and Management for this 440-acre tract. Important goals to be accomplished in the tract are *"to maintain the health, productivity, and natural biological diversity of the forestlands and to demonstrate forest stewardship practices."*

In summary, consider the following discussion from page 8 of the East Campus Plan of Conservation and Development:

- "The Preservation category for East Campus comprises areas of environmental significance that must be recognized in any future planning effort. These include:

- ⇨ Fenton Forest Tract. This 440-acre tract is the largest contiguous forest parcel in the entire University system and covers half of the East Campus site. Secondary growth upland central hardwoods dominate both the tract and the region. Particular consideration was given during this study to the age and quality of stands within the Fenton Forest Tract. The oldest timber stands – from 60 to 105 years – are centrally located or found near the Fenton River. These areas, including the Oguswitz Meadow, were considered to be of significance and were identified as special forestlands.
- ⇨ Fenton River. The tract is also part of a larger habitat corridor and includes important riparian habitat along the Fenton River – a locally significant water resource. The Town of Windham's water supply reservoir is fed by the Fenton River. The University has four wells in this area.
- ⇨ Direct Recharge Area. The Connecticut DEP has recognized the delineation of the Direct Recharge Area for the University's Fenton River Wellfield, of which 456 acres are within East Campus. Land use prohibitions and restrictions identified in the Connecticut DEP's aquifer protection regulations are therefore relevant to this area.

❑ The University currently maintains this area in traditional agricultural use or as managed forestland. With the exception of maintaining existing agricultural facilities and continuing forest management and environmental education activities, no development is recommended within the Preservation area."

Any development that could be proposed in the future would need to be consistent with the East Campus Plan of Conservation and Development and the Fenton Forest Tract goals; reviewed per CEPA; and authorized by the Town's aquifer protection regulations.

3.5 WELLHEAD PROTECTION REGULATIONS

The Aquifer Protection Land Use Regulations were made effective by the State of Connecticut in February 2004. These regulations require that Level A aquifer protection areas (ground water recharge and contribution areas) be delineated for wells located in stratified drift aquifers serving more than 1,000 people. The University of Connecticut completed Level A mapping for the Fenton River Wellfield in 2001 and for the Willimantic River Wellfield in 2007.

The Town of Mansfield completed an update of its Plan of Conservation and Development in 2006[13]. The plan expressly states that "the protection of wetlands, watercourses, and waterbodies is a high priority," and that "a major underlying goal of the plan is the protection of Mansfield's surface and groundwater quality." The plan places great importance on protecting drinking water supplies to sustain current needs and enable future development in Town. The plan suggests that the Town of Mansfield "consider regulation revisions or specialized zone classifications for designated aquifer protection regulations and areas of potential public water supply."

The Town of Mansfield adopted its first Aquifer Protection Area Regulations[14] on January 17, 2006, with the most recent revision occurring on January 7, 2007. These regulations control certain activities in the Town's formally mapped Aquifer Protection Areas associated with the Fenton River Wellfield and the Willimantic River Wellfield. The Town of Coventry adopted its regulations on January 24, 2008, and the Town of Willington adopted its regulations on July 1, 2009. Copies of these regulations are included in Appendix D.

The University recognizes that the watersheds of small tributaries of the Fenton River are not included in the aquifer protection area for the Fenton River Wellfield, as they are not direct recharge areas. However, most of these "indirect recharge area" watersheds are located in the "preserved area" described in detail above and identified in the East Campus Plan of Conservation and Development. Only the uppermost portion of one indirect recharge area watershed is located in a developed area; this is the stream associated with Mirror Lake. The upper part of this watershed extends from Mirror Lake to the northern side of South Eagleville Road. The University-owned land in this watershed is carefully managed and is continuously evaluated per the University's campus-wide drainage plan.

3.6 DIVERSION REGISTRATIONS

The University has a series of registrations through the Connecticut DEP. While the majority of the registrations are for public water supply, some of the registrations are recreational. Table 3-3 presents the registrations for the eight active University wells. Note that the total registered diversions for each wellfield are less than the sum of the individual registrations for each well.

TABLE 3-3
Diversion Registrations

Facility	Rate (mgd)	Equivalent Rate
Fenton River Well A	0.576 mgd	400 gpm
Fenton River Well B	1.008 mgd	700 gpm
Fenton River Well C	0.720 mgd	500 gpm
Fenton River Well D	0.720 mgd	500 gpm
Fenton River Wellfield Total	***0.8443 mgd***	--
Willimantic River Well #1	0.648 mgd	450 gpm
Willimantic River Well #2	0.432 mgd	300 gpm
Willimantic River Well #3	0.648 mgd	450 gpm
Willimantic River Well #4	0.720 mgd	500 gpm
Willimantic River Wellfield Total	***2.3077 mgd***	--

In 1982, the University registered Fenton Wells A through D and Willimantic River Wells #1, #2, and #3 with the Connecticut DEP. MTS registered MTS Well #2 separately. After MTS closed in 1993, the registration for MTS Well #2 was transferred to the University. The University installed Well #4 in 1998 to replace the function of MTS Well #2, and the registration amount for MTS Well #2 was transferred to Well #4.

The UConn-MTS interconnection is also registered with the DEP. This interconnection formerly occurred at a valve pit near the old Chemical Facility at the wellfield, but now occurs inside the new Chemical Facility constructed in 2010. Water treated at the Chemical Facility can now be more easily directed to the Depot Campus as needed. A previous UConn-MTS interconnection was active through Pink Ravine in the 1960s, but this interconnection was abandoned before the 1982 registration deadline as suggested by the "abandoned" six-inch water main on Weaver Road running towards Bone Mill Road on the 1983 MTS water system map.

3.7 FLOODING

The Willimantic River wells are located in the Special Flood Hazard Area (SFHA) of the Willimantic River, commonly known as the 100-year floodplain. Each well house sits atop a mound that provides elevation above the floodplain, thus preventing flooding of the wells for events equal to or less frequent than the flood with a recurrence interval of less than a 1% chance in any year. The top of each mound is at elevation 312 feet above sea level. The 100-year flood elevation is 308 feet.

The SFHA along the Fenton River was mapped by approximate methods. Flood elevations were not determined as part of the Flood Insurance Study (FIS) commissioned by FEMA. The four wells may be located adjacent to the floodplain. However, the wells are not believed to have ever been flooded.

3.8 SAFE YIELD EVALUATION

Safe yield is the maximum dependable quantity of water per unit of time that may flow or can be pumped continuously from a source of supply during a critical dry period without consideration of available water limitations. The concept of "safe yield" is strictly defined as being in terms of water quantity and does not consider environmental limitations.

A formal safe yield pumping test has not been conducted for either wellfield with all wells pumping simultaneously, although a number of yield tests have been conducted at each wellfield. Yield tests and other periods of observation are described in this section, followed by a conclusion for each wellfield relative to an interim safe yield.

Fenton River Wellfield

Over the years, there have been a number of different pumping tests conducted at the Fenton River Wellfield. Although most of these tests were performed to determine the yield of an individual well, a few tests were conducted with multiple wells pumping at the same time. These are described below.

June 1999 Testing

On June 16, 1999, the University's Facilities Management Unit conducted a one-hour pumping test of the Fenton River Wellfield. This was a simultaneous pumping test with all four wells pumping at the same time to test system hydraulics. Flows were recorded at each well as follows:

- Well A - 253 gpm.
- Well B - 391 gpm
- Well C - 271 gpm
- Well D - 355 gpm

The equivalent 24-hour withdrawal would have been 1.82 mgd for these four pumping rates. Because sustained pumping was not attempted for more than one hour, the figure can not be construed as a safe yield.

September 1999 Testing

On September 22 and 23, 1999, the firm of Leggette Brashears & Graham (LBG) performed a series of step-drawdown tests to evaluate safe yields of the Fenton River wells. Three different pumping rates were utilized for each well, and results were graphed and projected outward to determine rates that could be sustained without drawdown to well screens or pump intakes. The theoretical safe yields were as follows:

- Well A - 200 gpm.
- Well B - 500 gpm
- Well C - 290 gpm
- Well D - 290 gpm

The equivalent 24-hour withdrawal would have been 1.84 mgd for these four pumping rates. Because sustained pumping was not attempted with all four wells pumping simultaneously, the figure can not be construed as a safe yield.

November 1999 Testing

LBG conducted a 72-hour pumping test from November 16 through 19, 1999 to evaluate aquifer parameters. During this test, Well B was pumped at 517 gpm (0.744 mgd) while a series of observation wells and riverbed piezometers were monitored. Because sustained pumping was not attempted with all four wells pumping simultaneously, the figure may not be considered by DPH to be equal to the safe yield of Well B.

However, important conclusions have been gathered from an independent interpretation of the data collected during the pumping test.[1] First, the water level in Well B stabilized in the last 12 hours of the test, indicating that the pumping rate of Well B was potentially close to its true safe yield. Second, the water level in Well A was unaffected by pumping of Well B. Third, the water level in Well C was drawn down two feet by the pumping of Well B. Note that Well D was not monitored, but it is located much further away than Well A and its level would likely have been unaffected, similar to the level in Well A. It is possible that Wells B and C would experience mutual interference during a combined pumping test, but Wells A and D would not.

September 2000 Testing

LBG conducted an eight-day pumping test from September 11 through 19, 2000 to evaluate induced infiltration from the Fenton River. During this test, Well C was pumped at 405 gpm and Well D was pumped at 165 gpm (0.821 mgd combined) while a series of observation wells and riverbed piezometers were monitored. Because sustained pumping was not attempted with all four wells pumping simultaneously, the figure may not be considered by DPH to be equal to the combined safe yield of Wells C and D.

However, important conclusions have been gathered from an independent interpretation of the data collected during the pumping test[1]. First, the water levels in Wells C and D stabilized in the last 12 hours of the test, indicating that the pumping rates of Wells C and D were potentially close to their true safe yields. Second, the water level in Well B was drawn down two feet by the pumping of Well C. Note that Well A was not monitored.

[1] These conclusions are based on interpretations of the data contained in the LBG report of the Level A Mapping of the Fenton River Wellfield. The conclusions are not directly taken from the report.

Fenton River Study, 2003-2006

Two separate pumping tests were conducted in March and August of 2004 as part of the Fenton River Study. The tests were conducted to measure streamflow loss during pumping and estimate aquifer parameters. During the March pumping test, water levels in six monitoring wells were measured. The August pumping test was reportedly disqualified from analyses because numerous pump shut-offs were experienced. Neither test resulted in data that could be used to estimate safe yield.

Well D Pumping Test, 2010

The University commissioned a targeted field study of streamflows in the Fenton River in September 2010 while Well D was operated for seven days. The purpose of the test was to evaluate the potential impacts of pumping Well D on instream flow in the Fenton River at very low-flow conditions (less than 1.0 cfs at the USGS gauging station). Well D was activated on September 8, 2010 and operated 18 hours per day for seven days at an average rate of 0.35 mgd. Although the water level in Well D was not monitored, the well was easily able to produce the desired yield for seven days.

Summary

The results of the two LBG pumping tests in 1999 and 2000 are consistent with the physical distances between the four wells of the Fenton River Wellfield. Wells B and C are close in proximity and have been shown to affect the water level in one another (approximately two feet of drawdown in either well when the other is operated). Wells A and D are distant from one another and distant from Wells B and C, such that mutual interference is unlikely.

In lieu of a formal safe yield pumping test, the following safe yields are proposed as interim safe yields, for the reasons specified:

- Well A – 200 gpm (the rate estimated during the step-drawdown testing in September 1999).
- Well B – 517 gpm (the rate sustained in the November 1999 pumping test) reduced by 10% for mutual interference with Well C, or 465 gpm; the 10% correction is based on the ratio of drawdown in Well B that is caused by Well C (two feet) to the drawdown in Well B when pumped (20.5 feet).
- Well C – 405 gpm (the rate sustained in the September 2000 pumping test) reduced by 13% for mutual interference with Well B, or 352 gpm; the 13% correction is based on the ratio of drawdown in Well C that is caused by Well B (two feet) to the drawdown in Well C when pumped (15 feet).
- Well D – 0.35 mgd (the rate[2] sustained during the September 2010 pumping test); this is lower than the estimate from June 1999 and similar to the estimate from September 1999.

Thus, interim safe yield is 75% of the sum of all the individual rates for Wells A through C plus 0.35 mgd for Well D, or 1.56 mgd. The University does not propose that the Fenton River Wellfield safe yield be formally tested and verified because the available supply (described in the next section) is constrained by the diversion registration and the operating protocols set by the Fenton River Study. A safe yield pumping test would merely define a level of pumping that will never be achieved as long as the diversion registration is in place.

[2] A rate in gallons per minute is not available due to the pumping occurring less than 24 hours per day

Willimantic River Wellfield

Various Studies, 1964 to 1970

Yield tests were conducted in 1964 (Well 3), 1968 (MTS #2 and Well 3), and 1970 (Well 1 and Well 3). In each test, only one or two wells were pumped. Thus, total wellfield safe yield can not be calculated using the available data.

Yield Test, 1999

In 1998, Lenard Engineering, Inc. performed a test boring in the vicinity of MTS Well #2. The subsurface exploration found that the aquifer consists of coarse sand, gravel, and cobbles overlying fine to medium sand, with cobbles existing between 25 and 40 feet below the ground surface, fine sands present from 55 to 57 feet and below 61 feet, and bedrock at 71 feet. The University subsequently installed production Well #4 in 1998 to replace the aging MTS Well #2. Well #4 has a 12-inch diameter, 15-foot long screen located between 38 and 53 feet below the ground surface.

A safe yield test and aquifer pumping test were conducted by Lenard Engineering, Inc. during extended low-flow conditions in August 1999. Antecedent trends were monitored for eight days from August 11, 1999 to August 18, 1999 during a period of very little to zero pumping at the Willimantic River Wellfield. The pumping of Well #4 commenced on August 19, 1999 at 8:15 a.m. at a rate of 290 gpm. On the morning of August 20, 1999, the settings of the turbine bowls were adjusted to allow a pumping rate of 500 gpm.

Starting on August 20, 1999 at 10:30 a.m., Well #4 was pumped for 72 hours at a rate of 489.6 gpm. Two additional wells, Well #1 and Well #3, were activated on August 23, 1999. Well #1, Well #3, and Well #4 were pumped until 12:00 p.m. on August 28, 1999 at rates of 287 gpm, 282 gpm, and 414 gpm, respectively. The total yield of the three wells during the five-day test was 983 gpm, or 1.42 mgd.

During the test, water levels were measured in the four production wells, MTS Well #2, 17 observation wells, and five piezometers. Precipitation was also monitored using a temporary rain gage installed at the wellfield. Lenard Engineering, Inc. determined that Well #4 had an ultimate safe yield of 560 gpm, greater than the registered diversion rate. However, the total wellfield safe yield was not calculated, because: (1) Well 2 was not pumped; and (2) the wells were not pumped at their maximum rates.

Extended Pumping, 2007

Beginning in July 2007, flows in the Fenton River started to decline seasonally. In response, the University began closely monitoring flow to determine what, if any, operational or conservation measures would need to be implemented. This normal, seasonal decline in flow was exacerbated by a drought that resulted in streamflow dropping well below the 3.0 cfs flow threshold for an extended period of time. The Fenton River wells remained shut down until the following January.

The University's decision to not use any water from the Fenton River wells limited supply to the Willimantic River Wellfield. For six months, this wellfield was utilized to supply 100% of the water demands. As a result of the need for continuous pumping, total Willimantic Wellfield available supply approached 1,250 gpm, or 1.8 mgd. Eventually, production decreased to 1.7 mgd, with Well 2 and Well 4 operating at a limited combined rate of 300 gpm due to hydraulic limitations. The extended pumping experienced in 2007 underscored the fact that the 24-hour yield of the wellfield was likely no less than 1.7 mgd or 1.8 mgd.

Willimantic River Study, 2008-2010

In order to provide additional hydrogeologic information as part of the Willimantic River Study, the University retained Milone & MacBroom, Inc. to conduct three 72-hour pumping tests in 2008 and 2009. The original objective was to collect data during three different combinations of river flow regime and wellfield operation as described below:

1. Low wellfield operation (on the order of 1.0 mgd) and low to moderate river flow;
2. Moderate wellfield operation (on the order of 1.5 mgd) and low to moderate river flow; and
3. High wellfield operation (on the order of 2.0 mgd) and low river flow.

The 72-hour duration for each pumping period was selected to ensure that drawdowns would be relatively stable by the end of each test, thereby facilitating the analysis of data and its use in the numerical model. Although these exact combinations of pumping and instream flows could not be met due to the lack of low flows occurring when pumping could be manipulated, the tests were completed under conditions that differed from one another, thus lending a necessary variability in conditions for better model verification.

One pumping/monitoring event was conducted in August 2008, with the remaining two events conducted in September and November 2009:

- The first pumping/monitoring event captured a combination of "moderate" wellfield operation (1.5 mgd) and moderate river flow between August 18, 2008 and August 21, 2008, when 15-minute discharge in the Willimantic River ranged between 145 cfs and 89 cfs as recorded by the USGS Mansfield Depot gaging station at the wellfield. Pumping was according to system demand prior to and following this 72-hour pumping period. Data collection focused on river flow measurement, riverbed piezometer water levels, and groundwater levels in observation wells.

- The second pumping/monitoring event captured a combination of high wellfield operation (1.80 mgd) and low river flow between September 21, 2009 and September 24, 2009, when mean daily discharge in the Willimantic River ranged between 18 cfs and 23 cfs as recorded by the USGS gaging station at Merrow Road upstream of the wellfield. Data collection occurred on September 18, 2009 and September 23, 2009, again focusing on river flow measurement, riverbed piezometer water levels, and groundwater levels in observation wells. The mean daily pumping rate of the Willimantic River Wellfield prior to September 18 was 1.55 mgd, indicative of a period of moderate to high water usage.

- The third pumping/monitoring event captured a combination of high wellfield operation (1.97 mgd) and moderate river flow between November 9, 2009 and November 12, 2009, when mean daily discharge in the Willimantic River ranged between 42 cfs and 38 cfs as recorded by the USGS Merrow Road gaging station upstream of the wellfield. Data collection occurred on November 12, 2009, focusing on river flow measurement, riverbed piezometer water levels, and groundwater levels in observation wells.

The third pumping test verified the hypothesis formulated during the extended pumping from July 2007 through January 2008. Specifically, a sustained withdrawal of 1.97 mgd (1,368 gpm) was possible from the wellfield.

Extended Pumping, 2010

Beginning in June 2010, flows in the Fenton River decreased to the point that the Fenton River Wellfield was shut down, as it was in 2007. The Willimantic River Wellfield was again left as the sole source of available water, due to the continued adherence to the

Fenton River drought response protocols. Peak production from the Willimantic River wells in September 2010 was approximately 1.95 mgd.

Summary

The maximum pumping rate at the Willimantic River Wellfield sustained for 72 hours is proposed as an interim safe yield. Thus, safe yield is 75% of 1.97 mgd, or 1.48 mgd. The University proposes that the Willimantic River Wellfield safe yield be tested and verified because the interim safe yield is lower than the diversion registration of 2.3077 mgd. A safe yield pumping test could potentially prove that a higher level of pumping is possible for 72 hours, thus restoring a small but important increment of safe yield. Completion of a safe yield pumping test is listed in the Short Term Improvement Schedule in Section 7.0.

3.9 AVAILABLE SUPPLY

Available supply is the amount of water that can be assumed to be available for planning purposes. It can be lower than the safe yield as encumbered by diversion registrations, treatment limitation, system hydraulics, and wellfield operating protocols.

Fenton River Wellfield

For the Fenton River Wellfield, interim safe yield is 1.56 mgd. The available water from this wellfield is directly constrained by (1) its diversion registration of 0.8443 mgd and (2) the Fenton River drought management protocols. Regarding the latter, the various river flow habitat thresholds will likely continue to trigger progressive levels of pumping cut-backs as described in the Fenton River Study and amended by the Wellfield Management Plan. As such, there will be times of the year that available water from the Fenton River Wellfield is zero. This typically occurs from June through October, although it is recognized that in 2007 and 2010 the Fenton River wells were shut down through the end of the calendar year.

Available water for the Fenton River Wellfield is summarized in Table 3-4. Note that available water is considered to be zero from June through October in order to facilitate the most reasonable planning in this document in accordance with the Fenton River Wellfield operating protocols. For planning purposes, it is assumed that the wells will be available in November and December, although it is understood that this is not always the case. The implications of this assumption are reviewed in the discussion related to Table 3-5.

TABLE 3-4
Fenton River Wellfield Available Water Supply

Month	Available (mgd)
January	0.84
February	0.84
March	0.84
April	0.84
May	0.84
June	0
July	0
August	0
September	0
October	0
November	0.84
December	0.84

With the completion of the Fenton Well D pumping test in September 2010 and the development of the Wellfield Management Plan, the use of Well D for limited periods of pumping coincident with periods of low flow in the Fenton River (less than 3.0 cfs) is recommended. The rationale for this recommendation is described in detail in the Wellfield Management Plan. A withdrawal of 0.35 mgd is believed possible subsequent to a period of non-pumping of the Fenton River Wellfield. Up to two months of pumping Well D is proposed, aligned with the maximum consumption months of September and

October in any given year. This rate is less than half of the registered diversion of 0.72 mgd for Well D.

Therefore, this plan assumes that subsequent to approval of this water supply plan and buy-in from the appropriate State Agencies, Fenton Well D will be available in both wet and dry years to provide water from the Fenton River Wellfield in the months of September and October. Of course, if the drought management protocols are not in effect during this time due to relatively higher instream flows, any of the wells may be used.

Willimantic River Wellfield

For the Willimantic River Wellfield, interim safe yield is 75% of 1.97 mgd, or 1.48 mgd. The available water from this wellfield is not directly constrained by drought management protocols. Instead, the various river flow habitat thresholds will continue to trigger progressive levels of system-wide conservation as described in the Willimantic River Study and amended by the Wellfield Management Plan.

Available water from the Willimantic River Wellfield is thus 1.48 mgd for an average day demand analysis; 1.48 mgd for a maximum month average day demand analysis; and 1.97 mgd for a peak day demand analysis.

3.10 MARGIN OF SAFETY

Margin of safety is the unitless ratio of supply over demand. It is system specific and is based only on available active supplies, considering hydraulic or other supply limitations. The Connecticut Department of Public Utilities (DPUC) and DPH recommend a margin of safety of 1.15.

For most water utilities that complete water supply plans, margins of safety are calculated using a full year of production data to determine average day demand, maximum month average day demand, and peak day demand. The average day demand and maximum month average day demand are compared to the safe yield (or the available supply based on the safe yield) with a 75% factor applied. The peak day demands are compared to peak pumping capabilities over 24 hours. However, for the University of Connecticut, the average day margin of safety is not a meaningful figure because available supply from the Fenton River Wellfield is extremely variable. Therefore, this plan presents a monthly analysis for margin of safety calculations.

Margin of safety calculations for the most recent calendar year (2010) are presented in Table 3-5. Note that the availability of Fenton Well D was not factored into the analysis, as 2010 precedes any State Agency approval to use Well D during dry periods.

TABLE 3-5
Monthly Margins of Safety, 2010

Month	Willimantic River Wellfield Available Supply (mgd)	Fenton River Wellfield Available Supply (mgd)	Total Available Supply (mgd)	Production (mgd)	Margin of Safety
January	1.48	0.84	2.32	1.18	1.96
February	1.48	0.84	2.32	1.43	1.63
March	1.48	0.84	2.32	1.25	1.86
April	1.48	0.84	2.32	1.53	1.52
May	1.48	0.84	2.32	1.02	2.27
June	1.48	0.00	1.48	1.02	1.45
July	1.48	0.00	1.48	1.14	1.30
August	1.48	0.00	1.48	1.16	1.27
September	1.48	0.00	1.48	1.64	0.90
October	1.48	0.00	1.48	1.52	0.97
November	1.48	0.84	2.32	1.34	1.73
December	1.48	0.84	2.32	1.27	1.83

Margins of safety dropped below 1.0 in September and October 2010, as production ramped up to accommodate returning students combined with high water demands for the cooling towers in the Central Utility Plant (CUP). This dynamic is described more fully in Section 5.0. During this time, the University easily met demands by operating the

Willimantic River Wellfield for 19 to 20 hours per day as needed, exceeding the safe yield of the supply.

With reference to the months of November and December, note that margins of safety would have been greater than 1.0 even if the available water from the Fenton River wells had been set to zero. Thus, the assignment of a figure for Fenton River wellfield to the months of November and December is not pivotal to the appropriateness of the planning in this document. September and October are the critical months.

The peak day demand in 2010 during a period of time *without* the Fenton River Wellfield on line was 2.12 mgd, occurring in September. The peak day margin of safety was therefore below 1.0, at 0.93, relative to the maximum pumping of 1.97 mgd at the Willimantic River Wellfield. Existing storage facilities in the University's system provide more than triple the peak day demand. Therefore, the University has the ability to drop below a margin of safety of 1.0 periodically. Clearly this scenario is not advisable for extended periods of time.

The peak day demand in 2010 during a period of time *with* the Fenton River Wellfield available was 2.23 mgd, occurring in March. The peak day margin of safety was therefore 1.26 relative to the maximum pumping of 1.97 mgd at the Willimantic River Wellfield plus the 0.84 mgd from the Fenton River Wellfield.

It should be noted that had the University limited its available water to 1.48 mgd during September 2010, it would have had a production deficit of 160,000 gpd, or 4.8 MG over 30 days. This deficit is equivalent to a head drop of 13.3 feet in the 5.4 MG reservoir (360,000 gallons per foot), leaving the University with over three million gallons of remaining useable storage system-wide. This underscores the fact that the University possesses significant storage that can be used to address short-term deficits.

The University is committed to bolstering its available water supply and restoring monthly margins of safety to levels greater than 1.0 in the short term, and greater than 1.15 in the long term. Section 7.0 of this plan presents an evaluation of future water supplies. Individual projects to help increase available supply are listed in the Improvement Schedules in Section 7.0.

SECTION 4.0
EXISTING SYSTEM PERFORMANCE

4.0 EXISTING SYSTEM PERFORMANCE

The University maintains two sources of water supply for the Main Campus and the Depot Campus. These are the Fenton River Wellfield and the Willimantic River Wellfield. Water is treated at each wellfield before being pumped to the Main Campus or Depot Campus distribution system. Water from each wellfield is treated for disinfection, pH adjustment, and corrosion control before entering the distribution system. Other system components include 36 miles of transmission and distribution system piping, six water storage tanks, and four booster pump stations. Each of these system components are described in the ensuing text.

4.1 TREATMENT FACILITIES

Water from the four Fenton wells is directed into the 50,000 gallon clearwell located near Well A. Water leaving this tank is treated with sodium hypochlorite (chlorine) for disinfection and sodium hydroxide (25% caustic soda) for pH adjustment and corrosion control. The chemical dosages are paced to flow from a 4-20 milliamp signal. An automatic chlorine residual analyzer continuously measures and records the chlorine residuals. Table 4-1 summarizes the chemical feed pumps at the Fenton River Wellfield treatment building.

TABLE 4-1
Chemical Feed Pumps at the Fenton River Wellfield Treatment Building

Chemical	Pump	Maximum Pressure	Maximum Treatment Rate
Sodium Hydroxide	Pump 1	100 psi	4 gph[1]
	Spare 1	60 psi	8 gph
	Spare 2	60 psi	216 gpd
Sodium Hypochlorite	Pump 1	100 psi	2.5 gph
	Spare	100 psi	2.5 gph

Notes: [1]gph = gallons per hour.

Water from the four Willimantic wells is directed to the new chemical feed building constructed in 2010-2011 near the railroad crossing at the west end of Spring Manor Lane. Treatment includes sodium hypochlorite for disinfection and sodium hydroxide (25% caustic soda) for pH adjustment and corrosion control. Each chemical feed system consists of one bulk tank and one day tank, two chemical metering pumps (one active and one spare), and associated chemical appurtenances. The chemical feed systems are flow paced using an on-site raw water magnetic flow meter. Alarm, status, and initiation signals (on/off) are transmitted to the existing SCADA system using the existing remote telemetry system located at the facility. The treatment system is capable of delivering a maximum capacity of 2.3 mgd of treated water. An automatic chlorine residual analyzer continuously measures and records chlorine residuals. Table 4-2 summarizes the chemical feed pumps at the Willimantic River Wellfield chemical building.

TABLE 4-2
Chemical Feed Pumps at the Willimantic River Wellfield Chemical Building

Chemical	Pump	Maximum Pressure	Maximum Treatment Rate
Sodium Hydroxide	Pump 1	80 psi	10 gph
Sodium Hypochlorite	Pump 1	100 psi	1.3 gph
	Spare 1	300 psi	1.3 gph

In addition, the university has an inactive treatment station at the High Head pumping facility. This facility, when activated, can also treat with sodium hydroxide (two existing pumps, characteristics unknown) and sodium hypochlorite (one existing pump, 1.3 gph maximum rate, 300 psi maximum pressure). This facility is only operated during emergencies (see the *Emergency Contingency Plan*).

4.2 STORAGE, PUMPING, TRANSMISSION, AND DISTRIBUTION

4.2.1 Pressure Zones

The University water system is comprised of a two main service areas (the Main Campus and the Depot Campus) that are supplied directly from the pressure in their associated water storage tanks, and two booster pump zones in the Main Campus system that are serviced by the Towers High Pressure Booster Pump Station and the Hilltop Apartments jockey pumps. Each zone is described below and shown on Appended Figure II. The associated tanks and pumping stations are discussed in Sections 4.2.2 and 4.2.3.

Main Campus Zone – The Main Campus pressure zone is supplied by both the Fenton River and the Willimantic River wellfields, and includes the Fenton River treatment facility, 0.05 MG clearwell at the Fenton River Wellfield, the 5.4 MG reservoir at W-Lot, and the twin 1.0 MG water storage standpipes at Towers. The majority of the main campus is served with potable water and fire protection water from this pressure zone, with booster pumping assistance to maintain adequate fire protection. Water service is also provided to the Town of Mansfield and off-campus residential properties in this zone.

Towers Loop Zone – The Charter Oak Apartments, the Alan T. Busby Suites, and Husky Village (all University-owned) are served by the Towers High Pressure Loop Pumping Station. This booster pumping station can provide flows of up to 8,300 gpm for normal usage, peak usage, and fire protection purposes. This station maintains system pressures of at least 147 psi and adequate fire protection within the service area.

Hilltop Apartments Zone – This University apartment complex in the western part of the main campus system is served with the assistance of three five-horsepower jockey pumps to maintain adequate pressure within the complex.

Depot Campus Zone – The Depot Campus Zone is served by water from the Willimantic River Wellfield. This pressure zone includes the 0.75 MG and 0.50 MG water storage tanks in the Depot Campus. Currently, water is pumped to the Depot Campus storage tanks when the level in the storage tanks triggers a valve in the new chemical feed facility at the Willimantic River Wellfield. Water service is provided to University owned buildings at the Depot Campus, the Bergin Correctional Facility on Route 44, and a few off-campus customers nearby.

4.2.2 Storage Facilities

Six storage facilities serve the University system as summarized in Table 4-3. A total of 7.6 MG of useable storage is provided throughout the system for potable use, including the clearwell at the Fenton River Wellfield. Each of the tanks is described in the ensuing text.

TABLE 4-3
Summary of Storage Tank Specifications

	Fenton Clearwell	Depot Campus #1	Depot Campus #2	Towers #1	Towers #2	W-Lot Reservoir
Total Capacity (MG)	0.050	0.500	0.750	1.000	1.000	5.400
Useable Capacity (MG)	0.036	0.330	0.500	0.875	0.875	5.000
Overflow	--	33 ft	49 ft	80 ft	80 ft	--
Height	--	35 ft	51 ft	85 ft	85 ft	15 ft
Material	Concrete	Steel	Steel	Steel	Steel	Concrete
Booster Pumps	1 @ 550 gpm, 1 @ 1,000 gpm	None	None	None	None	3 @ 2,750 gpm
Year Constructed	1926	1954	1958	1954	2010	1972
Inspection	2007	2006	2006	2009	New/2010	2010
Condition*	Fair	Fair	Fair	Fair	Good	Good

*Note: Poor denotes significant maintenance, repair, or replacement needed; Fair denotes working condition with some maintenance and/or repair needed; Good denotes working condition with no significant deficiencies.

Fenton River Wellfield Clearwell – As described above, raw water from Wells A, B, C, and D is discharged into a 50,000-gallon clearwell at the Fenton River Wellfield. The clearwell is located near Well A and is constructed of concrete. The clearwell is divided into two 25,000-gallon sections with separate inlet and outlet piping in addition to concrete baffling to enhance the detention time within the tank.

Depot Campus Storage Tanks – The 0.75 MG storage tank on the north side of the Depot Campus is the primary water storage tank for this campus and measures 51 feet high by 50 feet in diameter. The overflow height is 49 feet. The tank was last inspected in 2006. Two older, inactive water storage tanks near this tank date back to the 1910s or 1920s. The 0.50 MG storage tank on the east side of the Depot Campus is the secondary storage tank and measures 35 feet high and 25 feet in diameter. The overflow is at 33 feet. The level set point for both tanks is 26.5 feet with a normal operating range of 25 to 28 feet.

Towers Storage Tanks – The twin 1.0 MG standpipes provide water pressure to the Main Campus system. The second 1.0 MG tank was installed in 2010 to replace the older 0.30 MG tank and the 0.60 MG tank. Each tank is 85 feet high by 45 feet in diameter. The overflows are set at 80 feet. The level set point for both tanks is 72 feet with a normal operating range of 67 to 77 feet.

W-Lot Reservoir – This 5.4 MG underground storage tank has dimensions of 180 feet by 280 feet by 15 feet deep. It is divided into two 2.7 MG sections with separate inlet and outlet piping in addition to concrete baffling to enhance the detention time within the tank. The tank was constructed in 1972 to hold water from the Willimantic River Wellfield and was last cleaned and inspected in 2010. The tank is in good condition. The level set point is 13.5 feet with a normal operating range of 13 to 14 feet.

Inspection reports for the W-Lot reservoir, Fenton clearwell, Depot Campus tanks, and the older of the two Towers tanks are included in Appendix E. The appendix also includes the design plans for the newer of the two Towers tanks, which has not been inspected given its construction in 2010.

4.2.3 Pumping Facilities

The pumping facilities that serve the University system include well pumps, treatment plant pumping facilities, and distribution pumping facilities. Pumping facilities are summarized in Table 4-4 and described below.

TABLE 4-4
Summary of Pumping Specifications

Pump Location	Horsepower (hp)	Year of Pump Installation	Condition*	Aux. Power
Fenton River Well A Pump and Motor	5	1977	Good	Yes
Fenton River Well B Pump and Motor	10	1949	Good	Yes
Fenton River Well C Pump and Motor	7.5	1949	Good	Yes
Fenton River Well D Pump and Motor	25	2008	Good	Yes
Fenton High Lift Pump – 550 gpm	125	2007	Good	Yes
Fenton High Lift Pump – 1,000 gpm	200	2002	Good	Yes
Willimantic River Well #1 Pump and Motor	100	2006	Good	Yes
Willimantic River Well #2 Pump and Motor	75	2009	Good	Yes
Willimantic River Well #3 Pump and Motor	100	2006	Good	Yes
Willimantic River Well #4 Pump and Motor	100	2006	Good	Yes
High Head #1 – 1,600 gpm	100	Late 1990s	Good	Yes
High Head #2 - 1,600 gpm	100	Late 1990s	Good	Yes
High Head #3 - 1,600 gpm	100	Late 1990s	Good	Yes
Towers Booster Pump Station #1 – 50 gpm	7.5	2003	Good	Yes
Towers Booster Pump Station #2 – 250 gpm	25	2003	Good	Yes
Towers Booster Pump Station #3 – 250 gpm	25	2003	Good	Yes
Towers Booster Pump Station #4 – 500 gpm	40	2003	Good	Yes
Towers Booster Pump Station #5 – 1,250 gpm	40	2003	Good	Yes
Towers Booster Pump Station #6 (Peaking) – 1,250 gpm	125	2003	Good	Yes
Towers Booster Pump Station #7 (Peaking) – 1,250 gpm	125	2003	Good	Yes
Towers Booster Pump Station #8 (Fire Demand) – 3,500 gpm	350	2003	Good	Yes
Hilltop Apartments (constant pressure Jockey pump)	5 hp each	2003	Good	No
Hilltop Apartments (constant pressure Jockey pump)	5 hp each	2003	Good	No
Hilltop Apartments (constant pressure Jockey pump)	5 hp each	2003	Good	No

Note: All VFD pumps have variable rates.

*Poor denotes significant maintenance, repair, or replacement needed; Fair denotes working condition with some maintenance and/or repair needed; Good denotes working condition with no significant deficiencies.

Fenton High Lift Pumping Station – Located at the Fenton River Wellfield treatment facility, this pumping station moves finished water up to the twin 1.0 MG standpipes at Towers. System improvements were installed in 1998 to allow for finished water to be routed to the 5.4 MG reservoir instead. The pumps are controlled by the SCADA system based on the level in the 1.0 MG standpipes and the clearwell. Emergency power supply is available.

High Head Pumps – The pumps at the former High Head treatment building consist of three 100 HP pumps capable of moving finished water at a rate of 2,750 gpm from the 5.4 MG reservoir into the twin 1.0 MG storage tanks. Emergency power supply is available.

Towers Booster Pump Station – Located near the 5.4 MG reservoir, this pump station uses as many as eight pumps to boost water into the Towers Loop Zone. Five pumps supply normal demands, with two pumps in reserve to assist with peak demands. The eighth pump can provide as much as 3,500 gpm for fire protection purposes. Water passing through this pump station is drawn from the 1.0 MG storage tanks. Emergency power supply is available.

Hilltop Apartments Jockey Pumps – This booster station provides constant water pressure to Hilltop Apartments. The booster station contains three Jockey pumps. Emergency power supply is not available.

4.2.4 System Pressures/Fire Protection

System pressures fluctuate with the time of day. Maximum pressures generally occur at night when demand is slightly lower. Industry standards recommend pressures in the range of 35 psi to 125 psi. Presently, the majority of the distribution system experiences pressures in the range of 140 psi to 175 psi. Pressures in each zone average 147 psi. The lowest pressure detected was 140 psi at Hilltop Suites, and the highest detected was 175 psi at the CUP.

Fire protection is provided throughout the service area. The Main Campus receives its fire protection from a combined domestic/fire protection distribution system, with a dedicated fire loop system for the central campus. The Towers loop system provides fire service for Husky Village and the Charter Oak Suites and apartment complexes. The fire loop system serving the central campus takes its water from the standpipes and the 50,000-gallon Fenton clearwell. Two fire pumping stations at South Campus and the Central Utility Plant also supplement this system. The Towers fire system receives water from the Towers high head system with a dedicated pump house. The Depot Campus receives fire protection through a combined domestic water/fire protection distribution system.

The Insurance Services Organization (ISO) provides target fire flows for residential areas of between 750 gpm and 1,000 gpm, and greater than 1,500 gpm to 2,500 gpm for commercial areas. Based on testing conducted in 2008 and 2009, fire flows met ISO fire flow criteria at all tested locations, including sites in different pressure zones. Recent fire flow testing was conducted on March 23, 2011 at a hydrant located near the intersection of Bolton Road and Route 195. The test achieved a flow of 1,160 gpm with nearby static and residual gauged pressures of 65 psi and 60 psi, respectively.

A hydraulic model of the University system was initially developed in 2008 and was updated between April 2010 and April 2011 in connection with this water supply plan. The model includes all pipes and tanks, but not the pipes that are generally considered to be laterals. The model was calibrated using limited flow testing conducted by The Connecticut Water Company in 2008 and 2009, and verified with the flow testing conducted on March 23, 2011. Refer to Section 4.5 for more information about the model and a discussion of fire flow simulations along Hillside Road.

4.2.5 Transmission and Distribution System Facilities

Water system inventories in previous water supply plans have reported a total of approximately 5.5 miles of water transmission main and 19 miles of distribution main. The piping age has been reported from new to 70 years old. Many of the older mains were replaced with new pipes as part of the UConn 2000 initiative; however, detailed records of the water main system improvements have not been kept in an accessible central database or mapping inventory. The University's 2004 Water Supply Plan included an overall summary of pipe lengths, size and condition.

Mapping of the distribution system was completed in November 2005 by the University, and it has been updated for use in the Water and Wastewater Master Plan (2007) and the subject Water Supply Plan. This exercise has further inventoried the system of pipes, expanding and completing the inventory to the greatest extent possible, and further classified transmission mains, distribution mains and service laterals. Extensive discussions with University staff were undertaken and important information was compiled relative to pipe locations, material types, estimated dates of installation, and information relative to existing connections. Tables 4-5 and 4-6 summarize the results of this evaluation.

TABLE 4-5
Distribution Piping Inventory for Main Campus

Pipe Purpose	***Approx. Total Length Potable System***	***Approx. Total Length Fire System***
Transmission	33,934 feet	N/A
Distribution	73,098 feet	6,584 feet
Laterals	65,297 feet	10,821 feet

TABLE 4-6
Distribution Piping Inventory for Depot Campus

Pipe Purpose	*Approx. Total Length Potable System*	*Approx. Total Length Fire System*[1]
Transmission	N/A feet	N/A
Distribution	46,862 feet	N/A
Laterals	24,196 feet	N/A

[1]The Depot Campus receives fire protection through a combined domestic water/fire protection distribution system.

In summary, the University system consists of 36 miles of pipe ranging in size from mainly six inches to 20 inches in diameter, although some "laterals" are as narrow as two inches in diameter. A total of 6.43 miles consists of transmission mains, while a total of 29.80 miles consists of distribution mains. Because the system is not comprised exclusively of water mains in roads, and because property lines are not a factor within different parts of the main campus and Depot Campus, a clear division between laterals and water mains is not always possible. On University property, water mains may be beneath roads or may travel under quadrangles and buildings. Off-campus, water mains are primarily within roadways.

Appendix F provides a more detailed and lengthy inventory of the pipe lengths and diameters along with a condition assessment. A differentiation between mains and laterals is provided in the table in the appendix. Sheets 1 through 5 of Appended Figure II depict the transmission and distribution systems along with laterals.

A number of improvements to the distribution system have been completed in the past few years, including the replacement of a select number of water mains on campus. Most recently in 2010, a new pipeline was installed in North Eagleville Road.

As mentioned above in Section 4.2.4, a hydraulic model of the University system was initially developed in 2008 and was updated between April 2010 and April 2011 in connection with this water supply plan. The model includes all pipes and tanks, but not the pipes that are generally considered to be laterals. Refer to the discussion in Section 4.5 for more information about the model.

Leak detection is an important component of maintaining the transmission and distribution systems. A water leak detection survey performed between November 1 and December 30, 2005 located four leaks in the University water distribution system totaling 11 gpm (15,840 gallons per day) of water loss. These leaks have since been repaired. NEWUS currently conducts leak detection surveys every two years, targeting specific areas of the system. Copies of leak detection reports are included in the Water Conservation Plan.

Major water main breaks do sometimes occur, and they are repaired immediately. In July 2010, approximately 40 linear feet of the Willimantic River Wellfield transmission pipeline to the main campus ruptured north of the correctional facility in the Depot Campus. To help prevent future breaks and leakage, a formal water main replacement program has been developed as part of the subject Water Supply Plan. The program is built into the tables in Appendix D, and includes a framework and methodology for more thoroughly assessing underground infrastructure and ranking those assets that may need to be replaced at some time in the future. This program will be informed as needed by the system hydraulic model.

4.2.6 Consumptive Use Metering

The University has been working diligently since 2005 to ensure that customers are individually metered, including University-owned building on each campus and most of the off-campus customers. A number of low-use buildings remain unmetered, with a higher number in the Depot Campus as compared to the main campus. However, only a few large buildings remain that are not metered, and these are suspected to have low water usage consisting only of sanitation needs.

It will not be cost-effective for the University to provide 100% metering for all buildings, especially in the Depot Campus area where water usage is negligible in some of the under-utilized buildings. Nevertheless, the University wishes to more accurately characterize unaccounted water. The following plan is proposed for continuation of the metering program:

- Buildings that will be taken out of service in the near future will not be metered. Examples include a handful of University-owned buildings along Route 195 that will be replaced with portions of the Storrs Center project.
- When buildings are replaced, refurbished, or redeveloped, they will be fitted with a meter. Examples include Arjona Hall and Monteith Hall on the main campus; and any of the buildings on the Depot Campus, as they have been identified as having potential for redevelopment as discussed in Section 6.0.
- Where several buildings are grouped together and share a common water main, there may be opportunities for installing a common meter. The meter would then record consumption for the group of buildings. Examples include the following:
  - Unmetered athletics facilities buildings on the southwest side of Hillside Road;
  - Unmetered Facilities Operations buildings in the Ledoyt Road area;
  - Unmetered dairy, poultry, and other outbuildings in the vicinity of Moulton Road and the northwest leg of Horsebarn Hill Road; and
  - Unmetered laboratory, classroom, and other buildings clustered along the southern and eastern portions of Horsebarn Hill Road.
- A few remaining large buildings will be metered as funds are available. These may include some of the fine arts, music, and drama buildings near Route 195; Bishop Hall; Sprague, Holcomb, and Whitney Halls; the School of Business; the library; Jorgenson Center for the Performing Arts; and the remaining portions of the Student Union that are not metered.

A line item has been included in the Improvement Tables in Section 7.0 for continued metering in accordance with the above plan.

4.3 OPERATIONS AND MAINTENANCE

4.3.1 System Operations

As explained in Section 2.2, the University's water systems are owned and controlled by the University. The contract operator for the Water System is the Connecticut Water Company through its subsidiary, NEWUS. NEWUS staff are responsible for the day-to-day operation of the water system and for ensuring that water quality meets state and federal drinking water standards. NEWUS is also responsible for providing 24-hour response to water system emergencies.

The University conducts its water system operations at the Facilities Building located off LeDoyt Road. The water system is automated by a computer-controlled SCADA system. The SCADA system continuously monitors production from wells, treatment, storage levels, water distribution, and water quality.

Facilities staff and NEWUS personnel monitor the system operations through more traditional means, in addition to the SCADA system. For example, visual inspections are conducted at the wellfields, the treatment plant, the storage facilities, and the pumping stations.

4.3.2 System Maintenance

NEWUS staff operate and maintain the wells, treatment facilities, distribution system piping, and associated storage and pumping facilities. These individuals are responsible for performing minor maintenance on equipment, scheduling major maintenance, collecting water samples for subsequent laboratory analysis per regulatory requirements, monitoring daily chemical dosage and water production, and completing other tasks listed in Table 4-7.

TABLE 4-7
Operation and Maintenance Schedule

Daily Schedule	
Routine Readings and Inspections	Log Book Entries
Water Quality Testing per DPH Requirements	Pumping Station Inspections
Weekly Schedule	
Water Quality Testing per DPH Requirements	Inspect Wells
Minor Maintenance as Necessary	Inspect Tanks and Clearwell
Monthly Schedule	
Water Quality Sampling per DPH Requirements	Submit Monthly Reports to DPH
Dead end flushing	Certain customer meter reading
Quarterly Schedule	
Water Quality Sampling per DPH Requirements	Certain customer meter reading
Semi-Annual Schedule	
Water Quality Sampling per DPH Requirements	Water main flushing
Annual Schedule	
Water Quality Sampling per DPH Requirements	Service Emergency Generators
Calibrate Flow Meters	Publish CCR Report
Cross Connection & Backflow Survey	
As Needed	
Update Maps and Records	Clean and Repair Service Distribution Lines
Meter Repairs	Call Before You Dig Mark-Outs
Response to Complaints	Service Alarm System
Grounds Maintenance of Well sites	Inspect, Clean, and Repair Tanks

Specialized routine maintenance functions are contracted out. These include maintenance of the SCADA computer system and instrumentation and calibration of certain treatment equipment.

Copies of all material safety data sheets (MSDSs) for chemical additives used at the treatment facilities are kept on site and at the Facilities Operations building. Files are also kept that document equipment maintenance and emergency responses.

Various Operation and Maintenance Manuals for different equipment and components of the water supply system are kept at the treatment facilities and office.

4.4 WATER QUALITY

4.4.1 Regulatory Overview

Prior to 1974, the major responsibility for regulation of public drinking water supplies rested on State Government. In 1974, the Federal Safe Drinking Water Act (SDWA) was passed. The Act authorized the Federal Government to set national drinking water standards, conduct special studies, and to generally oversee the implementation of the Act. However, primary responsibility of implementation and enforcement essentially remained in the hands of State government.

Subsequent to the passage of the SDWA, interim primary drinking water regulations were promulgated. These regulations and subsequent revisions set standards for organic, inorganic, and microbiological contaminants; turbidity; radionuclides; and trihalomethanes (THMs).

In June of 1986, amendments to the SDWA were adopted. The amendments converted interim and revised primary drinking water standards to national primary drinking water regulations and converted recommended maximum contaminant levels (RMCLs) to maximum contaminant level (MCL) goals.

Since the adoption of the 1986 amendments, the Environmental Protection Agency (EPA) has been working towards promulgating national primary drinking water regulations for various parameters. On July 8, 1987, EPA published regulations setting MCLs and MCL goals for eight volatile organic compounds and monitoring for a number of additional volatile organic compounds, without MCLs. These regulations became effective January 9, 1989. In May of 1989, EPA proposed national primary drinking water regulations for 38 additional inorganic and organic drinking water contaminants.

On January 30, 1991 (effective date July 30, 1992), EPA promulgated MCLs for a series of parameters referenced as the "Phase II" compounds, which include nine inorganic compounds, 10 volatile organic compounds, and 15 synthetic organic compounds. Monitoring requirements were specified for an additional 24 synthetic organic compounds, without MCLs.

On June 7, 1991, the U.S. Environmental Protection Agency promulgated maximum contaminant goals and National Primary Drinking Water Regulations for controlling lead and copper. These regulations were adopted pursuant to the Lead Contamination Act of 1988. The regulations specify a treatment technique that includes optimal corrosion control treatment, source water treatment, lead service line/connection replacement, and public education.

Beginning on July 1, 1992, any public water system that served greater than 3,300 and less than or equal to 50,000 persons were required to conduct initial tap water monitoring for lead and copper at targeted sampling sites. Any medium size water system that exceeded the lead or copper action level was required to monitor applicable water quality parameters at additional taps in the distribution system and at each entry point to the distribution system. Additionally, any water system that subsequently failed to meet the lead or copper action level was required to collect one source water sample from each entry point to the distribution system within six months after the exceedance. The first monitoring period was from July 1, 1992 to December 31, 1992 and the second monitoring period was from January 1, 1993 to June 30, 1993.

The lead action level is exceeded if the concentration of lead in more than 10 percent of tap water samples collected during any monitoring period is greater than 0.015 mg/L. The copper action level is exceeded if the concentration of copper in more than 10 percent of tap water samples is greater than 1.3 mg/L. Following the first two monitoring periods, if lead and copper levels were less than or equal to the action levels, water monitoring could be reduced.

On July 17, 1992 (effective date January 17, 1994), EPA promulgated the "Phase V" compounds, including five inorganic compounds and three volatile organic compounds with MCLs, and 21 volatile organic compounds and 15 synthetic organic compounds without MCLs.

The SDWA was reauthorized in 1996. The law focused water program spending on the contaminants believed to pose the greatest risk to human health and that are most likely to occur in a given water system. It also required water systems to notify the public of water safety violations within 24 hours. It maintains requirements that EPA set both a maximum contaminant level and a maximum contaminant level goal for regulated contaminants based on health risk reduction analysis that includes a cost/benefit consideration. The revised Act also required EPA to establish a database to monitor the presence of unregulated contaminants in water.

At the State level, the authority for regulation of drinking water is established under Section 25-32 of the Connecticut General Statutes and implemented through the Public Health Code. These requirements are consistent with Federal Regulations and have additional requirements such as annual watershed surveys, annual cross connection surveys, monitoring of raw and finished water, and public notification requirements.

In 1991, the State DPH adopted regulations and criteria pursuant to the EPA Surface Water Treatment Rule to evaluate all community ground water sources by June 29, 1994, to determine if the sources were under the direct influence of surface water. The University conducted a "Ground Water Under the Direct Influence of Surface Water" study from 1993 to 1994. It was subsequently determined that neither wellfield was under the direct influence of surface water. Correspondence from DPH is included in Appendix G.

In December 1998, EPA published the Stage 1 Disinfectants/Disinfection Byproducts Rule (DBPR). This Rule requires water suppliers to use treatment methods to reduce the formation of disinfection byproducts and to meet associated water quality standards. The disinfection byproducts and their corresponding standards include the total trihalomethanes (TTHM) and the haloacetic acids (THAA). The total TTHM is measured as the total concentration of chloroform, bromoform, bromodichloromethane, and dibromochloromethane. The EPA standard for TTHM concentration is 80 ppb. The total THAA is measured as the total concentration of monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid. The EPA standard for THAA is 60 ppb. Both disinfection byproduct standards are based on annual averages.

The Stage 2 DBPR was published by EPA in January 2006. The purpose for the second stage is to improve public health protection by reducing health risks connected to large concentrations of disinfection byproducts throughout the entire supply system. The Stage 2 DBPR emphasizes the monitoring and reduction of concentrations of TTHM and THAA at sampling locations throughout the distribution system. The monitoring frequency and sampling locations are dependent upon the population size which the distribution system serves, inclusive of the system that provides the water.

4.4.2 Water Quality Monitoring Program

The University's water quality monitoring program is conducted in accordance with State and federal requirements. Two programs are in place: one for the Depot Campus, and one for the Main Campus, consistent with the two separate public water system IDs maintained by the University.

For the Depot Campus, one entry point sample and a total of nine distribution system sampling sites are maintained. For the Main Campus, two entry point samples (High Head and Fenton River Wellfield) are currently listed on the DPH Water Quality Monitoring Schedule, although it is understood that this will change in accordance with recent system improvements regarding the chemical feed buildings and treatment systems. A total of 23 distribution system sampling sites are maintained. Each of the eight wells is a raw water sampling site.

Tables 4-8 through 4-10 summarize the water quality monitoring program and the frequencies of various analyses.

TABLE 4-8
Raw Water Quality Monitoring Program

Parameter	Monitoring Frequency
Physical (Color, Odor, pH, Turbidity)	Not required; as needed
Nitrogen Compounds	Not required; as needed
Inorganic Compounds (iron, manganese)	Not required; as needed

TABLE 4-9
Entry Point Water Quality Monitoring Program

Parameter	Monitoring Frequency – Depot Campus	Monitoring Frequency – Main Campus
Chlorine Residual	Daily	Daily
Nitrogen Compounds	Annually	Annually
Inorganic Compounds (Iron, Manganese, Copper)	Every three years	Every three years
Volatile organic compounds (VOCs)	Annually	Annually
Pesticides, PCBs, Herbicides (SOCs)	Every three years	Every three years
Radiological	Every three years	Every three years

TABLE 4-10
Distribution Water Quality Monitoring Program

Parameter	Monitoring Frequency – Depot Campus	Monitoring Frequency – Main Campus
Bacteriological & Physical Parameters	Twice monthly	15 times/month
Lead and Copper	Every three years	Every three years
Disinfection Byproducts	Annually	Quarterly
Asbestos	Every nine years	Every nine years

Chlorine residual monitoring is conducted on-site. Physical parameter testing takes place at a certified laboratory. Testing for other parameters is completed off-site at a certified laboratory.

4.4.3 Entry Point Monitoring

Maximum nitrate levels are typically on the order of 1.0 mg/L in treated water at the entry points. Sodium and chloride levels are typically in the range of 20 to 25 mg/L. VOCs, SOCs, and radiological parameters are either not detected, or detected at levels below their MCLs.

4.4.4 Distribution Monitoring

A total of approximately 50 samples per month are collected at various locations throughout the distribution system, including customer taps, tanks, and pumping stations; and are tested for physical and bacteriological parameters. A total of 30 samples are also collected for lead and copper testing. Testing for asbestos is conducted every nine years.

No coliform violations occurred during the last five years of routine testing. Exceedance of the secondary standards for color and turbidity occurred in 2005 and 2006 at the Main Campus and Depot Campus, but not since then. Lead and copper detections have been lower than their criteria. Asbestos has not been detected in distributed water. Disinfection byproduct levels have generally been low, consistent with the use of groundwater.

4.4.5 Cross Connections

As of 2009, 789 cross connection control devices have been installed at the Main Campus and 113 devices at the Depot Campus. An annual cross connection survey is conducted whereby approximately 265 buildings and establishments are investigated to detect any possible cross connections. Annual reports are submitted to the DPH. Table 4-11 presents the results of the most recent cross connection survey.

TABLE 4-11
Summary of Cross Connection Survey Report

Total Devices Tested	901
Total tests Performed	900
Total Number of Failures	30
Total Repairs	18

In the year 2009, 30 failures were detected. A total of 18 of the failures were repaired and retested, and one is out of service.

4.4.6 Summary

A review of the water quality data collected over the past five years indicates that the overall water quality is good, and with appropriate treatment it continues to exhibit excellent water quality. Entry point and distribution waters have an excellent compliance record, meeting State and Federal requirements. With the exception of turbidity and color in 2005 and 2006, no violations of water quality have occurred in the past five years for raw, entry point, or distribution water.

4.5 HYDRAULIC MODEL

Development of a hydraulic model has been underway for several years and was completed by Tighe & Bond under subcontract to Milone & MacBroom, Inc. in connection with the subject Water Supply Plan. Data used to develop the hydraulic model included:

- A pre-existing hydraulic model of the Main Campus system developed several years ago by Earth Tech;
- Updated water system mapping;
- Available State-wide two-foot contour ground elevation mapping;
- Results of fire flow test data conducted by the Connecticut Water Company in 2008, 2009, and 2011;
- System description data from the previous Water Supply Plan;
- Preliminary design report entitled "Demolition of Existing Water Storage Tanks and Construction of New Water Storage Tank" prepared by Earth Tech and dated December 2008; and
- Preliminary design report entitled "New Chemical Facility for Willimantic Wellfield" prepared by Earth Tech and dated December 2008.

The pre-existing hydraulic model was used as the basis for developing the updated model. Water system mapping was updated and corrected through an iterative process between Milone & MacBroom, Inc. and the University, then provided to Tighe & Bond as the basis for updating and expanding the hydraulic model. The model was expanded to include the Depot Campus as well as the Fenton River and Willimantic River Wellfields and the storage tanks located in the distribution system. The updated model contains 206 pipes and 174 nodes. Tables 4-12 and 4-13 provide a breakdown of pipes by diameter and by material, respectively.

TABLE 4-12
Breakdown of Distribution System Model Pipes by Diameter

Diameter	Total Length
4-inch	552 feet (0.10 miles)
6-inch	11,734 feet (2.22 miles)
8-inch	45,589 feet (8.63 miles)
10-inch	20,514 feet (3.89 miles)
12-inch	27,498 feet (5.21 miles)
14-inch	270 feet (0.05 miles)
16-inch	23,586 feet (4.47 miles)
20-inch	1,774 feet (0.34 miles)
Total	**131,517 feet (24.91 miles)**

TABLE 4-13
Breakdown of Distribution System Model Pipes by Material

Material	Total Length
Cast Iron	65,010 feet (12.31 miles)
Ductile Iron	62,998 feet (11.93 miles)
Asbestos Cement	2,706 feet (0.51 miles)
Steel	803 feet (0.15 miles)
Total	**131,517 feet (24.91 miles)**

The approximate age of installation, if known, was also entered in the model to help with the determination of C-factors. Approximate age information was available for 89% of the pipe by length. For the pipes that were already included in the existing hydraulic model, it was assumed that the model had been calibrated and the C-factors for those pipes were preserved in the updated model. For pipes that were added to the model, C-factors were estimated based on the age and material of the pipe. The range of C-factors used for each material is listed below:

- Cast Iron: 75 to 130
- Ductile Iron: 120 to 130
- Asbestos Cement: 90
- Steel: 100

The model was calibrated against the fire flow test data conducted by The Connecticut Water Company in 2008 and 2009. For these flow tests, hydrant flows and residual pressure information were provided, but detailed boundary condition information (i.e., storage tank levels at time of test, operation/flow of sources) was not provided; therefore storage tank levels and source flows were assumed. The results from the updated hydraulic model were comparable to those predicted by the original model. Due to the addition of more pipes, storage facilities, and additional sources to the updated model, exact replication of results was not expected.

Nodes that were part of the existing model already had elevations associated with them. For new nodes that were added to the model as part of the update, elevations were assigned based on two-foot contour ground elevation mapping. The hydraulic model was then updated to incorporate updated water demand information. Current day demands were based on actual 2010 metered usage.

It is noted that approximately 44% of the distribution system piping (calculated by length) was installed before 1960. Although the distribution system is characterized by several older pipes, the results of the hydraulic analysis indicate that adequate pressures (>35 psi) are simulated throughout the majority of the system. The only locations where simulated pressures were at the lower end of the acceptable pressure range were the suction side of the pumps from the underground reservoir and the immediate vicinity of the standpipes.
Because pumping water out of the underground reservoir is sufficient to provide adequate pressure to acceptable levels and because there are no customers served off of the suction side of the main, the simulated low pressures are not a concern.

Similarly, the simulated low pressures in the immediate vicinity of the standpipes (approximately 33 psi) are caused by the high elevations at these locations. The model-predicted pressures of 33 psi are minimally lower than the acceptable level of 35 psi. Since there are no customers served in the immediate vicinity of the standpipes, these low simulated pressures are also not a concern.

In addition to present day scenarios, future demand scenarios for a 5-year, 20-year, and 50-year analysis period were analyzed. The analysis of future demands focused on planned development at the four locations on and near the campus (North Campus, Storrs Center, North Eagleville Road/King Hill Road, Depot Campus) that are discussed in Section 6.3 of this plan. Table 4-14 lists the projected future demands at the four locations for the 5-year, 20-year, and 50-year analysis periods.

TABLE 4-14
Projected Future Demands Evaluated in Hydraulic Model

Area of Campus	2015 Additional Demand	2030 Additional Demand	2060 Additional Demand
North Campus	28,000 gpd	89,600 gpd	89,600 gpd
Storrs Center	59,255 gpd	169,300 gpd	169,300 gpd
North Eagleville/King Hill Road	5,000 gpd	5,000 gpd	5,000 gpd
Depot Campus	14,300 gpd	76,200 gpd	93,800 gpd

The results of the hydraulic modeling did not identify any normal daily pressure-related concerns associated with these increased demands.

The University plans to replace the water main on Hillside Road due to its age. The existing 8-inch cast iron water main was installed in the 1940s. The model was used to examine the impacts of replacing the main with 8-inch ductile iron as well as increasing the diameter to 12-inch ductile iron. Table 4-15 presents pressure and fire flow results for the existing conditions as well as replacing with new 8-inch and 12-inch main.

TABLE 4-15
Comparison of Pressure and Available Fire Flow (AFF) Results for Hillside Road Water Main Replacement

Location on Hillside Road	Existing Pipe		New 8-inch DI		New 12-inch DI	
	Pressure (psi)	AFF (gpm)	Pressure (psi)	AFF (gpm)	Pressure (psi)	AFF (gpm)
Hillside Rd/No. Eagleville Rd	95.5	2,600	95.5	3,200	95.5	5,400
Hillside Rd/Auditorium Road	93.2	5,000	93.2	5,300	93.2	6,400
Hillside Road/Glenbrook Road	82.3	5,200	82.3	5,900	82.3	6,800
Student Union	78.6	3,700	78.6	4,600	78.6	6,800
IT Engineering Building	78.4	3,700	78.4	4,600	78.4	6,700
Wolff-Zackin Natatorium	77.5	3,700	77.5	4,500	77.5	6,700
Gampel Pavillion	77.0	3,700	77.0	4,500	77.0	6,600
School of Business	75.9	4,000	75.9	4,700	75.9	6,500
Hillside Road/Stadium Road	74.7	3,700	74.7	4,400	74.7	6,300
McMahon Hall	69.9	3,500	69.9	4,000	69.9	5,600
Alumni Quadrangle	69.1	3,200	69.1	3,800	69.1	5,400
Brock Hall	65.1	3,000	65.1	3,400	65.1	4,900
Hillside Road/Bolton Court	64.0	3,000	64.0	3,400	64.0	4,700
Hillside Road/Hillside Court	63.3	2,900	63.3	3,200	63.3	4,600

The modeling results indicate that upgrading the main on Hillside Road will have a minimal impact on pressures, but the impact on available fire flow will be more substantial. It is important to note that the simulated fire flow under existing conditions ranges from 2,600 to 5,200 gpm along Hillside Road, which is adequate.

Overall, the modeling results indicate that the University's distribution system reliably provides adequate distribution system pressure and there is not an urgent need for any pipeline replacement or new piping installations due to areas of low pressure or due to high head losses or velocities. However, with the model advanced to its present form, the University is in a position to begin using it to help make decisions about the system such as prioritizing water main replacements.

More formalized model calibration and verification will be conducted in the future as time and budgetary considerations allow. A line item for future model calibration and verification has been listed in the Short Term Improvement Schedule in Section 7.0.

4.6 UTILITY DESIGN CRITERIA

The "Rules and Regulations of the University of Connecticut Water System" were adopted by the Board of Trustees and became effective October 1, 2006. Refer to Appendix H for a copy. The document provides policy and procedures for applications for new service, transfers of service, design and ownership of services, metering, billing, collections, termination of service, private fire service, and public fire protection service.

Although basic design criteria are set in the Rules and Regulations, the document does not include detailed design criteria that could be followed by a contractor for construction, installation, testing, and disinfection of pipes, valves, tapping sleeves, hydrants, and water service lines. This is due, in part, to the fact that the University has traditionally extended its distribution system as needed in response to requests in the Town of Mansfield, rather than relying on developers to extend its system. NEWUS is available to assist in matters related to design criteria.

4.7 SYSTEM DEFICIENCIES AND NEEDED IMPROVEMENTS

System deficiencies, where they exist, have been identified throughout the preceding sections. Detailed discussions of specific improvements designed to remediate these deficiencies, as well as those that will be necessary to meet future needs, are presented throughout this Plan and are summarized in Section 7.0. Tables 7-19, 7-20, and 7-21 present system improvements in Short-Term, Intermediate-Term, and Long-Term Improvement Schedules.

A distribution system deficiency discussed in the Emergency Contingency Plan is that the Depot Campus portion of the system could benefit from increased source redundancy. If the Willimantic River Wellfield were compromised, it would be difficult to immediately flow water from the Fenton River Wellfield through the system and down to the Depot Campus and its primary water user, the Bergin Correctional Facility. An item has been added to Table 7-20 to address the potential redundancy improvement.

SECTION 5.0
HISTORIC POPULATION

5.0 SERVICE POPULATION AND HISTORICAL WATER USE

5.1 SYSTEM OVERVIEW

The University of Connecticut is the primary provider of potable water for students, faculty, residents and businesses in the Storrs area. Potable water is provided through the Main Campus and the Depot Campus water systems. The transmission and distribution system is installed in both state-owned lands and roadways and beneath roadways owned by the Town of Mansfield. Residents beyond the University water system are served by private wells or by small community water systems.

Water meters have been installed at the water supply wells for several decades, and were originally installed in selected campus buildings in the early 1990s to track water usage by major water users. Commercial users and Town of Mansfield connections were also metered, but residential customers were not. Approximately 30 on-campus buildings were metered by 1999.

The University has embarked on an intensive metering program for both on-campus and off-campus water users since 2006. Thus, this is the first Water Supply Plan that is able to present reasonable estimates of water usage by traditional user category. While the Main Campus system and the Depot Campus system are classified as different systems, they are considered one for the purpose of this analysis. Water users can be divided into on-campus and off-campus users and are therefore categorized as follows:

- On-campus residential users: This category includes University-owned residence halls and apartments on the Main Campus system;
- On-campus non-residential users: This category includes transient visitors, non-transient commuting students, faculty, and staff; facilities usage; irrigation usage; and the cooling towers, chillers, and boilers at the Central Utility Plant (CUP) and South Campus chillers.

- Off-campus residential users: This category includes residential dwellings, apartments, and condominiums served by the University; and
- Off-campus non-residential users: This category includes commercial and business uses, municipal uses, usage by Regional School District #19, and institutional usage.

Unlike many other community water systems, the population served by the University's water system and its future growth are not proportional to population distribution and growth in the surrounding town (Mansfield). This is because the University's primary interest lies in providing water to serve the needs of its students, faculty, facilities, visitors, and off-campus support services. The University has committed to supplying a variety of off-campus users in the Town of Mansfield over the last three decades for several different reasons (some of which are listed in Section 2.1). In general, the off-campus customers are located in close proximity to the core water system.

The University has a small number of future committed water demands described in Section 6.0 that include future on-campus and off-campus buildings. Beyond serving these committed demands, the University has no current plans for future expansion of its water system.

5.2 CURRENT POPULATION AND WATER USAGE CATEGORIES

5.2.1 On-Campus Residential Users

According to the University's Residential Life website, the residential population of the University at the Main Campus in 2010 was 12,689 people. This total includes undergraduate students and graduate students in University-owned residence halls and apartments. Table 5-1 presents the resident population by housing complex.

TABLE 5-1
Main Campus Resident Populations and Water Demands, 2010

Name	Year Built	Dining Hall	2010 Population[1]	Average 2007 to 2009 Usage, gpd	Per-Capita Demand, gpcd[2]
Alumni Quadrangle	1966	Grab & Go	976	26,393	27.0
Buckley Hall	1969	Full Service	462	17,651	38.2
Charter Oak Apartments & Suites	2003	Grab & Go	1,307	23,461	18.0
East Campus	1922 - 1950	Full Service	576	24,955	43.3
Connecticut Commons (Graduate Residences)	1970	Common Kitchens	447	25,643	57.4
Greek Campus / Husky Village	2004	Kitchens	307	5,273	17.2
Hilltop Apartments	2000	Kitchens	1,224	32,687	26.7
Hilltop Complex	1971 & 2001	Full Service	1,313	43,663	33.3
Mansfield Apartments	Prior to 1951	Kitchens	268	5,977	22.3
McMahon Hall	1964	Full Service	619	18,054	29.2
North Campus	1950	Full Service	1,459	41,698	28.6
Northwest Quadrangle	1950; Renovated 1999	Full Service	1,040	54,508	52.4
Northwood Apartments	Prior to 1970	Kitchens	190[3]	9,958	52.4
Shippee Hall	1962	None	301	8,044	26.7
South Campus	2000	Full Service	724	28,527	39.4
Towers Quadrangle	1960 & 2003	Full Service	961	23,072	24.0
West Campus	1955	None	515	23,580	45.8
		Total:	***12,689***	***413,143***	***32.6***

[1]Population includes students and resident assistants. It does not include hall directors or their families who typically live in an apartment at each complex.
[2]Per-capita demand based on the 2007 to 2009 average day demand (gpd) usage divided by the 2010 population. Full Year data for the year 2010 was not available.
[3]Northwoods Apartments offers efficiency apartment units and family apartment units for enrolled students. As exact family sizes are unknown, the population for this complex has been estimated.

All 17 housing complexes are metered and are nearly 100% occupied for the majority of the year. Per capita water use for on-campus residential users was determined to be 32.6 gallons per capita per day (gpcd) based on the average of metered residential water use from 2007 to 2009 (an average of 413,143 gpd) and 32.7 gpcd based on metered residential consumption in 2009 (414,547 gpd). Both figures are low when compared to typical community water systems where per-capita consumption varies from approximately 45 gpcd to 75 gpcd, but reasonable for on-campus student housing where laundry, dining, and restroom facilities are shared and irrigation uses are lacking.

Note that most of the per-capita figures are skewed by the averaging that occurs when comparing annual consumption to a population that is largely absent from late May through late August. However, recent demand trends have begun to ramp up in the months of July and August as a result of summer programs. The completion of the Nathan Hale Inn in 2002 and its associated conferencing abilities has assisted in this summer expansion effort.

The University has no plans to expand on-campus housing in the foreseeable future. Future renovations that may be performed will result in a similar number of housing units. This policy on expansion may change in the future, and would likewise be reflected in future water supply plans.

5.2.2 On-Campus Non-Residential Users

The on-campus non-residential population served by the University is significant. The non-transient non-residential populations include the pre-school children at the Child Development Labs (currently unmetered), the many faculty and staff of the University (estimated at 3,250 people for the Storrs Campus), and the non-transient non-community undergraduate and graduate students who live off-campus (estimated to be 10,784 in 2010).

The transient non-residential population includes the many visitors of the University for campus tours (estimated by the Visitor's Center at 50,000 per year) and those who attend sporting events at Gampel Pavilion or other athletic stadiums. Additionally, other campus venues offer year-round programming to attract off campus visitors, including the Harriet S. Jorgensen Theatre, and the J. Louis von der Mahden Recital Hall among others. The total transient population attending such functions at the University is easily greater than 100,000 individual visits per year. Some of these visitors will, in turn, stay at the on-campus Nathan Hale Inn.

At this time, 45 of the approximately 170 on-campus buildings are metered. The metered uses include the majority of the high water-demand users on campus, so applying an average usage based on the high demand users to the remaining unmetered buildings would be meaningless. Thus, it is impossible at this time to determine the water usage in the unmetered buildings associated with the non-transient and transient populations. The remaining buildings will be metered as indicated by the improvement schedules listed in Section 7.0.

The 45 metered on-campus users (40 on the Main Campus system) can be broken down into four subcategories as shown in Table 5-2.

TABLE 5-2
On-Campus Non-Residential Water Usage

Subcategory	Number of Metered Connections	Average 2007 to 2009 Usage, gpd
Academic, Administrative, and other Buildings	29	211,672
Athletics Buildings	5	13,439
Utilities (CUP, Chiller, WPCA)*	6	266,676
Depot Campus	5	679
Total On-Campus Non-Residential Metered Usage:		***484,732***

Most of users of the University's water system exhibit a seasonality to their consumption patterns that is closely linked to the academic schedule. However, the CUP demands follow a modified seasonality pattern that is closely related to the heating and cooling needs. Heating and cooling needs are somewhat dependent on population, but are very much affected by the temperature and season.

Daily water consumption at the CUP includes makeup water for chilled water, the cooling towers, and the boilers. The CUP includes the pre-1960s Boiler Plant, the 1998

Chiller Plant and #9 Boiler, and the Co-Generation Plant with three gas turbines and adsorption chiller that was completed in 2005. The cooling towers cool water by evaporation and typically evaporate 80 to 90% of the incoming water, with the balance being returned to the sanitary sewer to prevent the buildup of excess solids in the system. Makeup water is needed for boilers to replace steam losses from leaks, steam traps, and humidification systems and to replace water that has been lost in the condensate return system.

Table 5-3 provides a comparison of metered makeup water demands to water production in the year 2006. Table 5-4 presents a similar table for the year 2008. Note that chiller makeup water figures were not available for 2008, but these remain a small component (often less than 1%) of total CUP water demand. The two years are similar, except that the old cooling towers are used less in recent years in favor of the new cooling towers.

TABLE 5-3
Summary of Makeup Water Consumption at Central Utilities Plant, 2006

Month	Produced (gallons)	Boiler (gallons)	Chilled Water (gallons)	Old Cooling Tower (gallons)	New Cooling Tower (gallons)	% of Production Used at CUP
Jan	36,977,000	4,630,300	329	347,942	485,272	15%
Feb	42,961,000	4,165,100	1,220	256,080	1,107,054	13%
Mar	44,276,000	4,106,400	2,220	415,680	1,303,281	13%
Apr	45,681,000	3,514,300	540	636,280	1,260,381	12%
May	33,492,000	2,905,300	**60,980**	1,160,620	2,678,010	20%
Jun	32,432,000	1,854,800	27,040	1,328,000	4,029,529	22%
Jul	42,516,000	3,473,729	11,160	**1,404,220**	**7,574,083**	**29%**
Aug	45,066,000	3,598,700	16,640	373,300	7,383,477	25%
Sep	**49,683,000**	3,113,000	3,500	960,380	3,902,169	16%
Oct	49,185,000	4,173,769	3,100	12,980	2,963,390	15%
Nov	41,928,000	**5,387,307**	3,500	26,560	1,747,865	17%
Dec	33,656,000	4,424,820	15,200	316,600	755,061	16%

Note: Peak numbers in each category are shown in bold text.

TABLE 5-4
Summary of Makeup Water Consumption at Central Utilities Plant, 2008

Month	Produced (gallons)	Boiler (gallons)	Chilled Water (gallons)	Old Cooling Tower (gallons)	New Cooling Tower (gallons)	% of Production Used at CUP
Jan	35,264,000	5,260,446	Not avail.	0	1,025,645	18%
Feb	46,226,000	4,722,837	Not avail.	0	1,187,325	13%
Mar	38,774,000	3,406,802	Not avail.	0	1,999,813	14%
Apr	43,226,000	2,648,239	Not avail.	100,830	2,365,501	12%
May	30,679,000	2,421,676	Not avail.	340,111	7,667,378	34%
Jun	32,607,000	2,030,276	Not avail.	**364,250**	**10,035,272**	**38%**
Jul	35,999,000	2,013,109	Not avail.	280,855	7,602,940	27%
Aug	36,304,000	2,416,730	Not avail.	269,214	6,600,863	26%
Sep	**47,735,000**	3,588,095	Not avail.	149,612	3,490,295	15%
Oct	44,913,000	4,557,590	Not avail.	12,005	2,362,027	15%
Nov	37,832,000	5,365,346	Not avail.	0	2,126,116	20%
Dec	33,088,000	**5,781,929**	Not avail.	0	2,058,950	24%

Note: Peak numbers in each category are shown in bold text.

The boiler makeup demand reaches its peak during the heating season, whereas cooling tower makeup water demands are at their peak when the temperatures are warmest. Overall, the percentage of wellfield withdrawals that are directed to the plant for makeup water ranges from 12% to 38% based on data from 2006 and 2008.

It is notable that the overall peak month for water production (typically September in any given year) does not coincide with the peak months of CUP makeup water consumption. This is because water usage by the University population drives the peak demands when the fall semester begins. Nevertheless, the cooling tower demands are significant in September, and they are an important fraction of overall water usage during that month.

5.2.3 Off-Campus Residential Users

The University serves a total of 115 residential structures that (1) are not group quarters; and (2) are considered off-campus even though some of these buildings are owned by the University. These buildings include private homes and, for the purposes of this plan, low-water usage religious services buildings. Streets that are served include:

- Main Campus System: Dog Lane, Eastwood Road, Gurleyville Road, Hillside Circle, Hunting Lodge Road, Meadowood Road, Moulton Road, North Eagleville Road, Oak Hill road, Separatist Road, Westwood Road, and Willowbrook Road, for a total of 106 connections; and

- Depot Campus System: Old Colony Road, Spring Manor Lane, and Stafford Road (Route 32), for a total of nine connections.

As of July 2010, a total of 17 (15%) of these services were not metered. The unmetered connections will soon be metered as part of the ongoing metering program that is scheduled to be completed in 2011 for the residential properties. Based on a population density of 2.51 persons per housing unit in non-group quarters in the Town of Mansfield (from the 2000 U.S. Census), these 115 residential buildings have an estimated service population of 289.

The 98 residential metered water users used approximately 13,333 gpd in 2010. This is equivalent to approximately 136 gpd per connection. It is assumed that the 17 unmetered connections also used approximately 136 gpd per connection such that the remaining unmetered off-campus residential demand is estimated at 2,313 gpd, giving a total current off-campus residential demand of 15,646 gpd. Given the estimated off-campus service area population of 289 people who are not in group quarters, the per-capita water usage is estimated to be 54.1 gpcd. This value is reasonable for the sizes and types of residential homes served by the University.

The University serves seven additional residential complexes off-campus from the Main Campus system. These are summarized in Table 5-5.

TABLE 5-5
Off-Campus Residential Complexes Served by the University

Name	Number of Units	Average 2007 to 2009 Usage, gpd	Per-Unit Demand, gpd/unit
Celeron Square Apartments	160	18,388	114.9
Courtyard Condominiums	47	5,127	109.1
Glen Ridge Cooperative	51	4,255	83.4
Hanks Hill Road Mobile Home Park	5	858	171.6
Holinko Estates Apartments	35	5,410	154.6
Juniper Hill Village	100	9,410	94.1
Wrights Village	40	3,824	95.6
Total:	***438***	***47,273***	***107.9***

Note that a number of the off-campus residential water users are also on-campus non-residential water users, because many of the residents are students, faculty, or staff. Much of this subset of the population lives in Celeron Square (approximate total population of 500).

5.2.4 Off-Campus Non-Residential Users

The University services a variety of commercial and institutional uses off campus. Service categories include commercial and business, municipal, school, and institutional users. A total of 15 such users are metered, with at least two connections (Store 24 Plaza and Storrs Automotive) that are connected but not metered. Some establishments have multiple meters. The number of individual customers for each commercial connection is unknown, but estimates of per-capita water usage can be made for the school and institutional categories.

This analysis breaks down the above service categories into "commercial and business" and "institutional" uses. The majority of the municipal connections fit into either the residential category (and were discussed in Section 5.2.3) or the institutional category (which include schools) such that the two remaining municipal users (the Mansfield Town Hall and the Mansfield Community Center) have been included in the commercial and business category. Thus, the commercial and business category currently includes 15 connections from the Main Campus system. These connections are outlined in Table 5-6.

TABLE 5-6
Off-Campus Commercial and Business Customers Served by the University

Name	Average 2007 to 2009 Usage, gpd
125 North Eagleville Road[1]	710
153 North Eagleville Road[2]	114
B&B Associates Plaza – 13 Dog Lane	732
Beck Building – Mansfield Town Hall	532
College Square – North Eagleville Road	2,406
Huskies Restaurant & Bar	701
Juniper Hill - Center for Rehab and Nursing	7,648
Mansfield Community Center	4,973
Phil's – 10 Dog Lane	84
SNET/AT&T – Storrs Road	19
Storrs Commons – 1244 Storrs Road	5,216
Ted's Restaurant & Bar	942
U.S. Post Office	156
UConn Prof. Employees Assn. – 18 Dog Lane	45
University Plaza – 1232 Storrs Road	6,296
Total:	***30,575***

[1]Businesses include Ted's Spirit Shop, Subway, Sara's Pockets, and Sam's Convenience Store.
[2]Businesses include a barber shop and a massage parlor.

The remaining category includes institutional users. These include E.O. Smith High School served from the Main Campus System, the E.O. Smith High School Depot Campus, the Mansfield Discovery Depot day care / pre-school center, and the Bergin Correctional Facility on the Depot Campus system. Water usage is outlined in Table 5-7. Note that some of the students or staff may live in areas that have potable water provided by the University, although this number is likely relatively minimal.

TABLE 5-7
Off-Campus Institutional Customers Served by the University

Name	2010 Population[1]	Average 2007 to 2009 Usage, gpd	Per-Capita Demand, gpcd[2]
Mansfield Discovery Depot	120	1,027	8.6
E. O. Smith High School	1,344	3,879	2.9
E. O. Smith – Depot Campus	45	33	1.4
Bergin Correctional Facility	1,227	73,066	59.5
Total:	***2,736***	***78,005***	***N/A***

[1]Population includes students or inmates and staff.
[2]Per-capita demand based on the 2007 to 2009 average day demand (gpd) usage divided by the 2010 population. Full calendar year consumption data for the year 2010 was not available.

5.2.5 Summary of Known Water Usage

The water consumption figures presented in Section 5.2.1 through 5.2.4 are summarized in Table 5-8.

TABLE 5-8
Service Population and Water Usage by Category, 2007-2009

Name	2010 Population	Average 2007 to 2009 Usage, gpd	Per-Capita or Per-Unit Demand
On Campus Residential	12,689	413,143	32.6 gpcd
On-Campus Non-Residential[1]	N/A	484,732	N/A
Off-Campus Residential Homes[2]	289	15,646	54.1 gpcd
Off-Campus Residential Complexes	N/A	47,273	107.9 gpd/unit
Off-Campus Commercial & Business	N/A	30,575	N/A
Off-Campus Institutional	2,549	78,005	N/A
	Total:	***1,069,374***	

[1]Does not include unmetered demands.
[2]Includes estimated unmetered values.

Typically, "non-revenue water" is the difference between total water produced at the source and metered water consumption. Some of the traditional non-revenue uses include tank flushing, main flushing and blow-offs, fire fighting, main breaks, and unauthorized water use; and these do occur throughout the University's water system. However, the University is not a traditional revenue-producing entity, so the term is a misnomer in this context. While the University produces some water that results in the collection of "revenue," the majority of its water production is to provide itself with water. Therefore, a better term for discussing the non-metered consumption is simply "non-metered" water.

The University has attempted to calculate non-metered water usage as a result of its ongoing intensive metering program. As discussed in Section 5.3, average daily water production from 2007 through 2009 was 1,263,520 gpd. Thus, the average daily metered water demand from 2007-2009 in Table 5-6 is approximately equal to 85% of average daily production over that same time frame. Thus, approximately 15% of the University's produced water is a combination of (1) distributed water that is consumed by un-metered uses; and (2) transmitted/distributed water that is truly unaccounted or lost. Thus, it is believed that the University's true "unaccounted for water" amounts to much less than 15% of total production.

The improvement schedules presented in Section 7.0 include continuation of the ongoing metering program, annual water audits, and biennial leak detection surveys to assess unaccounted for water. These efforts are anticipated to maintain unaccounted for water at levels far below 15%, and allow for more precise estimates of non-revenue water in future water supply plans.

5.3 HISTORIC WATER PRODUCTION

Table 5-9 summarizes the annual water production from the Fenton River Wellfield and the Willimantic River Wellfield since 1984. All data are based upon University production records.

TABLE 5-9
Summary of Annual Production

Year	Average Daily Production (MGD)	Year	Average Daily Production (MGD)
1984	1.21	1997	1.13
1985	1.08	1998	1.17
1986	1.36	1999	1.22
1987	1.35	2000	1.22
1988	1.57	2001	1.28
1989	1.61	2002	1.26
1990	1.54	2003	1.29
1991	1.54	2004	[not available]
1992	1.48	2005	1.49
1993	1.31	2006	1.36
1994	1.37	2007	1.29
1995	1.37	2008	1.26
1996	1.30	2009	1.23
		2010	1.29

It is well-documented that system demand is higher during the fall and spring semesters and lower when the majority of students are on breaks. As discussed in Section 3.10, the fluctuation in monthly demands is critical to the margin of safety in the water system. Monthly historical demand values are presented in Table 5-10, and average day demand by month is presented in Table 5-11. Peak day demands by month are presented in Table 5-12. All three tables follow this page.

As seen in Table 5-10 and Table 5-11, monthly water production has historically peaked in April and October. Since 2002, monthly water production has generally peaked in September and October with the return of students. The highest average day monthly water production in the past several years occurred in September of 2005, when the average was 1.95 mgd. Outside of this peak, September water demands from 2006 through 2010 have remained stable at approximately 1.60 mgd. The September demand is critical because it occurs during the typical low-flow periods in the two rivers adjacent to the University's wellfields.

Table 5-10
Monthly Water Production (MG)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Average Daily Demand (MGD)
1984	30.75	42.09	38.11	42.20	33.94	27.53	28.06	30.67	43.28	**48.36**	41.05	36.42	442.46	1.21
1985	30.93	39.60	38.71	**42.74**	33.55	25.76	27.36	28.49	35.63	30.44	34.92	26.79	394.92	1.08
1986	38.11	44.93	43.44	47.43	37.25	29.9	39.33	30.58	48.12	**49.76**	46.92	42.07	497.84	1.36
1987	33.28	43.67	44.17	45.66	39.3	30.78	35.47	33.65	47.62	**50.16**	44.48	43.08	491.32	1.35
1988	42.47	52.54	51.02	54.10	45.27	38.95	41.01	42.37	53.93	**54.99**	48.76	50.10	575.51	1.57
1989	43.48	50.40	49.52	54.50	47.41	39.23	41.81	41.75	55.31	**57.78**	53.00	52.56	586.75	1.61
1990	43.23	50.34	49.55	52.77	44.63	40.09	39.11	39.64	51.86	**54.37**	48.35	48.46	562.40	1.54
1991	46.06	48.86	47.25	50.63	42.27	39.34	39.87	37.93	53.88	**57.58**	49.47	48.32	561.46	1.54
1992	41.68	50.92	52.02	**54.05**	44.09	40.60	36.68	36.46	48.27	51.21	45.77	41.35	543.10	1.48
1993	36.07	42.12	43.42	**45.23**	37.01	32.12	36.40	36.10	44.99	43.37	42.05	40.22	479.10	1.31
1994	37.93	41.90	45.78	46.79	40.71	34.63	37.07	35.48	45.71	**46.86**	43.59	44.88	501.33	1.37
1995	41.63	46.06	44.52	**47.72**	43.95	35.07	38.37	35.41	43.60	45.55	40.38	38.52	500.78	1.37
1996	32.61	46.57	45.52	**48.47**	40.31	33.42	37.84	33.36	44.07	41.05	39.19	33.60	476.01	1.30
1997	24.57	35.48	37.22	**43.26**	32.91	29.90	30.87	30.74	40.65	40.42	35.20	30.74	411.96	1.13
1998	30.93	34.15	34.12	40.50	31.10	24.73	34.02	30.00	41.95	**50.04**	38.84	35.96	426.34	1.17
1999	37.20	37.47	37.99	42.44	32.05	28.62	33.55	30.65	44.06	**47.42**	38.08	36.68	446.21	1.22
2000	30.30	38.01	36.53	40.44	33.47	25.37	27.19	35.77	47.77	**48.54**	42.39	42.02	447.80	1.22
2001	29.55	42.07	40.96	43.84	38.04	30.55	30.97	38.10	40.59	**50.89**	43.75	36.82	466.13	1.28
2002	34.33	41.11	38.80	44.15	37.30	27.85	32.72	36.35	**45.58**	42.36	39.31	38.60	458.46	1.26
2003	37.17	43.06	41.81	44.38	38.76	32.19	35.18	37.58	**45.90**	43.99	37.30	31.91	469.23	1.29
2004														
2005	43.33	46.52	46.84	49.82	38.00	40.16	42.35	51.01	**58.35**	48.27	38.76	38.94	542.35	1.49
2006	36.98	42.96	44.28	45.68	33.49	32.43	42.52	45.07	**49.68**	49.19	41.93	33.66	497.85	1.36
2007	37.54	42.90	40.21	44.37	33.24	33.96	37.36	40.34	**46.69**	45.35	36.60	31.99	470.54	1.29
2008	35.26	46.23	38.77	43.23	30.68	32.61	36.00	36.30	**47.74**	44.91	37.83	33.09	462.65	1.26
2009	34.97	40.08	39.58	42.97	32.97	27.73	29.44	35.85	**47.37**	44.76	37.37	37.28	450.37	1.23
2010	36.64	39.90	38.74	45.85	31.74	30.68	35.23	36.00	**49.29**	47.07	40.23	39.46	470.82	1.29

Table 5-11
Monthly Water Production (MGD)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Maximum Month Average Daily Demand
1984	0.99	1.45	1.23	1.41	1.09	0.92	0.91	0.99	1.44	**1.56**	1.37	1.17	1.56
1985	1.00	1.41	1.25	**1.42**	1.08	0.86	0.88	0.92	1.19	0.98	1.16	0.86	1.42
1986	1.23	1.60	1.40	1.58	1.20	1.00	1.27	0.99	1.60	**1.61**	1.56	1.36	1.61
1987	1.07	1.56	1.42	1.52	1.27	1.03	1.14	1.09	1.59	**1.62**	1.48	1.39	1.62
1988	1.37	**1.81**	1.65	1.80	1.46	1.30	1.32	1.37	1.80	1.77	1.63	1.62	1.81
1989	1.40	1.80	1.60	1.82	1.53	1.31	1.35	1.35	1.84	**1.86**	1.77	1.70	1.86
1990	1.39	**1.80**	1.60	1.76	1.44	1.34	1.26	1.28	1.73	1.75	1.61	1.56	1.80
1991	1.49	1.75	1.52	1.69	1.36	1.31	1.29	1.22	1.80	**1.86**	1.65	1.56	1.86
1992	1.34	1.76	1.68	**1.80**	1.42	1.35	1.18	1.18	1.61	1.65	1.53	1.33	1.80
1993	1.16	1.50	1.40	**1.51**	1.19	1.07	1.17	1.16	1.50	1.40	1.40	1.30	1.51
1994	1.22	1.50	1.48	**1.56**	1.31	1.15	1.20	1.14	1.52	1.51	1.45	1.45	1.56
1995	1.34	**1.65**	1.44	1.59	1.42	1.17	1.24	1.14	1.45	1.47	1.35	1.24	1.65
1996	1.05	1.61	1.47	**1.62**	1.30	1.11	1.22	1.08	1.47	1.32	1.31	1.08	1.62
1997	0.79	1.27	1.20	**1.44**	1.06	1.00	1.00	0.99	1.36	1.30	1.17	0.99	1.44
1998	1.00	1.22	1.10	1.35	1.00	0.82	1.10	0.97	1.40	**1.61**	1.29	1.16	1.61
1999	1.20	1.34	1.23	1.41	1.03	0.95	1.08	0.99	1.47	**1.53**	1.27	1.18	1.53
2000	0.98	1.31	1.18	1.35	1.08	0.85	0.88	1.15	**1.59**	1.57	1.41	1.36	1.59
2001	0.95	1.50	1.32	1.46	1.23	1.02	1.00	1.23	1.35	**1.64**	1.46	1.19	1.64
2002	1.11	1.47	1.25	1.47	1.20	0.93	1.06	1.17	**1.52**	1.37	1.31	1.25	1.52
2003	1.20	**1.54**	1.35	1.48	1.25	1.07	1.13	1.21	1.53	1.42	1.24	1.03	1.54
2004													
2005	1.40	1.66	1.51	1.66	1.23	1.34	1.37	1.65	**1.95**	1.56	1.29	1.26	1.95
2006	1.19	1.53	1.43	1.52	1.08	1.08	1.37	1.45	**1.66**	1.59	1.40	1.09	1.66
2007	1.21	1.53	1.30	1.48	1.07	1.13	1.21	1.30	**1.56**	1.46	1.22	1.03	1.56
2008	1.14	1.59	1.25	1.44	0.99	1.09	1.16	1.17	**1.59**	1.45	1.26	1.07	1.59
2009	1.13	1.43	1.28	1.43	1.06	0.92	0.95	1.16	**1.58**	1.44	1.25	1.20	1.58
2010	1.18	1.43	1.25	1.53	1.02	1.02	1.14	1.16	**1.64**	1.52	1.34	1.27	1.64

Table 5-12
Peak Day Production (MGD)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Maximum Peak Day Demand
1988	2.09	2.36	2.50	2.39	2.40	1.83	2.56	1.92	2.25	**2.56**	2.19	2.53	2.56
1989	2.25	**2.85**	2.24	2.56	2.41	1.54	1.79	1.71	2.61	2.35	2.61	2.74	2.85
1990	2.02	2.24	1.94	2.37	1.96	1.85	1.64	1.62	**2.62**	2.05	2.07	2.50	2.62
1991	2.06	1.97	2.00	2.03	1.90	2.10	1.75	1.73	2.07	**2.42**	2.05	2.22	2.42
1992	1.97	2.08	2.17	**2.43**	2.22	2.30	1.46	1.76	2.07	2.23	1.82	2.04	2.43
1993	1.73	1.79	1.81	1.98	1.79	**2.26**	2.04	1.81	2.16	1.85	2.10	1.81	2.26
1994	1.99	1.86	2.00	2.06	1.95	1.47	1.69	1.44	**2.20**	1.84	1.90	2.06	2.20
1995	1.77	1.94	1.81	1.90	**1.97**	1.37	1.63	1.49	1.73	1.73	1.60	1.70	1.97
1996	1.75	2.02	1.83	**2.04**	1.80	1.36	1.59	1.58	1.93	1.68	1.87	1.67	2.04
1997	1.30	1.53	1.66	**1.75**	1.60	1.29	1.57	1.47	1.63	1.58	1.53	1.47	1.75
1998	1.58	1.46	1.60	1.99	1.94	1.25	1.73	1.54	1.78	**2.02**	1.82	1.58	2.02
1999										**2.13**			2.13
2000													
2001													
2002													
2003													
2004													
2005													
2006	2.19	2.05	2.01	1.89	1.76	**2.40**	2.13	2.03	2.09	1.86	2.01	1.64	2.40
2007	**1.98**	1.94	1.96	1.80	1.82	1.70	1.69	1.80	1.97	1.88	1.90	1.64	1.98
2008	1.82	2.04	1.84	1.93	1.70	1.90	1.72	**2.33**	2.05	1.84	2.14	1.73	2.33
2009	1.86	1.85	1.45	1.93	1.78	1.48	1.24	1.83	2.11	1.72	**2.16**	2.01	2.16
2010	1.68	1.73	**2.23**	2.03	1.68	1.43	1.93	2.02	2.12	2.02	1.89	1.97	2.23

TABLE 5-13

UConn Monthly Water Production (Thousands of Gallons)

Year	Willimantic River Wellfield				Fenton River Wellfield			
Month	Well #1	Well #2	Well #3	Well #4	Well A	Well B	Well C	Well D
2005								
Jan.	11,055	3,231	10,851	8,444	2,543	2,160	2,871	2,171
Feb.	9,985	3,074	10,055	9,828	3,739	2,898	4,370	2,572
Mar.	9,013	2,970	10,725	10,774	3,647	2,785	4,241	2,685
Apr.	9,967	3,046	10,198	9,778	4,730	3,692	5,704	2,703
May	10,170	2,869	9,806	8,876	1,698	1,286	1,977	1,320
June	9,036	2,899	9,127	8,308	2,569	2,571	3,315	2,337
July	9,805	3,142	9,219	9,297	2,832	3,291	2,587	2,179
Aug.	11,719	3,304	9,186	9,007	4,875	9,543	659	2,716
Sept.	11,515	4,981	11,514	8,017	4,299	13,730	1,267	3,028
Oct.	11,534	4,443	13,418	8,669	1,666	7,063	223	1,253
Nov.	10,890	3,282	12,269	8,041	1,229	2,174	125	754
Dec.	10,593	1,892	11,690	6,086	1,944	3,648	2,287	797
2006								
Jan.	10,031	3,011	11,989	4,822	2,310	3,218	653	943
Feb.	9,447	3,260	10,043	8,200	2,529	5,957	1,437	2,088
Mar.	11,306	4,573	3,401	8,817	3,999	8,526	1,432	2,222
Apr.	10,695	3,930	8,982	8,138	3,063	6,786	1,636	2,451
May	9,851	3,932	6,371	7,509	1,366	2,996	630	837
June	18,296	2,510	6,811	3,441	347	696	133	198
July	17,279	1,065	11,778	10,823	610	0	250	711
Aug.	18,721	1,286	18,319	5,260	437	936	104	3
Sept.	18,484	3,164	18,288	6,630	998	1,983	136	0
Oct.	17,653	4,839	17,192	6,461	959	1,944	137	0
Nov.	17,026	3,038	13,400	5,574	770	1,628	300	192
Dec.	12,608	3,474	7,941	6,341	770	1,668	334	520
2007								
Jan.	11,553	3,657	5,862	12,085	1,029	2,201	449	700
Feb.	12,754	3,724	11,083	10,931	1,018	2,198	461	727
Mar.	12,331	1,102	10,263	7,800	1,992	4,331	925	1,463
Apr.	12,684	1,778	13,546	7,675	1,985	4,324	956	1,427
May	9,158	2,427	9,452	7,261	1,226	2,532	399	743
June	9,895	2,635	9,945	7,378	778	2,110	592	739
July	12,053	3,234	12,138	8,724	0	765	258	349
Aug.	13,414	3,442	13,694	9,616	0	172	2	0
Sept.	16,742	3,842	16,778	9,177	0	155	0	0
Oct.	16,895	3,662	16,731	7,926	0	134	0	0
Nov.	13,984	2,582	13,506	6,436	0	0	0	0
Dec.	12,132	2,480	11,852	5,823	0	0	0	0

TABLE 5-13 (Continued)

UConn Monthly Water Production (Thousands of Gallons)

Year	Willimantic River Wellfield				Fenton River Wellfield			
Month	Well #1	Well #2	Well #3	Well #4	Well A	Well B	Well C	Well D
2008								
Jan.	10,638	2,208	10,246	5,780	0	489	273	5,630
Feb.	13,330	2,697	12,672	7,193	0	2,149	1,228	6,957
Mar.	10,685	2,147	10,033	5,952	0	2,366	1,361	6,230
Apr.	10,976	2,110	10,372	5,991	0	5,544	3,097	5,136
May	7,897	1,490	7,248	4,036	0	3,255	1,812	4,464
June	8,898	1,750	7,771	5,765	0	3,485	1,933	3,005
July	11,451	2,787	11,602	8,098	0	1,318	734	0
Aug.	12,923	2,905	13,000	7,347	0	81	47	0
Sept.	14,780	3,434	14,894	8,209	0	4,124	2,294	0
Oct.	12,915	2,715	12,905	7,304	0	5,828	3,246	0
Nov.	11,061	2,297	10,811	6,060	0	4,878	2,725	0
Dec.	8,723	1,780	8,790	4,940	0	5,637	3,218	0
2009								
Jan.	10,443	1,910	10,513	5,691	0	2,572	1,470	2,367
Feb.	11,587	2,024	11,726	6,550	0	4,802	2,720	669
Mar.	10,972	1,908	11,518	6,197	0	3,424	1,865	3,698
Apr.	12,494	1,852	12,599	7,033	0	4,781	2,728	1,482
May	8,460	1,100	8,584	5,695	0	2,748	1,572	4,809
June	7,143	914	7,178	3,851	0	2,644	1,505	4,499
July	7,507	861	7,545	4,210	0	2,813	1,607	4,854
Aug.	12,302	1,102	12,293	6,739	0	1,023	592	1,797
Sept.	15,435	4,300	14,110	8,899	0	1,296	736	1,600
Oct.	13,473	5,261	13,059	7,506	0	3,248	1,840	2
Nov.	11,201	4,319	11,310	6,323	0	2,689	1,524	0
Dec.	10,725	3,839	10,825	6,323	0	3,298	2,091	182
2010								
Jan.	10,615	3,867	10,706	6,390	0	3,118	1,924	57
Feb.	11,572	4,562	11,973	5,971	0	3,691	2,092	41
Mar.	10,446	3,861	10,578	6,720	0	4,243	2,447	441
Apr.	12,695	4,765	12,797	8,165	0	4,342	2,326	758
May	9,508	3,577	9,607	4,719	0	2,576	1,470	279
June	9,260	3,537	9,323	5,621	0	1,866	1,073	0
July	11,530	4,447	11,738	7,293	0	141	81	0
Aug.	11,811	4,566	11,862	7,557	0	131	74	0
Sept.	15,499	5,785	15,380	10,031	0	88	56	2,452
Oct.	15,383	5,929	15,523	10,009	0	120	71	35
Nov.	11,376	4,291	11,447	7,358	0	3,317	1,824	614
Dec.	10,363	3,868	10,407	6,709	1	4,461	2,497	1,149

- Renovation of the CUP and removal of independent furnaces and facilities throughout campus;
- Centralization of a chilled water plant and piping facility and removal of independent chilling facilities throughout campus;
- Installation of water efficient research equipment;
- Replacement of old fire service pipes with a new fire loop; and
- Reducing water usage at agricultural facilities.

5.4 HISTORIC WATER CONSUMPTION

Historic water consumption data prior to the last decade is relatively poor due to limited metering. Previous water supply plans have necessarily assumed that water production was equivalent or close to water demand. This is not necessarily the case for the University system, as water produced at the wells can go into storage and not reach an end user for several days.

The intensive metering program that has taken place since 2006 has provided more insight into water usage at various buildings around campus, and has given the University the opportunity to estimate that un-metered and unaccounted for water usage (combined) is roughly 15%.

Table 5-14 is a multi-page table that presents metered water usage by user category since 2000. Prior to 2006, meters were read on a semi-annual basis. Monthly meter reading began in 2006 for on-campus connections, with the remaining off-campus connections read quarterly. Note that the 2006 data is limited to the last three months of the year, and the 2010 data represents a partial year.

Table 5-14
Metered Water Demand Since 2000 (gpd)

Name	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
On-Campus Residential Demand											
Alumni Quadrangle							24,709	23,912	34,436	20,830	24,353
Buckley Hall								21,264	2,599	14,037	33,246
Charter Oak Apartments & Suites				1,346	45,608	36,256	20,955	21,563	24,330	24,490	29,545
East Campus							N/A	43,268	14,364	17,232	17,143
Connecticut Commons - Graduate Residences							15,142	46,452	15,909	14,568	22,831
Greek Campus/Husky Village				242	7,542	5,723	5,447	4,646	5,220	5,954	5,675
Hilltop Apartments		8,857	32,330	36,961	33,657	39,062	N/A	27,521	32,553	37,986	41,850
Hilltop Complex							169,508	42,973	42,951	45,066	51,877
Mansfield Apartments							7,400	5,539	6,717	5,674	5,718
McMahon Hall							22,624	21,839	20,988	11,334	2,454
North Campus							42,129	39,491	35,956	49,648	58,505
Northwest Quadrangle							40,283	61,899	38,806	62,818	37,188
Northwoods Apartments							9,294	9,100	10,091	10,682	9,957
Shippee Hall							9,463	7,990	8,045	8,098	9,833
South Campus							32,179	27,811	30,129	27,642	29,451
Towers Quadrangle							N/A	22,285	23,973	22,957	29,839
West Campus							20,855	16,109	21,110	33,522	19,235
Off-Campus Residential Complex Demand											
Celeron Square Apartments	22,726	18,692	21,680	22,528	24,351	24,216	21,429	22,640	16,631	15,893	14,641
Courtyard Condominiums	6,913	5,296	6,099	5,472	5,905	4,104	3,211	6,088	4,877	4,416	4,044
Glen Ridge Cooperative	462	481	475	2,962	4,205	3,977	3,507	4,399	4,601	3,766	3,547
Hanks Hill Road Mobile Home Park										858	674
Holinko Estates Apartments	2,234	2,515	2,394	2,107	1,543	1,508	N/A	3,300	6,783	6,148	5,586
Juniper Hill Village	25,591	12,380	9,592	16,752	18,447	16,132	11,668	16,320	6,000	5,910	5,497
Wrights Village	3,637	3,064	3,845	4,027	4,413	3,147	3,273	4,215	3,684	3,574	2,968
Off-Campus Residential Home Demand											
1 Eastwood Rd										76	315
2 Eastwood Rd										130	144
3 Eastwood Rd										174	160
4 Eastwood Rd										171	193
5 Eastwood Rd - not yet metered											
6 Eastwood Rd - not yet metered											
7 Eastwood Rd - not yet metered											
8 Eastwood Rd										142	144
9 Eastwood Rd										135	138
10 Eastwood Rd - not yet metered											
11 Eastwood Rd										87	105
12 Eastwood Rd										215	227
13 Eastwood Rd										215	227
15 Eastwood Rd										147	122
16 Eastwood Rd										54	50
17 Eastwood Rd										102	94
18 Eastwood Rd										91	133

Table 5-14
Metered Water Demand Since 2000 (gpd)

Name	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
19 Eastwood Rd										436	337
20 Eastwood Rd										102	110
22 Eastwood Rd										126	122
88 Gurleyville Road								120	172	170	138
3 Hillside Cir										22	28
5 Hillside Cir										130	105
6 Hillside Cir										152	177
7 Hillside Cir										130	149
8 Hillside Cir										36	44
9 Hillside Cir										182	138
10 Hillside Cir										138	88
15 Hillside Cir										185	199
18 Hillside Cir										38	66
19 Hillside Cir										87	199
20 Hillside Cir										N/A	176
21 Hillside Cir										178	160
22 Hillside Cir										283	61
23 Hillside Cir										73	122
25 Hillside Cir										359	155
11 Hunting Lodge Rd										43	110
15 Hunting Lodge Rd										142	193
16 Hunting Lodge Rd - not yet metered											
22 Hunting Lodge Rd										11	155
23 Hunting Lodge Rd										11	144
27 Hunting Lodge Rd										283	287
28 Hunting Lodge Rd										55	50
34 Hunting Lodge Rd										141	160
43 Hunting Lodge Rd										142	193
57 Hunting Lodge Rd - Friends Meeting House										22	66
81 Hunting Lodge Rd										92	105
87 Hunting Lodge Rd										201	276
97 Hunting Lodge Rd - not yet metered											
101 Hunting Lodge Rd										141	177
105 Hunting Lodge Rd - not yet metered											
109 Hunting Lodge Rd - not yet metered											
115 Hunting Lodge Rd										124	171
122 Hunting Lodge Rd										178	254
125 Hunting Lodge Rd										65	227
131 Hunting Lodge Rd										315	348
134 Hunting Lodge Rd - not yet metered											
135 Hunting Lodge Rd										33	66
146 Hunting Lodge Rd - not yet metered											
153 Hunting Lodge Rd										33	N/A
156 Hunting Lodge Rd										109	260

Table 5-14
Metered Water Demand Since 2000 (gpd)

Name	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
163 Hunting Lodge Rd										43	28
180 Hunting Lodge Rd										141	127
28 Meadowwood Rd											94
4 Moulton Rd										98	122
46 N Eagleville Rd - Saint Thomas Aquinas Chapel											
188 N Eagleville Rd										95	99
19 Oak Hill Rd										125	166
31 Oak Hill Rd											
32 Oak Hill Rd										43	149
33 Oak Hill Rd										120	133
37 Old Colony Rd										141	160
38 Old Colony Rd - not yet metered											
222 Separatist Rd										76	77
64 Spring Manor Ln										196	188
66 Spring Manor Ln										163	116
1250 Stafford Rd										114	144
1254 Stafford Rd										293	304
1281 Stafford Rd										130	122
1289 Stafford Rd										168	188
1308 Stafford Rd										185	348
1 Westwood Rd - not yet metered											
2 Westwood Rd										164	155
4 Westwood Rd											144
5 Westwood Rd										87	249
6 Westwood Rd										76	83
7 Westwood Rd										33	72
8 Westwood Rd										131	144
9 Westwood Rd										87	116
10 Westwood Rd - not yet metered											
11 Westwood Rd										87	94
12 Westwood Rd										91	188
13 Westwood Rd										91	99
14 Westwood Rd										189	182
15 Westwood Rd										338	381
16 Westwood Rd - not yet metered											
17 Westwood Rd										207	166
18 Westwood Rd - not yet metered											
19 Westwood Rd										33	11
23 Westwood Rd										136	138
24 Willowbrook Rd										175	193
25 Willowbrook Rd										178	166
28 Willowbrook Rd										120	72
31 Willowbrook Rd										109	94
34 Willowbrook Rd										261	238

Table 5-14
Metered Water Demand Since 2000 (gpd)

Name	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
39 Willowbrook Rd										87	160
47 Willowbrook Rd										76	232
52 Willowbrook Rd										80	105
57 Willowbrook Rd										261	204
58 Willowbrook Rd										125	133
64 Willowbrook Rd										212	215
67 Willowbrook Rd										295	331
76 Willowbrook Rd										55	72
82 Willowbrook Rd										151	144
85 Willowbrook Rd											144
Academic and Other Buildings											
Agriculture Biology, Lab & Greenhouse H2O Flow Bldg 0421							5,577	15,199	16,826	10,770	11,214
Alumni House	199	203	167	110	114	40	49	39	19	20	5
Atwater Laboratory H20 Flow Bldg 0040							5,494	2,821	2,463	1,273	1,722
Beach Hall H20 Flow Bldg 0038							153	171	950	674	150
Biobehavioral 4 Original Prefab Bldg 1101A							53	134	148	129	66
BioPhysics H20 Flow Bldg 0384							N/A	35,432	3,976	3,524	10,527
Chemistry H2O Flow Bldg 0409							1,810	1,921	1,798	1,094	1,115
College of Liberal Arts & Science H20 Flow Bldg 0238								72	927	1,208	1,461
Commisary Bakery & Warehouse H20 Flow Bldg 0244							1,750	1,905	3,328	1,560	3,077
Engineering 2 H20 Flow Bldg 0239							15,961	14,010	9,038	12,496	12,443
Engineering 3 - Arthur Bronwell Building - H20 Flow							16	19	1,233	594	4,531
IMS H20 Flow Bldg 0331A							37,408	21,064	29,619	27,206	30,658
ITEB H20 Flow Bldg 0434							1,732	1,127	1,042	6,420	7,882
Jones Building H20 Flow Bldg 0240								24,705	18,627	2,784	309
Museum of Natural History H20 Flow Bldg 0030							6	5	5	4	4
Nathan Hale Inn - CWC Metering									8,801	8,638	7,928
Nathan Hale Inn - UConn Metering			5,145	5,898	6,487	6,037	5,912	6,311	8,174	8,718	7,850
Pharmacy/Biology H20 Flow Bldg 0415							24,572	23,210	23,045	65,739	212,740
Physics Gant Complex (Physics Build, MSB) H20 Flow Bldg 0331C							6,013	46,963	38,947	13,001	9,562
Psychology Bousfield H20 Flow Bldg 0349							904	5,390	7,464	8,448	38,989
Torrey Life Science H20 Flow Bldg 0252									16,450	18,536	20,874
Total Student Union Vendors							2,591	2,245	1,031	1,409	N/A
Old UConn Co-Op to 2003; New Co-Op and South Garage	119	102	120	2	N/A	N/A	2,186	1,548	1,052	1,478	1,239
UConn Foundation	790	973	1,157	2,399	1,902	2,202	2,437	1,137	1,315	1,410	702
United Technologies Engineering Building H20 Flow Bldg 0369							268	430	611	413	410
White Dairy Building H20 Flow Bldg 0222								6	7	N/A	N/A
Williams Health Services Infirmary H2O Flow Bldg 0171							8,989	5,625	589	586	727
Wood Hall H20 Flow Bldg 0131										482	381
Young Building H20 Flow Bldg 0175										1,761	2,406
Athletics											
Batting and Pitching Facility H20 Flow Bldg 0406							540	1,393	1,318	123	12
Burton Football & Shenkman H20 Flow Bldg 0480							14,230	69,839	30,125	1,863	1,573
Gampel Pavilion Sports Center H2O Flow Bldg 0374							6,851	7,814	7,809	8,117	6,467

Table 5-14
Metered Water Demand Since 2000 (gpd)

Name	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Ice Rink Arena H20 Flow Bldg 0433							4,851	25,950	3,826	3,500	2,518
Soccer Field Bldg 530SW							2,718	N/A	N/A	N/A	N/A
Utilities											
Cogeneration Chiller Facility H2O Flow Bldg 0483								116,066	132,574	94,555	39,191
CUP Heating and Power Plant H2O Flow Bldg 0141								11,075	7,088	N/A	N/A
CUP RO System Inlet							120,790	128,875	120,801	134,828	162,865
Waste Water Control Building H20 Flow Bldg 0388								212	336	321	N/A
Waste Water: Odor Control H20 Flow Bldg 0389								3	4	3	N/A
Waste Water: Process H20 Flow Bldg 0390								25	10,664	18,806	N/A
Depot Campus											
Depot Campus Kennedy Cottage H2O Flow Bldg 2131							153	170	713	208	142
Depot Campus Longley School H20 Flow Bldg 1125							120	48	89	111	165
Depot Campus Mansfield Cottage H20 Flow Bldg 2138											
Depot Campus Coventry Cottage H20 Flow Bldg 2112							98	83	78	18	N/A
Enterprise H20 Flow (Depot Campus)							42	391	63	64	1,654
Commercial & Business											
B&B Associates Plaza	410	271	374	327	373	292	482	N/A	811	652	541
College Square	2,946	2,482	3,600	3,510	4,767	3,619	1,634	2,401	2,451	2,367	2,331
Huskies	1,494	1,079	2,100	1,516	1,401	N/A	N/A	N/A	N/A	701	818
Juniper Hill - Center for Rehab and Nursing	11,689	10,172	11,153	8,079	9,265	7,628	5,955	9,019	7,186	6,740	7,039
Phil's	90	66	99	88	87	82	60	23	126	104	61
SNET/AT&T	879	307	287	225	245	164	81	22	19	16	17
Storrs Commons (Storrs Assoc's)	3,764	6,028	6,047	7,476	7,980	7,505	4,594	6,652	5,250	3,747	3,223
Ted's Restaurant & Bar										942	801
U.S. Post Office	165	125	160	158	182	137	100	140	142	186	193
Uconn Prof. Employees Assn	96	N/A	N/A	62	31	28	31	30	27	77	39
University Plaza Stores	6,845	4,888	9,469	5,911	6,639	N/A	N/A	6,267	6,249	6,373	6,265
125 North Eagleville Road										710	862
153 North Eagleville Road			132	104	89	110	13	43	90	209	50
Beck Building/Town Hall	444	318	485	546	471	448	429	597	503	496	519
Mansfield Community Center					580	598	675	5,665	4,613	4,642	5,129
Institutional											
Bergin Correctional Facility	11,139	13,723	24,823	45,188	43,856	40,313	46,458	65,974	77,935	75,288	67,254
E.O. Smith High School - Depot Campus									25	33	33
E.O. Smith High School	3,672	3,041	3,841	3,329	4,140	3,545	3,041	3,806	4,475	3,355	3,713
Mansfield Discovery Depot (Day Care)	997	864	974	923	970	743	1,052	1,174	874	1,033	1,105

Table 5-15 summarizes the top five non-University water users.

TABLE 5-15
Top Five Non-University Water Users

Name	Type	Average 2007 to 2009 Usage, gpd	Per-Capita or Per-Unit Demand
Bergin Correctional Facility	Institutional	73,066	59.5 gpcd
Celeron Square Apartments	Residential	18,388	114.9 gpd/unit
Juniper Hill Village	Residential	9,410	94.1 gpd/unit
Juniper Hill Center for Rehab and Nursing	Institutional	7,648	N/A
University Plaza	Commercial	6,296	N/A

Table 5-16 summarizes the top ten University water users.

TABLE 5-16
Top Ten University Water Users

Name	Type or Use	Average 2007 to 2009 Usage, gpd	Per-Capita or Per-Unit Demand
RO System Inlet (Boilers)	Central Utility Plant	128,168	N/A
Cogeneration Chiller Facility	Central Utility Plant	114,398	N/A
Northwest Quadrangle	Residential	54,508	52.4 gpcd
Hilltop Complex	Residential	43,663	33.3 gpcd
North Campus	Residential	41,698	28.6 gpcd
Pharmacy / Biology Building	Academic/Research	37,331	N/A
Physics / Gant Complex	Academic/Research	32,970	N/A
Hilltop Apartments	Residential	32,687	26.7 gpcd
South Campus	Residential	28,527	39.4 gpcd
Alumni Quadrangle	Residential	26,393	27.0 gpcd

An understanding of the highest water users is an important component of water conservation. The Water Conservation Plan will further address the top users.

SECTION 6.0
LAND USE, FUTURE SERVICE AREA, AND DEMAND PROJECTIONS

6.0 LAND USE, FUTURE SERVICE AREA, & DEMAND PROJECTIONS

6.1 GENERAL

An evaluation and analysis of existing and future land uses and zoning was conducted as required by the Water Supply Plan Regulations to assess water supply needs in and adjacent to the University's water service area. Different land uses generate varying amounts of water demand. In this section, existing land use is described and future development potential is investigated. This analysis provides the basis for demand projections in the five, 20, and 50-year planning periods. The approach, the assumptions used, and sources of data are presented in detail in the ensuing text.

6.2 LAND USE, ZONING, AND FUTURE SERVICE AREA

6.2.1 Existing and Exclusive Service Areas

The boundaries of the existing water service area are shown on Figure 1-1 and Appended Figure I. The existing service area is entirely constrained within the Town of Mansfield. Because the Northeast Connecticut Water Utility Coordinating Committee (WUCC) has not convened, coordinated planning for the region has not occurred and exclusive service areas (ESAs) are not yet assigned in Mansfield.

6.2.2 Land Use

Land use in the Town of Mansfield is described in the current Plan of Conservation and Development, adopted January 2006 and effective April 15, 2006. According to the plan, Mansfield's early development was characterized by scattered villages and crossroads. During the 20th century and particularly since 1950, development has been concentrated in areas near the University of Connecticut and in southern Mansfield adjacent to Willimantic. These development patterns were influenced by the growth of the University, the need for services near the Willimantic urban center, the availability of public sewer and water services near the University and Willimantic, natural resource development limitations in Mansfield, and municipal land use policies.

The University's water system is closely tied to land use in Mansfield, as the presence of the water system has allowed development of residential, commercial, and institutional land uses in the Storrs area. In other cases, the expansion of the water system has been influenced by well-planned land uses such as the town-owned residential and community facilities located near South Eagleville Road and Maple Avenue. Where such development has been desired, the University has often accommodated an extension of the water system.

Based on the U.S. Census, about 5,450 dwelling units were located in Mansfield in the year 2000, excluding group quarters facilities at the University of Connecticut and Bergin Correctional Facility. About 3,400 of these dwelling units were single-family homes, 1,800 were multi-family units, and 250 were mobile home units. From 1990 to 2000, the number of housing units increased by about 300. In the five-year period from July 1, 2000 to July 1, 2005, a total of 263 units (181 single-family, 82 multi-family) were issued zoning permits. In 2004, nine subdivisions and a total of 59 lots were approved. The following year, ten subdivisions and 79 lots were approved. The number of new lots approved in 2004 and 2005 greatly exceeded the average of 25 new subdivision lots per year from the previous ten years. However, since that time, approvals have declined as the cooler economic conditions have prevailed from 2008 to the present time.

A number of significant governmental building projects have occurred in Mansfield since the 1990s. Completed municipal projects include an 80,000 square foot expansion and renovation of E.O. Smith High School, a 12,000 square foot expansion and renovation of the Mansfield Middle School, a four classroom addition to Southeast School, a 7,000 square foot expansion and renovation of the Mansfield Volunteer Fire Station, a 5,000 square foot expansion and renovation of the library, a 2,000 square foot expansion of the

Senior Center, and a new 40,000 square foot municipal community center with a swimming pool, gym, workout facilities, teen center and meeting rooms.

Commercial development and redevelopment in Mansfield has been limited in the last two decades, but a significant project is planned for the Storrs area. The Storrs Center project is described in Section 6.2.5. Very few industrial land uses are present in the Town of Mansfield.

6.2.3 Review of Local Planning Documents

As stated above, the current Plan of Conservation and Development was adopted January 2006 and became effective on April 15, 2006. For the most part, the Town's plan recommends that land use be similar to that described above, with the most intensive uses proximal to the University and southern Mansfield.

The plan contains a number of recommendations that are specific to the University of Connecticut water system. These include the following recommendations (with underlines added for emphasis) found within Policy Goal #1. Policy Goal #1 is *"To strengthen and encourage an orderly and energy-efficient pattern of development with sustainable balance of housing, business, industry, agriculture, government and open space and a supportive infrastructure of utilities, roadways, walkways and bikeways, and public transportation services."*

a) Objective – To address existing health or environmental quality issues and to <u>encourage appropriately located higher-density development by expanding existing sewer and public water services where appropriate</u> and considering appropriate community systems. Recommendations:

- ❑ Work with University of Connecticut, Town of Windham, Eastern Highlands Health District and State officials to <u>plan, fund and construct appropriate expansions of</u>

existing sewer and water systems and to promote water conservation. This Plan's mapping of Medium to High-Density Residential, Medium to High-Density Age-Restricted Residential, Agriculture/Medium to High-Density Residential/Open Space, Planned Business/Mixed Use, Planned Office/Mixed Use, and Medium to High-Density Institutional/Mixed Use should be used to help define potential sewer and public water service areas. Environmentally appropriate wellfield withdrawal capacities need to be established for the University of Connecticut's Fenton and Willimantic River wellfields and, as necessary, additional public water for the University campus areas needs to be obtained from the Willimantic or Shenipsit reservoirs or other sources.

- ❑ Support initiatives to document surface and groundwater quality and public health issues in the Four Corners area and to seek State and Federal funding to extend public sewer and water services to this area. This effort must be coordinated with the University of Connecticut and Eastern Highlands Health District and is of immediate importance. The University is finalizing plans to extend North Hillside Road to Route 44 and provide public utilities to undeveloped portions of North Campus.

b) Objective – To encourage higher-density residential and commercial uses in areas with existing or potential sewer, public water and public transportation services and to discourage development in areas without these public services by refining Zoning Map and Zoning Regulations. Recommendations:

- ❑ Encourage, where public sewer and water services exist, higher-density commercial uses and, where appropriate, mixed commercial/residential uses in areas designated as Planned Business/Mixed Use and Planned Office/Mixed Use on this Plan's "Planned Development Areas" Map. Land use regulations must include appropriate approval criteria that address health, safety, environmental impact and neighborhood compatibility issues.

- Consider, under comprehensive approval standards, higher residential densities in areas served by sewers and public water systems.

Part III of the Plan of Conservation and Development provides a discussion relative to consistency with the Conservation and Development Policies Plan for Connecticut, 2005-2010. The following are listed under Growth Management Principle #1:

- Mansfield's Plan recommends higher density residential, commercial uses in areas with existing or potential public sewer and water services and public transportation services….Map #22 of Mansfield's Plan (Planned Development Areas) clearly documents that the town's planned business, office, medium to high-density residential and institutional land use classifications are located in the two areas of town with existing or potential sewer and water service.

- Mansfield's Plan recommends working with the University of Connecticut, the town of Windham and State officials to plan, fund and construct appropriate expansions of existing sewer and water systems.

- Mansfield's Plan encourages mixed-use developments such as the Storrs Center "Downtown" project in areas with public infrastructure.

The Town of Mansfield Plan of Conservation and Development is relatively specific and provides significantly more commentary and guidance for water system expansion and usage as compared to most municipal plans. The future water system expansions described in this section of the subject Water Supply Plan are consistent with the goals and recommendations of the Town's Plan of Conservation and Development.

6.2.4 Zoning

A print of the zoning map for the Town of Mansfield is included as Appended Figure III. Table 6-1 summarizes the zoning districts in the Town of Mansfield, and Table 6-2 summarizes design criteria for residential zones.

TABLE 6-1
Summary of Zoning Designations

District	Symbol	Zone
Residential	R-20	Residence 20
	R-90	Residence 90
	RAR-90	Rural Agriculture Residence 90
	ARH	Age-Restricted Housing
	DMR	Design Multiple Residence Zone
	PRD	Planned Residential
Business	PB-1 through PB-5	Planned Business Zones
	B	Business Zone
	NB-1 and NB-2	Neighborhood Business Zones
	PO-1	Professional Office Zone
Industrial	IP	Industrial Park
Other	RD/LI	Research & Development/Limited Industrial Zone
	I	Institutional
	FH	Flood Hazard Zone
	SC-SDD	Storrs Center Special Design District
	PVRA	Pleasant Valley Residence/Agriculture Zone

TABLE 6-2
Design Criteria for Residential Zones

Zone	Minimum Lot Area (ft^2)	Minimum Lot Area (acres)	Maximum Building Density
R-20	20,000[1]	0.46	1 unit per lot
	40,000[2]	0.92	1 unit per lot
R-90	90,000	2.10	1 unit per lot
RAR-90	90,000[3]	2.10	1 unit per lot
	120,000[4]	2.75	2 units per lot

1. For lots with water and/or sewer service
2. For lots without water and sewer service
3. For single-family homes
4. For two-family homes

Professional Office Zone 1 (PO-1, associated with a few properties in Storrs), Planned Business Zone 2 (PB-2, associated with a few additional properties in Storrs), and Planned Business Zone 4 (PB-4, located along King Hill Road/North Eagleville Road) are currently in the water service area, as are the I zone (the Main and Depot Campuses) and the RD/LI zone (North Campus). Of the residential zones, sections of the DMR, R-90, and RAR-90 zones overlap with the water system.

Future service areas described below in Section 6.2.6 are located in the PO-1 and PB-2 zones (Storrs Center); PB-4 zone (King Hill Road/North Eagleville Road), RD/LI zone (North Campus), and I (Depot Campus). All future committed developments to be served by the University's water system are believed to be appropriate for their zoning.

6.2.5 General Discussion of Potential Future Service Areas

The Town of Mansfield Water Supply Plan (Milone & MacBroom, Inc., 2002) summarized projected new water demands in the Town of Mansfield, including developable land as well as small public water systems that were considered candidates for an expanded University or municipal water supply. The discussion was broken into two categories: "Existing and/or Committed UConn Water Service" and "Not Served by UConn Water System."

The category "Existing and/or Committed UConn Water Service" in the Mansfield plan included the North Campus area, Storrs Center project area, additional new University housing, Holinko Apartments, the North Eagleville Road/King Hill Road planned business area, and the Depot Campus. All of these areas were denoted as Planned Development Areas in the previous Mansfield Plan of Conservation and Development, and some of them remain as such in the current Plan of Conservation and Development.

Much of the new University housing has been completed since 2002 (such as Hilltop Apartments, Charter Oak Apartments, and Charter Oak Suites), although the portion of the new University housing that was predicted to be located at or west of Northwood Apartments is no longer proposed. The Storrs Center project, North Campus Development, and Depot Campus development are all pending with different timetables. Finally, current plans are not in place for redevelopment of the North Eagleville Road/King Hill Road planned business area, although redevelopment could occur at any time.

The category "Not Served by UConn Water System" included the following areas of interest: portions of Meadowood Road, Mansfield Four Corners inclusive of Rosal Apartments, Carriage House Apartments, Club House Apartments, Hunting Lodge Apartments, Jensen's Rolling Hills Mobile Home Park, and undeveloped parcels off Hunting Lodge Road, Separatist Road, and South Eagleville Road. All of these listed areas are relatively proximal to the University water system. To date, none of the areas listed above have been connected to the University water system. Some of the areas remain undeveloped; some continue to use community water systems; and some continue to rely on individual private wells.

Based on their inclusion in the Town of Mansfield Water Supply Plan, the above categories of future potential water demand were discussed in the University's Water and Wastewater Master Plan in 2007. The master plan included an additional category of future potential water demand based on a review of the Mansfield Plan of Conservation and Development. This review took an aggressive stance relative to future water demands but did not attach timetables or likelihoods to the listed water demands:

- Orchard Acres Apartments off Separatist Road – Existing apartment complex with community water system;
- Parcels southwest of Knollwood Acres Apartments – Proposed medium- to high-density age-restricted residential use;
- A parcel north of Route 44 and west of Cedar Swamp Road – Proposed medium- to high-density age-restricted residential use;

- Parcels north of Jensen's Mobile Home Park adjacent to the Four Corners planned business area – Proposed medium- to high-density age-restricted residential use or medium- to high-density residential use;
- Parcels southwest of Hunting Lodge Apartments at Birch Road and Hunting Lodge Road – Proposed medium- to high-density residential use; and
- Parcel southeast of Hunting Lodge Apartments on Hunting Lodge Road – Proposed medium- to high-density residential use.

Projected water demands for these parcels were primarily based on discussions with the Town of Mansfield Planning Department to determine the potential number of units except for the following parcels, where alternate estimation methods were used: for the Orchard Acres apartment complex, population was reported in the DPH sanitary survey report; and for the small parcel located southwest of Hunting Lodge Apartments, zoning was used to estimate a nominal build-out of two housing units.

During the development of the master plan, the Town of Mansfield also indicated that adjustments need to be considered for existing housing complexes that may increase density if water and sewer became available. The following complexes in particular were cited as potential candidates for additional water demands equal to 50% of the current estimated demands: Orchard Acres, Club House, Hunting Lodge and Carriage House Apartments.

In total, the following future potential water demands were estimated in the Water and Wastewater Master Plan:

- Committed Service – 357,700 gpd
- Areas Identified in the Mansfield Water Supply Plan – 170,600 gpd
- Additional Areas – 118,900 gpd

Including all of the above demands and irrespective of timelines or actual likelihoods of development, the total future potential additional water demand for the University water system would be 647,200 gpd.

6.2.6 Committed Future Service Areas

Subsequent to the completion of the Water and Wastewater Master Plan, the University has revisited its commitments for water service and currently has a firm understanding of future water demands that: (1) are likely to occur; and (2) will be served from the existing water system. These are known as "committed water demands" and are summarized in Table 6-3.

TABLE 6-3
Committed Water Demand Estimates

Description	Committed Demand Estimate
North Campus Development	89,600 gpd
Storrs Center	169,300 gpd
North Eagleville Road/King Hill Road PBA	5,000 gpd
Depot Campus (New Development)	93,800 gpd
Total	***357,700 gpd***

A description of the estimate for each is provided below.

North Campus – This area has been the focus of several studies and planning efforts. An Environmental Impact Evaluation (EIE) was first completed in 1994. The Outlying Parcels Master Plan (2000) and North Campus Master Plan EIE (2001) first provided detailed estimates of water demands on the order of 90,000 gpd exclusive of the residential components of the project (which have been constructed as the Charter Oak Apartments). The figure was based on an estimate of 0.1 gpd per square foot of research, office, or retail. This multiplier is provided in the DPH design guidelines for estimating wastewater flows from non-residential buildings.

The current Draft Environmental Impact Statement (2007) has not directly revised water demands, although the total square footage has been modified very slightly from 900,000 square feet to 896,000 square feet. Applying the same 0.1 gpd/square foot multiplier, the current estimate for water demand is 89,600 gpd. Table 6-4 provides a breakdown of the parcels and their respective square footage and water demand.

TABLE 6-4
North Campus Water Demand Estimates

Parcel	Building Square Footage	Average Day Water Demand Estimate
B	281,000	28,100 gpd
C	173,000	17,300 gpd
D	127,000	12,700 gpd
E	190,000	19,000 gpd
G	90,000	9,000 gpd
H	Charter Oaks Apartments	No new water demand
J	35,000	3,500 gpd
	Total	***89,600 gpd***

The University recognizes that applying a multiplier of 0.1 gpd/square foot is not the most ideal means of estimating water demands, as an analysis of actual building usage is typically preferred. However, until such time that plans are in place for any one of the North Campus parcels, the estimate of 89,600 gpd is a reasonable figure to use for planning purposes.

Storrs Center – The Storrs Center project has been in planning and development since 2001, and is currently expected to include approximately 200,000 square feet of retail/restaurant use and 700 residential units. Of the 700 units, 290 are anticipated to consist of upscale apartment homes with a mixture of studio, one-bedroom, two-bedroom and three-bedroom units. Scheduled to be completed in 2012 and 2013, respectively, the first two phases will include both commercial and residential components. Phase IA will include 125 residential rental units and 30,000 square feet of retail/ restaurant space, while Phase IB will include 150 residential rental units and 40,000 square feet of retail/restaurant space.

Water demand estimates for the Storrs Center project were previously estimated in the Mansfield Water Supply Plan (2002) and the University's Water and Wastewater Master Plan (2007), with the most recent estimate being 169,300 gpd.

Businesses at 1254 Storrs Road, 13 Dog Lane, 10 Dog Lane (sometimes known as Phil's building), and 4 Dog Lane will be affected by the construction of Storrs Center, as are the University of Connecticut Design Center, Print Shop, and former Publications building. The University has been relocating its facilities throughout campus. The businesses will be relocated to the project site. Specifically, Select Physical Therapy (13 Dog Lane), Tailoring by Tima (10 Dog Lane), Storrs Automotive (4 Dog Lane) and the businesses at 1254 Storrs Road (Wings, Travelplanners, Campus Cuts, Body Language, and Skoras barber shop) are current businesses that will be relocated to the new development.

The leasing process for Phase 1A began in 2009. Twelve tenants have signed letters of intent, including some existing businesses. These are Vanilla Bean Cafe, Cosimos, Insomnia Cookies, Moe's Southwest Grill, Storrs Automotive (to be relocated from 4 Dog Lane), and the following to be relocated from 1254 Storrs Road: Wings, Travelplanners, Campus Cuts, Body Language, Tailoring by Tima, Skoras and Select Physical Therapy. Negotiations are underway with other potential tenants.

This Storrs Center area is currently served by the University's water system. Phil's is a metered water customer with a demand of approximately 60 gpd to 100 gpd, whereas Storrs Automotive and the plaza at 1254 Storrs Road are non-metered water customers that are included in the 15% non-metered category discussed in Section 5.0. Phil's, Storrs Automotive, and the tenants of 1254 Storrs Road together utilize a nominal quantity of water that is included in the overall estimate for Storrs Center.

North Eagleville Road/King Hill Road – This area already contains some commercial establishments and is zoned for additional development. The area is currently served by the University water system, and therefore has continued access to the water system. Additional demand would be only a few thousand gallons per day. A figure of 5,000 gpd has been utilized in previous planning documents such as the Town of Mansfield Water Supply Plan and the University's Water and Wastewater Master Plan, and is carried forward to this plan.

Depot Campus (New Development) – Additional development of this area was addressed in the Outlying Parcel Master Plan. A mixture of housing, offices, and classrooms has been proposed. Water demands were estimated in the Mansfield Water Supply Plan on a parcel-by-parcel basis, utilizing the previously-available notations of "Parcel 1" through "Parcel 7" and taking into account the square footage of existing buildings that will remain on-site, as well as square footage of proposed buildings that may be developed. Based on these estimates, a water demand of 95,300 gpd was calculated. Water demand was not estimated for existing occupied buildings (such as Parcels 3 and 5), because these already use water from the existing supply.

The Center for Clean Energy Engineering ("Enterprise Building") was constructed on Parcel 2 in 2001. This metered building had a water demand of approximately 1,500 gpd in 2010. Therefore the previous calculation for Parcel 2 has been revised downward by 1,500 gpd. Table 6-5 provides a breakdown of the parcels and their respective square footage and water demand.

TABLE 6-5
Depot Campus Water Demand Estimates

Parcel	Building Square Footage	Average Day Water Demand Estimate
1	315,000	31,500 gpd
1B	48,800	4,900 gpd
2	135,000	13,500 gpd
2	Enterprise Building	-1,500 gpd
2C	23,300	2,300 gpd
3 & 3B	96,000	9,600 gpd
4 & 4B	255,000	25,500 gpd
5	Currently occupied	No new water demand
5B	80,000	8,000 gpd
	Total	***93,800 gpd***

As with the North Campus estimates, the University recognizes that applying a multiplier of 0.1 gpd/square foot is not the most ideal means of estimating water demands. However, until such time that plans are in place for any one of the Depot Campus parcels, the estimate of 93,800 gpd is the most reasonable figure to use for planning purposes.

6.3 POPULATION AND WATER DEMAND PROJECTIONS

6.3.1 Population Projections

University of Connecticut – Residential and Non-Residential Populations

Although fluctuations will occur from year to year, the University's on-campus residential population is not projected to increase or decrease substantially throughout the five, 20, or 50-year planning horizons. Therefore, the associated water demands have been captured in the recent production and consumption figures.

On-campus transient and non-transient non-residential water demands will increase in the specific areas already targeted for growth, such as North Campus and additional development in the Depot Campus. Therefore, these water demands have been described in the previous section of this plan.

Town of Mansfield

The Town of Mansfield has a population count that is uniquely influenced by the University of Connecticut and utilization of the Bergin Correctional Facility. Table 6-6 summarizes townwide population since 1920 alongside statewide population.

The Water Supply Plan Regulations require the evaluation of population projections that were formerly maintained and updated by the Connecticut Office of Policy and Management. Because the projections are very much out-of-date, their utility for water supply planning has decreased over the last decade.

TABLE 6-6
Statewide and Townwide Historic Population Data

	STATE OF CONNECTICUT		TOWN OF MANSFIELD	
Year	Population	% Change	Population	% Change
1920	1,380,631	--	2,574	--
1930	1,606,903	16.4%	3,349	30.11%
1940	1,709,242	6.4%	4,559	36.13%
1950	2,007,280	17.4%	10,008	119.52%
1960	2,535,234	26.3%	14,638	46.26%
1970	3,029,074	19.6%	19,994	36.59%
1980	3,107,576	2.5%	20,634	3.20%
1990	3,287,116	5.8%	21,103	2.27%
2000	3,405,565	3.6%	20,720	-1.81%
2010	3,574,097	4.9%	26,543	28.10%

Sources: U.S. Census Bureau, WinCOG.

Projections are additionally insufficient for understanding population growth in the vicinity of the University of Connecticut, where major residential development projects are well understood (for example, Storrs Center) or where residential projects that are currently proposed have been investigating on-site supplies (for example, the Ponde Place apartments located west of Hunting Lodge Road). Therefore, the subject water supply plan does not include a detailed discussion of population projections for the Town of Mansfield.

6.3.2 Projected Water Demands

Recall from Section 1.0 that the subject Water Supply Plan evaluates system performance for the five-, 20-, and 50-year planning periods corresponding to the years 2015, 2030 and 2060. Section 6.2.5 discussed three general categories of future water demand within, adjacent to, or near the University's water system:

- Committed Service – 357,700 gpd
- Areas Identified in the Mansfield Water Supply Plan – 170,600 gpd
- Additional Areas – 118,900 gpd

The University plans to provide water to only the committed water services in the five-, 20-, and 50-year planning periods. Other areas identified in the Mansfield Water Supply Plan and the "additional areas" discussed in the Water and Wastewater Master Plan will either be supplied by other entities, or will not be supplied by a public water system.

For example, The Connecticut Water Company now owns the Jensen's Trailer Park system and has informally committed to operating the water system for the Ponde Place development west of Hunting Lodge Road. Over time it is expected that additional areas of water service by The Connecticut Water Company will be supplied by the company.

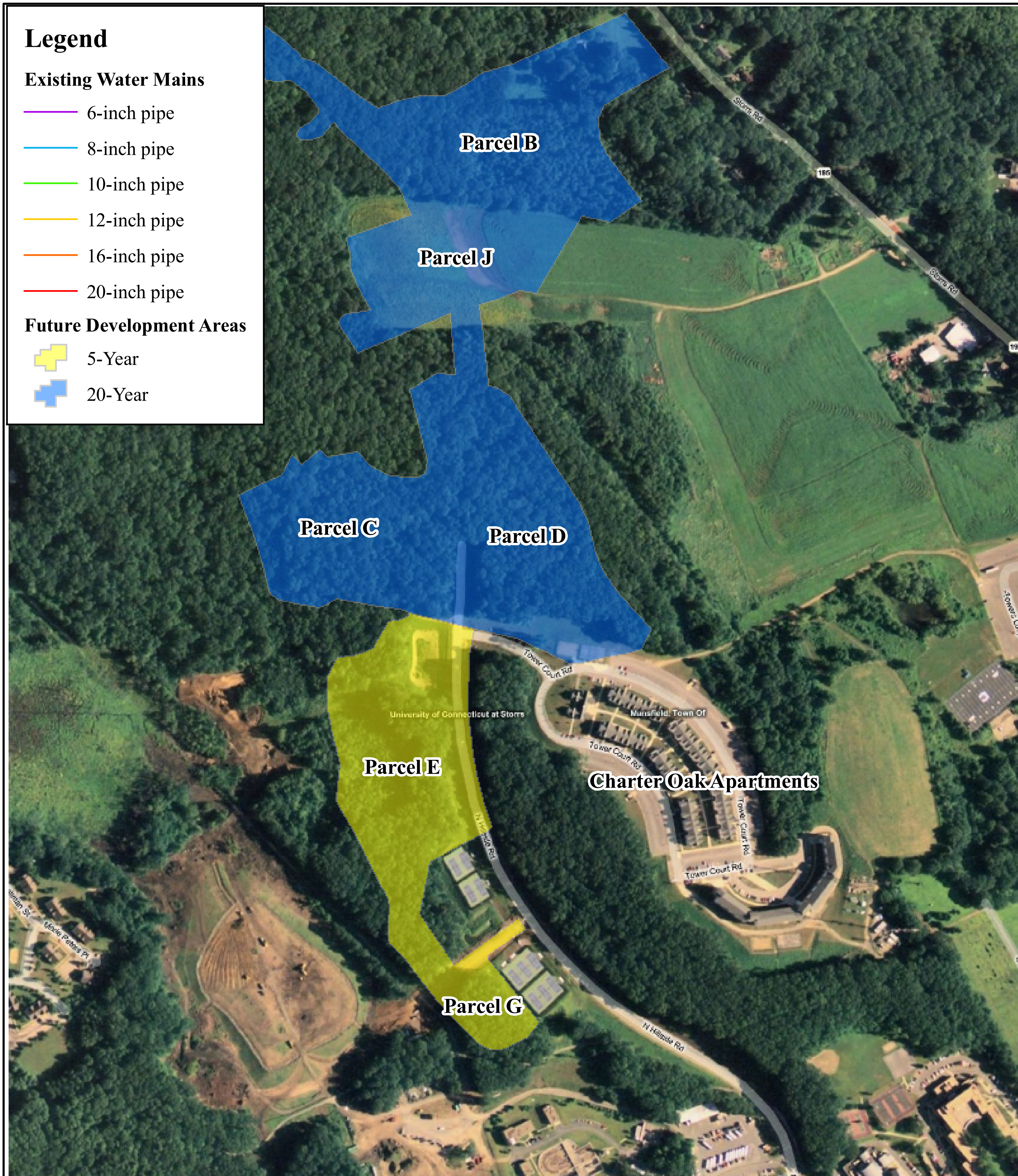
The Mansfield Four Corners area is an example of potential public water system service where the future water demand does not translate to a draw on the University's sources of supply. The Town of Mansfield has embarked on a study to identify different options for providing public water service in this area. Although the University of Connecticut may be a partner in this endeavor, the Willimantic River Wellfield and Fenton River Wellfield will not provide water to the Four Corners area.

The committed water demands were summarized in Table 6-3. Future water demands must be allocated into the required planning horizons. The following allocations are based on the current understandings associated with each of the four committed demands:

North Campus – The individual parcels associated with the North Campus development will likely be developed one at a time. The exact sequence and timing is not known, but a logical sequence has been assumed for this plan and is presented in Table 6-7 and illustrated on Figure 6-1. Parcel G has been placed in the first planning horizon (five years) due to its proposed use as a recreation center. Parcel E has also been placed in the five-year planning horizon due to its proximity to the main campus. The remaining parcels have been allocated to the 20-year planning horizon.

TABLE 6-7
North Campus Water Demand Planning Horizons

Parcel	Proposed Building Usage	Average Day Water Demand Estimate	Planning Horizon
B	Academic/Technology	28,100 gpd	2030
C	Academic/Technology	17,300 gpd	2030
D	Academic/Technology	12,700 gpd	2030
E	Academic/Technology	19,000 gpd	2015
G	Recreation Center	9,000 gpd	2015
J	Academic/Technology	3,500 gpd	2030



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North Campus Future Development

LOCATION: Mansfield, CT

MMI#: 1958-31
MXD: H:\Figure6-1.mxd
SOURCE: Microsoft, UConn

N

University of Connecticut Water Supply Plan

Map By: SJB
Date: 5/10/2011
Scale: 1"=500'

SHEET: **Figure 6-1**

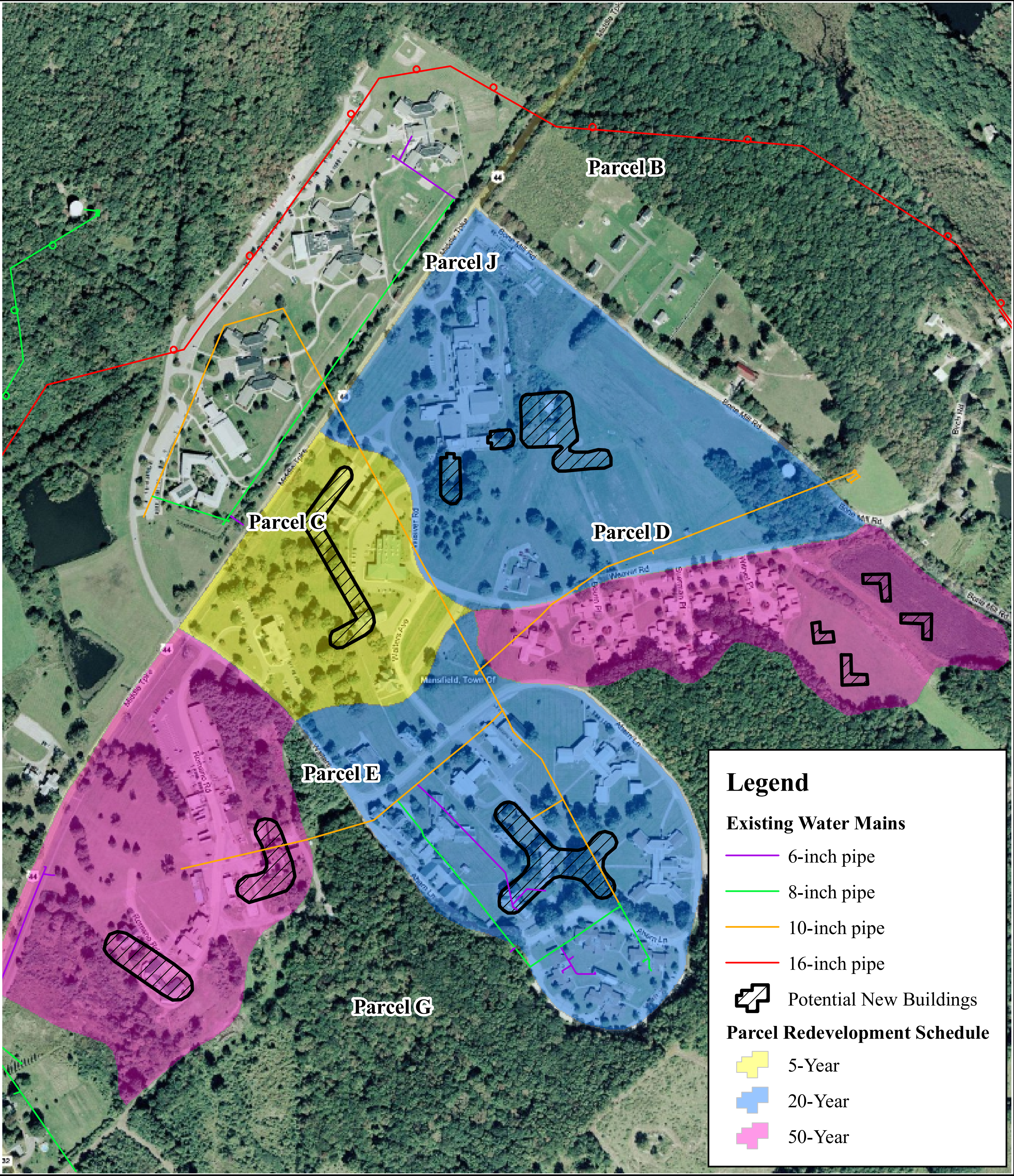
Storrs Center – Phase IA and Phase IB of the Storrs Center development are expected to be built by 2012 and 2013, respectively. Full occupancy should follow within the two years following these phases. Therefore, Phases IA and IB are anticipated to be completed by the first planning period of 2015. The remainder of the development is anticipated to be completed by 2030. Given that 70,000 square feet of retail/restaurant (out of 200,000 square feet) and 275 residential units (out of 700) are planned for Phase I, this plan assumes that 35% of the total water demand of 169,300 gpd (or 59,255 gpd) will be realized by 2015.

North Eagleville Road/King Hill Road – Because the associated average day demand of 5,000 gpd for this area is relatively low, all of the projected water demand has been allocated to the five-year planning horizon.

Depot Campus (New Development) – The individual parcels associated with the Depot Campus redevelopment will likely be developed one at a time. The exact sequence and timing is not known, but a logical sequence has been assumed for this plan and is presented in Table 6-8 and illustrated on Figure 6-2. Note that a potential expansion of the Center for Clean Energy Engineering is already in the planning stages. Therefore, Parcel 2 has been placed in the five-year planning horizon. The remaining parcels have been allocated to the 20- and 50-year planning horizons.

TABLE 6-8
Depot Campus Water Demand Planning Horizons

Parcel	Proposed Building Usage	Average Day Water Demand Estimate	Planning Horizon
1	Academic	31,500 gpd	2030
1B	Academic	4,900 gpd	2030
2	Academic	12,000 gpd	2015
2C	Academic	2,300 gpd	2015
3 & 3B	Services	9,600 gpd	2060
4 & 4B	Offices/Academic	25,500 gpd	2030
5B	Academic	8,000 gpd	2060



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Depot Campus Future Redevelopment		**LOCATION:** Mansfield, CT	
MMI#: 1958-31 **MXD:** H:\Figure6-2.mxd **SOURCE:** Microsoft, UConn	N **University of Connecticut Water Supply Plan**	**Map By:** SJB **Date:** 3/7/2011 **Scale:** 1"=500'	**SHEET:** **Figure 6-2**

Table 6-9 summarizes the allocation of combined committed future water demands into the planning horizons. A map showing the parcels to be served within the five, 20, and 50 year planning periods is included as Appended Figure IV.

TABLE 6-9
Allocation of Committed Water Demand Estimates

Description	2015	2030	2060
North Campus Development	28,000 gpd	89,600 gpd	89,600 gpd
Storrs Center	59,255 gpd	169,300 gpd	169,300 gpd
North Eagleville Road/King Hill Road PBA	5,000 gpd	5,000 gpd	5,000 gpd
Depot Campus (New Development)	14,300 gpd	76,200 gpd	93,800 gpd
Totals	***106,555 gpd***	***340,100 gpd***	***357,700 gpd***

6.3.3 Non-Revenue Water

Recall from Section 5.2.5 that the average daily metered water demand from 2007-2009 in was approximately equal to 85% of average daily production over that same time period. Thus, 15% of the University's produced water is a combination of (1) distributed water that is consumed by non-metered uses; and (2) transmitted/distributed water that is truly unaccounted or lost. Thus, it is believed that the University's true "unaccounted for water" amount is much less than 15% of total production.

The improvement schedules presented in Section 7.0 include continuation of the ongoing metering program, annual water audits, and biennial leak detection surveys to assess unaccounted for water. These efforts are anticipated to maintain unaccounted for water at levels far below 15%.

This plan assumes that 5% of the water needed for future committed demands will be truly unaccounted, and provides for this increment in the projections. A figure is not necessary to project for the unaccounted water associated with existing potable water demands, since the unaccounted water is already included in the totals.

6.3.4 Projected Monthly Demands

Note that the previous tables provide the average day figures and do not account for seasonality or peaking factors. Any future water consumption near the University is expected to exhibit a seasonality similar to that already experienced by the University's water system. These water use patterns essentially require a monthly basis for analysis, similar to the monthly presentation of available water in Section 3.9 and the monthly calculation of margin of safety in Section 3.10.

Table 6-10 provides the seasonality factors for future committed demands. These are based on the ratio of current monthly potable demands to the total annual potable water demands. Central Utility Plant water demands have been excluded from this calculation in order to ensure that the seasonality factors for the future committed demands are as realistic as possible, and based on water used for drinking, sanitation, and landscape irrigation.

TABLE 6-10
Seasonality of Potable Water Consumption

Month	Typical Potable, Non-Metered, and Unaccounted Demands (mgd)	Percent of Average
January	0.98	95.1%
February	1.39	135.0%
March	1.09	105.7%
April	1.35	130.9%
May	0.73	70.6%
June	0.74	71.5%
July	0.76	73.7%
August	0.80	78.1%
September	1.33	128.7%
October	1.29	125.0%
November	1.01	98.2%
December	0.95	92.2%

Seasonality factors range from a low of 71% in the early summer (the average monthly potable and non-metered water demand is only 71% of the annual average) to a high of approximately 130% in February, April, September, and October. This is reasonable, as the greatest water demand for drinking, sanitation, and related uses (food establishments, etc.) occurs when students are present during months without lengthy vacations. During this time, they are occupying housing and utilizing University facilities to the greatest extent possible.

Tables 6-11, 6-12, and 6-13 present future monthly water demands for each of the planning horizons. The maximum monthly production from 2008, 2009, and 2010 was used as the *base monthly water demand.* For example, the average production for September was 1.59 mgd, 1.58 mgd, and 1.64 mgd in 2008, 2009, and 2010. The figure of 1.64 mgd was selected for the base monthly water demand. This ensures that the analysis presents a scenario of maximum possible water demand for any given month, although it is important to note that the variation from year to year has been minimal over the last three years.

TABLE 6-11
Projected Monthly Water Demands, 2015

Month	Maximum Monthly Production, 2008-2010* (mgd)	New Committed Water Demand by 2015 *(0.11 mgd average)*	Additional 5% as Unaccounted Water Associated with New Water Demand (mgd)	Total Water Demand by 2015 (mgd)
January	1.18	0.10	0.005	1.29
February	1.59	0.15	0.007	1.75
March	1.28	0.12	0.006	1.40
April	1.53	0.14	0.007	1.68
May	1.06	0.08	0.004	1.14
June	1.09	0.08	0.004	1.17
July	1.16	0.08	0.004	1.25
August	1.17	0.09	0.004	1.26
September	1.64	0.14	0.007	1.79
October	1.52	0.14	0.007	1.66
November	1.34	0.11	0.005	1.46
December	1.27	0.10	0.005	1.38

**Includes current non-metered and unaccounted water demands; these are projected to remain stable although the University will continue to work toward more comprehensive metering*

TABLE 6-12
Projected Monthly Water Demands, 2030

Month	Maximum Monthly Production, 2008-2010* (mgd)	New Committed Water Demand by 2030 *(0.34 mgd average)*	Additional 5% as Unaccounted Water Associated with New Water Demand (mgd)	Total Water Demand by 2030 (mgd)
January	1.18	0.32	0.016	1.52
February	1.59	0.46	0.023	2.07
March	1.28	0.36	0.018	1.65
April	1.53	0.44	0.022	1.99
May	1.06	0.24	0.012	1.31
June	1.09	0.24	0.012	1.34
July	1.16	0.25	0.012	1.42
August	1.17	0.26	0.013	1.45
September	1.64	0.44	0.022	2.10
October	1.52	0.42	0.021	1.96
November	1.34	0.33	0.017	1.69
December	1.27	0.31	0.016	1.60

**Includes current non-metered and unaccounted water demands; these are projected to remain stable although the University will continue to work toward more comprehensive metering*

TABLE 6-13
Projected Monthly Water Demands, 2060

Month	Maximum Monthly Production, 2008-2010* (mgd)	New Committed Water Demand by 2060 *(0.36 mgd average)*	Additional 5% as Unaccounted Water Associated with New Water Demand (mgd)	Total Water Demand by 2060 (mgd)
January	1.18	0.34	0.017	1.54
February	1.59	0.48	0.024	2.10
March	1.28	0.38	0.019	1.67
April	1.53	0.47	0.023	2.02
May	1.06	0.25	0.013	1.33
June	1.09	0.26	0.013	1.36
July	1.16	0.26	0.013	1.44
August	1.17	0.28	0.014	1.47
September	1.64	0.46	0.023	2.12
October	1.52	0.45	0.022	1.99
November	1.34	0.35	0.018	1.71
December	1.27	0.33	0.017	1.62

**Includes current non-metered and unaccounted water demands; these are projected to remain stable although the University will continue to work toward more comprehensive metering*

In most water supply plans, peak day demands are typically estimated using a peaking factor determined from a ratio of peak day demand to average day demand. Because the analysis in this water supply plan relies on months as the fundamental unit of evaluation, peaking factors are based on the ratio of peak day to monthly average day. Table 6-14 presents the peaking factors.

Unlike most water supply plans, these peaking factors cannot be universally applied to future projected water demands. This is because the current peaking factors are calculated from monthly average and peak day demands that include CUP demands. It is well understood that the CUP water demands exert a significant influence on peaking factors. In contrast, the future committed demands will not have any associated cogeneration and cooling tower water needs, and therefore they will demonstrate a more moderate peaking factor.

TABLE 6-14
Peaking Factors

Month	Maximum Monthly Production, 2008-2010 (mgd)	Peak Day Production, 2008-2010 (mgd)	Peaking Ratio
January	1.18	1.86	1.58
February	1.59	2.04	1.28
March	1.28	2.23	1.74
April	1.53	2.03	1.33
May	1.06	1.78	1.68
June	1.09	1.90	1.74
July	1.16	1.93	1.66
August	1.17	2.33	1.99
September	1.64	2.12	1.29
October	1.52	2.02	1.33
November	1.34	2.16	1.61
December	1.27	2.01	1.58

The lowest CUP water demand typically occurs in April each year. Therefore, a peaking factor of 1.33 (the peaking ratio in April from Table 6-14 above) will be used for all future committed water demands. Tables 6-15, 6-16, and 6-17 present future peak day water demands for each of the planning horizons.

TABLE 6-15
Projected Peak Water Demands, 2015

Month	Peak Day Production, 2008-2010[1] (mgd)	New Committed Water Demand by 2015, Peak Day[2] (mgd)	Peak Water Demand by 2015 (mgd)
January	1.86	0.14	2.00
February	2.04	0.20	2.24
March	2.23	0.16	2.39
April	2.03	0.20	2.23
May	1.78	0.11	1.89
June	1.90	0.11	2.01
July	1.93	0.11	2.04
August	2.33	0.12	2.45
September	2.12	0.20	2.32
October	2.02	0.19	2.21
November	2.16	0.16	2.32
December	2.01	0.15	2.16

1. Includes current non-metered and unaccounted water demands; these are projected to remain stable although the University will continue to work toward more comprehensive metering.
2. 5% unaccounted water is already included in these figures

TABLE 6-16
Projected Peak Water Demands, 2030

Month	Peak Day Production, 2008-2010[1] (mgd)	New Committed Water Demand by 2030, Peak Day[2] (mgd)	Peak Water Demand by 2030 (mgd)
January	1.86	0.44	2.30
February	2.04	0.63	2.67
March	2.23	0.49	2.72
April	2.03	0.61	2.64
May	1.78	0.33	2.11
June	1.90	0.33	2.23
July	1.93	0.34	2.27
August	2.33	0.36	2.69
September	2.12	0.62	2.74
October	2.02	0.58	2.60
November	2.16	0.49	2.65
December	2.01	0.46	2.47

1. Includes current non-metered and unaccounted water demands; these are projected to remain stable although the University will continue to work toward more comprehensive metering.
2. 5% unaccounted water is already included in these figures

TABLE 6-17
Projected Peak Water Demands, 2060

Month	Peak Day Production, 2008-2010[1] (mgd)	New Committed Water Demand by 2060, Peak Day[2] (mgd)	Peak Water Demand by 2060 (mgd)
January	1.86	0.47	2.33
February	2.04	0.67	2.71
March	2.23	0.52	2.75
April	2.03	0.65	2.68
May	1.78	0.35	2.13
June	1.90	0.35	2.25
July	1.93	0.36	2.29
August	2.33	0.38	2.71
September	2.12	0.66	2.78
October	2.02	0.62	2.64
November	2.16	0.52	2.68
December	2.01	0.49	2.50

1. Includes current non-metered and unaccounted water demands; these are projected to remain stable although the University will continue to work toward more comprehensive metering.
2. 5% unaccounted water is already included in these figures

These projections are discussed in the context of available supplies and margin of safety in Section 7.0 of this Plan.

SECTION 7.0
ASSESSMENT AND SELECTION OF ALTERNATIVES

7.0 ASSESSMENT AND SELECTION OF ALTERNATIVES

7.1 PROJECTED MARGINS OF SAFETY

Projected water demands are presented in Section 6.0 of this Plan. Projected margins of safety are discussed herein. Recall from Section 3.10 that monthly margins of safety dropped below 1.0 in September and October 2010 as water production ramped up to accommodate returning students combined with high water demands at the CUP. The University has met demands for the past few years by operating the Willimantic River Wellfield for 19 to 20 hours per day as needed, exceeding the safe yield of the supply but not exceeding the hydraulic capacity of the wellfield or its transmission system.

Tables 7-1, 7-2, 7-3, and 7-4 present the monthly margins of safety for the University for 2015, 2030, and 2060 without consideration of any potential future supplies.

TABLE 7-1
Projected Monthly Margins of Safety, 2015

Month	Projected Water Demand (mgd)	Available Supply from Willimantic River Wells (mgd)	Available Supply from Fenton River Wells (mgd)	Margin of Safety
January	1.29	1.48	0.84	1.80
February	1.75	1.48	0.84	1.33
March	1.40	1.48	0.84	1.66
April	1.68	1.48	0.84	1.38
May	1.14	1.48	0.84	2.03
June	1.17	1.48	0.00	1.27
July	1.24	1.48	0.00	1.19
August	1.26	1.48	0.00	1.17
September	1.79	1.48	0.00	0.82
October	1.66	1.48	0.00	0.89
November	1.46	1.48	0.84	1.59
December	1.38	1.48	0.84	1.68

TABLE 7-2
Projected Monthly Margins of Safety, 2030

Month	Projected Water Demand (mgd)	Available Supply from Willimantic River Wells (mgd)	Available Supply from Fenton River Wells (mgd)	Margin of Safety
January	1.51	1.48	0.84	1.53
February	2.07	1.48	0.84	1.12
March	1.65	1.48	0.84	1.41
April	1.99	1.48	0.84	1.17
May	1.31	1.48	0.84	1.77
June	1.34	1.48	0.00	1.10
July	1.42	1.48	0.00	1.04
August	1.44	1.48	0.00	1.02
September	2.11	1.48	0.00	0.70
October	1.96	1.48	0.00	0.76
November	1.71	1.48	0.84	1.36
December	1.62	1.48	0.84	1.44

TABLE 7-3
Projected Monthly Margins of Safety, 2060

Month	Projected Water Demand (mgd)	Available Supply from Willimantic River Wells (mgd)	Available Supply from Fenton River Wells (mgd)	Margin of Safety
January	1.53	1.48	0.84	1.51
February	2.09	1.48	0.84	1.11
March	1.67	1.48	0.84	1.39
April	2.01	1.48	0.84	1.15
May	1.33	1.48	0.84	1.75
June	1.35	1.48	0.00	1.09
July	1.43	1.48	0.00	1.03
August	1.46	1.48	0.00	1.01
September	2.13	1.48	0.00	0.69
October	1.98	1.48	0.00	0.75
November	1.73	1.48	0.84	1.34
December	1.64	1.48	0.84	1.42

Without new sources of water supply, margins of safety will decrease as committed water demands are realized in the system. By 2015, average monthly margins of safety are projected to drop below 1.0 in September and October. Peak day margins of safety are likewise lacking as new committed water demands are realized. Tables 7-4 through 7-6 present the peak day margins of safety for the years 2015, 2030, and 2060.

TABLE 7-4
Projected Peak Day Margins of Safety, 2015

Month	Projected Water Demand (mgd)	Available Supply from Willimantic River Wells (mgd)	Available Supply from Fenton River Wells (mgd)	Margin of Safety
January	2.00	1.97	0.84	1.40
February	2.24	1.97	0.84	1.25
March	2.39	1.97	0.84	1.18
April	2.23	1.97	0.84	1.26
May	1.89	1.97	0.84	1.49
June	2.01	1.97	0.00	0.98
July	2.04	1.97	0.00	0.97
August	2.45	1.97	0.00	0.80
September	2.32	1.97	0.00	0.85
October	2.21	1.97	0.00	0.89
November	2.32	1.97	0.84	1.21
December	2.16	1.97	0.84	1.30

TABLE 7-5
Projected Peak Day Margins of Safety, 2030

Month	Projected Water Demand (mgd)	Available Supply from Willimantic River Wells (mgd)	Available Supply from Fenton River Wells (mgd)	Margin of Safety
January	2.30	1.97	0.84	1.22
February	2.67	1.97	0.84	1.05
March	2.72	1.97	0.84	1.03
April	2.64	1.97	0.84	1.06
May	2.11	1.97	0.84	1.33
June	2.23	1.97	0.00	0.88
July	2.27	1.97	0.00	0.87
August	2.69	1.97	0.00	0.73
September	2.74	1.97	0.00	0.72
October	2.60	1.97	0.00	0.76
November	2.65	1.97	0.84	1.06
December	2.47	1.97	0.84	1.14

TABLE 7-6
Projected Peak Day Margins of Safety, 2060

Month	Projected Water Demand (mgd)	Available Supply from Willimantic River Wells (mgd)	Available Supply from Fenton River Wells (mgd)	Margin of Safety
January	2.33	1.97	0.84	1.21
February	2.71	1.97	0.84	1.04
March	2.75	1.97	0.84	1.02
April	2.68	1.97	0.84	1.05
May	2.13	1.97	0.84	1.32
June	2.25	1.97	0.00	0.87
July	2.29	1.97	0.00	0.86
August	2.71	1.97	0.00	0.73
September	2.78	1.97	0.00	0.71
October	2.64	1.97	0.00	0.75
November	2.68	1.97	0.84	1.05
December	2.50	1.97	0.84	1.13

The University has identified a number of pending and potential water supplies to address the projected margin of safety shortfalls. These are described in Section 7.0.

7.2 ASSESSMENT OF ALTERNATIVE WATER SUPPLIES

The most feasible alternatives for meeting near-term future water demands include the use of Fenton Well D for potable water supply and the use of treated effluent to supply non-potable water needs at the CUP. Intermediate and long-term water demands may be met by relocating Fenton Well A to a site with lesser environmental impacts, using new interconnections with nearby water utilities, and/or development of new sources of supply. Each of these alternatives is described in the discussions that follow.

7.2.1 Fenton River Well D

As stated in Section 3.10, the University is committed to bolstering its available water supply and restoring monthly margins of safety to levels greater than 1.0 in the short term, and greater than 1.15 in the long term. The addition of Well D to the total available supply in the months of September and October of any given year will effectively restore average monthly margins of safety to levels close to or greater than 1.0. Refer to Table 7-7 and Table 7-8 for the projected monthly and peak day margins in the year 2015, respectively.

TABLE 7-7
Projected Monthly Margins of Safety With Well D, 2015

Month	Projected Water Demand (mgd)	Available Supply from Willimantic River Wells (mgd)	Available Supply from Fenton River Wells (mgd)	Margin of Safety
January	1.29	1.48	0.84	1.80
February	1.75	1.48	0.84	1.33
March	1.40	1.48	0.84	1.66
April	1.68	1.48	0.84	1.38
May	1.14	1.48	0.84	2.03
June	1.17	1.48	0.00	1.27
July	1.24	1.48	0.00	1.19
August	1.26	1.48	0.00	1.17
September	1.79	1.48	0.35	1.02
October	1.66	1.48	0.35	1.10
November	1.46	1.48	0.84	1.59
December	1.38	1.48	0.84	1.68

TABLE 7-8
Projected Peak Day Margins of Safety With Well D, 2015

Month	Projected Water Demand (mgd)	Available Supply from Willimantic River Wells (mgd)	Available Supply from Fenton River Wells (mgd)	Margin of Safety
January	2.00	1.97	0.84	1.40
February	2.24	1.97	0.84	1.25
March	2.39	1.97	0.84	1.18
April	2.23	1.97	0.84	1.26
May	1.89	1.97	0.84	1.49
June	2.01	1.97	0.00	0.98
July	2.04	1.97	0.00	0.97
August	2.45	1.97	0.00	0.80
September	2.32	1.97	0.35	1.00
October	2.21	1.97	0.35	1.05
November	2.32	1.97	0.84	1.21
December	2.16	1.97	0.84	1.30

Thus, Well D will accomplish the goal of bolstering available supply in the short term. However, Well D will not be sufficient as the sole future "new" supply to the University.

Refer to Table 7-9 and Table 7-10 for the projected monthly and peak day margins in the year 2030, respectively.

TABLE 7-9
Projected Monthly Margins of Safety With Well D, 2030

Month	Projected Water Demand (mgd)	Available Supply from Willimantic River Wells (mgd)	Available Supply from Fenton River Wells (mgd)	Margin of Safety
January	1.51	1.48	0.84	1.53
February	2.07	1.48	0.84	1.12
March	1.65	1.48	0.84	1.41
April	1.99	1.48	0.84	1.17
May	1.31	1.48	0.84	1.77
June	1.34	1.48	0.00	1.10
July	1.42	1.48	0.00	1.04
August	1.44	1.48	0.00	1.02
September	2.11	1.48	0.35	0.87
October	1.96	1.48	0.35	0.93
November	1.71	1.48	0.84	1.36
December	1.62	1.48	0.84	1.44

TABLE 7-10
Projected Peak Day Margins of Safety With Well D, 2030

Month	Projected Water Demand (mgd)	Available Supply from Willimantic River Wells (mgd)	Available Supply from Fenton River Wells (mgd)	Margin of Safety
January	2.30	1.97	0.84	1.22
February	2.67	1.97	0.84	1.05
March	2.72	1.97	0.84	1.03
April	2.64	1.97	0.84	1.06
May	2.11	1.97	0.84	1.33
June	2.23	1.97	0.00	0.88
July	2.27	1.97	0.00	0.87
August	2.69	1.97	0.00	0.73
September	2.74	1.97	0.35	0.85
October	2.60	1.97	0.35	0.89
November	2.65	1.97	0.84	1.06
December	2.47	1.97	0.84	1.14

Furthermore, the use of Well D is not intended to fuel development or expansion of the water system, including even those demands that have been committed and are viewed as important to the University and the Town of Mansfield. Additional new sources are more appropriate for meeting committed demands.

7.2.2 Reclaimed Water Project

The 2004 Campus Sustainable Design Guidelines developed for the University proposed several water reuse strategies. The infrastructure conditions assessment performed for the University in 2006 recommended an expansion of the wastewater treatment plant to include a new water treatment system capable of providing up to 0.5 mgd of treated effluent for reuse on campus. The project was recommended as a means for reducing the demand of water on the Fenton River Wellfield and reducing the overall impact of the wastewater discharge to the Willimantic River.

As a result of the 2004 and 2006 studies and recommendations in the Water and Wastewater Master Plan in 2007, the University authorized a feasibility study to evaluate the use of highly treated effluent from the University's Water Pollution Control Facility (WPCF) to produce reclaimed water. If feasible, it was believed that reclaimed water could then be used to reduce the reliance on potable water for non-potable uses such as heating and cooling at the CUP. Since the CUP requires an average of 0.4 mgd during its peak month each year, a significant benefit to margin of safety could be realized through the use of reclaimed water.

The reclaimed water feasibility study was completed by the firm Hazen & Sawyer in 2008. Hazen & Sawyer was then retained to complete design and permitting of the facility from 2009 through 2010. Bids for construction of the reclaimed water facility (RWF) were received in mid-2010, and the project is planned for construction from 2011 through 2012. The facility will likely be completed prior to occupancy of Phase IA of the Storrs Center project, allowing for the University to begin serving the first of its committed water demands without development of a new source of supply.

Tables 7-11 and 7-12 provide monthly and peak day margins of safety for the year 2015 with the reclaimed water facility available to the University, in addition to Fenton Well D. In these tables, the water made available as a result of the reclaimed water facility is shown as a subtraction from future water demand rather than as a future supply. Because average annual committed water demands will remain relatively low at 0.11 mgd by the year 2015, the projected monthly margins of safety are all above 1.15 in 2015. With regard to the peak day analysis, projected margins of safety will likely drop below 1.15 in August and September, and may drop below 1.0 for brief periods of time in August. The University's 5.4 million gallon reservoir will easily provide the buffer needed to address peak days.

It is important to note that this peak day margin of safety analysis relies on average monthly requirements of the CUP instead of peak day requirements of the CUP. This is an approximate approach since it is well understood that peak demands at the CUP exceed the average month demands. For example, during the peak month at the CUP (July), the maximum amount of water needed on the day with maximum cooling tower demands exceeds 0.4 mgd. The reclaimed water facility is designed to have a peak capacity of 1.0 mgd, and in reality it will provide a subtraction of greater than 0.4 mgd when CUP demands are peaking.

TABLE 7-11
Projected Monthly Margins of Safety with Well D and RWF, 2015

Month	Current Production (mgd)	Future Committed Demands (mgd)	Associated Unaccounted Water (mgd)	Future RWF Offset (mgd)	Total Future Demand (mgd)	Available Water Supply (mgd)			Margin of Safety
						Willimantic River Wells	Fenton River Wells	Total	
January	1.18	0.10	0.005	-0.20	1.09	1.48	0.84	2.32	2.14
February	1.59	0.15	0.007	-0.20	1.54	1.48	0.84	2.32	1.50
March	1.28	0.11	0.006	-0.19	1.21	1.48	0.84	2.32	1.92
April	1.53	0.14	0.007	-0.18	1.50	1.48	0.84	2.32	1.55
May	1.06	0.08	0.004	-0.34	0.81	1.48	0.84	2.32	2.88
June	1.09	0.08	0.004	-0.35	0.82	1.48	0	1.48	1.81
July	1.16	0.08	0.004	-0.40	0.84	1.48	0	1.48	1.75
August	1.17	0.08	0.004	-0.37	0.89	1.48	0	1.48	1.66
September	1.64	0.14	0.007	-0.27	1.53	1.48	0.35	1.83	1.20
October	1.52	0.13	0.007	-0.23	1.43	1.48	0.35	1.83	1.28
November	1.34	0.11	0.006	-0.25	1.21	1.48	0.84	2.32	1.92
December	1.27	0.11	0.005	-0.25	1.13	1.48	0.84	2.32	2.06

TABLE 7-12
Projected Peak Margins of Safety with Well D and RWF, 2015

Month	Current Production (mgd)	Future Committed Demands (mgd)	Future RWF Offset (mgd)	Total Future Demand (mgd)	Available Water Supply (mgd)			Margin of Safety
					Willimantic River Wells	Fenton River Wells	Total	
January	1.86	0.14	-0.20	2.00	1.97	0.84	2.81	1.56
February	2.04	0.20	-0.20	2.24	1.97	0.84	2.81	1.38
March	2.23	0.16	-0.19	2.39	1.97	0.84	2.81	1.28
April	2.03	0.20	-0.18	2.23	1.97	0.84	2.81	1.37
May	1.78	0.11	-0.34	1.89	1.97	0.84	2.81	1.81
June	1.90	0.11	-0.35	2.01	1.97	0	1.97	1.19
July	1.93	0.11	-0.40	2.04	1.97	0	1.97	1.20
August	2.33	0.12	-0.37	2.45	1.97	0	1.97	0.95
September	2.12	0.20	-0.27	2.32	1.97	0.35	2.32	1.13
October	2.02	0.19	-0.23	2.21	1.97	0.35	2.32	1.17
November	2.16	0.16	-0.25	2.32	1.97	0.84	2.81	1.36
December	2.01	0.15	-0.25	2.16	1.97	0.84	2.81	1.47

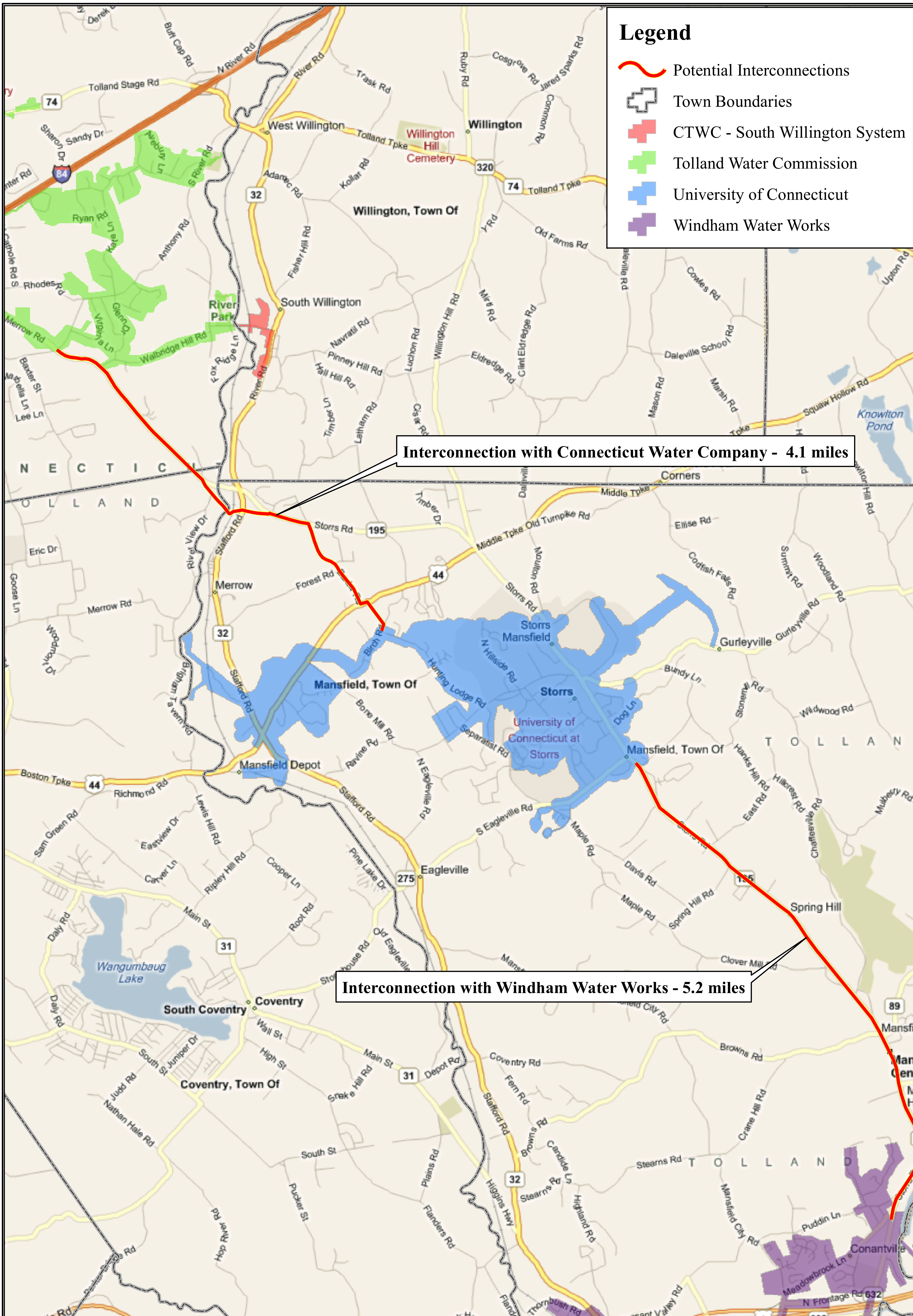
The University will continue to require additional water supplies beyond the offset provided by the RWF. Relocation of Fenton Well A, interconnections, and/or future groundwater supplies will need to supply the next increment of water demand. Refer to Figure 7-1 for an overview of potential interconnections. Refer to Figure 7-2 for an overview of potential groundwater supplies.

7.2.3 Relocation of Fenton Well A

Section 9.0 of the Fenton River Study report ("Testing of Selected Wellfield Management Scenarios") evaluated 11 different pumping scenarios comprised of different combinations of withdrawals from the four Fenton River wells. Scenarios 10 and 11 considered that Well A was relocated to a point 250 to the south or somewhat further to the south toward Well D, respectively. Both scenarios assumed that Well A was pumping for 14 hours at 300 gpm, or an equivalent of 252,000 gpd (0.25 mgd).

The study concluded that "it appears that the best management scenarios (Scenario 10 and 11) call for relocation of Well A by moving it either 250 feet in the South direction (i.e., without requiring a new permit) or approximately halfway between the original location of Well A and D (on university property)." Furthermore, "The new location of Well A was chosen under the premise that a well located in the parts of the aquifer where the Stratified Drift has greater thickness will have substantially reduced effects on the Fenton River stream flow [but] based on this preliminary analysis and with the caveat emptor statement above, the cost of relocating Well A beyond the 250 feet distance may not be justified as the decrease in ΔQ is only minimal."

The University believes that further investigation is warranted to evaluate whether relocating and pumping Well A in accordance with Scenario 10 (within 250 feet of the current location) may prove to have lesser impacts to instream flow than the well currently is believed to cause.



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Overview of Potential Interconnections

LOCATION: Mansfield, CT

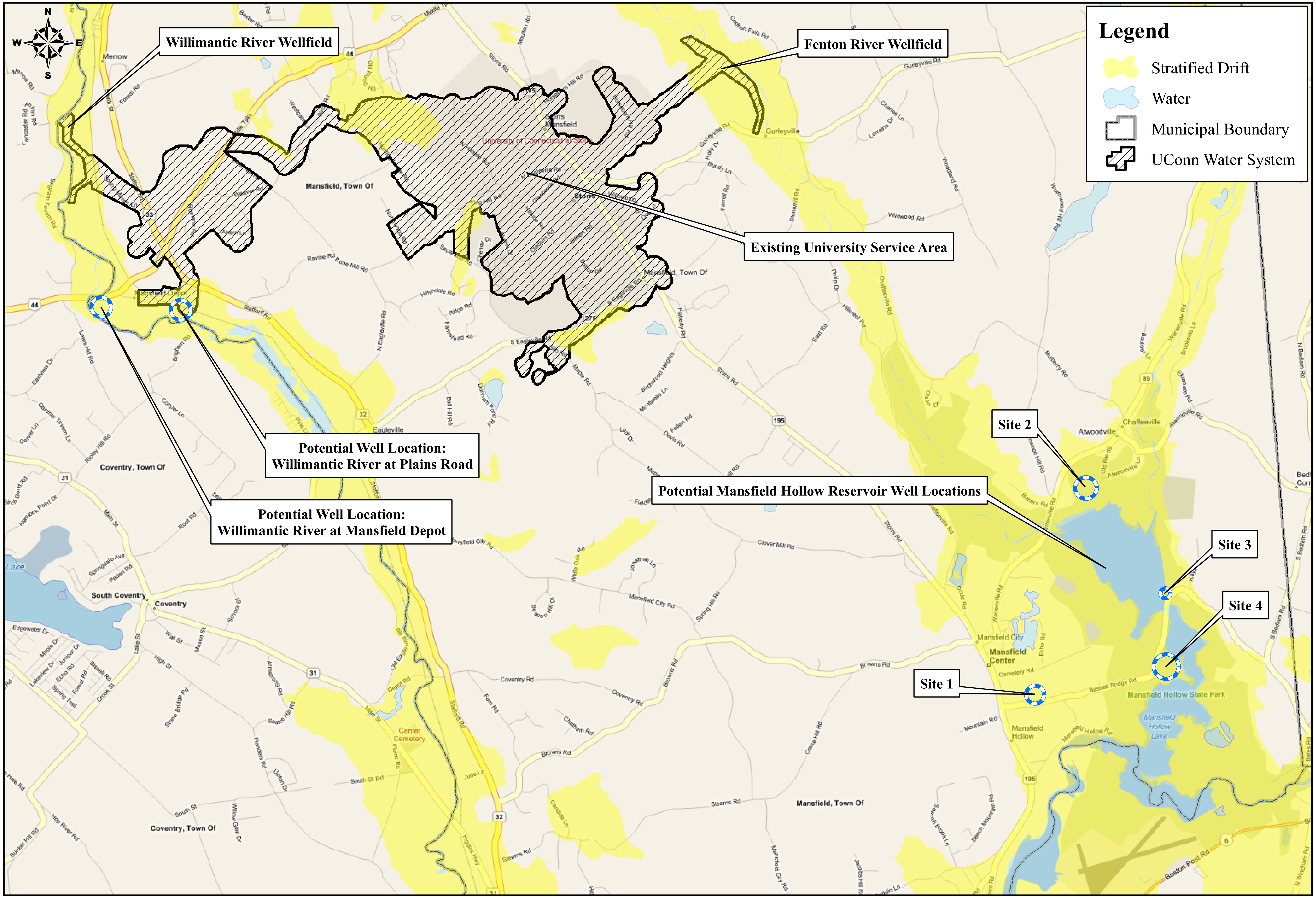
MMI#: 1958-31-1
MXD: H:\Figure7-1.mxd
SOURCE: Microsoft

N

University of Connecticut
Water Supply Plan

Map By: SJB
Date: 5/9/2011
Scale: 1"=4,000'

SHEET: Figure 7-1



OVERVIEW OF POTENTIAL GROUND WATER SUPPLIES

WATER SUPPLY PLAN

UNIVERSITY OF CONNECTICUT
STORRS, CONNECTICUT

Engineering, Landscape Architecture and Environmental Science
MILONE & MACBROOM®
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REVISIONS

5/9/2011	Service Area
5/10/2011	Well Locations

DM	SJB	DM
DESIGNED	DRAWN	CHECKED

SCALE: 1" = 3,000'

DATE: 1/7/2011

PROJECT NO: 1958-31

MXD NAME: H:\Figure7-2.MXD

FIGURE 7-2

SHEET NO.

Because field investigations have not been conducted, it is impossible to know precisely what volumes of water could be available on a daily basis. However, at least 0.25 mgd is assumed for planning purposes.

7.2.4 Interconnection with Windham Water Works

Windham Water Works is a municipal department of the Town of Windham. Windham Water Works operates a public water system that serves the Willimantic and South Windham portions of Windham, and the southern portion of the Town of Mansfield.

The Windham Water Works water supply plan was prepared by Milone & MacBroom, Inc. for the Windham Water Commission and submitted to DPH in early 2009. The plan is currently under review. Table 7-13 presents the projected water demands and margins of safety of the Windham Water Works system.

TABLE 7-13
Windham Water Works Projected Margins of Safety

Year	Average Day Demand/ Margin of Safety		Maximum Month Demand/ Margin of Safety		Peak Day Demand/ Margin of Safety	
2007-2008	2.16 mgd	1.90	2.56 mgd	1.60	3.06 mgd	1.34
2013	2.16 mgd	1.90	2.44 mgd	1.68	3.13 mgd	1.31
2020	2.33 mgd	1.76	2.63 mgd	1.56	3.38 mgd	1.21
2050	2.43 mgd	1.69	2.75 mgd	1.49	3.52 mgd	1.16

Note: Available water = 4.1 mgd

The sole source of supply for Windham Water Works is the Willimantic Reservoir. The reservoir is a run-of-the river impoundment of the Natchaug River. The reservoir has a safe yield of 7.9 mgd, which is largely a function of the relatively stable regulated flows released to the Natchaug River from the upstream Mansfield Hollow Dam. However, the Windham Water Works filter plant capacity and diversion permit limitation is only 4.1 mgd.

For the purpose of this alternatives analysis, Windham Water Works provided recent water production records to Milone & MacBroom, Inc. Table 7-14 lists actual water demands and margins of safety for 2008, 2009, and 2010.

TABLE 7-14
Windham Water Works Water Demands, 2008-2010

Year	Average Day Demand/ Margin of Safety		Maximum Month Demand/ Margin of Safety		Peak Day Demand/ Margin of Safety	
2008	2.10 mgd	1.95	2.36 mgd	1.74	2.86 mgd	1.43
2009	2.12 mgd	1.93	2.31 mgd	1.77	2.81 mgd	1.46
2010	2.26 mgd	1.81	2.50 mgd	1.64	3.02 mgd	1.36

Note: Available water = 4.1 mgd

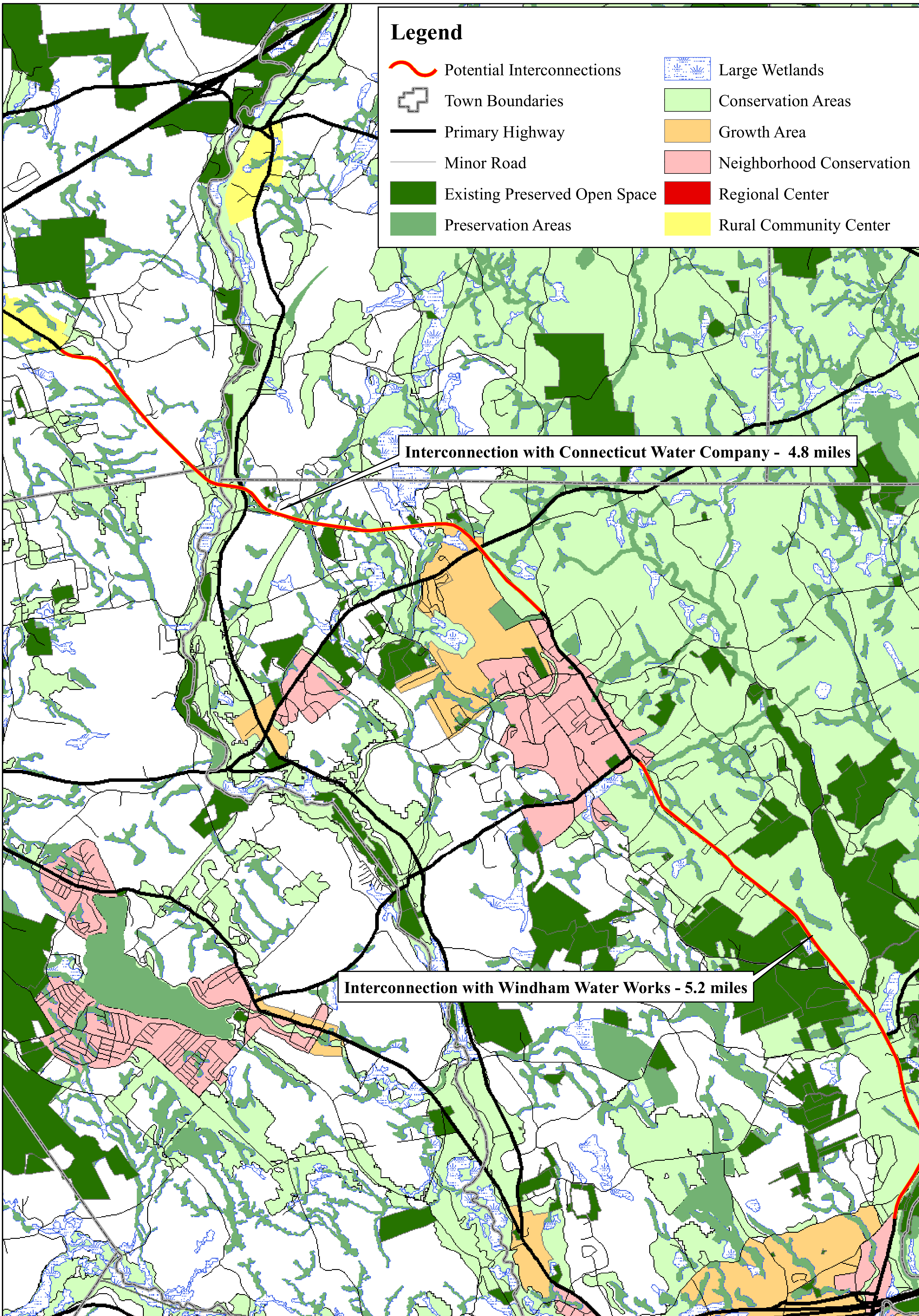
In general, Windham Water Works is producing average day, maximum month, and peak day volumes of water that are consistent with the projections. Because the available water is the same for an average day, maximum month average day, and a peak day, Windham Water Works is somewhat peak day limited. The system has approximately 0.5 mgd available as excess supply at the present time, but this increment will decrease as Windham's projections are realized. Much of Windham's projected increase in demand (on the order of 0.1 mgd) is located in southern Mansfield, although additional demand is projected within Windham as well.

According to the Windham Water Supply Plan, if any water were made available for use by the University of Connecticut, it would be necessary to increase the Windham Water Works treatment plant capacity and amend the diversion permit to allow a withdrawal that maintains the 15% margin of safety under average, maximum month, and peak day conditions. Based on the previous effort that was completed for the current diversion permit, any such additional withdrawal from the Willimantic Reservoir would be approved only if the Army Corps of Engineers were able to formally commit to operating Mansfield Hollow Lake for maintenance of instream flows in the Natchaug River.

If Windham Water Works were to provide water to the University of Connecticut, it may request that the University assist in the permit application process and any negotiations with the Army Corps of Engineers. Windham Water Works may also request that the University assist in the expansion of treatment plant capacity above 4.1 mgd. Such expansion would need to include all aspects of filter plant operations, including pumping, filtration, treatment, and the like.

A pipeline installed along 5.2 miles of Route 195 between the Windham Water Works system and the University system would be needed for the interconnection. Because the elevation change from the water treatment plant to the University system is approximately 450 feet (from approximately 200 feet to 650 feet), a pumping station would be necessary. The expense associated with a pipeline of that length would include significant capital costs for the water main and a pumping station, and operational costs associated with operation of the pumping station. Capital costs have not been formally estimated, but would likely exceed $4.5 million for the water main and pumping station.

In order to utilize University funds to upgrade Windham's water treatment plant, construct the pumping station, and install the water main, the project would be required to proceed through the Connecticut Environmental Policy Act (CEPA) review process and be evaluated in an Environmental Impact Evaluation (EIE). Because the pipeline would traverse Preservation and Conservation areas depicted in the Conservation and Development Policies Plan for Connecticut, 2005-2010 (also known as the State Plan of Conservation and Development), the EIE would be required to propose mitigation for induced development along the pipeline. Refer to Figure 7-3 for a copy of the state plan designations. Typically, mitigation for induced development can include amendments to a local Plan of Conservation and Development, zoning regulations, and/or other regulations.



Overview of Potential Interconnections
(State Plan of Conservation & Development Base)

Engineering, Landscape Architecture and Environmental Science MILONE & MACBROOM® 99 Realty Drive Cheshire, Connecticut 06410 (203) 271-1773 Fax: (203) 272-9733 www.miloneandmacbroom.com	MMI#: 1958-31-1 MXD: H:\Figure7-1.mxd SOURCE: Microsoft, State of CT	University of Connecticut Water Supply Plan	LOCATION: Mansfield, CT Map By: SJB Date: 1/7/2011 Scale: 1"=4,000' SHEET: Figure 7-3

Finally, in order to deliver water to the University system, the University and Windham Water Works would need to apply for and obtain a diversion permit from DEP and a sale of excess water permit from DPH. It is possible that the increased withdrawal from the Willimantic Reservoir and the interconnection with the University system could be authorized in a single diversion permit issued to Windham Water Works and the University, although this would need to be verified by DEP.

The above obstacles for interconnecting with the University of Connecticut will be challenging to overcome. Significant effort will be necessary to authorize additional withdrawals from the Willimantic Reservoir, expand the Windham Water Works treatment plant, and install a pipeline along Route 195. However, this alternative water supply is believed to be feasible.

7.2.5 Interconnection With Tolland Water Department

The Tolland Water Department manages a municipal water system in eastern Tolland. The system obtains water from two wells located along the Willimantic River. Tolland is currently operating with peak day margins of safety below 1.0 relative to its diversion permit limit of 0.22 mgd. A diversion permit application was submitted to DEP in 2008, requesting an increase to 0.41 mgd. The DEP denied the request for an increase in 2009. The same year, Tolland's water supply plan was completed and submitted to DPH for review. The water supply plan demonstrates a need for an increased diversion permit limit, and another diversion permit application was submitted in 2010.

Even when the Tolland system is authorized to withdraw greater than 0.22 mgd through a modified diversion permit, the supply will be completely allocated to meeting future demands in Tolland and South Willington. Excess supply will not be available to the University. Hence, this alternative is not feasible as an additional supply.

7.2.6 Interconnection With The Connecticut Water Company

CWC has expressed an interest in serving a portion of Mansfield from its Northern Region/Western System for at least ten years. The source of water to the University would be the Shenipsit Reservoir. Unlike Windham Water Works and Tolland, CWC currently has excess water supply in the Western System relative to its registered and permitted diversions.

However, similar to Windham Water Works, a treatment plant expansion would be necessary to facilitate additional withdrawals and filtration from Shenipsit Reservoir. Other project issues are similar to those that would be faced by Windham Water Works. A pipeline installed along Route 195 between the CWC and the University system would need to be 4.8 miles in length, although a portion of that distance would be overcome by utilizing the section of the Tolland system located in Route 195, which in turn requires a contract with the Town of Tolland.

Because the elevation change from the Coventry/Mansfield town line (along the Willimantic River) to the University system is approximately 300 feet, a pumping station in Mansfield would be necessary. The expenses associated with a pipeline would include significant capital costs for the water main and a pumping station in northwest Mansfield, and operational costs associated with operation of the pumping station. Capital costs have been estimated by CWC at $6.5 million.

In order to utilize University funds to construct the pumping station and install the water main, the project would be required to proceed through the CEPA review process and be evaluated in an EIE. Because the pipeline would traverse mainly designated rural areas and a few designated conservation areas depicted in the State Plan of Conservation and Development, the EIE would be required to propose mitigation for induced development along the pipeline. Typically, mitigation for induced development can include amendments to a local Plan of Conservation and Development, zoning regulations, and/or other regulations. The CEPA-related issues can be avoided if CWC funds the project, which is something that is not possible for a pipeline from Windham Water Works.

Finally, in order to deliver water to the University system, the University and CWC would need to apply for and obtain a diversion permit from DEP and a sale of excess water permit from DPH.

The CWC pipeline is believed to be feasible. Additionally, it has several advantages over a pipeline from Windham Water Works:

- CWC has adequate diversion permits and registrations for its Western System sources, whereas Windham Water Works would need to modify its diversion permit to allow increased withdrawals from its single source of supply;
- The CWC pipeline would be shorter than a Windham Water Works pipeline;
- The CWC pipeline would be mainly traversing designated rural areas whereas the Windham Water Works pipeline would be mainly traversing designated conservation areas depicted in the State Plan of Conservation and Development;
- As an investor-owned water utility, CWC can initiate treatment plant upgrades and a pipeline project more quickly than Windham Water Commission can;
- A pipeline from CWC can serve areas in need of a public water supply such as the Mansfield Four Corners area, areas that may benefit from a public water supply such as the Route 32 / Route 195 intersection in Mansfield, and existing small public water systems located along Route 195;
- The Windham Water Works pipeline would not pass by any significant areas in need of a public water supply.

7.2.7 New Stratified Drift Ground Water Sources

It is possible that new sources of ground water supply could be developed in a number of locations in the Town of Mansfield. In order to develop a new ground water source under current regulatory requirements and sanitary criteria, the following conditions generally need to be met or addressed:

- The wellheads must be raised above flood elevations;
- The wells must not significantly draw down the water table in adjacent wetlands;
- Direct impacts to wetlands must be avoided and/or mitigated;
- The wells must not reduce instream flows in nearby streams to the extent that it is detrimental to fish habitat, water quality, competing water users, or other environmental receptors;
- The land within 200 feet of each well must be in the control of the water utility;
- The wells must not draw contaminants from septic systems, landfills, or other potentially contaminated sites; and
- Existing private and public water supply wells cannot be impacted.

Stratified drift aquifer ground water supplies are typically used for larger, regional water needs as opposed to small local or clustered demands. These types of wells tend to produce large flow rates; however, they are also more expensive to develop, maintain, and protect from contamination, making them better suited for large customer bases.

The University's Water and Wastewater Master Plan (2007) reviewed the following alternative ground water supplies: (1) additional withdrawals at the Willimantic River Wellfield; (2) development of the Willimantic River aquifer at Mansfield Depot; (3) development of the Willimantic River aquifer at Eagleville; (4) additional withdrawals at the Fenton River Wellfield; and (5) development of the Fenton River aquifer near Mansfield Hollow Reservoir.

Alternative number 1 was also evaluated as part of the Willimantic River Study completed and published in 2010. The alternative was ruled out as part of the Willimantic River Study because the incremental supply did not make sense in light of the instream flow constraints identified by the study. Alternatives 2 and 3 warrant additional consideration and are revisited below, except that they have been combined in favor of the Mansfield Depot location and a site that is intermediate between Mansfield Depot and Eagleville.

Relative to similar instream flow concerns, Alternative number 4 was one of the least prudent of the five discussed in the master plan. Relocation of a well such as Well A is unlikely to gain back the operational capacity that is needed to bolster margins of safety as the committed water demands are developed because the middle section of the Fenton River at the wellfield is most vulnerable to flow diminution. Instead, the use of Well D is the most appropriate means of restoring operational capacity of the Fenton River Wellfield. Alternative 5 warrants additional consideration and is revisited below.

Willimantic River Aquifer

The Town of Mansfield has previously indicated that a potential well site exists in the area of Mansfield Depot where Route 44 crosses the Willimantic River. The mapped surficial geology in this area appears to support this assumption. Several successful wellfields have been sited along the Willimantic River, including the Willimantic River Wellfield and the Tolland Water Department Wellfield. Additionally, a large parcel of land is located adjacent to the river near Route 44. The size of the parcel would permit the required 200-foot radius of control.

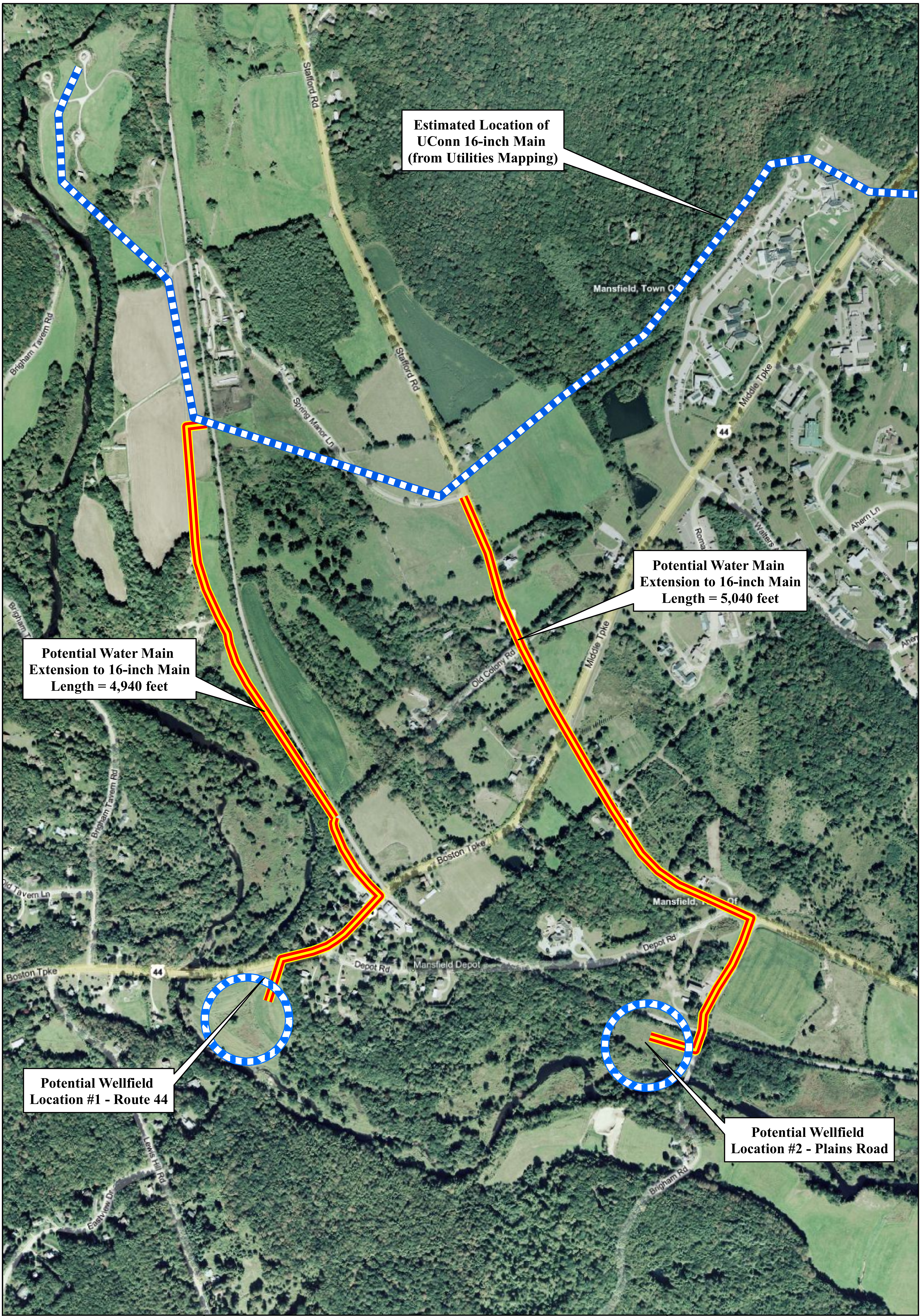
The USGS drilled a test hole just south of Route 44 in 1963. The hole encountered medium sand down to 34 feet, overlying compact sand and gravel (likely glacial till) from 34 to 51 feet. Bedrock was encountered at a depth of 51 feet. The static water level was only four feet below the ground surface, indicating a saturated thickness of 30 feet. Although high-yield production wells are typically deeper, a saturated thickness of 30 feet would not prohibit development of a well. The surficial material (medium sand) most likely has a high hydraulic conductivity, such that a high well yield would be expected.

Site disturbance and associated direct wetland impact may be issues at this site, as it has not been developed. Although private water supply wells are located nearby, these wells are drilled into bedrock and would not likely be impacted by a stratified drift wellfield. The area is located in the SFHA along the river, such that the development of a new well would require filling to raise the new wellhead above the flood elevation.

Two natural diversity database polygons are located just east of the potential well site. The associated Species of Special Concern are located in upland wooded areas. Development of a well site may require evaluation of habitat impacts. Closed landfills/dumps are located north and southeast of Mansfield Depot, both within one-half mile of the potential well site. Therefore, potential ground water quality problems must be considered if siting a well at this location. Certainly, high-quality ground water may be available at this site, even with the landfills nearby.

To deliver water from the Mansfield Depot area to the University system, 4,900 feet of water transmission main would need to be installed from the new well site to the existing 16-inch main that delivers water from the Willimantic River Wellfield to the system. Refer to Figure 7-4 for a depiction of this potential route.

In the last two years, a second nearby location has also been discussed. Town-owned land is available off Plains Road, further downstream from Route 44. This location is intermediate in location between the original alternatives described in the master plan (the site in Mansfield Depot and the site in Eagleville) and is superior to any sites further downstream due to the increasing distances involved.



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Potential Willimantic River Wellfields & Transmission Main Extensions

LOCATION: Mansfield, CT

MMI#: 1958-31
MXD: H:\Figure7-4.mxd
SOURCE: Microsoft, UConn

N

University of Connecticut Water Supply Plan

Map By: SJB
Date: 1/7/2011
Scale: 1"=600'

SHEET: Figure 7-4

This potential well site off Plains Road has similar issues as the site located near Route 44. For example, it is located in the SFHA and would require installation of a 5,000-foot water main to deliver water to the existing 16-inch transmission main. However, the Plains Road site is more favorable than the Route 44 site with respect to instream flows, as it is adjacent to the backwater of Eagleville Lake and therefore groundwater withdrawals will minimally impact fish habitats. Although the Depot Campus effluent discharge was historically located at the upstream end of Eagleville Lake, it has been discontinued. Therefore, no water quality concerns are related to sewage effluent.

One benefit of developing new ground water supplies along the Willimantic River is that the water withdrawn from the resource would ultimately be returned to the river via the treated wastewater effluent from the University WPCF. Development of ground water supplies in the Natchaug River basin (described below) would result in a transfer to the Willimantic River basin, although it is recognized that both rivers are part of the Shetucket drainage basin.

Mansfield Hollow Reservoir and Lower Fenton River Aquifer

The University's Water and Wastewater Master Plan (2007) included a planning-level evaluation of stratified drift along the lower Fenton River and Mansfield Hollow Reservoir. The stratified drift aquifers associated with the Fenton River, Mount Hope River, and Natchaug River meet at Mansfield Hollow Reservoir. Including the areas that are inundated by the existing impoundment, the aquifer is 1.5 miles wide and 2.6 miles long where the three rivers meet. According to the Water Resources Bulletin for the Shetucket River Basin (USGS, 1966), the saturated thickness of the aquifer ranges from less than 10 feet at its edges to more than 80 feet south of Echo Lake. Beneath the existing reservoir, the aquifer is approximately 40 feet thick, but the water column above the aquifer is at least 20 feet deep.

There are two blocks of glacial till in the interior of the aquifer, between Echo Lake and the reservoir, where the stratified drift aquifer is absent. The two glacial till blocks significantly limit the location of a wellfield on the west side of the reservoir.

Wetland systems adjacent to Echo Lake would likely limit the development of a wellfield in close proximity, as drawdown of the water table would be expected. Similar low-lying areas with potential wetlands also exist in Mansfield Hollow (on either side of Mansfield Hollow Road); along a watercourse that flows in a southerly direction in the vicinity of the landfill; perpendicular to Bassett Bridge Road; north of Mansfield Hollow Reservoir between the shore and Route 89; and along Bassett Bridge Road near the bridge over the reservoir.

To avoid unacceptable instream flow impacts, a wellfield would need to be distant from the main stems of the Fenton River and Mount Hope River, limiting the locations available to the northwest and northeast of Mansfield Hollow Reservoir. A well located near the lake would be expected to have negligible impacts to instream flows because the lake provides a significant control on ground water base level.

Private wells are located at every residential, institutional, and commercial property in the vicinity of the Mansfield Hollow Reservoir. Some dug wells operate in this area, and these would be susceptible to drawdown caused by pumping of a stratified drift wellfield. An aquifer pumping test would be necessary to evaluate possible dug well impacts in this area. Bedrock wells would not be expected to be susceptible to drawdown.

There are fewer potential environmental impacts and private well impacts east of the Mansfield Hollow Reservoir. However, areas east of the reservoir are likely too remote for development of a wellfield, especially as the distance from Bassett Bridge Road increases. Additionally, construction of a water main through large tracts of undeveloped land is undesirable.

Flood elevation constraints would be an important factor for siting a public water supply near the Mansfield Hollow Reservoir. A new wellfield here would need to be located above the spillway elevation of 257 feet in order to meet the flood elevation criteria. This requirement removes the entire reservoir fringe from consideration.

Natural diversity database polygons are located in the northern and central portions of the Mansfield Hollow Reservoir. The frosted elfin moth is associated with each polygon. Habitat impacts would need to be evaluated if these areas were selected for well development.

The active town landfill and compost area located off Route 89 severely limit the potential for wellfield development northwest of the reservoir near the Fenton River. The closed town landfill off Cemetery Road significantly limits the location of a wellfield on the west side of the Mansfield Hollow Reservoir. The necessary separation between the landfill and a wellfield would depend on the pumping rates of the wells, the natural ground water flow direction, and contaminants (if any) associated with the landfill.

With the limitations discussed above, there are very few potential well sites in the Mansfield Hollow stratified drift aquifer. The following sites are the only potentially feasible choices:

1. North or south of Bassett Bridge Road, 1,500 feet east of Route 195;
2. Immediately east of Route 89 at the intersection with Wormwood Hill Road;
3. Immediately adjacent to Bassett Bridge Road on the east side of the reservoir, above the spillway elevation; and
4. Immediately east of Bassett Bridge Road on the west side of the reservoir, where the road abruptly curves to the north, on a small "island" above the spillway elevation.

Of these four locations, development of a water supply would be difficult at locations 1, 2, or 3 because the parcels are small, and several parcels would need to be acquired to obtain the physical space and setbacks needed and/or deeded control of the land. Option 4 is contained wholly within the Mansfield Hollow State Park, lending itself to land-use control but requiring permission from the State of Connecticut and the federal government, as well.

In light of the environmental concerns, and without large tracts of available, contiguous land, it is unlikely that development of a community ground water supply in the vicinity of Mansfield Hollow Reservoir or the lower Fenton River would be feasible under the current regulatory framework.

7.2.8 Prioritization of Future Supplies

Well D from the Fenton River Wellfield is already in place and used along with the other Fenton River wells when instream flows in the river are sufficient. Given its immediate availability, Well D is the first logical increment of "new" supply for the University.

The RWF project is scheduled to begin construction in 2011 and be completed in 2012, serving as the second increment of new supply (reduced demand) to the University. The project will ensure that margins of safety are as high as possible as committed water demands begin to materialize.

Development of the next increment of new supply will need to be in progress as of 2015 in order to ensure that margins of safety remain above 1.15. Of the potential options discussed above, the following should be pursued on parallel tracks:

- Relocation of Fenton Well A
- CWC interconnection
- Windham Water Works interconnection
- New ground water supply along the Willimantic River

A new ground water supply near the lower Fenton River or Mansfield Hollow Reservoir is too distant and has too many associated uncertainties to justify its pursuit.

Discussions with CWC have focused on the provision of 0.5 mgd to the University. The same quantity, 0.5 mgd, is the upper limit of how much water could reasonably be supplied by Windham Water Works (in the short-term only) without a diversion permit modification or treatment plant upgrade. Because these quantities likely exceed the availability associated with a relocated Fenton Well A, they are used here for planning purposes.

Tables 7-15 and 7-16 provide margins of safety for projected monthly and peak day demands in 2030, and Tables 7-17 and 7-18 provide margins of safety for projected monthly and peak day demands in 2060. These projections assume that 0.5 mgd is available as needed, but particularly in late summer and early fall.

As shown on the tables, an additional increment of 0.5 mgd will provide margins of safety above 1.15 for all projected monthly demands. Peak day margins of safety will also be above 1.15 for all projected peak day demands, except occasionally in the month of August when the margin of safety will be above 1.0. The University anticipates that slightly more than 0.5 mgd can be supplied by a new source of supply during these isolated instances, or storage can be used to buffer the peak days.

TABLE 7-15
Projected Monthly Margins of Safety with Well D, RWF, and Additional 0.5 mgd, 2030

Month	Current Production (mgd)	Future Committed Demands (mgd)	Associated Unaccounted Water (mgd)	Future RWF Offset (mgd)	Total Future Demand (mgd)	Available Water Supply (mgd)				Margin of Safety
						Willimantic River Wells	Fenton River Wells	Additiona l Supply	Total	
January	1.18	0.32	0.016	-0.20	1.31	1.48	0.84	--	2.32	1.77
February	1.59	0.45	0.023	-0.20	1.86	1.48	0.84	--	2.32	1.25
March	1.28	0.35	0.018	-0.19	1.46	1.48	0.84	--	2.32	1.59
April	1.53	0.44	0.022	-0.18	1.81	1.48	0.84	--	2.32	1.29
May	1.06	0.24	0.012	-0.34	0.97	1.48	0.84	--	2.32	2.38
June	1.09	0.24	0.012	-0.35	0.99	1.48	0	--	1.48	1.50
July	1.16	0.25	0.012	-0.40	1.02	1.48	0	--	1.48	1.45
August	1.17	0.26	0.013	-0.37	1.08	1.48	0	--	1.48	1.37
September	1.64	0.44	0.022	-0.27	1.84	1.48	0.35	0.5	2.33	1.26
October	1.52	0.42	0.021	-0.23	1.73	1.48	0.35	0.5	2.33	1.35
November	1.34	0.35	0.018	-0.25	1.46	1.48	0.84	--	2.32	1.59
December	1.27	0.33	0.016	-0.25	1.36	1.48	0.84	--	2.32	1.70

TABLE 7-16
Projected Peak Margins of Safety with Well D, RWF, and Additional 0.5 mgd, 2030

Month	Current Production (mgd)	Future Committed Demands (mgd)	Future RWF Offset (mgd)	Total Future Demand (mgd)	Available Water Supply (mgd)				Margin of Safety
					Willimantic River Wells	Fenton River Wells	Additiona l Supply	Total	
January	1.86	0.44	-0.20	2.10	1.97	0.84	--	2.81	1.34
February	2.04	0.63	-0.20	2.46	1.97	0.84	--	2.81	1.14
March	2.23	0.49	-0.19	2.53	1.97	0.84	--	2.81	1.11
April	2.03	0.61	-0.18	2.46	1.97	0.84	--	2.81	1.14
May	1.78	0.33	-0.34	1.77	1.97	0.84	--	2.81	1.59
June	1.90	0.33	-0.35	1.88	1.97	0	0.5	2.47	1.31
July	1.93	0.34	-0.40	1.87	1.97	0	0.5	1.97	1.32
August	2.33	0.36	-0.37	2.33	1.97	0	0.5	2.47	1.06
September	2.12	0.62	-0.27	2.48	1.97	0.35	0.5	2.82	1.14
October	2.02	0.58	-0.23	2.37	1.97	0.35	0.5	2.82	1.19
November	2.16	0.49	-0.25	2.40	1.97	0.84	--	2.81	1.17
December	2.01	0.46	-0.25	2.22	1.97	0.84	--	2.81	1.27

TABLE 7-17
Projected Monthly Margins of Safety with Well D, RWF, and Additional 0.5 mgd, 2060

Month	Current Production (mgd)	Future Committed Demands (mgd)	Associated Unaccounted Water (mgd)	Future RWF Offset (mgd)	Total Future Demand (mgd)	Available Water Supply (mgd)				Margin of Safety
						Willimantic River Wells	Fenton River Wells	Additiona l Supply	Total	
January	1.18	0.34	0.017	-0.20	1.33	1.48	0.84	--	2.32	1.74
February	1.59	0.48	0.024	-0.20	1.89	1.48	0.84	--	2.32	1.23
March	1.28	0.37	0.019	-0.19	1.48	1.48	0.84	--	2.32	1.57
April	1.53	0.46	0.023	-0.18	1.83	1.48	0.84	--	2.32	1.27
May	1.06	0.25	0.012	-0.34	0.99	1.48	0.84	--	2.32	2.35
June	1.09	0.25	0.013	-0.35	1.00	1.48	0	--	1.48	1.47
July	1.16	0.26	0.013	-0.40	1.03	1.48	0	--	1.48	1.43
August	1.17	0.28	0.014	-0.37	1.09	1.48	0	--	1.48	1.35
September	1.64	0.47	0.024	-0.27	1.87	1.48	0.35	0.5	2.33	1.25
October	1.52	0.44	0.022	-0.23	1.75	1.48	0.35	0.5	2.33	1.33
November	1.34	0.37	0.019	-0.25	1.48	1.48	0.84	--	2.32	1.57
December	1.27	0.35	0.017	-0.25	1.38	1.48	0.84	--	2.32	1.68

TABLE 7-18
Projected Peak Margins of Safety with Well D, RWF, and Additional 0.5 mgd, 2060

Month	Current Production (mgd)	Future Committed Demands (mgd)	Future RWF Offset (mgd)	Total Future Demand (mgd)	Available Water Supply (mgd)				Margin of Safety
					Willimantic River Wells	Fenton River Wells	Additional Supply	Total	
January	1.86	0.47	-0.20	2.13	1.97	0.84	--	2.81	1.32
February	2.04	0.67	-0.20	2.50	1.97	0.84	--	2.81	1.12
March	2.23	0.52	-0.19	2.56	1.97	0.84	--	2.81	1.10
April	2.03	0.65	-0.18	2.49	1.97	0.84	--	2.81	1.13
May	1.78	0.35	-0.34	1.79	1.97	0.84	--	2.81	1.57
June	1.90	0.35	-0.35	1.90	1.97	0	0.5	2.47	1.30
July	1.93	0.36	-0.40	1.89	1.97	0	0.5	1.97	1.31
August	2.33	0.38	-0.37	2.35	1.97	0	0.5	2.47	1.05
September	2.12	0.66	-0.27	2.51	1.97	0.35	0.5	2.82	1.12
October	2.02	0.62	-0.23	2.41	1.97	0.35	0.5	2.82	1.17
November	2.16	0.52	-0.25	2.43	1.97	0.84	--	2.81	1.16
December	2.01	0.49	-0.25	2.24	1.97	0.84	--	2.81	1.25

In summary, the RWF plus an additional source of supply of up to 0.5 mgd is needed to meet all committed future water demands. The RWF will address the earlier components of the committed future water demands from 2012 through 2015, whereas the additional supply will address subsequent components of committed future demands.

7.3 SYSTEM IMPROVEMENTS AND MAINTENANCE ACTIVITIES

Source and system improvements have been identified and described in detail throughout this Plan. The improvement schedules summarized in Tables 7-19, 7-20, and 7-21 relate these recommended improvements to the time frame in which they are believed to be necessary. The Short, Intermediate, and Long Term Improvement Schedules correspond to the five, 20, and 50-year planning periods. Cost estimates, financing sources, and the year in which each is anticipated to occur are also listed.

TABLE 7-19
Short Term Improvement Schedule, 2011 - 2015

Item	Estimated Cost	Year	Funding Source
Proceed with construction of reclaimed water facility	$25,000,000	2011-2012	CI
Continue metering of service connections and groups of buildings	$100,000	2011-2012	OB
Safe yield pumping test of Willimantic River Wellfield	$25,000	2011-2012	OB
Replace Hillside Road water main	$200,000	2011-2012	OB
Permitting and design of interconnections with The Connecticut Water Company and/or Windham Water Works	$500,000	2012-2015	OS & OB
Work with Town of Mansfield regarding other potential water supplies such as new wells along the Willimantic River	$75,000	2012-2015	OS & OB

TABLE 7-19 (Continued)
Short Term Improvement Schedule, 2011 - 2015

Item	Estimated Cost	Year	Funding Source
Investigate feasibility of relocating Fenton Well A	$75,000	2012-2013	OB
Additional hydraulic model calibration and expansion as needed	$25,000	2012-2015	OB
System extension and installations for Storrs Center Phase IA	$150,000	2011-2012	OS
Additional system installations for Storrs Center Phase IB	$150,000	2012-2013	OS
Extend system into North Campus area	$250,000	2012-2013	CI
Repair main breaks as needed	$2,000/yr	As Needed	OB
Repair leaking services as needed	$2,000/yr	As Needed	OB
Meter testing/calibration/replacement program	$5,000/yr	Annually	OB
Annual water balance and conservation programs	NA	Annually	OB
Update water supply plan	$50,000	2015	OB
Begin construction of additional future supply such as interconnection or new wells along the Willimantic River	$3M to $7M	2014-2015	OS & CI

Note: Cost estimates are for planning purposes only. Where an estimated cost "NA" is shown, this work is intended to be conducted by in-house staff, or paid for by other departments.
CI = Capital Improvement funds
OB = Operating Budget
OS = Outside Sources

TABLE 7-20
Intermediate Term Improvement Schedule, 2016 - 2030

Item	Estimated Cost	Year	Funding Source
Complete construction of additional future supply such as interconnection or new wells along the Willimantic River	$3M to $7M	2016	OS & CI
Relocate Fenton Well A if feasible and prudent	$100,000	2016	OB
More fully interconnect the Depot Campus sub-system with the Main Campus sub-system such that the Fenton River Wellfield could provide water during emergencies	$700,000	By 2030	CI
Redevelop wells as needed	$20,000-$50,000	Various	OB
Repair main breaks as needed	$2,000/yr	As Needed	OB
Repair leaking services as needed	$2,000/yr	As Needed	OB
Meter testing/calibration/replacement program	$5,000/yr	Annually	OB
Annual water balance and conservation programs	NA	Annually	OB
Inspect and maintain storage facilities	$50,000	Various	OB
Update water supply plan	$50,000/ea	2022, 2030	OB

TABLE 7-21
Long Term Improvement Schedule, 2031 - 2060

Item	Estimated Cost	Year	Funding Source
Redevelop wells as needed	$20,000-$50,000	Various	OB
Repair main breaks as needed	$2,000/yr	As Needed	OB
Repair leaking services as needed	$2,000/yr	As Needed	OB
Meter testing/calibration/replacement program	$5,000/yr	Annually	OB
Annual water balance and conservation programs	NA	Annually	OB
Inspect and maintain storage facilities	$50,000	Various	OB
Update water supply plan	$50,000/ea	2038, 2046, 2054	OB

7.4 FINANCING OF PROPOSED IMPROVEMENTS AND PROGRAMS

Three types of financing are planned for the above improvements. Operating budget expenses such as metering, meter testing, main breaks, and routine repairs are paid from the annual budget of the Facilities Department. Revenue from water rates is the main contributor to this budget.

Capital improvement funds are necessary for significant projects like the RWF, which otherwise could not be constructed using funds from annual budgets and water ratepayers. Capital improvement funds may also be used for interconnections, depending on the contributions of other parties. The Connecticut Water Company will likely contribute a significant percentage of the total funds needed for an interconnection from its Western System, whereas Windham Water Works would contribute little if anything toward an interconnection with the University.

The Connecticut Water Company is an example of the third category of funding. Outside sources will be necessary for some of the projects listed in the improvement tables, such as the Storrs Center water system infrastructure. Without these outside sources, some of the University's projects would be difficult to fund using annual budgets and State funds.

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[9] Wikipedia, 2010, "University of Connecticut – History", http://en.wikipedia.org/wiki/University_of_Connecticut, Last Accessed October 27, 2010.

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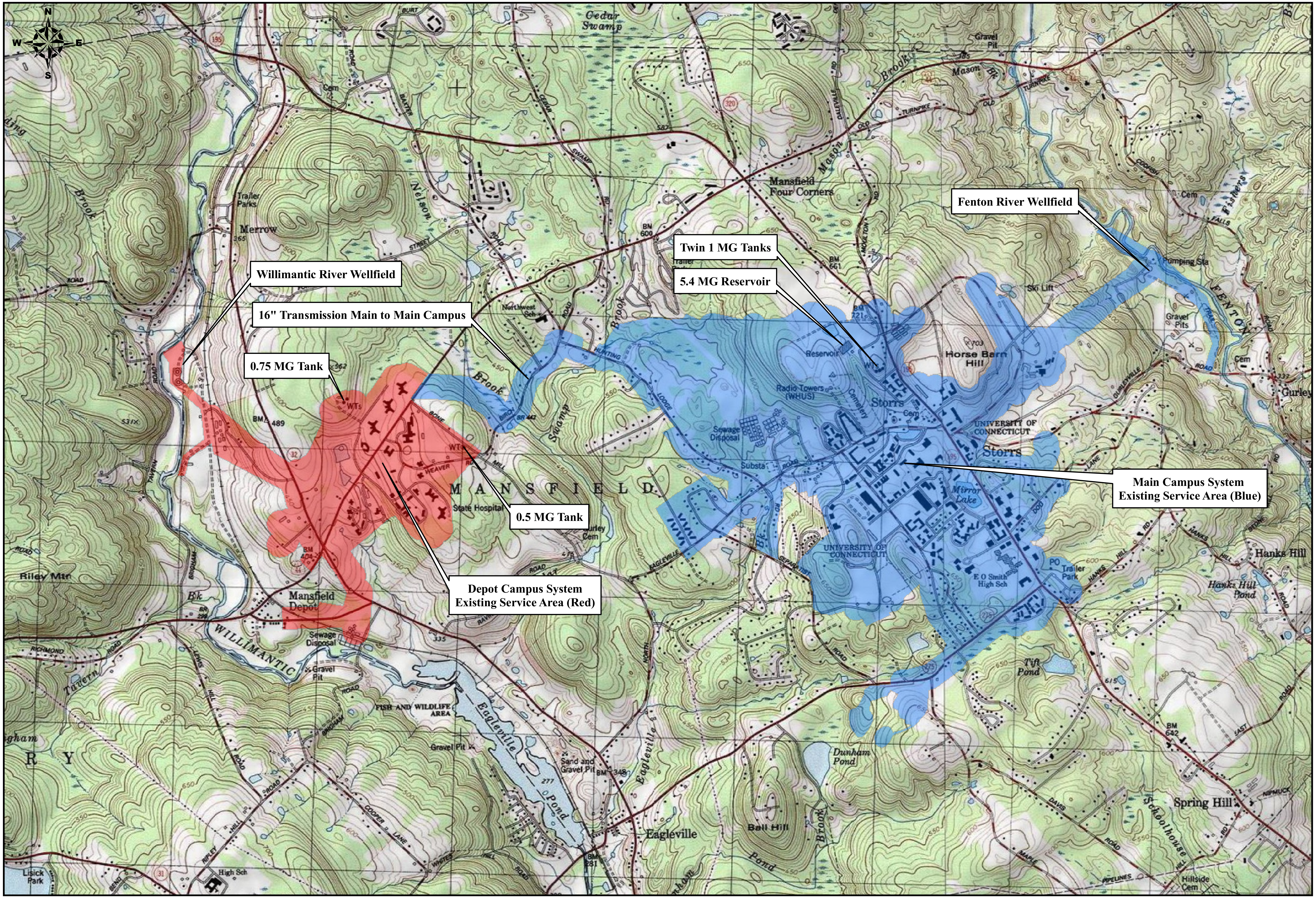
[12] Connecticut Department of Public Health & Connecticut Department of Environmental Protection, 2003, *Source Water Assessment Report – An Evaluation of the Susceptibility of Public Drinking Water Sources to Potential Contamination*, http://www.ct.gov/dph/cwp/view.asp?a=3139&q=398262&dphNav_GID=1824, Produced with Funding Provided by the United States Environmental Protection Agency.

[13] Town of Mansfield, Connecticut, 2006, *Mansfield Plan of Conservation and Development*.

[14] Town of Mansfield, Connecticut, 2006, "Aquifer Protection Area Regulations of the Town of Mansfield, Connecticut."



Sources:
-Service Area Based on University of Connecticut System Mapping
-USGS 1997 Topographic Basemap Provided by ESRI

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Engineering, Landscape Architecture and Environmental Science
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Cheshire, Connecticut 06410
(203) 271-1773 Fax (203) 272-9733
www.miloneandmacbroom.com

REVISIONS
5/9/2011 Service Area

WATER SERVICE AREA
UNIVERSITY OF CONNECTICUT
WATER SUPPLY PLAN
STORRS, CONNECTICUT

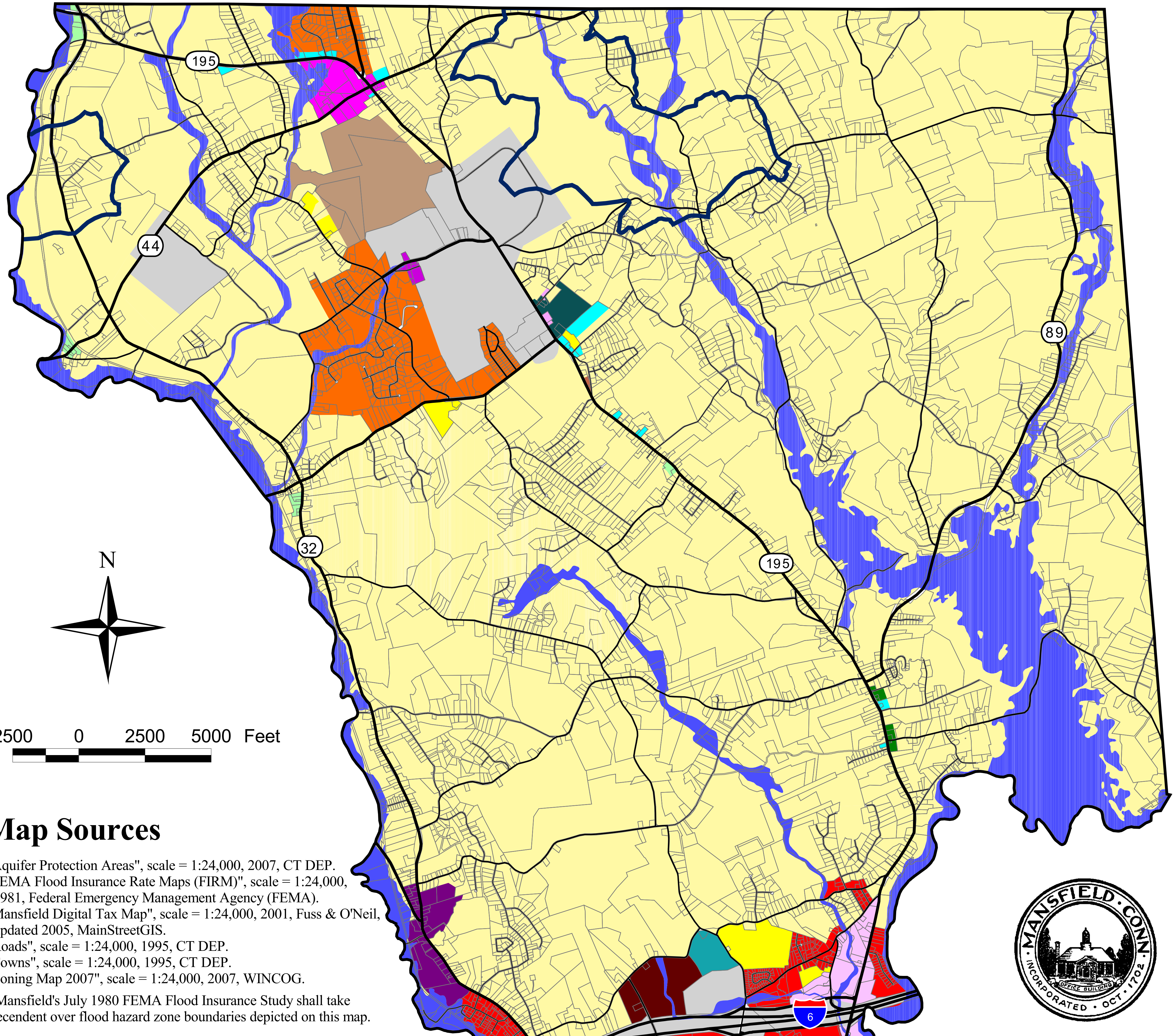
DESIGNED	DRAWN	CHECKED
SJB	SJB	DM

SCALE: 1" = 2,000'
DATE: 3/17/2011
PROJECT NO: 1958-31
MXD NAME: P:\AppendedFigure1.MXD

APPENDED FIGURE 1
SHEET NO.

Appended Figure II
(Secure Document – Not for Public Release)

MILONE & MACBROOM®



N

2500 0 2500 5000 Feet

- Residence 20 Zone (R-20)
- Residence 90 Zone (R-90)
- Rural Agricultural Residence 90 Zone (RAR-90)
- Design Multiple Residence Zone (DMR)
- Planned Business 1 Zone (PB-1)
- Planned Business 2 Zone (PB-2)
- Planned Business 3 Zone (PB-3)
- Planned Business 4 Zone (PB-4)
- Planned Business 5 Zone (PB-5)
- Neighborhood Business 1 Zone (NB-1)
- Neighborhood Business 2 Zone (NB-2)
- Business Zone (B)
- Professional Office 1 Zone (PO-1)
- Professional Office 3 Zone (PO-3)
- Storrs Center Special Design District (SC-DD)
- Industrial Park Zone (IP)
- Research and Development Limited Industrial Zone (RD/LI)
- Flood Hazard Zone (FH) *
- Institutional Zone (I)
- Aquifer Protection Areas

The boundaries of the aquifer protection areas are identical to the CT DEP approved aquifer protection areas for the University of Connecticut's Fenton River and Willimantic River wellfields.

Zoning Map

of the Town of Mansfield, Connecticut

(Effective December 7, 2007)

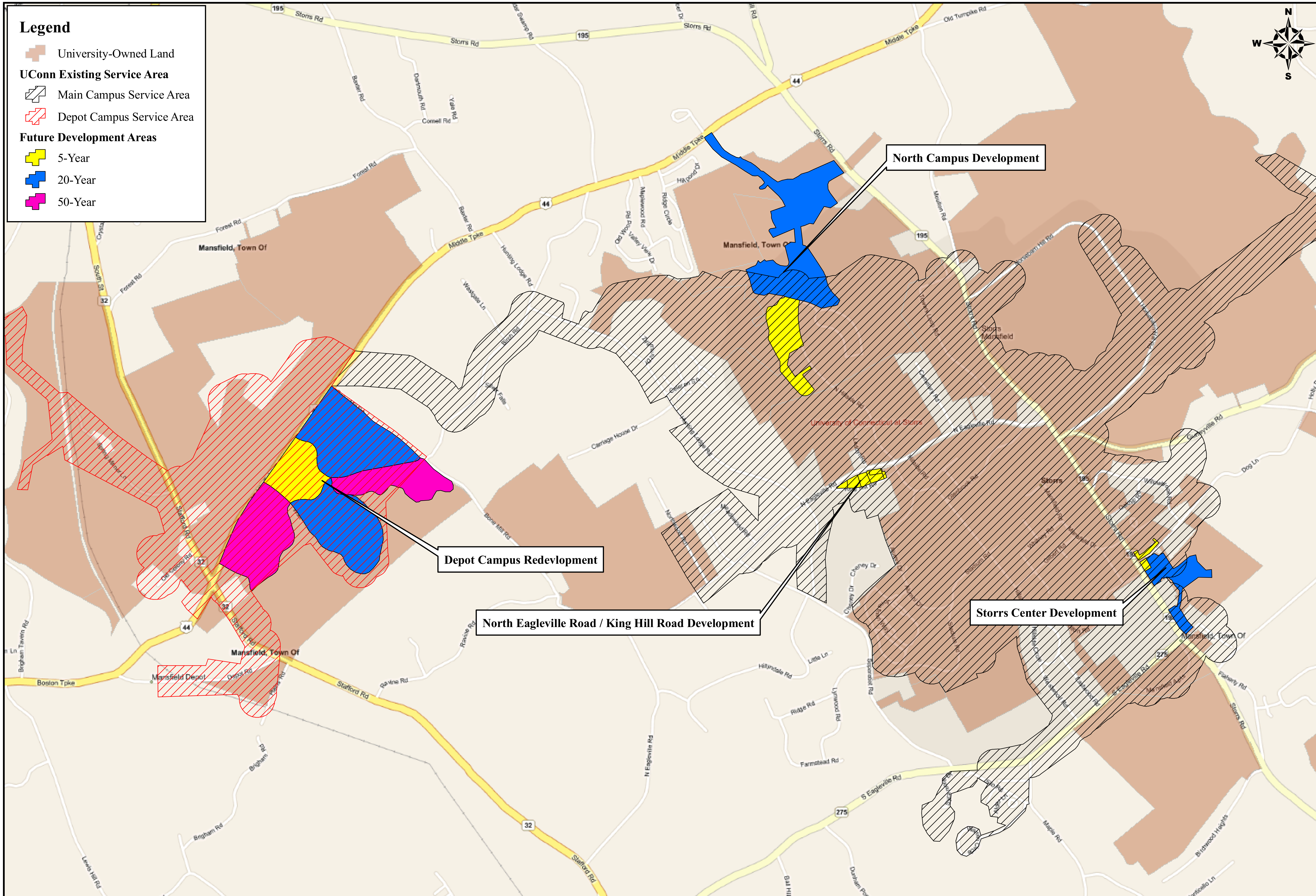
MANSFIELD · CONN. · INCORPORATED · OCT · 1702 · OFFICE BUILDING

Map Sources

"Aquifer Protection Areas", scale = 1:24,000, 2007, CT DEP.
"FEMA Flood Insurance Rate Maps (FIRM)", scale = 1:24,000, 1981, Federal Emergency Management Agency (FEMA).
"Mansfield Digital Tax Map", scale = 1:24,000, 2001, Fuss & O'Neil, updated 2005, MainStreetGIS.
"Roads", scale = 1:24,000, 1995, CT DEP.
"Towns", scale = 1:24,000, 1995, CT DEP.
"Zoning Map 2007", scale = 1:24,000, 2007, WINCOG.

* Mansfield's July 1980 FEMA Flood Insurance Study shall take precendent over flood hazard zone boundaries depicted on this map.

Prepared by the Windham Region Council of Governments.



Sources:
-Service Area Based on University of Connecticut System Mapping
-Basemap provided by Microsoft via ESRI subscription service

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REVISIONS

5/5/2011	Univ. Land
5/10/2011	Future Dev.

FUTURE SERVICE AREAS

UNIVERSITY OF CONNECTICUT WATER SUPPLY PLAN

STORRS, CONNECTICUT

SJB	SJB	DM
DESIGNED	DRAWN	CHECKED

SCALE: 1" = 1,500'

DATE: 3/17/2011

PROJECT NO: 1958-31

MXD NAME: P:\AppFigureIV.MXD

APPENDED FIGURE IV

SHEET NO.

Appendix A
Operator Certificates

State of Connecticut

Department of Public Health

Be it known that

PETER PEZANKO

having given evidence satisfactory to the Department of Public Health
of having met the qualifications required by the General Statutes
of Connecticut is issued this certificate as

Distribution System Class II Operator

in the State of Connecticut

in witness whereof the Connecticut Department of Public Health
has issued certificate number 184103 on this effective date of 1st day of
July, 2010 and expiration date of 30th day of June, 2013.

J Robert Galvin MD, MPH, MBA

J. Robert Galvin, MD, MPH, MBA
COMMISSIONER

State of Connecticut

Department of Public Health

Be it known that

PETER PEZANKO

having given evidence satisfactory to the Department of Public Health
of having met the qualifications required by the General Statutes
of Connecticut is issued this certificate as

Water Treatment Plant Class II Operator

in the State of Connecticut

in witness whereof the Connecticut Department of Public Health
has issued certificate number 200106 on this effective date of 1st day of
July, 2009 and expiration date of 30th day of June, 2012.

J Robert Galvin MD, MPH, MBA

J. Robert Galvin, MD, MPH, MBA
COMMISSIONER

State of Connecticut

Department of Public Health

Be it known that

Raymond J. Allain

having given evidence satisfactory to the Department of Public Health
of having met the qualifications required by the General Statutes
of Connecticut is issued this certificate as

Water Treatment Plant Class IV Operator

in the State of Connecticut

in witness whereof the Connecticut Department of Public Health
has issued certificate number 203137 on this effective date of 1st day of
July, 2009 and expiration date of 30th day of June, 2012.

J Robert Galvin MD, MPH, MBA

J. Robert Galvin, MD, MPH, MBA
COMMISSIONER

State of Connecticut

Department of Public Health

Be it known that

Raymond J. Allain

having given evidence satisfactory to the Department of Public Health
of having met the qualifications required by the General Statutes
of Connecticut is issued this certificate as

Distribution System Class I Operator

in the State of Connecticut

in witness whereof the Connecticut Department of Public Health
has issued certificate number 204218 on this effective date of 9th day of
July, 2010 and expiration date of 30th day of June, 2013.

J Robert Galvin MD, MPH, MBA

J. Robert Galvin, MD, MPH, MBA
COMMISSIONER

State of Connecticut

Department of Public Health

Be it known that

Raymond J. Allain

having given evidence satisfactory to the Department of Public Health
of having met the qualifications required by the General Statutes
of Connecticut is issued this certificate as

Tester/Inspector - General

in the State of Connecticut

in witness whereof the Connecticut Department of Public Health
has issued certificate number 204179 on this effective date of 29th day of
October, 2009 and expiration date of 30th day of September, 2012.

J Robert Galvin MD,MPH,MBA

J. Robert Galvin, MD, MPH, MBA
COMMISSIONER

State of Connecticut

Department of Public Health

Be it known that

ROBERT WITTENZELLNER

having given evidence satisfactory to the Department of Public Health
of having met the qualifications required by the General Statutes
of Connecticut is issued this certificate as

Distribution System Class III Operator

in the State of Connecticut

in witness whereof the Connecticut Department of Public Health
has issued certificate number 201148 on this effective date of 1st day of
July, 2010 and expiration date of 30th day of June, 2013.

J Robert Galvin MD, MPH, MBA

J. Robert Galvin, MD, MPH, MBA
COMMISSIONER

State of Connecticut

Department of Public Health

Be it known that

ROBERT WITTENZELLNER

having given evidence satisfactory to the Department of Public Health
of having met the qualifications required by the General Statutes
of Connecticut is issued this certificate as

Water Treatment Plant Class II Operator

in the State of Connecticut

in witness whereof the Connecticut Department of Public Health
has issued certificate number 191179 on this effective date of 1st day of
July, 2009 and expiration date of 30th day of June, 2012.

J Robert Galvin MD, MPH, MBA

J. Robert Galvin, MD, MPH, MBA
COMMISSIONER

State of Connecticut

Department of Public Health

Be it known that

Robert Wittenzellner

having given evidence satisfactory to the Department of Public Health
of having met the qualifications required by the General Statutes
of Connecticut is issued this certificate as

Tester/Inspector - General

in the State of Connecticut

in witness whereof the Connecticut Department of Public Health
has issued certificate number 204190 on this effective date of 13th day of
March, 2009 and expiration date of 31st day of March, 2012.

J Robert Galvin MD, MPH, MBA

J. Robert Galvin, MD, MPH, MBA
COMMISSIONER

Appendix B
Agreement with Town of Mansfield

THE UNIVERSITY OF CONNECTICUT

The Office of the Vice President
for Administration
U-130
Gulley Hall
352 Mansfield Road
Storrs, CT 06269-2130
Telephone (203) 486-4429, 4430

May 12, 1989

TO: BOARD OF TRUSTEES

FROM: Sallie A. Giffen SAGiffen

RE: WATER AND SEWER SERVICE AGREEMENT

BACKGROUND:

The University first entered into a Sewer and Water Service Agreement with the Town of Mansfield in January, 1984 in which the Town of Mansfield transferred ownership of certain water and sewer lines to the University. In turn, the University provided guarantees of water and sewer service provided that consumption remained within limits set by the agreement and discharges to the sewage system met the criteria set forth in the University Sewer Operating Ordinance.

The Water and Sewer Service Agreement has been updated to reflect the current conditions and has been reviewed by both the Town of Mansfield and the Office of Facilities.

RECOMMENDATION:

That the Board of Trustees approve the Water and Sewer Service Agreement between The University of Connecticut and the Town of Mansfield.

jsp
Attachment

THE UNIVERSITY OF CONNECTICUT

The Office of the Vice President
for Administration
U-130
Gulley Hall
352 Mansfield Road
Storrs, CT 06269-2130
Telephone (203) 486-4429, 4430

May 18, 1989

Mr. Martin H. Berliner
Town Manager
Audrey P. Beck Building
Four South Eagleville Road
Storrs, CT 06268

Dear Marty:

I am enclosing a signed copy of the agreement between the Town of Mansfield and The University of Connecticut for provision of water and sewer services. The new agreement is for five years and thereafter to be renewed on a year-to-year basis.

Please have one copy of this agreement signed and returned to me.

Sincerely,

Sallie A. Giffen

Sallie A. Giffen
Vice President for
Administration

jsp
Enclosure

TOWN OF MANSFIELD
UNIVERSITY OF CONNECTICUT
SEWER & WATER SERVICE AGREEMENT

This agreement shall become effective on the 1st day of January, 1989, between:

The TOWN OF MANSFIELD, acting by and through its Town Council, hereinafter referred to as "TOWN".

The UNIVERSITY OF CONNECTICUT, acting by and through its Board of Trustees, hereinafter referred to as "UNIVERSITY".

WITNESSETH:

WHEREAS, Special Act NO. 78-79 and Public Act No. 85-544 of the State of Connecticut Legislature authorize the UNIVERSITY to enter into agreements with the Mansfield Retirement Community, Inc., the Town of Mansfield, and the Mansfield Housing Authority to provide sewer and water service to facilities for predominantly low and moderate income elderly persons, and

WHEREAS, extensions of the UNIVERSITY'S sewer and water systems have been made for these purposes, and said systems are now in place, complete and functional, and

WHEREAS, UNIVERSITY also supplies water to and collects sewage from the Audrey P. Beck Municipal Building, and

WHEREAS, TOWN and UNIVERSITY are now jointly interested in entering into a formal agreement with each other setting forth the terms and conditions of all said water and sewer services, and

WHEREAS, the terms and conditions of said sewer service have been set forth in the UNIVERSITY'S sewer operating ordinance approved by the Connecticut Department of Environmental Protection and U.S. Environmental Protection Agency attached hereto in part as Appendix A, and by reference made a part hereof, and

NOW, THEREFORE, in consideration of the above premises and the agreements and commitments hereinafter following, TOWN and UNIVERSITY do hereby agree as follows:

I. WATER SERVICE TERMS AND CONDITIONS:

UNIVERSITY shall provide water service to: Mansfield Retirement Community, Inc., (Juniper Hill), the Town of Mansfield Senior Center, the Town of Mansfield Housing Authority's Wright's Village, Development and the Mansfield Cooperative's Glen Ridge for a maximum population of approximately five hundred (500) persons, and water service to the Audrey P. Beck Building and Mansfield Housing Authority's Holinko Estates as set forth herein. In addition, water service shall be provided to a nursing facility of one hundred twenty (120) bed maximum when and if such facility is constructed. Said water service shall be in accordance with the quality, quantity and pressure standards for potable water as set forth in sections 19-13-B102 of the Connecticut Public Health Code, excepting that no fire hydrants shall be permitted in the distribution lines beyond the juncture with the UNIVERSITY'S 8" line at the intersection of Westwood and South Eagleville Roads.

UNIVERSITY shall maintain adequate sources of supply, treatment facilities, storage facilities, and distribution lines to provide said water service now and for the terms of this Agreement except that the TOWN shall maintain or cause to be maintained all distribution lines, meters and auxiliaries associated with the above referenced facilities beyond the juncture with the UNIVERSITY'S 8" line at the intersection of Westwood and South Eagleville Roads in accordance with the UNIVERSITY'S operation and maintenance methods and accepted standards for water distribution systems.

UNIVERSITY shall bill the TOWN for the water consumed by the above referenced facilities. Said billings shall be on a semi-annual basis based on meter readings located at or near these establishments.

UNIVERSITY shall establish unit water service rates and charges to recover water system operation, maintenance, administrative, and overhead costs on an annual basis. Said rates shall be communicated to TOWN as soon as possible after being established or revised, and prior to the first billing of each fiscal year.

II. SEWER SERVICE TERMS AND CONDITIONS:

UNIVERSITY shall receive sanitary sewage generated only by the facilities named in the first paragraph of Section I above.

TOWN shall cause said sewage from these facilities to be delivered to the UNIVERSITY's sewer system by means of owned and maintained system consisting of a pump station located on Eagleville Road and a 6" force main location on South Eagleville Road, Westwood Road, and Hillside Circle discharging into the UNIVERSITY'S gravity sewer system.

TOWN shall be responsible for the operation and maintenance of said pump station and force main in accordance with UNIVERSITY specifications and standard operation procedures at no cost to UNIVERSITY. To this end, TOWN shall permit UNIVERSITY inspection and approval of TOWN design, construction, maintenance and operation of these facilities whenever appropriate.

UNIVERSITY shall maintain, expand and enlarge, as necessary, any and all of its facilities so as to maintain adequate collection and treatment facilities for said sewage from the TOWN as described above now and for the term of this Agreement.

UNIVERSITY shall bill the town for the sewage accepted from the above referenced facilities.

UNIVERSITY shall establish unit sewer service rates and charges to recover their sewer system operation, maintenance, administrative, and overhead costs on an annual basis. Said user charges shall be communicated to TOWN as soon as possible after being established or revised, and prior to the first billing each fiscal year.

III. TERM AND AGREEMENT:

This Agreement shall be binding upon the parties, their successors and assigns for a period of five years, and thereafter shall be renewed on a year-to-year basis unless otherwise terminated by either party sixty days in advance of the anniversary date.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on the date first above written.

TOWN OF MANSFIELD
STATE OR COUNTY

Martin H Berliner 6-27-89

Martin H. Berliner
Town Manager

Recommended as to form
and content:

Town Attorney

UNIVERSITY OF CONNECTICUT

Sallie A. Giffen 5/5/89

Sallie A. Giffen
Vice President for
Finance and Administration

Attest:

Paul M. Shapiro

Paul M. Shapiro
Assistant Attorney General

Appendix C
Source Water Assessment Report

SOURCE WATER ASSESSMENT REPORT

AN EVALUATION OF THE SUSCEPTIBILITY OF PUBLIC DRINKING WATER SOURCES TO POTENTIAL CONTAMINATION

APA **135**

University Of Connecticut
Fenton River Wellfield

The State of Connecticut Department of Public Health (DPH) in cooperation with the Department of Environmental Protection (DEP) recently completed an assessment of the Fenton River Wellfield, which is a source of public drinking water that is maintained and operated by the University Of Connecticut. This one-time assessment is part of a nationwide effort mandated by Congress under the Safe Drinking Water Act Amendments of 1996 to evaluate the susceptibility of all public drinking water sources in Connecticut to potential sources of contamination. DPH began working in partnership with the DEP in 1997 to develop Connecticut's Source Water Assessment Program, which was approved by the U.S. Environmental Protection Agency in 1999. Sources of potential contamination that are of concern to public drinking water supplies here in Connecticut are generally associated with historic waste disposal or commercial, industrial, agricultural and residential properties that store or use hazardous materials like petroleum products, solvents or agricultural chemicals.

The assessment is intended to provide University Of Connecticut consumers with information about where their public drinking water comes from, sources of potential contamination that could impact it, and what can be done to help protect it. This assessment will also assist the public water supply system, regional planners, local government, public health officials and state agencies in evaluating the degree to which the Fenton River Wellfield may be at risk from potential sources of contamination. The assessment can be used to target and implement enhanced source water protection measures such as routine inspections, protective land use regulations, acquisition of critical land, proper septic system maintenance, and public education. General sources of contamination with the potential to impact the Fenton River Wellfield include properties with underground fuel storage tanks, improperly maintained on-site septic systems, improper waste disposal, or commercial/industrial sites that store or use chemicals or generate hazardous wastes.

Fenton River Wellfield Source Water Assessment Summary

STRENGTHS

Local aquifer protection regulations adopted

Public Water System Source Protection Program

Less than 10% of this source water area is currently developed for commercial or industrial use

POTENTIAL RISK FACTORS

Potential contaminant sources in source water area

Susceptibility Rating

Rating	Environmental Sensitivity	Potential Risk Factors	Source Protection Needs
Low	X	X	X
Moderate			
High			

Overall Susceptibility Rating: Low

This rating indicates susceptibility to potential sources of contamination that may be in the wellfield source water area and does not necessarily imply poor water quality.

Detailed information about the specific factors and information used in establishing this rating can be found in Table 1. Information about opportunities to improve protection in the Fenton River Wellfield source water area is also presented in Table 2.

CONNECTICUT DEPARTMENT OF PUBLIC HEALTH
Keeping Connecticut Healthy

State of Connecticut Department of Public Health
Drinking Water Division
410 Capitol Avenue – MS# 51WAT
P.O. Box 340308 Hartford, CT 06134
(860) 509-7333

Produced With Funding Provided By The United States Environmental Protection Agency - May 2003

OVERVIEW - The Fenton River Wellfield is located in an aquifer that is comprised largely of water-bearing sand and gravel deposits. The source water area is delineated by a final Level A aquifer protection mapping area, which encompasses some 1360.0 acres of land in Mansfield and Willington. Vacant land and residential properties in the Fenton River Wellfield source water area presently account for approximately 87.2 percent of the land cover. Commercial development at 2.5 percent and agricultural land use at 10.3 percent, account for the remainder of the land coverage's in the source water area. Information about drinking water quality and treatment is available in the University Of Connecticut's annual Consumer Confidence Report.

ASSESSMENT METHODS.

The drinking water source assessment methods used by the Department of Public Health Drinking Water Division to evaluate the susceptibility of public drinking water sources to contamination are based on criteria individually tailored to surface water and groundwater sources. The criteria are keyed to sanitary conditions in the source water area, the presence of potential or historic sources of contamination, existing land use coverage's, and the need for additional source protection measures within the source water area. Source-specific data for community and non-community systems were used to determine whether a particular criterion should be rated as low, moderate or high, relative to the risk of potential contamination at the drinking water source. Further, a ranking system was used to compute an average rank for each community drinking water source based on its environmental sensitivity, potential risk of contamination and source protection needs.

Wellfields rated as having a low, moderate or high susceptibility to potential sources of contamination generally exhibit the characteristics summarized in Table 1.

Table 1 – General Source Water Area Characteristics and Susceptibility Ratings

Susceptibility Rating	**General Characteristics of the Source Water Area***
Low	Low density of potential contaminant sources Lower intensity of land development
Moderate	Low to moderate density of potential contaminant sources Moderate intensity of land development
High	Moderate to high density of potential contaminant sources Higher intensity of land development No local aquifer protection regulations Detectable nitrates and/or volatile organic chemicals in the untreated source water during the past three years that are below the maximum contaminant levels allowed by state and federal drinking water regulations

***** ***Note: Not all characteristics may be present for a given susceptibility rating***

Readers of this assessment are encouraged to use the attached glossary to assist in the understanding of the terms and concepts used throughout this report.

Maps representing the location and features of the Fenton River Wellfield source water area have not been included with this assessment report because of homeland security concerns

FENTON RIVER WELLFIELD ASSESSMENT RESULTS.

Based on a combination of current wellfield and source water area conditions, existing potential contaminant sources, and the level of source protection measures currently in place, the source water assessment for this wellfield indicates that it has an overall Low risk of contamination from identified potential sources of contamination. The assessment findings for the Fenton River Wellfield are summarized in Table 2, which lists current conditions in the wellfield source water area and recommendations or opportunities to enhance protection of this public drinking water source. A listing of potential contaminant source types in the area can be found in Table 3. A summary of source water area features is shown in Table 4.

The assessment of this and other comparable wellfields throughout Connecticut generally finds that adopting recommendations similar to those presented in Table 2 could reduce the susceptibility of most groundwater sources to potential sources of contamination.

Table 2 **Source Water Assessment Findings and Source Protection Opportunities**

Fenton River Wellfield

Assessment Category	**Conditions Through June 2002**	**Recommendations and Source Protection Opportunities**
Environmental Sensitivity Factors	All wells in the Fenton River Wellfield are sited and constructed in accordance with DPH regulations and the most recent DPH sanitary survey of this wellfield indicates that it is free of deficiencies.	
Contaminants Detected in Untreated Source Water	None Except where noted above, any detected contaminants listed are below maximum contaminant levels (MCL) established by the federal government or guidance levels established by the Connecticut Department of Public Health. The presence of these contaminants, in general, indicates that this wellfield is sensitive to human activity. Click here to review EPA's current drinking water standardsT	Maintain monitoring levels specified in the Connecticut Public Health Code Section 19-13-B102 Encourage homeowners to adopt residential best management practices that minimize the use hazardous materials or generation of hazardous waste.
Potential Risk Factors	Potential contaminant sources in source water area More than 50% of land for this source water area is undeveloped, which could present a risk if developed inappropriately.	Periodically inspect SPCS sites and maintain a water quality monitoring program consistent with the level of potential risk Proactively work with local officials and developers to insure that only low-risk development occurs within the source water area Encourage residential property owners to conduct scheduled inspections and maintenance of underground fuel storage tanks and on-site septic systems.
Source Protection Needs Factors	Level A aquifer mapping completed 100 percent ownership or control of sanitary radius around wellheads in wellfield. Aquifer protection regulations adopted for the entire source water area Less than 10% of the land in the source water area exists as preserved open space	Complete Level A mapping Support and encourage the acquisition of open space land within the source water area Support environmental awareness and education within the community.

Inventoried significant potential contaminant sources in the Fenton River Wellfield source water area are listed in Table 3. While these facilities have the potential to cause groundwater contamination, there is no indication that they are doing so at this time.

Table 3 Summary of Significant Potential Contaminant Types in the Fenton River Wellfield Source Water Area

Category	Subcategory	Number of SPCS Types
Waste Storage, Handling, Disposal	Hazardous Waste Facilities	0
	Solid Waste Facilities	0
	Miscellaneous	0
Bulk Chemical, Petroleum Storage	Underground Storage Tanks	2
	Tank Farms	0
	Warehouses	0
Industrial Manufacturing / Processing	Chemical & Allied Production	0
	Chemical Use Processing	0
	Miscellaneous	1
Commercial Trades and Services	Automotive and Related Services	0
	Chemical Use Services	0
	Miscellaneous	0
Agriculture and Related	Pesticide Storage, Handling or Application	0
Total Number of Contaminant Types		3

Prominent features of the Fenton River Wellfield source water area are summarized in Table 4.

Table 4 Features of the *Fenton River Wellfield* Source Water Area

Number and Type of Public Drinking Water Supply Wells	1 caisson and 3 stratified drift wells
Source Water Area Delineation Method [a]	final Level A
DEP Groundwater Classification	GAA - Groundwater used as a public drinking water supply, presumed to be drinkable without treatment
Size of Source Water Area	1360.0 acres
Location of Source Water Area	Mansfield and Willington
Predominant Land Use and Land Cover in Source Water Area [b] -Urban - Commercial or Industrial -Urban - Residential -Agricultural -Undeveloped Land	 2.5 % 3.0 % 10.3 % 84.2 %
Preserved Land In Source Water Area [d]	18.5 acres
Significant Potential Contamination Sources -Number of inventoried facilities in source water area -Count of inventoried facilities per square mile -Number of contaminant sources within inventoried facilities	 3 1.41 per sq mile 3
Number of Contaminant Release Points Inventoried by CTDEP [c]	0

[a] Source water delineation method depends on data available for the wellfield

[b] Based on statewide data layer of land use and land cover developed by UCONN Dept of Natural Resource Management Engineering and Connecticut DEP satellite imagery.

[c] Sites or locations with documented accidental spills, leaks or discharges. While these sources, which are cataloged and tracked by the Connecticut DEP, may fall within a public drinking water supply source water area, they may or may not presently be discharging to the environment or causing contamination of a public drinking water source.

[d] Any combination of state forest and parklands and municipally or privately held land designated as open space.

M-1

SOURCE WATER ASSESSMENT REPORT

AN EVALUATION OF THE SUSCEPTIBILITY OF PUBLIC DRINKING WATER SOURCES TO POTENTIAL CONTAMINATION

APA 136

University Of Connecticut
Willimantic River Wellfield

The State of Connecticut Department of Public Health (DPH) in cooperation with the Department of Environmental Protection (DEP) recently completed an assessment of the Willimantic River Wellfield, which is a source of public drinking water that is maintained and operated by the University Of Connecticut. This one-time assessment is part of a nationwide effort mandated by Congress under the Safe Drinking Water Act Amendments of 1996 to evaluate the susceptibility of all public drinking water sources in Connecticut to potential sources of contamination. DPH began working in partnership with the DEP in 1997 to develop Connecticut's Source Water Assessment Program, which was approved by the U.S. Environmental Protection Agency in 1999. Sources of potential contamination that are of concern to public drinking water supplies here in Connecticut are generally associated with historic waste disposal or commercial, industrial, agricultural and residential properties that store or use hazardous materials like petroleum products, solvents or agricultural chemicals.

The assessment is intended to provide University Of Connecticut consumers with information about where their public drinking water comes from, sources of potential contamination that could impact it, and what can be done to help protect it. This assessment will also assist the public water supply system, regional planners, local government, public health officials and state agencies in evaluating the degree to which the Willimantic River Wellfield may be at risk from potential sources of contamination. The assessment can be used to target and implement enhanced source water protection measures such as routine inspections, protective land use regulations, acquisition of critical land, proper septic system maintenance, and public education. General sources of contamination with the potential to impact the Willimantic River Wellfield include properties with underground fuel storage tanks, improperly maintained on-site septic systems, improper waste disposal, or commercial/industrial sites that store or use chemicals or generate hazardous wastes.

Willimantic River Wellfield Source Water Assessment Summary

STRENGTHS

Local aquifer protection regulations adopted

Public Water System Source Protection Program

Less than 10% of this source water area is currently developed for commercial or industrial use

POTENTIAL RISK FACTORS

Potential contaminant sources in source water area

1 contaminant release point in source water area

Susceptibility Rating

Rating	Environmental Sensitivity	Potential Risk Factors	Source Protection Needs
Low	X	X	
Moderate			X
High			

Overall Susceptibility Rating: Low

This rating indicates susceptibility to potential sources of contamination that may be in the wellfield source water area and does not necessarily imply poor water quality.

Detailed information about the specific factors and information used in establishing this rating can be found in Table 1. Information about opportunities to improve protection in the Willimantic River Wellfield source water area is also presented in Table 2.

CONNECTICUT DEPARTMENT OF PUBLIC HEALTH

Keeping Connecticut Healthy

State of Connecticut Department of Public Health
Drinking Water Division
410 Capitol Avenue – MS# 51WAT
P.O. Box 340308 Hartford, CT 06134
(860) 509-7333

Produced With Funding Provided By The United States Environmental Protection Agency - May 2003

OVERVIEW - The Willimantic River Wellfield is located in an aquifer that is comprised largely of water-bearing sand and gravel deposits. The source water area is delineated by a preliminary Level B aquifer protection mapping area, which encompasses some 1660.0 acres of land in Coventry and Mansfield. Vacant land and residential properties in the Willimantic River Wellfield source water area presently account for approximately 78.3 percent of the land cover. Commercial development at 1.9 percent and agricultural land use at 19.8 percent, account for the remainder of the land coverage's in the source water area. Information about drinking water quality and treatment is available in the University Of Connecticut's annual Consumer Confidence Report.

ASSESSMENT METHODS.

The drinking water source assessment methods used by the Department of Public Health Drinking Water Division to evaluate the susceptibility of public drinking water sources to contamination are based on criteria individually tailored to surface water and groundwater sources. The criteria are keyed to sanitary conditions in the source water area, the presence of potential or historic sources of contamination, existing land use coverage's, and the need for additional source protection measures within the source water area. Source-specific data for community and non-community systems were used to determine whether a particular criterion should be rated as low, moderate or high, relative to the risk of potential contamination at the drinking water source. Further, a ranking system was used to compute an average rank for each community drinking water source based on its environmental sensitivity, potential risk of contamination and source protection needs.

Wellfields rated as having a low, moderate or high susceptibility to potential sources of contamination generally exhibit the characteristics summarized in Table 1.

Table 1 – General Source Water Area Characteristics and Susceptibility Ratings

Susceptibility Rating	General Characteristics of the Source Water Area*
Low	Low density of potential contaminant sources Lower intensity of land development
Moderate	Low to moderate density of potential contaminant sources Moderate intensity of land development
High	Moderate to high density of potential contaminant sources Higher intensity of land development No local aquifer protection regulations Detectable nitrates and/or volatile organic chemicals in the untreated source water during the past three years that are below the maximum contaminant levels allowed by state and federal drinking water regulations

** Note: Not all characteristics may be present for a given susceptibility rating*

Readers of this assessment are encouraged to use the attached glossary to assist in the understanding of the terms and concepts used throughout this report.

Maps representing the location and features of the Willimantic River Wellfield source water area have not been included with this assessment report because of homeland security concerns

WILLIMANTIC RIVER WELLFIELD ASSESSMENT RESULTS.

Based on a combination of current wellfield and source water area conditions, existing potential contaminant sources, and the level of source protection measures currently in place, the source water assessment for this wellfield indicates that it has an overall Low risk of contamination from identified potential sources of contamination. The assessment findings for the Willimantic River Wellfield are summarized in Table 2, which lists current conditions in the wellfield source water area and recommendations or opportunities to enhance protection of this public drinking water source. A listing of potential contaminant source types in the area can be found in Table 3. A summary of source water area features is shown in Table 4.

The assessment of this and other comparable wellfields throughout Connecticut generally finds that adopting recommendations similar to those presented in Table 2 could reduce the susceptibility of most groundwater sources to potential sources of contamination.

Table 2

Source Water Assessment Findings and Source Protection Opportunities

Willimantic River Wellfield

Assessment Category	Conditions Through June 2002	Recommendations and Source Protection Opportunities
Environmental Sensitivity Factors	All wells in the Willimantic River Wellfield are sited and constructed in accordance with DPH regulations and the most recent DPH sanitary survey of this wellfield indicates that it is free of deficiencies.	
Contaminants Detected in Untreated Source Water	None Except where noted above, any detected contaminants listed are below maximum contaminant levels (MCL) established by the federal government or guidance levels established by the Connecticut Department of Public Health. The presence of these contaminants, in general, indicates that this wellfield is sensitive to human activity. Click here to review EPA's current drinking water standardsT	Maintain monitoring levels specified in the Connecticut Public Health Code Section 19-13-B102 Encourage homeowners to adopt residential best management practices that minimize the use hazardous materials or generation of hazardous waste.
Potential Risk Factors	Potential contaminant sources in source water area 1 contaminant release point in source water area More than 50% of land for this source water area is undeveloped, which could present a risk if developed inappropriately.	Periodically inspect SPCS sites and maintain a water quality monitoring program consistent with the level of potential risk Maintain an adequate level of surveillance around contaminant release point sites to insure that groundwater contamination is not occurring Proactively work with local officials and developers to insure that only low-risk development occurs within the source water area Encourage residential property owners to conduct scheduled inspections and maintenance of underground fuel storage tanks and on-site septic systems.
Source Protection Needs Factors	Level B aquifer mapping completed 100 percent ownership or control of sanitary radius around wellheads in wellfield. Aquifer protection regulations adopted for the entire source water area Less than 10% of the land in the source water area exists as preserved open space	Complete Level A mapping Adhere to local aquifer protection regulations Support and encourage the acquisition of open space land within the source water area Support environmental awareness and education within the community.

Inventoried significant potential contaminant sources in the Willimantic River Wellfield source water area are listed in Table 3. While these facilities have the potential to cause groundwater contamination, there is no indication that they are doing so at this time.

Table 3 **Summary of Significant Potential Contaminant Types in the Willimantic River Wellfield Source Water Area**

Category	Subcategory	Number of SPCS Types
Waste Storage, Handling, Disposal	Hazardous Waste Facilities	0
	Solid Waste Facilities	0
	Miscellaneous	0
Bulk Chemical, Petroleum Storage	Underground Storage Tanks	1
	Tank Farms	0
	Warehouses	0
Industrial Manufacturing / Processing	Chemical & Allied Production	0
	Chemical Use Processing	0
	Miscellaneous	0
Commercial Trades and Services	Automotive and Related Services	0
	Chemical Use Services	1
	Miscellaneous	0
Agriculture and Related	Pesticide Storage, Handling or Application	0
Total Number of Contaminant Types		2

Prominent features of the Willimantic River Wellfield source water area are summarized in Table 4.

Table 4 **Features of the *Willimantic River Wellfield* Source Water Area**

Number and Type of Public Drinking Water Supply Wells	4 stratified drift wells
Source Water Area Delineation Method [a]	preliminary Level B
DEP Groundwater Classification	GAA - Groundwater used as a public drinking water supply, presumed to be drinkable without treatment
Size of Source Water Area	1660.0 acres
Location of Source Water Area	Coventry and Mansfield
Predominant Land Use and Land Cover in Source Water Area [b] -Urban - Commercial or Industrial -Urban - Residential -Agricultural -Undeveloped Land	 1.9 % 5.5 % 19.8 % 72.9 %
Preserved Land In Source Water Area [d]	91.6 acres
Significant Potential Contamination Sources -Number of inventoried facilities in source water area -Count of inventoried facilities per square mile -Number of contaminant sources within inventoried facilities	 2 0.77 per sq mile 2
Number of Contaminant Release Points Inventoried by CTDEP [c]	1

[a] Source water delineation method depends on data available for the wellfield

[b] Based on statewide data layer of land use and land cover developed by UCONN Dept of Natural Resource Management Engineering and Connecticut DEP satellite imagery.

[c] Sites or locations with documented accidental spills, leaks or discharges. While these sources, which are cataloged and tracked by the Connecticut DEP, may fall within a public drinking water supply source water area, they may or may not presently be discharging to the environment or causing contamination of a public drinking water source.

[d] Any combination of state forest and parklands and municipally or privately held land designated as open space.

Appendix D
Aquifer Protection Regulations

AQUIFER PROTECTION AREA REGULATIONS

OF THE

TOWN OF MANSFIELD, CONNECTICUT

First adopted: January 17, 2006
First effective: February 15, 2006
Revised effective: January 7, 2007

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Section 1

Title and Authority

A. Aquifers are an essential natural resource and a major source of public drinking water for the State of Connecticut. Use of groundwater will increase as the population grows and opportunities for new surface water supplies diminish due to the rising cost of land and increasingly intense development. At the same time, numerous drinking water wells have been contaminated by certain land use activities, and others are now threatened. To address this problem, Connecticut has established the Aquifer Protection Area Program (Connecticut General Statutes §22a-35bb) to identify critical water supply aquifers and to protect them from pollution by managing land use. Protection requires coordinated responsibilities shared by the state, municipality and water companies to ensure a plentiful supply of public drinking water fro present and future generations. It is therefore the purpose of these regulations to protect aquifer protection areas within the Town of Mansfield by making provisions for:

1. Implementing regulations consistent with state regulations and An Act Concerning Aquifer Protection Areas, Connecticut General Statutes §22a-354a to §22a-354bb ("the Act");
2. delineating aquifer protection areas on the city/town zoning or inland wetland and watercourse areas maps;
3. regulating land use activity within the aquifer protection area including: prohibiting certain new activities; registering existing regulated activities; and issuing permits for new regulated activities at registered facilities; and
4. administering and enforcing these regulations.

B. These regulations shall be known as the Aquifer Protection Area Regulations (the "APA Regulations") of the Town of Mansfield.

C. These regulations were adopted and may be amended, from time to time, in accordance with the provisions of §221-354p of An Act Concerning Aquifer Protection Areas, the Connecticut General Statutes §22a-354a to §22a-354bb and the Regulations of Connecticut State Agencies §22a-354i-l through §22a-354i-10.

D. The Planning and Zoning Commission of the Town of Mansfield is established as the Aquifer Protection Agency (the "Agency") in accordance with the "Ordinance for the Establishment of an Aquifer Protection Agency", (the "APA Ordinance"), effective July 10, 2004, and shall implement the purposes and provisions of the APA Ordinance and the Act.

E. The Agency shall administer all provisions of the Act and shall approve or deny registrations, issues permits, issue permits with terms, conditions or modifications, or deny permits for all regulated activities in aquifer protection areas in the Town of Mansfield, pursuant to the Act.

Section 2

Definitions

A. As used in these regulations, the following definitions apply:

1. “Affected water company” means “affected water company” as defined in §22a-354h of the Connecticut General Statutes;
2. “Agency” means the board or commission authorized by the municipality under §22a-354o of the Connecticut General Statutes;
3. “Agriculture” means “agriculture” as defined in the §1-1(q) of the Connecticut General Statutes;
4. “Applicant” means, as appropriate in context, a person who applies for an exemption under §22a-354i-6

of the Regulations of Connecticut State Agencies, a permit under §22a-354i-8 of the Regulations of Connecticut State Agencies or a permit under Section 9 of the APA Regulations;

5. "Application" means, as appropriate in context, an application for an exemption under §22a-354i-6 of the Regulations of Connecticut State Agencies, an application for a permit under §22a-354i-8 of the Regulations of Connecticut State Agencies or an application for a permit under Section 9 of the APA Regulations;
6. "Aquifer protection area" means "aquifer protection area" as defined in §22a-354h of the Connecticut General Statutes and any extension of such area approved by the Commissioner pursuant to §22a-354i-4 of the Regulations of Connecticut State Agencies;
7. "Area of contribution" means "area of contribution" as defined in §22a-354h of the Connecticut General Statutes and as mapped in accordance with §22a-354b-1 of the Regulations of Connecticut State Agencies;
8. "Bulk storage facility" means property where oil or petroleum liquids are received by tank vessel, pipeline, railroad car or tank vehicle for the purpose of storage for wholesale distribution;
9. "Certified Hazardous Materials Manager" means a hazardous materials manager certified by the Institute of Hazardous Materials Management and who is qualified by reason of relevant specialized training and relevant specialized experience to conduct audits of regulated activities to ensure compliance with applicable laws and identify appropriate pollution prevention practices for such activities;
10. "Commissioner" means the commissioner of environmental protection, or his or her agent;
11. "Domestic sewage" means "domestic sewage" as defined in §22a-430-3(a) the Regulations of Connecticut State Agencies;
12. "Facility" means property where a regulated activity is conducted by any person, including without limitation any buildings located on the property that are owned or leased by that person; and includes contiguous land owned, leased, or for which there is an option to purchase by that person;
13. "Floor drain" means any opening in a floor or surface which opening or surface receives materials spilled or deposited thereon;
14. "Hazardous material" means (A) any hazardous substance as defined in 40 CFR 302.4 and listed therein at Table 302.4, excluding mixtures with a total concentration of less than 1% hazardous substances based on volume, (B) any hazardous waste as defined in §22a-449(c)-101 of the Regulations of Connecticut State Agencies, (C) any pesticide as defined in §22a-47 of the Connecticut General Statutes, or (D) any oil or petroleum as defined in §22a-448 of the Connecticut General Statutes;
15. "Hazardous waste" means "hazardous waste" as defined in §22a-449(c)-101 of the Regulations of Connecticut State Agencies;
16. "Industrial laundry" means a facility for washing clothes, cloth or other fabric used in industrial operations;
17. "Infiltration device" means any discharge device installed below or above the ground surface that is designed to discharge liquid to the ground;
18. "Inland wetland and watercourse areas map" means a map pursuant to §22a-42a of the Connecticut General Statutes;
19. "ISO 14001 environmental management system certification" means a current ISO 14001 environmental management system certification issued by an ISO 14001 environmental management system registrar that is accredited by the ANSI-ASQ National Accreditation Board;
20. "Level A mapping" means the lines as shown on Level A maps approved or prepared by the

Commissioner pursuant to §22a-354c, §22a-354d or §22a-354z of the Connecticut General Statutes encompassing the area of contribution and recharge areas;

21. "Lubricating oil" means oil that contains less than 1% chlorinated solvents and is used for the sole purpose of lubricating, cutting, grinding, machining, stamping or quenching metals;
22. "Municipality" means "municipality" as defined in §22a-354h of the Connecticut General Statutes;
23. "Owner" means the owner or lessee of the facility in question;
24. "De-icing chemical" means sodium chloride, calcium chloride, or calcium magnesium acetate;
25. "Person" means any individual, firm, partnership, association, syndicate, company, trust, corporation, limited liability company, municipality, agency, political or administrative subdivision of the state, or other legal entity of any kind;
26. "Pollution" means "pollution" as defined in §22a-423 of the Connecticut General Statutes;
27. "Pollution prevention" means the use of processes and materials so as to reduce or minimize the amount of hazardous materials used or the quantity and concentration of pollutants in waste generated;
28. "Professional engineer" means a professional engineer licensed in accordance with chapter 391 of the Connecticut General Statutes, and who is qualified by reason of relevant specialized training and relevant specialized experience to conduct audits of regulated activities to ensure compliance with applicable law and identify appropriate pollution prevention practices for such activities;
29. "Publicly Owned Treatment Works" means "publicly owned treatment works" as defined in §22a-430-3 of the Regulations of Connecticut State Agencies;
30. "Public service company" means "public service company" as defined in §16-1 of the Connecticut General Statutes;
31. "Public supply well" means "public supply well" as defined in §19-13-B51b of the Regulations of Connecticut State Agencies;
32. "Recharge area" means "recharge area" as defined in §22a-354h of the Connecticut General Statutes and as mapped in accordance with §22a-354b-1 of the Regulations of Connecticut State Agencies;
33. "Registered regulated activity" means a regulated activity which has been registered under §22a-354i-7 of the Regulations of Connecticut State Agencies or Section 8 of the APA Regulations, and is conducted at the facility identified in such registration;
34. "Registrant" means a person, who or which, has submitted a registration for an existing regulated activity under §22a-354i-7 of the Regulations of Connecticut State Agencies or Section 4 of the APA Regulations;
35. "Regulated activity" means any of the following activities, which are located or conducted, wholly or partially, in an aquifer protection area, except as provided for in §22a-354i-5(c) and §22a-354i-6 of the Regulations of Connecticut State Agencies, or Section 4 of the APA Regulations:
    a. underground storage or transmission of oil or petroleum, to the extent such activity is not pre-empted by federal law, or hazardous material, except for (i) an underground storage tank that contains number two (2) fuel oil and is located more than five hundred (500) feet from a public supply well subject to regulation under §22a-354c or §22a-354z of the Connecticut General Statutes, or (ii) underground electrical facilities such as transformers, breakers, or cables containing oil for cooling or insulation purposes which are owned and operated by a public service company,
    b. oil or petroleum dispensing for the purpose of retail, wholesale or fleet use,
    c. on-site storage of hazardous materials for the purpose of wholesale sale,

d. repair or maintenance of vehicles or internal combustion engines of vehicles, involving the use, storage or disposal of hazardous materials, including solvents, lubricants, paints, brake fluids, transmission fluids or the generation of hazardous wastes,

e. salvage operations of metal or vehicle parts,

f. discharges to ground water other than domestic sewage, except for discharges from the following that have received a permit from the Commissioner: (i) a pump and treat system for ground water remediation, (ii) a potable water treatment system, (iii) heat pump system, (iv) non-contact cooling water system, (v) storm water discharge system, or (vi) swimming pools,

g. car or truck washing, unless all waste waters from such activity are lawfully disposed of through a connection to a publicly owned treatment works,

h. production or refining of chemicals, including without limitation hazardous materials or asphalt,

i. clothes or cloth cleaning service which involves the use, storage or disposal of hazardous materials including without limitation dry-cleaning solvents,

j. industrial laundry activity that involves the cleaning of clothes or cloth contaminated by hazardous material, unless all waste waters from such activity are lawfully disposed of through a connection to a publicly owned treatment works,

k. generation of electrical power by means of fossil fuels, except for (i) generation of electrical power by an emergency engine as defined by §22a-174-22(a)(2) of the Regulations of Connecticut State Agencies, or (ii) generation of electrical power by means of natural gas or propane,

l. production of electronic boards, electrical components, or other electrical equipment involving the use, storage or disposal of any hazardous material or involving metal plating, degreasing of parts or equipment, or etching operations,

m. embalming or crematory services which involve the use, storage or disposal of hazardous material, unless all waste waters from such activity are lawfully disposed of through a connection to a publicly owned treatment works,

n. furniture stripping operations which involve the use, storage or disposal of hazardous materials,

o. furniture finishing operations which involve the use, storage or disposal of hazardous materials, unless all waste waters from such activity are lawfully disposed of through a connection to a publicly owned treatment works,

p. storage, treatment or disposal of hazardous waste subject to a permit under §22a-449(c)-100 to §22a-449(c)-110, inclusive, of the Regulations of Connecticut State Agencies,

q. biological or chemical testing, analysis or research which involves the use, storage or disposal of hazardous material, unless all waste waters from such activity are lawfully disposed of through a connection to a publicly owned treatment works, and provided that on-site testing of a public supply well by a public water utility is not a regulated activity,

r. pest control services which involve storage, mixing or loading of pesticides or other hazardous materials,

s. photographic finishing which involves the use, storage or disposal of hazardous materials, unless all waste water from such activity are lawfully disposed of through a connection to a publicly owned treatment works,

t. production or fabrication of metal products which involves the use, storage or disposal of hazardous materials including (i) metal cleaning or degreasing with industrial solvents, (ii) metal plating, or (iii) metal etching,

u. printing, plate making, lithography, photoengraving, or gravure, which involves the use, storage or disposal of hazardous materials,

v. accumulation or storage of waste oil, anti-freeze or spent lead-acid batteries which are subject to a general permit issued under §22a-208(i) and §22a-454(e)(1) of the Connecticut General Statutes,

w. production of rubber, resin cements, elastomers or plastic, which involves the use, storage or disposal of hazardous materials,

x. storage of de-icing chemicals, unless such storage takes place within a weather-tight water-proof structure for the purpose of retail sale or for the purpose of de-icing parking areas or access roads to parking areas,

y. accumulation, storage, handling, recycling, disposal, reduction, processing, burning, transfer or composting of solid waste which is subject to a permit issued by the Commissioner pursuant to §22a-207b, §22a-208a, and §22a-208c of the Connecticut General Statute, except for a potable water treatment sludge disposal area,

z. dying, coating or printing of textiles, or tanning or finishing of leather, which activity involves the use, storage or disposal of hazardous materials,

aa. production of wood veneer, plywood, reconstituted wood or pressure-treated wood, which involves the use, storage or disposal of hazardous material, and

bb. pulp production processes that involve bleaching;

36. "Release" means "release" as defined in §22a-133k-1 of the Regulations of Connecticut State Agencies;
37. "State aquifer protection regulations" means §22a-354i-l to §22a-354i-40, inclusive, of the Regulations of Connecticut State Agencies;
38. "Storage" means the holding or possession of any hazardous material;
39. "Storage tank" means a stationary device which is designed to store hazardous materials, and is constructed of non-earthen materials including without limitation concrete, steel, fiberglass or plastic;
40. "Topographic feature" means an object, whether natural or man-made, located on the earth surface and of sufficient size that it appears on a 1:24,000 scale topographic quadrangle map drawn by the United States Geological Survey;
41. "Underground" when referring to a storage tank or storage tank component means that ten percent or more of the volumetric capacity of such tank or component is below the surface of the ground and that portion which is below the surface of the ground is not fully visible for inspection;
42. Vehicle" or "vehicles" means a "vessel" as defined by §15-170 of the Connecticut General Statues, and any vehicle propelled or drawn by any non-muscular power, including without limitation an automobile, aircraft, all-terrain vehicle, tractor, lawn mower or snowmobile.
43. "Waters" means "waters" as defined in §22a-423 of the Connecticut General Statutes;
44. "Well field" means "well field" as defined in §22a-354h of the Connecticut General Statutes; and
45. "Zoning District Map" means any map showing zoning districts prepared in accordance with maps adopted pursuant to §8-3 of the Connecticut General Statutes.

Section 3

Delineation of Aquifer Protection Area Boundaries

A. The Planning and Zoning Commission shall delineate the aquifer protection areas on the Town of Mansfield zoning map. Such delineation shall consist of the combined areas of contribution and recharge areas as shown on Level A maps approved or prepared by the Commissioner.

1. Such boundaries shall be delineated within one hundred twenty (120) days after being notified by the Commissioner that an aquifer protection area is located partially or entirely within the Town of Mansfield.

2. Notice of such delineation shall be published in a newspaper having substantial circulation in the affected area. Such notice shall include at least the following:

   a. a map or detailed description of the subject aquifer protection area; and

   b. the name, telephone number, and address of a representative of the Agency who may be reached for further information.

B. In order to clarify the location of an aquifer protection area boundary, the Agency may apply to the Commissioner to extend such boundary to coincide with the nearest property line, municipal boundary or topographic feature pursuant to §22a-354i-4 of the Regulations of Connecticut State Agencies. Such extension shall, at a minimum, fully encompass the aquifer protection areas bounded by the approved level A mapping but shall not exceed the distance necessary to clarify the location of the aquifer protection area or to facilitate the administration of regulations pertaining thereto. An aquifer protection area boundary may not be extended without prior written approval of the Commissioner.

1. Any request by the Agency to the Commissioner for extension of an aquifer protection area boundary shall include at least the following:

   a. A map to scale delineating (i) the aquifer protection area boundary mapped under section 3(a) of the APA regulations and (ii) the proposed extension of the aquifer protection area boundary;

   b. A certification by the chairperson or duly authorized agent of the Agency that notice of such request has been provided to all owners of property within the proposed extended aquifer protection area and all affected water companies in accordance with the following:

      1) Such notice shall include at least the following:

         a) A map showing the aquifer protection area boundaries and the proposed extension of such boundaries,

         b) the name, address, and telephone number of a representative of the Agency who may be contacted for further information, and

         c) a statement that any person may, not later than thirty (30) days after said notification, submit to the Agency written comments on such proposed boundary extension;

      2) Such notice shall be effectuated by the following:

         a) Delivery of notice by certified mail to those individuals and entities identified in subsection (b)(1)(B) of this section, or

         b) the publication of a notice in a newspaper having substantial circulation in the affected area; and posting of notice near the proposed boundaries of the subject aquifer protection area of at least four signs each of which shall be at least four square feet in size (2′ x 2′); and

      3) a summary of comments received by such Agency regarding the proposed boundary extension and the Agency’s response.

2. Not later than sixty (60) days after receiving the Commissioner's written approval of a request to extend an aquifer protection area boundary, the Agency shall cause such boundary to be delineated in accordance with subsection (a) of this section.

C. No person may challenge the boundaries of the aquifer protection area under the APA Regulations unless such challenge is based solely on a failure by the Agency to properly delineate the boundaries in accordance with §22a-354n of the Connecticut General Statutes.

D. A map of the location and boundaries of the aquifer protection areas, or regulated areas, shall be available for inspection in the Office of the City/Town Clerk or the Agency.

E. If the Level A mapping is amended in accordance with §22a-354b-1(i) or §22a-354b-1(j) of the Regulations of Connecticut State Agencies, the Agency shall cause the amended aquifer protection area boundary to be delineated in accordance with subsections (a) or (b) of this section.

Section 4

Prohibited and Regulated Activities

A. All regulated activities are prohibited in aquifer protection areas, except as specified in subsection (b) of this section.

B. The following regulated activities are not prohibited in aquifer protection areas:

1. A registered regulated activity which is conducted in compliance with §22a-354i-9 of the Regulations of Connecticut State Agencies or section 12 of the APA Regulations; and
2. a regulated activity which has received a permit issued pursuant to §22a-354i-8 of the Regulations of Connecticut State Agencies or section 9 of the APA Regulations.

C. The following are not regulated activities:

1. Any activity conducted at a residence without compensation;
2. any activity involving the use or storage of no more than two and one-half (2.5) gallons of each type of hazardous material on-site at any one time, provided the total of all hazardous materials on-site does not exceed fifty-five (55) gallons at any one time;
3. any agricultural activity regulated pursuant to §22a-354m(d) of the Connecticut General Statutes;
4. any activity provided all the following conditions are satisfied:
    a. such activity takes place solely within an enclosed building in an area with an impermeable floor,
    b. such activity involves no more than 10% of the floor area in the building where the activity takes place,
    c. any hazardous material used in connection with such activity is stored in such building at all times,
    d. all waste waters generated by such activity are lawfully disposed through a connection to a publicly owned treatment works, and
    e. such activity does not involve (i) repair or maintenance of internal combustion engines, including without limitation, vehicles, or equipment associated with such vehicles, (ii) underground storage of any hazardous material, or (iii) above ground storage of more than one hundred and ten (110) gallons of hazardous materials;
5. any activity solely involving the use of lubricating oil provided all the following conditions are satisfied:
    a. such activity does not involve cleaning of metals with chlorinated solvents at the facility,
    b. such activity takes place solely within an enclosed building in an area with an impermeable floor,
    c. any hazardous material used in connection with such activity is stored in such building at all times, and
    d. such activity does not involve: (i) repair or maintenance of internal combustion engines, including without limitation, vehicles, or equipment associated with such vehicles, (ii) underground storage of any hazardous material, or (iii) above ground storage of more than one hundred ten (110) gallons of

such lubricating oil and associated hazardous waste; and

6. any activity involving the dispensing of oil or petroleum from an above-ground storage tank or tanks with an aggregate volume of two thousand (2000) gallons or less provided all the following conditions are satisfied:
   a. such dispensing activity takes place solely on a paved surface which is covered by a roof,
   b. the above-ground storage tank(s) is a double-walled tank with overfill alarms, and
   c. all associated piping is either above ground, or has secondary containment.

D. Determination of a non-regulated activity
   1. Any person proposing to carry out a non-regulated activity, as set forth in section 4(c) of these regulations, in an aquifer protection area shall, prior to commencement of such activity, notify the Agency or its duly authorized agent on a form provided by the Agency. Such form shall provide sufficient information to enable the Agency or its duly authorized agent to properly determine that the proposed activity is a regulated activity or a non-regulated activity within the aquifer protection area.
   2. If such activity is determined to be a non-regulated activity, then no further action under the APA Regulations is necessary.

Section 5

Activities Regulated by the State

A. The Commissioner shall exclusively regulate activities within aquifer protection areas that are specified in §22a-354p(g) of the Connecticut General Statutes. The Agency shall regulate all other regulated activities.

B. Any person conducting regulated activities that are within the authority of the Commissioner shall submit a registration or obtain a permit or exemption from the Commissioner prior to engaging in such activity. The Commissioner shall process applications for those regulated activities.

C. The Agency may submit an advisory decision to the Commissioner for consideration on any permit regulated under this section in accordance with the Connecticut General Statutes §22a-354p(g).

Section 6

Application for an Exemption from Prohibition or Regulation

A. The owner or operator of a regulated activity may seek an exemption from the Commissioner pursuant to §22a-354i-6 of the Regulations of Connecticut State Agencies. Any person seeking an exemption from the Commissioner shall concurrently submit a copy of the application for an exemption to the Agency and any affected water company.

B. The Agency may submit written comments to the Commissioner on any exemption regulated under this section in accordance with §22a-354i-6(c) of the Regulations of Connecticut State Agencies within sixty (60) days of the agency receipt of copy of the application.

Section 7

General Registration, Permit Application and Transfer Procedures

A. All applications for permits and registrations shall contain sufficient information for a fair and informed determination of the issues. The Agency may request additional information from the applicant for this purpose.

B. The day of receipt of a registration, permit application or transfer form shall be the day of the next regularly scheduled meeting of the Agency, immediately following the day of submission of the application to the Agency or its duly authorized agent, or thirty-five days after such submission, whichever is sooner.

C. At any time during the review period, the Agency may require the applicant or registrant to provide additional information about the regulated activity. Requests for additional information shall not stay the time limitations for registrations and permits as set forth in sections 8 and 9 of the APA Regulations.

D. All permit applications and registrations shall be open for public inspection.

E. Incomplete permit applications and registrations may be denied without prejudice.

F. No permit or registration issued under sections 8 or 9 of the APA Regulations shall be assigned or transferred except with written approval by the Agency.

G. The Agency shall notify the town clerk of any adjoining municipality of the pendency of any application, petition, appeal, request or plan concerning any project on any site in which: (1) any portion of the property affected by a decision of such agency is within five-hundred feet of the boundary of the adjoining municipality; (2) a significant portion of the traffic to the completed project on the site will use streets within the adjoining municipality to enter or exit the site; (3) a significant portion of the sewer or water drainage from the project on the site will flow through and significantly impact the drainage or sewerage system within the adjoining municipality; or (4) water runoff from the improved site will impact streets or other municipal or private property within the adjoining municipality. Such notice shall be made by certified mail, return receipt requested, and shall be mailed within seven days of the date of receipt of the application, petition, request or plan. Such adjoining municipality may, through a representative, appear and be heard at any hearing on any such application, petition, appeal, request or plan.

Section 8

Registration Requirements

A. Any person engaged in a regulated activity which substantially commenced, or was in active operation within the past five (5) years, or with respect to which a municipal building permit was issued, either (A) before the effective date of the state aquifer protection regulations, or (B) before the date an applicable aquifer protection area is designated on a municipal zoning district map or inland wetland and watercourse areas map, whichever occurs later, shall register the activity in accordance with this section unless such person has pending an application for an exemption pursuant to §22a-354i-6 of the Regulations of Connecticut State Agencies.

   1. The Commissioner shall process registrations for those regulated activities specified in §22a-354p(g) of the Connecticut General Statutes. The Agency shall process registrations for all other regulated activities.

   2. If the regulated activity is not specified in §22a-354p(g) of the Connecticut General Statutes, the person engaged in such activity shall submit a registration to the Agency not later than one hundred eighty (180) days after adoption of regulations pursuant to §22a-354p of the Connecticut General Statutes, or the designation the aquifer protection area pursuant to §22a-354i-2 of the Regulations of Connecticut State Agencies, whichever occurs later. Said person shall simultaneously file a copy of the registration with the Commissioner, Commissioner of Public Health and the affected water company.

B. All registrations shall be provided on a form prescribed by the Agency and shall be accompanied by the correct registration fee in accordance with section 18 of the APA Regulations. Such registration forms may be obtained from the Agency. Such registration forms shall include at least the following information in writing or on maps or drawings:

   1. The name, business telephone number, street address and mailing address of the:

      a. Registrant; if the registrant is a corporation or limited partnership, the full name of the facility and such corporation or limited partnership as registered with the Connecticut Secretary of State, and any officer or governing or managing body of any partnership, association, firm or corporation,

b. owner of such facility if different than the registrant, and

c. manager or operator overseeing the operations of such facility;

2. the location of such facility, using street address or other appropriate method of location, and a map showing the property boundaries of the facility on a 1:24,000 scale United States Geological Survey topographic quadrangle base;

3. an identification of the regulated activity or activities conducted at the facility, as described in 2(a)(35) of the APA Regulations, which regulated activity or activities shall consist of any regulated activity which substantially commenced, was in active operation, or with respect to which a municipal building permit was issued within the past five years; and

4. a certification by the registrant that the subject regulated activity is in compliance with the best management practices set forth in section 12(a) of the APA Regulations, as follows, signed after satisfying the statements set forth in the following certification:

> "I have personally examined and am familiar with the information submitted in this registration and all attachments, and I certify, based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement made in this document or certification may be punishable as a criminal offense under §53a-157b of the Connecticut General Statutes and any other applicable law."

C. When deemed necessary to protect a public supply well subject to regulation under §22a-354c or §22a-354z of the Connecticut General Statutes, the Agency may:

1. require, by written notice, any registrant to submit for review and written approval a storm water management plan prepared in accordance with section 12(b) of the APA Regulations. If so required, the storm water management plan shall be implemented by the registrant immediately upon its approval; or

2. require, by written notice, any registrant to submit for review and written approval the materials management plan prepared in accordance with section 12(a) of the APA Regulations. If so required, the materials management plan shall be implemented by the registrant immediately upon its approval.

D. If the Agency determines that a registration is incomplete, it shall reject the registration and notify the registrant of what additional information is required and the date by which it shall be submitted.

E. If the registration is determined to be complete, and the regulated activity is eligible for registration, the Agency shall send written notification of such registration to the registrant. Such registration shall be determined to be complete and eligible if the registrant has not otherwise received a notice of rejection from the Agency, not later than one hundred and eighty (180) days after the date the registration is received by the Agency.

F. The following general provisions shall be included in the issuance of all registrations:

1. The Agency has relied in whole or in part on information provided by the registrant and if such information subsequently proves to be false, deceptive, incomplete or inaccurate, the registration may be modified, suspended or revoked;

2. all registrations issued by the Agency are subject to and do not derogate any present or future rights or powers of the Commissioner, Agency, or municipality, and convey no rights in real estate or material nor any exclusive privileges, and are further subject to any and all public and private rights and to any federal, state, and municipal laws or regulations pertinent to the subject land or activity;

3. a complete registration shall expire five (5) years from the date of receipt of such registration by the

Agency;

4. the registrant shall apply to the Agency to renew the registration on a form prescribed by the Agency for a facility prior to expiration of such registration; and
5. If a registered regulated activity is out of business or inactive when registration renewal is required, a five (5) year allowance shall be in effect from the date the registration expires. If the registrant has not applied to renew the registration within five (5) years of the date the registration expires, the facility is no longer eligible for registration.

G. If a regulated activity which is eligible for registration in accordance with subsection (a) of this section fails to be registered or if the registrant of an active registered activity fails to apply for renewal prior to expiration, the Commissioner or municipal aquifer protection agency, as appropriate, may accept a late registration at their discretion, subject to the limitations in subsection (f)(5) of this section.

H. Any person wishing to assume the benefits under a registration for regulated activities shall apply to transfer such registration on a form prescribed by the Agency and submitted to the Agency.

Section 9

Permit Requirements

A. Any person may apply for a permit to add a regulated activity to a facility where a registered regulated activity occurs.

B. The Agency shall process permit applications for those registrants that have registered pursuant to section 8 of the APA Regulations. The Commissioner shall process permit applications for regulated activities specified in §22a-354p(g) of the Connecticut General Statutes and for those registrants that have registered pursuant to §22a-354i-7(b)(1) of the Regulations of Connecticut State Agencies.

C. Action shall be taken on permit applications within sixty-five (65) days after the completion of a public hearing or in the absence of a public hearing within sixty-five (65) days from the date of receipt of the application.

D. An application for a permit shall be made on a form prescribed by the Agency and shall be accompanied by the correct application fee in accordance with section 18 of the APA Regulations. Such permit application forms may be obtained from the Agency. Simultaneously with filing an application, the applicant shall send a copy of the application to the Commissioner, the Commissioner of Public Health and the affected water company. An application shall include the following information:

1. The information as required for a registration under section 8(b) of the APA Regulations shall be provided for the proposed regulated activity;
2. a confirmation and certification that the existing and proposed activity:
    a. remains and shall remain in compliance with section 12(a) of the APA Regulations,
    b. shall not increase the number of underground storage tanks used for storage of hazardous materials, and
    c. remains and shall remain in compliance with all local, state, and federal environmental laws;
3. a materials management plan in accordance with section 12(a) of the APA Regulations;
4. a storm water management plan in accordance with section 12(b) of the APA Regulations;
5. the following environmental compliance information with respect to environmental violations which occurred at the facility where the regulated activities are conducted, within the five years immediately preceding the date of the application:

a. any criminal conviction involving a violation of any environmental protection law,

b. any civil penalty imposed in any state or federal judicial proceeding, or any penalty exceeding five thousand dollars imposed in any administrative proceeding, and

c. any judicial or administrative orders issued regarding any such violation together with the dates, case or docket numbers, or other information which identifies the proceeding. For any such proceeding initiated by the state or federal government, the Agency may require submission of a copy of any official document associated with the proceeding, the final judgment or order;

6. any additional information deemed necessary by the Agency regarding potential threats to the ground water and proposed safeguards; and

7. the following certification signed by the applicant and the individual responsible for preparing the application, after satisfying the statements set forth in the certification:

"I have personally examined and am familiar with the information submitted in this document and all attachments, and I certify, based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement made in the submitted information is punishable as a criminal offense under §53a-157b of the Connecticut General Statutes and any other applicable law."

E. The Commissioner, any affected water company or the Commissioner of Public Health may, not later than thirty (30) days after receiving a copy of an application for a permit under this section, submit to the Agency written comments on such application. The Agency shall give due consideration to any such comments, and shall provide a copy of the decision to the Commissioner, the affected water company and the Commissioner of Public Health.

F. To carry out the purposes of the Act, the Agency may grant an application as filed, grant it upon such terms, conditions, limitations or modifications necessary, or deny it. The Agency shall state upon the record the reason for its decision.

G. The Agency may hold a public hearing on an application for a permit in accordance with section 10 of the APA regulations.

H. The Agency shall not issue a permit unless a complete application has been received and the applicant demonstrates to the Agency's satisfaction that all requirements of this section of the APA regulations have been satisfied and all of the following standards and criteria have been met:

1. the proposed regulated activity shall take place at a facility where a registered regulated activity occurs;

2. the proposed regulated activity shall not increase the number, or storage capacity of underground storage tanks used for hazardous materials except for the replacement of an existing underground storage tank in accordance with section 12(a)(3) of the APA Regulations;

3. the materials management plan and storm water management plan have been satisfactorily prepared in accordance with sections 12(a) and 12(b) of the APA Regulations;

4. the applicant has submitted a confirmation and certification that all regulated activities remain and shall remain in compliance with all local, state and federal environmental laws in accordance with subsection (d)(2) of this section;

5. the applicant's compliance record does not indicate (A) that any noncompliance resulted from indifference to or disregard for the legal requirements, (B) an unwillingness or inability to devote the resources necessary to comply and remain in compliance, or (C) that instances of noncompliance have led to serious environmental harm, harm to human health or safety, or a substantial risk of such harm;

6. the proposed regulated activity shall be conducted in accordance with section 12 of the APA

Regulations;

7. the existing regulated activity is being conducted in accordance with section 12 of the APA Regulations; and
8. the certification required under subsection (d)(7) of this section has been signed by the applicant and the individual responsible for preparing the application.

I. The Agency may impose reasonable conditions or limitations on any permit issued under this section to assure protection of the ground water, including, but not limited to the following:

1. best management practices in addition to those set forth in section 12 of the APA Regulations; and
2. ground water monitoring.

J. The following general provisions shall be included in the issuance of all permits:

1. the Agency has relied in whole or in part on information provided by the applicant and if such information subsequently proves to be false, deceptive, incomplete or inaccurate, the permit may be modified, suspended or revoked;
2. all permits issued by the Agency are subject to and do not derogate any present or future rights or powers of the Commissioner, Agency, or municipality, and convey no rights in real estate or material nor any exclusive privileges, and are further subject to any and all public and private rights and to any federal, state, and municipal laws or regulations pertinent to the subject land or activity;
3. the permit shall expire ten (10) years from the date of issuance of such permit by the Agency; and
4. a person shall apply to the Agency to renew the permit on a form prescribed by the Agency prior to expiration of such permit. Such renewal shall be granted upon request by the Agency unless a substantial change in the permitted activity is proposed, or enforcement action with regard to the regulated activity has been taken, in which case, a new permit application shall be submitted and reviewed in accordance with the provisions of this section.

K. The Agency shall notify the applicant or permittee within fifteen (15) days of the date of the decision by certified mail, return receipt requested, and the Agency shall cause notice of its order in issuance or denial of a permit to be published in a newspaper having a general circulation in the municipality in which the aquifer protection area is located.

L. A permittee may request a modification of a permit from the Agency. Such request shall be on a form prescribed by the Agency, and shall include the facts and reasons supporting the request. The Agency may require the permittee to submit a new application for a permit or renewal in lieu of a modification request.

M. A person wishing to assume the benefits under a permit for regulated activities shall apply to transfer such permit on a form prescribed by the Agency and submitted to the Agency.

Section 10

Public Hearings Regarding Permit Applications

A. If the Agency decides to hold a public hearing regarding an application for a permit to conduct a regulated activity within an aquifer protection area, such hearing shall commence no later than sixty-five (65) days after the receipt of such application.

B. Notice of the hearing shall be published at least twice at intervals of not less than two (2) days, the first not more than fifteen (15) days and not fewer than ten (10) days, and the last not less than two (2) days before the date set for the hearing in a newspaper having a general circulation in each city/town where the affected aquifer, or any part thereof, is located.

C. The Agency shall send to any affected water company, at least ten (10) days before the hearing, a copy of the notice by certified mail, return receipt requested. Any affected water company may, through a representative, appear and be heard at any such hearing.

D. All applications, maps and documents relating thereto shall be open for public inspection.

E. At such hearing any person or persons may appear and be heard.

F. The hearing shall be completed within thirty-five (35) days of its commencement.

G. The applicant may consent to an extension of the time frames in Subsections (a) or (f) of this Section, provided the total extension of all such periods, including any extensions provided in Section 9(c), totals sixty-five (65) days or less.

H. In reaching its decision on any application after a public hearing, the Agency shall base its decision on the record of that hearing. Documentary evidence or other material not in the hearing record shall not be considered by the Agency in its decision.

I. The applicant or permittee shall be notified of the Agency's decision in accordance with section 9(k) of the APA Regulations.

Section 11

Bond and Insurance Relevant to Permit Applicants

A. An applicant may be required to file a bond as a condition of the permit.

B. Any bond or surety shall be conditioned on compliance with all provisions of these regulations and the terms, conditions and limitations established in the permit.

Section 12

Best Management Practices

A. Every regulated activity shall be conducted in accordance with the following:

1. hazardous materials may be stored above ground within an aquifer protection area only in accordance with the following conditions:

   a. hazardous material shall be stored in a building or under a roof that minimizes storm water entry to the hazardous material storage area, except that a roof is not required for a bulk storage facility as defined in section 2 of the APA Regulations,

   b. floors within a building or under a roof where hazardous material may be stored shall be constructed or treated to protect the surface of the floor from deterioration due to spillage of any such material,

   c. a structure which may be used for storage or transfer of hazardous material shall be protected from storm water run-on, and ground water intrusion,

   d. hazardous material shall be stored within an impermeable containment area which is capable of containing at least the volume of the largest container of such hazardous material present in such area, or 10% of the total volume of all such containers in such area, whichever is larger, without overflow of released hazardous material from the containment area,

   e. hazardous material shall not be stored with other hazardous materials that are incompatible and may create a hazard of fire, explosion or generation of toxic substances,

   f. hazardous material shall be stored only in a container that has been certified to meet state or federal specifications for containers suitable for the transport or storage of such material,

g. hazardous material shall be stored only in an area that is secured against un-authorized entry by the public, and

h. the requirements of this subdivision are intended to supplement, and not to supersede, any other applicable requirements of federal, state, or local law, including applicable requirements of the Resource Conservation and Recovery Act of 1976;

2. no person shall increase the number of underground storage tanks used to store hazardous materials;

3. an underground storage tank used to store hazardous materials shall not be replaced with a larger tank unless (A) there is no more than a 25% increase in volume of the larger replacement tank, and (B) the larger replacement tank is a double-walled tank with co-axial piping, both meeting new installation component standards pursuant to §22a-449(d)-1(e) and §22a-449(d)-102 of the Regulations of Connecticut State Agencies, and with interstitial monitoring;

4. no person shall use, maintain or install floor drains, dry wells or other infiltration devices or appurtenances which allow the release of waste waters to the ground, unless such release is permitted by the Commissioner in accordance with §22a-430 or §22a-430b of the Connecticut General Statutes; and

5. a materials management plan shall be developed and implemented in accordance with the following:

   a. a materials management plan shall contain, at a minimum, the following information with respect to the subject regulated activity:

      1) a pollution prevention assessment consisting of a detailed evaluation of alternatives to the use of hazardous materials or processes and practices that would reduce or eliminate the use of hazardous materials, and implementation of such alternatives where possible and feasible,

      2) §22a a description of any operations or practices which may pose a threat of pollution to the aquifer, which shall include the following:

         a) a process flow diagram identifying where hazardous materials are stored, disposed and used, and where hazardous wastes are generated and subsequently stored and disposed,

         b) an inventory of all hazardous materials which are likely to be or will be manufactured, produced, stored, utilized or otherwise handled, and

         c) a description of waste, including waste waters generated, and a description of how such wastes are handled, stored and disposed,

      3) the name, street address, mailing address, title and telephone number of the individual(s) responsible for implementing the materials management plan and the individual(s) who should be contacted in an emergency,

      4) a record-keeping system to account for the types, quantities, and disposition of hazardous materials which are manufactured, produced, utilized, stored, or otherwise handled or which are discharged or emitted; such record-keeping system shall be maintained at the subject facility and shall be made available thereat for inspection during normal business hours by the Commissioner and the municipal aquifer protection agency, and

      5) an emergency response plan for responding to a release of hazardous materials. Such plan shall describe how each such release could result in pollution to the underlying aquifer and shall set forth the methods used or to be used to prevent and abate any such a release;

(B) when a materials management plan is required under either section 8(c) or 9(d) of the APA Regulations, such materials management plan shall be completed and certified by a professional engineer or a certified hazardous materials manager, or, if the facility where the regulated activity is conducted has received and maintained an ISO 14001 environmental management system certification, then the registrant may complete and certify the materials management plan; and

(C) the materials management plan shall be maintained at the subject facility and shall be made available thereat for inspection during normal business hours by the Commissioner and the municipal aquifer protection agency.

B. The development and implementation of a storm water management plan required for regulated activities in accordance with sections 8(c) and 9(d) of the APA Regulations, shall be as follows: A storm water management plan shall assure that storm water run-off generated by the subject regulated activity is (i) managed in a manner so as to prevent pollution of ground water, and (ii) shall comply with all of the requirements for the General Permit of the Discharge of Storm Water associated with a Commercial Activity issued pursuant to §22a-430b of the Connecticut General Statutes.

Section 13

Other State, Federal and Local Laws

A. Nothing in these regulations shall obviate the requirement for the applicant to obtain any other assents, permits or licenses required by law or regulation by the Town of Mansfield, State of Connecticut and the Government of the United States including any approval required by the Connecticut Department of Environmental Protection and the U.S. Army Corps of Engineers and the United States Environmental Protection Agency. Obtaining such assents, permits or licenses are the sole responsibility of the applicant.

B. No person shall conduct any regulated activity within an aquifer protection area which requires zoning or subdivision approval without first having obtained a valid certificate of zoning or subdivision approval, special permit, special exception or variance, or other documentation establishing that the proposal complies with the Town of Mansfield zoning or subdivision regulations.

Section 14

Enforcement

A. The Agency may appoint a duly authorized agent to act in its behalf with the authority to issue notices of violation or cease and desist orders.

B. If the Agency or its duly authorized agent finds that any person is conducting or maintaining any activity, facility or condition which violates any provision of these regulations, the Agency or its duly authorized agent may:

1. Issue a notice of violation.

    a. The notice of violation shall state the nature of the violation, the jurisdiction of the Agency, and the necessary action required to correct the violation including without limitation halting the activity in the aquifer protection area.

    b. The Agency may request that the person appear at the next regularly scheduled meeting of the Agency to discuss the unauthorized activity, and/or provide a written reply to the notice or file an application for the necessary permit or registration. Failure to carry out the action(s) directed in a notice of violation may result in issuance of an order under subsection (2) of this section or other enforcement proceedings as provided by law.

2. Issue a written order.

    a. Such order shall be issued by certified mail, return receipt requested to such person conducting such activity or maintaining such facility or condition to cease such activity immediately or to correct such facility or condition. The Agency shall send a copy of such order to any affected water company by certified mail, return receipt requested.

    b. Within ten (10) days of the issuance of such order the Agency shall hold a hearing to provide the person an opportunity to be heard and show cause why the order should not remain in effect. Any affected water company may testify at the hearing. The Agency shall consider the facts presented at the hearing and, within ten (10) days of the completion of the hearing, notify the person by certified mail, return receipt requested, that the original order remains in effect, that a revised order is in effect, or that the order has been withdrawn.

3. Suspend or revoke registration or permit.
   a. The Agency may suspend or revoke a registration or a permit if it finds, after a hearing, that the registrant or permittee has not complied with the terms, conditions or limitations set forth in the registration or the permit. Prior to revoking or suspending any registration or permit, the Agency shall issue notice to the registrant or the permittee, personally or by certified mail, return receipt requested, setting forth the facts or conduct that warrants the intended action.
   b. The Agency shall hold a hearing to provide the registrant or permittee an opportunity to show that it is in compliance with its registration or permit. The Agency shall notify the registrant or permittee of its decision by certified mail within fifteen (15) days of the date of its decision. The Agency shall publish notice of a suspension or revocation in a newspaper having general circulation in the Town of Mansfield.

C. An order issued pursuant to subsection (b)(2) shall be effective upon issuance, shall remain in effect until the Agency affirms, revises, or withdraws the order, and shall not delay or bar an action pursuant to subsection (b)(3) of this section.

D. A court may assess criminal and or civil penalties to any person who commits, takes part in, or assists in any violation of any provision of the APA regulations in accordance with §22a-354s(b) and §22a-354s(c) of the Connecticut General Statutes.

Section 15

Amendments

A. These regulations may be amended, changed or repealed in accordance with §22a-354p(b) of the Connecticut General Statutes.

B. If a complete application is filed with the Agency which is in conformance with the APA regulations as of the date of its filing, the permit issued shall not be required to comply with any changes in regulations taking effect on or after the date that the filing date. The provisions of this section shall not apply to the establishment, amendment, or change of the boundaries of the aquifer protection area or to any changes in the APA Regulations necessary to make the regulations consistent with chapter 446i of the Connecticut General Statutes as of the date of the Agency's decision.

Section 16

Appeals

A. Appeal of the Agency's regulation, order, decision or action shall be made in accordance with §22a-354q of the Connecticut General Statutes.

Section 17

Conflict and Severance

A. If there is a conflict between the provisions of the APA Regulations, the provision that imposes the most stringent standards shall govern. The invalidity of any word, clause, sentence, section, part, subsection, subdivision or provision of these regulations shall not affect the validity of any other part that can be given effect without such valid part or parts.

B. If there is a conflict between the provisions of the APA Regulations and the Act, the provisions of the Act shall govern.

Section 18

Registration and Permit Application Fees

A. All fees required by these regulations shall be submitted to the Agency by certified check or money order payable to the Town of Mansfield at the time the registration or permit application is filed with the Agency.

B. No registration or permit application shall be granted or approved by the Agency unless the correct registration/application fee is paid in full or unless a waiver has been granted by the Agency pursuant to subsection (f) of this section.

C. The registration or permit application fee is nonrefundable.

D. Registration or permit application fees shall be based on the following schedule:

Fee Schedule			
	Facility Size		
	Small (< 1 acre)	Medium (1-5 acres)	Large (> 5 acres)
Registrations:			
Industrial	$250	$400	$600
Commercial	$250	$400	$600
Other	$250	$400	$600
Permits:			
Industrial	$500	$750	$1,000
Commercial	$500	$750	$1,000
Other	$500	$750	$1,000
Materials Management Plan Reviews	$150	$150	$150
Storm water Management Plan Reviews	$150	$150	$150
Public Hearing	$200	$200	$200
Facility Inspection/Monitoring	$150	$150	$150
Regulation Petition	$250	$250	$250

E. Boards, commissions, councils and departments of the Town of Mansfield are exempt from all fee requirements.

F. The registrant or applicant may petition the Agency to waive, reduce or allow delayed payment of the fee. Such petitions shall be in writing and shall state fully the facts and circumstances the Agency should consider in its determination under this section. The Agency may waive all or part of the application fee if the Agency determines that:

1. the activity applied for would clearly result in a substantial public benefit to the environment or to the public health and safety and the registrant or applicant would reasonably be deterred from initiating the activity solely or primarily as a result of the amount of the registration or permit application fee; or

2. the amount of the registration or permit application fee is clearly excessive in relation to the cost to the

City/Town for reviewing and processing the application.

G. Extra Assessments

In the event that additional expenses, including but not limited to outside consultants, experts, or legal advisors are incurred in processing the registration or permit application the applicant/ registrant may be assessed an additional fee not to exceed $2,000 to cover said costs. Said fees are to be estimated by the duly authorized agent and submitted with the application fee and held until the application is completely processed after which time any residual funds pertaining to this assessment are to be returned to the applicant/registrant.

For the purpose of this assessment, an “outside consultant” means a professional who is not an employee of the Town of Mansfield including but not limited to engineering, environmental, hydrogeology and hazardous materials management professionals.

The Agency shall state upon its record the basis for all actions under this section.

Section 19

Effective Date of Regulations

The APA Regulations, APA boundaries and amendments thereto, shall become effective upon (1) the Commissioner’s determination that such regulations are reasonably related to the purpose of ground water protection and not inconsistent with the Regulations of Connecticut State Agencies §22a-354i-1 through §22a-354i-10 and (2) filing in the Office of the Town Clerk.

Effective Date: February 15, 2006

Town of Willington

Inland Wetlands and Watercourses Agency

Aquifer Protection Regulations

for the protection of CT State delineated Aquifers

adopted 6-22-09
effective 7-1-09

Town of Willington
Aquifer Protection Regulations

Effective Date:

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Model Municipal Regulations
Aquifer Protection Areas

SECTION 1. Title and Authority

(a) Aquifers are an essential natural resource and a major source of public drinking water for the State of Connecticut. Use of groundwater will increase as the population grows and opportunities for new surface water supplies diminish due to the rising cost of land and increasingly intense development. At the same time, numerous drinking water wells have been contaminated by certain land use activities, and others are now threatened. To address this problem, Connecticut has established the Aquifer Protection Area Program (Connecticut General Statutes §22a-354a to §22a-354bb) to identify critical water supply aquifers and to protect them from pollution by managing land use. Protection requires coordinated responsibilities shared by the state, municipality and water companies to ensure a plentiful supply of public drinking water for present and future generations. It is therefore the purpose of these regulations to protect aquifer protection areas within the Town of Willington by making provisions for:

(1) implementing regulations consistent with state regulations and An Act Concerning Aquifer Protection Areas, Connecticut General Statutes §22a-354a to §22a-354bb ("the Act");

(2) delineating aquifer protection areas on the city/town zoning or inland wetland and watercourse areas maps;

(3) regulating land use activity within the aquifer protection area including: prohibiting certain new activities; registering existing regulated activities; and issuing permits for new regulated activities at registered facilities; and

(4) administering and enforcing these regulations.

(b) These regulations shall be known as the Aquifer Protection Area Regulations (the "APA Regulations") of the Town of Willington

(c) These regulations were adopted and may be amended, from time to time, in accordance with the provisions of §22a-354p of An Act Concerning Aquifer Protection Areas, the Connecticut General Statutes §22a-354a to §22a-354bb and the Regulations of Connecticut State Agencies §22a-354i-1 through §22a-354i-10.

(d) The Inland Wetlands Commission of the /Town of Willington is established as the Aquifer Protection Agency (the "Agency") in accordance with the "Ordinance for the Establishment of an Aquifer Protection Agency," (the "APA Ordinance") effective May, 5 2004, and shall implement the purposes and provisions of the APA Ordinance and the Act.

(e) The Agency shall administer all provisions of the Act and shall approve or deny registrations, issue permits, issue permits with terms, conditions, limitations or modifications, or deny permits for all regulated activities in aquifer protection areas in the Town of Willington pursuant to the Act.

SECTION 2. Definitions

(a) As used in these regulations, the following definitions apply:

(1) "Affected water company" means "affected water company" as defined in §22a-354h of the Connecticut General Statutes. Presently, § 22a-354h defines "affected water company" as "any public or private water company owning or operating a public water supply well within an aquifer protection area";

(2) "Agency" means the board or commission authorized by the municipality under §22a-354o of the Connecticut General Statutes (*i.e.* the Willington Inland Wetlands and Watercourses Commission);

(3) "Agriculture" means "agriculture" as defined in the §1-1(q) of the Connecticut General Statutes. Presently, § 1-1(q) defines "agriculture" as including "cultivation of the soil, dairying, forestry, raising or harvesting any agricultural or horticultural commodity, including the raising, shearing, feeding, caring for, training and management of livestock, including horses, bees, poultry, fur-bearing animals and wildlife, and the raising or harvesting of oysters, clams, mussels, other molluscan shellfish or fish; the operation, management, conservation, improvement or maintenance of a farm and its buildings, tools and equipment, or salvaging timber or cleared land of brush or other debris left by a storm, as an incident to such farming operations; the production or harvesting of maple syrup or maple sugar, or any agricultural commodity, including lumber, as an incident to ordinary farming operations or the harvesting of mushrooms, the hatching of poultry, or the construction, operation or maintenance of ditches, canals, reservoirs or waterways used exclusively for farming purposes; handling, planting, drying, packing, packaging, processing, freezing, grading, storing or delivering to storage or to market, or to a carrier for transportation to market, or for direct sale, any agricultural or horticultural commodity as an incident to ordinary farming operations, or, in the case of fruits and vegetables, as an incident to the preparation of such fruits or vegetables for market or for direct sale;

(4) "Applicant" means, as appropriate in context, a person who applies for an exemption under §22a-354i-6 of the Regulations of Connecticut State Agencies, a permit under §22a-354i-8 of the Regulations of Connecticut State Agencies or a permit under Section 9 of the APA Regulations;

(5) "Application" means, as appropriate in context, an application for an exemption under §22a-354i-6 of the Regulations of Connecticut State Agencies, an application for a permit under §22a-354i-8 of the Regulations of Connecticut State Agencies or an application for a permit under Section 9 of the APA Regulations;

(6) "Aquifer protection area" means "aquifer protection area" as defined in §22a-354h of the Connecticut General Statutes and any extension of such area approved by the Commissioner pursuant to §22a-354i-4 of the Regulations of Connecticut State Agencies. Presently, § 22a-354h defines "aquifer protection area" means "any area consisting of well fields, areas of contribution and recharge areas, identified on maps approved by the commissioner of environmental protection pursuant to sections 22a-354b to 22a-354d, inclusive, within which land uses or activities shall be required to comply with regulations adopted pursuant to sections 22a-354o by the municipality where the aquifer protection area is located";

(7) "Area of contribution" means "area of contribution" as defined in §22a-354h of the Connecticut General Statutes and as mapped in accordance with §22a-354b-1 of the Regulations of Connecticut State Agencies. Presently § 22a-354h defines "area of contribution" as "the area where the water table or other potentiometric surface is lowered due to the pumping of a well and groundwater flows directly to the well";

(8) "Bulk storage facility" means property where oil or petroleum liquids are received by tank vessel, pipeline, railroad car or tank vehicle for the purpose of storage for wholesale distribution;

(9) "Certified Hazardous Materials Manager" means a hazardous materials manager certified by the Institute of Hazardous Materials Management and who is qualified by reason of relevant specialized training and relevant specialized experience to conduct audits of regulated activities to ensure compliance with applicable laws and identify appropriate pollution prevention practices for such activities;

(10) "Commissioner" means the commissioner of environmental protection, or his or her agent;

(11) "Domestic sewage" means "domestic sewage" as defined in §22a-430-3(a) the Regulations of Connecticut State Agencies. Presently, § 22a-430-3(a) defines "domestic sewage" as "sewage that consists of water and human excretions or other waterborne wastes incidental to the occupancy of residential buildings or non-residential buildings but not including manufacturing process water, cooling water, wastewater from water softening equipment, commercial laundry wastewater, blowdown from heating or cooling equipment, water from cellar or floor drains or surface water from roofs, paved surfaces or yard drains";

(12) "Facility" means property where a regulated activity is conducted by any person, including without limitation any buildings located on the property that are owned or leased by that person; and includes contiguous land owned, leased, or for which there is an option to purchase by that person;

(13) "Floor drain" means any opening in a floor or surface which opening or surface receives materials spilled or deposited thereon;

(14) "Hazardous material" means (A) any hazardous substance as defined in 40 CFR 302.4 and listed therein at Table 302.4, excluding mixtures with a total concentration of less

than 1% hazardous substances based on volume, (B) any hazardous waste as defined in §22a-449(c)-101 of the Regulations of Connecticut State Agencies, (C) any pesticide as defined in §22a-47 of the Connecticut General Statutes, or (D) any oil or petroleum as defined in §22a-448 of the Connecticut General Statutes;

(15) "Hazardous waste" means "hazardous waste" as defined in §22a-449(c)-101 of the Regulations of Connecticut State Agencies. Presently Section 22a-449(c)-101 of the Regulations of Connecticut State Agencies defines hazardous wastes as follows: Hazardous waste means a solid, liquid or gaseous waste that meets one of the following conditions: (1) Is listed in Subpart D of 40 CFR 261; (2) Exhibits a characteristic defined in Subpart C of 40 CFR part 261 that include ignitability, corrosivity, reactivity and toxicity; (3) Is a mixture containing a listed hazardous waste and a non-hazardous solid waste; (4) Is derived from storage, treatment or disposal of a hazardous waste (For example: leachate is derived from disposal); (5) Is not excluded from regulation as a hazardous waste (Exclusions are limited and include very specific wastes treated in specific ways. For example: wastewater treatment plant sludges generated from electroplating operations and stored in on-site land fill);

(16) "Industrial laundry" means a facility for washing clothes, cloth or other fabric used in industrial operations;

(17) "Infiltration device" means any discharge device installed below or above the ground surface that is designed to discharge liquid to the ground;

(18) "Inland wetland and watercourse areas map" means a map pursuant to §22a-42a of the Connecticut General Statutes;

(19) "ISO 14001 environmental management system certification" means a current ISO 14001 environmental management system certification issued by an ISO 14001 environmental management system registrar that is accredited by the American National Standards Institute (ANSI) - American Society for Quality (ASQ) National Accreditation Board (ANAB);

(20) "Level A mapping" means the lines as shown on Level A maps approved or prepared by the Commissioner pursuant to §22a-354c, §22a-354d or §22a-354z of the Connecticut General Statutes encompassing the area of contribution and recharge areas;

(21) "Lubricating oil" means oil that contains less than 1% chlorinated solvents and is used for the sole purpose of lubricating, cutting, grinding, machining, stamping or quenching metals;

(22) "Municipality" means "municipality" as defined in §22a-354h of the Connecticut General Statutes. Presently § 22a-354h defines “municipality” as “any town, consolidated town and city, consolidated town and borough, city or borough”;

(23) "Owner" means the owner or lessee of the facility in question;

(24) "De-icing chemical" means sodium chloride, calcium chloride, or calcium magnesium acetate;

(25) "Person" means any individual, firm, partnership, association, syndicate, company, trust, corporation, limited liability company, municipality, agency, political or administrative subdivision of the state, or other legal entity of any kind;

(26) "Pollution" means “pollution” as defined in §22a-423 of the Connecticut General Statutes. Presently, § 22a-423 defines “pollution” as “harmful thermal effect or the contamination or rendering unclean or impure of any waters of the state by reason of any waste or other materials discharged or deposited therein by any public or private sewer or otherwise so directly or indirectly to come in contact with any waters. This includes, but is not limited to, erosion and sedimentation resulting from any filling, land clearing or excavation activity”;

(27) “Pollution prevention” means the use of processes and materials so as to reduce or minimize the amount of hazardous materials used or the quantity and concentration of pollutants in waste generated;

(28) "Professional engineer" means a professional engineer licensed in accordance with Chapter 391 of the Connecticut General Statutes, and who is qualified by reason of relevant specialized training and relevant specialized experience to conduct audits of regulated activities to ensure compliance with applicable law and identify appropriate pollution prevention practices for such activities;

(29) "Publicly Owned Treatment Works” means “publicly owned treatment works” as defined in §22a-430-3 of the Regulations of Connecticut State Agencies. Presently, § 22a-430-3 defines “publically owned treatment works” as “a system used for the collection, treatment, and/or disposal of sewage from more than one lot as defined in section 22a-430-1 of the Regulations of the Connecticut State Agencies and which discharges to the waters of the state and which is owned by a municipality or the state”;

(30) "Public service company" means "public service company" as defined in §16-1 of the Connecticut General Statutes. Presently, § 16-1 defines “public service company” as including “electric, electric distribution, gas, telephone, telegraph, pipeline, sewage, water and community antenna television companies, owning, leasing, maintaining, operating, managing or controlling plants or parts of plants or equipment, and all express companies having special privileges on railroads within this state, but shall not include telegraph company functions concerning intrastate money order service, towns, cities, boroughs, any municipal corporation or department thereof, whether separately incorporated or not, a private power producer, as defined in section 16-243b, or an exempt wholesale generator, as defined in 15 USC 79z-5a”;

(31) “Public supply well" means “public supply well” as defined in §19-13-B51b of the Regulations of Connecticut State Agencies. Presently, § 19-13-B51b defines “public supply well” as “a water supply well used or made available by a water company to

two or more consumers, as defined in section 25-32a of the 1969 supplement to the general statutes";

(32) "Recharge area" means "recharge area" as defined in §22a-354h of the Connecticut General Statutes and as mapped in accordance with §22a-354b-1 of the Regulations of Connecticut State Agencies. Presently, § 22a-354h defines "recharge area" as the area from which groundwater flows directly to the area of contribution";

(33) "Registered regulated activity" means a regulated activity which has been registered under §22a-354i-7 of the Regulations of Connecticut State Agencies or Section 8 of the APA Regulations, and is conducted at the facility identified in such registration;

(34) "Registrant" means a person, who or which, has submitted a registration for an existing regulated activity under §22a-354i-7 of the Regulations of Connecticut State Agencies or Section 4 of these Regulations;

(35) "Regulated activity" means any of the following activities, which are located or conducted, wholly or partially, in an aquifer protection area, except as provided for in §22a-354i-5(c) and §22a-354i-6 of the Regulations of Connecticut State Agencies, or Section 4 of the APA Regulations:

(A) underground storage or transmission of oil or petroleum, to the extent such activity is not pre-empted by federal law, or hazardous material, except for (i) an underground storage tank that contains number two (2) fuel oil and is located more than five hundred (500) feet from a public supply well subject to regulation under §22a-354c or §22a-354z of the Connecticut General Statutes, or (ii) underground electrical facilities such as transformers, breakers, or cables containing oil for cooling or insulation purposes which are owned and operated by a public service company,

(B) oil or petroleum dispensing for the purpose of retail, wholesale or fleet use,

(C) on-site storage of hazardous materials for the purpose of wholesale sale,

(D) repair or maintenance of vehicles or internal combustion engines of vehicles, involving the use, storage or disposal of hazardous materials, including solvents, lubricants, paints, brake fluids, transmission fluids or the generation of hazardous wastes,

(E) salvage operations of metal or vehicle parts,

(F) wastewater discharges to ground water other than domestic sewage and stormwater, except for discharges from the following that have received a permit from the Commissioner pursuant to §22a-430 of the Connecticut General Statutes: (i) a pump and treat system for ground water remediation, (ii) a potable water treatment system, (iii) heat pump system, (iv) non-contact cooling water system, (v) swimming pools,

(G) car or truck washing, unless all waste waters from such activity are lawfully disposed of through a connection to a publicly owned treatment works,

(H) production or refining of chemicals, including without limitation hazardous materials or asphalt,

(I) clothes or cloth cleaning service which involves the use, storage or disposal of hazardous materials including without limitation dry-cleaning solvents,

(J) industrial laundry activity that involves the cleaning of clothes or cloth contaminated by hazardous material, unless all waste waters from such activity are lawfully disposed of through a connection to a publicly owned treatment works,

(K) generation of electrical power by means of fossil fuels, except for (i) generation of electrical power by an emergency engine as defined by §22a-174-22(a)(2) of the Regulations of Connecticut State Agencies, or (ii) generation of electrical power by means of natural gas or propane,

(L) production of electronic boards, electrical components, or other electrical equipment involving the use, storage or disposal of any hazardous material or involving metal plating, degreasing of parts or equipment, or etching operations,

(M) embalming or crematory services which involve the use, storage or disposal of hazardous material, unless all waste waters from such activity are lawfully disposed of through a connection to a publicly owned treatment works,

(N) furniture stripping operations which involve the use, storage or disposal of hazardous materials,

(O) furniture finishing operations which involve the use, storage or disposal of hazardous materials, unless all waste waters from such activity are lawfully disposed of through a connection to a publicly owned treatment works,

(P) storage, treatment or disposal of hazardous waste subject to a permit under §22a-449(c)-100 to §22a-449(c)-110, inclusive, of the Regulations of Connecticut State Agencies,

(Q) biological or chemical testing, analysis or research which involves the use, storage or disposal of hazardous material, unless all waste waters from such activity are lawfully disposed of through a connection to a publicly owned treatment works, and provided that on-site testing of a public supply well by a public water utility is not a regulated activity,

(R) pest control services which involve storage, mixing or loading of pesticides or other hazardous materials,

(S) photographic finishing which involves the use, storage or disposal of hazardous materials, unless all waste water from such activity are lawfully disposed of through a connection to a publicly owned treatment works,

(T) production or fabrication of metal products which involves the use, storage or disposal of hazardous materials including (i) metal cleaning or degreasing with industrial solvents, (ii) metal plating, or (iii) metal etching,

(U) printing, plate making, lithography, photoengraving, or gravure, which involves the use, storage or disposal of hazardous materials,

(V) accumulation or storage of waste oil, anti-freeze or spent lead-acid batteries which are subject to a general permit issued by the Commissioner under §22a-208(i) and §22a-454(e)(1) of the Connecticut General Statutes,

(W) production of rubber, resin cements, elastomers or plastic, which involves the use, storage or disposal of hazardous materials,

(X) storage of de-icing chemicals, unless such storage takes place within a weather-tight water-proof structure for the purpose of retail sale or for the purpose of de-icing parking areas or access roads to parking areas,

(Y) accumulation, storage, handling, recycling, disposal, reduction, processing, burning, transfer or composting of solid waste which is subject to a permit issued by the Commissioner pursuant to §22a-207b, §22a-208a, and §22a-208c of the Connecticut General Statute, except for a potable water treatment sludge disposal area,

(Z) dying, coating or printing of textiles, or tanning or finishing of leather, which activity involves the use, storage or disposal of hazardous materials,

(AA) production of wood veneer, plywood, reconstituted wood or pressure-treated wood, which involves the use, storage or disposal of hazardous material, and

(BB) pulp production processes that involve bleaching;

(36) "Release" means "release" as defined in §22a-133k-1 of the Regulations of Connecticut State Agencies. Presently, § 22a-133k-1(a)(50) defines “release” as “any discharge, spillage, uncontrolled loss, seepage, filtration, leakage, injection, escape, dumping, pumping, pouring, emitting, emptying, or disposal of a substance”;

(37) "State aquifer protection regulations" means §22a-354i-1 to §22a-354i-10, inclusive, of the Regulations of Connecticut State Agencies;

(38) "Storage" means the holding or possession of any hazardous material;

(39) "Storage tank" means a stationary device which is designed to store hazardous materials, and is constructed of non-earthen materials including without limitation

concrete, steel, fiberglass or plastic;

(40) "Topographic feature" means an object, whether natural or man-made, located on the earth surface and of sufficient size that it appears on a 1:24,000 scale topographic quadrangle map drawn by the United States Geological Survey;

(41) "Underground" when referring to a storage tank or storage tank component means that ten percent or more of the volumetric capacity of such tank or component is below the surface of the ground and that portion which is below the surface of the ground is not fully visible for inspection;

(42) “Vehicle” or "vehicles" means a “vessel” as defined by §15-170 of the Connecticut General Statutes, and any vehicle propelled or drawn by any non-muscular power, including without limitation an automobile, aircraft, all-terrain vehicle, tractor, lawn mower or snowmobile. Presently, §15-170 defines "vessel" as “every description of watercraft, other than a seaplane on water, used or capable of being used as a means of transportation on water”;

(43) "Waters” means “waters” as defined in §22a-423 of the Connecticut General Statutes. Presently, § 22a-423 defines "waters" as “all tidal waters, harbors, estuaries, rivers, brooks, watercourses, waterways, wells, springs, lakes, ponds, marshes, drainage systems and all other surface or underground streams, bodies or accumulations of water, natural or artificial, public or private, which are contained within, flow through or border upon this state or any portion thereof.”;

(44) "Well field" means “well field” as defined in §22a-354h of the Connecticut General Statutes. Presently, § 22a-354h defines “well field” as “the immediate area surrounding a public drinking water supply well or group of wells”; and

(45) "Zoning district map" means any map showing zoning districts prepared in accordance with maps adopted pursuant to §8-3 of the Connecticut General Statutes.

SECTION 3. Delineation of Aquifer Protection Area Boundaries

(a) The Willingon Planning and Zoning Commission shall delineate the aquifer protection areas on the Town of Willington zoning district map. Such delineation shall consist of the combined areas of contribution and recharge areas as shown on Level A maps approved or prepared by the Commissioner.

(1) Such boundaries shall be delineated within one hundred twenty (120) days after being notified by the Commissioner that an aquifer protection area is located partially or entirely within the Town of Willington.

(2) Notice of such delineation shall be published in a newspaper having substantial circulation in the affected area. Such notice shall include at least the following:

(A) a map or detailed description of the subject aquifer protection area; and

(B) the name, telephone number, and address of a representative of the Agency who may be reached for further information.

(b) In order to clarify the location of an aquifer protection area boundary, the Agency may apply to the Commissioner to extend such boundary to coincide with the nearest property line, municipal boundary or topographic feature pursuant to §22a-354i-4 of the Regulations of Connecticut State Agencies. Such extension shall, at a minimum, fully encompass the aquifer protection areas bounded by the approved level A mapping but shall not exceed the distance necessary to clarify the location of the aquifer protection area or to facilitate the administration of regulations pertaining thereto. An aquifer protection area boundary may not be extended without prior written approval of the Commissioner.

(1) Any request by the Agency to the Commissioner for extension of an aquifer protection area boundary shall include at least the following:

(A) A map to scale delineating (i) the aquifer protection area boundary mapped under Section 3(a) of these Regulations and (ii) the proposed extension of the aquifer protection area boundary;

(B) A certification by the chairperson or duly authorized agent of the Agency that notice of such request has been provided to all owners of property within the proposed extended aquifer protection area and all affected water companies in accordance with the following:

(i) Such notice shall include at least the following:

(aa) A map showing the aquifer protection area boundaries and the proposed extension of such boundaries,

(bb) the name, address, and telephone number of a representative of the Agency who may be contacted for further information, and

(cc) a statement that any person may, not later than thirty (30) days after said notification, submit to the Agency written comments on such proposed boundary extension;

(ii) Such notice shall be effectuated by the following:

(aa) Delivery of notice by certified mail to those individuals and entities identified in Subsection (b)(1)(B) of this Section, or

(bb) the publication of a notice in a newspaper having substantial circulation in the affected area; and posting of notice near the proposed boundaries of the subject aquifer protection area of at least four signs each of which shall be at least four square feet in size (2′ x 2′); and

(iii) a summary of comments received by such Agency regarding the proposed boundary extension and the Agency’s response.

(2) Not later than sixty (60) days after receiving the Commissioner's written approval of a request to extend an aquifer protection area boundary, the Agency shall cause such boundary to be delineated in accordance with Subsection (a) of this Section.

(c) No person may challenge the boundaries of the aquifer protection area under these Regulations unless such challenge is based solely on a failure by the Agency to properly delineate the boundaries in accordance with §22a-354n of the Connecticut General Statutes.

(d) A map of the location and boundaries of the aquifer protection areas, or regulated areas, shall be available for inspection in the Office of the City/Town Clerk or the Agency.

(e) If the Level A mapping is amended in accordance with §22a-354b-1(i) or §22a-354b-1(j) of the Regulations of Connecticut State Agencies, the Agency shall cause the amended aquifer protection area boundary to be delineated in accordance with Subsections (a) or (b) of this Section.

SECTION 4. Prohibited and Regulated Activities

(a) All regulated activities are prohibited in aquifer protection areas, except as specified in Subsection (b) of this Section 4.

(b) The following regulated activities are not prohibited in aquifer protection areas:

(1) A registered regulated activity which is conducted in compliance with §22a-354i-9 of the Regulations of Connecticut State Agencies or Section 12 of these Regulations; and

(2) a regulated activity which has received a permit issued pursuant to §22a-354i-8 of the Regulations of Connecticut State Agencies or Section 9 of these Regulations.

(c) The following are not regulated activities:

(1) Any activity conducted at a residence without compensation;

(2) any activity involving the use or storage of no more than two and one-half (2.5) gallons of each type of hazardous material on-site at any one time, provided the total of all hazardous materials on-site does not exceed fifty-five (55) gallons at any one time;

(3) any agricultural activity regulated pursuant to §22a-354m(d) of the Connecticut General Statutes;

(4) any activity provided all the following conditions are satisfied:

(A) such activity takes place solely within an enclosed building in an area with an impermeable floor,

(B) such activity involves no more than 10% of the floor area in the building where the activity takes place,

(C) any hazardous material used in connection with such activity is stored in such building at all times,

(D) all waste waters generated by such activity are lawfully disposed through a connection to a publicly owned treatment works, and

(E) such activity does not involve (i) repair or maintenance of internal combustion engines, including without limitation, vehicles, or equipment associated with such vehicles, (ii) underground storage of any hazardous material, or (iii) above ground storage of more than one hundred and ten (110) gallons of hazardous materials;

(5) any activity solely involving the use of lubricating oil provided all the following conditions are satisfied:

(A) such activity does not involve cleaning of metals with chlorinated solvents at the facility,

(B) such activity takes place solely within an enclosed building in an area with an impermeable floor,

(C) any hazardous material used in connection with such activity is stored in such building at all times, and

(D) such activity does not involve: (i) repair or maintenance of internal combustion engines, including without limitation, vehicles, or equipment associated with such vehicles, (ii) underground storage of any hazardous material, or (iii) above ground storage of more than one hundred ten (110) gallons of such lubricating oil and associated hazardous waste; and

(6) any activity involving the dispensing of oil or petroleum from an above-ground storage tank or tanks with an aggregate volume of two thousand (2000) gallons or less provided all the following conditions are satisfied:

(A) such dispensing activity takes place solely on a paved surface which is covered by a roof,

(B) the above-ground storage tank(s) is a double-walled tank with overfill alarms, and

(C) all associated piping is either above ground, or has secondary containment.

(d) Determination of a non-regulated activity

(1) Any person proposing to carry out a non-regulated activity, as set forth in Section 4(c) of these regulations, in an aquifer protection area shall, prior to commencement of such activity, notify the Agency or its duly authorized agent on a form provided by the Agency. Such form shall provide sufficient information to enable the Agency or its duly authorized agent to properly determine that the proposed activity is a regulated activity or a non-regulated activity within the aquifer protection area.

(2) If such activity is determined to be a non-regulated activity, then no further action under these Regulations is necessary.

SECTION 5. Activities Regulated by the State

(a) The Commissioner shall exclusively regulate activities within aquifer protection areas that are specified in §22a-354p(g) of the Connecticut General Statutes. The Agency shall regulate all other regulated activities.

Presently, §22a-354p(g) grants the Commissioner exclusive authority to regulate activities proposed by:

(1) any person to whom the Commissioner has issued an individual permit under the national pollutant discharge elimination system of the federal Clean Water Act (33 USC 1251, *et seq.*), or
(2) under the state pollutant discharge elimination system pursuant to Conn. Gen. Stats. § 22a-430, or
(3) any person to whom the Commissioner has issued a permit under the provisions of the federal Resource Conservation and Recovery Act (42 USC 6901, *et seq.*) for a treatment, storage or disposal facility;
(4) any public service company, as defined in Conn. Gen. Stats. § 16-1, providing gas, electric, pipeline, water or telephone service;
(5) any large quantity generator, as defined in regulations adopted by the Commissioner under Conn. Gen. Stats. § 22a-339; or
(6) any state department, agency or instrumentality, except any local or regional board of education.

(b) Any person conducting regulated activities that are within the authority of the Commissioner shall submit a registration or obtain a permit or exemption from the Commissioner prior to engaging in such activity. The Commissioner shall process applications for those regulated activities.

(c) The Agency may submit an advisory decision to the Commissioner for consideration on any permit regulated under this Section in accordance with the Connecticut General Statutes §22a-354p(g).

SECTION 6. Application for an Exemption from Prohibition or Regulation

(a) The owner or operator of a regulated activity may seek an exemption from the Commissioner pursuant to §22a-354i-6 of the Regulations of Connecticut State Agencies.

(b) The Agency may submit written comments to the Commissioner on any exemption regulated under this Section in accordance with §22a-354i-6(c) of the Regulations of Connecticut State Agencies within sixty (60) days of the agency receipt of copy of the application.

SECTION 7. General Registration, Permit Application and Transfer Procedures

(a) All applications for permits and registrations shall contain sufficient information for a fair and informed determination of the issues. The Agency may request additional information from the applicant for this purpose.

(b) The day of receipt of a registration, permit application or transfer form shall be the day of the next regularly scheduled meeting of the Agency, immediately following the day of submission of the application to the Agency or its duly authorized agent, or thirty-five (35) days after such submission, whichever is sooner.

(c) At any time during the review period, the Agency may require the applicant or registrant to provide additional information about the regulated activity. Requests for additional information shall not stay the time limitations for registrations and permits as set forth in Sections 8 and 9 of these Regulations.

(d) All permit applications and registrations shall be open for public inspection.

(e) Incomplete permit applications and registrations may be denied without prejudice.

(f) No permit or registration issued under Sections 8 or 9 of these Regulations shall be assigned or transferred except with written approval by the Agency.

(g) The Agency shall notify the town clerk of any adjoining municipality of the pendency of any application, petition, appeal, request or plan concerning any project on any site in which: (1) any portion of the property affected by a decision of such agency is within five-hundred feet of the boundary of the adjoining municipality; (2) a significant portion of the traffic to the completed project on the site will use streets within the adjoining municipality to enter or exit the site; (3) a significant portion of the sewer or water drainage from the project on the site will flow through and significantly impact the drainage or sewerage system within the adjoining municipality; or (4) water runoff from the improved site will impact streets or other municipal or private property within the adjoining municipality. Such notice shall be made by certified mail, return receipt requested, and shall be mailed within seven days of the date of receipt of the application, petition, request or plan. Such adjoining municipality may, through a representative, appear and be heard at any hearing on any such application, petition, appeal, request or plan.

SECTION 8. Registration Requirements

(a) Any person engaged in a regulated activity which substantially commenced, or was in active operation within the past five (5) years, or with respect to which a municipal building permit was issued, either (A) before the effective date of the state aquifer protection regulations, or (B) before the date an applicable aquifer protection area is designated on a municipal zoning district map or inland wetland and watercourse areas map, whichever occurs later, shall register the activity in accordance with this Section unless such person has pending an application for an exemption pursuant to §22a-354i-6 of the Regulations of Connecticut State Agencies.

(1) The Commissioner shall process registrations for those regulated activities specified in §22a-354p(g) of the Connecticut General Statutes. The Agency shall process registrations for all other regulated activities.

(2) If the regulated activity is not specified in §22a-354p(g) of the Connecticut General Statutes, the person engaged in such activity shall submit a registration to the Agency not later than one hundred eighty (180) days after adoption of regulations pursuant to §22a-354p of the Connecticut General Statutes, or the designation the aquifer protection area pursuant to §22a-354i-2 of the Regulations of Connecticut State Agencies, whichever occurs later. Said person shall simultaneously file a copy of the registration with the Commissioner, Commissioner of Public Health and the affected water company.

(b) All registrations shall be provided on a form prescribed by the Agency and shall be accompanied by the correct registration fee in accordance with Section 18 of these Regulations. Such registration forms may be obtained from the Willington /Town Clerk or the Agency. Such registration forms shall include at least the following information in writing or on maps or drawings:

(1) The name, business telephone number, street address and mailing address of the:

(A) Registrant; if the registrant is a corporation or limited partnership, the full name of the facility and such corporation or limited partnership as registered with the Connecticut Secretary of State, and any officer or governing or managing body of any partnership, association, firm or corporation,

(B) owner of such facility if different than the registrant, and

(C) manager or operator overseeing the operations of such facility;

(2) the location of such facility, using street address or other appropriate method of location, and a map showing the property boundaries of the facility on a 1:24,000 scale United States Geological Survey topographic quadrangle base;

(3) an identification of the regulated activity or activities conducted at the facility, as described in Section 2(a)(35) of the APA Regulations, which regulated activity or

(4) a certification by the registrant that the subject regulated activity is in compliance with the best management practices set forth in Section 12(a) of the APA Regulations, as follows, signed after satisfying the statements set forth in the following certification:

> "I have personally examined and am familiar with the information submitted in this registration and all attachments, and I certify, based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement made in this document or certification may be punishable as a criminal offense under §53a-157b of the Connecticut General Statutes and any other applicable law."

(c) When deemed necessary to protect a public supply well subject to regulation under §22a-354c or §22a-354z of the Connecticut General Statutes, the Agency may:

(1) require, by written notice, any registrant to submit for review and written approval a storm water management plan prepared in accordance with Section 12(b) of the APA Regulations. If so required, the storm water management plan shall be implemented by the registrant immediately upon its approval; or

(2) require, by written notice, any registrant to submit for review and written approval the materials management plan prepared in accordance with Section 12(a) of the APA Regulations. If so required, the materials management plan shall be implemented by the registrant immediately upon its approval.

(d) If the Agency determines that a registration is incomplete, it shall reject the registration and notify the registrant of what additional information is required and the date by which it shall be submitted.

(e) If the registration is determined to be complete, and the regulated activity is eligible for registration, the Agency shall send written notification of such registration to the registrant. Such registration shall be determined to be complete and eligible if the registrant has not otherwise received a notice of rejection from the Agency, not later than one hundred and eighty (180) days after the date the registration is received by the Agency.

(f) The following general provisions shall be included in the issuance of all registrations:

(1) The Agency has relied in whole or in part on information provided by the registrant and if such information subsequently proves to be false, deceptive, incomplete or inaccurate, the registration may be modified, suspended or revoked;

(2) all registrations issued by the Agency are subject to and do not derogate any present or future rights or powers of the Commissioner, Agency, or municipality, and convey

no rights in real estate or material nor any exclusive privileges, and are further subject to any and all public and private rights and to any federal, state, and municipal laws or regulations pertinent to the subject land or activity;

(3) a complete registration shall expire five (5) years from the date of receipt of such registration by the Agency;

(4) the registrant shall apply to the Agency to renew the registration on a form prescribed by the Agency for a facility prior to expiration of such registration; and

(5) If a registered regulated activity is out of business or inactive when registration renewal is required, a five (5) year allowance shall be in effect from the date the registration expires. If the registrant has not applied to renew the registration within five (5) years of the date the registration expires, the facility is no longer eligible for registration.

(g) If a regulated activity which is eligible for registration in accordance with Subsection (a) of this Section fails to be registered or if the registrant of an active registered activity fails to apply for renewal prior to expiration, the Commissioner or municipal aquifer protection agency, as appropriate, may accept a late registration at their discretion, subject to the limitations in Subsection (f)(5) of this Section.

(h) Any person wishing to assume the benefits under a registration for regulated activities shall apply to transfer such registration on a form prescribed by the Agency and submitted to the Agency.

SECTION 9. Permit Requirements

(a) Any person may apply for a permit to add a regulated activity to a facility where a registered regulated activity occurs.

(b) The Agency shall process permit applications for those registrants that have registered pursuant to Section 8 of these Regulations. The Commissioner shall process permit applications for regulated activities specified in §22a-354p(g) of the Connecticut General Statutes and for those registrants that have registered pursuant to §22a-354i-7(b)(1) of the Regulations of Connecticut State Agencies.

(c) Action shall be taken on permit applications within sixty-five (65) days after the completion of a public hearing or in the absence of a public hearing within sixty-five (65) days from the date of receipt of the application. The applicant may consent to one or more extensions of either of these timeframes, provided the total extension of all such periods is sixty-five (65) days or less.

(d) An application for a permit shall be made on a form prescribed by the Agency and shall be accompanied by the correct application fee in accordance with Section 18 of these Regulations. Such permit application forms may be obtained from the Willington Town Clerk or the Agency. Simultaneously with filing an application, the applicant shall send a copy of the application to the Commissioner, the Commissioner of Public Health and the affected water company. An application shall include the following information:

(1) The information as required for a registration under Section 8(b) of these Regulations shall be provided for the proposed regulated activity;

(2) a confirmation and certification that the existing and proposed activity:

  (A) remains and shall remain in compliance with Section 12(a) of these Regulations,

  (B) shall not increase the number of underground storage tanks used for storage of hazardous materials, and

  (C) remains and shall remain in compliance with all local, state, and federal environmental laws;

(3) a materials management plan in accordance with Section 12(a) of these Regulations;

(4) a storm water management plan in accordance with Section 12(b) of these Regulations;

(5) the following environmental compliance information with respect to environmental violations which occurred at the facility where the regulated activities are conducted, within the five years immediately preceding the date of the application:

  (A) any criminal conviction involving a violation of any environmental protection law,

  (B) any civil penalty imposed in any state or federal judicial proceeding, or any penalty exceeding five thousand dollars imposed in any administrative proceeding, and

  (C) any judicial or administrative orders issued regarding any such violation together with the dates, case or docket numbers, or other information which identifies the proceeding. For any such proceeding initiated by the state or federal government, the Agency may require submission of a copy of any official document associated with the proceeding, the final judgment or order;

(6) any additional information deemed necessary by the Agency regarding potential threats to the ground water and proposed safeguards; and

(7) the following certification signed by the applicant and the individual responsible for preparing the application, after satisfying the statements set forth in the certification:

> "I have personally examined and am familiar with the information submitted in this document and all attachments, and I certify, based on reasonable investigation, including my inquiry of those individuals responsible for obtaining

the information, the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement made in the submitted information is punishable as a criminal offense under §53a-157b of the Connecticut General Statutes and any other applicable law."

(e) The Commissioner, any affected water company or the Commissioner of Public Health may, not later than thirty (30) days after receiving a copy of an application for a permit under this Section, submit to the Agency written comments on such application. The Agency shall give due consideration to any such comments, and shall provide a copy of the decision to the Commissioner, the affected water company and the Commissioner of Public Health.

(f) To carry out the purposes of the Act, the Agency may grant an application as filed, grant it upon such terms, conditions, limitations or modifications necessary, or deny it. The Agency shall state upon the record the reason for its decision.

(g) The Agency may hold a public hearing on an application for a permit in accordance with Section 10 of these Regulations.

(h) The Agency shall not issue a permit unless a complete application has been received and the applicant demonstrates to the Agency's satisfaction that all requirements of this Section of the Regulations have been satisfied and all of the following standards and criteria have been met:

(1) the proposed regulated activity shall take place at a facility where a registered regulated activity occurs;

(2) the proposed regulated activity shall not increase the number, or storage capacity of underground storage tanks used for hazardous materials except for the replacement of an existing underground storage tank in accordance with Section 12(a)(3) of these Regulations;

(3) the materials management plan and storm water management plan have been satisfactorily prepared in accordance with Sections 12(a) and 12(b) of these Regulations;

(4) the applicant has submitted a confirmation and certification that all regulated activities remain and shall remain in compliance with all local, state and federal environmental laws in accordance with Subsection (d)(2) of this Section;

(5) the applicant's compliance record does not indicate (A) that any noncompliance resulted from indifference to or disregard for the legal requirements, (B) an unwillingness or inability to devote the resources necessary to comply and remain in compliance, or (C) that instances of noncompliance have led to serious environmental harm, harm to human health or safety, or a substantial risk of such harm;

(6) the proposed regulated activity shall be conducted in accordance with Section 12 of these Regulations;

(7) the existing regulated activity is being conducted in accordance with Section 12 of these Regulations; and

(8) the certification required under Subsection (d)(7) of this Section has been signed by the applicant and the individual responsible for preparing the application.

(i) The Agency may impose reasonable conditions or limitations on any permit issued under this Section to assure protection of the ground water, including, but not limited to the following:

(1) best management practices in addition to those set forth in Section 12 of these Regulations; and

(2) ground water monitoring.

(j) The following general provisions shall be included in the issuance of all permits:

(1) the Agency has relied in whole or in part on information provided by the applicant and if such information subsequently proves to be false, deceptive, incomplete or inaccurate, the permit may be modified, suspended or revoked;

(2) all permits issued by the Agency are subject to and do not derogate any present or future rights or powers of the Commissioner, Agency, or municipality, and convey no rights in real estate or material nor any exclusive privileges, and are further subject to any and all public and private rights and to any federal, state, and municipal laws or regulations pertinent to the subject land or activity;

(3) the permit shall expire ten (10) years from the date of issuance of such permit by the Agency; and

(4) a person shall apply to the Agency to renew the permit on a form prescribed by the Agency prior to expiration of such permit. Such renewal shall be granted upon request by the Agency unless a substantial change in the permitted activity is proposed, or enforcement action with regard to the regulated activity has been taken, in which case, a new permit application shall be submitted and reviewed in accordance with the provisions of this Section.

(k) The Agency shall notify the applicant or permittee within fifteen (15) days of the date of the decision by certified mail, return receipt requested, and the Agency shall cause notice of its order in issuance or denial of a permit to be published in a newspaper having a general circulation in the municipality in which the aquifer protection area is located.

(l) A permittee may request a modification of a permit from the Agency. Such request shall be on a form prescribed by the Agency, and shall include the facts and reasons supporting the request. The Agency may require the permittee to submit a new application for a permit or renewal in lieu of a modification request.

(m) A person wishing to assume the benefits under a permit for regulated activities shall apply to transfer such permit on a form prescribed by the Agency and submitted to the Agency.

SECTION 10. Public Hearings Regarding Permit Applications

(a) If the Agency decides to hold a public hearing regarding an application for a permit to conduct a regulated activity within an aquifer protection area, such hearing shall commence no later than sixty-five (65) days after the receipt of such application.

(b) Notice of the hearing shall be published at least twice at intervals of not less than two (2) days, the first not more than fifteen (15) days and not fewer than ten (10) days, and the last not less than two (2) days before the date set for the hearing in a newspaper having a general circulation in each city/town where the affected aquifer, or any part thereof, is located.

(c) The Agency shall send to any affected water company, at least ten (10) days before the hearing, a copy of the notice by certified mail, return receipt requested. Any affected water company may, through a representative, appear and be heard at any such hearing.

(d) All applications, maps and documents relating thereto shall be open for public inspection.

(e) At such hearing any person or persons may appear and be heard.

(f) The hearing shall be completed within thirty-five (35) days of its commencement.

(g) The applicant may consent to an extension of the time frames in Subsections (a) or (f) of this Section, provided the total extension of all such periods, including any extensions provided in Section 9(c), totals sixty-five (65) days or less.

(h) In reaching its decision on any application after a public hearing, the Agency shall base its decision on the record of that hearing. Documentary evidence or other material not in the hearing record shall not be considered by the Agency in its decision.

(i) The applicant or permittee shall be notified of the Agency's decision in accordance with Section 9(k) of these Regulations.

SECTION 11. Bond and Insurance Relevant to Permit Applicants

(a) An applicant may be required to file a bond as a condition of the permit.

(b) Any bond or surety shall be conditioned on compliance with all provisions of these regulations and the terms, conditions and limitations established in the permit.

SECTION 12. Best Management Practices

(a) Every regulated activity shall be conducted in accordance with the following:

(1) hazardous materials may be stored above ground within an aquifer protection area

(A) hazardous material shall be stored in a building or under a roof that minimizes storm water entry to the hazardous material storage area, except that a roof is not required for a bulk storage facility as defined in Section 2 of these Regulations,

(B) floors within a building or under a roof where hazardous material may be stored shall be constructed or treated to protect the surface of the floor from deterioration due to spillage of any such material,

(C) a structure which may be used for storage or transfer of hazardous material shall be protected from storm water run-on, and ground water intrusion,

(D) hazardous material shall be stored within an impermeable containment area which is capable of containing at least the volume of the largest container of such hazardous material present in such area, or 10% of the total volume of all such containers in such area, whichever is larger, without overflow of released hazardous material from the containment area,

(E) hazardous material shall not be stored with other hazardous materials that are incompatible and may create a hazard of fire, explosion or generation of toxic substances,

(F) hazardous material shall be stored only in a container that has been certified to meet state or federal specifications for containers suitable for the transport or storage of such material,

(G) hazardous material shall be stored only in an area that is secured against un-authorized entry by the public, and

(H) the requirements of this subdivision are intended to supplement, and not to supersede, any other applicable requirements of federal, state, or local law, including applicable requirements of the Resource Conservation and Recovery Act of 1976;

(2) no person shall increase the number of underground storage tanks used to store hazardous materials;

(3) an underground storage tank used to store hazardous materials shall not be replaced with a larger tank unless (A) there is no more than a 25% increase in volume of the larger replacement tank, and (B) the larger replacement tank is a double-walled tank with co-axial piping, both meeting new installation component standards pursuant to §22a-449(d)-1(e) and §22a-449(d)-102 of the Regulations of Connecticut State Agencies, and with interstitial monitoring;

(4) no person shall use, maintain or install floor drains, dry wells or other infiltration devices or appurtenances which allow the release of waste waters to the ground,

unless such release is permitted by the Commissioner in accordance with §22a-430 or §22a-430b of the Connecticut General Statutes; and

(5) a materials management plan shall be developed and implemented in accordance with the following:

(A) a materials management plan shall contain, at a minimum, the following information with respect to the subject regulated activity:

(i) a pollution prevention assessment consisting of a detailed evaluation of alternatives to the use of hazardous materials or processes and practices that would reduce or eliminate the use of hazardous materials, and implementation of such alternatives where possible and feasible,

(ii) a description of any operations or practices which may pose a threat of pollution to the aquifer, which shall include the following:

(aa) a process flow diagram identifying where hazardous materials are stored, disposed and used, and where hazardous wastes are generated and subsequently stored and disposed,

(bb) an inventory of all hazardous materials which are likely to be or will be manufactured, produced, stored, utilized or otherwise handled, and

(cc) a description of waste, including waste waters generated, and a description of how such wastes are handled, stored and disposed,

(iii) the name, street address, mailing address, title and telephone number of the individual(s) responsible for implementing the materials management plan and the individual(s) who should be contacted in an emergency,

(iv) a record-keeping system to account for the types, quantities, and disposition of hazardous materials which are manufactured, produced, utilized, stored, or otherwise handled or which are discharged or emitted; such record-keeping system shall be maintained at the subject facility and shall be made available thereat for inspection during normal business hours by the Commissioner and the municipal aquifer protection agency, and

(v) an emergency response plan for responding to a release of hazardous materials. Such plan shall describe how each such release could result in pollution to the underlying aquifer and shall set forth the methods used or to be used to prevent and abate any such a release;

(B) when a materials management plan is required under either Section 8(c) or 9(d) of the APA Regulations, such materials management plan shall be completed and certified by a professional engineer or a certified hazardous materials manager, or, if the facility where the regulated activity is conducted has received and maintained an ISO 14001 environmental management system certification, then the registrant may complete and certify the materials management plan; and

(C) the materials management plan shall be maintained at the subject facility and shall be made available thereat for inspection during normal business hours by the Commissioner and the municipal aquifer protection agency.

(b) The development and implementation of a storm water management plan required for regulated activities in accordance with Sections 8(c) and 9(d) of these Regulations, shall be as follows: A storm water management plan shall assure that storm water run-off generated by the subject regulated activity is (i) managed in a manner so as to prevent pollution of ground water, and (ii) shall comply with all of the requirements for the General Permit of the Discharge of Storm Water associated with a Commercial Activity issued pursuant to §22a-430b of the Connecticut General Statutes.

SECTION 13. Other State, Federal and Local Laws

(a) Nothing in these regulations shall obviate the requirement for the applicant to obtain any other assents, permits or licenses required by law or regulation by the Town of Willington, State of Connecticut and the Government of the United States including any approval required by the Connecticut Department of Environmental Protection and the U.S. Army Corps of Engineers and the United States Environmental Protection Agency. Obtaining such assents, permits or licenses are the sole responsibility of the applicant.

(b) No person shall conduct any regulated activity within an aquifer protection area which requires zoning or subdivision approval without first having obtained a valid certificate of zoning or subdivision approval, special permit, special exception or variance, or other documentation establishing that the proposal complies with the Town of Willington zoning or subdivision regulations.

SECTION 14. Enforcement

(a) The Agency may appoint a duly authorized agent to act in its behalf with the authority to issue notices of violation or cease and desist orders.

(b) If the Agency or its duly authorized agent finds that any person is conducting or maintaining any activity, facility or condition which violates any provision of these regulations, the Agency or its duly authorized agent may:

(1) Issue a notice of violation.

(A) The notice of violation shall state the nature of the violation, the jurisdiction of the Agency, and the necessary action required to correct the violation including without limitation halting the activity in the aquifer protection area.

(B) The Agency may request that the person appear at the next regularly scheduled meeting of the Agency to discuss the unauthorized activity, and/or provide a written reply to the notice or file an application for the necessary permit or registration. Failure to carry out the action(s) directed in a notice of violation may result in issuance of an order under Subsection (2) of this Section or other enforcement proceedings as provided by law.

(2) Issue a written order.

(A) Such order shall be issued by certified mail, return receipt requested to such person conducting such activity or maintaining such facility or condition to cease such activity immediately or to correct such facility or condition. The Agency shall send a copy of such order to any affected water company by certified mail, return receipt requested.

(B) Within ten (10) days of the issuance of such order the Agency shall hold a hearing to provide the person an opportunity to be heard and show cause why the order should not remain in effect. Any affected water company may testify at the hearing. The Agency shall consider the facts presented at the hearing and, within ten (10) days of the completion of the hearing, notify the person by certified mail, return receipt requested, that the original order remains in effect, that a revised order is in effect, or that the order has been withdrawn.

(3) Suspend or revoke registration or permit.

(A) The Agency may suspend or revoke a registration or a permit if it finds, after a hearing, that the registrant or permittee has not complied with the terms, conditions or limitations set forth in the registration or the permit. Prior to revoking or suspending any registration or permit, the Agency shall issue notice to the registrant or the permittee, personally or by certified mail, return receipt requested, setting forth the facts or conduct that warrants the intended action.

(B) The Agency shall hold a hearing to provide the registrant or permittee an opportunity to show that it is in compliance with its registration or permit. The Agency shall notify the registrant or permittee of its decision by certified mail within fifteen (15) days of the date of its decision. The Agency shall publish notice of a suspension or revocation in a newspaper having general circulation in the /Town of Willington.

(c) An order issued pursuant to Subsection (b)(2) of this Section shall be effective upon issuance, shall remain in effect until the Agency affirms, revises, or withdraws the order, and shall not delay or bar an action pursuant to Subsection (b)(3) of this Section.

(d) A court may assess criminal and or civil penalties to any person who commits, takes part in, or assists in any violation of any provision of the APA regulations in accordance with §22a-354s(b) and §22a-354s(c) of the Connecticut General Statutes.

SECTION 15. Amendments

(a) These regulations may be amended, changed or repealed in accordance with §22a-354p(b) of the Connecticut General Statutes.

(b) If a complete application is filed with the Agency which is in conformance with **these Regulations** as of the date of its filing, the permit issued shall not be required to comply with any changes in regulations taking effect on or after the filing date. The provisions of this Section shall not apply to the establishment, amendment, or change of the boundaries of the aquifer protection area or to any changes in these Regulations necessary to make the regulations consistent with Chapter 446i of the Connecticut General Statutes as of the date of the Agency's decision.

SECTION 16. Appeals

(a) Appeal of the Agency's regulation, order, decision or action shall be made in accordance with §22a-354q of the Connecticut General Statutes.

SECTION 17. Conflict and Severance

(a) If there is a conflict between the provisions of these Regulations, the provision that imposes the most stringent standards shall govern. The invalidity of any word, clause, sentence, section, part, subsection, subdivision or provision of these regulations shall not affect the validity of any other part that can be given effect without such valid part or parts.

(b) If there is a conflict between the provisions of these Regulations and the Act, the provisions of the Act shall govern.

SECTION 18. Registration and Permit Application Fees

(a) All fees required by these regulations shall be submitted to the Agency by certified check or money order payable to the Town of Willington at the time the registration or permit application is filed with the Agency.

(b) No registration or permit application shall be granted or approved by the Agency unless the correct registration/application fee is paid in full or unless a waiver has been granted by the Agency pursuant to Subsection (f) of this Section.

(c) The registration or permit application fee is nonrefundable.

(d) Registration or permit application fees shall be based on the following schedule:

SECTION 19. Fee Schedule

Fee Schedule			
	Facility Size		
	Small (< 1 acre)	Medium (1-5 acres)	Large (> 5 acres)
Registrations:			
Industrial	$250	$400	$600
Commercial	$250	$400	$600
Other	$250	$400	$600
Permits:			
Industrial	$500	$750	$1,000
Commercial	$500	$750	$1,000
Other	$500	$750	$1,000
Materials Management Plan Reviews	$150	$150	$150
Storm water Management Plan Reviews	$150	$150	$150
Public Hearing	$200	$200	$200
Facility Inspection/Monitoring	$150	$150	$150
Regulation Petition	$250	$250	$250

(a) Boards, commissions, councils and departments of the Town of Willington are exempt from all fee requirements.

(b) The registrant or applicant may petition the Agency to waive, reduce or allow delayed payment of the fee. Such petitions shall be in writing and shall state fully the facts and circumstances the Agency should consider in its determination under this Section. The Agency may waive all or part of the application fee if the Agency determines that:

(1) the activity applied for would clearly result in a substantial public benefit to the environment or to the public health and safety and the registrant or applicant would reasonably be deterred from initiating the activity solely or primarily as a result of the amount of the registration or permit application fee; or

(2) the amount of the registration or permit application fee is clearly excessive in relation to the cost to the City/Town for reviewing and processing the application.

(c) Extra Assessments

In the event that additional expenses, including but not limited to outside consultants, experts, or legal advisors are incurred in processing the registration or permit application the applicant/registrant may be assessed an additional fee not to exceed the cost to the Town, to cover said costs. Said fees are to be estimated by the duly authorized agent and submitted with the application fee and held until the application is completely processed after which time any residual funds pertaining to this assessment are to be returned to the applicant/registrant.

For the purpose of this assessment, an “outside consultant” means a professional who is not an employee of the Town of Willington including but not limited to engineering, environmental, hydrogeology and hazardous materials management professionals.

(d) The Agency shall state upon its record the basis for all actions under this Section.

SECTION 20. Effective Date of Regulations

The APA Regulations, APA boundaries and amendments thereto, shall become effective upon (1) the Commissioner’s determination that such regulations are reasonably related to the purpose of ground water protection and not inconsistent with the Regulations of Connecticut State Agencies §22a-354i-1 through §22a-354i-10 and (2) filing in the Office of the Town Clerk.

Effective Date: 7-1-09

Revision Date: _____________

Appendix E
Tank Inspection Reports

Water Tank Inspection Report
For
Connecticut Water Company

Of the

UCONN Underground Tank
Storrs, CT

November 16, 2010

455 Main Street Bldg 1 Suite A-B
Deep River, CT 06417
Tel: (860) 526-2610 Fax:(860) 526-5018)
www.extechllc.com

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UCONN Underground Concrete Tank

Storrs, CT.

INTRODUCTION

On November 16, 2010 EXTECH representatives, Brian Klatzko and Alec Condil performed an assessment of the interior and exterior of a concrete underground atmospheric tank for the Connecticut Water Company in Storrs Connecticut. The inspection was conducted to establish the current condition of the tank's concrete structure and sanitary equipment.

CWC UCONN Atmospheric Underground Concrete Tank

The tank was inspected in accordance with the latest version of AWWA D101 standard for water tank inspections, CT DPH Guidelines, as well as the new AWWA M42 Tank Manual.

The interior of the tank was inspected with the TankRover remotely operated vehicle, while full. The TankRover is the only piece of equipment like it in the United States and was developed by Extech. By using the TankRover the interior of the tank was inspected with no special preparation, no additional disinfection and no downtime.

The TankRover is equipped with high-powered thrusters, which are used to maneuver throughout the tank and are used to wash away bottom sediment for observations.

The TankRover was prepared for the inspection by disinfecting with a 200-ppm chlorine solution in accordance with AWWA C652.

The interior of the tank was accessed through the roof hatch while the tank was online. The roof hatch was unlocked while onsite.

1. Perform field inspections and tests to assess the structural integrity of the tank.
2. Formulate a report to document the assessment findings.
3. Provide recommendations for rehabilitation.

Executive Summary

The condition and recommendations for each tank are briefly summarized in this section. For detailed information regarding detailed tank conditions and the specific recommendations please refer to the designated section for each tank.

The tank appears to be in good structural condition with no failure locations found such as excessive spalling or cracking on the internal roof structure and shell walls. The liner prevents direct viewing of the interior walls.

The liner on the shell walls has failed in numerous places throughout the tank. The exterior, exposed portions of the shell had shallow spalling at the top edges and efflorescence staining.

The concrete tank floor has minor, trace accumulations of sediment. The liner has failed in many locations in all three chambers and has lifted away from the floor. There was no spalling or crack locations found where the liner has failed.

The tank should be re-inspected in the spring of 2015 according to AWWA D-101-53-86R recommendations and current industry practice.

OBSERVATIONS

Interior and exterior photographs provided in the report were developed from a digital camera. The interior images are as clear as our printing technology will allow. The interior digital photos in the report provide a reference for our comments.

No data plate or as built drawings were available at the time of inspection. It appears that the tank was constructed in the mid 1970's from dates cast into the vent pipes. The tank capacity is 5.4 million gallons, 24-feet height and is approximately 175-feet square. The tank is equipped with a three, 36-inch square access hatches. The hatches are bilco style hatches that do not have sanitary curbing but use an internal drainage system, see DP# 20. The contact onsite was Bob Wittenzellner.

<u>UCONN Underground Concrete Tank</u>

Exterior

Roof

The exterior roof of the tank is below grade and could not be inspected as part of this inspection. The top of the tank is covered with bituminous concrete, which is in poor condition with numerous longitudinal separations in the cold joints see DP# 10. No sinkholes were found that would indicate structural problems of the roof or the backfill under the pavement.

Ladders

The tank is equipped with three interior access ladders for each manway hatch. The ladder rungs are extruded aluminum and cast into the concrete wall see DP# 12.

Shell

Only one shell wall is partially exposed. The other walls are completely concealed below grade. The visible portions of the shell wall have typical areas of efflorescence buildup around hairline cracks. Some shallow spalling was found on the upper shell probably due to chloride infiltration from snow removal and fence posts that allow water intrusion, see DP# 13-16.

Foundation

The foundation was not accessible and not evaluated as part of this inspection.

Vent/Overflow Pipe

The tank is equipped with two overflow pipes, see VS# 7 Chamber #1. The overflow discharge points for the pipes are located on the east and west sides of the tank, both are properly screened.

The tank is equipped with four perimeter snorkeled roof vents that are 12-inches in diameter and have a vent opening to grade distance of 33-inches see DP# 2,4,6&8. The vent openings have both fine and coarse mesh screening installed that is in good condition and securely fastened see DP# 3,5,7&9. The vent bodies are constructed from ductile iron and are in good condition.

Interior

The water level was consistently 1-foot below the overflow. Each of the three chambers was accessed through the corresponding manway openings. The first chamber accessed, (chamber# 1), was the chamber closest to the parking lot.

Roof

The roof structure consisted of multiple columns supporting concrete beams and perpendicular roof rafters see VS# 1&2. Chamber# 3 had light efflorescence staining from the roof beam see VS# 14. All roof components were in very good condition with no significant areas of failure in all chambers. The columns showed no evidence of exposed reinforcement or spalling see VS# 5.

Shell

All tank walls have a liner material installed. The liner is a fiber, reinforced material that uses an adhesive to adhere to the wall. All three chambers had failure of the liner at the seams and has lifted away or displaced from the concrete substrate see VS# 6,8,16,17. No areas of spalling were found on the shell or baffle walls. The roof to shell and floor to shell seams were in good condition.

Floor

The floor liner was in similar condition as the shell liner with areas of failure throughout the floor. Numerous lifting locations were found in all chambers but the liner in chamber 1 was in the worst condition see VS# 3&4. Light sediment accumulation was found sporadically in all chambers see VS# 18. No spalling locations were found under the lifted liner.

Inlet/Outlet

The tanks are equipped with separate inlet/outlet pipes. The main inlet pipe enters the tank on the north side of the tank. The gate valve chamber was not accessed during the inspection see DP# 11. Three 16-inch diameter outlet pipes are located in the south side of the tank and enter into a pump house see DP# 16-18. The internal portions of the pipes are fitted with mesh screening see VS# 9-12. One pipe is not currently being used and capped on the dry side.

RECOMMENDATIONS

<u>CWC UCONN Underground Concrete Tank</u>

The bilco hatches should be inspected bi-annually for debris accumulation within the drainage tracks. Any debris must be removed to facilitate drainage and keep surface water from entering the tank. The drainage lines need to be open and clear.

The failed liner is not currently protecting the concrete from water infiltration. Due to most concrete tanks not being equipped with a liner, the cost of replacement and the outlet pipes being equipped with screening, repairs are not recommended at this time.

No repairs are recommended until the next scheduled inspection. The tank should be inspected again in the fall of 2015 according to AWWA recommendations and current industry practice.

At some point when the tank is drained the liner material should be removed. Any cracks in the concrete can be repaired and then future inspection can view the walls directly.

NACE Certified Coating Insp. #0050

GLOSSARY OF TERMS

Cathodic Protection - The use of a sacrificial metal or energized substance to polarize the structures surface and prevent corrosion.

Chalking - The degradation of a paint system when exposed to ultra-violet light which creates a loose residue on the surface.

Corrosion Cell - a concentrated localized site of accelerated corrosion that creates pitting.

Dry Film Thickness - Total thickness of a paint film when complete cured.

Finial Vent - The central roof vent on top of a water tank.

Holiday - a hole in a protective coating that may be invisible to the unaided eye that extends to the substrate.

Lead Abatement - The removal and a lead bearing paint system.

Lead Encapsulation - The covering over of a lead based paint by applying a compatible topcoat.

Osmotic Blister- Raised coating area created by build up of fluid under the coating. Fluid moves through coating in response to water/solvent concentrations between coating and tank water.

ROV- Remotely operated vehicle, underwater inspection device “TankRover”

Silt - Material that accumulates in the bottom of a water tank originating from treatment by products and distribution system debris.

Tubercle- Domed shaped build up of corrosion products over an active corrosion site. Promotes metal loss through pitting due to differential oxygen concentrations.

Ultrasonic Measurement - The use of high frequency sound waves passed through a material to measure the time required to return. The time required to pass through the material is correlated to the speed of sound in the substrate to yield an actual thickness at a specific location.

Appendix A

Photographs

UCONN Underground Concrete Tank
Storrs, CT

01.JPG
11/16/2010
Overall view of bituminous concrete covering roof of underground tank.

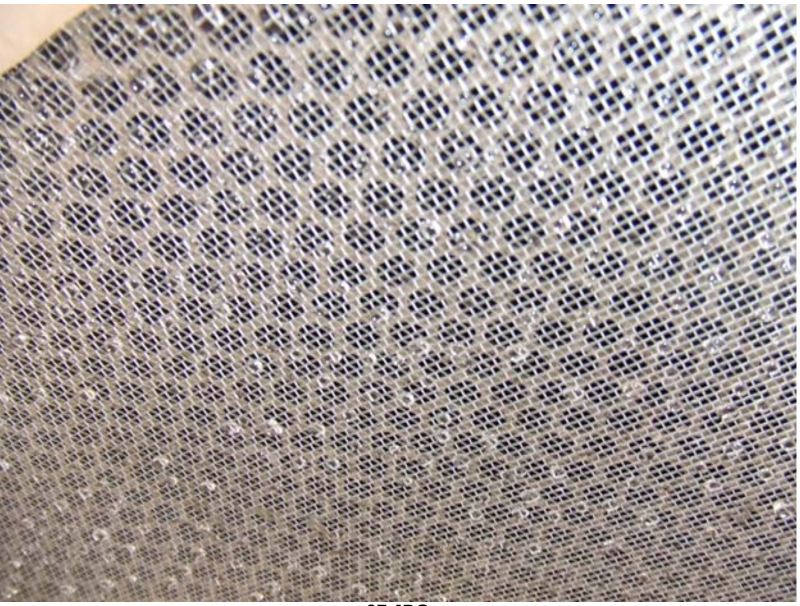
02.JPG
11/16/2010
Snorkeled vent (1 of 4).

03.JPG
11/16/2010
Fine screen installed on vent# 1.

04.JPG
11/16/2010
Snorkeled vent (2 of 4).

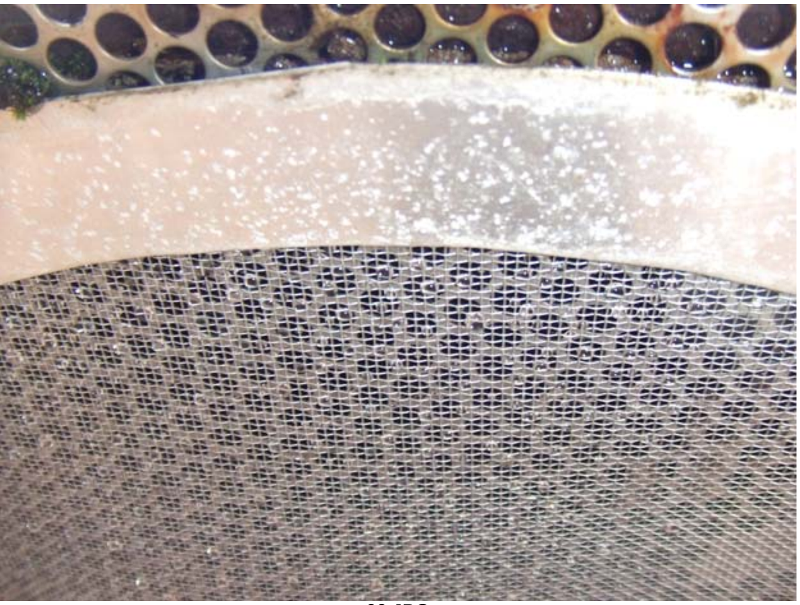
05.JPG
11/16/2010
Fine screening installed over vent# 2.

06.JPG
11/16/2010
Snorkeled vent (3 of 4)



07.JPG
11/16/2010
Fine screening installed over vent# 3.

08.JPG
11/16/2010
Snorkeled vent (4 of 4)



09.JPG
11/16/2010
Fine screening installed over vent# 4.

10.JPG
11/16/2010
Typical large crack in the pavement above the underground tank.

11.JPG
11/16/2010
Vault for inlet gate valve.

12.JPG
11/16/2010
36x36-inch roof mounted access hatch.

13.JPG
11/16/2010
Exposed portion of shell wall.

14.JPG
11/16/2010
Efflorescence on exterior shell wall.

15.JPG
11/16/2010
Efflorescence emanating from a hairline crack in shell wall.

16.JPG
11/16/2010
Spalling locations on upper exterior shell.

17.JPG
11/16/2010
16-inch outlet pipe (1 or 3).

18.JPG
11/16/2010
16-inch outlet pipe (2 of 3)

19.JPG
11/16/2010
16-inch outlet pipe (3 of 3)

20.JPG
11/16/2010
Drainage system for bilco style manway hatch.

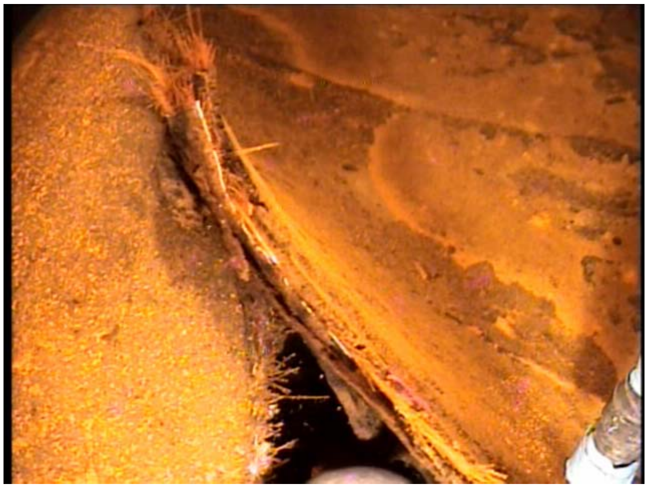
Connecticut Water Company **UCONN Tank- Chamber #1**

VS #1: Typical column, roof beam and rafters (Time 3:10)

VS. #2: Rafters and interior roof surface (Time 5:00)

VS. #3: Widespread area of failed liner (Time 10:48)

Connecticut Water Company **UCONN Tank- Chamber #1**



VS. #4: Close up view of lifted liner material (Time 11:35)

VS. #5: Base of typical column. No exposed reinforcement or spalling found. (Time 14:08)

VS. #6: Typical split in liner material on interior shell wall (Time 24:35)

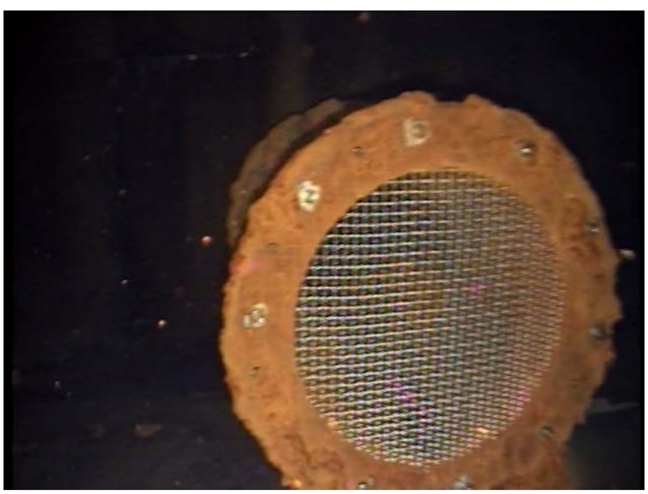
Connecticut Water Company **UCONN Tank- Chamber #1**

VS. #7: Interior portion of overflow pipe (Time 25:50)

Connecticut Water Company **UCONN Tank- Chamber #2**

VS. #8: Split in liner on shell wall (Time 5:35)

VS. #9: Unused outlet pipe (Time 7:30)



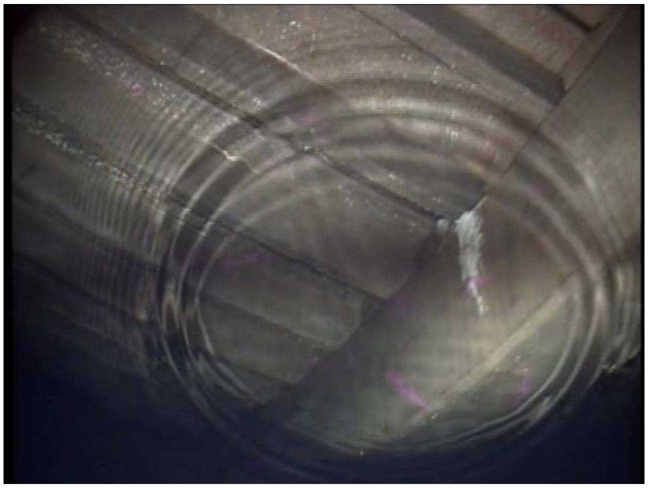
VS. #10: Outlet pipe #1 with screen (Time 7:50)

Connecticut Water Company **UCONN Tank- Chamber #2**

VS. #11: Outlet pipe #2 with screen (Time 8:11)

VS. #12: Outlet pipe #3 with screen (Time 8:20)

VS. #13: Roof structure and gate valve control rod (Time 11:20)



VS. #14: Efflorescence staining on roof beam (Time 2:45)

VS. #15: Support column, beam and rafter configuration (Time 4:35)

VS. #16: Failed liner on shell wall (Time 9:20)

Connecticut Water Company **UCONN Tank- Chamber #3**

VS. #17: Lifted liner on shell wall (Time 10:00)

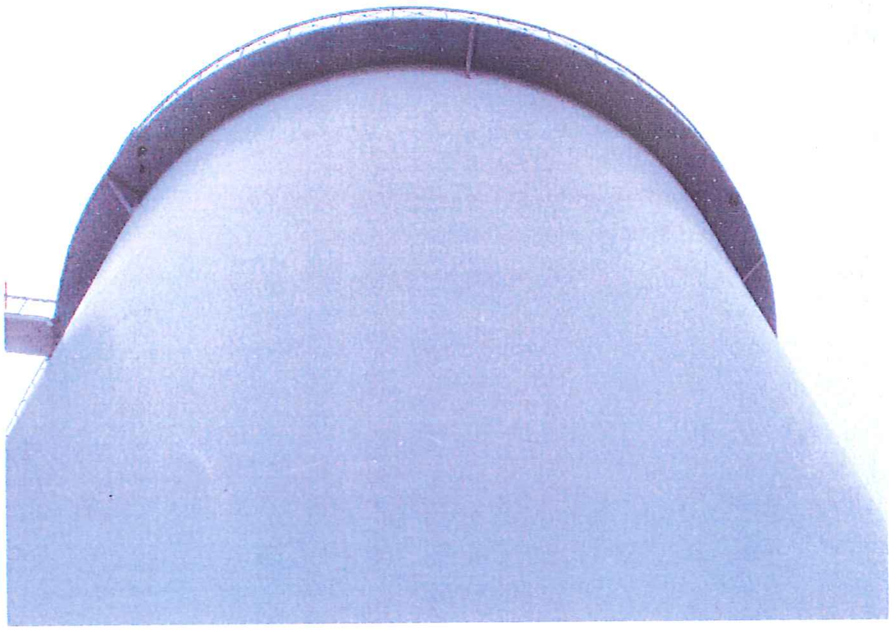
VS. #18: Light sediment accumulation on floor (Time 14:32)

WATER TANK INSPECTION REPORT

For the

Connecticut Water Company

Of the



1.0MG UConn Standpipe
Storrs, CT

June 15, 2009

Extech, LLC

490 Industrial Park Road
Deep River, CT 06417
Tel: (860) 526-2610 Fax:(860) 526-5018)
www.extechllc.com

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Connecticut Water Company

UConn Standpipe

Storrs, CT

INTRODUCTION

On June 15, 2009 EXTECH representatives, Brian Klatzko and Robert Meskill performed corrosion and coating assessments of the exterior and interior of one steel water tank for The Connecticut Water Company at UCONN in Storrs, CT. This inspection was conducted to establish the current condition of the tank's coatings, substrate steel, and sediment depth.

- **UCONN 1.0MG Standpipe**

The tank was inspected in accordance with the latest version of AWWA D101 standard for water tank inspections, CT DPH Guidelines, as well as the new AWWA M42 Tank Manual.

The tank interior was inspected while full and in operation with the TankRover remotely operated vehicle. The TankRover is the only piece of equipment like it in the United States and was developed by Extech. By using the TankRover the tank was inspected with no special preparation, no additional disinfection, no confined space entry and no downtime.

The TankRover was prepared for the inspection by disinfecting in accordance with AWWA C652-02, by spray application of a 200-ppm chlorine solution prior to insertion of each tank.

The exterior portion of the tank was inspected by walking the roof, shell portions that were accessible from the balcony and vertical ladder, and portions that could be inspected from each tank's base. The objectives of the assessment were to:

1. Perform field inspections and tests to assess the structural and coating integrity of the tank
2. Review the safety compliance of tank ladders and access.
3. Determine if any interior coating damage was done during cellular antenna installation.
4. Formulate a report to document the assessment findings.
5. Provide recommendations for rehabilitation.

EXECUTIVE SUMMARY

The condition and recommendations for each tank are briefly summarized in this section. For detailed information regarding detailed tank conditions and the specific recommendations please refer to the designated section for each tank.

The tank appears to be in sound condition with regards to the steel shell, floor and roof. There is no evidence of significant metal loss or deep localized pitting.

The exterior coating is peeling at the interface between subsequent overcoats and the old paint.

The interior paint is failing on the plates, roof and weld seams. Interior corrosion is developing on the weld seams and producing pits.

The tank should be scheduled for an interior and exterior blast and repainting within the next 1-2 years to prevent major pitting on the interior.

In addition to the prevention of corrosion the tank should have the foundation repaired as well as upgrades to hatches, vents and the inlet pipe. Additional details are provided in the Recommendation section of this report.

OBSERVATIONS

Interior and exterior photographs provided in the report were developed from a digital camera and were captured in digital format from the interior videotape. The interior images are as clear as our printing technology will allow. The interior videosnaps in the report provide a reference for our comments. Keep in mind that the videotape provides the greatest detail and should be viewed as part of the report. Each Videosnap (VS) is marked with the time stamp from the videotape. This allows the reader to easily view the original footage for each feature.

A Posi-Tector 6000 was used to gather dry film thickness measurements on the exterior roof and shell surfaces.

Adhesion measurements were made using the ASTM 3359 A or B Method depending on coating thickness.

1.0MG Welded Standpipe UCONN

The year of construction was unknown because there is no tank plate. It is a welded steel standpipe that is approximately 85-ft tall and 45-ft in diameter.

The tank has a self-supporting dome roof with no interior support rafters or columns. The shell is constructed of 12-rings.

The overflow pipe terminates at the top ring and does not go to the ground.

The paint systems on the tank appear to be the following:

Interior- multi-coat vinyl
Exterior- Alkyd with at least one overcoat application

Interior

The interior of the tank was accessed through a 24-inch round roof hatch. The hatch has a 5-inch sanitary lip and a 2-inch hatch lip. See DP# 20. The hatch was locked at the time of the inspection.

Roof (ceiling)

The roof is dome shaped with a spider rod assembly to stabilize the top of the shell. The tension rods are corroding and have coating failure. See DP# 28, 31, 33. The roof plate

welds have backer bars on the interior that are corroding with minor metal loss. The roof plates are covered with surface rust and blisters. See DP# 29, 30, 32.
Shell

The interior coating is in fair to poor condition. There are blistering and corrosion cells along the weld seams and the shell wall. See VS# 3-7. Some corrosion cells were brushed with the ROV and have minor localized metal loss behind them. See VS# 8, 9. The corrosion cells and the blistering are common throughout the entire tank. The majority of the corrosion cells are along the horizontal weld seams. See VS# 10.

The ground hatch is visible on the bottom ring. There is corrosion along the edge of the hatch and the swing arm. See VS# 14.

Floor

The floor had a very light and thin material covering it. There is approximately 1/8 to ½-inch on the floor. See VS# 11. There are corrosion cells along the floor to shell seam and on the floor plates. See VS# 12, 13.

The inlet pipe comes from the bottom ring and angles up towards the roof. The outlet pipe is on the floor and has a sediment ring around it. See VS # 15, 16.

Ladders

There were no fixed interior ladders in the tank.

Cathodic Protection

There is no cathodic protection in the tank.

Exterior

Roof

The roof is in fair condition with moderate chalking. There are areas with the mid coat and the primer visible. There are also areas on the weld seams with coating failure down to the substrate and the steel is rusting. See DP# 21-25. There is no widespread corrosion and no significant metal loss on the exterior.

Dry film thickness readings were taken on the roof. There are 45 reading with a low reading of 10.7 mils, a high reading of 25.1 mils and with an average of 17.7 mils.

Vent

The roof has a center finial vent that has a 12"-inch collar. The distance from the vent cap to the roof is 11-inches. The screen is a steel, honeycomb screen that is secure and in good condition. See DP# 26, 27.

Ladders and Railings

The shell ladder is approximately 50-ft from the ground and is equipped with a safety cage. The entry point from the shell ladder to the balcony has a steel cover that is welded in place. See DP# 11, 13. The ladder from the balcony to the roof has rungs that are 12-inches apart with an 8-inch toe clearance and are 13-inches wide. See DP# 22. The ladder meets current OSHA requirements.

The railing system is in fair condition. There are many areas with paint delamination and primer visible. The floor of the balcony has areas of sitting water and is causing areas of corrosion. There is approximately 50% - 60% loss of paint on the railing system and the floor. The top rail is 36-inches tall with a 6-inch kick plate. See DP# 12, 14. The balcony rail does not meet current OSHA Fall Protection requirements.

Overflow Pipe

The overflow pipe terminates at the top ring and doesn't reach the ground. There is a coarse screen on the overflow that is secure and in tact. The overflow pipe is also equipped with a weir box. See DP# 18,19.

Shell

The shell coating has rock damage and mildew growing on the bottom ring. There is moderate chalking below and above the balcony. There are areas above the balcony that appear to be over-coated and have failed. See DP#1, 2, 16.

There were 45 dry film thickness reading taken on the ground. There is an average of 14.49 mils on the bottom shell with a high reading of 23.4 mils and a low reading of 8.6 mils.

There were 45 dry film thickness reading taken from the balcony floor as well. There is an average of 15.65 mils with a high reading of 29.5 mils and a low reading of .15 mils.

Foundation

The tank is sitting on a concrete foundation. The foundation is spalling throughout with deeply exposed aggregate. See DP# 2, 7. The chine plate that rests on the concrete foundation has paint delamination as well as metal loss in some areas. See DP # 4,5.

There are a total of 6 anchor chairs. The anchor bolts are 18-inch tall and 1.5-inch in width. The chair size is 12-inch tall and is 6-inchin width. They all enter into the concrete foundation. See DP# 6.

There is one ground hatch that is oval in shape. It is 24-inch in width and 18"-inch tall, see DP# 3.

RECOMMENDATIONS

Based on the condition of the tank, past metal loss, existing coating condition and metals content of the paint the following recommendations are made:

The interior and exterior should be blasted and repainted in the next 1-2 years. Although the exterior does not require painting from a corrosion standpoint it will be more cost effective to paint the entire tank under one contract.

When the tank is painted several upgrades are recommended to meet current OSHA and current industry practices;

The roof vent should be replaced with an AWWA Style vacuum/relief vent to allow for the use of a fine mesh bug screen.

The balcony rail should be extended to a total height of 42-inches to meet OSHA and a full mid rail should be installed.

When the tank is drained for painting a second ground hatch should be installed 30-inches in diameter.

Given the height of the tank consideration should be given to raising the inlet pipe 10-12 feet to provide better mixing of the tank.

The foundation should be sealed with a cement coat and then sealed against moisture intrusion with an epoxy coating.

The roof ladder should be equipped with a safety climb cable and/or handrail from the shell ladder to the vent.

Theodore W. Lewis

NACE Certified Coating Inspector #00050

GLOSSARY OF TERMS

Cathodic Protection - The use of a sacrificial metal or energized substance to polarize the structures surface and prevent corrosion.

Chalking - The degradation of a paint system when exposed to ultra-violet light which creates a loose residue on the surface.

Corrosion Cell - a concentrated localized site of accelerated corrosion that creates pitting.

Dry Film Thickness - Total thickness of a paint film when complete cured.

Finial Vent - The central roof vent on top of a water tank.

Holiday - a hole in a protective coating that may be invisible to the unaided eye that extends to the substrate.

Lead Abatement - The removal and a lead bearing paint system.

Lead Encapsulation - The covering over of a lead based paint by applying a compatible topcoat.

Osmotic Blister- Raised coating area created by build up of fluid under the coating. Fluid moves through coating in response to water/solvent concentrations between coating and tank water.

ROV- Remotely operated vehicle, underwater inspection device "TankRover"

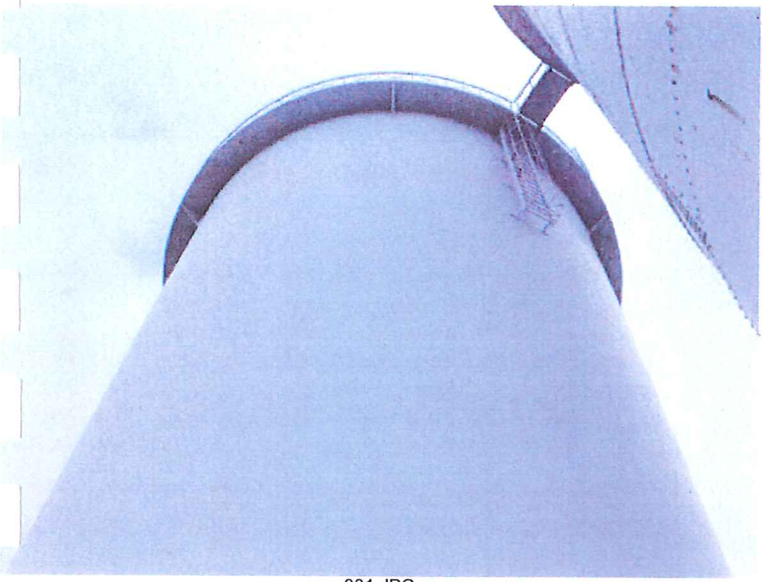
Silt - Material that accumulates in the bottom of a water tank originating from treatment by products and distribution system debris.

Tubercle- Domed shaped build up of corrosion products over an active corrosion site. Promotes metal loss through pitting due to differential oxygen concentrations.

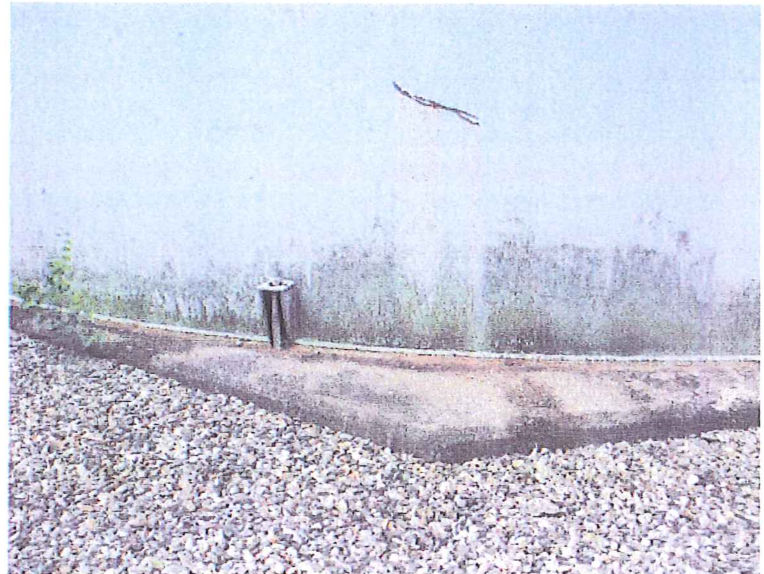
Ultrasonic Measurement - The use of high frequency sound waves passed through a material to measure the time required to return. The time required to pass through the material is correlated to the speed of sound in the substrate to yield an actual thickness at a specific location.

APPENDIX A

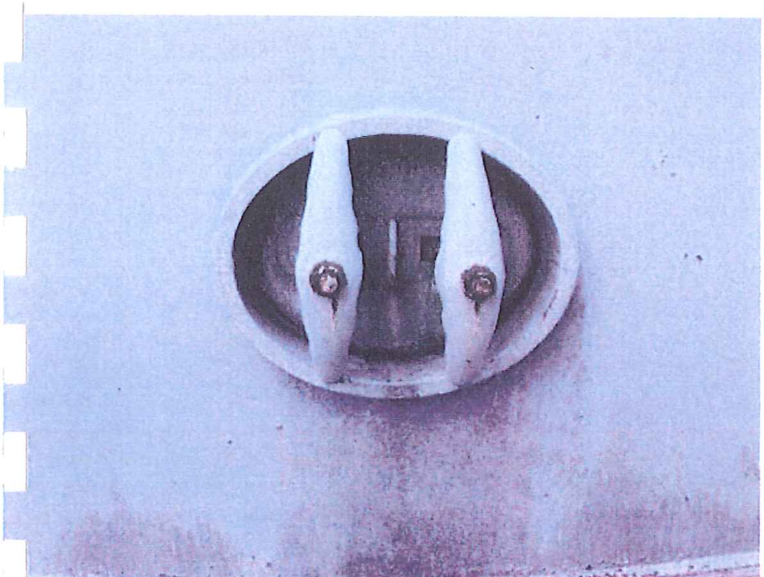
Digital Pictures
&
Video Snaps



001.JPG
06/14/2009
ınk overview. Ladder approx 50' off the ground and walkway to the stairway on the other t...



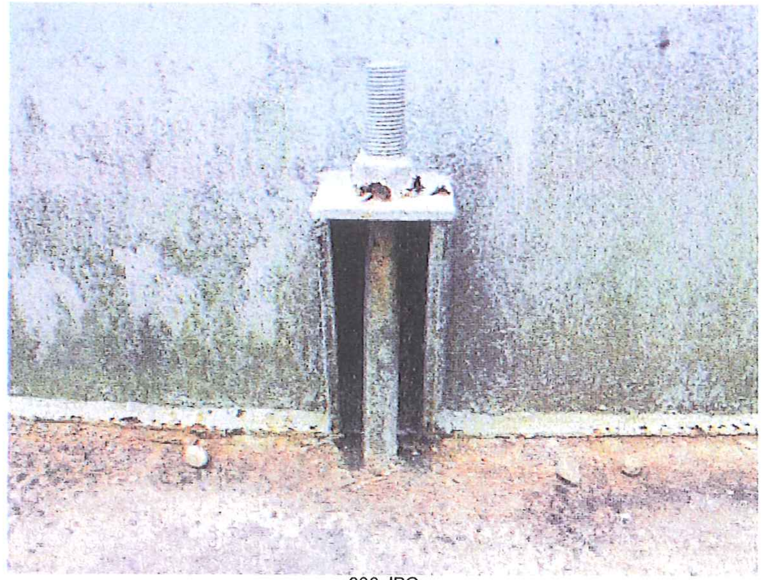
002.JPG
06/14/2009
Mildew on bottom ring - Concrete foundation in fair condition



003.JPG
06/14/2009
Hatch is 24"W x 18"H. Corrosion on bolts holding the hatch in place.

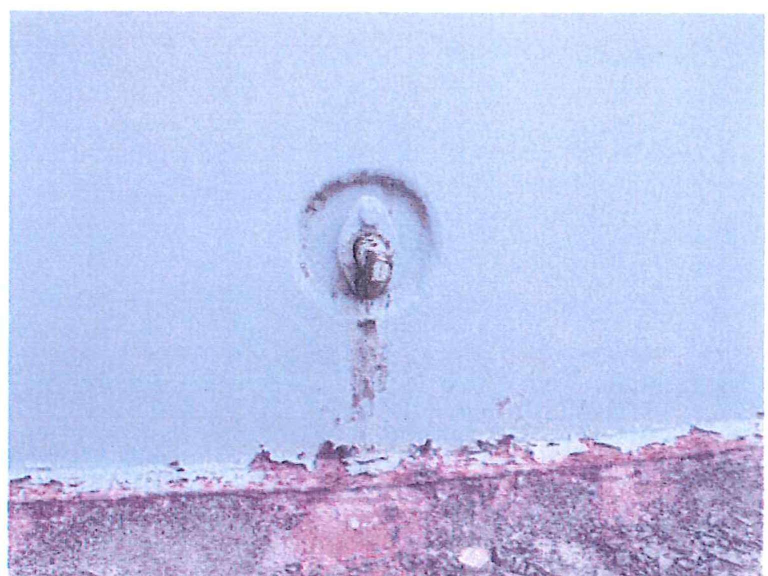
004.JPG
06/14/2009
Corrosion on base plate and deterioration of concrete foundation.

005.JPG
06/14/2009
Corrosion and flaking on the base plate.



006.JPG
06/14/2009
Corrosion on anchor bolt and mildew on the exterior shell.

007.JPG
06/14/2009
Spalling of concrete foundation.



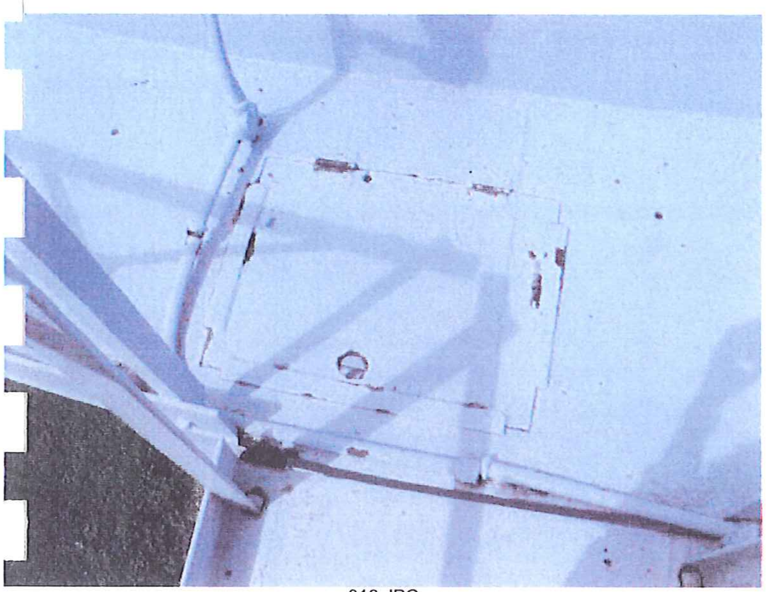
008.JPG
06/14/2009
Corrosion on old internal valve stem

009.JPG
06/14/2009
Gate 1 to stairwell is in poor condition

010.JPG
06/14/2009
Gate 2 to the stairwell works well.

011.JPG
06/14/2009
Manway to the tank from the middle tank. ladder is welded shut.

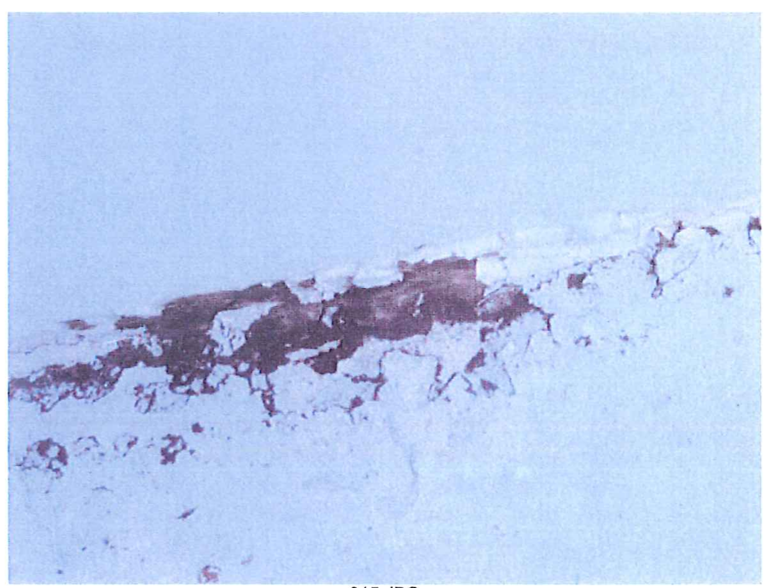
012.JPG
06/14/2009
Ladder to the roof is in good condition.



013.JPG
06/14/2009
For the ladder. Not used.

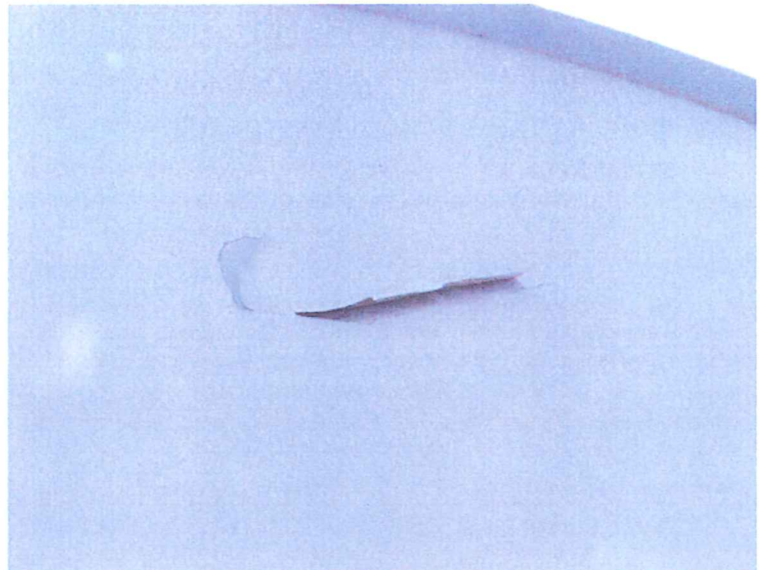
014.JPG
06/14/2009
Paint on balcony is flaking off.

014a.JPG
06/14/2009
Railing system - Coating failure and corrosion throughout the entire balcony

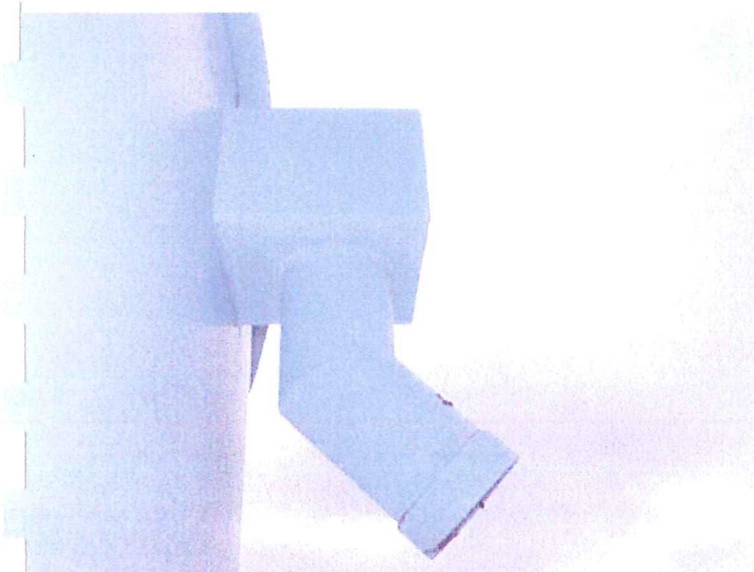


015.JPG
06/14/2009
Weld seam where paint has failed and steel is showing.

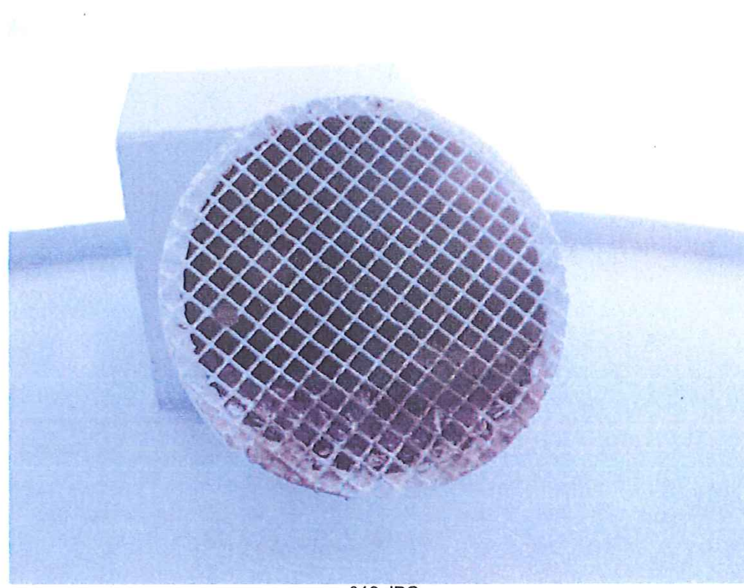
016.JPG
06/14/2009
Paint on shell wall is delaminating.



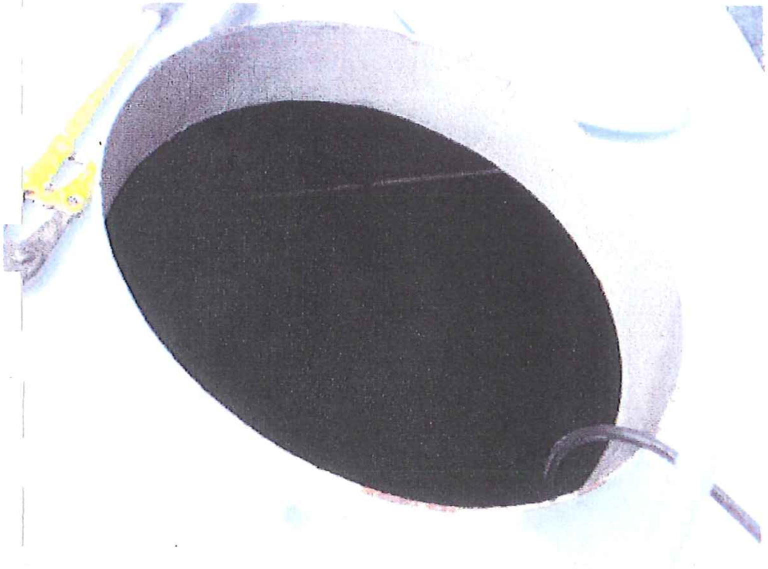
017.JPG
06/14/2009
Paint is delaminating.



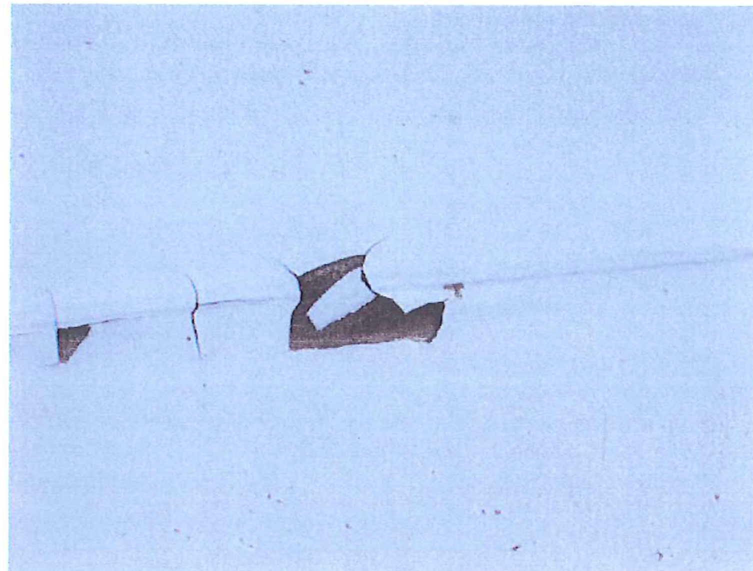
018.JPG
06/14/2009
Weirbox for the overflow pipe.



019.JPG
06/14/2009
Overflow screen in good condition.

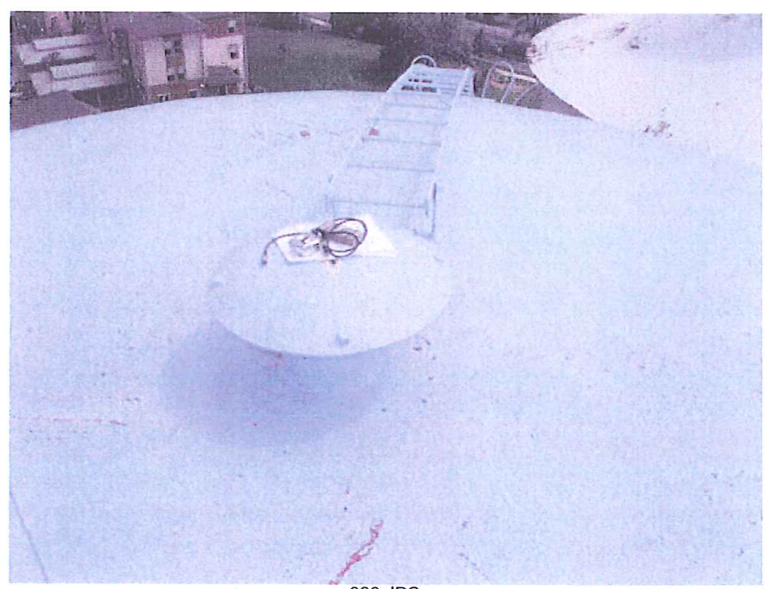


020.JPG
06/14/2009
Hatch, 24" dia, is in good condition.

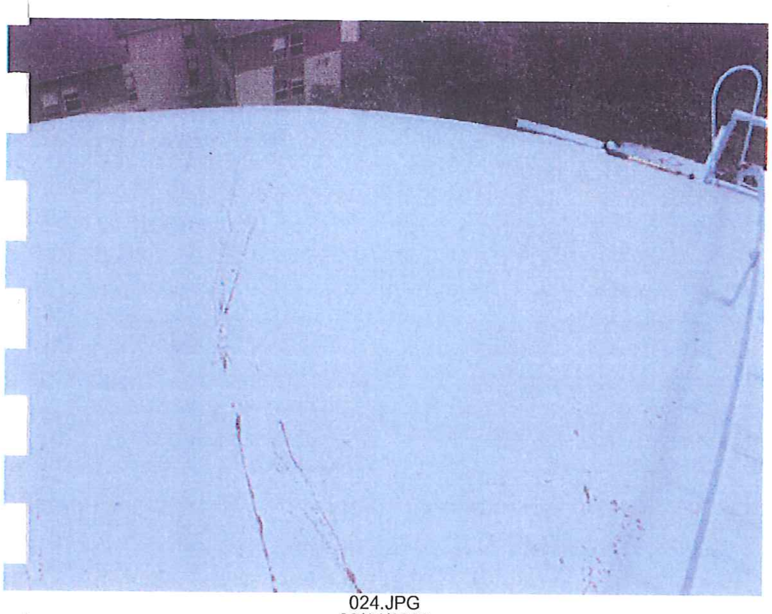


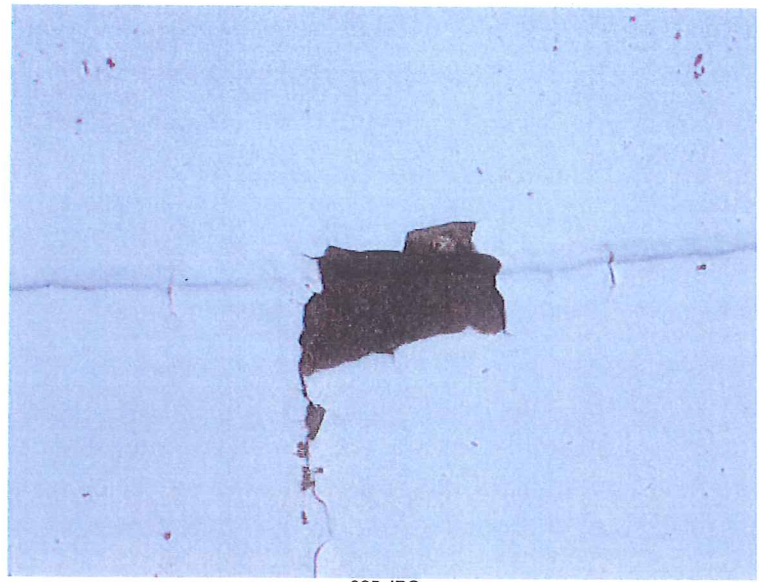
021.JPG
06/14/2009
Peeling of paint at weld seam.

022.JPG
06/14/2009
Roof ladder system to vent. Notice corrosion spots on shell.

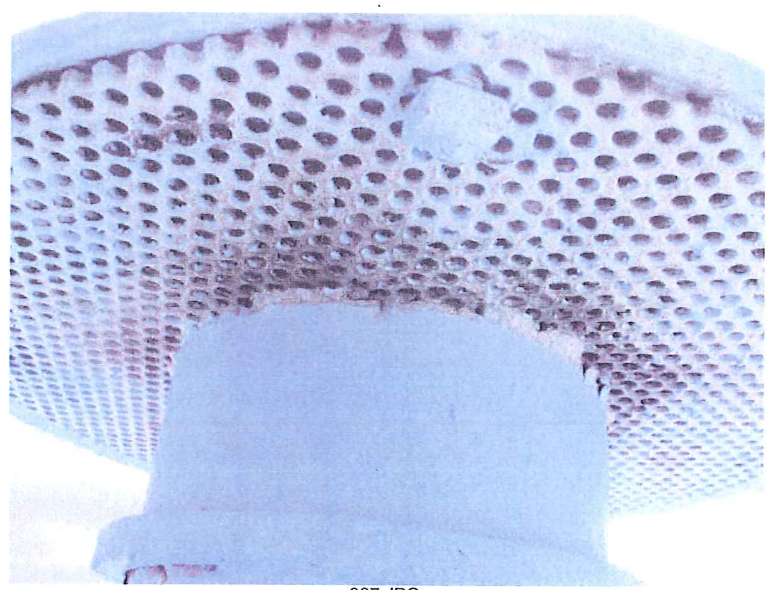


023.JPG
06/14/2009
Vent cap and view down the ladder.


024.JPG
06/14/2009
Mid coat and primer visible with some surface rust


025.JPG
06/14/2009
Corrosion on weld seam on the exterior part of the roof.

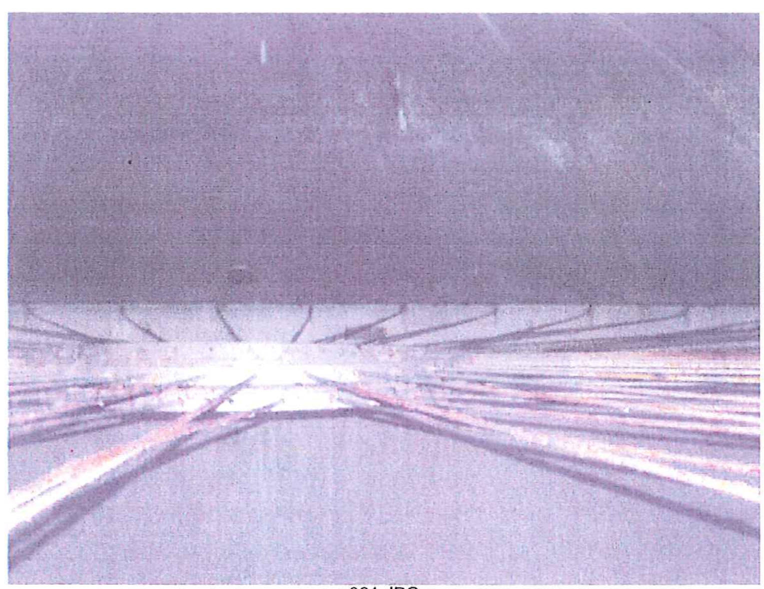

026.JPG
06/14/2009
Vent collar is in good condition.


027.JPG
06/14/2009
Steel vent screen in good condition


028.JPG
06/14/2009
Tension rods corroding - Paint on roof flaking off

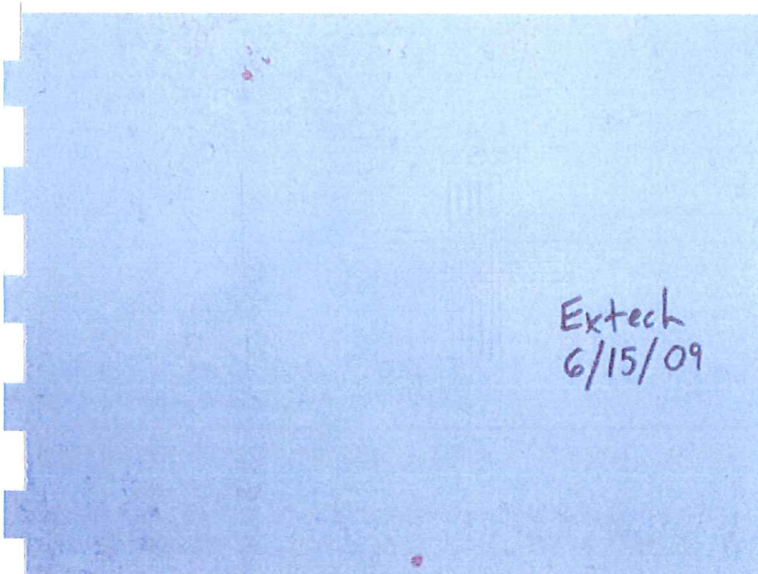

029.JPG
06/14/2009
Coating failure throughout the roof


030.JPG
06/14/2009
Roof corroding and paint flaking off


031.JPG
06/14/2009
Tension rods and the center hub

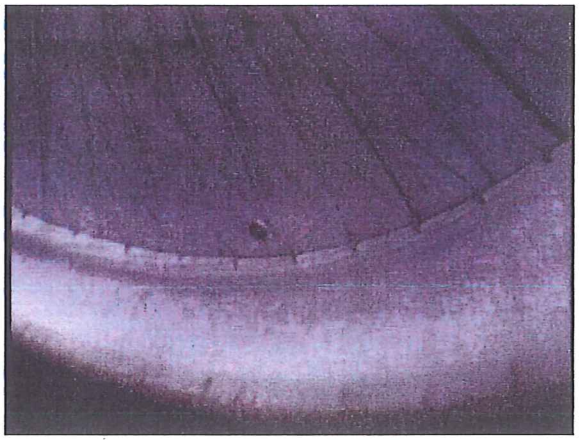
032.JPG
06/14/2009
Dollar plate with surface rust - Edge corrosion on roof weld seams

033.JPG
06/14/2009
Closeup of the paint failure on the tension rods

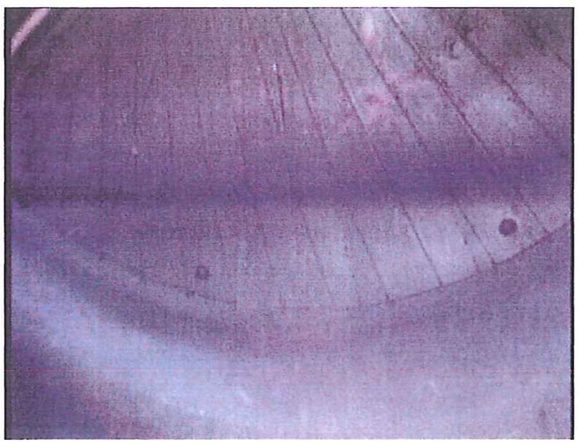


034.JPG
06/14/2009
Cross cut adhesion taken on the roof

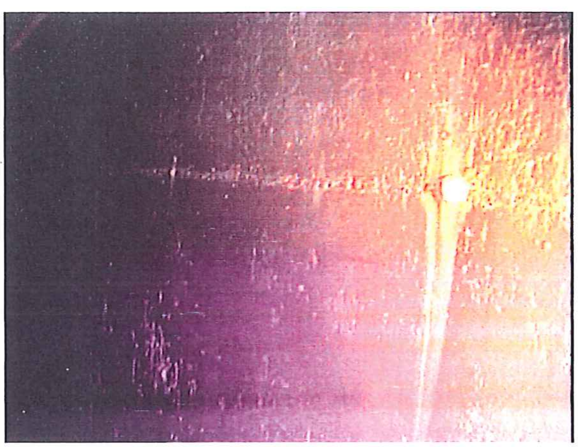
Connecticut Water Company **UCONN Tank**



VS # 1: Tension rods with center hub; Tension rods are corroding (Time: 01:40)

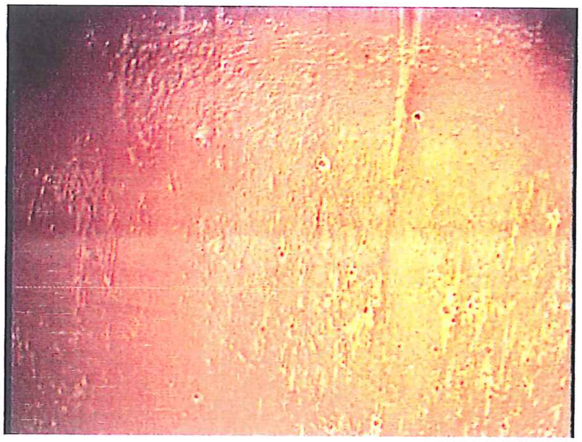


VS # 2: Roof plates with surface rust (Time: 02:36)



VS # 3: Dark iron staining on interior wall and blistering (Time: 05:12)

Connecticut Water Company **UCONN Tank**

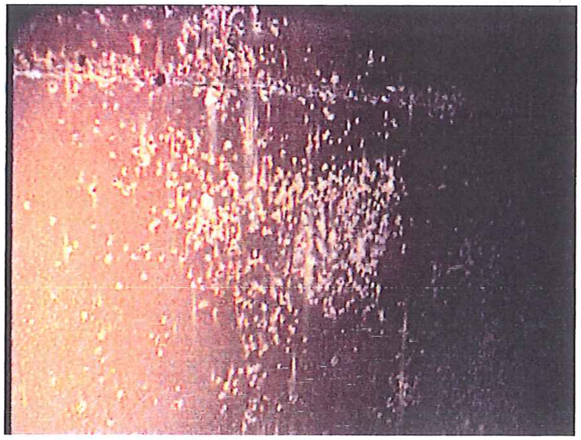


VS # 4: Areas with previous pitting on interior wall (Time: 05:21)

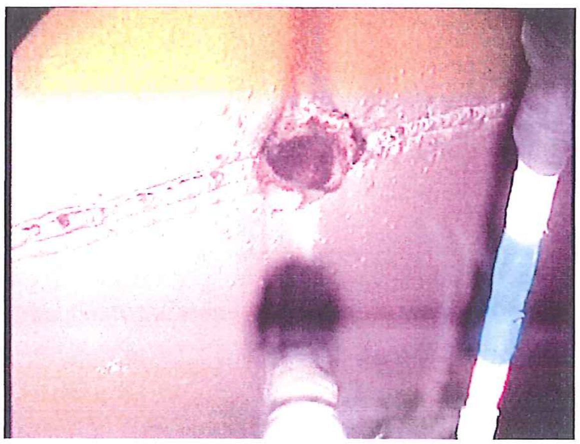
VS # 5: Corrosion cells on interior shell wall (Time: 06:44)

VS # 6: Corrosion cells along horizontal weld seam (Time: 08:18)

Connecticut Water Company **UCONN Tank**



VS # 7: Blistering on interior wall (Time: 11:30)



VS # 8: Corrosion cell before being brushed (Time: 16:26)

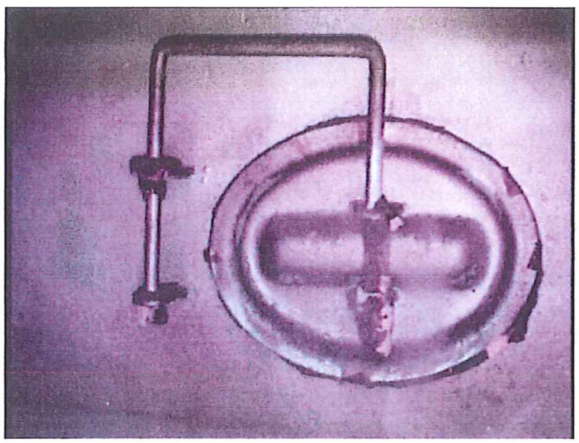
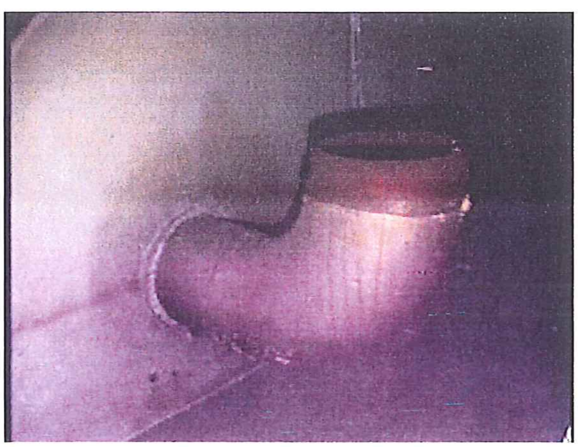
VS # 9: Corrosion cell after being brushed (Time: 17:08)

Connecticut Water Company **UCONN Tank**

VS # 10: Big corrosion cells along horizontal weld seam (Time: 19:29)

VS # 11: 1/8" of sediment on tank floor (Time: 28:08)

VS # 12: Blistering and corrosion on floor to shell seam (Time: 29:00)

Connecticut Water Company	**UCONN Tank**
	VS # 13: Corrosion cells on tank floor (Time: 29:27)
	VS # 14: Oval ground hatch with a swing arm (Time: 30:10)
	VS # 15: Inlet pipe (Time: 31:10)

Connecticut Water Company **UCONN Tank**

VS # 16: Outlet pipe (Time: 32:11)

APPENDIX B

Dry Film Thickness Readings

C.W.C Uconn Standpipe
D.F.T Readings

Batch 1 Shell

6000
S/N 56196

Batch1
Cal 2
2009/06/15
Probe Model: FS
Probe S/N: 37424

#	Reading	Time
1	16.8mils	09:49:16
2	18.2mils	09:49:19
3	16.5mils	09:49:22
4	17.3mils	09:49:25
5	14.0mils	09:49:28
6	12.6mils	09:49:31
7	18.4mils	09:49:42
8	9.7mils	09:49:44
9	10.7mils	09:49:47
10	14.5mils	09:49:49
11	14.8mils	09:49:52
12	13.0mils	09:49:55
13	23.4mils	09:49:58
14	10.2mils	09:50:01
15	16.8mils	09:50:04
16	13.5mils	09:50:08
17	9.8mils	09:50:11
18	10.4mils	09:50:15
19	11.6mils	09:50:23
20	12.7mils	09:50:25
21	9.5mils	09:50:28
22	11.6mils	09:50:31
23	9.5mils	09:50:33
24	11.3mils	09:50:36
25	8.6mils	09:50:39
26	11.6mils	09:50:41
27	13.9mils	09:50:44
28	12.7mils	09:50:47
29	17.7mils	09:50:50
30	17.8mils	09:50:53
31	15.8mils	09:50:55
32	15.9mils	09:50:57
33	19.3mils	09:50:59
34	15.5mils	09:51:01
35	20.6mils	09:51:25
36	12.4mils	09:51:27
37	16.4mils	09:51:29
38	12.2mils	09:51:31
39	18.2mils	09:51:35
40	15.5mils	09:51:37
41	17.7mils	09:51:39
42	14.0mils	09:51:41
43	20.0mils	09:51:44
44	12.1mils	09:51:46
45	17.7mils	09:51:48

#	45
↓	8.6mils
↑	23.4mils
$\bar{x}$	14.49mils
σ	3.48mils

Batch 2 Balcony

Batch2
Cal 2
2009/06/15
Probe Model: FS
Probe S/N: 37424

#	Reading	Time
1	17.9mils	10:51:41
2	18.4mils	10:51:43
3	15.6mils	10:51:45
4	12.6mils	10:51:47
5	14.9mils	10:51:50
6	19.6mils	10:51:52
7	15.2mils	10:51:54
8	15.8mils	10:51:56
9	13.7mils	10:51:58
10	16.1mils	10:52:01
11	16.5mils	10:52:03
12	12.5mils	10:52:06
13	19.1mils	10:52:09
14	15.1mils	10:52:11
15	14.1mils	10:52:14
16	14.9mils	10:52:17
17	17.5mils	10:52:20
18	14.5mils	10:52:22
19	15.6mils	10:52:26
20	17.1mils	10:52:28
21	11.6mils	10:52:31
22	15.9mils	10:52:34
23	17.0mils	10:52:38
24	17.0mils	10:52:40
25	20.6mils	10:52:43
26	15.3mils	10:52:46
27	20.0mils	10:52:50
28	19.7mils	10:52:53
29	3.2mils	10:52:58
30	0.15mils	10:53:02
31	29.5mils	10:53:04
32	1.85mils	10:53:07
33	1.75mils	10:53:09
34	21.1mils	10:53:11
35	21.2mils	10:53:14
36	20.0mils	10:53:17
37	21.3mils	10:53:21
38	19.0mils	10:53:24
39	16.1mils	10:53:36
40	18.1mils	10:53:39
41	22.9mils	10:53:42
42	12.1mils	10:53:46
43	13.3mils	10:54:01
44	15.6mils	10:54:04
45	13.5mils	10:54:07

#	45
↓	0.15mils
↑	29.5mils
$\bar{x}$	15.65mils
σ	5.50mils

Batch 3 Roof

Batch3
Cal 2
2009/06/15
Probe Model: FS
Probe S/N: 37424

#	Reading	Time
1	14.7mils	11:14:52
2	14.9mils	11:14:54
3	13.9mils	11:14:56
4	15.8mils	11:14:58
5	21.4mils	11:15:00
6	14.8mils	11:15:02
7	12.0mils	11:15:05
8	17.1mils	11:15:07
9	20.8mils	11:15:09
10	16.4mils	11:15:11
11	16.9mils	11:15:14
12	18.5mils	11:15:16
13	18.3mils	11:15:19
14	10.8mils	11:15:22
15	16.9mils	11:15:24
16	18.2mils	11:15:27
17	16.5mils	11:15:29
18	15.1mils	11:15:31
19	11.5mils	11:15:34
20	15.9mils	11:15:36
21	10.7mils	11:15:38
22	21.3mils	11:15:40
23	14.3mils	11:15:43
24	21.3mils	11:15:45
25	14.1mils	11:15:47
26	17.0mils	11:15:49
27	15.2mils	11:15:52
28	17.7mils	11:15:54
29	21.2mils	11:15:57
30	21.5mils	11:15:59
31	20.3mils	11:16:01
32	20.9mils	11:16:03
33	15.7mils	11:16:06
34	19.2mils	11:16:08
35	18.1mils	11:16:10
36	20.3mils	11:16:13
37	22.1mils	11:16:15
38	22.8mils	11:16:17
39	18.0mils	11:16:19
40	17.9mils	11:16:22
41	25.1mils	11:16:24
42	21.6mils	11:16:26
43	18.9mils	11:16:29
44	20.4mils	11:16:31
45	21.3mils	11:16:33

#	45
↓	10.7mils
↑	25.1mils
$\bar{x}$	17.72mils
σ	3.38mils

APPENDIX C
ASTM 3359 Adhesion
Test Procedures

Standard Methods for MEASURING ADHESION BY TAPE TEST[1]

This standard is issued under the fixed designation D 3359; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

These methods have been approved for use by agencies of the Department of Defense and for listing in the DoD Index of Specifications and Standards.

1. Scope

1.1 These methods cover procedures for assessing the adhesion of coating films to metallic substrates by applying and removing pressure-sensitive tape over cuts made in the film.

1.2 Method A is primarily intended for use at job sites while Method B is more suitable for use in the laboratory. Also, Method B is not considered suitable for films thicker than 5 mils (125 μm).

1.3 These methods are used to establish whether the adhesion of a coating to a substrate is at a generally adequate level. They do not distinguish between higher levels of adhesion for which more sophisticated methods of measurement are required.

1.4 In multicoat systems adhesion failure may occur between coats so that the adhesion of the coating system to the substrate is not determined.

2. Applicable Documents

2.1 *ASTM Standards:*

D609 Methods for Preparation of Steel Panels for Testing Paint, Varnish, Lacquer, and Related Products[2]

D823 Methods of Producing Films of Uniform Thickness of Paint, Varnish, Lacquer, and Related Products on Test Panels[2]

D1730 Recommended Practices for Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting[2]

D2092 Practices for Preparation of Zinc-Coated Steel Surfaces for Painting[2]

D3330 Test Method for Peel Adhesion of Pressure-Sensitive Tape of 180° Angle[3]

3. Summary of Methods

3.1 *Method A*—An X-cut is made in the film to the substrate, pressure-sensitive tape is applied over the cut and then removed, and adhesion is assessed qualitatively on the 0 to 5 scale.

3.2 *Method B*—A lattice pattern with either six or eleven cuts in each direction is made in the film to the substrate, pressure-sensitive tape is applied over the lattice and then removed, and adhesion is evaluated by comparison with descriptions and illustrations.

METHOD A—X-CUT TAPE TEST

4. Apparatus and Materials

4.1 *Cutting Tool*—Sharp razor blade, scalpel, knife or other cutting devices. It is of particular importance that the cutting edges be in good condition.

4.2 *Cutting Guide*—Steel or other hard metal straightedge to ensure straight cuts.

4.3 *Tape*—One-inch (25-mm) wide semitransparent pressure-sensitive tape with an adhesion strength of 40 ± 2.5 oz/in. (44.6 ± 2.8 g/mm) width when tested in accordance with Test Method D 3330. The adhesion shall not change by more than ± 6.5 % of its mean value within 12 months. The backing of the tape may consist of fiber-reinforced cellulose acetate,[4] unplasti-

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[1] These methods are under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings and Materials and are the direct responsibility of Subcommittee D01.23 on Physical Properties of Applied Paint Films.

Current edition approved March 25, 1983. Published July 1983. Originally published as D 3359 – 74. Last previous edition D 3359 – 78.

[2] *Annual Book of ASTM Standards*, Vol 06.01.

[3] *Annual Book of ASTM Standards*, Vol 15.09.

[4] Permacel 99 manufactured by Permacel, New Brunswick, NJ 08903, is reported to be suitable for the purpose. The manufacturer of the tape used in the interlaboratory study[5] has advised that as of September 1981 the properties of this tape are being changed. Users of its should, therefore, check whether current material gives comparable results to previous supplies."

cized poly(vinyl chloride), or polyester film.

4.4 *Rubber Eraser*, on the end of a pencil.

4.5 *Illumination*—A light source is helpful in determining whether the cuts have been made through the film to the substrate.

5. Test Specimens

5.1 When this method is used in the field, the specimen is the coated structure or article on which the adhesion is to be evaluated.

5.2 For laboratory use apply the materials to be tested to panels of the composition and surface conditions on which it is desired to determine the adhesion.

NOTE 1—Applicable test panel description and surface preparation methods are given in: Method D 609, Recommended Practice D 1730, and Practice D 2092.

NOTE 2—Coatings should be applied in accordance with Methods D 823, or as agreed upon between the purchaser and the seller.

NOTE 3—If desired or specified, the coated test panels may be subjected to a preliminary exposure such as water immersion, salt spray, or high humidity before conducting the tape test. The conditions and time of exposure will be governed by ultimate coating use or shall be agreed upon between the purchaser and seller.

6. Procedure

6.1 Select an area free of blemishes and minor surface imperfections. For tests in the field, ensure that the surface is clean and dry. Extremes in temperature or relative humidity may affect the adhesion of the tape or the coating.

6.2 Make two cuts in the film each about 1.5 in. (40 mm) long that intersect near their middle with a smaller angle of between 30 and 45°. When making the incisions, use the straightedge and cut through the coating to the substrate in one steady motion.

6.3 Inspect the incisions for reflection of light from the metal substrate to establish that the coating film has been penetrated. If the substrate has not been reached make another X in a different location. Do not attempt to deepen a previous cut as this may affect adhesion along the incision.

6.4 Remove two complete laps of the pressure-sensitive tape from the roll and discard. Remove an additional length at a steady (that is, not jerked) rate and cut a piece about 3 in. (75 mm) long.

6.5 Place the center of the tape at the intersection of the cuts with the tape running in the same direction as the smaller angles. Smooth the tape into place by finger in the area of the incisions and then rub firmly with the eraser on the end of a pencil. The color under the transparent tape is a useful indication of when good contact has been made.

6.6 Within 90 ± 30 s of application, remove the tape by seizing the free end and pulling it off rapidly (not jerked) back upon itself at as close to an angle of 180° as possible.

6.7 Inspect the X-cut area for removal of coating from the substrate or previous coating and rate the adhesion in accordance with the following scale:

5A No peeling or removal
4A Trace peeling or removal along incisions
3A Jagged removal along incisions up to 1/16 in. (1.6 mm) on either side
2A Jagged removal along most of incisions up to 1/8 in. (3.2 mm) on either side
1A Removal from most of the area of the X under the tape
0A Removal beyond the area of the X

6.8 Repeat the test in two other locations on each test panel. For large structures make sufficient tests to ensure that the adhesion evaluation is representative of the whole surface.

6.9 After making several cuts examine the cutting edge and, if necessary, remove any flat spots or wire-edge by abrading lightly on a fine oil stone before using again. Discard cutting tools that develop nicks or other defects that tear the film.

7. Report

7.1 Report the number of tests, their mean and range, and for coating systems, where the failure occurred that is, between first coat and substrate, between first and second coat, etc.

7.2 For field tests report the structure or article tested, the location and the environmental conditions at the time of testing.

7.3 For test panels report the substrate employed, the type of coating, the method of cure, and the environmental conditions at the time of testing.

8. Precision

8.1 In an interlaboratory study[5] of this method in which operators in six laboratories made one adhesion measurement on three panels each of three coatings covering a wide range of adhesion, the within-laboratories standard deviation was found to be 0.33 and the between-

[5] The report on which this precision statement is based has been filed at ASTM Headquarters, 1916 Race St., Philadelphia, Pa. 19103, as RR: D01-1008.

laboratories 0.44. Based on these standard deviations, the following criteria should be used for judging the acceptability of results at the 95 % confidence level:

8.1.1 *Repeatability*—Provided adhesion is uniform over a large surface, results obtained by the same operator should be considered suspect if they differ by more than 1 rating unit for two measurements.

8.1.2 *Reproducibility*—Two results, each the mean of triplicates, obtained by different operators should be considered suspect if they differ by more than 1.5 rating units.

METHOD B—CROSS-CUT TAPE TEST

9. Apparatus and Materials

9.1 *Cutting Tool*—Sharp razor blade, scalpel, knife or other cutting device having a cutting edge angle between 15 and 30° that will make either a single cut or several cuts at once. It is of particular importance that the cutting edge be in good condition.

9.2 *Cutting Guide*—If cuts are made manually (as opposed to a mechanical apparatus) a steel or other hard metal straightedge or template to ensure straight cuts.

9.3 *Rule*—Tempered steel rule graduated in 0.5 mm for measuring individual cuts.

9.4 *Tape*, as described in 4.3.

9.5 *Rubber Eraser*, on the end of a pencil.

9.6 *Illumination*, as described in 4.5.

9.7 *Magnifying Glass*—An illuminated magnifier to be used while making individual cuts and examining the test area.

10. Test Specimens

10.1 As described in Section 5.

11. Procedure

11.1 Where required or when agreed upon, subject the specimens to a preliminary test before conducting the tape test (see Note 3). After drying or testing, select an area free of blemishes and minor surface imperfections.

11.2 Place the panel on a firm base and under the illuminated magnifier make parallel cuts as follows:

11.2.1 For coatings having a dry film thickness up to and including 2.0 mils (50 µm) space the cuts 1 mm apart and make eleven cuts unless otherwise agreed upon.

11.2.2 For coatings having a dry film thickness between 2.0 mils (50 µm) and 5 mils (125 µm), space the cuts 2 mm apart and make six cuts. For films thicker than 5 mils use Method A.

11.2.3 Make all cuts about ¾ in. (20 mm) long. Cut through the film to the substrate in one steady motion using just sufficient pressure on the cutting tool to have the cutting edge reach the substrate. When making successive single cuts with the aid of a guide, place the guide on the uncut area.

11.3 After making the required cuts brush the film lightly with a soft brush or tissue to remove any detached flakes or ribbons of coatings.

11.4 Examine the cutting edge and, if necessary, remove any flat spots or wire-edge by abrading lightly on a fine oil stone. Make the additional number of cuts at 90° to and centered on the original cuts.

11.5 Brush the area as before and inspect the incisions for reflection of light from the substrate. If the metal has not been reached make another grid in a different location.

11.6 Remove two complete laps of tape and discard. Remove an additional length at a steady (that is, not jerked) rate and cut a piece about 3 in. (75 mm) long.

11.7 Place the center of the tape over the grid and in the area of the grid smooth into place by a finger. To ensure good contact with the film rub the tape firmly with the eraser on the end of a pencil. The color under the tape is a useful indiction of when good contact has been made.

11.8 Within 90 ± 30 s of application, remove the tape by seizing the free end and rapidly (not jerked) pulling it off at as close to an angle of 180° as possible.

11.9 Inspect the grid area for removal of coating from the substrate or from a previous coating using the illuminated magnifier. Rate the adhesion in accordance with the following scale illustrated in Fig. 1:

5B The edges of the cuts are completely smooth; none of the squares of the lattice is detached.
4B Small flakes of the coating are detached at intersections; less than 5 % of the area is affected.
3B Small flakes of the coating are detached along edges and at intersections of cuts. The area affected is 5 to 15 % of the lattice.
2B The coating has flaked along the edges and on parts of the squares. The area affected is 15 to 35 % of the lattice.
1B The coating has flaked along the edges of cuts in large ribbons and whole squares have detached. The area affected is 35 to 65 % of the lattice.
0B Flaking and detachment worse than Grade 1.

Classification of Adhesion Test Results

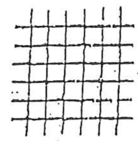
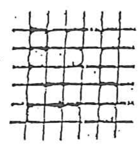
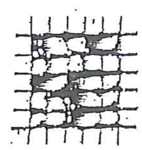
Classification	Surface of cross-cut area from which flaking has occurred. (Example for six parallel cuts)
5B	None
4B	
3B	
2B	
1B	
0B	Greater than 65%

FIG. 1 Classification of Adhesion Test Results

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

UNDERWATER SOLUTIONS INC.

INSPECTION AND CLEANING OF THE FENTON WELL FIELD
50,000-GALLON UNDERGROUND CONCRETE RESERVOIR

UNIVERSITY OF CONNECTICUT-FACILITIES MANAGEMENT UTILITIES
STORRS, CONNECTICUT

AUGUST 22, 2005

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UNDERWATER SOLUTIONS INC.

INSPECTION AND CLEANING OF THE FENTON WELL FIELD 50,000-GALLON UNDERGROUND CONCRETE RESERVOIR

UNIVERSITY OF CONNECTICUT-FACILITIES MANAGEMENT UTILITIES STORRS, CONNECTICUT

AUGUST 22, 2005

SCOPE:

On August 22, 2005, Underwater Solutions Inc. conducted an inspection of the Fenton Well Field 50,000-gallon underground concrete reservoir to provide information regarding the overall condition and integrity of this structure and removed the sediment accumulation found on the floor of the structure.

EXTERIOR INSPECTION:

The entire exterior of this water storage reservoir (and components) was inspected to include vents and hatches.

Vents

Two 8" inside diameter pipes exit the roof of this structure having 6" outside diameter screens securely in place. These 30" tall vent pipes are unobstructed and functioning as designed.

Hatches

The 23" inside diameter hatches have been upgraded since our prior inspection of May 17, 2000. The hatches now have 30" by 30" concrete trunks poured around the outer circumference of the original hatches and have locking aluminum hatch covers. All hatches remain excellent at this time.

INTERIOR INSPECTION:

The entire interior of this water storage reservoir (and components) was inspected to include sediment accumulations, floor, piping, walls and coating, overhead and aesthetic water quality.

Sediment Accumulations

A uniform layer of precipitate was found on all floor surfaces of this structure ranging from 1/2" to 1" in depth.

Upon completing this inspection, all floor surfaces were vacuumed.

Floor

After removing all precipitate, the concrete floor surfaces were inspected and found to be excellent. No indications of fatigue were witnessed while light staining exists throughout.

Piping

Within each cell a 48" by 48" by 6" sump has an 11" inside diameter pipe exiting its southernmost side. No obstructions were found within these pipes and no flow was occurring at the time of inspection.

Also found within each cell was an 8" inside diameter pipe penetration which consists of a (T) facing east and west. Each of these (T)'s enter the reservoir approximately 10" and sit approximately 5" above the floor. A diffuser wall causes flow to exit through cutouts measuring 20" by 4" when flow is entering this reservoir.

A 1/4" tube also enters this reservoir through the south wall of each chamber, 2" below the overhead. This tube extends down and terminates approximately 12" above the tank floor. No flow was occurring within this tube at the time of inspection.

Walls and Coating

All interior walls were inspected beginning at the floor and moving up to the water surface.

All concrete wall surfaces were found having a coating which has failed within the 36" working zone causing flaking and loss in numerous areas. This condition has no bearing on the integrity of these concrete walls as we found very sound concrete conditions and no indications of cracking, spall or other types of fatigue.

A light staining was witnessed on all wall surfaces below the working zone, yet no accumulation was found.

Overhead

The entire overhead was inspected from the water surface and was found in excellent condition. No cracking, spall or any types of concrete failure was witnessed.

Aesthetic Water Quality

The aesthetic water quality within this reservoir was found to be good. This condition allowed our visibility during this inspection to be unlimited.

CONCLUSION:

It is the opinion of Underwater Solutions Inc. that this water storage reservoir remains in good structural condition throughout.

All vents were found to be properly screened while the new hatch replacements are in very good working order and secured with locks.

We found all interior surfaces consistently in good condition and all piping unobstructed.

Upon completing this inspection, all floor surfaces were vacuumed.

As always, we recommend reinspection and cleaning of all water storage facilities in accordance with A.W.W.A. Standards and local guidelines.

Christopher A Cole

UNDERWATER SOLUTIONS INC.
Christopher A. Cole, Project Manager

UNDERWATER SOLUTIONS INC.

INSPECTION AND CLEANING OF THE BONE MILL ROAD 500,000-GALLON WELDED STEEL WATER STORAGE TANK

UNIVERSITY OF CONNECTICUT-FACILITIES MANAGEMENT UTILITIES STORRS, CONNECTICUT

SEPTEMBER 11, 2006

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UNDERWATER SOLUTIONS INC.

INSPECTION AND CLEANING OF THE BONE MILL ROAD 500,000-GALLON WELDED STEEL WATER STORAGE TANK

UNIVERSITY OF CONNECTICUT-FACILITIES MANAGEMENT UTILITIES STORRS, CONNECTICUT

SEPTEMBER 11, 2006

SCOPE:

On September 11, 2006, Underwater Solutions Inc. conducted an inspection of the Bone Mill 500,000-gallon welded steel water storage tank to provide information regarding the overall condition and integrity of this structure and removed the sediment accumulation found on the floor of the structure.

EXTERIOR INSPECTION:

The entire exterior of this water storage tank (and components) was inspected to include walls and coating, manway, ladder, overflow, roof, vent and hatch.

Walls and Coating

The exterior wall surfaces were inspected and found with very sound structural conditions.

All surfaces of these steel wall panels and welds remain well protected as good adhesion value of the coating system remains.

All surfaces of this structure have a moderate mildew accumulation at this time.

Manway

One 26" inside diameter manway penetration was inspected approximately 18" above the ground. This manway is securely bolted in place with (28) bolts and nuts. Mild corrosion was found on all hardware, yet this manway remains secure and free of leakage.

Ladder

A ladder begins approximately 12' above the ground and extends up to the rooftop properly and securely in place with three sets of welded standoffs. All surfaces of this ladder are well coated at this time.

Overflow

A 6" inside diameter overflow pipe exits the top wall panel 18" below the roof. This pipe extends out 20" away from the tank having a screen secured at its end.

Roof

The entire rooftop of this water storage tank was found with very sound conditions and with good coating adhesion an all surfaces. Mild chalking of these surfaces has occurred due to weathering of the coating.

Vent

The vent is located in the center of the domed rooftop having a 12" inside diameter and standing 24" tall. A 32" outside diameter cap is securely placed over this vent, yet there is not a screen in place.

Hatch

On 24" by 24" roof hatch provides good access to the tank interior through the roof. This hatch was found in good working order, yet unlocked upon our arrival.

Upon completing this inspection, a lock was installed.

INTERIOR INSPECTION:

The entire interior of this water storage tank (and components) was inspected to include sediment accumulations, floor, manway, piping, walls and coating, overhead, overflow and aesthetic water quality.

Sediment Accumulations

A uniform layer of precipitate was found on all floor surfaces of this structure averaging 1/4" in depth.

Upon completing this inspection, all floor surfaces were vacuumed.

Floor

After removing all precipitate, these steel floor panels were inspected and found with very good coating adhesion on all surfaces.

Manway

One round 26" inside diameter manway was inspected approximately 18" above the tank floor. This manway was found without leakage and with mostly good coating adhesion. Four 1/4" diameter coating blisters were found on the manway cap, yet no indications of metal fatigue were witnessed.

Piping

The inlet/outlet pipe is located 42" in from the tank wall penetrating the floor. This 12" inside diameter pipe stands 4" tall and was found completely unobstructed.

Walls and Coating

All interior wall surfaces were inspected beginning at the floor and spiraling the circumference up to the water surface.

The lowest row of wall panels and welds was found with very good coating adhesion on all surfaces protecting the steel.

The second, third and fourth rows of panels above the ground have indications of coating failure, as numerous coating blisters were found. At this time, approximately 20% of these surfaces yield coating blisters. Approximately 50% of these blisters have fractured causing exposure of the steel and mild pitting. At this time, pit depths of 1/16" exist on these surfaces.

The top wall panel was found with all coating in place while having very good adhesion value.

Overhead

The entire overhead of this water storage tank was inspected from the water surface. These overhead panels remain well protected as the coating system is intact and has good adhesion value. Mild rust staining was witnessed at the junction of the roof and walls bleeding down from the panel overlaps.

Overflow

The 6" inside diameter overflow penetration located within the top wall panel 18" below the roof enters the tank and turns and extends up towards the roof terminating 2" below the overhead. This pipe flares out to a 12" inside diameter at its end.

Aesthetic Water Quality

The aesthetic water quality within this tank was found to be good. This condition allowed our visibility during this inspection to be unlimited.

CONCLUSION:

It is the opinion of Underwater Solutions Inc. that this water storage tank remains in good condition while the interior coating system has begun to fail.

All exterior surfaces of this tank to include all affiliated components remain well coated.

We recommend that a screen be immediately placed over the vent preventing access to the tank interior.

The interior coating system on three rows of the wall panels yields extensive adhesion loss.

Numerous coating blisters on these panels have fractured causing mild fatigue (pitting) of the steel averaging 1/16" in depth.

We recommend that this structure be scheduled for a complete sandblasting and recoating within two years in an effort to prevent further deterioration of the steel and protect the present integrity.

Upon completing this inspection, all floor surfaces of this tank were vacuumed.

As always, we recommend re-inspection and cleaning of all water storage facilities in accordance with A.W.W.A. Standards and local guidelines.

UNDERWATER SOLUTIONS INC.
Christopher A. Cole, Project Manager

This report, the conclusions, recommendations and comments prepared by Underwater Solutions Inc. are based upon spot examination from readily accessible parts of the tank. Should latent defects or conditions which vary significantly from those described in the report be discovered at a later date, these should be brought to the attention of a qualified individual at that time. These comments and recommendations should be viewed as information to be used by the Owner in determining the proper course of action and not to replace a complete set of specifications. All repairs should be done in accordance with A.W.W.A Standards.

CAC/ljf

INSPECTION AND CLEANING OF THE CORRECTION FACILITY 750,000-GALLON WELDED STEEL WATER STORAGE TANK

UNIVERSITY OF CONNECTICUT-FACILITIES MANAGEMENT UTILITIES STORRS, CONNECTICUT

SEPTEMBER 11, 2006

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UNDERWATER SOLUTIONS INC.

INSPECTION AND CLEANING OF THE CORRECTION FACILITY 750,000-GALLON WELDED STEEL WATER STORAGE TANK

UNIVERSITY OF CONNECTICUT-FACILITIES MANAGEMENT UTILITIES STORRS, CONNECTICUT

SEPTEMBER 11, 2006

SCOPE:

On September 11, 2006, Underwater Solutions Inc. conducted an inspection of the Correction Facility 750,000-gallon welded steel water storage tank to provide information regarding the overall condition and integrity of this structure and removed the sediment accumulation found on the floor of the structure.

EXTERIOR INSPECTION:

The entire exterior of this water storage tank (and components) was inspected to include walls and coating, manway, ladder and safety cage, overflow, roof, vent and hatch.

Walls and Coating

The exterior wall surfaces were inspected and found with very good conditions.

This structure consists of seven rows of steel wall panels all having very good coating adhesion at this time.

A moderate mildew accumulation was found on all surfaces of this structure within the lowest 25' of the walls.

Manway

One 26" inside diameter round manway was inspected approximately 22" above the ground. All surfaces of this manway were found well coated and no leakage was occurring at the time of inspection.

Mild corrosion was found on twenty-eight nuts and bolts, which secure this manway in place.

Ladder and Safety Cage

A ladder and safety cage extend from 12' above the ground up to the rooftop supported with seven standoffs. This entire ladder is well coated at this time and remains securely in place.

Overflow

A 6" inside diameter overflow pipe exits the top wall panel 24" below the roof. This pipe extends 20" away from the tank and terminates with a screen secured at its end.

Roof

The entire rooftop of this water storage tank was found with very sound conditions and with very good coating adhesion on all surfaces.

Vent

The vent is located in the center of the domed rooftop having a 12" inside diameter and standing 24" tall.

A 32" outside diameter cap and screen are securely attached on top of this vent preventing access to the tank interior.

Hatch

A 32" by 32" hatch provides access through the roof to the interior of the tank. This hatch was found with the hinge pins missing and without a lock to secure it in place. All surfaces of this hatch were found well coated.

INTERIOR INSPECTION:

The entire interior of this water storage tank (and components) was inspected to include sediment accumulations, floor, manway, piping, walls and coating, overhead, overflow, center support column and aesthetic water quality.

Sediment Accumulations

A uniform layer of precipitate was found on all floor surfaces of this tank averaging 1/4" in depth.

Upon completing this inspection, all floor surfaces were vacuumed.

Floor

After removing all accumulated precipitate, these steel floor panels were inspected and found with very good coating adhesion.

A moderate staining exists on all floor panels as a result of the accumulated precipitate.

Manway

One round 26" inside diameter manway was inspected 22" above the floor. This manway was found securely in place, free of leakage and with good coating adhesion on all surfaces.

Piping

A 10" inside diameter flush penetration within the floor was inspected approximately 48" in from the wall. The 6" tall by 14" inside diameter mud ring was found dislodged and laying on the floor.

Upon completing this project, the mud ring was reinserted into the floor penetration.

Walls and Coating

All interior wall surfaces were inspected beginning at the floor and spiraling the circumference up to the water surface.

The lowest row of wall panels was found with poor coating adhesion causing blistering of the coating on 10% of these surfaces. Approximately 85% of these coating blisters have ruptured, exposing the steel. Pitting of the steel averaging 1/16" in depth was found in each area where a coating blister has fractured.

All remaining six rows of wall panels extending up to the overhead were found with very good coating adhesion protecting the steel panels.

Some mild rust staining bleeds down into the top row of wall panels coming from behind the painters ring due to some flaky rusting on the ring.

Moderate staining was found on all interior surfaces extending from 30' below the roof down to the floor.

Overhead

The entire overhead of this water storage tank was inspected from the water surface. All overhead panels remain with very sound conditions, while having good coating adhesion. The angle iron supports were found with blotch rusting showing throughout the coating on approximately 5% of all surfaces.

Overflow

The 6" inside diameter overflow pipe enters the tank wall approximately 24" below the roof at an angle. This pipe extends approximately 18" and terminates 4" below the roof.

Center Support Column

A center support column extends from the overhead down to the floor consisting of two 13" wide channel beams welded together. This column extends down and terminates at the floor atop an 8" tall by 30" by 30" welded footer made from 8" wide channel beams. This entire column was found with very sound conditions, while having coating blisters on approximately 5% of its surfaces throughout its length.

Aesthetic Water Quality

The aesthetic water quality within this tank was found to be good. This condition allowed our visibility during this inspection to be unlimited.

CONCLUSION:

It is the opinion of Underwater Solutions Inc. that this water storage tank remains in good condition.

The exterior wall surfaces and overhead were found with very good coating adhesion protecting the steel substrate.

All components also remain well coated and properly in place, while the hatch requires repair.

The hinge pins are missing from this hatch allowing it to be removed. We recommend repairing the hinge pins preventing access.

The interior of the tank remains with mostly good coating adhesion protecting these surfaces.

The lowest row of wall panels and the center support column were found with coating blisters and some exposed steel causing pitting.

We recommend scheduling this structure for a complete coating rehabilitation within 2 to 3 years in an effort to prevent further fatigue of the steel.

Upon completing this inspection, all floor surfaces were vacuumed.

As always, we recommend re-inspection and cleaning of all water storage facilities in accordance with A.W.W.A. Standards and local guidelines.

Christopher A. Cole

UNDERWATER SOLUTIONS INC.
Christopher A. Cole, Project Manager

This report, the conclusions, recommendations and comments prepared by Underwater Solutions Inc. are based upon spot examination from readily accessible parts of the tank. Should latent defects or conditions which vary significantly from those described in the report be discovered at a later date, these should be brought to the attention of a qualified individual at that time. These comments and recommendations should be viewed as information to be used by the Owner in determining the proper course of action and not to replace a complete set of specifications. All repairs should be done in accordance with A.W.W.A Standards.

CAC/hmp

EARTH TECH | AECOM

Report

Preliminary Design Report
Demolition of Existing Water Storage Tanks and Construction of New Water Storage Tank

Project No. BI-901311

University of Connecticut
Storrs, Connecticut

Prepared for:

Office of Capital Projects and Contract Administration
University of Connecticut
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Prepared by:

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PROFESSIONAL ENGINEER

12-1-08

December 2008

J.N. 106018

EARTH TECH | AECOM

PRELIMINARY DESIGN REPORT

DEMOLITION OF EXISTING WATER STORAGE TANKS AND CONSTRUCTION OF NEW WATER STORAGE TANK

PROJECT NO. BI-901311

UNIVERSITY OF CONNECTICUT
STORRS, CONNECTICUT

Prepared for:

Office of Capital Projects and Contract Administration
University of Connecticut
31 LeDoyt Road, Unit 3047
Storrs, CT 06269-3047

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December 1, 2008

Mr. James M. Pietrzak, PE CHMM
Senior Project Manger
Architectural and Engineering Services
University of Connecticut
31 LeDoyt Road, Unit 3038
Storrs, CT 06269-3047

Subject: Preliminary Design Report
Water Tank Replacement
Project No. BI-901311
Storrs, Connecticut

Dear Mr. Pietrzak:

We are pleased to submit, for your use, the Preliminary Design Report (PDR) presenting the preliminary design of the water tank replacement at the University of Connecticut Storrs Campus. We look forward to reviewing this document and its contents with you. This report will be used as the basis for our final design and for the preparation of detailed Contract Drawings and Specifications required for the construction of this facility

If you have any questions regarding this report, please contact the undersigned at your earliest convenience.

Very truly yours,

Dennis G. Setzko, P.E.
Senior Project Director

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EXECUTIVE SUMMARY

This Preliminary Design Report (PDR) includes preliminary design background for the demolition of the two smaller and older water storage tanks and the construction of a new welded steel water storage tank at the University of Connecticut, Storrs campus. The new 1 MG water storage tank is proposed to be constructed at the site of the existing water storage tanks and will be approximately 45 feet in diameter with a sidewall height of 85’-3” duplicating the dimensions of the existing 1 MG water storage tank slated to remain in service.

The proposed water storage tank will be constructed to meet the design criteria established by the American Water Works Association, the Connecticut Department of Public Health, and the 2005 Connecticut State Building Code.

Based upon the subsurface geotechnical investigations completed to date, it is anticipated that the proposed water tank will be founded upon a shallow reinforced concrete foundation.

More details regarding the design of the facility are presented within the PDR.

Earth Tech developed an opinion of probable construction costs for the project to be used for budgetary purposes, and is estimated to range from $1,680,000 to $2,052,000 including an allowance for construction contingency.

It should be noted that the American Association of Cost Engineers has defined levels of accuracy that are commonly used by professional cost estimators. Three categories of accuracy include: (1) order-of-magnitude, (2) budget, and (3) definitive estimates. The estimates of cost presented are considered order-of- magnitude, and were developed based on the preliminary information presented in this PDR.

1.0 INTRODUCTION

A. GENERAL

The University of Connecticut water distribution system is currently served by three steel water storage standpipes with capacities of 1 million gallons (MG), 600,000 gallons, and 300,000 gallons respectively. The 1 MG tank was constructed in 1955 and the two smaller tanks that utilize riveted steel plate construction were built in the early part of the twentieth century. This project proposes to demolish the two smaller and older water storage tanks and replace them with one new welded steel water storage standpipe with a capacity of 1 MG. The new tank is proposed to be the same diameter and height as the remaining existing standpipe but will be constructed to meet current codes and regulations.

B. OBJECTIVES

This preliminary design report (PDR) presents the criteria to be used for the final design of the water storage tank. The PDR summarizes the basis of design and operation of the proposed water storage tank. The following design considerations were evaluated:

- Site layout;
- Coordination with existing facilities;
- Estimate of the capital construction costs.

C. PERMITS

Table 1-1 lists the permits and/or approvals required to construct the proposed water storage facility:

TABLE 1-1
REQUIRED PERMITS AND APPROVALS

Permit/Approval	Regulating Agency
Final Design Drawings and Specifications	Connecticut Department of Public Health
Demolition Permit	Town of Mansfield
Building Permits	University of Connecticut, Office of Fire Marshall and Building Inspector and Office of the State Building Inspector
Notice of Proposed Construction or Alteration (Form 7460-1)	U.S. Federal Aviation Administration

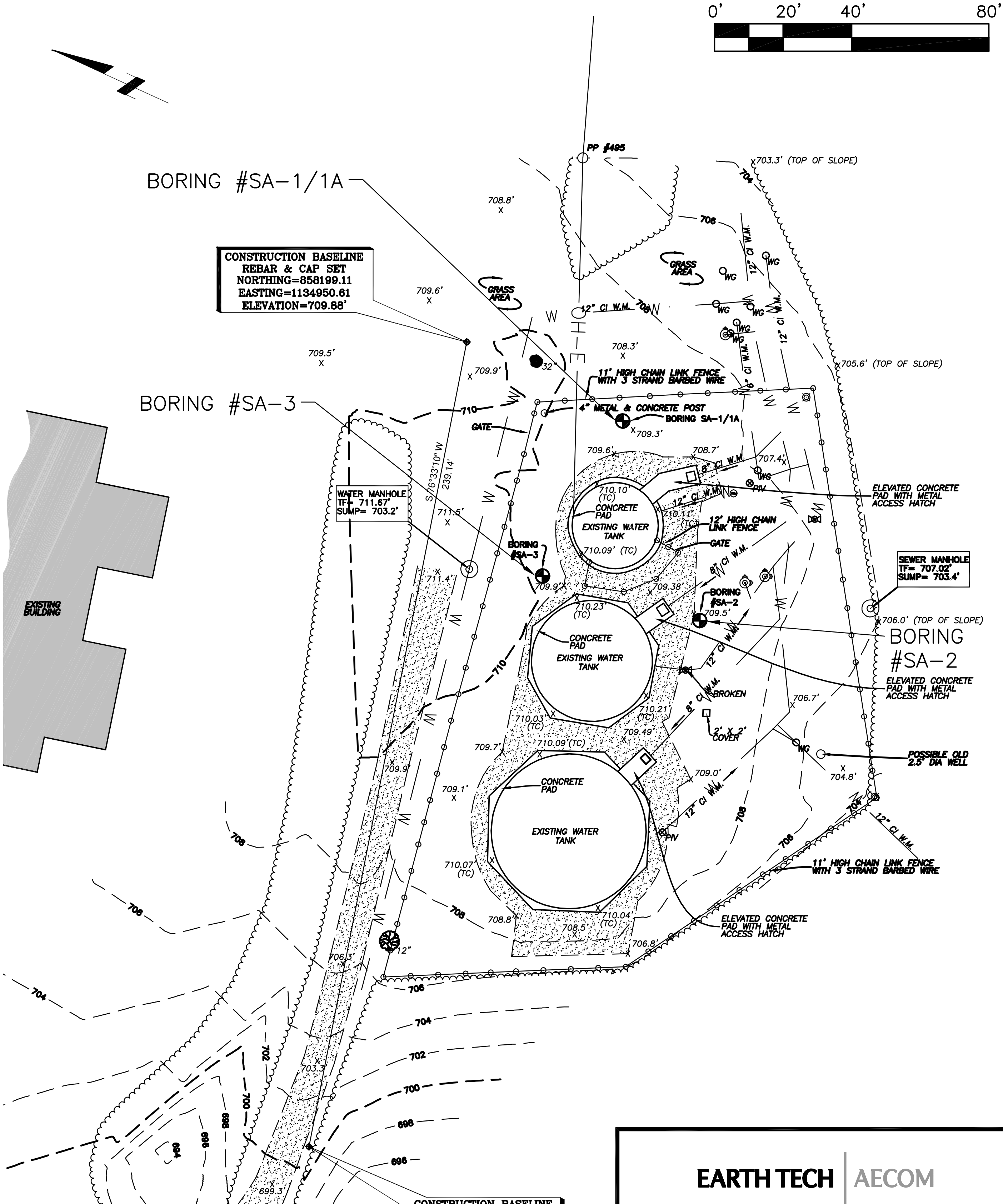
2.0. SUBSURFACE INVESTIGATION

A. INTRODUCTION

Seaboard Drilling ("Drillers") of Springfield, Massachusetts performed three soil borings at the Water Tank Site on September 10 through 12, 2008 under the direction of Stephens Associates, the geotechnical sub-consultant. The Drillers advanced Borings SA-1, SA-2, and SA-3 to depths of about 46, 74, and 44 ft. below ground surface ("BGS"), respectively, using a truck-mounted drill rig and wash boring techniques. Subsurface conditions in these borings generally consisted of about 4 ft. of sand fill overlying dense to very dense glacial till consisting of sand with varying proportions of silt and gravel. Water levels were measured at about 8 to 10 ft. below ground surface inside the drilling casing at the end of drilling; however, the drilling technique added water to the borings.

The geotechnical laboratory investigation is currently ongoing. Once completed, Stephens Associates will complete a geotechnical report which will provide shallow foundation design parameters and construction considerations be utilized for the structural design of the facility.

Figure 2-1 shows the locations of the boring locations as recorded by the project surveyor Gesick and Associates. Draft boring logs showing specific information at the actual boring locations are provided in Appendix A.



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BORING LOCATION PLAN

Demolition of Existing Water Storage Tank and Construction of New Water Storage Tank

UNIVERSITY OF CONNECTICUT
STORRS, CONNECTICUT

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE NO.
	RMB	106018	DEC. 2008	2-1

3.0. DESIGN CRITERIA

A. FACILITY DESIGN

The new 1 MG water storage tank and its appurtenances will be designed and constructed in conformance with the following codes and standards:

- AWWA Standard D100-05, Welded Carbon Steel Water Tanks for Water Storage;
- AWWA Standard D102-06, Coating Steel Water-Storage Tanks;
- AWWA Standard D652-02, Disinfection of Water-Storage Facilities;
- Guidelines for the Design and Operation of Public Water System Treatment, Works, and Sources, State of Connecticut Department of Public Health Water Supplies Section
- State of Connecticut 2005 State Building Code which includes,
  - 2003 International Building Code
  - 2003 International Existing Building Code
  - 2003 International Mechanical Code
  - 2003 International Plumbing Code
  - 2003 International Energy Conservation Code (re-adopted with changes)
  - ICC/ANSI A117.1-2003 Accessible and Usable Buildings and Facilities
  - 2005 Connecticut Supplement
- 2005 National Electrical Code (NFPA-70)

The new tank is proposed to be the same diameter and height as the remaining existing standpipe but will be constructed to meet current codes and regulations. The hydraulic grade line in the new tank will be identical to the hydraulic grade line in the existing tanks that it will replace.

The water storage tank foundation reinforced concrete design will be in accordance with ACI 318, Building Code Requirements for Structural Plain Concrete. Concrete design strength will be 4,500 psi and reinforcement will conform to American Society of Testing and Materials (ASTM) A615 grade 60 deformed bars. Design live loads will meet the 2005 Connecticut Building Code and operational requirements. Design conditions will include snow, wind, earthquake, earth pressure and operational loads including fluid pressures and equipment loads. Concrete work will be performed in accordance with ACI 301, Specifications for Structural Concrete.

4.0 WATER STORAGE TANK FACILITY DESCRIPTION

A. SITE DEVELOPMENT

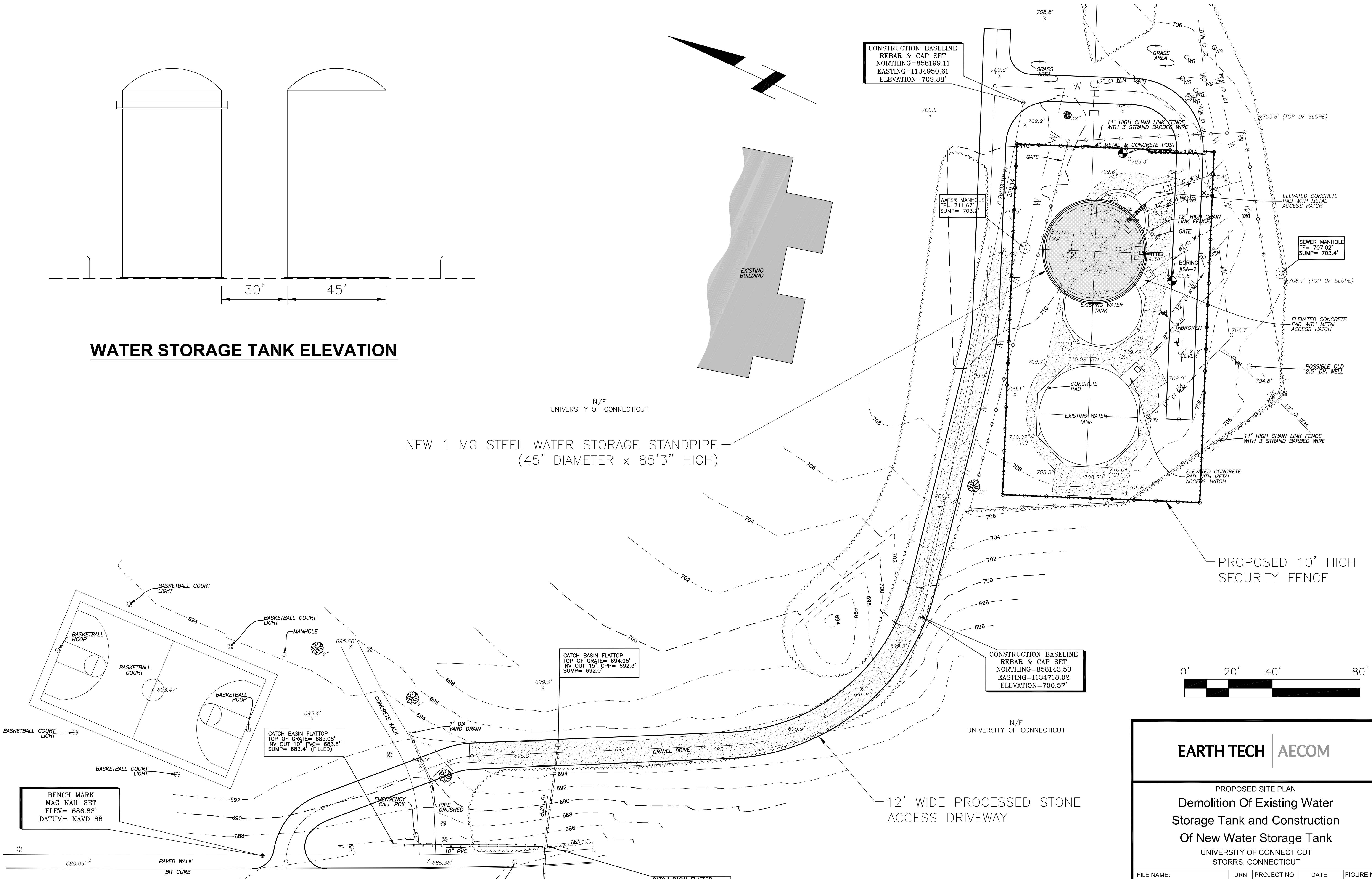
The new 1 MG water will be constructed approximately 30 feet to the east of the existing 1 MG storage tank that will remain as indicated in Figure 4-1. The tank will be connected to the existing supply and discharge pipes that serve the existing 600,000 gallon tank. The top of the foundation of the new tank will match the foundation elevation of the existing tanks. The existing vegetation to the west and south of the tanks will be cut back approximately 20 feet to allow for replacement of the fence, site drainage and grading. A new ten foot high chain link fence will be installed around the tank site with a new gate. A processed stone driveway will be provided from the water storage tank site to Tower Loop Road in order to provide for all weather access to the tanks for maintenance and security. Landscaping will consist of the loaming and seeding of areas disturbed by construction that are not specified to receive some other type of surface treatment.

B. EXISTING TANK DEMOLITION

The existing 300,000 and 600,000 gallon water storage tanks are to be withdrawn from service and demolished prior to construction of the new 1 MG tank in order to make room for the new tank. The existing tanks will be drained and disconnected from the water distribution system by cutting and plugging the existing supply and discharge pipes to the tanks. In order to protect the remaining water storage tank from damage, the existing tanks will need to be demolished by flame cutting them into pieces in place and lowering the pieces to the ground by crane. The tank pieces will be further cut up for transport, loaded on to trailers, and removed from the site. The concrete tank foundations will be demolished by an excavator mounted demolition hammer and removed from the site. Testing is underway to characterize the presence and levels of lead paint and asbestos at the existing tank site. Additionally, the existing electrical conduits, valves, piping, equipment, and accessories associated with the two tanks will be demolished and removed from the site.

C. WATER STORAGE TANK FEATURES AND ACCESSORIES

The proposed tank will have a diameter of approximately 45 feet and a sidewall height of approximately 85 feet and it will be provided with a domed steel roof. Additional features of the tank are included in Table 4-1 below.



EARTH TECH | AECOM

PROPOSED SITE PLAN

Demolition Of Existing Water Storage Tank and Construction Of New Water Storage Tank

UNIVERSITY OF CONNECTICUT
STORRS, CONNECTICUT

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE NO.
	RMB	106018	DEC. 2008	4-1

TABLE 4-1
WATER STORAGE TANK FEATURES AND ACCESSORIES

Item	**Description**
Inlet Connection	12 inch diameter connected to tank bottom; a precast concrete underground valve vault will be provided for the check valve, isolation valves, and sample taps. An emergency fill connection will be provided. Internal tank piping will be installed to provide mixing within the tank.
Outlet Connection	12 inch connected to tank bottom, provided with 8 inch high removable silt stop; a precast concrete underground valve vault will be provided for the check valve, isolation valves, and sample taps.
Drain Connection	A fire hydrant will be provided at the tank site to provide for draining the tank for maintenance.
Overflow	An exterior weir box will be provided along with an exterior overflow pipe attached to the tank side and extended to within 24” of ground; a 24-mesh stainless steel outlet screen will be provided. Splash protection will be provided at the base of the overflow. The overflow will be of sufficient diameter to permit overflow of water at a rate in excess of the maximum storage tank fill rate.
Vent	Provide with a stainless steel screen designed to prevent the entrance of birds, animals and insects. The standpipe will be provided with a fail safe automatically resetting pressure-vacuum relief vent to protect the tank in the event of a clogged vent screen.
Roof Hatches	Three 30 inch square access hatches will be provided; All roof hatches will be provided with a minimum 4 inch high curb, 2 inch curb overlap, and be sealed water tight.
Shell Manholes	Provide 3 - 36 inch diameter water tight manholes spaced evenly around the tank with hinged access covers

TABLE 4-1 (Continued)
WATER STORAGE TANK FEATURES AND ACCESSORIES

Item	Description
Outside Tank Access Ladder	Provide for tank access from a point 8 feet above tank bottom to the roof. Access ladder shall incorporate a lockable entrance, fall protection cage at junction with roof ladder, fall prevention harness and track and shall comply with OSHA standards.
Roof Ladder	Access to the roof hatches and vents to be provided and shall include, as a minimum, handrails with safety harness attachment hardware and non-skid surfaces.
Tank Instrumentation and Sampling	Provisions for a tank level pressure gage, and a tank level indicator/transmitter will be contained in the underground tank piping vault. A Kupferle Model 88 sampling box will be provided for water quality monitoring.
Antennae	Provisions will be made for the future addition of antennae to the new tank.
Lighting	No airspace obstruction lighting, tank mounted security lighting, or feature lighting will be provided.

D. ELECTRICAL AND INSTRUMENTATION DESIGN

The electrical design for the project will comply with the 2005 National Electric Code (NFPA-70) and all state and local codes. Presently the tank level controls are connected to the 1 MG tank that is slated to remain and these controls will remain in service.

5.0 COST ESTIMATE

A. WATER STORAGE TANK COSTS

Our estimates of probable project cost are for planning purposes only and should be re-evaluated prior to appropriating funds for the actual construction of the project. The opinion of probable construction costs is estimated to range from $1,680,000 to $2,052,000.

The opinion of probable construction costs are shown in the following Table 5-1.

TABLE 5-1
OPINION OF PROBABLE CONSTRUCTION COSTS

Item	Description	Cost
1.	1 MG Welded Steel Standpipe	$ 1,200,000
2.	Steel Standpipe Foundation	$ 240,000
3.	Process Piping	$ 75,000
4.	Existing Tank Demolition and Disposal	$ 100,000
5.	Site Clearing, Grading and Restoration	$ 20,000
6.	Access Driveway	$ 10,000
7.	Site Fencing and Gates	$ 50,000
	Sub-Total	$ 1,695,000
	Contingency (10%)	$ 170,000
	Total	**$ 1,865,000**

It should be noted that the American Association of Cost Engineers has defined levels of accuracy that are commonly used by professional cost estimators. Three categories of accuracy include: (1) order-of- magnitude, (2) budget, and (3) definitive estimates. The estimates of cost presented are considered order-of-magnitude, and were developed on the preliminary information presented in this PDR.

Appendix F
Water Transmission and Distribution System Mains

University of Connecticut
Job No. 1958-31
Water Main Pipe Inventory

			Length		Condition
TRANSMISSION SYSTEMS					
Willimantic Wellfield Transmission Main	CLDI	16"	21,560	1972	Fair
Willimantic Wellfield Transmission Main	CLDI	16"	2,200	Portion Replaced in 2006	Good
Fenton River Wellfield Transmission Main	CI	12"	3,374	1954	Good
Fenton River Wellfield Transmission Main	CL-CI	12"	6,800	Portion CL in 1989	Good
DISTRIBUTION SYSTEM					
Main Campus					
LINE A	DI	20"	592	2003	Excellent
High Pressure Line to Charter Oak Apartments	DI	16"	1,412	2003	Excellent
	DI	12"	1,638	2003	Excellent
	DI	8"	478	2003	Excellent
	DI	6"	52	2003	Excellent
LINE B	CI	20"	1,111	1950s	Fair
From High Head Pump Station	CI	16"	579	1950s	Fair
	CI	12"	658	1950s	Fair
No. Eagleville Road - Newer Line	CI	10"	879	1950s	Fair
	DI	10"	2,436	1985	Good
	DI	10"	2,219	2000	Excellent
LINE C	DI	12"	2,840	2004-05	Excellent
High Pressure Towers Loop - Fire & Domestic Combined					
From Towers Loop Pump Station					
LINE D	CI	12"	2,000	1920s	Unknown
Storrs Road - Old Line	CI	10"	394	1920s	Unknown
8" portion in Storrs Road to Mansfield Road	CI	8"	1,946	1920s	Unknown
Mansfield Road to So. Eagleville Road	CI	8"	6,450	1950s	Fair
LINE E	CI	6"	4,796	1920s	Unknown
North Eagleville Road - Old Line					
LINE F	CI	12"	1,252	1920s	Unknown
Connects Line D and Line H	DI	8"	323	2003	Good
	Transite	8"	574	late 1950s-early 1960s	Fair
LINE G	CI	12"	1,431	1920s	Unknown
Gravity Feed to Bio 4 & Horsebarns	CI	10"	5,313	1920s	Abandoned
LINE H	CI	8"	5,895	1940s	Unknown
	DI	8"	2,577	2003	
LINE J	DI	10"	842	1999	Excellent
	CI	10"	890	1996	Excellent
LINE K	CLDI	12"	4,772	1999/2000	Excellent
"Express" - Dedicated Line to South Campus Chiller Station					
LINE L1	CI	6"	170	1920s	Unknown
LINE L2	Steel	12"	800	1999-2000	In tunnel
	DI	12"	620	2000	Excellent
LINE L3	CI	8"	3,104	1920s	Unknown
Includes connection to Line D					
LINE M	DI	8"	938	1999	Excellent
From Chiller Station servicing South Campus Residence Halls					
LINE N	CI	8"	1,958	1960s	Good
Service to Hilltop Apartments	DI	8"	3,813	2003	Excellent
LINE P	DI	8"	1,590	1992-1996	Good
LeDoyt Road - WPCA					
LINE Q	DI	16"	1,531	2010	Excellent
North Eagleville Road - New Line installed					
Hunting Lodge Road - North to Holinko	DI	8"	3,600	1991	Good
Hunting Lodge Road - South	DI	6"	1,485	1991	Good
Connection from LINE G to LINE D	CI	10"	453	1950s	Fair
Connection from LINE D to LINE H (Bolton Road)	DI	8"	393	2003	Excellent
Service to Post Office (in road)	DI	8"	496	1974-75	Fair

University of Connecticut
Job No. 1958-31
Water Main Pipe Inventory

			Length		Condition
Hillside Circle	Transite	8"	2,124	late 1950s - early 1960s	Fair
Eastwood Road	CI	8"	1,160	late 1950s - early 1960s	Fair
Westwood Road	CI	8"	1,245	late 1950s - early 1960s	Fair
Willowbrook Road	CI	6"	2,200	1920s - 1930s	Unknown
	DI	4"	210	2005	Excellent
Meadowood Road	DI	10"?	2,250	2000-2006 (Approx. - No Mapping)	Excellent
Northwood Road (University land)	DI	8"?	700	2000-2006 (Approx.-Incomplete Mapping)	Excellent
DISTRIBUTION SYSTEM					
Depot Campus					
Line A - Transmission	DI	8"	209	Unknown	Unknown
Line to Main Campus	DI	10"	228	Unknown	Unknown
	DI	12"	125	Unknown	Unknown
	DI	14"	175	Unknown	Unknown
	DI	16"	10,697	Unknown	Unknown
Line A Laterals	CI	8"	198	Unknown	Unknown
	CI	8"	148	Unknown	Unknown
	CI	8"	91	Unknown	Unknown
	CI	8"	137	Unknown	Unknown
	CI	8"	96	Unknown	Unknown
	CI	12"	267	Unknown	Unknown
Line B					
From valve pit/chem house	CI	10"	3,500	Unknown	Unknown
0.75 MG tank	CI	8"	2,725	Unknown	Unknown
Line C	CI	8"	652	Unknown	Unknown
	CI	6"	433	Unknown	Unknown
	CI	4"	527	Unknown	Unknown
Line C Laterals					
Wayside	CI	?	163	Unknown	Unknown
Greenlawn	CI	?	388	Unknown	Unknown
Woodside & Hilltop	CI	?	546	Unknown	Unknown
Woodside & Hilltop	CI	4"	198	Unknown	Unknown
Woodside & Hilltop	CI	8"	134	Unknown	Unknown
Poultry Plant	CI	?	734	Unknown	Unknown
Hillside 1 and 2	CI	?	123	Unknown	Unknown
Loop D		8"	1,102	Unknown	Unknown
		6"	2,617	Unknown	Unknown
		10"	2,118	Unknown	Unknown
		?	823	Unknown	Unknown
Loop D Laterals					
misc laterals		8"	2,019	Unknown	Unknown
misc laterals		?	3,560	Unknown	Unknown
misc laterals		6"	1,715	Unknown	Unknown
misc laterals		10"	864	Unknown	Unknown
misc laterals		4"	159	Unknown	Unknown
misc laterals		2.5"	182	Unknown	Unknown
Misc. Lines		10"	5,031	Unknown	Unknown
		16"	1,547	Unknown	Unknown
		2"	769	Unknown	Unknown
		?	9,364	Unknown	Unknown
		8"	5,685	Unknown	Unknown
Misc. Laterals					
misc laterals		?	3,811	Unknown	Unknown
misc laterals		8"	3,755	Unknown	Unknown
misc laterals		4"	1,813	Unknown	Unknown
misc laterals		6"	585	Unknown	Unknown
misc laterals		2"	468	Unknown	Unknown
From 0.5 MG tank		?	485	Unknown	Unknown
Depot Road to Railroad Crossing	DI	?	1,200	Unknown	Unknown
TOTAL TRANSMISSION (FEET)			*33,934*		
TOTAL TRANSMISSION (MILES)			*6.43*		
TOTAL DISTRIBUTION & LATERALS (FEET)			*157,355*		
TOTAL DISTRIBUTION & LATERALS (MILES)			*29.80*		

Appendix G
Ground Water Under the Direct Influence Correspondence

STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC HEALTH AND ADDICTION SERVICES

QUI TRANSTULIT SUSTINET

July 27, 1995

Mr. Stefan Wawzyniecki, Jr.
Chemical Health & Safety Mgr.
University of Connecticut
Environmental Health and Safety
189 Auditorium Road
Room 219, U-97
Storrs, CT 06269-3097

RE: Fenton River Wellfield-Evaluation of Groundwater Under the Direct Influence of Surface Water Demonstration Study

Dear Mr. Wawzyniecki:

I have evaluated all the detailed data submitted by the University of Connecticut to determine whether the Fenton River wells are under the direct influence of surface water. The evaluation included a review of historical water quality data, the Step 2 Sampling Program including quarterly microscopic particulate analysis (MPA) from Fenton River Wells A, B, and C; weekly physical analyses from Fenton River Wells A, B, and C and the Fenton River; construction records and physical features of Wells A, B, and C; Level B aquifer mapping data, and a site survey of the Fenton River wellfield.

The historical water quality data provided by the University of Connecticut is satisfactory. The weekly physical analyses (pH, color, temperature, turbidity) of the wells and the Fenton River differ in composition and do not indicate a direct influence exists between the entities.

The quarterly microscopic particulate analysis (MPA) of samples from the wells were typically characteristic of groundwater according to submitted reports by Northeast Laboratories, Inc. and Analytical Services, Inc. The MPA analyses were evaluated under the criteria set forth by the EPA document "Consensus Method for Determining groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA)". While some particulate matter (algae, diatoms) was detected in the first quarterly sample at Well C, this sample is considered an anomaly which could have resulted from either sample collection and/or laboratory error. An additional quarterly sample was required during the same seasonal time of year at this source and no evidence of any surface water indicators was detected. All other quarterly MPA samples at all three Fenton River wells had no particulate matter associated with surface water detected. No Giardia, Cryptosporidium, or any other high risk organisms were detected in any of the samples.

Phone:
Telephone Device for the Deaf (203) 566-1279
150 Washington Street — Hartford, CT 06106
An Equal Opportunity Employer

The aquifer in which the Fenton River wellfield is located is well documented as a stratified drift aquifer consisting of sand, gravel, and some clays. Well construction logs for production and test wells and data obtained from the Level B aquifer mapping project were all reviewed to evaluate well construction and geologic features of the aquifer. These records all indicate proper well construction and good natural filtration materials provided by the geologic features of the aquifer.

The data presented by the Environmental Health and Safety Office of the University of Connecticut does not show evidence that the groundwater from Fenton River Wells A, B, and C is under the direct influence of surface water. Therefore, filtration is not required for the Fenton River wellfield at this time. This assessment does not preclude a future determination of potential direct surface water influence, should any of the previously mentioned factors change or additional factors become relevant. This section will continue to review your routine compliance reports for any such indications and notify you if any possible concerns ever arise.

Thank you for your completion of this arduous groundwater determination study at the University of Connecticut.

Sincerely,

Steve Messer
Sanitary Engineer III
Water Supplies Section

SM/ml
cc: Earl Eldredge, Facilities Mgmt.
University of CT
189 Auditorium Road, Bx. U-38
Storrs, CT 06269-3038

FentonRv

STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC HEALTH AND ADDICTION SERVICES

July 28, 1995

Mr. Stefan Wawzyniecki, Jr.
Chemical Health & Safety Mgr.
University of Connecticut
Environmental Health and Safety
189 Auditorium Road
Room 219, U-97
Storrs, CT 06269-3097

RE: Willimantic River Wellfield-Evaluation of Groundwater Under the Direct Influence of Surface Water Demonstration Study

Dear Mr. Wawzyniecki:

I have evaluated all the detailed data submitted by the University of Connecticut to determine whether the Willimantic River wells are under the direct influence of surface water. The evaluation included a review of historical water quality data, the Step 2 Sampling Program including quarterly microscopic particulate analysis (MPA) from Willimantic Rivers Wells #1 and #2; weekly physical analyses from Willimantic River Wells #1 and #2 and the Willimantic River; construction records and physical features of Wells #1 and #2; Level B aquifer mapping data, and a site survey of the Willimantic River wellfield.

The historical water quality data provided by the University of Connecticut is satisfactory. The weekly physical analyses (pH, color, temperature, turbidity) of the wells and the Willimantic River differ in composition and do not indicate a direct influence exists between the entities.

The quarterly microscopic particulate analysis (MPA) of samples from the wells were typically characteristic of groundwater according to submitted reports by Northeast Laboratories, Inc. and Analytical Services, Inc. The MPA analyses were evaluated under the criteria set forth by the EPA document "Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA)." All quarterly samples from both wells had no detection of any particulate matter associated with surface water. No Giardia, Cryptosporidium, or any other high risk organisms were detected in any of the samples.

Phone: 240-9262
Telephone Device for the Deaf (203) 566-1279
150 Washington Street — Hartford, CT 06106
An Equal Opportunity Employer

The aquifer in which the Willimantic River wellfield is located is well documented as a stratified drift aquifer consisting of sand, gravel, and some clays. Well construction logs for production and test wells and data obtained from the Level B aquifer mapping project were all reviewed to evaluate well construction and geologic features of the aquifer. These records all indicate proper well construction and good natural filtration materials present in the geologic features of the aquifer.

The data presented by the Environmental Health and Safety Office of the University of Connecticut does not show evidence that the groundwater from Willimantic River Wells #1 and #2 is under the direct influence of surface water. Therefore, filtration is not required for the Willimantic River wellfield at this time. This assessment does not preclude a future determination of potential direct surface water influence should any of the previously mentioned factors change or additional factors become relevant. This section will continue to review your routine compliance reports for any such indications and notify you if any possible concerns ever arise.

Thank you for your completion of this arduous groundwater determination study at the University of Connecticut.

Sincerely,

Steve Messer
Sanitary Engineer III
Water Supplies Section

SM/ml
cc: Earl Eldredge, Facilities Mgmt.
U. of CT

Williman.ml

Appendix H
Rules and Regulations of the
University of Connecticut Water System

University of Connecticut
Board of Trustees

June 20, 2006

The following is an excerpt from the University of Connecticut Board of Trustees' minutes of June 20, 2006:

> "On a motion by Mr. Kuchta, seconded by Mr. Martinez, **THE BOARD VOTED** to approve the Water System Rules and Regulations for the University and its non-University affiliated users to become effective October 1, 2006.

The full resolution is presented in the agenda of the June 20, 2006 meeting in Attachment 4.

Ronald C. Schurin
Executive Secretary

Date June 20, 2006

An Equal Opportunity Employer

Gulley Hall
352 Mansfield Road Unit 2048
Storrs, Connecticut 06269-2048

Telephone: (860) 486-2333
Facsimile: (860) 486-2627

THE UNIVERSITY OF CONNECTICUT

WATER SYSTEM

RULES AND REGULATIONS

As Approved by Univeristy of Connecticut Board of Trustees

Effective Date: October 1, 2006

RULES AND REGULATIONS

OF

THE UNIVERSITY OF CONNECTICUT WATER SYSTEM

Dear Customer:

Providing high quality water and service to <u>all</u> our customers requires us to have uniform practices. The following Rules and Regulations, which cover our Water System's policies and procedures, have been approved by the University of Connecticut Board of Trustees. We urge you to read them and keep them for reference.

This booklet focuses on frequently asked questions. It is impossible to anticipate every situation that may arise, so if you have questions that require further explanation, please contact us by calling our Work Order Control Department at 860-486-3113.

These policies and procedures help us provide you with quality water and service while ensuring fair and equitable treatment for all of our customers. We appreciate your cooperation and compliance with these provisions.

Sincerely,

[redacted]

Effective Date

RULES AND REGULATIONS
OF
THE UNIVERSITY OF CONNECTICUT WATER SYSTEM

TABLE OF CONTENTS

Effective Date

ABOUT YOUR WATER SERVICE

The University of Connecticut Water System is a University owned water utility serving not only the University of Connecticut Storrs Campus and Depot Campus, but also residential, commercial, and municipal customers located in the Storrs/Mansfield area. The University of Connecticut is committed to providing all of our customers with a reliable supply of high quality water.

Please call our Work Order Control Department at 860-486-3113 Monday through Friday, 8:00 A.M. to 4:30 P.M., except holidays, if you need assistance for routine customer service matters such as:

- Account information
- A billing question
- A special payment arrangement
- A pending property sale
- To schedule a service appointment

If you ever need emergency service, you may call the same telephone number (860-486-3113), which is our Work Order Control Department anytime, 24 hours a day.

Please note the following services:

We will furnish rate schedules and such additional information as customers may reasonably request.

We maintain a regular water sampling program in compliance with state and federal requirements to monitor water quality at our sources and in the distribution system.

We periodically flush all mains and test hydrants and valves to assure the best possible quality and fire protection. Some discoloration can occur in conjunction with flushing and may cause temporary inconvenience to customers in the area.

We can assist customers whenever possible to locate or mark out existing underground pipes. If a customer is planning excavation on their property, they need to utilize Connecticut's one-call system, Call Before You Dig, Inc., at 1-800-922-4455 to ensure the identification and proper marking of underground utilities are done prior to the excavation.

We will, upon request, send a service person to turn off a curb stop if the customer's main valve is not holding, so that necessary repairs can be made. A charge is made for the turn on.

We hope these Rules & Regulations will clarify any questions you may have about your water service. If you have further questions or suggestions for improved service, call us at 860-486-3113. We will be glad to hear from you.

Effective Date

RULES AND REGULATIONS
(Subject to change without notice)

I. DEFINITIONS

Common Enclosure: Property under common ownership which is bounded by fences, property lines, public streets or highways.

Cross Connection Control Device: A Department of Public Health approved device for preventing backflow, also known as back pressure or back siphonage device.

Curb Stop: A shut off valve on water service connection generally located at the curb or property line.

Customer: Any person, firm, corporation, company, association, governmental unit, lessee who, by the terms of a written lease, is responsible for the water bill, or owner of property furnished water service by the Water System.

Delinquent Account: A water service bill which has remained unpaid for a period of more than 63 days after the date of mailing of a bill rendered on a quarterly or semi-annual basis.

DPH: State of Connecticut Department of Public Health.

Family: Individuals living as a single housekeeping unit.

Fire Service Line: A service pipe used exclusively for fire protection purposes.

Main: A water pipe owned, operated and maintained by the Water System, which is used for the purpose of transmission or distribution of water but is not a water service pipe.

Meter: A device for measuring the quantity of water used as a basis for determining charges for water service to a customer. A meter is owned by the Water System.

Meter Vault or Meter Pit: An outdoor pit or vault used to house a water meter when no suitable location is available within the premises. Meter pits and vaults, including their covers, shall be owned and maintained by the property owner, and must be constructed in accordance with Water System specifications.

Meter Yoke: Piping and valve arrangement approved by the Water System used for installing a Water System meter. The meter yoke is owned and maintained by the customer.

Premises: Shall include but is not restricted to the following:

a.) A building or combination of buildings owned or leased by one customer, in one common enclosure, occupied by one family as a residence or one corporation or firm as a place of business.

b.) Each unit of a multiple house or building separated by a solid vertical partition wall occupied by one family as a residence or one corporation or firm as a place of business.

c.) A building owned or leased by one customer and having a number of apartments, offices or lofts which are rented to tenants using in common one hall and one or more means of entrance.

d.) A building two or more stories high under one roof owned or leased by one customer and having an individual entrance for the ground floor occupants and one for the occupants of the upper floors.

e.) A combination of buildings owned by one customer, in one common enclosure, none of the individual buildings of which is adapted to separate ownership.

f.) A public building.

g.) A single plot used as a park, recreational area, or for other purposes.

Reasonable Amortization Agreement: A mutually agreed upon promise of a customer to pay an account balance over a reasonable period of time.

Receipt or Received: Three days after the date of mailing, or, if a bill notice or other document is delivered rather than mailed, the date of delivery, unless another date can be shown.

Service Connection: The service pipe, including corporation stop, from the main to and including the curb stop adjacent to the street line or the customer's property line, and such other valves and fittings as the Water System may require between the main and curb stop, which are owned and maintained by the Water System.

Tap: The fittings installed at the main to which the service pipe is connected.

Termination: The voluntary or involuntary discontinuance of water service to an individual customer.

Water System: The University of Connecticut water system that serves the Main Campus the Depot Campus and proximal areas.

II. GENERAL RULES

a.) The Rules and Regulations as herein set forth constitute a part of the contract with every customer taking water from the Water System, each of whom shall be deemed to assent and be bound thereby. These Rules and Regulations are subject to periodic change. Copies of revised Rules & Regulations shall be made available to customers.

b.) Water service and use are charged in accordance with the Water System approved rate schedules. All metered water, whether used or lost, shall be paid for by the customer.

c.) The Water System's regulations regarding water main extensions are available as a separate document.

d.) The Water System will undertake to provide an adequate supply of potable water at adequate pressure throughout its system, but cannot assume responsibility or liability, direct, indirect or consequential, for any damage from failure to do so. Whenever possible, work requiring the interruption of service will be scheduled to provide the least inconvenience to the customer. The Water System will make a reasonable effort to give notice in advance of any work requiring the interruption of service. To safeguard against possible damage due to interruption of service, customers are advised to regulate their installations connected with the water supply system so that damage will not occur if water is shut off without notice.

e.) Authorized employees or contractors of the Water System shall have reasonable access to customers' premises for the purpose of reading, testing, repairing, installing or replacing meters and meter appurtenances; inspecting plumbing connections, fixtures or pipes, or discontinuing service for any reasons listed under Section VII. Such employee will carry a badge, identification card or insignia identifying him/her as a Water System employee or a contractor employee. Services rendered after hours or on weekends or holidays are subject to special charges.

f.) The piping and plumbing on all premises supplied from the Water System shall conform to the State of Connecticut Public Health Regulations and Building Code and Sanitary Codes, if any, of the town in which the premises are located.

g.) Customers are responsible for keeping their service pipe, house pipes and fixtures in good order and protected from freezing. Failure to do so may result in interruption of service and costly repairs for which the Water System is not liable. (See Sections IV-i, j and k.)

h.) Whenever the public interest so requires, the Water System reserves the right to curtail or suspend entirely the use of water for non-essential purposes. Such limitation of use shall be without liability on the part of the Water System.

i.) In areas where pressure is low, the Water System may recommend and/or require that customers install, operate and maintain a booster pump and tank of a combined capacity approved by the Water System. In such cases, customers will enter into a written agreement with the Water System in which they hold the Water System blameless for possible damages and inconvenience resulting from the low pressure.

In areas where pressure is high, the Water System may recommend and/or require that customers install and maintain pressure-reducing valves (PRV). In such cases, the Water System shall not be responsible for any possible damages or inconvenience resulting from the high pressure or the PRV.

j.) If there is not sufficient pressure or flow in a particular region of the Water System to permit a customer to qualify for preferred risk insurance, the expense for any improvement in the system for this specific purpose shall be borne by the customer.

k.) In the event that any customer shall use water at rates of flow that cause noticeable pressure variations in the water system, the Water System may require that the customer control their flow rates or install equipment to minimize such variations to an acceptable level.

l.) No customer shall supply water to other persons or permit any connection to be made on his/her premises for supply to other premises, without approval of the Water System for "temporary service".

m.) Any changes in location of meters or services required by the customer shall, if approved by the Water System, be made at the customer's expense.

n.) The Water System, at its discretion, may install remote reading devices on existing water meters.

o.) No pipe or fixture connected with the mains of the Water System may be connected with pipes or fixtures supplied with water from any other auxiliary source. Auxiliary Source, for the purpose of this regulation means (1) a water supply which is not approved for potable use such as a pond, river, open storage tank or large swimming pool; (2) potable water which has become unpotable, such as by the addition of chemicals or from contamination while the water is being stored or held in reserve; or (3) a private well unless safe sanitary quality and the interconnection is approved by the Commissioner of Public Health.

Such cross connections are in violation of the Connecticut Department of Public Health regulations. Installation of cross connection control devices shall be approved and inspected by Water System personnel and must be in conformance with the applicable provisions of the Public Health Code. All devices shall be easily accessible for inspection and testing. If the applicant is unable to obtain and/or install the minimum cross connection control device required by the Public Health Code, the applicant will be responsible for the next highest level of protection.

p.) All new water service lines installed on the Water System shall be provided with a Reduced Pressure Principle Backflow Preventer Device (RPD) at the entrance of each new premise served, in addition to any Backflow Devices within the premises that may be required by the Cross Connection Regulations of the Public Health Code. Such RPDs shall be installed in a suitable location protected from freezing and capable of safely draining any water discharge from the RPDs. Such RPDs shall be approved by the Water System, and shall be installed and maintained, including annual device testing, at the customer's expense.

q.) Filling of tank trucks for any purpose shall only be done at Water System designated locations with approved backflow prevention under the direction of Water System personnel.

r.) Customers who plan to install air conditioning or refrigeration equipment totaling over three tons in capacity shall provide water conserving equipment as approved by the Water System, except that if such water is subsequently re-used in industrial processing or similar purposes, water conserving equipment shall not be required.

III. APPLICATIONS AND TRANSFERS

a.) Applications for the installation of new water service shall be made on forms provided by the Water System and signed by the applicant, or a duly authorized representative, for service of the premises to be supplied. Any applicable service connection fees are payable in advance. The Water System may require appropriate identification such as a Social Security number, a driver's license, or a state issued identification card.

b.) The Water System will not accept an application for service from a customer having a delinquent water account, until the account has been paid in full.

c.) Customers shall notify the Water System when premises are to be vacated so that the water may be turned off, the meters read and/or removed, and the account transferred.

If the premises are to be permanently abandoned, owners shall notify the Water System in writing immediately so that the service connection can be closed. Closure will be made at the Water System's expense.

d.) Transfers may be authorized in writing or by verbal request by the Water System.

e.) When the Water System renders temporary or intermittent service to a customer, it may require that the customer bear the costs in excess of any salvage realized of installing and removing the service.

f.) Water for construction purposes shall be applied for on forms provided by the Water System. All water used must be metered, and charged in accordance with Water System approved rate schedule.

g.) Applicants desiring to connect to a main already under contract may be required to pay the Water System an amount which, in its judgment, represents their equitable share of the original costs of the main, or to assume their equitable share of an existing guarantee provision.

Applicants taking service from an extension of main under special contract may be required to pay the Water System an equitable share of the original cost of a pump station, storage tank or other facility.

Payments to the Water System as share of original costs will be refunded to the original depositors.

IV. **SERVICES** - (See Appendices A-D for typical service installation diagrams)

a.) A single service may not supply more than a single premise. Division of premises presently served by a single pipe will require installation of corresponding additional service pipes.

b.) All services, new or renewed, for year round use shall typically be laid at a minimum invert depth of five feet below ground surface.

c.) All services, except those for private fire protection, shall be metered. The Water System may meter private fire lines if it so desires.

d.) All new and renewed service connections with meters up to 1" in diameter are required to have installed, at the customer's expense, a meter yoke which meets Water System standards.

e.) All new and renewed services shall be sized and constructed to comply with the Water System's current design criteria and shall be a minimum of 1" in diameter. Service pipes normally shall be Type K Copper with no soldered joints underground, or cement-lined cast iron. In some instances, the Water System may approve the use of plastic pipe. Such pipe shall be PE 3408 SDR 9 polyethylene, rated from 200 psi working pressure, or PE 3406 SDR 9 polyethylene, rated from 160 psi working pressure, with this information and the NSF seal appearing on the pipe. A metallic wire or strip for ease in locating must parallel non-metallic pipe.

Service piping of any material except Type K Copper shall conform to Water System specifications. Its use must have advance approval of the Water System, and be acceptable under the requirements of the town building codes. The Water System will not allow any plastic service within 500 feet of any commercial or industrial zoned area or any area with underground fuel tanks.

f.) All services shall be provided with a curb valve and curb box at the curb or at a convenient point prescribed by the Water System between the curb and property line.

Seasonal service lines with a vertical rise shall be equipped with a stop and waste valve with an operating rod and valve box outside the building between the Water System's curb valve and the building, regardless of meter location.

Where more than one building on the premises is supplied by a single service, the branch line to each building shall have an underground shutoff valve box and operating rod outside the building.

g.) When an applicant applies for service, except in conjunction with new main extensions, the Water System will furnish, install, own and maintain such new service connections. The Water System will bear the cost of the service pipe from the main to the curb stop, the curb stop and their installation, but will make a charge to the applicant for tapping the main, furnishing and installing the corporation cock and curb box. The applicant will bear the costs of excavation, backfill removal and replacement of paving, walks, curbs, etc., necessarily incurred with respect to new services, and will be responsible for obtaining necessary permits and complying with safety requirements including shoring and all other trenching safety requirements. Services installed in conjunction with new main extensions shall be paid in full by the customer, during the life of the main extension contract.

h.) The Water System will furnish and install at its expense all replacements of service connections, except as indicated below. When replacement is made at a customer's request for change in location or size of the service, the customer shall bear the full expense of relocation or enlargement. Unless the water piping is owned by the Water System with suitable easement rights by previous negotiation, maintenance of water piping installed within a private development and supplied from one service connection to the Water System's main, shall be the responsibility of the private development. Repairs may be made and billed for by the Water System by pre-arrangement with the owners.

i.) The customers, at their own expense, shall furnish, install, own and maintain the service pipe from the curb stop to the interior of the building and shall assume ownership of a Water System approved curb box, keeping service pipe and box in good repair and keeping the curb box readily accessible. If the curb box is not accessible for Water System use, the Water System has the right to make it accessible and/or operable and bill any cost to the customer. Installation of this section of the service line should be performed by a licensed plumber or in accordance with those provisions defined in Section 20-340 of the Connecticut General Statutes. Violations of this section of the Connecticut General Statutes are subject to fines by the State of Connecticut.

j.) When there is a leak in any service pipe from the curb box to the customer's premises and the owner cannot be readily found or shall refuse to make immediate repairs, the Water System shall have the right but not the duty to make the necessary repairs and charge the customer for the same. The customer is responsible for repairing all leaks and for other repairs, renovations and maintenance to all customer owned pipe, fixtures and equipment. If a leak develops in a customer service line or a customer owned service connection, the customer shall repair it without delay. If such repair work is not completed within a reasonable period specified by the Water System (by telephone, in person or in writing to the customer), the Water System may discontinue service until the leak is repaired, or repair the leak itself. In either case, the customer shall pay all costs incurred by the Water System in performing such work.

k.) The customer shall inform the Water System prior to backfill in order that the Water System may make an inspection and test to assure that the service pipe and installation complies with Water System requirements. Testing is to include pressurizing the service pipe and a visual inspection of all joints for leakage. After inspection and approval of the trench, the depth of invert of the service may not be reduced to less than 5'-0", nor may any connection be made to the service pipe between the street shutoff and the meter. If the customer does not schedule the inspection prior to backfill, the Water System may require that the pipe be re-excavated at the customer's expense to allow the Water System to perform the necessary inspection. No service pipe shall be turned on without prior approval by the Water System.

l.) The customer shall assume the responsibility and expense of maintenance of customer's portion of the service pipe, including thawing of frozen service pipes. Such services may be lowered at the customer's expense to prevent repetition of freezing.

m.) The service pipe shall extend through that point on the customer's property line or the street line easiest of access to the utility from its existing distribution system and from a point at right angles to the existing or proposed distribution line in front of the premises to be served. If a multiple premises building is positioned at right angles to the existing distribution line, a new distribution line placed in an easement shall be necessary to permit right angle services to each premises. New or reconstructed service pipes shall not cross intervening properties. The approval of the Water System shall be secured as to the proper location for the service pipe.

n.) Water service may not be laid in the same trench with other underground utility facilities. Separation distances shall comply with the Great Lakes-Upper Mississippi River Board of State Sanitary Engineers Recommended Standards for Water Works.

o.) No service pipe shall cross any portion of a seepage or septic system or be installed less than 10 feet away from any portion of a seepage or septic system.

p.) All underground lawn sprinkling systems shall be equipped with proper backflow prevention devices. Plans for such a system shall be approved by the Water System before the installation is made, and the Water System's final on-site inspection and approval is required before backfilling.

q.) If a multiple family house is being served by a single service and meter, and a part of the house changes ownership, the new owner shall have a separate service and meter installed.

r.) Restoration of an abandoned service will be considered a new service installation.

s.) The installation of combined fire and domestic services will not be permitted without special approval of the Water System. Prior to installation of fire sprinklers on any domestic service less than 2", the Water System shall be notified in accordance with Section 19a-37a-1 of the Connecticut Public Health Code. Such sprinklers may only be installed on piping that is metered. No meter bypasses are permitted for such installations. It is the customer's responsibility to have the system designed and installed in accordance with all applicable state and local regulations. The Water System makes no claim of reliability or adequacy of such system for fire protection. Such installation will not prevent the Water System from pursuing normal termination procedures.

t.) If a fire pump is desired at a customer's location, the pump curve data must be provided to the Water System for review and approval prior to installation to determine if the location is suitable for a pump.

u.) Installation of new or renewed services is not allowed in easements or right of ways, without prior Water System approval.

V. METERS

a.) The Water System shall determine the type, size and installation of the meter to be installed. All premises must be separately metered.

b.) Submetering shall be permitted only with the approval of the Water System.

c.) If a service cannot be shut down for periodic testing and removal of the meter, a second meter will be required.

d.) Meters will be owned, installed, tested and removed by the Water System. Damage due to freezing, hot water, faulty connections, or customer's negligence shall be paid for by the customer.

e.) No person, other than a Water System employee, shall break seals or disconnect meters unless specifically authorized in writing by the Water System to do so. If any person takes such action without authorization from the Water System, that person will be liable for any damages which may result therefrom, and shall be billed on the basis of water used in a similar period.

f.) The customer will provide, at their expense, an accessible and protected location for the meter, which location shall be subject to the approval of the Water System at the time of service pipe installation.

The meter may be located inside a building when, in the opinion of the Water System, an inside setting will provide adequate accessibility, protection against freezing or other damage to the meter, and when the service pipe from street line to place of use does not exceed 150 feet in length. A setting within a building shall be located just inside the cellar wall at a point which will control the entire supply, exclusive of fire lines, to the premises.

When no suitable place inside the building is available, or the service pipe exceeds 150 feet in length, the Water System may require that the meter be set near the street shutoff with suitable valve in a pit at least five feet deep, with a cover. Pit and cover shall be approved by the Water System. Meter pits or vaults, including the meter vault cover, become the property of the customer upon installation, and the customer is responsible for the maintenance and repair of the vaults as needed from time to time. Meter pits or vaults should be kept accessible and free of debris, which will help prevent the meter from freezing or being otherwise damaged.

g.) The Customer is responsible for maintaining piping on either side of the meter in good condition and valved on both sides of the meter so that the meter may be removed or replaced conveniently and without damaging such piping. If a problem should develop subsequent to meter removal or replacement due to poor condition or the piping or hand valve, the customer shall be responsible for any necessary repairs and damage.

h.) Swimming pools or other facilities, which might require considerable quantities of water, may be required to be separately metered and to have separate services. Customers are not permitted to fill pools with water directly from hydrants. The Water System may pursue appropriate enforcement action and may assess a usage fee based on estimated metered consumption.

i.) The customer is requested to notify the Water System promptly of any defect in or damage to the meter or its connections.

j.) In order to assure accuracy, the Water System may at any time remove a meter for tests, repairs or replacement. At a minimum, meters will be tested periodically in accordance with the testing schedule adopted by the Water System. Customers shall allow the Water System access to their property for such periodic meter tests.

k.) Upon written request of a customer, the Water System will test without charge to the customer, the accuracy of a meter in use at his premises provided the meter has not been tested by the Water System within one year prior to such request.

Upon a request by a customer, the Water System shall notify the customer in writing within one week of the request that he, or his authorized representative, has the right to be present during the test. If the customer wishes to be present for the meter test, he shall notify the Water System within 10 (ten) days of the written notification to arrange to be present for the test. The Water System shall schedule a convenient time for all parties at an approved meter testing facility as soon as possible. A written report of the results of the test shall be furnished to the customer. The customer shall agree to abide by the results of such test as the basis for any adjustment of disputed charges.

l.) The Water System can assume no responsibility for the clogging of interior house plumbing or flooding which may occur during or after interruption of service or repairs to services, meters or mains.

m.) The Water System may, at its discretion, install remote meter reading devices on its existing customers' meters. Customer requests for these installations will be reviewed on the basis of necessity.

n.) The Water System may not be required to install a meter until all the requirements for a new service installation have been met, including the installation of a meter yoke.

VI. BILLING AND COLLECTION

a.) Separate premises shall be separately billed.

b.) Bills are payable when rendered. Failure of the customer to receive the bill or notice does not relieve him/her from the obligation of payment or from the consequences of its non-payment.

c.) The property owner is generally the customer of record and is responsible for payment of water bills. However, if the property is rented or leased, the tenant may be the customer if a written lease specifies that the tenant is responsible for the water bill. The Water System's usual procedures for applying for water service should be followed in either case.

d.) The Customer shall be liable for all charges for water service until such service has been disconnected by the Water System pursuant to instruction from the customer or until the Water System receives a notice of change in ownership or change in lessee.

e.) Where a premise is supplied by two or more meters connected to a single service, the minimum charge for each meter shall be applied and the registrations combined in the computation of consumption charges. Where a premise is supplied through more than one service, the minimum charge shall be applied to each meter and the registrations shall not be combined. Combined billing will not be allowed except where approved by the Water System.

f.) Customer billing is normally quarterly or semi-annually with the frequency for an account determined by the Water System based on the days of service, classification and consumption.

g.) Private fire protection charges are billed either quarterly or semi-annually and cover service during the previous quarter or six month period.

h.) Water for construction purposes, or for tank trucks, will be metered in accordance with the Water System's approved rates and charges.

i.) Miscellaneous sales are billed as the service is rendered.

j.) Bills that are incorrect due to meter or billing errors will be adjusted as described below:

Whenever a meter in service is tested and found to have over-registered more than two percent, the Water System will adjust the customer's bill for the excess amount paid determined as follows:

1.) If the time at which the error first developed can be definitely determined, the amount of overcharge shall be based thereon.

2.) If the time at which the error first developed cannot be definitely determined, it shall be assumed that the over-registration existed for a period equal to one-half of the time since the meter was last tested. If more than one customer received service through the meter during the period for which the refund is due, a refund will be paid to the present customer only for the time during which they received service through the meter.

Whenever a meter in service is found not to register or meter reading is not available, the Water System may render an estimated bill. The Water System will estimate the charge for the water used by averaging the amount registered over a similar period preceding or subsequent to the period of non-registration or for corresponding periods in previous years, adjusting for any changes in the customer's usage.

Billing adjustments due to fast meters will be calculated on the basis that the meter should be 100% accurate. For the purpose of billing adjustment, the meter error shall be one-half of the algebraic sum of the error at a maximum test flow plus the error at intermediate test flow.

When a customer has been overcharged as a result of incorrect reading of the meter, incorrect calculation of the bill, incorrect connection of the meter, or other similar reasons, the amount of the overcharge will be refunded or credited to the customer.

When a customer has been undercharged as a result of incorrect reading of the meter, incorrect calculation of the bill, incorrect connection of the meter, or other similar reasons, the Water System may bill or otherwise hold the customer financially liable for no more than one year after the customer received such service.

k.) The Water System must receive approval from the local fire marshal before a customer's request for discontinuance of a private fire service can be processed by the Water System. The owner is responsible for billings until terminated.

VII. DENIAL OR TERMINATION OF SERVICE

a.) Refusal or discontinuation of service by the Water System is restricted to certain situations, as described in this Section of the Water System's "Rules and Regulations".

b.) Notices regarding termination of service shall:

1.) Be sent via first class mail at least 15 days before the termination.
2.) Contain the grounds for termination.
3.) Contain explanation of customers' rights.

c.) New service may be denied or termination proceedings may be started by the Water System for any of the following specific reasons.

1.) Service may be terminated <u>without</u> notice, for:

a.) A condition determined by the Water System to be hazardous.
b.) In the event of illegal or unauthorized provision of service.

2.) Service may be terminated <u>with</u> notice, for:

a.) Failure by a customer to comply with the terms of any agreement whereunder they are permitted to amortize the unpaid balance of an account over a reasonable period of time, or any failure for such a customer to simultaneously keep their account for utility service current as charges accrue in each subsequent billing period. Except where the customer has made a payment or payments amounting to 20% of the balance due, in which case the Water System shall not terminate service until further notice of the conditions the customer must meet to avoid termination is sent to the customer. Such notice shall not entitle the customer to further review as provided by Subsection VII e-1 of these regulations or to additional notice upon subsequent payment of 20% of the balance due.

b.) Failure of the customer to furnish such service, equipment, permits, certificates or rights of way as shall have been specified by the Water System as a condition to obtaining service, or if such equipment or permissions are withdrawn or terminated.

c.) Failure of non-residential customer to fulfill their contractual obligations for service or facilities.

d.) Failure of the customer to permit the Water System reasonable access to its equipment during normal working hours.

e.) Failure or refusal of the customer to reimburse the Water System for repairs to or loss of Water System property on the customer's property when such repairs are necessitated or loss is occasioned by the intentional or negligent acts of the customer or their agents.

f.) Customer use of equipment in such a manner as to adversely affect the Water System's equipment or the Water System's service to others.

g.) When the Water System has discovered that a customer has obtained unauthorized water service by fraudulent means or material misrepresentation or has diverted the water service for unauthorized use or has obtained water service without same being properly registered upon the Water System's meter.

h.) Tampering with the equipment furnished and owned by the Water System.

i.) Violation of or non-compliance with the Water System's Rules and Regulations.

j.) When the Water System has determined that the furnishing of water service would be contrary to any orders, ordinances of laws of the federal or state government or any political subdivision thereof.

k.) Failure of the customer to make necessary service line repairs after reasonable notice to avoid the wasting of water.

l.) Failure of the customer to provide identification within 15 days of opening an account.

m.) Non-payment of a delinquent account, provided the Water System notified the customer and is in accordance with all of the procedures prescribed in these Rules And Regulations.

n.) In the event unauthorized unmetered service or unauthorized metered service is found to be used.

o.) Failure to comply with the Public Health Code of the State of Connecticut pertaining to cross connection control requirements at the premises.

d.) Termination proceedings may be started by the Water System for non-payment of a delinquent account, provided that the Water System has notified the customer of the delinquency and has made a diligent effort to have the customer pay the delinquent account. A termination notice to a customer whose account is delinquent will be mailed no earlier than 63 days after mailing the original quarterly or semi-annual bill. Actual termination of the service will not occur earlier than 13 days after mailing the termination notice.

e.) The Water System will not terminate service to a customer if:

1.) the customer has filed an unresolved complaint or dispute with the Water System. Such complaints must be made to the Water System within seven days of receipt of a termination notice. Such complaint shall be reviewed by the Water System in accordance with the provisions of Section 16-3-100 (g) of the Regulations of Connecticut State Agencies;

2.) there is known to be serious illness in the home of a residential customer. The Water System must be notified by a doctor within 13 days of a customer's receipt of a termination notice, and such notice must be confirmed by letter within a week after the verbal notification. The notice must be renewed every 15 days or the last day of the period specified by the physician as to the length of the illness. The customer is required to make a reasonable arrangement with the Water System to pay the delinquent part of his/her bill, and to pay all future bills on a current basis while the illness continues;

3.) the customer is a landlord or agent for an occupied residential rental property, and the delinquent bill is for water service to that property. If practicable, arrangements may be made with the tenant for payment of bills for future service, and appropriate legal action may be taken against the customer for the delinquent and current amounts. However, if reasonable arrangements have been made with the tenant and the tenant refused to cooperate, the Water System may terminate service to the tenant upon proper notice;

4.) the day immediately prior to a weekend or holiday except under conditions as set forth in sub-paragraph 1 (a) of this section.

VIII. PRIVATE FIRE SERVICE

a.) Fire hydrants and sprinkler systems shall be installed and maintained at the expense of the customer. The size, material and locations of piping, and plans and specifications for any tanks and pumps that may be required, shall be submitted in writing to the Water System for approval. The Water System must inspect the installation before backfill and must witness the pressure test and all flow tests for compliance with the approved plans and specifications. The Water System may meter private fire lines where there is demonstrated justification such as unauthorized use of the service and/or where unusual circumstances prevail in the customer's premises.

b.) Operating tests of private fire hydrants and sprinkler systems shall be made only after 96 hours written notification to, and approval by, the Water System.

c.) No water shall be taken from a private fire hydrant except for use on the property in which it is located, nor for any purpose other than to extinguish fires or to test fire fighting equipment. Such uses of water for purposes other than fire fighting shall be made only after 96 hours written notification to and approval by the Water System.

d.) The Water System shall not be held liable or responsible for any losses or damage resulting from fire or water which may occur due to the installation of a private fire service system or any leakage or flow of water therefrom.

e.) In cases where a private development is to be served by a single service connection and ownership of the single service pipe or distribution main is not held by the Water System, a separate fire service main may be required to accommodate private fire hydrant service.

f.) With Water System approval, a single fire service may service more than a single premise.

g.) A backflow prevention device shall be required on a line to a fire sprinkler system with any siamese connection in accordance with the Connecticut Public Health Code.

h.) The Water System must receive approval from the local fire marshal before a customer's request for discontinuance of a private fire service can be processed by the Water System. The owner is responsible for billings until terminated.

i.) Prior to the installation of any fire sprinkler system, the Company shall be notified in accordance with Section 19a-37a-1 of the Connecticut Public Health Code.

IX. PUBLIC FIRE PROTECTION

a.) Fire departments desiring to use water from hydrants for testing equipment or for any purpose other than that of extinguishing fires, must notify the Water System in writing 96 hours in advance of such usage.

b.) Persons who desire to use water from public hydrants for purposes other than fire fighting must first obtain permission in writing from the Water System. Persons using water without permission of the Water System shall be prosecuted to the full extent of the law.

c.) All public fire hydrants shall be owned and maintained by the Water System.

X. WATER SYSTEM RESPONSIBILITIES

a.) The Water System undertakes to supply its customers with water which meets the requirements of the State of Connecticut Department of Public Health, and which has such physical and chemical properties as to make it acceptable for domestic use. However, the Water System does not undertake to render any special service, to maintain any fixed pressure, to deliver any fixed quantity of water, or special quality water.

b.) The Water System shall not be liable for any damage to person or property, sustained as a result of any break, failure or accident in or to its system or any part thereof, which is not due to the Water System's negligence, or which, being known to the customer, was not reported by that customer in time to avoid or mitigate such damage.

XI. NOTES

Effective Date

XII. APPENDIX

a.) Diagram - Typical Water Service Installation

b.) Diagram - Typical Water Service Installation with a Meter Pit

c.) Diagram - Typical Meter Yoke Installation and with PRV