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Tylerville Center Water Supply Alternatives Evaluation

Final

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List of Acronyms

AOP	Advanced Oxidation Process
ADD	Average Daily Demand
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
C&D	State of Connecticut Conservation and Development Policies
CEPA	Connecticut Environmental Policy Act
CGS	Connecticut General Statutes
COCs	Contaminants of Concern
ConnDOT	Connecticut Department of Transportation
CT DEEP	Connecticut Department of Energy and Environmental Protection
CT DEEP SASU	Connecticut Department of Energy and Environmental Protection Site Assessment and Support Unit
CT DPH	Connecticut Department of Public Health
CVOCs	Chlorinated Volatile Organic Compounds
CWC	Connecticut Water Company
DBP	Disinfection Byproduct
DCE	1,1-Dichloroethene
DWAL	Drinking Water Action Level
ECD	Environmental Classification Document
EIE	Environmental Impact Evaluation
ESA	Environmental Site Assessment
ESP	Exclusive Service Provider
ft	Feet
GAC	Granular Activated Carbon
GIS	Geographic Information System
GPCD	Gallons Per Capita Per Day
GPD	Gallons Per Day

GPM	Gallons Per Minute
GWPC	Groundwater Protection Criteria
in	Inches
ISO	Insurance Services Office
LGM	Locational Guide Map
MCL	USEPA Drinking Water Maximum Contaminant Level
MCLG	USEPA Drinking Water Maximum Contaminant Level Goal
MDF	Maximum Daily Flow
MOS	Margin of Safety
msl	Mean Sea Level
MTBE	Methyl Tert-Butyl Ether
NDDB	Natural Diversity Database
O&M	Operation and Maintenance
OPM	Office of Policy and Management
PCE	Tetrachloroethene
PFA	Priority Funding Area
PHD	Peak Hour Demand
POCD	Plan of Conservation and Development
PPC™	Public Protection Classification Program
RCSA	Regulations of Connecticut State Agencies
RSR	Remediation Standard Regulations
STEAP	Small Town Economic Assistance Program
SWPC	Surface Water Protection Criteria
TCA	1,1,1-Trichloroethane
TCE	Trichloroethene
TPH	Total Petroleum Hydrocarbons
US EPA	United States Environmental Protection Agency
USGS	United States Geological Survey

UTM	Universal Transverse Mercator
VOCs	Volatile Organic Compounds

Executive Summary

The Tylerville section of Haddam, Connecticut relies upon groundwater as the sole drinking water supply to residences and commercial properties. Groundwater in Tylerville has been impacted by historic releases of chlorinated solvents, 1,4-dioxane (a solvent stabilizer), gasoline constituents (including methyl tert-butyl ether, or MTBE), and sodium chloride. The Tylerville Center Study Area includes approximately 240 acres and is bordered by Camp Bethel to the North, the Connecticut River to the East, a Connecticut Department of Transportation maintenance facility to the South, and Route 154 to the West. The Tylerville Center Study Area consists of 99 parcels zoned for residential, commercial, and industrial uses in the area, or nearby, where groundwater impacts have been detected. No public water utility exists for the impacted area; hence parcels with wells impacted with contaminants above applicable state and federal criteria currently utilize individual filter systems and/or receive bottled water for consumptive use.

The Connecticut Department of Energy and Environmental Protection (CT DEEP) and the Chatham Health District have conducted periodic sampling of potable water at many properties in the Tylerville Center area. Several contaminants of concern have been identified and linked to historic and on-going releases. Generally, chlorinated solvents and gasoline constituents, including MTBE, have polluted the overburden and bedrock aquifers, impacting numerous potable wells. Naturally occurring arsenic has also been detected at concentrations exceeding applicable regulatory criteria at select properties. Recent investigation of the groundwater impacts indicate that contamination is present in overburden and bedrock within the Study Area and that these impacts, due to their nature and extent, are likely to persist for a very long time.

This project includes the evaluation of potential water supply alternatives to provide a reliable, long-term source of potable water to the affected properties in accordance with Section 22a-471-1 of the Regulations of Connecticut State Agencies. These alternatives include the following:

- Extension of the existing Connecticut Water Company water distribution system which currently terminates in the Town of Chester,
- Development of a local groundwater supply and distribution system,
- Development of new individual wells, and
- The continued use of individual water treatment in the Proposed Water Supply Area.

These alternatives were evaluated based on effectiveness in protecting human health, reliability, typical cost, and implementation. A screening process was conducted to evaluate the potential alternatives. This initial evaluation eliminated the development of a local groundwater supply and distribution system and development of new individual wells options. Multiple unknowns, including the questionable and/or unlikely possibility of identifying an adequate groundwater supply source(s), led to the rejection of these alternatives.

Detailed analyses were conducted on the extension of the Connecticut Water Company water distribution system and continued use of individual water treatment system alternatives. Based on review of the evaluation criteria, the extension of the Connecticut Water Company distribution system is the recommended alternative. This alternative provides the most reliable, long term solution. The resistance of 1,4-dioxane to effective treatment and the persistence and extent of chlorinated solvents in Study Area groundwater are key determinants in the selected alternative. The selected alternative is also consistent with municipal and state conservation and development plans and policies.

Expected water demand was calculated for the Study Area. Based on these projections, and on consultations with the water provider with service rights to the Study Area, Connecticut Water Company, an 8-inch diameter main is proposed to be installed to serve the Study Area. This water main will be connected to the existing water distribution system in the Town of Chester near Denlar Drive, and an 8-inch diameter transmission main will be installed along Saybrook Road (Route 154) in a generally northerly direction into the Study Area. Eight-inch diameter distribution mains will be installed within the Study Area to provide potable water to impacted properties as well as properties that may be threatened by the mobility of groundwater contamination. Eight-inch diameter and 12-inch diameter water mains were considered during the detailed alternative analysis and 8-inch was selected as it provides adequate delivery of required flowrates at acceptable pressures within the Study Area. Installation of 12-inch diameter water mains would accommodate future development, in the Tylerville Village Priority Funding Area, within the Proposed Water Supply Area, but would require additional study through an Environmental Impact Evaluation.

A preliminary evaluation of fire protection needs was conducted by the Connecticut Water Company. The findings indicate that the 8-inch diameter water mains are adequate in meeting the needed residential fire flow requirements while the installation of 12-inch diameter water mains would meet the needed fire flow for residential buildings and would also provide additional capacity for larger commercial/industrial buildings.

Section 22a-471-1 of the Regulations of CT State Agencies (RCSA) establishes the regulatory framework for “Grants to Municipalities and Water Companies for Potable Water Supplies” for situations “where groundwater pollution has rendered existing supplies unusable for potable drinking water.” Unallowable project costs associated with the recommended water main extension alternative would be related to costs for fire protection or use of a 12-inch water main size and would not be reimbursable by the State of Connecticut.

The CT DEEP recommends, and the Town of Haddam concurs, that the 8-inch base layout water main extension is the recommended alternative to provide a long-term source of potable water to Tylerville.

1.0 Introduction

The Tylerville Center Impacted Groundwater Study Area (Study Area) is located in the Tylerville section of Haddam, Middlesex County, Connecticut (**Figure 1-A and Figure 1-B**). This Study Area includes properties that have exhibited concentrations of contaminants in groundwater exceeding the Connecticut Department of Public Health (CT DPH) Drinking Water Action Levels (DWALs) and/or the United States Environmental Protection Agency (US EPA) Maximum Contaminant Levels (MCLs) for one or more constituents and on additional nearby surrounding properties and adjacent parcels. The Connecticut Department of Energy and Environmental Protection (CT DEEP) has contracted with AECOM to evaluate water supply alternatives for the Proposed Water Supply Area and recommend a preferred alternative in accordance with Connecticut General Statute (CGS) Section 22a-471 and the Regulations of Connecticut State Agencies (RCSA) Section 22a-471-1. All observations, findings, and conclusions presented herein are subject to the Statement of Limitations presented in **Appendix A**.

1.1 Study Area Description

The Study Area is centered along Bridge Road (Route 82) and bordered by Camp Bethel to the North, the Connecticut River to the East, the Connecticut Department of Transportation (ConnDOT) facility to the South, and Saybrook Road (Route 154) to the West. Several properties where releases of volatile organic compounds (VOCs) have occurred and have impacted groundwater in the area have reportedly been identified through sampling conducted by CT DEEP, the Chatham Health District, the Town of Haddam prior to joining the Chatham Health District, and various responsible parties. In addition to VOCs, MTBE and gasoline constituents have been identified in groundwater in the vicinity of Bridge Road and Saybrook Road. Documented release areas potentially contributing to groundwater impacts in Tylerville are listed below.

Documented release areas include:

- 95 Bridge Road: The Former Sibley Company
- 105 Bridge Road: Former ConnDOT Maintenance Facility
- 79-81 Bridge Road: Botelle Property
- 1598 Saybrook Road (Rt. 154): Tylerville Mobil Gas Station
- 1618 Saybrook Road (Rt. 154): LukOil Gas Station
- Little Meadow Road: Former Camelot Cruises

While some level of remedial activities have been conducted at the above referenced properties, additional investigation/remediation work may still be necessary. Other areas of concern potentially contributing to groundwater pollution in Tylerville are being evaluated separately by CT DEEP as part of an on-going regional investigation.

Based on records obtained from the Town of Haddam Assessor's office, approximately 99 parcels are located within the Study Area. Of these 99 parcels, an estimated 71 have had detected chemical constituents in groundwater. Of these 71 properties with known impacts, there are 24 individual treatment systems utilized to filter potable water (seven locations with treatment systems also receive bottled water). In addition, one (1) property receives bottled water for consumptive use. A summary of the properties within the Study Area is provided in **Section 2.5.1** and **Table 2**.

1.2 Project Objectives

The primary objectives of the project include:

- Identify the area of currently and potentially impacted properties and those with the potential to be impacted in the future – the Study Area.
- Identify a subset of properties requiring a potable water supply – the Proposed Water Supply Area.
- Screen potential water supply alternatives.
- Prepare water demand projections for the Proposed Water Supply Area.
- Prepare a detailed evaluation of alternatives that result from the initial screening process.

1.3 Report Organization

The findings of the project tasks are presented in the following sections:

- Section 1.0 presents an introduction, Study Area description and project objectives.
- Section 2.0 presents a summary of Study Area characteristics and identifies properties that have exceeded applicable regulatory criteria for groundwater. The Proposed Water Supply Area is defined.
- Section 3.0 presents a screening level evaluation of the potential water supply alternatives.
- Section 4.0 presents the calculated water demands for the Proposed Water Supply Area.
- Section 5.0 presents a detailed evaluation of the water supply alternatives that result from the screening level process.
- Section 6.0 presents a summary of the study findings and a recommended alternative.
- Section 7.0 includes references.

2.0 Study Area Characteristics and Impacted Groundwater Areas

Tylerville has a long history of mixed industrial/commercial and residential use. During the 1700s, Tylerville was a shipbuilding village and active seaport. In 1871, Connecticut Valley Railroad began transporting along the Connecticut River and the Goodspeed Station opened. Camp Bethel was established in the 1800s as a camp surrounding a central chapel. Today, the Study Area includes a mix of zoned industrial/commercial and residential properties. The commercial properties are concentrated along Bridge Road and Saybrook Road (Route 154) while the residential properties are generally located on Little Meadow Road, adjacent to the Connecticut River, and Camp Bethel Road. Open space consisting of Clark Creek Wildlife Management Area and Eagle Landing State Park is located along the eastern portion of the Site.

2.1 Anthropogenic Setting

2.1.1 Land Use and Demographics

The Study Area is referenced as Tylerville Center and is located within the Town of Haddam, Middlesex County, Connecticut. It includes a mix of commercial, industrial, and residential properties. The Study Area contains 99 total parcels zoned for residential, commercial, and industrial land uses. Population data within the Study Area was not available from the Town offices; however the Town population in 2015 was 8,338, according to the United States Census Bureau report released in December 2016.

Based on the modified Phase I ESA conducted at the Study Area (AECOM, 2010), manufacturing operations have occurred on portions of the Study Area since the early 1900's. Aerial photos identified manufacturing, agricultural, and residential land uses since 1936. Historic topographic maps identify increasing development in the Tylerville section of Haddam.

2.2 Physical Setting

2.2.1 Physical Geography

Haddam, Connecticut lies within the Connecticut Valley Lowland, a north-south trending basin in Central Connecticut that is also known as the Central Lowland or Hartford Basin. The study area topography ranges from approximately 10 feet to 80 feet above mean sea level (msl). Properties along Saybrook Road are at approximately 50 feet above msl, and properties along the western portion of Bridge Road range from approximately 50 feet to 80 feet above msl. The eastern section of Bridge Road drops off towards the Connecticut River to approximately 10 feet above msl or lower. The properties along Little Meadow Road are at approximately 10 feet to 20 feet above msl.

2.2.2 Geology

The Tylerville Center area is located on glacial meltwater deposits known as the Lower Connecticut River Tylerville-Portland Deposits (USGS, 2005). These deposits are predominantly derived from deposition within sediment dammed ponds as the ice sheet melted and retreated during the last glaciation. An ice contact margin was noted by USGS (2005) to run from northwest to southeast through Tylerville, where a localized lobe of ice extended from the glacial margin. It is inferred that the depositional environment would be very complex based on the position of the ice contact margin and ponding caused by sediment dams. Deposits are up to 250 feet thick in this unit. Deltaic sediments within this depositional unit are primarily coarse grained materials with fine interbedded clays and silts. Alluvial floodplain materials were identified adjacent to the Connecticut River in this location.

Bedrock is identified as Hebron Gneiss, interlayered dark-gray to brownish gray quartz-biotite schist and greenish gray, fine to medium-grained calc-silicate gneiss. This is an early Paleozoic formation that comprises the Hebron Formation. The Hebron Formation comprises a large portion of bedrock in this section of the state (USGS, 2000). Investigations for the Sibley site (95 Bridge Road) have shown outcrops nearby dipping gently and moderately westward and that some areas are capable of producing adequate amounts of groundwater to supply drinking water domestic wells (Ebasco, 1987). Investigations in the shallow overburden have identified unconsolidated materials of varying thickness consisting of fine to medium sand, fine to coarse sand, and/or fine sand and silt (CEI, 2008).

2.2.3 Hydrogeology and Contaminant Migration

Groundwater flow is generally eastward toward the Connecticut River in the bedrock aquifer and may be south/southeast in the deltaic sediments where depositional features may be dipping south. There is evidence of groundwater flow vertically downward into bedrock as inferred by water levels in overburden and bedrock wells. Based on several shallow monitoring well installations in Tylerville, sand, silt, and clay layers exist in the overburden aquifer, likely affecting vertical groundwater migration where present. The silt and clay lenses from glacial deltaic deposits are generally not continuous, especially where depositional bedding has collapsed, and may inhibit vertical migration in areas where these are present. Where the silt and clay lenses pinch out, vertical migration is possible, especially with dense contaminants, such as chlorinated solvents. Numerous pumping wells within the bedrock aquifer in the area may enhance the vertical gradient between the overburden aquifer and the bedrock aquifer below. Contaminants likely enter the bedrock fractures along the overburden/bedrock interface.

Advective transport with groundwater flow dispersing chemicals is the dominant mode of contaminant transport (as described above); however, diffusion may also play a role in the transport of contaminants through the silt and clay layers. Diffusion relies on concentration gradients rather than pressure gradients, and may play an important role in vertical migration through silt and clay if continuous low permeable layers are present.

Once contaminants reach bedrock, transport is a function of the fracture geometry and hydraulic conditions within the fracture network. Bedrock fracture networks are often unpredictable in their connectivity. Several bedrock wells located in close proximity may exhibit very different characteristics, including water quality and yield, depending on the fractures that they intersect. Depending on how the fracture network is connected, how often and at what rate the bedrock aquifer is pumped, contaminants can readily and rapidly become widely distributed in the subsurface.

As noted in the draft EPA *Technical Comments on Sibley Company Work Plan* (2000), the Study Area geology and hydrogeology is quite complex. Historic water quality data indicates multiple contaminant sources in the overburden aquifer (e.g. Sibley, Botelle, and gas stations); however, the limited availability of borehole logs, well construction details, well installation techniques, and incomplete/sporadic historic water quality data has complicated complete understanding of the area groundwater flow characteristics. Several residential and commercial wells are completed in the bedrock aquifer at variable depths with varying yield, identifying heterogeneity in the fracture networks within the study area (i.e. it does not appear that every well intersects and pumps from one particular fracture). In a general sense, based on site topography and the presence of the Connecticut River, it is expected that water infiltrates the overburden aquifer and recharges the bedrock aquifer. Based on regional hydraulic gradients, groundwater from both the overburden and bedrock aquifers may ultimately discharge to the Connecticut River. However, based on the limited data in both the overburden and bedrock aquifers, available information is incomplete to fully understand hydrogeologic conditions at the Site.

In 2014, CT DEEP contracted with USGS to perform borehole geophysical survey, and with Loureiro Engineering Associates, Inc. to collect discrete groundwater sampling of select private bedrock wells in the Study Area. Data indicates that contamination is entering at least two bedrock wells along Little Meadow Road at depths of 150+ feet below the bedrock surface (300+ feet below ground surface).

2.3 Groundwater Impacts

Groundwater in the Tylerville Center area has been impacted as a result of documented releases of contaminants from multiple sources. **Figure 2** outlines the Study Area, historical detections of contaminants, contaminants detected at concentrations exceeding applicable regulatory criteria, and properties currently utilizing individual water treatment systems. **Appendix B** lists each property in the Study Area, provides the laboratory results from the most current round of sampling at each property, historic ranges of concentrations for the periods 1981-2010 and 2011-2017, as well as the collected laboratory data for the period 2010-2017.

2.3.1 Documented Release Areas

Current and historic land uses have resulted in impacted groundwater in the vicinity of the Study Area. Suspected release areas and contaminants are summarized below.

95 Bridge Road: The Former Sibley Company
The former Sibley Company Site is located at 95 Bridge Road. Manufacturing operations were conducted at the site from the 1950s until 1986 when a fire destroyed the building. Historic sampling of the potable well has been completed by the Chatham Health District.

Past investigations identified impacts to soil and groundwater associated with the historic facility operations. Reported facility use of solvents and degreasers, including tetrachloroethene (PCE), trichloroethene (TCE) and 1,1,1-trichloroethane (TCA) have impacted on-site soil and groundwater and may have resulted in impacts to groundwater resources within the Study Area. Metals and ETPH impacts to soil and groundwater have also been identified.

105 Bridge Road: Former ConnDOT Facility
The former CONN DOT maintenance facility is located at 105 Bridge Road. The facility conducted operations at the site from 1953 to the late 1980s or early 1990s. The facility was then moved to its current location at 1640 Saybrook Road, contiguous with the former location. The 105 Bridge Road parcel is now owned by CCC Haddam LLC. Several environmental investigations and groundwater monitoring events have been conducted at this site. The Chatham Health District and CT DEEP have sampled the on-site drinking water wells since 2008.

Historic investigations identified impacts to soil and groundwater associated with the facility operations. Historically, sodium was detected in the shallow and deep overburden groundwater samples at concentrations that exceed CT DPH notification levels. Sodium impacts were also noted in neighboring property wells, including 95 Bridge Road. Total petroleum hydrocarbons (TPH), TCE, and chromium were detected above GA Groundwater Protection Criteria (GWPC) at this location (CEE, 2000). Overall site investigation activities have included the collection of soil samples from approximately 115 locations and the installation of 15 groundwater monitoring wells. Groundwater impacts have been attributed to on site releases of salt (i.e., sodium and chloride) and potential on-site migration from off-site releases (i.e., VOCs) (GeoInsight, 2015). However, more recent groundwater monitoring have identified reduced levels of contamination on the property (CTDEEP SASU, 2017), including only arsenic at concentrations exceeding the SWPC.

79-81 Bridge Road: Botelle Property
The Botelle property is located at 79-81 Bridge Road. The site was reportedly operated as a small manufacturer of antiqued copper powder kegs by a prior owner. The work was reportedly conducted in the former garage for a few years in the mid-1970s. Degreasing solvents were reportedly used during this operation. Septic tank sludge was sampled in 1981 and TCA was detected at an elevated concentration. CT DEEP issued an order to the Botelles to remove the sludge. Compliance with the order was subsequently achieved. The CT DEEP conducted limited subsurface investigations of the property in the 1990s, in the fall of 2009 and more recently in 2014-2015. Contaminants were not detected above the applicable regulatory criteria in the shallow subsurface soils and shallow groundwater.

1598 Saybrook Road (Rt. 154): Tylerville Mobil Gas Station
The Tylerville Mobil Gas Station (Mercury Fuel Services, Inc.) is located at 1598 Saybrook Road (Rt. 154) and is currently an active gasoline station. Several environmental investigations and groundwater monitoring events have been conducted at this site. Releases of benzene, toluene, ethylbenzene, and toluene (BTEX) and MTBE have been documented in soil and groundwater at this property. A Notice of Significant Environmental Hazard Report was filed in August 2009 and May 2011. In response to these notices, Mercury Fuel Services has conducted voluntary monitoring of potable wells on 19 properties impacted or potentially impacted with gasoline constituents. Mercury Fuel Services has also voluntarily provided potable water or granular activated carbon (GAC) filtration systems to 5 of the 19 properties it is monitoring. In June 2012, Mercury Fuel entered into a consent order with CT DEEP to investigate and remediate pollution on and emanating from the site. Remediation via air sparging and soil vapor extraction has been conducted. The voluntary potable well monitoring program has been reduced to monitoring 8 of the 19 original potable wells as MTBE concentrations have been declining.

1618 Saybrook Road (Rt. 154): LukOil Gas Station
The LukOil Gas Station is located at 1618 Saybrook Road (Rt. 154) and is currently an active gasoline station. It is also referred to as the Tylerville General Store. Historic investigations detected MTBE, arsenic, barium, and selenium in groundwater at concentrations that exceeded the GWPC. Impacts to groundwater were identified in 1995. Historic investigations note that the release was terminated.

Little Meadow Road: Former Camelot Cruises (now Eagle Landing State Park)
Contaminated soil was removed from the site in 1983; however, sampling of the on-site well in 1996 and 2003 yielded some of the highest solvent concentrations found in the Study Area to date. It is not clear whether shallow groundwater impacts of solvents to the former Camelot Cruise property resulted from releases occurring on the property, if the overburden in this location receives impacted groundwater from the bedrock aquifer, or if another contaminant source exists. The CT DEEP Site Assessment and Support Unit (SASU) performed an investigation in 2015 (CT DEEP SASU, 2017). Findings indicated that deep overburden groundwater was impacted but shallow groundwater was not impacted. Additional investigation is necessary to determine if a vertical gradient exists at this location.

2.3.2 Contaminants of Concern (COCs)

Chlorinated volatile organic compounds (CVOCs), MTBE, and 1,4-dioxane are the primary COCs in the Study Area. CT DEEP and the Chatham Health District have conducted periodic sampling of potable water at many properties in the Tylerville Center area. CT DEEP has conducted routine sampling at 18 residential properties where it maintains GAC filter systems and also collects annual and biennial water samples of other nearby residential wells. Analyses have included VOCs and MTBE at all locations with a subset including 1,4-dioxane. In 2011, Mercury Fuel Services began quarterly sampling at 19 locations and analyzes for VOCs and MTBE. Laboratory results are typically distributed to the owner/occupant, the local health department (formerly Chatham Health District, now Connecticut River Area Health District as of July 2016), and CT DEEP. In addition to sampling potable water, Mercury Fuel Services has installed and maintains granular activated carbon (GAC) filtration systems and/or provides bottled water service to five properties. **Figure 2** outlines the Study Area, historical detections of COCs, exceedances of regulatory criteria, and properties currently utilizing individual water treatment systems. Regulatory criteria are described in **Section 2.4**.

CVOCs detected in the Study Area include PCE, TCE, 1,1-dichloroethene (DCE), TCA, vinyl chloride, and associated breakdown products. These solvents are typical of degreasing/processing operations in industrial applications. Chlorinated solvents are generally denser than water and have high solubility. Depending on aquifer conditions they may be naturally biodegraded over time. In the absence of reducing conditions, CVOCs may persist for long periods until the aquifer can effectively flush out the contaminants. In the saturated overburden, solvents may be bound in silty layers. In fractured rock aquifers, long tailing of concentrations may occur where back diffusion from secondary pore spaces of the rock matrix transports contaminants to primary pore spaces. Typically, chlorinated solvents respond well to GAC filtration, which is currently in use at several properties within the Study Area.

MTBE, a fuel oxygenate, was formerly used in gasoline until 2004. MTBE has high solubility and is not readily degraded in the environment, allowing it to become more widely distributed than other gasoline constituents. MTBE does not have a high affinity for aquifer-bound organic materials, so it is likely more widespread than other gasoline constituents. MTBE will likely persist in the aquifer until it is effectively flushed out and it may exhibit long tailing effects as it diffuses back out of secondary porosity. MTBE does not easily bind to active GAC sites given its affinity for staying in solution, and in the presence of other gasoline constituents, it may be the limiting factor in GAC filter lifetimes requiring more frequent filter change outs.

1,4-Dioxane is an emerging contaminant used as a solvent in numerous industrial processes, products, and as a solvent stabilizer in TCA (USEPA, 2009). 1,4-Dioxane is completely miscible in water and is not readily degraded in the environment, so it may be more widely distributed than other contaminants in the subsurface. It is likely to persist until flushing of the aquifer or remediation occurs because it is not readily biodegraded. Similar to MTBE, 1,4-dioxane does not respond well to GAC filtration. The contaminant does not bind strongly to carbon filter media and is easily displaced by other chlorinated solvents. As a result, 1,4-dioxane breaks through GAC filters relatively rapidly. Extended treatment trains, and extensive monitoring is required to ensure breakthrough of the contaminant has not occurred. More sophisticated oxidation mechanisms are needed to more efficiently and effectively remove 1,4-dioxane from drinking water, but these technologies are not available for use at a residential scale.

Industrial/commercial land uses have been in place within the Study Area since at least the 1950s. It is conceivable that environmental impacts have been present since that time. Recent investigation has shown that CVOCs are present deep in the bedrock aquifer in the Study Area and are likely to persist for a very long time. Additional environmental investigation is being completed to more fully understand fate and transport of contaminants within the Study Area.

Separate from the anthropogenic COCs discussed above, naturally-occurring arsenic has been recently detected in 7 residential wells within the Study Area at levels of concern. The source of the arsenic is believed to be the bedrock in which the wells are drilled. Arsenic cannot be treated with a GAC filter like other Study Area COCs. Instead, arsenic removal from water is accomplished using reverse osmosis, ion exchange, or metal oxide filters. Because arsenic is naturally occurring, CT DEEP does not provide a remedy for the pollution, and the property owner is responsible for any treatment that may be needed.

2.4 Applicable Regulatory Criteria

The applicable regulatory criteria associated with an evaluation of the impacted groundwater within the Study Area include the CT DPH Drinking Water Action Levels (DWALs) and the EPA MCLs. The table below presents a summary of the applicable regulatory criteria for the contaminants of concern within the Study Area. **Table 1** provides maximum historic and current concentrations of COCs detected and **Appendix B** provides the laboratory results from the most current round of sampling at each property, historic ranges of concentrations for the periods 1981-2010 and 2011-2017, as well as the collected laboratory data for the period 2010-2017. **Figure 3** identifies properties with exceedances of applicable drinking water criteria.

Parameter	US EPA MCL (µg/L)	CT DPH Drinking Water Action Levels (µg/L)	CT DPH Showering/Bathing Action Levels (µg/L)
1,4-Dioxane	~	3	50
MTBE	~*	70	~
1,1,1-Trichloroethane	200	200	~
Tetrachloroethene	5	5	~
Trichloroethene	5	1	~
1,1-Dichloroethene	7	7	~
Cis-1,2-Dichloroethene	70	~	~
Trans-1,2-Dichloroethene	100	~	~
1,1-Dichloroethane	~	25	~
Vinyl chloride	2	0.5	~

*US EPA does not currently have an MCL for MTBE, but advises for a 20-40 µg/L limit for smell and taste.

2.4.1 CT DPH Drinking Water Action Levels

The DWALs set forth by the CT DPH provide numeric screening criteria for contaminants prescribed in CGS Section 22a-471 which are identified in potable groundwater currently in use as the sole or primary source of drinking water. If contaminants are identified in drinking water wells at concentrations that exceed the DWALs, the CT DEEP and CT DPH will advise residential users to utilize bottled water and/or install an appropriate water treatment system to remove the contaminant. According to CT DPH, the levels are set to avoid health risks from potential exposure. The DWALs for COCs present in the Study Area are included in the table above. The laboratory data for Study Area drinking water wells provided by CT DEEP and summarized in Appendix B were compared to the CT DPH DWALs.

2.4.2 Maximum Contaminant Levels

Drinking water standards are regulations that EPA sets to control the level of contaminants in the nation's drinking water. These standards are part of the Safe Drinking Water Act's "multiple barrier" approach to drinking water protection, which includes assessing and protecting drinking water sources; protecting wells and collection systems; making sure water is treated by qualified operators; ensuring the integrity of distribution systems; and making information available to the public on the quality of their drinking water.
After reviewing health effects studies, EPA sets a Maximum Contaminant Level Goal (MCLG), the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health of persons would occur, and which allows an adequate margin of safety. MCLGs are non-enforceable public health goals. Since MCLGs consider only public health and not the limits of detection and treatment technology, sometimes they are set at a level which water systems cannot meet. When determining an MCLG, EPA considers the risk to sensitive subpopulations (infants, children, the elderly, and those with compromised immune systems) of experiencing a variety of adverse health effects.

Once the MCLG is determined, EPA sets an enforceable standard. In most cases, the standard is a MCL, the maximum permissible level of a contaminant in water which is delivered to any user of a public water system. EPA's Drinking Water Strategy Goals propose to regulate 16 carcinogenic VOCs with a public health goal of 0 µg/L.

2.5 Impacted Groundwater Areas

Laboratory data focused on the COCs highlighted above, collected within the Study Area from 1980-2017 and provided primarily by the CT DEEP and Chatham Health District, is summarized and included in **Appendix B** as described in **Sections 2.3 and 2.4**. **Figure 2** presents a summary of those properties that have reported concentrations of COCs in groundwater, utilize GAC filtration, and/or receive bottled water. It should be noted that **Figure 2** presents a summary of laboratory data over the course of the sampling period noted above (1980-2017). Some contaminant concentrations have declined on specific properties over time (e.g., MTBE concentrations in potable wells in the western part of the Study Area). However, the intent of this Study is to detail historic and continuing impacts to groundwater and identify an alternative for long-term water supply. A detailed evaluation of spatial contaminant concentrations over time is beyond the scope of this Study and is being evaluated as part of an on-going investigation of the regional groundwater contamination problem by CT DEEP.

In general, higher concentrations of MTBE were identified in the vicinity of gasoline stations located at the intersection of Saybrook Road and Bridge Road, with lower concentrations detected sporadically throughout the remainder of the Study Area. CVOCs and 1,4-dioxane were identified in the vicinity of former potential sources located east of the intersection along Bridge Road extending east and southeast to Little Meadow Road. Properties downgradient from both locations (Camp Bethel Road, Little Meadow Road) are generally impacted with multiple COCs. Naturally occurring arsenic is an additional COC that has been detected in certain bedrock drinking water wells in the Study Area. Additional details are summarized in **Section 2.5.1**.

The Phase I ESA completed for Tylerville Center notes that the former ConnDOT facility located at 105 Bridge Road had concentrations of sodium at levels exceeding CT DPH criteria (AECOM, 2010). This information was summarized from a portion of a 1987 Preliminary Test Report which indicated that sodium and chloride levels exceeded the applicable regulatory criteria. However, more recent reports indicate that levels of sodium in groundwater have decreased since uncovered road salt storage practices ceased. It was also noted that neighboring properties also had elevated levels of sodium in the past; however, detailed investigation of the extent of sodium impacted groundwater has not yet been completed.

Many drinking water wells in the Study Area were completed in the bedrock aquifer. Some wells were completed in the sand and gravel overburden. Generally, bedrock wells intersect many water-bearing fractures, which yield enough water for consumptive use. Wells that are hydraulically connected to the pollution source areas are impacted or may become impacted in the future. Wells drilled into isolated fractures will likely remain potable, but it is difficult to ascertain which wells are truly isolated from pollution sources. Naturally occurring arsenic present in Study Area bedrock could require additional water treatment. Based on the unpredictable nature of fracture geometry, properties in close proximity may exhibit very different water quality depending on the fracture geometry and induced groundwater flow directions. Due to the nature and widespread occurrence of the impacts, COCs, especially CVOCs and 1,4-dioxane, will likely persist in groundwater at Tylerville Center for some time. On-going sampling of residential water supply wells has been utilized by CT DEEP to monitor impacts and potential migration of COCs within Tylerville Center.

2.5.1 Tylerville Study Area

The properties contained within the Study Area are listed in **Table 2** with other defining characteristics (land use, population/building square footage, etc.). Population data for **Table 2** was estimated for residential land use as four people per household. For many commercial and retail properties, the estimated population was not available, so the existing building square footage was included. It should be noted that not all properties within the Study Area have exhibited exceedances of applicable criteria in groundwater. The borders of the Study Area have been developed to provide the primary limits of the area for evaluation of water supply alternatives.

Properties in the Study Area utilize groundwater resources for potable water supplies. Individual wells supply water to each of the industrial/commercial and residential properties. Drinking water at approximately 37 properties is currently exceeding, or has historically exceeded, applicable drinking water criteria. An additional 37 properties have current detections, or have historically had detections, of COCs within the Study Area. Individual water treatment systems are currently utilized at approximately 24 locations. Ten locations receive bottled water. Most of the commercial properties receive no water treatment or bottled water. A summary of land uses, detections and exceedances of regulatory criteria, and water treatment for Study Area properties is provided in the following table.

Overview of Study Area – Potable Water Impacts

Property Type (Zoning)	Total Properties	Relative Contaminant Concentrations				Current Water Treatment	
		ND	Detections	Exceed	No Information[1]	Filter	Bottled
Residential	58	8	18	24	8	18[2]	7
Commercial	38	2	15	8	5	10[3]	3
Industrial	3	0	4	5	1	1	0
Totals	**99**	**10**	**37**	**37**	**14**	**29***	**10****

Notes:

* 26 filter systems are utilized on 24 properties (79/81 Bridge Road has 2 systems on one property, 1610 Saybrook Road has 2 systems on 1 property)

** Seven residential and one commercial properties receive bottled water and also have treatment systems

(1) Either no access or no well present

(2) 64 Bridge Road has a filter system that serves 9 additional residential dwellings

(3) One commercial zoned property has two dwellings each with a filter system (79/81 Bridge Road)
Exceed – Contaminants exceed MCL or DWAL criteria for one or more contaminants
ND – Contaminants not detected

2.5.2 Proposed Water Supply Area

A Proposed Water Supply Area has been delineated to serve as the basis for evaluating potable water supply alternatives. The approximate limits of the Proposed Water Supply Area are illustrated on **Figure 3**. It includes a total of 99 properties, which are listed in **Table 2**. The area was defined to include properties where concentrations of COCs currently exceed or have historically exceeded applicable drinking water criteria, where documented releases have occurred, and adjacent properties. These properties are generally located on Bridge Road, Saybrook Road, a portion of Camp Bethel Road, Bethel Lane, Bridge Lane, South Side Bluff, and Little Meadow Road. Generally, detections of COCs have been identified in wells located in northern portions of the Study Area (not included in the Proposed Water Supply Area); however, the current and historic concentrations have not exceeded applicable drinking water criteria. Although groundwater flow is generally eastward toward the Connecticut River, this is complicated by the unpredictable nature of groundwater flow in bedrock. Also, continued pumping of existing water supply wells north of this portion of the Study Area may induce a hydraulic gradient allowing impacted groundwater to flow to the area. South of the Proposed Water Supply Area, Clark Creek and associated wetlands exist with few properties pumping groundwater, so similar changes are unlikely to affect areas south of the Study Area. To fully assess anticipated changes, additional characterization of the current impacts of COCs is needed in deep overburden and bedrock aquifers.

2.5.3 Connecticut Department of Health Regulated Water Supply Systems

The CT DPH regulates community water systems to ensure a safe and adequate supply of water is available. CT DPH regulates three types of systems:

Community water systems- Water systems with at least 15 service connections, which serve at least 25 residents throughout the year.

Non-transient, non-community water systems- non-residential water systems that regularly serve 25 or more of the same people on a daily basis for at least 6 months per year (e.g. schools, offices).

Transient, non-community water systems- non-residential water systems that serve 25 or more people, not necessarily the same people, on a daily basis for at least 60 days per year. According to CT DPH, the population served by transient, non-community water systems are difficult to estimate. Values for this type of well included in the table below are estimated.

Within the Study Area, 10 locations have water systems that are regulated by CT DPH. An additional four wells serve multiple properties, but are not regulated by CT DPH. These locations are:

- 79/81 Bridge Road which serves two separate residences (79 and 81 Bridge Road);
- 64 Bridge Road which serves 56, 64, and 72 Bridge Road; 6, 16, and 17 Bridge Lane; and 151, 155, 159, and 163 Camp Bethel Road;
- 1572 Saybrook Road serves 1564 Saybrook Road; and
- 149 Camp Bethel Road serves 143 Camp Bethel Road.

The CT DPH regulated systems are listed in the following table.

Connecticut Department of Health Regulated Water Systems Community Water Systems					
Address	**Land Use**	**In Proposed Water Supply Area**	**Population Served**	**Impacts**	**GAC Filter System In Use**
1556 Saybrook Road	Residential	No	155	MTBE	No
Non-Transient, Non-Community Water Systems					
Address	**Land Use**	**In Proposed Water Supply Area**	**Population Served**	**Impacts**	**Filter**
95 Bridge Road	Commercial	Yes	65 (3 Connections)	MTBE & CVOCs	Yes
117 Bridge Road (located at 1610 Saybrook Road)	Commercial	Yes	100 (2 Connections)	(MTBE threatened)	Yes
1610 Saybrook Road	Commercial	Yes	103	MTBE	Yes
Transient, Non-Community Water Systems					
Address	**Land Use**	**In Proposed Water Supply Area**	**Population Served**	**Impacts**	**Filter**
85 Bridge Road	Commercial	Yes	25 (Estimated)	MTBE, CVOCs	Yes
106 Bridge Road	Commercial	Yes	25 (Estimated)	MTBE	No
Camp Bethel	Residential	No	78 Service Connections	MTBE	No
1618 Saybrook Road	Commercial	Yes	25 (Estimated)	MTBE	Yes
82 Bridge Road	Commercial	Yes	200 (Estimated)	MTBE	Yes
1572 Saybrook Road	Commercial	Yes	25 (Estimated)	MTBE	No
1617 Saybrook Road	Commercial	Yes	25 (Estimated)	ND	No
1627 Saybrook Road	Commercial	Yes	25 (Estimated)	ND	No
55 Bridge Road	Commercial	Yes	304	CVOCs, 1,4-Dioxane	Yes

Notes:
MTBE – Methyl Tert-Butyl Ether
CVOCs – Chlorinated Volatile Organic Compounds
ND – Compounds not detected
N/A – Information not available

3.0 Screening Level Evaluation of Water Supply Alternatives

Potential water supply alternatives have been identified and evaluated in accordance with CGS Section 22a-471 and RCSA Section 22a-471-1(f). The alternatives, as outlined in the statute, include the development of a community well system, individual household filtration systems (point of entry treatment), new individual wells and the extension of existing water mains. Initial screening criteria include an analysis of effectiveness in protecting human health, reliability, cost, and implementation.

3.1 Water Supply Alternatives

Four water supply alternatives have been identified for the impacted properties in the Proposed Water Supply Area. They include the development of a community groundwater supply and distribution system, the continued use of individual treatment systems, the installation of new wells at each property, and the extension of the neighboring Connecticut Water Company (CWC) water distribution system in Chester. Each potential alternative has been screened based on the criteria listed above.

3.1.1 Development of Community Groundwater Supply

Development of a community groundwater supply includes the development of a new groundwater source proximal to the Proposed Water Supply Area. A distribution system would be installed within or proximal to the Proposed Water Supply Area and would provide all potable water to identified properties. This alternative, combined with institutional controls limiting the use of groundwater from within the impacted area, would limit exposure to contaminated groundwater. Development of this alternative requires the following actions:

- Identify potential groundwater source outside of the Proposed Water Supply Area and the limits of the contaminant plume;
- Acquire and control land where wells will be located;
- Limitation on future groundwater use;
  (From Sections 19-13-B51(b) of the CT Public Health Code)
  No water supply well permit shall be given by the director of health:
  (1) To premises used for human occupancy when a community water supply system having at least fifteen service connections or regularly serving at least twenty-five individuals is deemed available if the boundary of the parcel of property in which the premises is on or will be located on is within two hundred feet, measured along a street, alley or easement, of the approved water supply: or
  (2) To non-residential premises, where the water may be used for human consumption, when a community water supply system having at least fifteen service connections or regularly serving at least twenty-five individuals is deemed available if the boundary of the parcel of property in which the premises is on or will be located on is within two hundred feet, measured along a street, alley or easement, of the approved water supply.

- Apply for CT DPH Diversion Permit, if necessary;
- Road Encroachment Permit from the DOT;
- Wetlands Permit from the Haddam Wetlands Commission;

- Installation of community water distribution system;
- Connect all properties in the Proposed Water Supply Area;
- Abandon existing wells;
- Groundwater monitoring to assess potential changes in contaminant mobility; and
- Operation and maintenance of installed infrastructure.

Weston and Sampson Engineers, Inc. (WSE) previously performed a study to evaluate options for providing potable water to Tylerville Center (WSE, 1999). In this study, WSE identified a potential location for a new groundwater source at a former gravel pit, located on Rutty Ferry Road approximately ¾ mile north of the commercial area. Although this site is outside the Study Area, this or any other nearby site for groundwater extraction would likely require additional investigation to identify whether contamination would impact the new well field. This alternative may increase mobility of contaminants if the well field is hydraulically connected to the impacted portion of the bedrock aquifer. Extraction of groundwater from a single location may induce a large gradient which may pull contaminants toward it, eventually impacting the well field. It should also be noted that the Rutty Ferry Road location is adjacent to an electric transformer substation not under the control of the Town of Haddam.

Implementation of this alternative includes installation and development of new groundwater supply wells, assumed to be upgradient of the Proposed Water Supply Area. Currently, there is no suitable land under the ownership or direct control of the Town of Haddam. Although the Town of Haddam owns a 63 acre parcel southwest of the Study Area and south of the Route 82 connector identified as Map 67, lot 3, the upland location is isolated and is not considered suitable. Typically, large community supply wells are located in river valleys within high yielding stratified drift or sand and gravel deposits. Because of the upland location, bedrock wells would need to be drilled, which have uncertainty with regard to both water quantity and quality (e.g., possible high arsenic levels).

Along with the new supply wells, a hydropneumatic station, water storage tank (back-up supply and fire suppression), and back-up power supply would be required including generator and fuel supply. A chemical treatment system and building will be required. The proposed distribution system would include the installation of gate valves, connections to impacted properties within the Proposed Water Supply Area, and meters in accordance with general industry practice. Once properties are connected, existing individual property wells would be properly abandoned.

AECOM expanded upon the water supply evaluation conducted by WSE and included updated estimated costs associated with the new community water source in the Modified Phase I Environmental Site Assessment and Review of Historical Data Report (AECOM, September 2010). The principal components of the cost include capital costs and cost for operation and maintenance (O&M). Capital costs of more than $6.6 million were estimated and consist of direct and indirect costs initially incurred to develop, construct and implement the alternative. O&M costs include maintenance of the installed infrastructure and operation and administration of the water distribution service area.

3.1.2 Individual Water Treatment

Individual water treatment includes the installation and/or continued use of individual filter systems. Currently, a number of treatment systems are operating in order to provide potable water to individual properties. CT DEEP personnel provide system oversight, operation and maintenance of 18 granular activated carbon (GAC) treatment systems on 17 residential properties where the contaminant levels in drinking water exceed DWALs for one or more constituents. CT DEEP also provides system effectiveness monitoring. In addition to treatment systems, CT DEEP provides bottled water to seven locations to prevent exposure to 1,4-dioxane. Mercury Fuel is currently maintaining three treatment systems on three commercial properties. Mercury Fuel also provides bottled water for one (1) property. Five other commercial properties maintain their own systems.

The following list summarizes actions necessary to implement this alternative:

- Routine potable water sampling of properties with and without treatment systems;
- Installation of individual treatment systems, at each location with exceedances of applicable regulatory criteria, and at other locations not currently exceeding criteria as a precaution;
- Treatment systems to be selected for the contaminants of concern at each specific location (e.g., carbon adsorption);
- May include continued use of existing individual treatment systems components;
- Regular treatment system operation and maintenance required (e.g., carbon change-out); and
- Bottled water provision as a precaution for wells containing greater than 3 μg/L of 1,4-dioxane.

This alternative includes continued use and/or installation of new individual treatment systems to properties within the Proposed Water Supply Area. The systems will be specifically designed to treat contaminant concentrations found at each individual location. As stated previously, CVOCs, MTBE, and 1,4-dioxane are the primary contaminants of concern. CVOCs are more readily absorbed to GAC and may displace both MTBE and 1,4-dioxane from adsorption sites in the granular carbon or allow MTBE and 1,4-dioxane to flow through (e.g. solubility of MTBE and 1,4-dioxane is higher than TCE, thus it is energetically favorable for MTBE and 1,4-dioxane to stay in solution), so it is necessary to periodically monitor the performance of these systems to ensure breakthrough has not occurred. Additionally, the presence of 1,4-dioxane is of particular concern because its poor treatment by carbon adsorption and combined with low DWAL requires provision of bottled water for locations that have concentrations greater than 3 µg/L (CT DPH DWAL) as a precaution against 1,4-dioxane breakthrough of the GAC filters.

The principal components of the cost include capital costs and cost for O&M. Capital costs consist of direct and indirect costs initially incurred to develop, construct and implement the installation of filter systems. O&M costs include maintenance of the installed systems including carbon changes and routine monitoring to verify system effectiveness. Additional details are provided in **Section 5.1**.

3.1.3 Development of New Individual Groundwater Supply

This alternative includes the development of a new groundwater source for each property within the Proposed Water Supply Area. This would require the installation of new wells at each property with exceedances of applicable criteria and groundwater monitoring to determine if COCs are present or become present in the newly installed wells. Many of the existing potable wells exceeding applicable drinking water criteria are installed in the bedrock aquifer. The location of the various contaminant plumes is uncertain, but documented in both the overburden and bedrock aquifers, thus installing additional wells in the immediate area with known contamination is not recommended. Additional mobilization of COCs in the subsurface may occur and potentially increase exposure to other users.

3.1.4 Extension of Existing Connecticut Water Company Water Distribution System

This alternative includes the connection to and the extension of the existing CWC Water Distribution System (system) located in the Town of Chester. The CWC system currently terminates on Route 154 at Denlar Drive, approximately two miles from the Proposed Water Supply Area. The extension would connect a new water main to the existing CWC water main. The new water main would be extended north on Route 154 into the Study Area. Water mains would be installed within the Proposed Water Supply Area, on Route 154 north of Bridge Road, along Brookes Court, along Bridge Road, along a portion of Camp Bethel Road and Bethel Lane, along Bridge Lane, along South Side Bluff, and then along Little Meadow Road to its termination. CWC would provide all operations and maintenance functions associated with the implementation of this alternative, and these costs would be borne by the property owners through the water rates.

This alternative, combined with Health Code requirements limiting the use of groundwater from within the new service area, would limit exposure to contaminated groundwater. The following list summarizes actions necessary to implement this alternative:

- Limitations on future groundwater use, per Section 19-13-B51(b)(1) and (2) of the Public Health Code (properties will be required to hook up to a water main if within 200 feet of the main);
- Connection to existing CWC system in Town of Chester and extension of system into the Proposed Water Supply Area;
- Connect all properties in the Proposed Water Supply Area;
- Abandon existing wells; and
- Operation and maintenance of installed infrastructure by CWC.

The proposed distribution system would include the installation of gate valves and connections to impacted constituents within the Proposed Water Supply Area and service meters in accordance with general industry practice.

The principal components of the cost estimate include capital costs and cost for O&M. The costs for water provided by CWC are not included in the cost estimate. Capital costs consist of direct and indirect costs initially incurred to develop, construct and implement the alternative. O&M costs include maintenance of the installed infrastructure and administration of the water distribution. Details for this alternative are outlined in **Section 5.2.**

3.2 Alternatives Screening

Several water supply alternatives were proposed in the preceding sections including:

- Development of a community groundwater supply;
- Installation of individual treatment systems;
- Installation of new individual groundwater supplies; and
- Extension of the water main from existing CWC facilities in the Town of Chester.

Initial screening of each of these alternatives included an analysis of the effectiveness in protecting human health, reliability, cost, and implementation, as discussed below.

The development of a new community groundwater supply is not a recommended alternative based on many uncertainties associated with implementation. Suitable land would need to be identified and acquired, and well yield and groundwater quality are uncertain. Additionally, without a thorough understanding of current plume dynamics, a groundwater supply located near Tylerville may become contaminated in the future. Further, suitable land would need to be identified to install the infrastructure needed for the community system, including a hydropneumatic water booster station, water storage tank, water treatment building, and emergency generator and fuel supply. Costs for this alternative are comparable to others.

Individual treatment systems, already used in the Study Area to treat individual water wells, are proposed as a viable alternative. One potential drawback is the presence of 1,4-dioxane. 1,4-Dioxane is resistant to treatment by GAC filters and would require the provision of bottled water for concentrations greater than 3 μg/L. Additional filter canisters in the treatment train and/or frequent canister replacement is required to eliminate the potential for breakthrough of this difficult to treat contaminant. This option, currently in use in the Study Area, requires extensive monitoring of contaminants to ensure that the water systems remain potable. These actions impose residents and business owners in the area with intrusive O&M activities. This option poses limited environmental impacts since site buildings are already in place and systems can be housed inside (with the exception of a few of the smaller buildings).

Installation of new individual groundwater supplies is not feasible since many polluted drinking water supply wells are completed in both the overburden and bedrock aquifers. This option would likely result in impacts to the newly installed wells.

Extending the water main from the Town of Chester to the Tylerville Center area is a feasible option. Homes and businesses would be served by a reliable source of potable water. Extension of the existing CWC Chester System is one of the proposed means to serve the Tylerville Center area.

Based on the application of the screening criteria detailed previously in this section, two alternatives are recommended for additional evaluation. They are the installation and/or continued use of individual treatment systems and the extension of the CWC water distribution system currently located in the Town of Chester. These two alternatives will be further evaluated with respect to their effectiveness in protecting human health, reliability, relative cost and implementation. The development of a community groundwater supply and distribution system is eliminated from further consideration due to implementation, reliability, relative cost, and uncertainties in a new system's well yield and water quality. The installation of new individual groundwater supplies is also eliminated from further consideration due to concerns associated with the protection of human health and reliability since new wells installed within the Proposed Water Supply Area may also become contaminated.

4.0 Water Demand Calculations

Estimated water demands within the Proposed Water Supply Area were calculated and are included in **Tables 3 and 4**. Additionally, estimated water demands were calculated for the Route 154 corridor from Chester to Haddam, with the anticipation that properties along that section may connect to the water main (**Table 5**). Average daily, maximum daily and peak hourly demands were calculated based on CT DPH flow estimating techniques. Water demand was categorized as residential, commercial or industrial, based on the zoning of each lot within the designated Area. Street address, land use, zoning and building information were compiled from the Haddam Geographic Information System (GIS) for each parcel located in the Proposed Water Supply Area. A summary of water use for the Proposed Water Supply Area and the Chester/Haddam Route 154 corridor is included in **Table 6**.

4.1 Residential Water Demands

Residential water demands were estimated based on the number of service connections times the number of people per service connection times 75 gallons per capita per day (gpcd). This estimating technique is detailed in "Guidelines for Design and Operation of Public Water System, Treatment, Works, and Sources, State of Connecticut Department of Public Health, Water Section", Section III.B.2 Water Quantity. The number of people per service connection was estimated at 4 people for single-family residences, two for mixed use apartments, and one multi-family home was estimated to have 4 one bedroom units with an estimated population of 2 people per unit.

The number of households was estimated from a combination of the zoning information and the land use information provided by the Town of Haddam. In some cases, mixed land use was identified (e.g. industrial property with multiple buildings- residence and warehouse or single family apartment in a commercial building, etc). Where multiple buildings/uses were identified, Haddam tax information was used to determine the applicable land uses for the most appropriate water demand calculation, assuming that separate service connections would be made. In the Proposed Water Supply Area, 64 single-family homes (including properties with multiple single family homes), 3 mixed-use apartments, and 1 multi-family home were identified. In addition, a high density residential water demand, associated with the proposed Brookes Court development, was included.

4.2 Commercial and Industrial Water Demands

Commercial and industrial demands were estimated based on zoning information, total building size, and current land uses. The Connecticut Public Health Code On-Site Sewage Disposal Regulations and Technical Standards for Subsurface Sewage Disposal Systems, Technical Standards Section IV, Table 4 specifies flow calculations based on square footage and land use for commercial and industrial properties. In addition to the residential connections described above, the Proposed Water Supply Area is comprised of six food service facilities, five commercial garages (three of which are active), one ConnDOT maintenance facility, nine office spaces, 16 retail spaces, and seven industrial spaces.

4.3 Future Development

In addition to what is currently developed/utilized within the Proposed Water Supply Area, water demands were calculated for one undeveloped and one proposed redevelopment/

subdivision within the Proposed Water Supply Area. Maximum build out scenarios were assumed for a conservative estimate of potential future use. Each scenario listed below assumes a single story building:

- One commercially-zoned lot, Parcel 2-1, is six acres. The Town of Haddam allows up to 40% of the commercial property to be covered by the footprint of a building. This permits a building area of approximately 104,500 square feet.
- Recent subdivision of 1564 and 1572 Saybrook Road includes plans for high-density residential units. A total of 90 units are planned, including 60 in the first phase and 30 in the second phase.

Note that Parcel 22-2 is undeveloped and portions of the parcel are currently zoned for industrial use with smaller portions of the parcel zoned for residential use along Bridge Road. This parcel is owned by CT DEEP and is part of the Clark Creek Wildlife Management Area. CT DEEP has no development plans for this property and intends to maintain it for passive wildlife management. Given this conservation use, water demand was not calculated for Parcel 22-2.

4.4 Chester/Haddam Route 154 Corridor

The Chester/Haddam Route 154 corridor includes both residential and commercial land uses between Denlar Drive in Chester and the Proposed Water Supply Area. Water use for residential and commercial properties was estimated similarly to those in the Proposed Water Supply Area. These properties are included as a conservative estimate of additional water demand if they are permitted to tie into a water main (if installed) based on current land use regulations.

4.5 Estimated Study Area Water Demands

The total average daily demand (ADD) for the Proposed Water Supply Area is approximately 53,106 gallons per day (GPD). With 10% contingency, the ADD increases to 58,416 GPD. The maximum day water demand was estimated using a demand multiplier of 1.50 as recommended by CT DPH, which results in a maximum day flow (MDF) of 79,658 (87,624 with 10% contingency) GPD. Peak hour demand (PHD) was calculated using “Guidelines for Design and Operation of Public Water System, Treatment, Works, and Sources, State of Connecticut Department of Public Health, Water Section”. The PHD factor is one-third of the ADD, resulting in a PHD of approximately 298 gallons per minute (GPM). Water usage from parcels along the Haddam/Chester Route 154 corridor (which may connect in the case of CWC system extension) accounts for an ADD of approximately 14,875 (16,363 with 10% contingency) GPD or an MDF of approximately 22,313 (24,544 with 10% contingency) GPD. The PHD was estimated to be approximately 83 GPM.

The total ADD for the existing consumption within the Proposed Water Supply Area and the Chester/Haddam Route 154 Corridor is approximately 67,981 GPD (74,779 with 10% percent contingency) GPD. The MDF and PHD were estimated to be approximately 101,971 GPD (112,168 with 10% contingency) GPD and 381 GPM, respectively. If maximum development of undeveloped parcels within the Water Supply Area is included, the total ADD for the Water Supply Area and Route 154 Corridor increases to approximately 108,625 (119,488 with 10% contingency) GPD and the MDF increases to 152,906 (168,197 with 10% contingency) GPD. The PHD for this scenario increases to 570 GPM. As shown, the maximum development estimates are very conservative and increase the estimated demand substantially.

Table 6 provides a summary of the ADD, MDF, and PHD for the Proposed Water Supply Area, the Chester/Haddam Route 154 corridor, the combination of the Water Supply Area with the additional parcels along Route 154 in Chester and Haddam, and for the combined area including the potential future maximum development of undeveloped parcels.

CWC estimated water demand, projected on the 5 year horizon, for the Haddam/Chester-Route 154 corridor and the Tylerville area based on census data consisting of; current average household size, projected population growth, and projected additional development. Industrial and commercial use was estimated on a per acre basis. Average daily demand was estimated to be approximately 46,338 GPD for residential, industrial, and commercial properties. Maximum month average daily demand (a different metric than MDF) was estimated to be 64,873 GPD. Peak day demand (a different metric than PHD) was estimated at 82,482 GPD. For direct comparison, CWC's ADD was used as a base to calculate MDF and PHD to compare directly with the calculations for this evaluation. The comparison is shown in the table below.

Comparison of AECOM and CWC Water Demand Calculations			
Method	**Total ADD (GPD)**	**MDF (GPD)**	**PHD (GPM)**
CWC	46,338	69,507	257
AECOM Existing Demand (including 10% ADF, MDF unallocated water)	73,789	100,041	340
AECOM Maximum Development	119,488	168,197	570

In general, the existing demand estimates for this study are comparable (but higher) than the CWC demand estimates. The study estimates of total demand including a very conservative future development scenario are substantially higher than the CWC estimates. In addition, the AECOM estimates include additional properties along the northern boundary of the Study Area that were not included in the CWC estimate.

4.6 Fire Protection

In addition to the base (consumption) demand discussed above, flows required for fire protection to the Proposed Water Supply Area have also been evaluated at the request of the Town of Haddam. Fire protection needs were evaluated based on the Insurance Services Office (ISO) Public Protection Classification (PPC™) Program on Water Supply Evaluations found in **Appendix C**. ISO looks at whether a community has sufficient water for fire suppression beyond a community's daily maximum consumption for other purposes. For residential areas with one and two family dwellings, ISO determines the needed fire flow by considering the distance between buildings in an effort to account for increased fire risks when buildings are closely spaced. Based on the existing building spacing along Route 154 and within the Tylerville area, a minimum fire flow of between 500 and 1,000 GPM is needed to maintain a desirable ISO PPC grading.

For individual buildings, ISO calculates the needed fire flow based on the specific building's characteristics. Fire flows required for individual buildings can vary substantially from a minimum of 500 GPM to a maximum of 12,000 GPM dependent on factors such as building use, materials of construction, and occupancy. In its previous study, WSE calculated the needed fire flow for a typical 16,000 square foot, one story, un-sprinklered building of masonry construction to be approximately 2,500 GPM. Buildings protected by an automatic sprinkler system typically have smaller needed fire flows due to the ability of a sprinkler system to divide the building into smaller hazard exposure zones. When evaluating a community's PPC grading, ISO does not typically consider individual buildings with a needed fire flow greater than 3,500 GPM, nor those with an automatic sprinkler system.

Considering these factors, should fire protection be desired by the Town of Haddam, additional water demand of at least 500 GPM should be included for planning purposes.

4.7 Water Main Sizing

Water main sizing to provide adequate supply of potable water to properties within the Study Area was evaluated based on information provided by CWC. This included a review of water supply capacity as well as consideration of delivery of the anticipated potable water supply flowrates, identified previously, at acceptable pressures. This evaluation concludes that installation of a network of 8-inch diameter water mains is sufficient to provide adequate water supply to the currently impacted and at-risk properties within the Study Area as well as those along the path of a proposed extension of the CWC system. This evaluation focuses on the delivery of potable water and therefore, water main sizing has not been selected based on the potential fire protection flow requirements.

5.0 Detailed Evaluation of Alternatives

The water supply alternatives identified in **Section 3.0** for additional evaluation include the installation and/or continued use of individual treatment systems and the connection to the existing CWC water distribution system in the Town of Chester. This section provides a detailed evaluation of these alternatives in accordance with RCSA Section 22a-471-1(f)(1)(A-F). The objective of these alternatives is to provide potable water to all properties within the Proposed Water Supply Area and to prevent exposure to contaminated groundwater.

5.1 Individual Treatment Systems

This alternative includes the installation or continued use of existing, individual treatment systems, specifically designed to treat contaminant concentrations found at each individual location. As stated previously, VOCs are the primary contaminants of concern. However, a particular contaminant of concern is 1,4-dioxane, because of its resistance to efficient treatment by carbon adsorption.

CT DEEP currently maintains 20 residential GAC treatment systems, Mercury Fuel maintains two systems, and seven commercial properties and one industrial property maintain their own systems within the Proposed Water Supply Area (total of 29 GAC treatment systems in use). CT DPH regulates five water supply treatment systems. Many residential systems along Bridge Road have been in use since the late 1980s, whereas some properties along Little Meadow Road have seen installations as recently as 2010/2011.

Based on information provided by CT DEEP, drinking water at residential properties with filter systems is generally sampled before the first filter (raw), between filters (mid), and after the second filter (treated) to determine if/when breakthrough has occurred. The majority of the properties are sampled on a quarterly basis.

CT DPH regulates five non-community wells with treatment systems on commercial properties. The five properties are 1610 Saybrook Road, 55 Bridge Road, 82 Bridge Road, 95 Bridge Road and 117 Bridge Road. Sampling frequencies and parameters are established by the CT DPH and implemented by individual system operators.

This water supply alternative includes installation of individual GAC treatment systems at every location within the Proposed Water Supply Area as a conservative approach to ensure potable water is supplied to all properties. Estimated costs include a new system for each location within the Proposed Water Supply Area, which includes replacement of existing systems. At a minimum, existing systems will require inspection to ensure their condition is adequate for future use and existing carbon canisters will likely require a base change out. Based on available sampling data, two classifications of individual GAC treatment systems have been developed. In general the classifications are as follows:

- *Standard residential and commercial/industrial treatment systems (two carbon units)* – 84 locations (149 systems total) (Note: Saybrook at Haddam (1556 Saybrook) and Brookes Court high-density residential development require multiple systems to accommodate flowrates).
- *Enhanced residential and commercial/industrial treatment systems (three carbon units)* – 15 locations (16 systems total)

The standard residential and commercial/industrial systems are identical to the existing systems. They include two carbon units, each with approximately 2 cubic feet of activated carbon. The standard systems are specified for those locations with elevated concentrations of CVOCs and MTBE, but without elevated concentrations of 1,4-dioxane. CVOCs are more readily absorbed to GAC and may displace MTBE from adsorption sites in the granular carbon and allow MTBE to break through (e.g. solubility of MTBE is higher than TCE, thus it is energetically favorable for MTBE to stay in solution), so it is necessary to periodically monitor the performance of these systems to ensure breakthrough has not occurred.

The enhanced residential and commercial/industrial systems contain three carbon units to prevent 1,4-dioxane breakthrough and to reduce 1,4-dioxane concentration to acceptable levels. Similar to MTBE, 1,4-dioxane does not readily sorb to carbon and is easily displaced from the carbon media by CVOCs with which it co-occurs. However, 1,4-dioxane has a much lower DWAL than MTBE; thus three filters are proposed to be used. Proposed locations for the enhanced systems have historically, or are currently exceeding, the CT DPH DWAL of 3 µg/L for 1,4-dioxane. In addition to the enhanced GAC treatment systems, bottled water must also be provided to these locations with 1,4-dioxane as a precaution based on the low DWAL. Advanced Oxidation Processes (AOP) would provide more effective removal of 1,4-dioxane, but the practicality of these systems begins at flow rates of approximately 6 to 10 GPM and greater. Many locations within Tylerville currently utilize water at flow rates much less than 10 GPM. Multiple carbon unit systems with frequent carbon changes and bottled water provision are proposed to address those locations with 1,4-dioxane contamination in drinking water. Additional monitoring will be required to ensure the 50 µg/L bathing/showering action level is not exceeded in the post-treatment water.

Table 7 summarizes the locations in the Proposed Water Supply Area receiving enhanced and standard GAC individual treatment systems. System configuration for the proposed high-density residential development at Brookes Court and Saybrook at Haddam Assisted Living Facility (1556 Saybrook Road) were addressed with multiple standard systems and are assumed to be constructed in parallel. **Figure 4** outlines the properties receiving enhanced and standard filter systems.

The individual treatment system alternative would not provide water capacity for fire protection use within the Proposed Water Supply Area.

5.1.1 Long Term Reliability and Feasibility

Reliability of the individual treatment alternative, particularly GAC units, is dependent on routine monitoring of raw water, between filters, and after filter to determine whether contaminant concentrations are increasing prior to filtration and whether contaminant breakthrough has occurred. Proper operation and maintenance of the individual treatment systems is feasible on a long term basis. Continued migration of the contaminant plume(s) may require modification of treatment schemes at individual properties, particularly if 1,4-dioxane is detected above applicable CT DPH action levels. Thus, consistent treatment efficacy associated with 1,4-dioxane will also require monitoring and the potential for revising treatment schemes.

Drinking water criteria for given contaminants may change in the future as additional data and research modifies acceptable exposure levels in potable water. Currently, EPA is revisiting MCLGs and MCLs for TCE and other VOCs. It may be necessary to modify treatment systems in the future to address changes in acceptable drinking water criteria.

5.1.2 Capital Cost and Operating and Maintenance Cost Estimates

Detailed capital cost and O&M cost estimates are included in **Table 8**. For purposes of capital cost estimating, it is assumed that all existing individual treatment systems would be replaced. At a minimum, existing systems will require inspection to ensure all systems are operational and in good condition with a likely base carbon filter change out on existing systems. Without performing an initial inspection of the systems, conservative cost calculations assume that existing systems will require replacement. Properties currently undeveloped have been included since systems will be required should future development or expansion of facilities occur. Capital costs consist of direct and indirect costs initially incurred to develop, install, and implement this alternative. Direct capital costs include system engineering/design, implementation, procurement of the system components and hardware, installation, removal of existing individual treatment system (if necessary), and initial system monitoring. Indirect capital costs are generally included in labor rates; however, generally include overhead costs (e.g. communications, office supplies, copies, etc) associated, but not directly billable to the project.

O&M costs include maintenance of the individual treatment systems as well as carbon filter change-out costs and water quality sampling and analysis. A 20-year planning horizon has been used to evaluate future O&M costs. In accordance with EPA guidance, annual cash outflows associated with O&M costs are estimated in constant dollars (i.e. year 0) and are not impacted by price inflation. A discount rate of 3% has been applied to calculate the present value of future costs. It is also assumed that system replacement would occur on a 20 year basis.

A capital cost estimate and operation and maintenance cost estimate are included in **Table 8**. The total capital cost to implement this alternative within the Proposed Water Supply Area is **$692,063**. The net present value of twenty year O&M costs for this alternative is **$3,862,427**.

5.1.3 Consistency with Plans of Conservation and Development

Implementation of this alternative is consistent with the 2007 Adopted Town of Haddam Plan of Conservation and Development (POCD), the 2009 Town of Chester POCD and the State of Connecticut Conservation and Development Plan (C&D Plan). This alternative would continue to support the land uses highlighted in the Haddam POCD; namely the commercial land uses clustered around the Bridge Road (Route 82) and Route 154 intersections and the bordering residential use. The C&D Plan identifies the majority of the Proposed Water Supply Area as a Village Priority Funding Area for mixed-use development. Lands immediately adjacent to the Connecticut River are identified as Protected and Conservation Areas (Eagle Landing State Park). Land use in the Town of Chester would be unaffected by this alternative.

Four undeveloped parcels identified below are located within the Proposed Water Supply Area. All the parcels are zoned for commercial (C-1) except for the 17 acre plot (Parcel 22-2) directly south of 55 Bridge Road which is zoned for Industrial (I-1) with residential frontage on Bridge Road. In the future, these currently undeveloped parcels can be serviced with individual treatment systems to support potable water needs; however, the fact that the systems will require periodic maintenance and sampling may detract potential buyers and developers, where applicable.

- Map 49, Lot 2-1 (Old Chester Road North) - Commercial
- Map 49, Lot 22-2 (Clark Creek Wildlife Management Area, located south of 55 Bridge Road) – Residential frontage, industrial interior but owned by CT DEEP

and will likely remain undeveloped, based on its current and anticipated future use as a passive wildlife management area.

- Map 49, Lot 22-1A (14 Little Meadow Road) – Eagle Landing State Park, not for private development but state park may require potable water service in the future.
- Map 49, Lot 22-1 (located south of 14 Little Meadow Road) – Eagle Landing State Park (State-owned property), not for private development but state park may require potable water service in the future.

5.1.4 Environmental Impacts

The purpose of the Connecticut Environmental Policy Act (CEPA) – administered by the Connecticut Office of Policy & Management - is to identify and evaluate the impacts of proposed State projects ("actions") that could have the potential to significantly affect the environment (for the purposes of CEPA, the term "environment" means "*the physical, biological, social, and economic surroundings and conditions which exist within an area which may be affected by a proposed action including land, air, water, minerals, flora, fauna, noise, objects of historic or aesthetic significance and community or neighborhood characteristics"*). This evaluation enables the State agency proposing or funding a project to judge the appropriateness of proceeding with the action in light of its environmental impacts. The process also provides opportunity for public review and comment through an early public scoping process, as well as later review of an Environmental Impact Evaluation (EIE), if required.

As stipulated in the CEPA, sponsoring agencies must prepare environmental classification and impact documents. An evaluation of an action must be made with respect to potential direct and indirect effects and cumulative impacts to the environment. A full evaluation of this proposed alternative is not within the scope of this document; however, short term and long term environmental impacts are limited and it is unlikely that a full CEPA evaluation would be required. Existing wells would continue to be used. The treatment systems would be installed within the existing structures. Long term impacts would be limited to the O&M activities associated with system monitoring and carbon change-outs. Long-term system monitoring may impose on families and operations within businesses as it is an invasive procedure requiring access to interior portions of buildings at the Proposed Water Supply Area properties. Carbon change-outs also require access to site buildings and may require site activities to cease while change out occurs.

5.1.5 Potential for Future Contamination

Current and historic land uses in the Tylerville area have contributed to adverse groundwater impacts. MTBE, CVOCs and/or 1,4-dioxane have been detected in many drinking water samples collected from wells within the Study Area. Portions of the Study Area have trace to low levels of MTBE not exceeding regulatory criteria. The distribution of COCs within Tylerville will continue to be influenced by pumping-induced gradients associated with the use of individual wells with treatment systems. New developments and water wells may also alter groundwater flow, likely changing the flow and transport of contaminants in Tylerville. More recently identified releases of gasoline constituents may continue to migrate away from source areas at the intersection of Bridge Road and Saybrook Road. For this alternative, monitoring would continue to occur to determine if GAC filter systems continue to effectively treat contaminant loads and to ensure that breakthrough has not occurred. 1,4-Dioxane may potentially continue to migrate, requiring system modifications in the future and provision of bottled water to additional properties.

More recent environmental studies have shown that contamination is present not only in the overburden aquifer, but it has also reached at least 100 feet deep into fractures in bedrock drinking water wells in the southeastern portion of the Study Area. Detailed environmental investigations of overburden and bedrock groundwater, simulating various pumping scenarios, would be required to define plume boundaries for both current and future plume migration. Given the length of time contamination has persisted and the relatively stable concentrations, it is anticipated that groundwater pollution will continue to persist for a long time.

5.1.6 Public Acceptance

Public acceptance of this alternative is likely to be problematic due to the continued use of impacted groundwater within the Proposed Water Supply Area and the fact that individual water treatment systems have been in use at some properties since the mid-1980s (more than 30 years).

5.1.7 Implementation Schedule

Implementation of this alternative, assuming the replacement of all existing individual treatment systems and installation of new systems, would require approximately six months. This would include system selection and design, removal of existing systems, new system installation, and an initial round of sampling (raw, between filters, post-filters) to ensure proper operation of the systems.

5.2 Connection to Connecticut Water Company Water Distribution System

This alternative includes extension of the existing CWC public community water system to the Proposed Water Supply Area. The CWC system currently terminates on Route 154 (Saybrook Road) at Denlar Drive in the Town of Chester, approximately three quarters of a mile south of the Town of Haddam line. Two different layouts have been developed for the extension of the existing CWC system.

Base Layout

The Base Layout is consistent with existing CWC plans, dated July 22, 2010, prepared by Gesick & Associates, P.C. on behalf of CWC and includes installing a water main along Route 154 from the termination of the CWC system at Denlar Drive in Chester to beyond the intersection with Bridge Road (Route 82), easterly along Bridge Road to the intersection with Little Meadow Road, and southerly along Little Meadow Road to its termination. Water main spurs would be installed as necessary within the Proposed Water Supply Area to provide service to all properties within this area. An additional extension of approximately 1,100 feet along Route 154 has been added to service the impacted residents north of the intersection of Route 154 and Bridge Road (Route 82). Other sections of proposed main include small water main spurs down Bridge Lane and South Side Bluff, a spur down Camp Bethel Road and Bethel Lane and a spur down Brookes Court to serve those residents affected and threatened by groundwater contamination.

Alternate Layout

The Alternate Layout seeks to decrease the total linear distance of water main installed by connecting from Route 154 to Little Meadow Road before Tylerville. The difference is approximately 1,945 linear feet, however, the Alternate Layout would require crossing train tracks twice (Bridge Road and Little Meadow Road) and a wetland/stream area. This would complicate installation and potentially adversely impact a sensitive ecological area. This alternative also does not provide water service to a 1,600 foot length of Route 154 and 14 properties located outside of the Proposed Water Supply Area, should they require connection in the future.

Water Main Size

In addition to two different possible layouts for the proposed water main extension, two different water main sizes are being considered for the extension: 8-inch or 12-inch diameter ductile iron piping. These main sizes were evaluated due to the expected water demand. They are also standard water main sizes and regularly installed by CWC and within the water supply industry. CWC has evaluated each size main using a hydraulic model to simulate the performance of its existing system and the proposed extension and found that either size main will have adequate capacity for the anticipated base (consumption) water demand associated with the extension. Although the 12-inch main would cost more than the 8-inch main (approximately $564,000 more), there are several potential benefits to this larger main size:

- The additional hydraulic capacity of the 12-inch main would provide greater available fire flow, improving the community's safety and the ability of the local fire department to provide fire protection, as well as potentially lowering insurance rates for the community within the service area;
- The additional hydraulic capacity of the 12-inch main would accommodate larger increases in demand within the Proposed Water Supply Area; and
- The additional hydraulic capacity of the 12-inch main would accommodate greater increases in demand beyond the limits of the Proposed Water Supply Area.

Implementation

In 2010, CWC prepared detailed engineering drawings for the extension of their water distribution system from the Town of Chester into the Tylerville Center area similar to the Base Layout. The plans depict water main installation that would provide service to an area that is slightly larger than the Study Area. Specifically, the CWC plans propose water main installation that extends outside the north boundaries of the Study Area along Camp Bethel Road. However, the Base Layout includes extension of the main along Route 154 beyond the intersection with Bridge Road to serve affected properties in this area. The CWC plans terminate the main extension along Route 154 at the Bridge Road intersection. Certain other minor differences exist between the CWC plans and the Base Layout described herein, including small water main spurs along several local residential roads to distribute water to these neighborhoods. Given that work would be required within state highway right of ways, CONN DOT review and approval will be required. In addition, CT DPH review and approval of the water system expansion will be required.

It is anticipated that once installation of the water main is complete and connections are made, all existing potable wells would be properly abandoned in accordance with regulation [RCSA Section 22a-471-1(g)(2)(B)]. Existing individual water treatment systems would also be removed.

<u>Disinfection Byproducts</u>
One additional factor to be considered is the potential for the presence of disinfection byproducts (DBPs) within the extended water service area. These chemicals are formed when organic carbon reacts with chlorine, the chemical used by the CWC and other public water service providers, to disinfect water against pathogenic organisms. Disinfection

byproducts include the groups of chemicals known as trihalomethanes and haloacetic acids.

Due to the hydraulic characteristics of the extended water service piping and the associated water quality characteristics, the formation of disinfection byproducts is possible. Therefore, the potential for DBPs to form was evaluated in the “Water Quality Study to Evaluate Disinfection Byproducts (DBPs) Formation,” dated April 2017, prepared by AECOM. In general, the report findings indicate the potential for minor issues associated with the formation of DBPs and water age in the potential water main extension, particularly at dead ends and also with the larger, 12-inch water main alternative. The report also details potential mitigation actions to be conducted by CWC, such as water main flushing, efficient use of chlorine, and management of treated water quality. Mitigation actions will likely only be required during specific conditions (e.g. early autumn) and would require that hydrants, or other flushing devices, be installed near dead ends in the system to purge water. Mitigation actions will also not impact the ability of CWC to deliver water at acceptable flowrates and pressure. The report is included in **Appendix D**.

5.2.1 Base Layout (8-Inch)

Figure 5-A provides a schematic layout of the proposed (base layout) extension of an 8-inch water main from the Town of Chester to service the Proposed Water Supply Area. **Figure 5-B** provides a detailed view of this base layout. The Proposed Water Supply Area includes service to 99 properties (with one property receiving two service connections) for a total of 85 connections. Segments of the proposed 8-inch water main base layout are outlined in the following table.

Water Main Extension Proposed Water Supply Area – Base Layout (8-Inch)

Section	Pipe Diameter (in.)	Length (ft)
Route 154 – Chester	8	4,082
Route 154 – Haddam	8	8,863
Route 82 (Bridge Road)	8	2,735
Little Meadow Road	8	3,368
Camp Bethel Road and Bethel Lane	8	1,550
Bridge Lane	8	450
South Side Bluff	8	750
Brookes Court	8	510
	Total Length	**22,308**

5.2.2 Alternate Layout (8-Inch)

An alternate layout for the 8-inch main extension, presented in **Figures 6-A and 6-B**, has also been developed. It includes routing the water main from Route 154 directly to Little Meadow Road and extending the main via this route through the Proposed Water Supply Area. Segments of the alternate 8-inch water main layout are outlined in the table below.

Water Main Extension Proposed Water Supply Area – Alternate Layout (8-Inch)

Section	Pipe Diameter (in.)	Length (ft)
Route 154 – Chester	8	4,082
Route 154 – Haddam	8	5,618
Route 82 (Bridge Road)	8	2,735
Little Meadow Road	8	4,668
Camp Bethel Road and Bethel Lane	8	1,550
Bridge Lane	8	450
South Side Bluff	8	750
Brookes Court	8	510
	Total Length (ft)	**20,363**

5.2.3 Base Layout (12-Inch)

Figure 7-A provides a schematic layout of the proposed (base layout) of a 12-inch main extension from the Town of Chester to service the Proposed Water Supply Area. **Figure 7-B** provides a detailed view of this base layout. Segments of the proposed 12-inch water main base layout are outlined in the following table. Note that certain minor water main spurs serving smaller areas would remain 8-inch diameter as opposed to the primary 12-inch distribution main.

Water Main Extension Proposed Water Supply Area – Base Layout (12-Inch)

Section	Pipe Diameter (in.)	Length (ft)
Route 154 - Chester	12	4,082
Route 154 – Haddam	12	8,863
Route 82 (Bridge Road)	12	2,735
Little Meadow Road	8	3,368
Camp Bethel Road and Bethel Lane	8	1,550
Bridge Lane	8	450
South Side Bluff	8	750
Brookes Court	8	510
	Total Length	**22,308**

5.2.4 Alternate Layout (12-Inch)

An alternate layout for the 12-inch main extension, presented in **Figures 8-A and 8-B**, has also been developed. It includes routing the water main from Route 154 directly to Little Meadow Road and extending the main via this route through the Proposed Water Supply Area. Segments of the 12-inch alternate water main layout are outlined in the table below.

Water Main Extension Proposed Water Supply Area – Alternate Layout (12-Inch)

Section	Pipe Diameter (in.)	Length (ft)
Route 154 – Chester	12	4,082
Route 154 – Haddam	12	5,618
Route 82 (Bridge Road)	12	2,735
Little Meadow Road	12	4,668
Camp Bethel Road and Bethel Lane	8	1,550
Bridge Lane	8	450
South Side Bluff	8	750
Brookes Court	8	510
	Total Length (ft)	**20,363**

5.2.5 Fire Protection

In addition to supplying water for consumptive use, the water main extension could also help to address fire protection needs in the area. In accordance with Insurance Services Office (ISO) evaluation requirements, needed fire flows for residential areas range from 500 to 1,000 GPM for the study area depending on the distance between buildings. Needed fire flows for un-sprinklered commercial and industrial buildings is determined based upon the building area, construction, occupancy, and exposure and can range from a minimum of 500 GPM to a maximum of 12,000 GPM, above the base domestic water demand. Needed fire flow for buildings with automatic sprinkler systems can be significantly less. In cases where the needed fire flow for a larger commercial or industrial building is greater than the capacity of the water distribution system to provide this, the building's owner may construct his own private fire suppression system which may include private fire suppression water storage tanks and dedicated fire pumps.

Available fire flows will vary throughout the system depending on several factors including the elevation, distance from the source, and other additional demand on the system. CWC evaluated the capacity of its system with the proposed water main extension (for either an 8-inch or 12-inch main extension) using a hydraulic model to simulate the system performance. For this simulation, CWC applied estimated peak summer demand throughout the system and then evaluated the available fire flow at the point in the system expected to be the hydraulically weakest. This simulation estimated the maximum fire flow that could be discharged from the system at this location until the system pressure reached a minimum of 20 psi. This evaluation found that:

- An 8-inch main extension could provide a needed fire flow of up to approximately 650 GPM above the base (consumption) demand;
- A 12-inch main extension could provide a needed fire flow of up to approximately 1,250 GPM above the base (consumption) demand for fire flow.

Based on these estimates, the 8-inch main extension would be adequate in addressing the residential needed fire flow required by ISO to achieve a desirable Public Protection Classification (PPC) grading. The PPC is the nationwide classification system used to reflect a community's local fire protection for property insurance rating purposes. The 12-inch main would be adequate for meeting not only residential needed fire flow demand, but also fire flow for larger industrial buildings.

Provisions for fire protection would also include the installation of fire hydrants on the proposed water main extension in both the Towns of Haddam and Chester. The potential locations of the fire hydrants would be based on ISO requirements and recent input provided by the local fire department. The location of fire hydrants would be selected based on land use and flexibility in delivering fire flows. Final locations would be dependent on field conditions and additional input from the local fire department to optimize areal coverage and hydrant accessibility.

5.2.6 Long Term Reliability and Feasibility

Public water mains provide the greatest degree of reliability with respect to supplying a continuous supply of potable water. Considering the resistance of 1,4-dioxane to treatment with GAC filtration, public water service ensures that high quality water is available to all recipients without monitoring individual locations and having to change out filters. Bottled water would not be required to be provided at properties with 1,4-dioxane. This alternative provides the greatest degree of long term feasibility. Proper operation and maintenance of the system, to be performed by CWC, is feasible on a long term basis. Public water would eliminate the long term intrusion upon home and business owners needed for long term filter operation and water quality monitoring that will be required based on the persistence and distribution of COCs in both overburden and bedrock aquifers in the Study Area.

5.2.7 Capital Cost and Operating and Maintenance Cost Estimates

Capital cost estimate summaries are included for the Proposed Water Supply Area (base and alternate layouts) in **Tables 9 and 10**. Detailed cost estimate backup for the Proposed Water Supply Area is included in **Appendix E**. The total estimated capital cost to implement this alternative is **$7,225,900** for the eight-inch base layout, **$6,768,900** for the eight-inch alternate layout, **$7,789,900** for the twelve-inch base layout and **$7,396,900** for the twelve-inch alternate layout. These costs do not include any additional infrastructure for fire protection such as hydrants. Note that the difference in cost between the 8-inch and the 12-inch mains is fairly small relative to the overall water system cost and is due almost entirely to the difference in the material cost of the pipe. All other costs such as excavation, installation and surface restoration remain the same.

Estimated Capital Costs for Public Water Main Alternatives		
Alternative:	**8-inch Main**	**12-inch Main**
Base Layout	$7,225,900	$7,789,900
Alternative Layout	$6,768,900	$7,396,900
Fire Protection (hydrants)	$117,100	$120,800

Operation and maintenance costs would be provided by CWC and included within the service fees paid by the property owners. **Appendix F** includes rate information provided by CWC and summarized below.

Users would incur costs associated with typical water usage rates and service fees. Based on CWC rate schedules, users would be responsible for the costs once the water main is installed and individual connections are made to the properties:

Estimated Costs for Public Water Service for End Users		
Property Type:	**Residential**	**Commercial**
Service Turn On (one time):	$43.00	$43.00
Basic Service Charge (per month):	$25.87	$82.81
Water Usage (per 1,000 gallons):	$7.907	$6.920

Service connections from the water main to the individual building are included in the cost estimate for each alternative and would not be the responsibility of the individual property owner.

CWC also charges the municipality for the cost of public fire protection. This includes a monthly charge per hydrant as well as a monthly charge per linear foot of installed water main. Detailed costs are detailed in **Appendix F** and summarized in the table:

Estimated Monthly Costs for Public Fire Protection		
Service Fee	**Town of Chester**	**Town of Haddam**
Hydrant charge ($18.80/hydrant/month)	$75 (4 hydrants)	$169 (9 hydrants)
Linear foot charge ($0.09522/lf/month)	$390	$744
Total Monthly Cost	**$465**	**$913**

The estimated cost for installing fire hydrants in conjunction with the water main extension is approximately $117,100 for the 8" main base layout alternative and $120,800 for the 12" main base layout option (the only difference being the different size fitting to connect the hydrant assembly to the actual main). This cost estimate is summarized in **Appendix G.**

5.2.8 Consistency with Plans of Conservation and Development

Town of Haddam

Implementation of this alternative is consistent with the 2007 Adopted Town of Haddam POCD. This alternative would continue to support the land uses highlighted in the POCD; namely the commercial land uses clustered around the Bridge Road (Route 82) and Saybrook Road (Route 154) intersections and the bordering residential use. Development opportunities within Tylerville Center may be enhanced as a result of the implementation of this alternative. Please note the Haddam POCD, as of the date of this report, is being updated. As discussed in **Section 5.1.3**, four properties within the Proposed Water Supply Area are currently undeveloped.

Town of Chester

Implementation of this alternative is consistent with the 2009 Adopted Town of Chester POCD. This alternative would continue to support the land uses highlighted in the POCD. Measured development of the Saybrook Brook (Route 154) corridor is highlighted in the POCD. The POCD also specifically notes the expansion of the CWC water distribution system into the Tylerville area.

State of Connecticut

The 2013-2018 State Conservation and Development Policies Plan (C&D) requires that state agencies be consistent with the C&D. It should be noted that the C&D does not require municipal POCDs be consistent with one another or the State C&D. Public Act 05-205 required the Office of Policy and Management (OPM) to develop recommendations for the delineation of Priority Funding Areas (PFAs). The Act further required that no state agency shall provide funding for a "growth related project" unless such project was in a PFA.

The Locational Guide Map (LGM), a component of the C&D, is used to aid state agencies in the administrative requirements associated with funding decision making. The Study Area is largely within the Village PFA as shown on **Figure 9.** Extension of the CWC water distribution system into the Study Area is consistent with the C&D but it should be noted that OPM review of the proposed extension could require an exception to address areas along the extension route outside of the Village PFA. Designated conservation and protected lands are not included within the Proposed Water Supply Area with the exception of Eagle Landing State Park), though such lands border the proposed water main route along Route 154 in both Chester and Haddam. However, provisions to limit or prohibit connection to the water main could be implemented to achieve consistency with the C&D.

5.2.9 Connecticut Environmental Policy Act (CEPA)

The purpose of CEPA, which is administered by the Connecticut Office of Policy and Management (OPM), is to identify and evaluate the impacts of proposed State projects ("actions") that could have the potential to significantly affect the environment (for the purposes of CEPA, the term "environment" means "*the physical, biological, social, and economic surroundings and conditions which exist within an area which may be affected by a proposed action including land, air, water, minerals, flora, fauna, noise, objects of historic or aesthetic significance and community or neighborhood characteristics"*). This evaluation enables the State agency proposing or funding a project to judge the appropriateness of proceeding with the action in light of its environmental impacts. The process also provides opportunity for public review and comment through an early public scoping process, and potentially of an Environmental Impact Evaluation (EIE), if required.

To determine if a given project is subject to CEPA review, the State agency conducting the project must review either its own agency-specific Environmental Classification Document (ECD) or the statewide generic ECD. In either case, the ECD lists the types of projects which either will automatically require that an EIE be prepared, and also those for which, at a minimum, public scoping is required, which may or may not subsequently result in the preparation of an EIE for the action.

Relevant to water supply projects, the historic CT DEEP-specific ECD lists, among its actions, item II. 5 which covers "Capital improvement grants for long-term provision of potable water for which: A.) pipe sizing allows for or anticipates significant future growth or B.) environmentally sensitive areas will be traversed or potentially impacted." Though the historic CT DEEP-specific ECD is technically not currently in effect, it is still used to provide guidance on CEPA applicability for actions undertaken or funded by CT DEEP. The statewide generic ECD listing which is potentially applicable to the Tylerville project is:

> *II.g Any other action ... which may significantly affect the environment in an adverse manner. The significance of a likely consequence should be assessed by the agency in connection with its setting, its probability of occurring, its duration, its irreversibility, its controllability, its geographic scope and its magnitude.*

The proposed Tylerville water main extension project will undergo public scoping to gather both agency and public input concerning its potential impacts. Following public scoping, CT DEEP will determine if the project merits the preparation of an EIE and will publish a notice in the Environmental Monitor to inform agencies and the public of its determination, and of the anticipated timeframe for EIE preparation and distribution should that outcome be chosen. If an EIE is prepared and distributed for comment, all comments received would be addressed within a Record of Decision prepared by CT DEEP and forwarded for approval to OPM. The Record of Decision would state the agency's intention relative to proceeding with the project, would address any issues raised in the public and agency comments, and would describe any modifications or mitigation to be incorporated into the project to address issues or concerns that have been raised.

5.2.10 Potential for Future Contamination

Current and historic land uses in the Tylerville area have contributed to adverse groundwater impacts that have persisted for decades. MTBE, CVOCs and/or 1,4-dioxane have been detected in many drinking water samples collected from the Study Area since the early 1980s. Low concentrations of MTBE and CVOCs (not exceeding applicable criteria) have been detected in northern portions of the Study Area. More recent environmental studies have shown that contamination is present not only in the overburden aquifer, but it has also reached at least 150 feet deep into fractures in bedrock drinking water wells in the southeastern portion of the Study Area. The distribution of COCs within Tylerville is likely to change somewhat with the installation of a water main in the Proposed Water Supply Area and cessation of well use within the Area. However, the contaminant plumes are still expected to flow generally east/southeast toward the Connecticut River. Detailed environmental investigations of overburden and bedrock groundwater, simulating various pumping scenarios, would be required to define plume boundaries for both current and future plume migration. Given the length of time contamination has persisted and the relatively stable concentrations, it is anticipated that groundwater pollution will continue to persist for a long time.

5.2.11 Public Acceptance

The public typically widely accepts connection to a community water supply and distribution system. Eliminating access and use of impacted groundwater is typically considered the main benefit of connection to a community water supply. In addition, residents and business owners would no longer be inconvenienced by on-going, long term visits from contractors for maintenance and monitoring of individual filter systems. Some residents may object to fees associated with public water.

5.2.12 Implementation Schedule

Implementation of this alternative is anticipated to take approximately 12-15 months provided funding is available. This assumes a comprehensive EIE is not required, which would add approximately one year to the overall schedule.

6.0 Summary and Recommended Water Supply Alternative

Groundwater contamination in the Tylerville Center area was first identified in the late 1970s and early 1980s. The evaluation of contamination focused on the apparent discharge of solvents to groundwater, sodium chloride (from road salt storage) and MTBE. Several sites where releases have occurred have been identified. This report has identified a Proposed Water Supply Area which encompasses properties with significantly impacted groundwater, and those at risk of having groundwater becoming impacted in the future, within the Tylerville Center Study Area.

Water supply alternatives for the Proposed Water Supply Area have been identified and evaluated in accordance with CGS Section 22a-471 and RCSA Section 22a-471-1. The alternatives evaluated included the extension of the existing CWC water distribution system located in the Town of Chester, the development of a local groundwater supply and distribution system, the development of new individual wells, and the continued use of individual water treatment systems. The alternatives were evaluated based on effectiveness in protecting human health, reliability, typical cost, and implementability.

Based on an initial screening process, the development of a local groundwater supply and distribution system and the development of new individual wells were eliminated from detailed evaluation. The extension of the CWC water distribution system and the use of individual water treatment systems were evaluated in detail.

6.1 Recommended Alternative

The recommended alternative to supply potable water to the Proposed Water Supply Area in the Tylerville Center area is the base layout, 8-inch extension of the existing water main from the Town of Chester. Water mains provide the greatest degree of long term reliability, especially in the presence of 1,4-dioxane, which is resistant to treatment with GAC filtration and has a low DWAL. Under the recommended alternative, drinking water would be supplied to the Proposed Water Supply Area from existing water supply sources monitored and maintained by the CWC. This alternative is preferable to individual GAC treatment systems, which would require consistent, invasive monitoring, carbon canister exchanges, and maintenance over the service life to ensure a continuous supply of potable water. Individual GAC treatment systems have been used for more than 30 years already at some properties within the Study Area, and will be needed for an indeterminate time into the future based on the stability of CVOC concentrations and the presence of contaminants deep in the Study Area bedrock. In addition if GAC filters were used, bottled water would still need to be supplied to properties with 1,4-dioxane well water contamination. Further, potential changes in the MCLGs or MCLs for certain contaminants could complicate the long term use and/or viability of the individual treatment system option.

Installation of the water main is also the most feasible option for long term water supply. To reiterate, the individual treatment systems would require consistent, periodic monitoring and maintenance, which imposes undue intrusion on residences and business owners. Water mains, while not maintenance free, require far less than the individual treatment option.

Water mains of either an 8-inch or 12-inch diameter have been considered for this alternative, and CWC has determined that either water main size will have sufficient capacity to meet the existing domestic (consumption) demands of the Proposed Water Supply Area. CT DEEP recommends and the Town of Haddam concurs with selection of the 8-inch water main extension alternative. As stated previously, the 8-inch diameter water main provides adequate capacity to provide potable water to the Proposed Water Supply Area based on current zoning. In addition, the water main sizing in conjunction with designation of a transmission main along the Route 154 corridor from Chester to the Proposed Water Supply Area is consistent with the State C&D and local POCDs. The 8-inch main also meets residential fire flow requirements that are desired by the Town of Haddam.

Although the 12-inch main would provide additional capacity (for future development and additional fire flows and differs only in the additional cost of the 12-inch pipe, selection of this alternative would require completion of an EIE to further evaluate the project's consistency with the State C&D. This additional capacity would help to accommodate future development, not only in the Tylerville Village Priority Funding Area, but also potentially to areas outside of the Proposed Water Supply Area, which is beyond the scope of this study. In addition, use of a 12-inch main would increase water age and the likelihood of the formation of DBPs that would require additional maintenance by CWC to control (e.g., increased water main purging).

Engineering and institutional controls would likely be required to limit human exposure to impacted groundwater in this area. Institutional controls (e.g. CT DPH requirement that properties must connect when they are located within 200 feet of a water main, notifying future property owners) can provide a legally binding means of limiting exposure. Engineering controls consist of proper abandonment of potable wells, or conversion of potable wells to monitoring wells.

CWC is the designated Exclusive Service Provider (ESP) for Tylerville. In the CWC 2004 Water Supply Plan, CWC did not anticipate serving the Tylerville area until the 20/50 year planning periods. However, the recommended alternative does not negatively impact the Margin of Safety (MOS) associated with the CWC Chester Water System. Based on CWC's 2010 Water Service Plan, CWC specifically states that they intend to serve Tylerville within the five year planning period. Based on the projected needs of Tylerville, and Chester's water usage rates, the Chester Water System presently has an adequate margin of safety and excess water under all demand conditions to serve Tylerville. Correspondence between CT DPH and CWC in June 2012 reinforces CWC's commitment to providing Tylerville with adequate potable water and also indicates CT DPH concurrence with this. The correspondence is included in **Appendix H**.

In 2010, CWC prepared detailed engineering drawings for the extension of their water distribution system from the Town of Chester into the Tylerville Center area. The plans depict a 12-inch water main with 8-inch branch main installation that would provide service to an area that is slightly larger than the Proposed Water Supply Area. These CWC plans are generally consistent with the Base Layout discussed in this study except for minor differences discussed previously. Both ConnDOT and CT DPH review and approval of these plans will be required.

The recommended alternative is consistent with the Towns of Haddam and Chester POCD. It is also consistent with the State C&D as the project focuses on providing potable water to the Study Area which is largely within a Village PFA. As such, properties within the Study Area would be authorized to connect to the proposed distribution water main.

However, as noted in Section 5.2.8, Consistency with Plans of Conservation and Development, some areas in Chester and Haddam along the proposed water main extension route lie outside of the Tylerville Village PFA. Portions of the Route 154 corridor in Chester and Haddam are depicted as undesignated, protected, or conservation lands on the C&D Locational Guide Map. In order to maintain consistency with the C&D and LGM, the length of water main extending along Route 154 from Denlar Drive in Chester to the Study Area in Haddam would be considered a transmission main. Any property along this section of the water main would be authorized to connect to the water main if a local health department, CT DPH, and/or CT DEEP determines that the property must be connected to that water main to correct a public health problem on that property.

6.1.1 Funding for the Recommended Alternative

The Town of Haddam has initiated the procurement of funds for the water main installation option. The Town of Haddam has received a Small Town Economic Assistance Program (STEAP) grant for $500,000 to install a water main extension to Tylerville Center consistent with the Base Layout (Route 154 to Tylerville). On February 24, 2011, the State Bond Commission awarded the Town of Haddam $2,100,000 through the CT DEEP for lateral hookups and well abandonments associated with extension of water mains to the Tylerville area.

CT DEEP will need to request additional funds from the State Bond Commission in the amount of $5,125,900 for project completion. The Town of Haddam will need to enter into a Consent Order with CT DEEP pursuant to CGS Section 22a-471, which will allow state funds to be transferred to the Town on a reimbursement basis to complete the water main construction.

Unallowable Project Costs for State Funding Assistance

Section 22a-471-1 of the Regulations of CT State Agencies (RCSA) establishes the regulatory framework for “Grants to Municipalities and Water Companies for Potable Water Supplies” for situations “where groundwater pollution has rendered existing supplies unusable for potable drinking water.” Section 22a-471-1(g)(3) of these regulations states, “those costs which are not necessary for the construction of the potable water supply facilities are unallowable” for state funding assistance under this program. Unallowable project costs associated with the recommended water main extension alternative would be related to costs for fire suppression or use of a 12-inch water main size, as described below.

Section 22a-471-1(g)(3)(H) of the RCSA identifies as an unallowable project cost, “the incremental cost of a potable water supply facility that provides incremental capacity for fire flow protection.” If fire suppression is included in the water main alternative, the cost to install hydrants would be an unallowable project cost. In addition, if the 12-inch water main extension is chosen to provide additional capacity for fire flow beyond the capacity of the 8-inch main, the additional cost for the 12-inch main would not be eligible for state funding under this program.

Further, Section 22a-471-1(g)(3)(I) of the RCSA states, “for those potable water supply facilities that may provide capacity beyond that necessary to serve the area of contaminated wells or the area of potential contamination, unallowable project costs shall be determined by the following formula…,” which involves a ratio of the difference between the 8-inch and 12-inch pipe sizes. An 8-inch pipe size would provide sufficient capacity to convey potable water to the Proposed Water Supply Area.

Effective June 2, 2016, PA 16-88 changed CGS 22a-471 to make this cost sharing formula for larger water mains not apply for certain sites including Tylerville. The State of Connecticut would pay for an 8” main (minus fire hydrants and associated appurtenances). The Town of Haddam, CWC or other entity would have to pay the difference for a 12-inch main plus fire hydrants and associated appurtenances (which are still an unallowable project cost.

The Town of Haddam should be aware these additional costs for fire hydrants and a 12-inch water main could be up to $750,000.

6.2 Public Hearing

Notice of a combined public hearing pursuant to RCSA Section 22a-471-1(f)(2)(B) and scoping meeting pursuant to CEPA on the draft final *Water Supply Alternatives Evaluation Report* (AECOM, 2017) was published on June 10, 2017 in the *Middletown Press* and on the CT DEEP website. The draft final report was presented at the public hearing/scoping meeting, held at the Haddam Fire House on June 21, 2017 where verbal comments were received. The public comment period extended until July 10, 2017 for the receipt of written comments. Public comments made at the public hearing as well as correspondence received during the public comment period were compiled and are included in **Appendix I**. Responses to the comments and correspondence are also included in **Appendix I**.

7.0 References

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Tables

Table 1

Summary of Applicable Drinking Water Regulatory Criteria and Maximum Concentrations Detected

Parameter	US EPA MCL (µg/L)	CT DPH Drinking Water Action Levels (µg/L)	CT DPH Bathing/Showering Action Levels (µg/L)	Maximum Historic Concentrations (µg/L)	Location, Year	Maximum 2016/17 Concentrations (µg/L)	Location
1,4-Dioxane	~	3	50	**62**	77 Little Meadow Road, 2017	**46**	77 Little Meadow Road
MTBE	50,000	70	~	**900**	1618 Saybrook Road, 1997	**77**	98 Bridge Road
1,1,1-Trichloroethane	200	200	~	**590**	14 Little Meadow Road, 1997	11	71 Little Meadow Road
Tetrachloroethene	5	5	~	**330**	71 Little Meadow Road, 1991	4.4	14 Little Meadow Road
Trichloroethene	5	1	~	**1,600**	14 Little Meadow Road, 1996	**140**	14 Little Meadow Road
1,1-Dichloroethene	7	7	~	**180**	14 Little Meadow Road, 1998	**35**	77 Little Meadow Road
cis-1,2-Dichlorethene	70	~	~	**130**	77 Little Meadow Road, 2009	**78**	78 Little Meadow Road
trans-1,2-Dichloroethene	100	~	~	**110**	134 Little Meadow Road, 2014	69	134 Little Meadow Road
1,1-Dichloroethane	~	25	~	24	77 Little Meadow Road, 2012	16	77 Little Meadow Road
Vinyl Chloride	2	0.5	~	**68**	130 Little Meadow Road, 2016	**68**	130 Little Meadow Road

Notes:
MCL Maximum Contaminant Level
Bold indicates regulatory exceedance

Table 2
Study Area - Properties, Land Use, and Impacts

Street #	Street Address	Land Use Description	Zone	Relative Concentration	Contaminant	Water Treatment	Est. Population	Building Area (ft^2)	Note
Bethel Lane									
10	Bethel Lane	Existing Home	R-2A	Not Sampled	N/A	- - -	4	- - -	
18	Bethel Lane	Existing Home	R-2A	Detections	MTBE	- - -	4	- - -	
Bridge Lane									
6	Bridge Lane	Existing Apartment	R-2A	Exceedances	CVOCs, Low MTBE	CT DEEP Filter System (64 Bridge Road)	4	- - -	Served by 64 Bridge Road. Receives filtered water from 64 Bridge Road.
16	Bridge Lane	Existing Home	R-2A	Exceedances	CVOCs, Low MTBE	CT DEEP Filter System (64 Bridge Road)	4	- - -	Served by 64 Bridge Road. Receives filtered water from 64 Bridge Road.
17	Bridge Lane	Existing Home	R-2A	Exceedances	CVOCs, Low MTBE	CT DEEP Filter System (64 Bridge Road)	4	- - -	Served by 64 Bridge Road. Receives filtered water from 64 Bridge Road.
Bridge Road									
1	Bridge Road	Existing Home	Commercial	Exceedances	CVOCs, Low MTBE	- - -	4	- - -	
22	Bridge Road	Commercial	Commercial	Detections	Low MTBE, Trace CVOCs	- - -	- - -	3,610	
27	Bridge Road	Existing Home	Commercial	Exceedances	CVOCs	- - -	4	- - -	
55/57	Bridge Road	Restaurant/Existing Home	Commercial	Exceedances	CVOCs, Low MTBE, Low 1,4-Dioxane	Filter System	4	12,078	Commercial banquet facility with a single family home on premises. Shares same lot. 55- irrigation well/overburden. 57 - bedrock supply well.
56	Bridge Road	Existing Home	R-2A	Exceedances	CVOCs, Low MTBE	CT DEEP Filter System (64 Bridge Road)	4	- - -	Served by 64 Bridge Road. Receives filtered water from 64 Bridge Road.
61	Bridge Road	Existing Home	R-2A	Exceedances	CVOCs, 1,4-Dioxane, Low MTBE	CT DEEP Filter System/Bottled Water	4	- - -	Arsenic detected at concentration greater than drinking water action level.
64	Bridge Road	Existing Home	R-2A	Exceedances	CVOCs, Low MTBE	CT DEEP Filter System	4		Serves nine other residences. Additional home on property also considered 64 Bridge Lane. Property in foreclosure - Town of Haddam paying for electric service in order to keep well pump on.
71	Bridge Road	Existing Home	R-2A	Exceedances	CVOCs, 1,4-Dioxane, Low MTBE	CT DEEP Filter System	4	- - -	Arsenic detected at concentration greater than drinking water action level.
72	Bridge Road	Existing Home	R-2A	Exceedances	CVOCs, Low MTBE	CT DEEP Filter System (64 Bridge Road)	4	- - -	Served by 64 Bridge Road. Receives filtered water from 64 Bridge Road.
Lot 22-2	Bridge Road	Land - CT DEEP	Industrial/R-2A	Not Sampled	CVOCs, 1,4-dioxane	- - -	0	- - -	Clark Creek Wildlife Management Area - owned by State of CT/DEEP. Undeveloped Land. Majority of land zoned for industrial use, frontage along Bridge Road zoned for residential use.
76	Bridge Road	Existing Home	R-2A	Exceedances	CVOCs, 1,4-Dioxane, Low MTBE	CT DEEP Filter System/Bottled Water	4	- - -	Arsenic detected at concentration greater than drinking water action level.
78	Bridge Road	Existing Home	R-2A	Detections	Trace MTBE	- - -	4	- - -	
80	Bridge Road	Existing Home	R-2A	Detections	Low MTBE	- - -	4	- - -	
79/81	Bridge Road	2 Existing Homes	Commercial	Exceedances	CVOCs, 1,4-Dioxane, Low MTBE	2x CT DEEP Filter System/Bottled Water	8	- - -	Use of whole house humidifier necessitates frequent GAC change-outs.
82	Bridge Road	Restaurant	Commercial	Detections	Low MTBE	Filter System	- - -	1,993	
85	Bridge Road	Commercial	Commercial	Exceedances	MTBE, Trace CVOCs	Filter System	- - -	2,640	Provided by Mercury Fuel
88	Bridge Road	Self Storage	Commercial	Exceedances	MTBE	- - -	- - -	34,540	Multiple self storage buildings.
95	Bridge Road	Commercial/Industrial	Commercial	Detections	Low MTBE, CVOCs	Filter System	- - -	27,624	Multiple buildings: market, liquor store,industrial buildings
98	Bridge Road	Commercial	Commercial	Exceedances	MTBE, Trace CVOCs	Bottled Water	- - -	1,784	Provided by Mercury Fuel
100	Bridge Road	Commercial	Commercial	Exceedances	MTBE, Trace CVOCs	Filter System	- - -	3,364	Provided by Mercury Fuel
105	Bridge Road	Industrial/Offices	Commercial	Exceedances	MTBE	Bottled Water	- - -	8,512	Multiple vacant buildings: office, 6 bay garage, 4 bay garage - redevelopment planned
106	Bridge Road	Restaurant/Commercial	Commercial	Detections	Low MTBE	- - -	- - -	5,280	
112	Bridge Road	Commercial	Commercial	Detections	Low MTBE	- - -	- - -	7,900	
116	Bridge Road	Commercial	Commercial	Detections	Trace MTBE	- - -	- - -	1,182	
Brookes Court									
3	Brookes Court	Commercial	Commercial						Subidivided parcel from 1564 Saybrook Road - please see 1564 Saybrook for property specific data. Proposed 90 units high density residential. Two bedroom units, 60 units in first phase, 30 units in second phase.
4	Brookes Court	Commercial	Commercial						
6	Brookes Court	Commercial	Commercial						

Table 2
Study Area - Properties, Land Use, and Impacts

AECOM

Street #	Street Address	Land Use Description	Zone	Relative Concentration	Contaminant	Water Treatment	Est. Population	Building Area (ft^2)	Note
Camp Bethel Road									
115	Camp Bethel Road	2 Existing Homes	R-2A	Detections	Low MTBE	- - -	8	- - -	
117	Camp Bethel Road	Existing Home	R-2A	Detections	Low MTBE	- - -	4	- - -	
121	Camp Bethel Road	Existing Home	R-2A	Detections	Low MTBE	- - -	4	- - -	
124	Camp Bethel Road	Camp Bethel	R-2A	Detections	Low MTBE	- - -	288	- - -	Two wells located at this property (east and west), historic PCE detection is ND now.
125	Camp Bethel Road	Existing Home	R-2A	Non Detections	ND	- - -	4	- - -	
129	Camp Bethel Road	Existing Home	R-2A	Non Detections	ND	- - -	4	- - -	Arsenic detected at concentration greater than drinking water action level.
133	Camp Bethel Road	Existing Home	R-2A	Not Sampled	N/A	- - -	4	- - -	
137	Camp Bethel Road	Existing Home	R-2A	Non Detections	ND	- - -	4	- - -	
143	Camp Bethel Road	Existing Home	R-2A	Detections	Trace MTBE	- - -	4	- - -	Served by 149 Camp Bethel
149	Camp Bethel Road	Existing Home	R-2A	Detections	Trace MTBE	- - -	4	- - -	Serves 143 Camp Bethel
151	Camp Bethel Road	Existing Home	R-2A	Not Sampled	CVOCs, Low MTBE (64 Bridge Road)	CT DEEP Filter System (64 Bridge Road)	4	- - -	Served by 64 Bridge Road. Receives filtered water from 64 Bridge Road.
155	Camp Bethel Road	Existing Home	R-2A	Not Sampled	CVOCs, Low MTBE (64 Bridge Road)	CT DEEP Filter System (64 Bridge Road)	4	- - -	Served by 64 Bridge Road. Receives filtered water from 64 Bridge Road.
156	Camp Bethel Road	Existing Home	R-2A	Detections	MTBE	- - -	4	- - -	
159	Camp Bethel Road	Existing Home	R-2A	Exceedances	CVOCs, Low MTBE	CT DEEP Filter System (64 Bridge Road)	4	- - -	Served by 64 Bridge Road. Receives filtered water from 64 Bridge Road.
160	Camp Bethel Road	Existing Home	R-2A	Exceedances	CVOCs, Low MTBE, As	CT DEEP Filter System	4	- - -	Arsenic treatment system installed by homeowner. Arsenic detected at concentration greater than drinking water action level.
163	Camp Bethel Road	Existing Home	R-2A	Exceedances	CVOCs, Low MTBE	CT DEEP Filter System (64 Bridge Road)	4	- - -	Served by 64 Bridge Road. Receives filtered water from 64 Bridge Road.
168	Camp Bethel Road	Existing Home	R-2A	Non Detections	ND	- - -	4	- - -	
180	Camp Bethel Road	Existing Home	R-2A	Exceedances	CVOCs, Low MTBE	CT DEEP Filter System	4	- - -	
Harper's Landing									
4	Harper's Landing	Marina/Commercial/Residential	Commercial	Detections	Trace CVOCs, Low MTBE	- - -	8	693	Marina with retail space, two residential buildings
Little Meadow Road									
14	Little Meadow Road	Former Camelot Cruises	Commercial	Exceedances	CVOCs, 1,4 Dioxane, low MTBE, Cr	- - -	- - -	704	Eagle Landing State Park, Docking for Lady Katherine Cruises
Lot 22-1	Little Meadow Road	Marine Parking - CT DEEP	Commercial	Not Sampled	CVOCs, 1,4-dioxane, As	- - -	0	- - -	Eagle Landing State Park, Clark Creek Wildlife Management Area - former bedrock well sampled. Still contaminated - CVOCs, 1,4-dioxane, As
69	Little Meadow Road	Existing Home	R-2A	Exceedances	CVOCs, Low 1,4-Dioxane	CT DEEP Filter System	4	- - -	
71	Little Meadow Road	Existing Home	R-2A	Exceedances	CVOCs, 1,4-Dioxane, Low MTBE	CT DEEP Filter System/Bottled Water	4	- - -	
74	Little Meadow Road	Existing Home	R-2A	Not Sampled	N/A	- - -	4	- - -	Presence of water supply well unknown
75	Little Meadow Road	Existing Home	R-2A	Exceedances	CVOCs, Low MTBE, Low 1,4-Dioxane	CT DEEP Filter System	4	- - -	
76	Little Meadow Road	Existing Home	R-2A	Exceedances	CVOCs, 1,4-Dioxane, Low MTBE	CT DEEP Filter System	4	- - -	
77	Little Meadow Road	Existing Home	R-2A	Exceedances	CVOCs, 1,4-Dioxane, Trace MTBE	CT DEEP Filter System/Bottled Water	4	- - -	
78	Little Meadow Road	Existing Home	R-2A	Exceedances	CVOCs, Low MTBE, Low 1,4-Dioxane	CT DEEP Filter System/Bottled Water	4	- - -	
84	Little Meadow Road	Existing Home	R-2A	Exceedances	CVOCs, Low MTBE	CT DEEP Filter System	4	- - -	
88	Little Meadow Road	Existing Home	R-2A	Not Sampled	N/A	- - -	4	- - -	No well at property
90	Little Meadow Road	Existing Home	R-2A	Not Sampled	N/A	- - -	4	- - -	Well at property - sampling access refused
94	Little Meadow Road	Existing Home	R-2A	Not Sampled	N/A	- - -	4	- - -	
98	Little Meadow Road	Existing Home	R-2A	Exceedances	CVOCs	CT DEEP Filter System	4	- - -	
102	Little Meadow Road	Existing Home	R-2A	Non Detections	ND	- - -	4	- - -	
104	Little Meadow Road	Existing Home	R-2A	Non Detections	ND	- - -	4	- - -	
106	Little Meadow Road	Existing Home	R-2A	Detections	Trace MTBE	- - -	4	- - -	
109	Little Meadow Road	Existing Home	R-2A	Detections	Trace CVOCs	- - -	4	- - -	
110	Little Meadow Road	Existing Home	R-2A	Exceedances	CVOCs	CT DEEP Filter System	4	- - -	
116	Little Meadow Road	Existing Home and Apartment	R-2A	Detections	Trace MTBE	- - -	8	- - -	Homeowner filter system
120	Little Meadow Road	Existing Home	R-2A	Non Detections	ND	- - -	4	- - -	Well at property - sampling access refused
124	Little Meadow Road	Existing Home	R-2A	Non Detections	ND	- - -	4	- - -	Well at property - sampling access refused
128	Little Meadow Road	2 Existing Homes	R-2A	Detections	MTBE	- - -	8	- - -	Well at property - sampling access refused
130	Little Meadow Road	Existing Home	R-2A	Exceedances	CVOCs, 1,4-Dioxane, As	CT DEEP Filter System/Bottled Water	4	- - -	Arsenic detected at concentration greater than drinking water action level.
134	Little Meadow Road	Existing Home	R-2A	Exceedances	CVOCs, 1,4-Dioxane, As	CT DEEP Filter System/Bottled Water	4	- - -	Arsenic detected at concentration greater than drinking water action level.

Table 2
Study Area - Properties, Land Use, and Impacts

Street #	Street Address	Land Use Description	Zone	Relative Concentration	Contaminant	Water Treatment	Est. Population	Building Area (ft^2)	Note
Old Chester Road-North									
0	Old Chester Road-N	Land	Commercial	Not Sampled	N/A	- - -	4	- - -	Undeveloped land
Saybrook Road									
1556	Saybrook Road	72 Unit Health Care Facility	Commercial	Detections	Trace MTBE	- - -	150	- - -	
1557	Saybrook Road	Existing Home	Commercial	Detections	Trace MTBE	- - -	4	- - -	
1564	Saybrook Road	Industrial Buildings/Residential	Commercial	Detections	Trace MTBE (1572 Saybrook Road)	- - -	4	8,909	Served by 1572 Saybrook Road. Subdivided - creating 3, 4, and 6 Brookes Court
1565	Saybrook Road	Commerical/Residential	Commercial	Not Sampled	N/A	- - -	4	2,891	Per Town of Haddam - Water supply well on property
1569	Saybrook Road	Apartments Residential	Commercial	Not Sampled	N/A	- - -	8	1,900	Per Town of Haddam - Water supply well on property
1572	Saybrook Road	Existing 2 Family Residential	Commercial	Detections	Trace MTBE	- - -	- - -	3,036	Well also serves 1564 Saybrook Road, to be redeveloped
1573	Saybrook Road	Auto Service/Residential	Commercial	Detections	MTBE, CVOCs	- - -	4	2,368	Significant Hazard #607 Notification 1/17/2007, No action required. Drilled new well.
1583	Saybrook Road	Commercial	Commercial	Non Detections	ND	- - -	- - -	7,470	
1584	Saybrook Road	Commercial/Residential	Commercial	Not Sampled	N/A	- - -	- - -	1,805	
1586	Saybrook Road	Industrial Buildings/Residential	Industrial	Detections	Low MTBE	- - -	4	27,465	Multiple buildings: 2 industrial, 1 residential
1588	Saybrook Road	Commercial/Residential	Commercial	Detections	Low MTBE	- - -	- - -	2,737	
1598	Saybrook Road	Service Station	Commercial	Detections	Low MTBE	- - -	- - -	1,972	CT DEEP Order to abate pollution
1609	Saybrook Road	Commercial/Office	Commercial	Detections	Low CVOCs, Trace MTBE	- - -	- - -	1,152	
1610	Saybrook Road	Restaurant/Commercial/Res	Commercial	Exceedances	MTBE	Two filter systems	4	11,707	Multiple commercial buildings, two wells at this location. Will soon utilize two filter systems.
1617	Saybrook Road	Restaurant/Residential	Commercial	Non Detections	ND	- - -	4	4,624	
1618	Saybrook Road	Service Station/Commercial	Commercial	Exceedances	MTBE	Filter System	- - -	7,466	Multiple buildings: service station, commercial, 3 service bays
1627	Saybrook Road	Service Station/Commercial	Commercial	Non Detections	ND	- - -	4	4,048	
1640	Saybrook Road	ConnDOT Facility	Industrial	Exceedances	CVOCs	Filter System	- - -	19,824	
South Side Bluff									
16	South Side Bluff	Existing Home	R-2A	Detections	Trace MTBE	- - -	4	- - -	
22	South Side Bluff	Existing Home	R-2A	Detections	Trace MTBE	- - -	4	- - -	
26	South Side Bluff	Existing Home	R-2A	Detections	Low MTBE	- - -	4	- - -	
30	South Side Bluff	Existing Home	R-2A	Detections	Trace MTBE, Trace CVOCs	- - -	4	- - -	

Notes:
MTBE - Methyl Tert-Butyl Ether
CVOC - Chlorinated Volatile Organic Compound
N/A - No access or no well present
ND - Non detection

Table 3
Proposed Water Supply Area - Water Use Calculations
Existing Site Uses

Residential / Commercial

Land Use	Building Type	Quantity	People	Water Demand GPD/Person*	AVG. Daily Demand (ADD) (gpd)	MAX Day Flow (ADD X 1.5) (gpd)	PEAK Hour Flow (ADD/3) (gpm)
Residential	Single Family	66	4	75	19,800	29,700	110
Residential	Mixed Use Apartment	3	2	75	450	675	3
Residential	Multi-family	1	8	75	600	900	3
Commercial	Saybrook at Haddam - Assisted Living Center	1			6,000	9,000	33

Commercial/Industrial

Food Service

Land Use	Address	Square Footage	Seats/Meals	Water Demand GPD/(Seat/Meals)**	AVG. Daily Demand (ADD) (gpd)	MAX Day Flow (ADD X 1.5) (gpd)	PEAK Hour Flow (ADD/3) (gpm)
Banquet	55/57 Bridge Road	12,078	300	30	6,000	9,000	33
Carry-out Food Service[1]	1610 Saybrook Road	5,347	100	5	500	750	3
Carry-out Food Service[1]	82 Bridge Road	1,993	100	5	500	750	3
Carry-out Food Service[1]	106 Bridge Road	NA	100	5	500	750	3
Restaurant[2]	106 Bridge Road	NA	25	30	750	1,125	4
Restaurant[2]	1617 Saybrook Road	4,624	50	30	1,500	2,250	8

Automotive Service

Land Use	Address	Square Footage	Vehicles Serviced	Water Demand GPD/Vehicle**	AVG. Daily Demand (ADD) (gpd)	MAX Day Flow (ADD X 1.5) (gpd)	PEAK Hour Flow (ADD/3) (gpm)
Commercial Garage[3]	105 Bridge Road	4,452	40	5	200	300	1
Storage Building/Garage	105 Bridge Road	1,540					
Commercial Garage[3]	1573 Saybrook Road	2,368	12	5	60	90	1
Commercial Garage[3]	1618 Saybrook Road	4,316	12	5	60	90	1
DOT Garage[4]	1640 Saybrook Road	19,824	24	5	120	180	1

Office Space

Land Use	Address	Square Footage	People (200 sq. ft/person)	Water Demand GPD/Person**	AVG. Daily Demand (ADD) (gpd)	MAX Day Flow (ADD X 1.5) (gpd)	PEAK Hour Flow (ADD/3) (gpm)
Chiropractic	1609 Saybrook Road	1,152	6	20	115	173	1
Office/Park	14 Little Meadow Road	704	4	20	70	106	1
Lady Katherine Cruises[5]	14 Little Meadow Road	NA	NA	NA	263	395	1
Office	105 Bridge Road	2,520	13	20	252	378	1
Office	116 Bridge Road	1,182	6	20	118	177	1
Office	1610 Saybrook Road	668	3	20	67	100	1
Office	98 Bridge Road	1,784	9	20	178	268	1
Office	1588 Saybrook Road	2,737	14	20	274	411	2
Office	1584 Saybrook Road	1,805	9	20	181	271	1

Retail Space

Land Use	Address	Square Footage		Water Demand GPD/sq. ft**	AVG. Daily Demand (ADD) (gpd)	MAX Day Flow (ADD X 1.5) (gpd)	PEAK Hour Flow (ADD/3) (gpm)
Retail	22 Bridge Road	3,610		0.1	361	542	2
Retail/Marina	4 Harper's Landing	693		0.1	69	104	1
Retail	85 Bridge Road	2,640		0.1	264	396	1
Retail	100 Bridge Road	3,364		0.1	336	505	2
Retail	106 Bridge Road	1,000		0.1	100	150	1
Retail	106 Bridge Road	1,000		0.1	100	150	1
Retail	112 Bridge Road	7,900		0.1	790	1,185	4
Retail	1583 Saybrook Road	7,470		0.1	747	1,121	4
Retail	1618 Saybrook Road	1,560		0.1	156	234	1
Retail	1610 Saybrook Road	5,692		0.1	569	854	3
Retail Petroleum	1618 Saybrook Road	1,350		0.1	135	203	1
Retail Petroleum	1627 Saybrook Road	4,048		0.1	405	607	2
Retail Petroleum	1598 Saybrook Road	1,972		0.1	197	296	1
Retail	1572 Saybrook Road	1,746		0.1	175	262	1
Retail/Bakery	1565 Saybrook Road	2,891		0.1	289	434	2
Supermarket	95 Bridge Road	17,136		0.1	1,714	2,570	10

Industrial Space

Land Use	Address	Square Footage		Water Demand GPD/sq. ft**	AVG. Daily Demand (ADD) (gpd)	MAX Day Flow (ADD X 1.5) (gpd)	PEAK Hour Flow (ADD/3) (gpm)
Industrial	88 Bridge Road	34,540		0.1	3,454	5,181	19
Industrial	95 Bridge Road	6,000		0.1	600	900	3
Industrial	95 Bridge Road	4,488		0.1	449	673	2
Industrial	1564 Saybrook Road	6,000		0.1	600	900	3
Industrial	1564 Saybrook Road	2,909		0.1	291	436	2
Industrial	1586 Saybrook Road	15,465		0.1	1,547	2,320	9
Warehouse	1586 Saybrook Road	12,000		0.1	1,200	1,800	7

Totals

	AVG. Daily Demand (ADD) (gpd)	MAX Day Flow (ADD X 1.5) (gpd)	PEAK Hour Flow (ADD/3) (gpm)
SUBTOTALS	**53,106**	**79,658**	**298**
TOTAL (GPD) Assumed additional 10% for unaccounted water	**58,416**	**87,624**	
TOTAL (GPM) Assumed flow divided by 16 hours	**61**	**91**	

Notes:

[1] Estimated 100 meals/day

[2] Estimated number of seats

[3] Estimated 4 vehicles/day/garage bay

[4] Estimated 1 vehicle/day/garage bay

[5] Estimated usage for 6 months/year

* Values from CT Department of Public Health

**Values from CT Public Health Code, Table 4

Table 4
Proposed Water Supply Area - Maximum Development
Undeveloped Parcels and Parcels in Application/Hearing Process

AECOM

Potential Development/Redevelopment - Maximum Build Out Scenario							
Land Use	**Address**	**Maximum Square Footage[1]**	**Use/Pop.**	**Estimated Water Demand GPD/Person* or sq. ft****	**AVG. Daily Demand (ADD) (gpd)**	**MAX Day Flow (ADD X 1.5) (gpd)**	**PEAK Hour Flow (ADD/3) (gpm)**
Commercial	Parcel 22-2, Bridge Road[2]						
Commercial	Parcel 2-1, Old Chester Road North (6 Acres)	104,500	NA	0.1	10,450	15,675	58
High Density Residential/Commercial/ Industrial	1564/1572 Saybrook Road (9.4 Acres) Development						
	High Density Residential Lots (3, 4, 6 Brookes Court)	NA	360	75	27,000	40,500	150
	TBD - 2 Industrial Lots (1564, 1572 Saybrook)	40,947	NA	0.1	4,095	6,142	23

Totals	AVG. Daily Demand (ADD) (gpd)	MAX Day Flow (ADD X 1.5) (gpd)	PEAK Hour Flow (ADD/3) (gpm)
SUBTOTALS	**41,545**	**62,317**	**231**
TOTAL (GPD) Assumed additional 10% for unaccounted water	**45,699**	**68,549**	
TOTAL (GPM) Assumed flow divided by 16 hours	**48**	**71**	

Notes:

[1]Estimated maximum build out based on Haddam Town Planner input (% of total lot size- 25% industrial, 40% commercial)

[2]Although Town zoning is Industrial, the State of Connecticut owns the parcel and development is not anticipated. Town does not currently have open space zoning design

* Values from CT Department of Public Health

**Values from CT Public Health Code, Table 4

Table 5
Route 154 - Water Use Calculations
Existing Site Uses

AECOM

Chester - From Denlar Drive to Town Line							
Residential							
Land Use	**Building Type**	**Quantity**	**People**	**Water Demand GPD/Person***	**AVG. Daily Demand (ADD) (gpd)**	**MAX Day Flow (ADD X 1.5) (gpd)**	**PEAK Hour Flow (ADD/3) (gpm)**
Residential[1]	Single Family	13	4	75	3,900	5,850	22
Commercial							
Land Use	**Address**	**Square Feet[2]**	**Population, Beds, Slips**	**Water Demand GPD/sq. ft/bed/slip****	**AVG. Daily Demand (ADD) (gpd)**	**MAX Day Flow (ADD X 1.5) (gpd)**	**PEAK Hour Flow (ADD/3) (gpm)**
Commercial- Motor Sports	244 Middlesex Turnpike	2,500	NA	0.1	250	375	1
Commercial- Veterinary Clinic	264 Middlesex Turnpike	2,500	NA	0.2	500	750	3
Commercial- Assisted Living	268 Middlesex Turnpike	2,500	16	150	2,400	3600	13
Commercial- Marina	276 Middlesex Turnpike	2,500	50	20	1,000	1500	6
Haddam - From Town Line to Water Supply Area							
Residential							
Land Use	**Building Type**	**Quantity**	**People**	**Water Demand GPD/Person***	**AVG. Daily Demand (ADD) (gpd)**	**MAX Day Flow (ADD X 1.5) (gpd)**	**PEAK Hour Flow (ADD/3) (gpm)**
Residential[3]	Single Family	17	4	75	5,100	7,650	28
Commercial							
Land Use	**Address**	**Square Feet**		**Water Demand GPD/sq. ft****	**AVG. Daily Demand (ADD) (gpd)**	**MAX Day Flow (ADD X 1.5) (gpd)**	**PEAK Hour Flow (ADD/3) (gpm)**
Commercial	1697 Saybrook Road	2,732		0.1	273	409.8	2
Commercial- Veterinary Clinic	1721 Saybrook Road	2,760		0.2	552	828	3
Totals							
					AVG. Daily Demand (ADD) (gpd)	**MAX Day Flow (ADD X 1.5) (gpd)**	**PEAK Hour Flow (ADD/3) (gpm)**
				SUBTOTAL	**13,975**	**20,963**	**78**
				TOTAL (GPD) Assumed additional 10% for unaccounted water	**15,373**	**23,059**	
				TOTAL (GPM) Assumed flow divided by 16 hours	**16**	**24**	

Notes:
* Values from CT Department of Public Health
**Values from CT Public Health Code, Table 4
[1]Online database not available for Chester- assume 50% of all residential lots are developed
[2]Square footage assumed
[3] 17 of 21 lots developed

Table 6
Summary of Water Use Calculations

Proposed Water Supply Area (Tylerville) Totals - Existing Demand	AVG. Daily Demand (ADD) (gpd)	MAX Day Flow (ADD X 1.5) (gpd)	PEAK Hour Flow (ADD/3) (gpm)
SUBTOTAL	53,106	79,658	262
TOTAL (GPD) Assumed additional 10% for unaccounted water	58,416	87,624	
TOTAL (GPM) Assumed flow divided by 16 hours	61	91	

Route 154 - Chester/Haddam Adjoining Properties - Existing Demand	AVG. Daily Demand (ADD) (gpd)	MAX Day Flow (ADD X 1.5) (gpd)	PEAK Hour Flow (ADD/3) (gpm)
SUBTOTAL	13,975	20,963	78
TOTAL (GPD) Assumed additional 10% for unaccounted water	15,373	23,059	
TOTAL (GPM) Assumed flow divided by 16 hours	16	24	

Totals for Proposed Water Supply Area (Tylerville) and Route 154 - Chester/Haddam - Existing Demand	AVG. Daily Demand (ADD) (gpd)	MAX Day Flow (ADD X 1.5) (gpd)	PEAK Hour Flow (ADD/3) (gpm)
SUBTOTAL	67,081	90,946	340
TOTAL (GPD) Assumed additional 10% for unaccounted water	73,789	100,041	
TOTAL (GPM) Assumed flow divided by 16 hours	77	104	

Proposed Water Supply Area (Tylerville) - Maximum Buildout Parcels Additional Demand	AVG. Daily Demand (ADD) (gpd)	MAX Day Flow (ADD X 1.5) (gpd)	PEAK Hour Flow (ADD/3) (gpm)
SUBTOTAL	41,545	62,317	231
TOTAL (GPD) Assumed additional 10% for unaccounted water	45,699	68,549	
TOTAL (GPM) Assumed flow divided by 16 hours	48	71	

Totals for Proposed Water Supply Area (Tylerville) and Route 154 - Chester/Haddam - Maximum Buildout Scenario	AVG. Daily Demand (ADD) (gpd)	MAX Day Flow (ADD X 1.5) (gpd)	PEAK Hour Flow (ADD/3) (gpm)
*TOTAL	108,625	152,906	570
TOTAL (GPD) Assumed additional 10% for unaccounted water	119,488	168,197	
TOTAL (GPM) Assumed flow divided by 16 hours	124	175	

Note:

Table 7
Proposed Water Supply Area
Individual Water Treatment Summary

Street #	Street Address	Water Treatment System	Note
Bethel Lane			
10	Bethel Lane	Standard	
18	Bethel Lane	Standard	
Bridge Lane			
6	Bridge Lane	Standard	Served by 64 Bridge Road
16	Bridge Lane	Standard	Served by 64 Bridge Road
17	Bridge Lane	Standard	Served by 64 Bridge Road
Bridge Road			
1	Bridge Road	Standard	
22	Bridge Road	Standard	
27	Bridge Road	Standard	
55/57	Bridge Road	**Enhanced/ Bottled Water**	1,4-Dioxane present
56	Bridge Road	Standard	Served by 64 Bridge Road
61	Bridge Road	**Enhanced/ Bottled Water**	1,4-Dioxane present, naturally occurring arsenic
64	Bridge Road	Standard	Serves nine other residences
71	Bridge Road	**Enhanced/ Bottled Water**	1,4-Dioxane present, naturally occurring arsenic
72	Bridge Road	Standard	Served by 64 Bridge Road
Parcel 22-2	Bridge Road	Standard	
76	Bridge Road	**Enhanced/ Bottled Water**	1,4-Dioxane present, naturally occurring arsenic
78	Bridge Road	Standard	
80	Bridge Road	Standard	
79/81	Bridge Road	**2x Enhanced/ Bottled Water**	1,4-Dioxane present
82	Bridge Road	Standard	
85	Bridge Road	Standard	
88	Bridge Road	Standard	
95	Bridge Road	Standard	
98	Bridge Road	Standard	
100	Bridge Road	Standard	
105	Bridge Road	Standard	
106	Bridge Road	Standard	
112	Bridge Road	Standard	
116	Bridge Road	Standard	
Brookes Court			
3	Brookes Court	10x Standard	Ten units in parallel to accommodate required flowrate associated with high density residential development
4	Brookes Court	10x Standard	Ten units in parallel to accommodate required flowrate associated with high density residential development
6	Brookes Court	10x Standard	Ten units in parallel to accommodate required flowrate associated with high density residential development
Camp Bethel Road			
115	Camp Bethel Road	2x Standard	Servest two existing homes
117	Camp Bethel Road	Standard	
121	Camp Bethel Road	Standard	
124	Camp Bethel Road	10x Standard	Ten units in parallel to accommodate required flowrate
125	Camp Bethel Road	Standard	
129	Camp Bethel Road	Standard	
133	Camp Bethel Road	Standard	
137	Camp Bethel Road	Standard	
143	Camp Bethel Road	Standard	Served by 149 Camp Bethel
149	Camp Bethel Road	Standard	Serves 143 Camp Bethel
151	Camp Bethel Road	Standard	Served by 64 Bridge Road
155	Camp Bethel Road	Standard	Served by 64 Bridge Road
156	Camp Bethel Road	Standard	
159	Camp Bethel Road	Standard	Served by 64 Bridge Road
160	Camp Bethel Road	Standard	Naturally occurring arsenic, homeowner has reverse osmosis treatment system
163	Camp Bethel Road	Standard	Served by 64 Bridge Road
168	Camp Bethel Road	Standard	
180	Camp Bethel Road	Standard	
Harper's Landing			
4	Harper's Landing	Standard	
Little Meadow Road			

Table 7
Proposed Water Supply Area
Individual Water Treatment Summary

Street #	Street Address	Water Treatment System	Note
14	Little Meadow Road	**Enhanced/ Bottled Water**	Eagle Landing State Park, well at property not in use. Well pump present. Chromium detected.
Parcel 22-1	Little Meadow Road	**Enhanced/ Bottled Water**	Clark Creek Wildlife Management Area. Well at property not in use. No well pump.
69	Little Meadow Road	**Enhanced/ Bottled Water**	1,4-Dioxane present
71	Little Meadow Road	**Enhanced/ Bottled Water**	1,4-Dioxane present
74	Little Meadow Road	Standard	Presence of water supply well unknown
75	Little Meadow Road	**Enhanced/ Bottled Water**	1,4-Dioxane present
76	Little Meadow Road	**Enhanced/ Bottled Water**	1,4-Dioxane present
77	Little Meadow Road	**Enhanced/ Bottled Water**	1,4-Dioxane present
78	Little Meadow Road	**Enhanced/ Bottled Water**	1,4-Dioxane present
84	Little Meadow Road	Standard	
88	Little Meadow Road	Standard	No well at property - will require a filter if well is installed
90	Little Meadow Road	Standard	Well present, access refused for sampling
94	Little Meadow Road	Standard	Well present, access refused for sampling
98	Little Meadow Road	Standard	
102	Little Meadow Road	Standard	
104	Little Meadow Road	Standard	
106	Little Meadow Road	Standard	
109	Little Meadow Road	Standard	
110	Little Meadow Road	Standard	
116	Little Meadow Road	Standard	
120	Little Meadow Road	Standard	Sampling access refused
124	Little Meadow Road	Standard	Sampling access refused
128	Little Meadow Road	Standard	Sampling access refused
130	Little Meadow Road	**Enhanced/ Bottled Water**	1,4-Dioxane present, naturally occurring arsenic
134	Little Meadow Road	**Enhanced/ Bottled Water**	1,4-Dioxane present, naturally occurring arsenic
Old Chester Road-North			
0	Old Chester Road-N	Standard	Will require a filter when developed
Saybrook Road			
1556	Saybrook Road	10x Standard	Ten units in parallel to accommodate required flowrate
1557	Saybrook Road	Standard	
1564	Saybrook Road	10x Standard	Ten units in parallel to accommodate required flowrate associated with high density residential development
1565	Saybrook Road	Standard	Per Town of Haddam - Water supply well on property
1569	Saybrook Road	Standard	Per Town of Haddam - Water supply well on property
1572	Saybrook Road	10x Standard	Ten units in parallel to accommodate required flowrate associated with high density residential development
1573	Saybrook Road	Standard	Significant Hazard #607 Notification 1/17/2007, No action required. New well installed
1583	Saybrook Road	Standard	
1584	Saybrook Road	Standard	
1586	Saybrook Road	Standard	
1588	Saybrook Road	Standard	
1598	Saybrook Road	Standard	
1609	Saybrook Road	Standard	
1610	Saybrook Road	2x Standard	Two wells located at this property
1617	Saybrook Road	Standard	
1618	Saybrook Road	Standard	
1627	Saybrook Road	Standard	
1640	Saybrook Road	Standard	
South Side Bluff			
16	South Side Bluff	Standard	
22	South Side Bluff	Standard	
26	South Side Bluff	Standard	
30	South Side Bluff	Standard	

Standard - 2 canister granular activated carbon filtration system
Enhanced - 3 canister granular activated carbon filtration system

Table 8
Proposed Water Supply Area - Individual Water Treatment
Cost Overview

AECOM

Item Description - Capital Cost	Unit	Quantity	Unit Cost	Total	Present Value
Standard Residential - Commercial GAC System	EA	149	$2,750	$409,750	$409,750
Enhanced Residential - Commercial GAC System	EA	16	$3,350	$53,600	$53,600
Remove existing POU equipment	EA	37	$1,600	$59,200	$59,200
Bottled Water - Residential Properties	EA	14	$225	$3,150	$3,150
Bottled Water - Commercial Properties	EA	2	$225	$450	$450
Initial GW Monitoring, Engineering Design	LS	1	$27,500	$27,500	$27,500
Contingency (25%)				$138,413	$138,413
Capital Cost Total				**$692,063**	**$692,063**

Item Description - O&M Cost (20 year horizon)	Unit	Quantity	Unit Cost	Annual Cost	Present Value
Standard System GAC changeout (every third year/20 years)*	EA	149	$815	$121,435	$605,624
Enhanced GAC changeout (annually for 20 years)**	EA	16	$1,260	$20,160	$299,930
Sediment Filter changeout (monthly x 20 years)***	EA	90	$130	$11,700	$174,066
Standard System Monitoring (quarterly - years 0-5)	EA	300	$350	$105,000	$480,869
Standard System Monitoring (semi-annual - years 6-20)	EA	150	$350	$52,500	$540,633
Enhanced System Monitoring (quarterly - years 0-5)	EA	60	$525	$31,500	$144,261
Enhanced System Monitoring (semi-annual years 6-20)	EA	30	$525	$15,750	$162,190
Bottled Water - Residential Properties***	EA	144	$225	$32,400	$482,030
Bottled Water - Commercial Properties***	EA	24	$225	$5,400	$80,338
Subtotal				$395,845	$2,969,942
Emergency on-call service allowance					$150,000
Contingency (25%)					$742,485
O&M Cost Total					**$3,862,427**

*Costs are calculated for one filter changeout/one filter rotation every third year

**Costs are calculated under the assumption that two filters will be changed out/one filter rotated annually

***Costs are calculated on an annualized basis

Table 9
Proposed Water Supply Area - Proposed 8" Water Main Extension
Preliminary Capital Cost Estimate Summary

(8-Inch) Base Layout - Route 154 to Tylerville Center

Item Description	Total Cost
Route 154, Chester Section - CWC connection to Chester/Haddam line	$992,000
Route 154, Haddam Section - Chester/Haddam line to Bridge Road area	$2,698,000
Bridge Road (Rt. 82) Section	$1,166,000
Bridge Lane Section	$99,000
Little Meadow Road Section	$842,000
Camp Bethel Road and Bethel Lane Section	$290,000
South Side Bluff Section	$153,000
Brookes Court Section	$134,000
Service Connections and Well Abandonment	$656,900
Engineering Design, Permitting, Legal	$195,000
Total	**$7,225,900**

(8-Inch) Alternate Layout - Route 154 to Little Meadow Road to Tylerville Center

Item Description	Total Cost
Route 154, Chester Section - CWC connection to Chester/Haddam line	$992,000
Route 154, Haddam Section - Chester/Haddam line to Little Meadow Road Connector and Route 154 Section within Water Supply Area	$1,701,000
Bridge Road (Rt. 82) Section	$1,166,000
Bridge Lane Section	$99,000
Little Meadow Road Section & Route 154 Connector	$1,312,000
Camp Bethel Road and Bethel Lane Section	$290,000
South Side Bluff Section	$153,000
Brookes Court Section	$134,000
Service Connections and Well Abandonment	$656,900
Engineering, Design, Permitting, Legal	$265,000
Total	**$6,768,900**

Table 10
Proposed Water Supply Area - Proposed 12" Water Main Extension
Preliminary Capital Cost Estimate Summary

(12-Inch) Base Layout - Route 154 to Tylerville Center

Item Description	Total Cost
Route 154, Chester Section - CWC connection to Chester/Haddam line	$1,126,000
Route 154, Haddam Section - Chester/Haddam line to Bridge Road area	$2,995,000
Bridge Road (Rt. 82) Section	$1,296,000
Bridge Lane Section	$99,000
Little Meadow Road Section	$842,000
Camp Bethel Road and Bethel Lane Section	$290,000
South Side Bluff Section	$153,000
Brookes Court Section	$137,000
Service Connections and Well Abandonment	$656,900
Engineering Design, Permitting, Legal	$195,000
Total	**$7,789,900**

(12-Inch) Alternate Layout - Route 154 to Little Meadow Road to Tylerville Center

Item Description	Total Cost
Route 154, Chester Section - CWC connection to Chester/Haddam line	$1,126,000
Route 154, Haddam Section - Chester/Haddam line to Little Meadow Road Connector and Route 154 Section within Water Supply Area	$1,887,000
Bridge Road (Rt. 82) Section	$1,296,000
Bridge Lane Section	$99,000
Little Meadow Road Section & Route 154 Connector	$1,487,000
Camp Bethel Road and Bethel Lane Section	$290,000
South Side Bluff Section	$153,000
Brookes Court Section	$137,000
Service Connections and Well Abandonment	$656,900
Engineering, Design, Permitting, Legal	$265,000
Total	**$7,396,900**

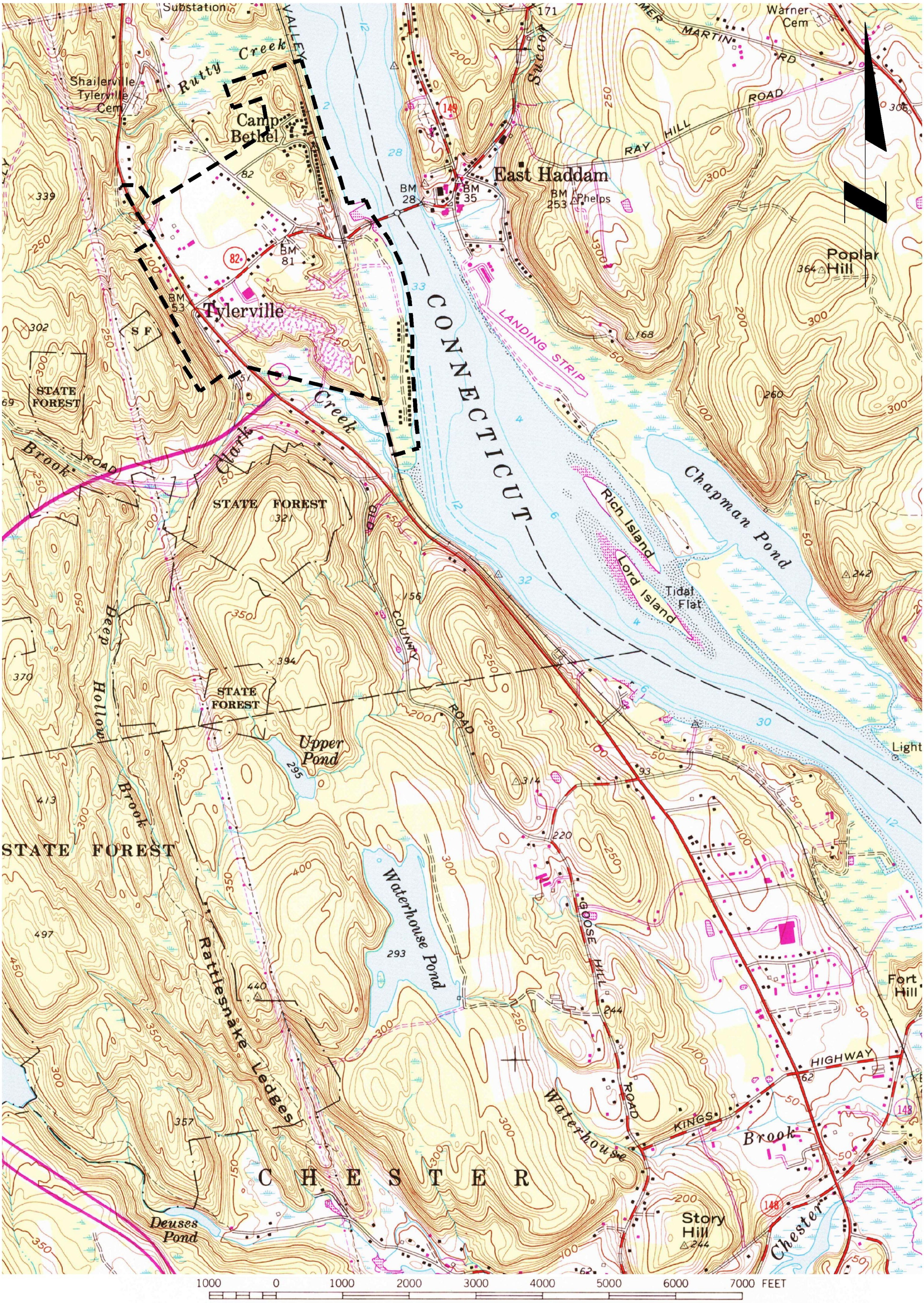
Figures

PATH/FILENAME: X:\60190457 CTDEP TYLERVILLE WATER SUPPLY\400 BACKGROUND INFORMATION\OLD DWGS\TYLERVILLE STUDY AREA 012511 UPDATED.DWG

LAST UPDATE: Wednesday, October 25, 2017 2:15:47 PM

11X17 – 9/16/11

PLOT DATE: Wednesday, October 25, 2017 2:17:29 PM



LEGEND:

APPROXIMATE BOUNDARY OF TYLERVILLE CENTER STUDY AREA

FIGURE:

1-A

AECOM

AECOM Environment
500 ENTERPRISE DR, STE 1A
ROCKY HILL, CT 06067
(860) 263-5800
www.aecom.com

SITE LOCATION MAP
TYLERVILLE WATER SUPPLY STUDY
HADDAM, CONNECTICUT

SCALE: AS SHOWN | DATE: OCT. 2017 | PN: 60285195

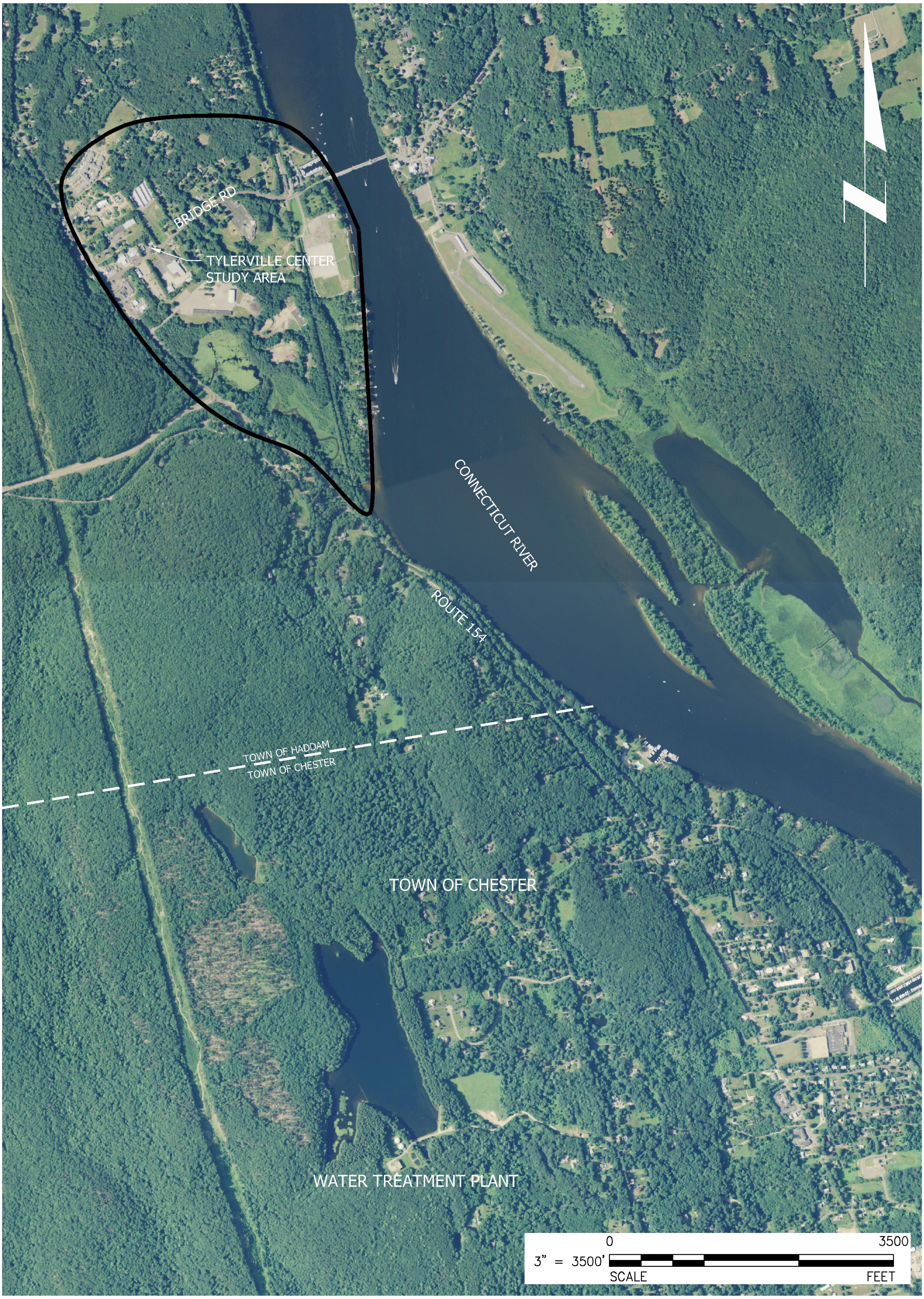
MAP SOURCE: USGS Quadrangle Map, DEEP RIVER, CONN.
Photorevised 1971

PATH/FILENAME: X:\60190457 CTDEP TYLERVILLE WATER SUPPLY\400 BACKGROUND INFORMATION\OLD DWGS\TYLERVILLE STUDY AREA 012511 UPDATED.DWG

LAST UPDATE: Tuesday, October 24, 2017 4:05:54 PM

11X17 - 9/16/11

PLOT DATE: Wednesday, October 25, 2017 2:09:38 PM



LEGEND:

— GENERAL LOCATION OF STUDY AREA

FIGURE: 1-B

AECOM Environment
500 ENTERPRISE DR, STE 1A
ROCKY HILL, CT 06067
(860) 263-5800
www.aecom.com

SITE LOCATION MAP
TYLERVILLE WATER SUPPLY STUDY
HADDAM, CONNECTICUT

SCALE: 3" = 3500' | DATE: OCT. 2017 | PN: 60285195

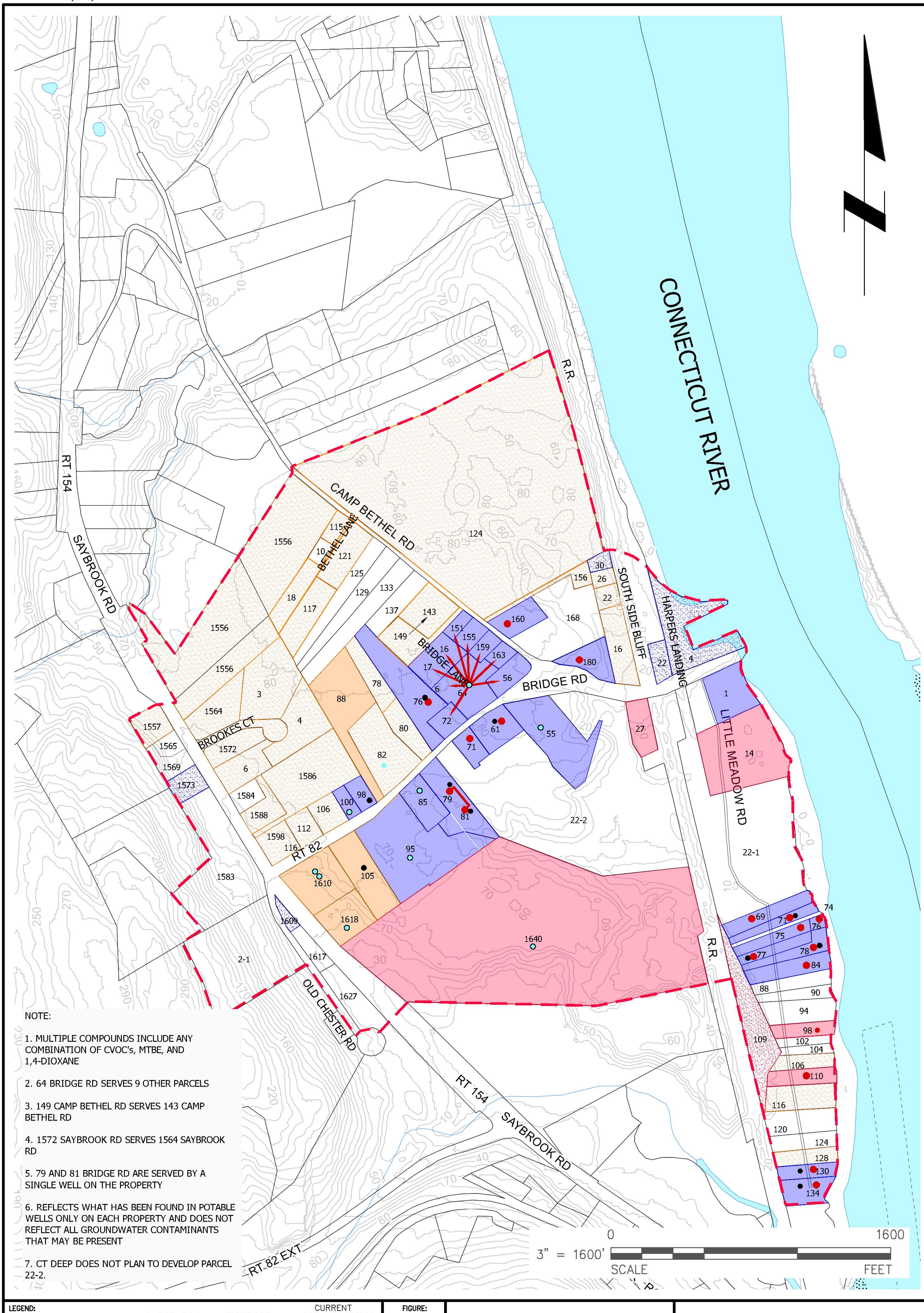
MAP SOURCE: Connecticut 2008 NAIP 4 Band Color and Color Infrared Orthophoto   Publication Date: 3/10/09

PATH/FILENAME: X:\60190457 CTDEP TYLERVILLE WATER SUPPLY\400 BACKGROUND INFORMATION\OLD DWGS\TYLERVILLE STUDY AREA 012511 UPDATED.DWG

LAST UPDATE: Tuesday, June 20, 2017 3:26:36 PM

11X17 – 9/16/11

PLOT DATE: Thursday, October 19, 2017 1:16:53 PM



NOTE:

1. MULTIPLE COMPOUNDS INCLUDE ANY COMBINATION OF CVOC's, MTBE, AND 1,4-DIOXANE

2. 64 BRIDGE RD SERVES 9 OTHER PARCELS

3. 149 CAMP BETHEL RD SERVES 143 CAMP BETHEL RD

4. 1572 SAYBROOK RD SERVES 1564 SAYBROOK RD

5. 79 AND 81 BRIDGE RD ARE SERVED BY A SINGLE WELL ON THE PROPERTY

6. REFLECTS WHAT HAS BEEN FOUND IN POTABLE WELLS ONLY ON EACH PROPERTY AND DOES NOT REFLECT ALL GROUNDWATER CONTAMINANTS THAT MAY BE PRESENT

7. CT DEEP DOES NOT PLAN TO DEVELOP PARCEL 22-2.

LEGEND:

	EXCEEDANCE	DETECTION	CURRENT WATER TREATMENT
STUDY AREA	CVOC's	CVOC's	FILTER
123 ADDRESS NO.	MTBE	MTBE	BOTTLED WATER
2-1 PARCEL #	MULTIPLE COMPOUNDS	MULTIPLE COMPOUNDS	DEEP FILTER
			WELL SERVICE

FIGURE: 2

AECOM

AECOM Environment
500 ENTERPRISE DR, STE 1A
ROCKY HILL, CT 06067
(860) 263-5800
www.aecom.com

STUDY AREA
CHARACTERISTICS AND IMPACTS - BY COC
TYLERVILLE WATER SUPPLY STUDY
HADDAM, CONNECTICUT

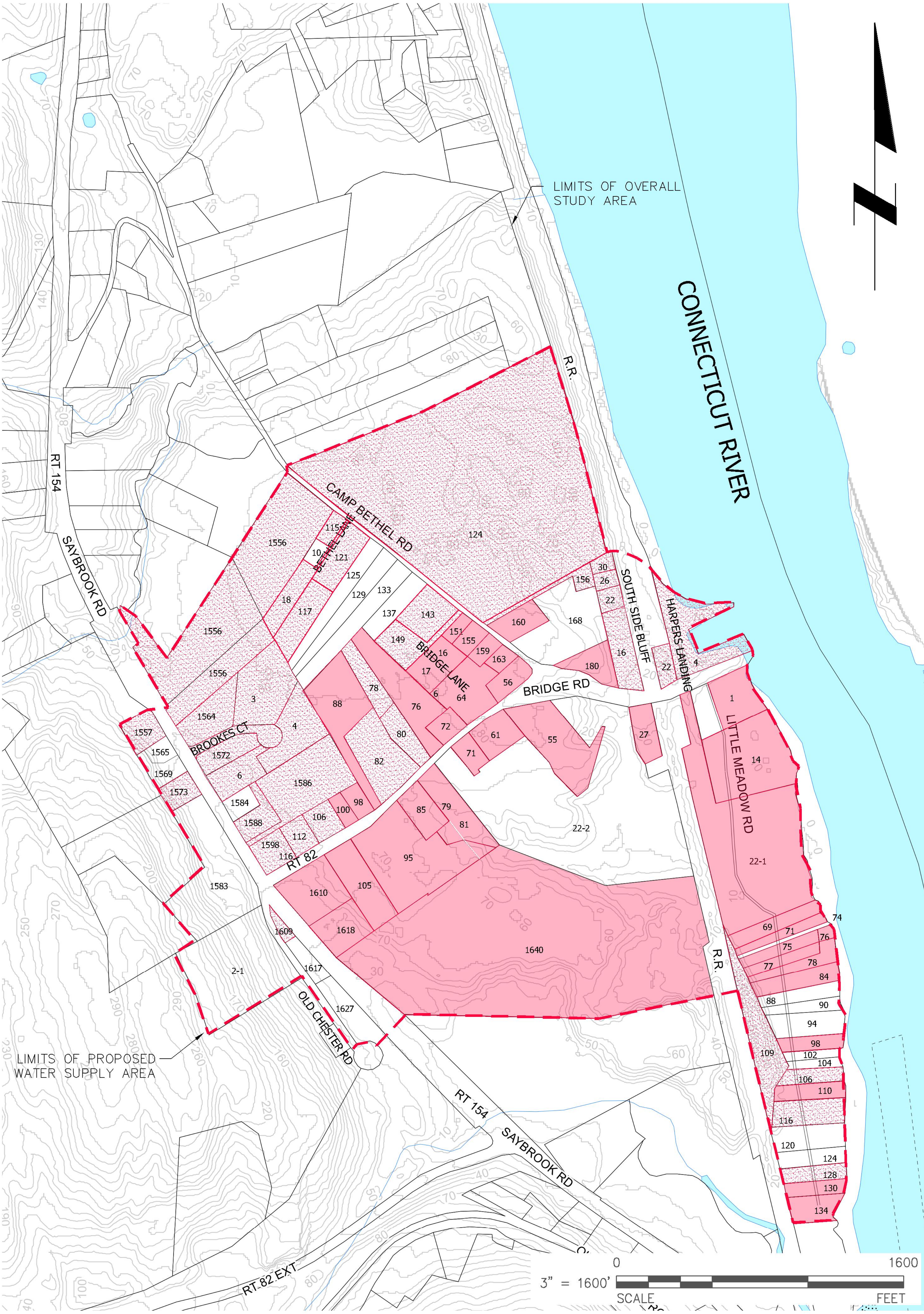
SCALE: 3" = 1600' | DATE: OCT. 2017 | PN: 60285195

PATH/FILENAME: X:\60190457 CTDEP TYLERVILLE WATER SUPPLY\400 BACKGROUND INFORMATION\OLD DWGS\TYLERVILLE STUDY AREA 012511 UPDATED.DWG

LAST UPDATE: Tuesday, June 20, 2017 3:26:36 PM

11X17 – 9/16/11

PLOT DATE: Thursday, October 19, 2017 1:18:47 PM



LEGEND:		
STUDY AREA	EXCEEDENCE	DETECTION
123 ADDRESS NO.	EXCEEDENCE OF MAXIMUM CONTAMINANT LEVEL OR DRINKING WATER ACTION LEVEL	DETECTION OF A CONTAMINANT OF CONCERN
2-1 PARCEL #		

FIGURE: 3

AECOM

AECOM Environment
500 ENTERPRISE DR, STE 1A
ROCKY HILL, CT 06067
(860) 263-5800
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STUDY AREA IMPACTED PROPERTIES SUMMARY
TYLERVILLE WATER SUPPLY STUDY
HADDAM, CONNECTICUT

SCALE: 3" = 1600' | DATE: OCT. 2017 | PN: 60285195

PATH/FILENAME: X:\60190457 CTDEP TYLERVILLE WATER SUPPLY\400 BACKGROUND INFORMATION\OLD DWGS\TYLERVILLE STUDY AREA 012511 UPDATED.DWG

LAST UPDATE: Tuesday, June 20, 2017 3:26:36 PM

11X17 - 9/16/11

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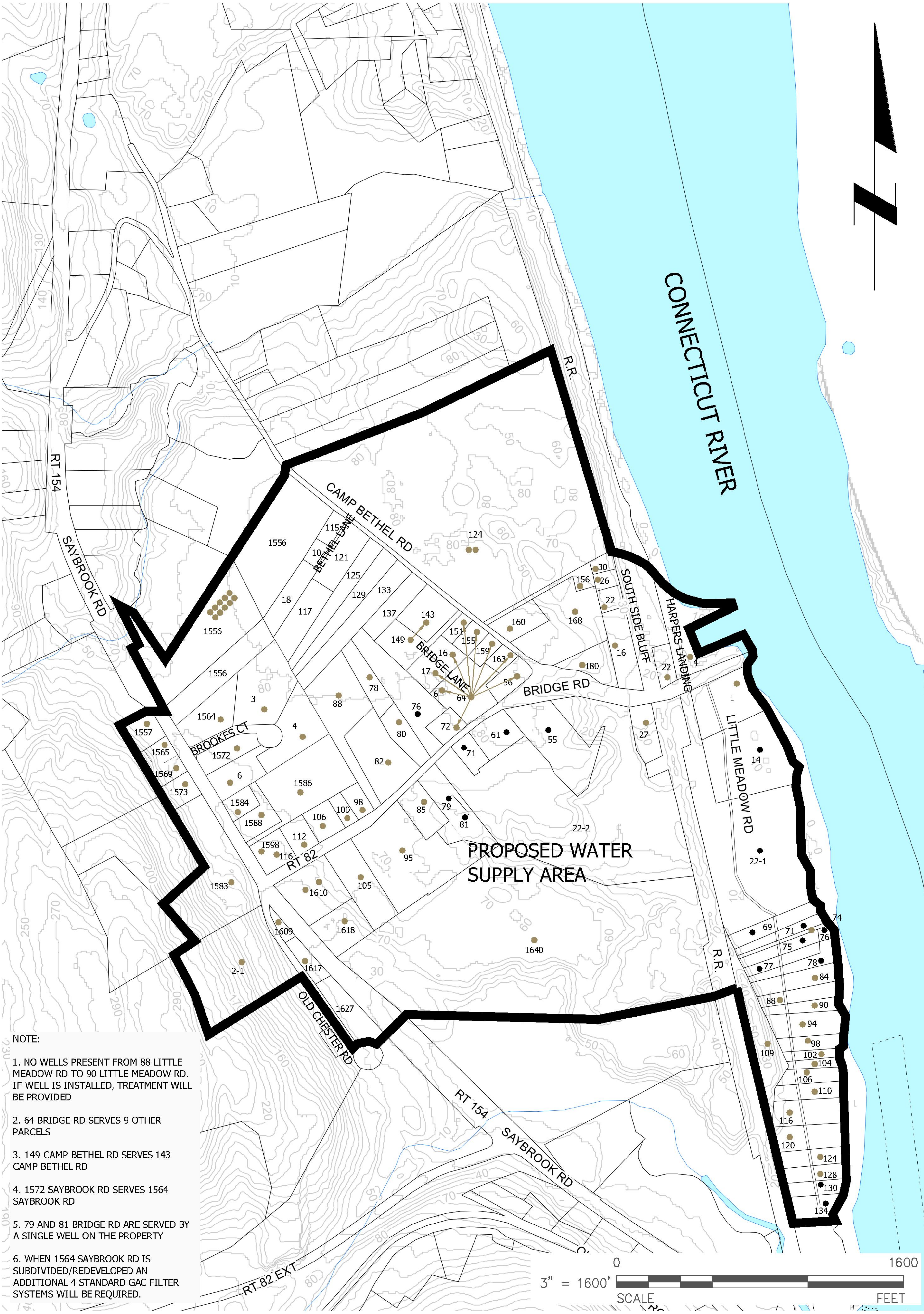


NOTE:

1. NO WELLS PRESENT FROM 88 LITTLE MEADOW RD TO 90 LITTLE MEADOW RD. IF WELL IS INSTALLED, TREATMENT WILL BE PROVIDED

2. 64 BRIDGE RD SERVES 9 OTHER PARCELS

3. 149 CAMP BETHEL RD SERVES 143 CAMP BETHEL RD

4. 1572 SAYBROOK RD SERVES 1564 SAYBROOK RD

5. 79 AND 81 BRIDGE RD ARE SERVED BY A SINGLE WELL ON THE PROPERTY

6. WHEN 1564 SAYBROOK RD IS SUBDIVIDED/REDEVELOPED AN ADDITIONAL 4 STANDARD GAC FILTER SYSTEMS WILL BE REQUIRED.

LEGEND:

PROPOSED WATER SUPPLY AREA

123 ADDRESS NO.

2-1 PARCEL #

FILTER DATA

PROPERTY RECEIVES ENHANCED GAC FILTER AND BOTTLED WATER SERVICE

PROPERTY RECEIVES STANDARD GAC FILTER

WELL SERVICE

FIGURE: 4

AECOM

AECOM Environment
500 ENTERPRISE DR, STE 1A
ROCKY HILL, CT 06067
(860) 263-5800
www.aecom.com

PROPOSED INDIVIDUAL WATER TREATMENT SYSTEMS

PROPOSED WATER SUPPLY AREA

TYLERVILLE WATER SUPPLY STUDY

HADDAM, CONNECTICUT

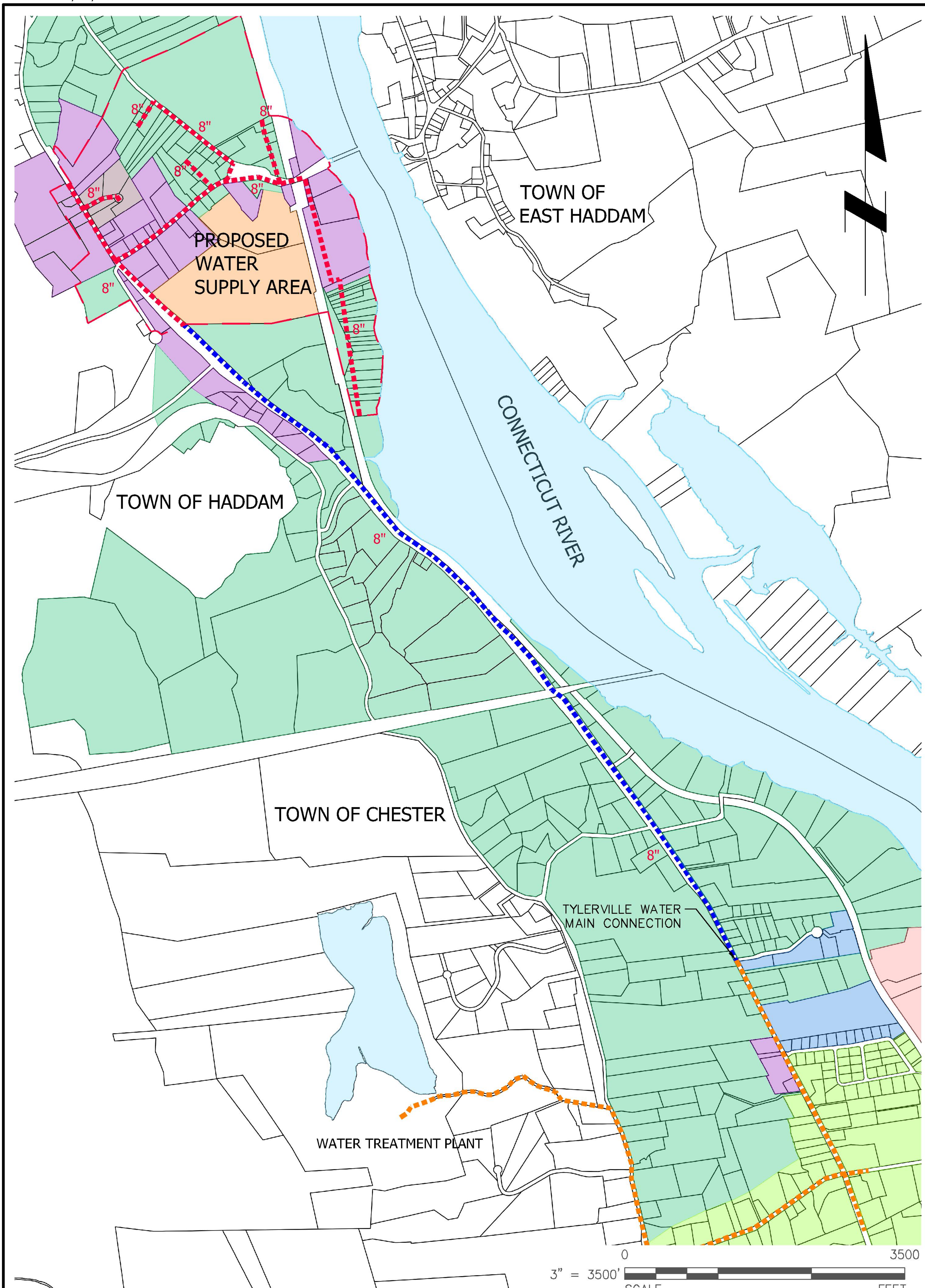
SCALE: 3" = 1600' | DATE: OCT. 2017 | PN: 60285195

PATH/FILENAME: X:\60190457 CTDEP TYLERVILLE WATER SUPPLY\400 BACKGROUND INFORMATION\OLD DWGS\TYLERVILLE STUDY AREA 012511 UPDATED.DWG

LAST UPDATE: Wednesday, October 25, 2017 2:19:02 PM

11X17 - 9/16/11

PLOT DATE: Thursday, October 26, 2017 4:41:58 PM



LEGEND:

- PROPOSED WATER TRANSMISSION MAIN
- PROPOSED WATER DISTRIBUTION MAIN
- CHESTER EXISTING WATER MAIN
- PROPOSED WATER SUPPLY AREA

LAND USE/ZONING

- RESIDENTIAL (R-1)
- RESIDENTIAL (R-2)
- COMMERCIAL (C-1)
- INDUSTRIAL (I-1)
- RESEARCH/LIGHT MANUFACTURING (RLM)
- WATERFRONT DESIGN DISTRICT (WDD2)
- WATER
- HIGH DENSITY RESIDENTIAL OVERLAY

FIGURE: 5-A

AECOM

AECOM Environment
500 ENTERPRISE DR, STE 1A
ROCKY HILL, CT 06067
(860) 263-5800
www.aecom.com

PROPOSED WATER MAIN EXTENSION
BASE LAYOUT (8-INCH)
TYLERVILLE WATER SUPPLY STUDY
HADDAM, CONNECTICUT

SCALE: 3" = 3500' | DATE: OCT. 2017 | PN: 60285195

PATH/FILENAME: X:\60190457 CTDEP TYLERVILLE WATER SUPPLY\400 BACKGROUND INFORMATION\OLD DWGS\TYLERVILLE STUDY AREA 012511 UPDATED.DWG

LAST UPDATE: Thursday, October 26, 2017 5:03:00 PM

11X17 – 9/16/11

PLOT DATE: Tuesday, October 31, 2017 10:41:11 AM

LEGEND:

PROPOSED WATER TRANSMISSION MAIN	PROPOSED WATER DISTRIBUTION MAIN	LAND USE/ZONING
PROPOSED WATER SUPPLY AREA	BUILDING OUTLINE	RESIDENTIAL (R–2)
123 ADDRESS NO.		COMMERCIAL (C–1)
		INDUSTRIAL (I–1)
		HIGH DENSITY RESIDENTIAL OVERLAY

FIGURE: 5-B

AECOM

AECOM Environment
500 ENTERPRISE DR, STE 1A
ROCKY HILL, CT 06067
(860) 263-5800
www.aecom.com

PROPOSED WATER MAIN EXTENSION
BASE LAYOUT (8-INCH)
TYLERVILLE WATER SUPPLY STUDY
HADDAM, CONNECTICUT

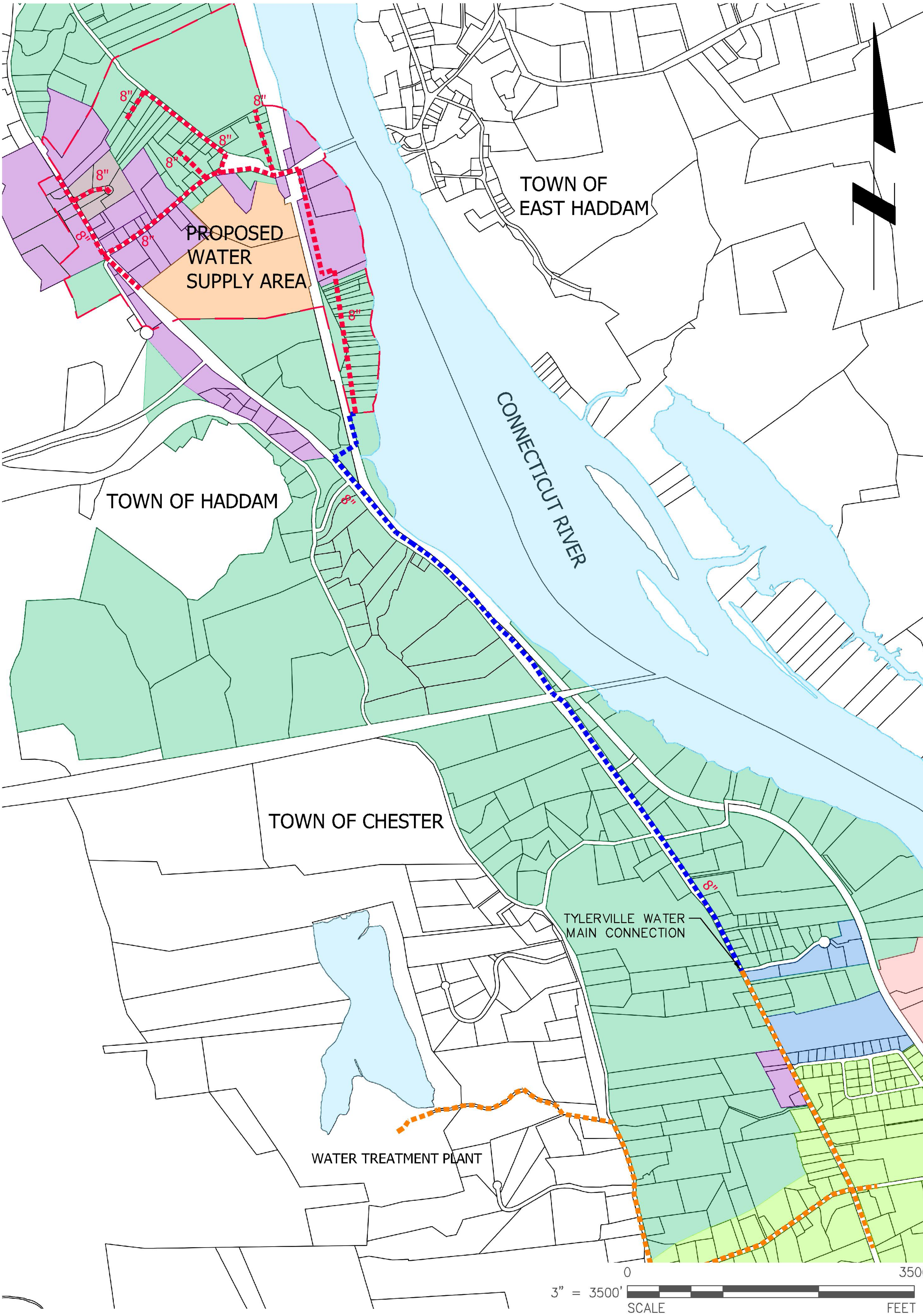
SCALE: 1" = 500' | DATE: OCT. 2017 | PN: 60285195

PATH/FILENAME: X:\60190457 CTDEP TYLERVILLE WATER SUPPLY\400 BACKGROUND INFORMATION\OLD DWGS\TYLERVILLE STUDY AREA 012511 UPDATED.DWG

LAST UPDATE: Wednesday, October 25, 2017 2:19:02 PM

PLOT DATE: Thursday, October 26, 2017 4:42:58 PM

11X17 – 9/16/11



LEGEND:

- ALTERNATE PROPOSED WATER DISTRIBUTION MAIN
- PROPOSED WATER TRANSMISSION MAIN
- CHESTER EXISTING WATER MAIN
- PROPOSED WATER SUPPLY AREA

LAND USE/ZONING

- RESIDENTIAL (R–1)
- RESIDENTIAL (R–2)
- COMMERCIAL (C–1)
- INDUSTRIAL (I–1)
- RESEARCH/LIGHT MANUFACTURING (RLM)
- WATERFRONT DESIGN DISTRICT (WDD2)
- WATER
- HIGH DENSITY RESIDENTIAL OVERLAY

FIGURE:

6-A

AECOM

AECOM Environment
500 ENTERPRISE DR, STE 1A
ROCKY HILL, CT 06067
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www.aecom.com

PROPOSED WATER MAIN EXTENSION
ALTERNATE LAYOUT (8-INCH)
TYLERVILLE WATER SUPPLY STUDY
HADDAM, CONNECTICUT

SCALE: 3" = 3500'	DATE: OCT. 2017	PN: 60285195

PATH/FILENAME: X:\60190457 CTDEP TYLERVILLE WATER SUPPLY\400 BACKGROUND INFORMATION\OLD DWGS\TYLERVILLE STUDY AREA 012511 UPDATED.DWG

LAST UPDATE: Thursday, October 26, 2017 5:03:00 PM

11X17 – 9/16/11

PLOT DATE: Tuesday, October 31, 2017 10:40:11 AM

LEGEND:

PROPOSED WATER SUPPLY AREA

123 ADDRESS NO.

ALTERNATE PROPOSED WATER DISTRIBUTION MAIN

PROPOSED WATER TRANSMISSION MAIN

BUILDING OUTLINE

LAND USE/ZONING

RESIDENTIAL (R–2)

COMMERCIAL (C–1)

INDUSTRIAL (I–1)

HIGH DENSITY RESIDENTIAL OVERLAY

FIGURE: 6-B

AECOM

AECOM Environment
500 ENTERPRISE DR, STE 1A
ROCKY HILL, CT 06067
(860) 263-5800
www.aecom.com

PROPOSED WATER MAIN EXTENSION
ALTERNATE LAYOUT (8-INCH)
TYLERVILLE WATER SUPPLY STUDY
HADDAM, CONNECTICUT

SCALE: 1" = 500'	DATE: OCT. 2017	PN: 60285195

PATH/FILENAME: X:\60190457 CTDEP TYLERVILLE WATER SUPPLY\400 BACKGROUND INFORMATION\OLD DWGS\TYLERVILLE STUDY AREA 012511 UPDATED.DWG

LAST UPDATE: Wednesday, October 25, 2017 2:19:02 PM

11X17 – 9/16/11

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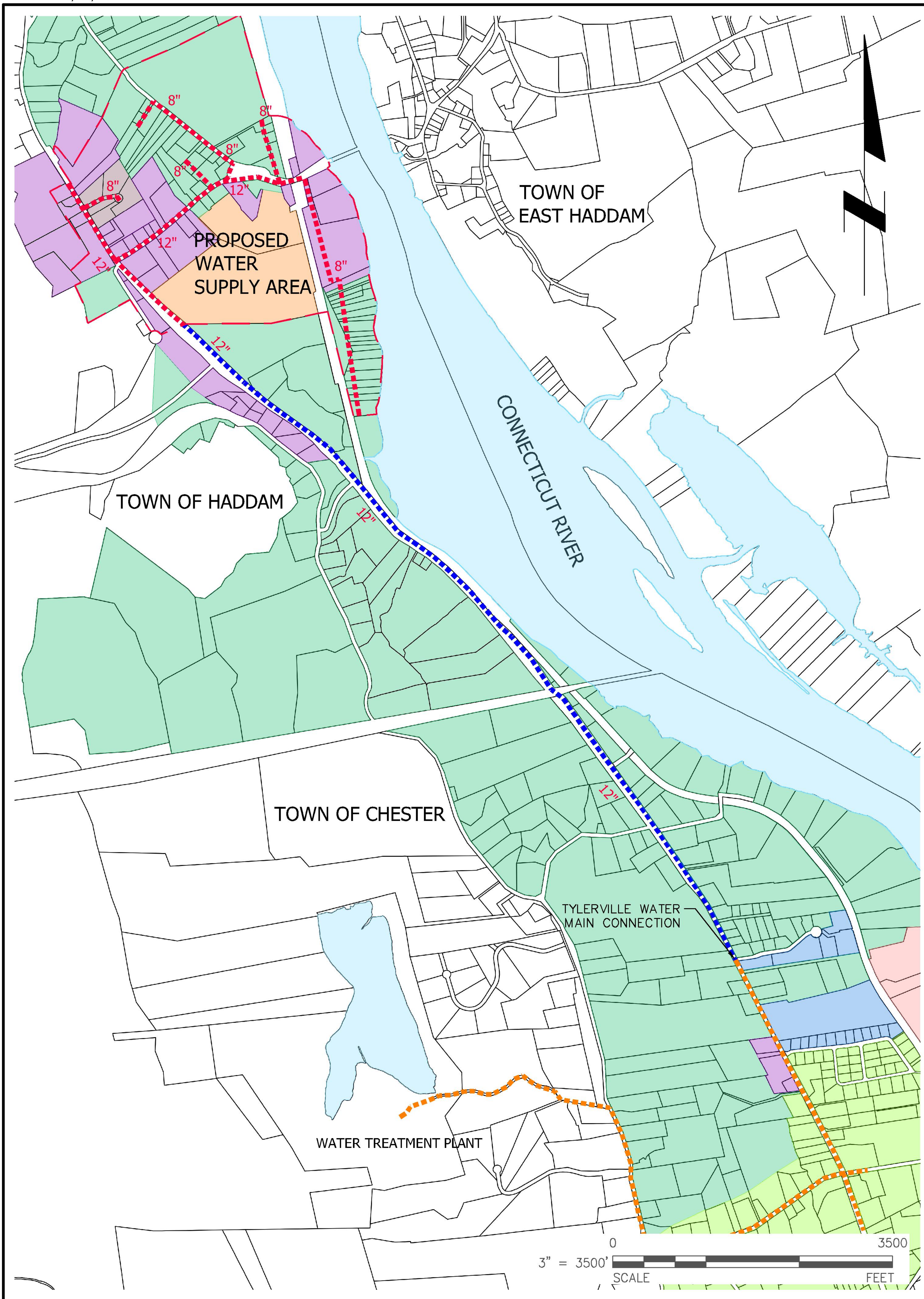

LEGEND:

- PROPOSED WATER DISTRIBUTION MAIN
- PROPOSED WATER TRANSMISSION MAIN
- CHESTER EXISTING WATER MAIN
- PROPOSED WATER SUPPLY AREA

LAND USE/ZONING

- RESIDENTIAL (R–1)
- RESIDENTIAL (R–2)
- COMMERCIAL (C–1)
- INDUSTRIAL (I–1)
- RESEARCH/LIGHT MANUFACTURING (RLM)
- WATERFRONT DESIGN DISTRICT (WDD2)
- WATER
- HIGH DENSITY RESIDENTIAL OVERLAY

FIGURE:

7-A

AECOM

AECOM Environment
500 ENTERPRISE DR, STE 1A
ROCKY HILL, CT 06067
(860) 263-5800
www.aecom.com

PROPOSED WATER MAIN EXTENSION
BASE LAYOUT (12-INCH)
TYLERVILLE WATER SUPPLY STUDY
HADDAM, CONNECTICUT

SCALE: 3" = 3500' | DATE: OCT. 2017 | PN: 60285195

PATH/FILENAME: X:\60190457 CTDEP TYLERVILLE WATER SUPPLY\400 BACKGROUND INFORMATION\OLD DWGS\TYLERVILLE STUDY AREA 012511 UPDATED.DWG

LAST UPDATE: Thursday, October 26, 2017 5:03:00 PM

11X17 – 9/16/11

PLOT DATE: Tuesday, October 31, 2017 10:36:52 AM

LEGEND:

- PROPOSED WATER SUPPLY AREA
- 123 ADDRESS NO.
- PROPOSED WATER DISTRIBUTION MAIN
- PROPOSED WATER TRANSMISSION MAIN
- BUILDING OUTLINE

LAND USE/ZONING

- RESIDENTIAL (R-2)
- COMMERCIAL (C-1)
- INDUSTRIAL (I-1)
- HIGH DENSITY RESIDENTIAL OVERLAY

FIGURE: 7-B

AECOM

AECOM Environment
500 ENTERPRISE DR, STE 1A
ROCKY HILL, CT 06067
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www.aecom.com

PROPOSED WATER MAIN EXTENSION
BASE LAYOUT (12-INCH)
TYLERVILLE WATER SUPPLY STUDY
HADDAM, CONNECTICUT

SCALE: 1" = 500'	DATE: OCT. 2017	PN: 60285195

PATH/FILENAME: X:\60190457 CTDEP TYLERVILLE WATER SUPPLY\400 BACKGROUND INFORMATION\OLD DWGS\TYLERVILLE STUDY AREA 012511 UPDATED.DWG

LAST UPDATE: Wednesday, October 25, 2017 2:19:02 PM

11X17 – 9/16/11

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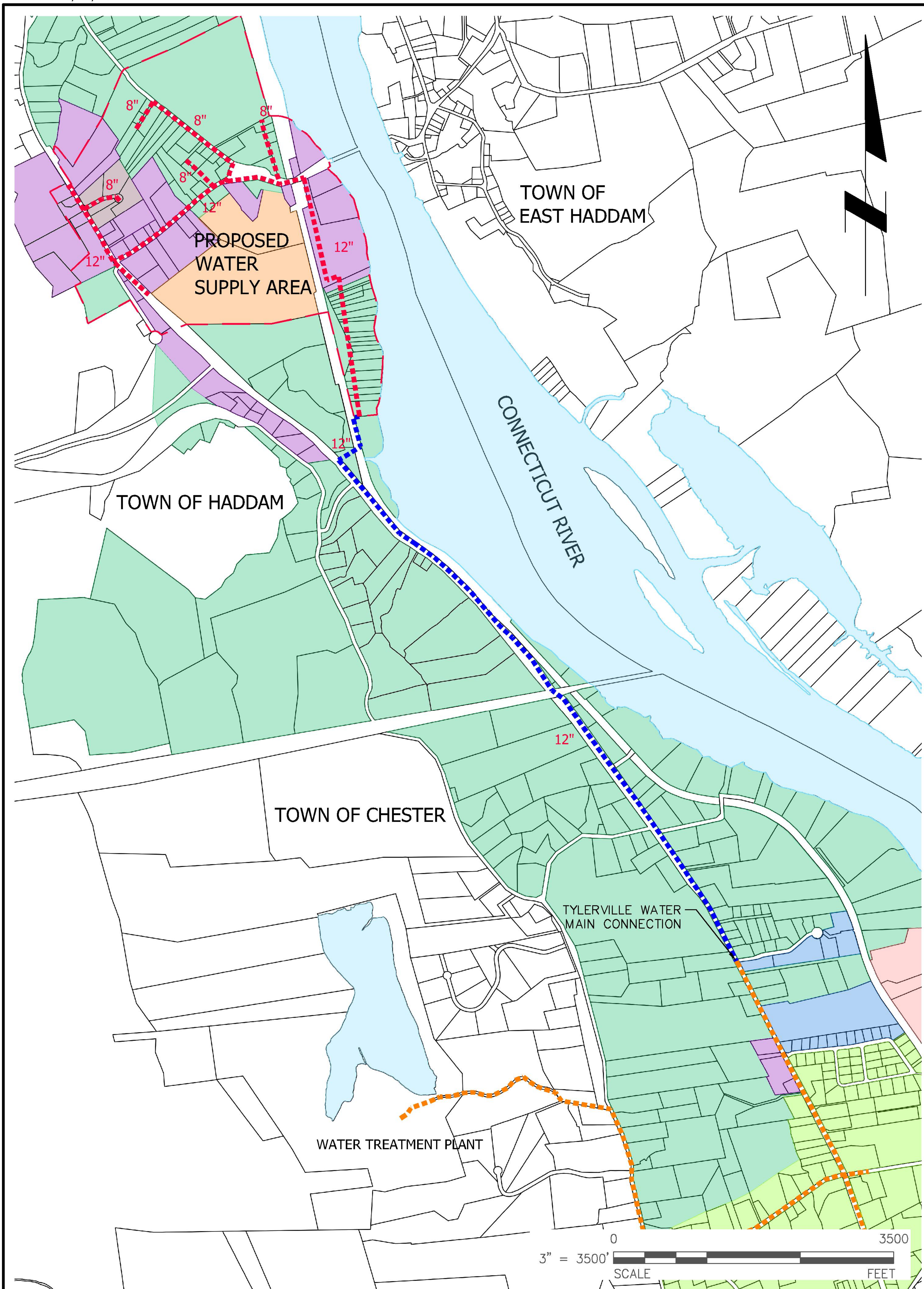

LEGEND:

- ALTERNATE PROPOSED WATER DISTRIBUTION MAIN
- PROPOSED WATER TRANSMISSION MAIN
- CHESTER EXISTING WATER MAIN
- PROPOSED WATER SUPPLY AREA

LAND USE/ZONING

- RESIDENTIAL (R–1)
- RESIDENTIAL (R–2)
- COMMERCIAL (C–1)
- INDUSTRIAL (I–1)
- RESEARCH/LIGHT MANUFACTURING (RLM)
- WATERFRONT DESIGN DISTRICT (WDD2)
- WATER
- HIGH DENSITY RESIDENTIAL OVERLAY

FIGURE: 8-A

AECOM

AECOM Environment
500 ENTERPRISE DR, STE 1A
ROCKY HILL, CT 06067
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PROPOSED WATER MAIN EXTENSION
ALTERNATE LAYOUT (12-INCH)
TYLERVILLE WATER SUPPLY STUDY
HADDAM, CONNECTICUT

SCALE: 3" = 3500' | DATE: OCT. 2017 | PN: 60285195

PATH/FILENAME: X:\60190457 CTDEP TYLERVILLE WATER SUPPLY\400 BACKGROUND INFORMATION\OLD DWGS\TYLERVILLE STUDY AREA 012511 UPDATED.DWG

LAST UPDATE: Thursday, October 26, 2017 5:03:00 PM

11X17 – 9/16/11

PLOT DATE: Tuesday, October 31, 2017 10:32:04 AM

LEGEND:

PROPOSED WATER SUPPLY AREA

123 ADDRESS NO.

PROPOSED WATER DISTRIBUTION MAIN

PROPOSED WATER TRANSMISSION MAIN

BUILDING OUTLINE

LAND USE/ZONING

RESIDENTIAL (R–2)

COMMERCIAL (C–1)

INDUSTRIAL (I–1)

HIGH DENSITY RESIDENTIAL OVERLAY

FIGURE:

8-B

AECOM

AECOM Environment
500 ENTERPRISE DR, STE 1A
ROCKY HILL, CT 06067
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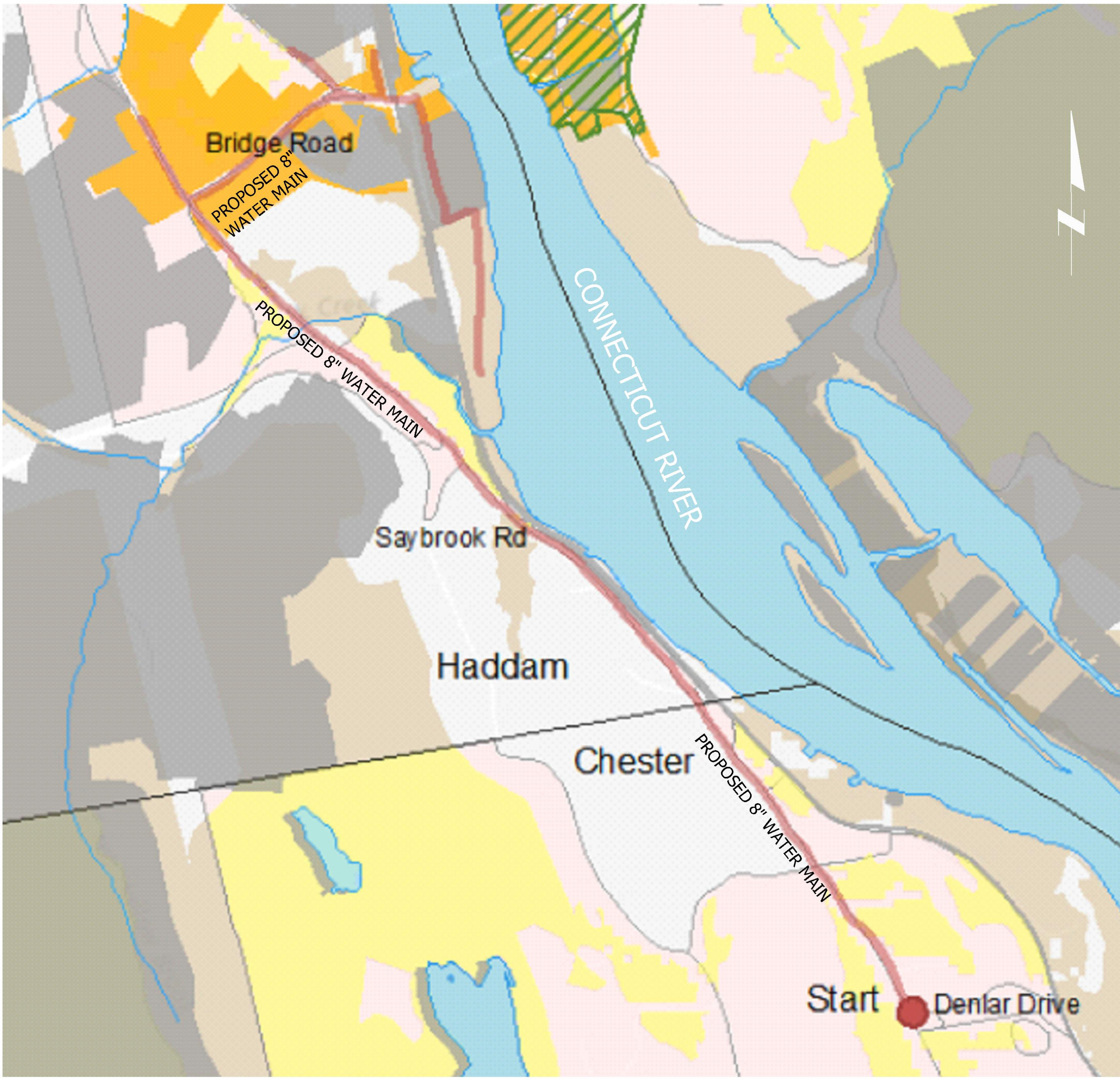
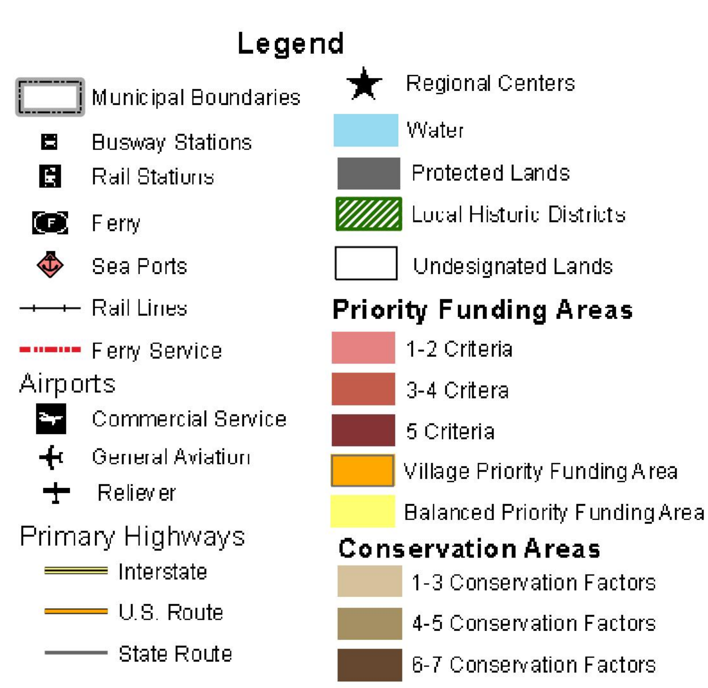
PROPOSED WATER MAIN EXTENSION
ALTERNATE LAYOUT (12-INCH)
TYLERVILLE WATER SUPPLY STUDY
HADDAM, CONNECTICUT

SCALE: 1" = 500' | DATE: OCT. 2017 | PN: 60285195





MAP SOURCE:
CONNECTICUT OFFICE OF POLICY AND MANAGEMENT (2013). CONSERVATION AND DEVELOPMENT POLICIES PLAN AND LOCATIONAL GUIDE MAP, 2013-2018. ADOPTED JUNE 5, 2013.

LEGEND:	FIGURE:		
	9	AECOM AECOM Environment 500 ENTERPRISE DR, STE 1A ROCKY HILL, CT 06067 (860) 263-5800 www.aecom.com	CT C&D POLICIES PLAN LOCATIONAL GUIDE MAP HADDAM, CONNECTICUT

SCALE: NTS | DATE: OCT. 2017 | PN: 60285195

Appendix A

Statement of Limitations

STATEMENT OF LIMITATIONS

The data presented and the opinions expressed in this report are qualified as follows:

1. The sole purpose of this report is to present a preliminary assessment of the physical characteristics of the Site with respect to the presence or absence in the environment of oil or hazardous materials and substances as defined in the applicable state and federal environmental laws and regulations and to identify and evaluate potential water supply alternatives for the Site.

2. AECOM derived the data in this report primarily from visual inspections, examinations of records provided by the Client, interviews with individuals with information about the Site. The passage of time, manifestation of latent conditions or occurrence of future events may require further exploration at the Site, analysis of the data, and reevaluation of the findings, observations, and conclusions expressed in the report.

3. In preparing this report, AECOM has relied upon and presumed accurate certain information (or the absence thereof) about the Site and adjacent properties provided by governmental officials and agencies, the Client, and others identified herein. Except as otherwise stated in the report, AECOM has not attempted to verify the accuracy or completeness of any such information.

4. The data reported and the findings, observations, and conclusions expressed in the report are limited by the Scope of Services. The Scope of Services was defined by the requests of the Client, the time and budgetary constraints imposed by the Client, and the availability of access to the Site.

5. Because of the limitations stated above, the findings, observations, and conclusions expressed by AECOM in this report are not, and should not be considered, an opinion concerning the compliance of any past or present owner or operator of the site with any federal, state or local law or regulation. No warranty or guarantee, whether express or implied, is made with respect to the data reported or findings, observations, and conclusions expressed in this report. Further, such data, findings, observations, and conclusions are based solely upon site conditions in existence at the time of investigation.

6. This report has been prepared on behalf of and for the exclusive use of the Client, and is subject to and issued in connection with the Agreement and the provisions thereof.

Appendix B

Laboratory Data Summary Tables

Appendix B - Table B.1
Study Area Raw Well Water Analytical Results - Most Current Sampling Even

Street #	Street Address	Sample Date	Sample_Pt	Tetrachloroethene (PCE) (µg/L)	Trichloroethene (TCE) (µg/L)	1,1,1-Trichloroethane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)	1,1-Dichloroethene (µg/L)	1,1-Dichloroethane (µg/L)	Vinyl Chloride (µg/L)	1,4-Dioxane (µg/L)	Methyl T-Butyl Ether (µg/L)
	US EPA MCL			5	5	200	70	100	7	---	2	---	---
	CT DPH DWAL			5	1	200	---	---	7	25	0.5	3	70
	CT DPH B/SAL			---	---	---	---	---	---	---	---	50	---
Street #	Street Address			Tetrachloroethene (PCE) (µg/L)	Trichloroethene (TCE) (µg/L)	1,1,1-Trichloroethane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)	1,1-Dichloroethene (µg/L)	1,1-Dichloroethane (µg/L)	Vinyl Chloride (µg/L)	1,4-Dioxane (µg/L)	Methyl T-Butyl Ether (µg/L)
Bethel Lane													
18	Bethel Lane	6/1/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bridge Road													
1	Bridge Road	7/10/2017	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
22	Bridge Road	6/20/2016	Kitchen Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
27	Bridge Road	8/30/2012	Kitchen Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55	Bridge Road	6/25/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.9**
56	Bridge Road	3/27/2002	Kitchen Tap	ND	**3.3**	ND	ND	ND	**0.1**	ND	ND	N/A	ND
57	Bridge Road	11/6/2014	Raw	ND	**30**	ND	**2.1**	ND	**1.3**	ND	ND	**0.76**	**1.1**
61	Bridge Road	10/18/2016	Raw	ND	**5**	ND	**0.74**	ND	ND	ND	ND	**0.58**	ND
64	Bridge Road	7/5/2017	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
71	Bridge Road	12/21/2016	Raw	ND	**7.7**	ND	**0.75**	ND	**0.87**	ND	ND	**0.73**	ND
76	Bridge Road	5/22/2017	Raw	**0.57**	**80**	ND	**8.2**	ND	**11**	ND	ND	**10**	ND
78	Bridge Road	5/20/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
79	Bridge Road	8/3/2010	Raw	**2.2**	**250**	**1.8**	**17**	**0.5**	**36**	**7.8**	**0.1**	N/A	**1.3**
80	Bridge Road	9/15/2016	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.76**
81	Bridge Road	3/21/2017	Raw	**0.7**	**110**	ND	**8.2**	ND	**12**	**2.6**	ND	**9.2**	**1.3**
82	Bridge Road	3/22/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**3.2**
85	Bridge Road	4/29/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**192**
88	Bridge Road	12/19/1997	Kitchen Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**4.9**
95	Bridge Road	1/20/2014	Raw	ND	**1.04**	**1.39**	ND	ND	ND	ND	ND	N/A	ND
98	Bridge Road	4/5/2017	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**43.7**
100	Bridge Road	1/24/2017	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**43.3**
105	Bridge Road	11/12/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**102**
106	Bridge Road	10/10/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**7.49**
112	Bridge Road	4/5/2017	Bathroom Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
116	Bridge Road	10/11/2016	Bathroom Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
95	Bridge Road/Market	10/19/2010	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.5**
Camp Bethel Road													
115	Camp Bethel Road	10/8/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**3.2**
117	Camp Bethel Road	10/8/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**3.1**
121	Camp Bethel Road	6/1/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**2.4**
125	Camp Bethel Road	10/8/2014	Kitchen Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
129	Camp Bethel Road	6/16/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
137	Camp Bethel Road	9/20/2012	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
143	Camp Bethel Road	5/16/2011	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.1**
149	Camp Bethel Road	5/11/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.61**
156	Camp Bethel Road	5/13/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
160	Camp Bethel Road	12/21/2016	Raw	ND	**1.2**	ND	ND	ND	ND	ND	ND	ND	ND
163	Camp Bethel Road	6/6/2002	Outside Tap	ND	**5**	ND	ND	ND	**0.1**	ND	ND	N/A	ND
168	Camp Bethel Road	5/12/2015	Kitchen Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
180	Camp Bethel Road	11/7/2016	Raw	ND	**1.2**	ND	ND	ND	ND	ND	ND	ND	ND
124	Camp Bethel Road - East Well	5/27/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
124	Camp Bethel Road - West Well	5/27/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Harpers Landing													
4	Harpers Landing	5/1/2015	Sink Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
12	Harpers Landing	11/7/1996	Kitchen Tap	ND	ND	**0.1**	ND	ND	ND	ND	ND	N/A	ND
Little Meadow Road													
0	Little Meadow Road	6/25/1997	Raw	ND	**1100**	ND	ND	ND	**0.7**	ND	ND	N/A	ND
14	Little Meadow Road	10/18/2016	Outside Tap	**4.4**	**140**	**19**	**2.4**	ND	**23**	**2.7**	ND	**6.2**	ND
69	Little Meadow Road	7/18/2017	Raw	N/A	**16**	**2.6**	ND	ND	**2.9**	**0.8**	ND	**0.75**	N/A
71	Little Meadow Road	5/9/2016	Raw	**0.95**	**40**	**11**	**0.93**	ND	**12**	**0.66**	ND	**3.2**	ND
75	Little Meadow Road	7/11/2017	Raw	ND	**14**	**1**	ND	ND	**2.5**	**0.99**	ND	**0.85**	ND
76	Little Meadow Road	7/11/2017	Raw	ND	**17**	ND	**0.69**	ND	**3.2**	**1.5**	ND	**1.2**	ND
77	Little Meadow Road	9/15/2016	Raw	N/A	**100**	ND	**64**	**18**	**27**	**11**	**0.74**	**36**	ND
78	Little Meadow Road	8/4/2016	Raw	ND	**22**	**5.8**	ND	ND	**4.6**	ND	ND	**1.6**	ND
84	Little Meadow Road	8/8/2016	Raw	ND	**1**	ND	**1.9**	ND	**0.51**	ND	ND	**0.62**	ND
94	Little Meadow Road	7/18/2017	Kitchen Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
98	Little Meadow Road	7/11/2017	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
102	Little Meadow Road	5/26/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
104	Little Meadow Road	5/26/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
106	Little Meadow Road	5/5/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
109	Little Meadow Road	9/26/2016	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
110	Little Meadow Road	9/13/2016	Raw	ND	**4.8**	ND	ND	ND	ND	ND	ND	ND	ND
116	Little Meadow Road	6/20/2016	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
120	Little Meadow Road	8/31/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
124	Little Meadow Road	9/2/2009	Raw	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	N/A
128	Little Meadow Road	7/31/2012	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
130	Little Meadow Road	7/11/2017	Raw	ND	ND	ND	**7.2**	**14**	**2.4**	**1.4**	**5.1**	**4.2**	ND
134	Little Meadow Road	7/12/2017	Raw	ND	**3.6**	ND	**49**	**35**	**11**	**4.5**	**17**	**14**	ND

Appendix B - Table B.1
Study Area Raw Well Water Analytical Results - Most Current Sampling Even

Street #	Street Address	Sample Date	Sample_Pt	Tetrachloroethene (PCE) (µg/L)	Trichloroethene (TCE) (µg/L)	1,1,1-Trichloroethane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)	1,1-Dichloroethene (µg/L)	1,1-Dichloroethane (µg/L)	Vinyl Chloride (µg/L)	1,4-Dioxane (µg/L)	Methyl T-Butyl Ether (µg/L)
	US EPA MCL			**5**	**5**	**200**	**70**	**100**	**7**	**---**	**2**	**---**	**---**
	CT DPH DWAL			**5**	**1**	**200**	**---**	**---**	**7**	**25**	**0.5**	**3**	**70**
	CT DPH B/SAL			**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**50**	**---**
Street #	**Street Address**			**Tetrachloroethene (PCE) (µg/L)**	**Trichloroethene (TCE) (µg/L)**	**1,1,1-Trichloroethane (µg/L)**	**cis-1,2-Dichloroethene (µg/L)**	**trans-1,2-Dichloroethene (µg/L)**	**1,1-Dichloroethene (µg/L)**	**1,1-Dichloroethane (µg/L)**	**Vinyl Chloride (µg/L)**	**1,4-Dioxane (µg/L)**	**Methyl T-Butyl Ether (µg/L)**
Saybrook Road													
1556	Saybrook Road	10/30/2014	Kitchen Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1557	Saybrook Road	5/13/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
1572	Saybrook Road	10/25/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1573	Saybrook Road	5/20/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1583	Saybrook Road	10/13/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1586	Saybrook Road	1/24/2017	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1588	Saybrook Road	4/12/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1592	Saybrook Road	4/5/2017	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1598	Saybrook Road	4/5/2017	Kitchen Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1609	Saybrook Road	4/5/2017	Bathroom Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1617	Saybrook Road	8/30/2013	Kitchen Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1618	Saybrook Road	1/19/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1640	Saybrook Road	11/10/2015	Raw	ND	**3.3**	ND	ND	ND	**0.56**	ND	ND	**0.5**	ND
1610	Saybrook Road - Consignment	9/17/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**1**
1610	Saybrook Road - Cooking Company	9/17/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**2**
South Side Bluff													
16	South Side Bluff	5/18/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
22	South Side Bluff	5/18/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
26	South Side Bluff	5/16/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
30	South Side Bluff	5/13/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:	
(blue)	Value exceeds both US EPA MCL and CT DPH DWAL
(green)	Value exceeds CT DPH DWAL or CT B/SAL
BOLD	Detected compound
ND	Non detect
N/A	Not sampled

1. 79 Bridge Road is also considered 81 Bridge Road (two separate houses served by one well
2. 4 Harpers Landing is also considered 12 Andrews Marina.

Appendix B - Table B.2
Study Area Raw Well Water Analytical Results - Historic Concentration Ranges (1981-2010)

	COC	Tetrachloroethene (PCE) (µg/L)		Trichloroethene (TCE) (µg/L)		1,1,1-Trichloroethane (µg/L)		cis-1,2-Dichloroethene (µg/L)		trans-1,2-Dichloroethene (µg/L)		1,1-Dichloroethene (µg/L)		1,1-Dichloroethane (µg/L)		Vinyl Chloride (µg/L)		1,4-Dioxane (µg/L)		Methyl T-Butyl Ether (µg/L)	
	US EPA MCL	5		5		200		70		100		7		---		2		---		---	
	CT DPH DWAL	5		1		200		---		---		7		25		0.5		3		70	
	CT DPH B/SAL	---		---		---		---		---		---		---		---		50		---	
Street #	**Street Address**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**
Bridge Road																					
1	Bridge Road	ND	ND	ND	110	ND	2.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1
22	Bridge Road	ND	ND	ND	0.1	ND	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	1.4
27	Bridge Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND
55	Bridge Road	ND	1.9	ND	18	ND	7.2	ND	ND	ND	ND	ND	1.9	ND	ND	ND	ND	N/A	N/A	ND	0.7
57	Bridge Road	ND	0.6	ND	100	ND	1.3	ND	2.4	ND	ND	ND	6	ND	0.9	ND	ND	1.7	1.7	ND	7.2
61	Bridge Road	ND	0.1	7.3	25	ND	0.8	ND	1.5	ND	ND	0.1	3.1	ND	0.1	ND	ND	ND	28	ND	0.1
64	Bridge Road	ND	ND	ND	3.3	ND	ND	ND	0.1	ND	ND	ND	0.1	ND	ND	ND	ND	ND	1.5	ND	ND
71	Bridge Road	ND	0.7	12	69	ND	14	ND	1.1	ND	ND	ND	2.1	ND	0.1	ND	ND	ND	3.8	ND	0.1
72	Bridge Road	ND	ND	3.3	3.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND
76	Bridge Road	ND	1.5	9.5	270	ND	10	ND	11	ND	0.1	0.8	18	ND	5.2	ND	0.1	ND	9.2	ND	8.6
78	Bridge Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND
79	Bridge Road	ND	2.6	51	530	ND	10	ND	17	ND	0.5	ND	36	ND	8.5	ND	0.1	1.5	29.1	ND	1.3
80	Bridge Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	1.7
81	Bridge Road	ND	10	ND	620	ND	10	ND	25	ND	2.5	ND	48	ND	13	ND	0.1	ND	27.3	ND	2.5
85	Bridge Road	0.1	0.1	0.1	0.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	56	210
88	Bridge Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	3.6	160
95	Bridge Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	0.1	0.6
98	Bridge Road	ND	0.1	0.1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	58	490
100	Bridge Road	ND	0.1	ND	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	27	840
106	Bridge Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	0.1	15
112	Bridge Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	0.6	2.6
116	Bridge Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	0.1
95	Bridge Road/Market	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	0.5	0.5
Camp Bethel Road																					
19	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND
27	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND
48	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND
49	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND
84	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND
96	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1	0.1
137	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
149	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	0.1	0.1
156	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND
160	Camp Bethel Road	ND	0.1	ND	11	ND	ND	ND	0.1	ND	ND	ND	6	ND	0.1	ND	ND	ND	ND	ND	0.1
163	Camp Bethel Road	ND	ND	5	5	ND	ND	ND	ND	ND	ND	0.1	0.1	ND	ND	ND	ND	N/A	N/A	ND	ND
168	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
180	Camp Bethel Road	ND	ND	1.4	1.6	ND	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1	2
124	Camp Bethel Road - East Well	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND
124	Camp Bethel Road - West Well	ND	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	1.9
Harpers Landing																					
4	Harpers Landing	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	0.6
Little Meadow Road																					
0	Little Meadow Road	ND	ND	1100	1100	ND	ND	ND	ND	ND	ND	0.7	0.7	ND	ND	ND	ND	N/A	N/A	ND	ND
14	Little Meadow Road	23	23	1300	1300	460	460	ND	ND	ND	ND	150	150	ND	ND	ND	ND	N/A	N/A	ND	ND
69	Little Meadow Road	ND	0.1	13	40	1.8	9.1	ND	0.1	ND	ND	0.1	4.6	0.7	1.4	ND	ND	ND	ND	ND	ND
71	Little Meadow Road	ND	330	31	330	ND	55.5	ND	3.8	ND	ND	ND	22	ND	1.1	ND	ND	2.6	39	ND	1
75	Little Meadow Road	ND	0.1	40	67	8.6	20	ND	1.25	ND	ND	2.5	10	0.8	3.6	ND	ND	N/A	N/A	ND	20
76	Little Meadow Road	ND	0.1	ND	83	ND	20	ND	1.5	ND	ND	ND	7.6	ND	2.9	ND	ND	2.6	7	ND	21
77	Little Meadow Road	ND	1	2.2	350	ND	54.6	ND	130	ND	15	0.1	68	ND	24	ND	1.3	ND	55	ND	ND
78	Little Meadow Road	ND	0.1	ND	91	ND	22	ND	0.8	ND	ND	ND	11	ND	0.7	ND	ND	1.2	2	ND	8.5
84	Little Meadow Road	ND	0.1	ND	97	ND	23	ND	2.1	ND	ND	ND	10	ND	2.1	ND	ND	ND	ND	ND	11
98	Little Meadow Road	ND	ND	ND	0.1	ND	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
102	Little Meadow Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
104	Little Meadow Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
106	Little Meadow Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.8
109	Little Meadow Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
110	Little Meadow Road	ND	ND	ND	18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND
116	Little Meadow Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.8
120	Little Meadow Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
124	Little Meadow Road	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND	N/A	N/A
128	Little Meadow Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1	9.4
130	Little Meadow Road	ND	ND	ND	19	ND	ND	ND	8.2	ND	12	ND	3.4	ND	2	ND	ND	ND	ND	ND	ND
134	Little Meadow Road	ND	ND	ND	74	ND	ND	ND	37	ND	50	ND	10	ND	5.1	ND	ND	7.4	15.6	ND	ND

Appendix B - Table B.2
Study Area Raw Well Water Analytical Results - Historic Concentration Ranges (1981-2010)

	COC	Tetrachloroethene (PCE) (µg/L)		Trichloroethene (TCE) (µg/L)		1,1,1-Trichloroethane (µg/L)		cis-1,2-Dichloroethene (µg/L)		trans-1,2-Dichloroethene (µg/L)		1,1-Dichloroethene (µg/L)		1,1-Dichloroethane (µg/L)		Vinyl Chloride (µg/L)		1,4-Dioxane (µg/L)		Methyl T-Butyl Ether (µg/L)	
	US EPA MCL	5		5		200		70		100		7		---		2		---		---	
	CT DPH DWAL	5		1		200		---		---		7		25		0.5		3		70	
	CT DPH B/SAL	---		---		---		---		---		---		---		---		50		---	
Street #	**Street Address**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**
Saybrook Road																					
1573	Saybrook Road	**0.1**	**3.9**	ND	**0.1**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	**0.9**	**1.1**
1586	Saybrook Road	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**4.1**	**4.1**
1598	Saybrook Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	**0.5**
1609	Saybrook Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.7**	ND	ND	ND	ND	N/A	N/A	ND	**1**
1618	Saybrook Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**11**	**880**
1610	Saybrook Road - Cooking Company	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	**0.1**	**9**
South Side Bluff																					
16	South Side Bluff	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.1**
22	South Side Bluff	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.1**
26	South Side Bluff	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND

Notes:

	Value exceeds both US EPA MCL and CT DPH DWAL
	Value exceeds CT DPH DWAL or CT B/SAL
BOLD	Detected compound
ND	Non detect
N/A	Not sampled

1. 79 Bridge Road is also considered 81 Bridge Rd. (two separate houses served by one well
2. 4 Harpers Landing is also considered 12 Andrews Marina

Appendix B - Table B.3
Study Area Raw Well Water Analytical Results - Historic Concentration Ranges (2011-2017)

	COC	Tetrachloroethene (PCE) (µg/L)		Trichloroethene (TCE) (µg/L)		1,1,1-Trichloroethane (µg/L)		cis-1,2-Dichloroethene (µg/L)		trans-1,2-Dichloroethene (µg/L)		1,1-Dichloroethene (µg/L)		1,1-Dichloroethane (µg/L)		Vinyl Chloride (µg/L)		1,4-Dioxane (µg/L)		Methyl T-Butyl Ether (µg/L)	
	US EPA MCL	5		5		200		70		100		7		---		2		---		---	
	CT DPH DWAL	1		5		200		---		---		7		25		0.5		3		70	
	CT DPH B/SAL	---		---		---		---		---		---		---		---		50		---	
Street #	Street Address	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Bethel Lane																					
10	Bethel Lane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18	Bethel Lane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1
Bridge Road																					
1	Bridge Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
22	Bridge Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55	Bridge Road	ND	ND	ND	1.5	ND	0.75	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.79	ND	0.9
57	Bridge Road	ND	0.1	30	55	ND	0.1	1.7	2.6	ND	ND	1.2	2.6	ND	ND	ND	ND	0.76	1.1	0.9	1.6
61	Bridge Road	ND	0.53	3.5	60	ND	1.2	ND	4.4	ND	ND	ND	7.3	ND	1.4	ND	ND	ND	4.6	ND	ND
64	Bridge Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
71	Bridge Road	ND	0.1	4.8	23	ND	0.1	ND	1.3	ND	ND	ND	1.1	ND	0.5	ND	ND	ND	1.4	ND	0.1
76	Bridge Road	ND	1.3	59	140	ND	1.3	4.8	12	ND	ND	7.2	17	ND	3.6	ND	ND	5.1	16	ND	0.7
78	Bridge Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
80	Bridge Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.76	2.1
81	Bridge Road	ND	2.6	69	260	ND	1.2	ND	16	ND	0.1	ND	31	ND	8	ND	ND	2.2	21	ND	2.2
82	Bridge Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	3.1	3.2
85	Bridge Road	ND	0.1	ND	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	175	246
95	Bridge Road	ND	ND	ND	1.04	ND	1.43	ND	ND	ND	2.01	ND	0.56	ND	ND	ND	ND	N/A	N/A	ND	0.1
98	Bridge Road	ND	0.1	ND	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	43.7	436
100	Bridge Road	ND	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	40.8	530
105	Bridge Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	102	114
106	Bridge Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	7.49
112	Bridge Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	0.9	0.9
116	Bridge Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	0.1	0.1
Camp Bethel Road																					
115	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.2
117	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.6	3.1
121	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.3	2.4
125	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
129	Camp Bethel Road	ND	ND	ND	1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
137	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
143	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1	0.1
149	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.61
156	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
160	Camp Bethel Road	ND	ND	1.2	3.7	ND	ND	ND	ND	ND	ND	ND	0.1	ND	ND	ND	ND	ND	0.62	ND	ND
168	Camp Bethel Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
180	Camp Bethel Road	ND	ND	1	2.1	ND	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1
124	Camp Bethel Road - East Well	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.69
124	Camp Bethel Road - West Well	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.2
Harpers Landing																					
4	Harpers Landing	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Little Meadow Road																					
14	Little Meadow Road	3.8	5.6	84	250	19	42	2.4	3.7	ND	ND	20	39	2.7	4	ND	ND	6.2	15	ND	ND
69	Little Meadow Road	ND	0.1	ND	27	ND	4.8	ND	0.8	ND	ND	ND	5.4	ND	1.5	ND	ND	ND	1.5	ND	ND
71	Little Meadow Road	0.79	1.3	37	120	7.1	23	0.69	1.9	ND	ND	8	14	ND	0.92	ND	ND	3	16	ND	ND
75	Little Meadow Road	ND	0.1	13	48	ND	8	ND	0.1	ND	ND	2.5	6.9	ND	1.4	ND	ND	0.85	2.7	ND	ND
76	Little Meadow Road	ND	0.1	9.8	38	ND	7.9	ND	1	ND	ND	2.6	6.4	ND	1.7	ND	ND	1.1	2.7	ND	0.1
77	Little Meadow Road	ND	ND	ND	340	ND	0.1	ND	91	ND	38	ND	72	ND	24	ND	0.8	ND	62	ND	0.1
78	Little Meadow Road	ND	0.5	ND	42	ND	9.8	ND	1.7	ND	ND	ND	6.7	ND	0.6	ND	ND	ND	2.2	ND	1.4
84	Little Meadow Road	ND	ND	ND	3.7	ND	0.75	ND	4.1	ND	ND	ND	0.95	ND	ND	ND	ND	ND	0.62	ND	ND
98	Little Meadow Road	ND	ND	ND	2.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
102	Little Meadow Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
104	Little Meadow Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
106	Little Meadow Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
109	Little Meadow Road	ND	ND	ND	3.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
110	Little Meadow Road	ND	ND	1.6	110	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7
116	Little Meadow Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
120	Little Meadow Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
128	Little Meadow Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
130	Little Meadow Road	ND	ND	ND	6.2	ND	ND	1.5	33	2.2	55	0.1	9.5	ND	4.3	ND	68	ND	17	ND	ND
134	Little Meadow Road	ND	ND	1.3	10	ND	ND	26	70	32	110	2.4	20	3.3	7.8	ND	35	10	28	ND	ND

Appendix B - Table B.3
Study Area Raw Well Water Analytical Results - Historic Concentration Ranges (2011-2017)

	COC	Tetrachloroethene (PCE) (µg/L)		Trichloroethene (TCE) (µg/L)		1,1,1-Trichloroethane (µg/L)		cis-1,2-Dichloroethene (µg/L)		trans-1,2-Dichloroethene (µg/L)		1,1-Dichloroethene (µg/L)		1,1-Dichloroethane (µg/L)		Vinyl Chloride (µg/L)		1,4-Dioxane (µg/L)		Methyl T-Butyl Ether (µg/L)	
	US EPA MCL	5		5		200		70		100		7		---		2		---		---	
	CT DPH DWAL	1		5		200		---		---		7		25		0.5		3		70	
	CT DPH B/SAL	---		---		---		---		---		---		---		---		50		---	
Street #	**Street Address**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**
Saybrook Road																					
1557	Saybrook Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.6**
1572	Saybrook Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND
1573	Saybrook Road	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND	N/A	N/A
1583	Saybrook Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND
1586	Saybrook Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND
1588	Saybrook Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	**1.08**
1592	Saybrook Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND
1598	Saybrook Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	**0.1**	**0.1**
1609	Saybrook Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	**0.1**	**0.1**
1617	Saybrook Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND
1618	Saybrook Road	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	**8.2**
1640	Saybrook Road	ND	ND	**1.8**	**7.6**	ND	ND	ND	**0.9**	ND	ND	ND	**1.3**	ND	**0.59**	ND	ND	ND	**1.2**	ND	ND
1610	Saybrook Road - Consignment	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	**1**	**120**
1610	Saybrook Road - Cooking Company	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	**2**
South Side Bluff																					
16	South Side Bluff	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.1**
22	South Side Bluff	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
26	South Side Bluff	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
30	South Side Bluff	ND	ND	ND	ND	ND	**0.1**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

	Value exceeds both US EPA MCL and CT DPH DWAL
	Value exceeds CT DPH DWAL or CT B/SAL
BOLD	Detected compound
ND	Non detect
N/A	Not sampled

1. 79 Bridge Road is also considered 81 Bridge Rd. (two separate houses served by one well
2. 4 Harpers Landing is also considered 12 Andrews Marina

Appendix B - Table B.4
Study Area Raw Well Water Analytical Results 2010-2017

				Tetrachloroethene (PCE) (µg/L)	Trichloroethene (TCE) (µg/L)	1,1,1-Trichloroethane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)	1,1-Dichloroethene (µg/L)	1,1-Dichloroethane (µg/L)	Vinyl Chloride (µg/L)	1,4-Dioxane (µg/L)	Methyl T-Butyl Ether (µg/L)
		US EPA MCL		**5**	**5**	**200**	**70**	**100**	**7**	**--**	**2**	**---**	**---**
		CT DPH DWAL		**5**	**1**	**200**	**--**	**--**	**7**	**25**	**0.5**	**3**	**70**
		CT DPH B/SAL		**---**	**---**	**--**	**--**	**--**	**---**	**--**	**--**	**50**	**---**
Street #	**Street Address**	**Sample Date**	**Sample_Pt**	**Tetrachloroethene (µg/L)**	**Trichloroethene (µg/L)**	**1,1,1-Trichloroethane (µg/L)**	**cis-1,2-Dichloroethene (µg/L)**	**trans-1,2-Dichloroethene (µg/L)**	**1,1-Dichloroethene (µg/L)**	**1,1-Dichloroethane (µg/L)**	**Vinyl Chloride (µg/L)**	**1,4-Dioxane (µg/L)**	**Methyl T-Butyl Ether (µg/L)**
Bethel Lane													
18	Bethel Lane	5/18/2011	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.1**
18	Bethel Lane	10/17/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
18	Bethel Lane	6/1/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bridge Road													
1	Bridge Road	1/28/2010	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1	Bridge Road	5/3/2010	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1	Bridge Road	7/19/2012	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1	Bridge Road	10/9/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1	Bridge Road	5/20/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1	Bridge Road	7/10/2017	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
22	Bridge Road	7/5/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55	Bridge Road	7/31/2012	Raw	ND	**1.5**	**0.75**	ND	ND	ND	ND	ND	ND	ND
55	Bridge Road	9/24/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55	Bridge Road	5/21/2015	Raw	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**0.79**	N/A
55	Bridge Road	6/25/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.9**
57	Bridge Road	10/19/2010	Raw	**0.1**	**65**	**0.6**	**2.2**	ND	**2.9**	**0.1**	ND	N/A	**2**
57	Bridge Road	3/22/2011	Raw	**0.1**	**55**	**0.1**	**2**	ND	**2.6**	ND	ND	N/A	**1.6**
57	Bridge Road	7/31/2012	Raw	ND	**32**	ND	**2**	ND	**1.6**	ND	ND	**1**	**0.9**
57	Bridge Road	11/15/2012	Raw	ND	**44**	ND	**1.7**	ND	**1.9**	ND	ND	**1.1**	**1.1**
57	Bridge Road	1/27/2014	Raw	ND	**38**	ND	**2.6**	ND	**1.7**	ND	ND	**0.82**	**1.1**
57	Bridge Road	9/24/2014	Raw	ND	**30**	ND	**2**	ND	**1.2**	ND	ND	**1**	**1**
57	Bridge Road	11/6/2014	Raw	ND	**30**	ND	**2.1**	ND	**1.3**	ND	ND	**0.76**	**1.1**
61	Bridge Road	1/20/2010	Raw	**0.1**	**18**	**0.5**	ND	ND	**2**	ND	ND	N/A	**0.1**
61	Bridge Road	1/22/2010	Raw	**0.1**	**18**	**0.5**	**1.5**	ND	**2**	**0.1**	ND	N/A	ND
61	Bridge Road	5/10/2010	Raw	**0.1**	**25**	**0.8**	ND	ND	**3.1**	ND	ND	N/A	**0.1**
61	Bridge Road	7/5/2012	Raw	ND	**43**	**0.98**	**3.4**	ND	**5.9**	ND	ND	**4.2**	ND
61	Bridge Road	7/31/2012	Raw	**0.53**	**60**	**1.2**	**4.4**	ND	**7.3**	**1.4**	ND	**4.6**	ND
61	Bridge Road	11/2/2012	Raw	ND	**8.8**	ND	ND	ND	**0.79**	ND	ND	**1.1**	ND
61	Bridge Road	3/20/2013	Raw	ND	**6.8**	ND	**0.92**	ND	ND	ND	ND	ND	ND
61	Bridge Road	12/12/2013	Raw	ND	**29**	ND	**2.3**	ND	**3.1**	**0.56**	ND	**2.8**	ND
61	Bridge Road	10/3/2014	Raw	ND	**40**	ND	**3**	ND	**4.1**	**0.85**	ND	**4.3**	ND
61	Bridge Road	3/3/2015	Raw	ND	**5.9**	ND	**0.74**	ND	ND	ND	ND	**0.55**	ND
61	Bridge Road	5/5/2015	Raw	ND	**15**	ND	**1.4**	ND	ND	ND	ND	**1.6**	ND
61	Bridge Road	11/20/2015	Raw	ND	**3.5**	ND	**0.52**	ND	ND	ND	ND	**0.59**	ND
61	Bridge Road	10/18/2016	Raw	ND	**5**	ND	**0.74**	ND	ND	ND	ND	**0.58**	ND
64	Bridge Road	2/18/2010	Raw	ND	**0.1**	ND	ND	ND	ND	ND	ND	ND	ND
64	Bridge Road	5/10/2010	Raw	ND	**0.1**	ND	ND	ND	ND	ND	ND	N/A	ND
64	Bridge Road	4/15/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
64	Bridge Road	2/3/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
64	Bridge Road	8/24/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
64	Bridge Road	10/15/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
64	Bridge Road	9/23/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
64	Bridge Road	4/20/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
64	Bridge Road	7/5/2017	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
71	Bridge Road	3/10/2010	Raw	**0.1**	**17**	**0.5**	**1.1**	ND	**2.1**	**0.1**	ND	ND	**0.1**
71	Bridge Road	4/15/2011	Raw	**0.1**	**23**	**0.1**	**1.3**	ND	**1.1**	**0.5**	ND	**1.3**	**0.1**
71	Bridge Road	7/5/2012	Raw	ND	**5.2**	ND	ND	ND	**0.53**	ND	ND	ND	ND
71	Bridge Road	7/31/2012	Raw	ND	**5.2**	ND	ND	ND	**0.61**	ND	ND	ND	ND
71	Bridge Road	11/2/2012	Raw	ND	**8**	ND	**0.54**	ND	**0.75**	ND	ND	ND	ND
71	Bridge Road	6/27/2013	Raw	ND	**4.8**	ND	**0.57**	ND	ND	ND	ND	ND	ND
71	Bridge Road	3/5/2014	Raw	ND	**9.4**	ND	**0.7**	ND	**0.83**	ND	ND	**0.82**	ND
71	Bridge Road	9/19/2014	Raw	ND	**9.1**	ND	**0.69**	ND	**0.83**	ND	ND	**0.9**	ND
71	Bridge Road	4/23/2015	Raw	N/A	**12**	ND	**0.96**	ND	**0.56**	ND	N/A	**1.4**	N/A
71	Bridge Road	11/18/2015	Raw	ND	**6.3**	ND	**0.57**	ND	ND	ND	ND	**0.78**	N/A
71	Bridge Road	9/27/2016	Raw	ND	**8.3**	ND	**0.91**	ND	**1.1**	ND	ND	**0.86**	ND
71	Bridge Road	12/21/2016	Raw	ND	**7.7**	ND	**0.75**	ND	**0.87**	ND	ND	**0.73**	ND
76	Bridge Road	3/10/2010	Raw	**0.1**	**29**	**0.6**	**2**	ND	**2.6**	**0.7**	ND	**1.8**	**0.1**
76	Bridge Road	8/12/2010	Raw	**1.2**	**110**	**1.5**	**7.9**	ND	**12**	**3.2**	**0.1**	N/A	**0.6**
76	Bridge Road	12/3/2010	Raw	**1.5**	**150**	**1.7**	**9.8**	**0.1**	**17**	**3.7**	ND	**9.1**	**0.6**
76	Bridge Road	4/1/2011	Raw	**1.3**	**140**	**1.3**	**9.4**	ND	**15**	**3.5**	ND	**12**	**0.7**
76	Bridge Road	10/24/2011	Raw	**1.1**	**100**	**0.92**	**8**	ND	**10**	**2.9**	ND	**5.1**	**0.53**
76	Bridge Road	2/3/2012	Raw	**1.1**	**120**	**0.9**	**7.7**	ND	**13**	**2.7**	ND	**8.1**	**0.52**
76	Bridge Road	6/15/2012	Raw	**0.85**	**84**	**0.51**	**5.6**	ND	**9.4**	**1.9**	ND	**6.5**	ND
76	Bridge Road	9/21/2012	Raw	**0.63**	**68**	ND	**4.8**	ND	**8**	**1.6**	ND	**6.5**	ND
76	Bridge Road	1/28/2013	Raw	**0.79**	**86**	ND	**6.6**	ND	**11**	**2.2**	ND	**7.6**	ND
76	Bridge Road	4/22/2013	Raw	**0.71**	**77**	ND	**6.3**	ND	**10**	**2.1**	ND	**7.1**	ND
76	Bridge Road	9/16/2013	Raw	ND	**59**	ND	**4.9**	ND	**7.2**	**1.6**	ND	**6.7**	ND
76	Bridge Road	12/26/2013	Raw	**0.77**	**85**	ND	**6.7**	ND	**10**	**2.1**	ND	**6.6**	ND
76	Bridge Road	5/12/2014	Raw	**1**	**110**	ND	**8.6**	ND	**11**	**2.6**	ND	**13**	ND
76	Bridge Road	10/6/2014	Raw	**0.75**	**110**	ND	**9.7**	ND	**12**	**3**	ND	**15**	ND
76	Bridge Road	2/23/2015	Raw	**1**	**120**	ND	**11**	ND	**13**	**3.2**	ND	**13**	ND
76	Bridge Road	5/11/2015	Raw	**0.81**	**77**	ND	**12**	ND	**17**	**3.6**	ND	**16**	N/A
76	Bridge Road	9/14/2015	Raw	**0.63**	**66**	ND	**6.7**	ND	**9.7**	**1.8**	ND	**8.6**	ND
76	Bridge Road	12/14/2015	Raw	**0.75**	**81**	ND	**9.2**	ND	**9**	**2.7**	ND	**12**	ND
76	Bridge Road	5/9/2016	Raw	**0.81**	**80**	ND	**9.5**	ND	**10**	**2.7**	ND	**13**	ND
76	Bridge Road	11/7/2016	Raw	**0.66**	**83**	ND	**9.7**	ND	**10**	**2.8**	ND	**10**	ND
76	Bridge Road	5/22/2017	Raw	**0.57**	**80**	ND	**8.2**	ND	**11**	ND	ND	**10**	ND

Appendix B - Table B.4
Study Area Raw Well Water Analytical Results 2010-2017

				Tetrachloroethene (PCE) (µg/L)	Trichloroethene (TCE) (µg/L)	1,1,1-Trichloroethane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)	1,1-Dichloroethene (µg/L)	1,1-Dichloroethane (µg/L)	Vinyl Chloride (µg/L)	1,4-Dioxane (µg/L)	Methyl T-Butyl Ether (µg/L)
		US EPA MCL		5	5	200	70	100	7	--	2	---	---
		CT DPH DWAL		5	1	200	--	--	7	25	0.5	3	70
		CT DPH B/SAL		---	---	--	--	--	---	--	--	50	---
Street #	**Street Address**	**Sample Date**	**Sample_Pt**	**Tetrachloroethene (µg/L)**	**Trichloroethene (µg/L)**	**1,1,1-Trichloroethane (µg/L)**	**cis-1,2-Dichloroethene (µg/L)**	**trans-1,2-Dichloroethene (µg/L)**	**1,1-Dichloroethene (µg/L)**	**1,1-Dichloroethane (µg/L)**	**Vinyl Chloride (µg/L)**	**1,4-Dioxane (µg/L)**	**Methyl T-Butyl Ether (µg/L)**
78	Bridge Road	7/6/2012	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
78	Bridge Road	8/22/2013	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
78	Bridge Road	10/16/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
78	Bridge Road	5/20/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
79	Bridge Road	8/3/2010	Raw	2.2	250	1.8	17	0.5	36	7.8	0.1	N/A	1.3
80	Bridge Road	8/3/2010	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	1.7
80	Bridge Road	5/13/2011	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.4
80	Bridge Road	7/31/2012	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.6
80	Bridge Road	9/19/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.1
80	Bridge Road	5/5/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.1
80	Bridge Road	11/18/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.4
80	Bridge Road	9/15/2016	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.76
81	Bridge Road	1/6/2010	Raw	2.6	620	1.8	15	0.1	32	7.3	0.1	18	1.7
81	Bridge Road	2/4/2010	Raw	2.2	210	2	12	0.1	26	6	0.1	9.8	1.3
81	Bridge Road	3/2/2010	Raw	2.5	260	2.2	14	0.5	25	6.3	0.1	12	1.5
81	Bridge Road	5/3/2010	Raw	0.1	260	0.1	12	ND	25	5	ND	N/A	0.1
81	Bridge Road	6/4/2010	Raw	2.7	290	2.3	16	0.1	29	7.6	ND	27	1.2
81	Bridge Road	8/3/2010	Raw	1.9	170	1.3	11	0.1	23	5.8	ND	N/A	1.3
81	Bridge Road	8/17/2010	Raw	2	230	1	13	0.1	24	5.9	ND	14	0.9
81	Bridge Road	9/24/2010	Raw	0.9	93	0.1	5.4	ND	9.8	2.4	ND	4.2	1.2
81	Bridge Road	10/28/2010	Raw	1.3	220	0.9	13	0.1	23	6	ND	9.3	1.5
81	Bridge Road	11/30/2010	Raw	2.7	320	1.5	17	0.1	32	7.6	ND	18	1.3
81	Bridge Road	12/21/2010	Raw	2.4	240	1.1	13	ND	25	6.7	ND	12	1.3
81	Bridge Road	2/16/2011	Raw	2.1	220	0.9	13	0.1	22	5.8	ND	10	1.6
81	Bridge Road	3/17/2011	Raw	2.6	240	1.1	16	0.1	31	8	ND	18	1.3
81	Bridge Road	4/15/2011	Raw	2.4	210	0.8	14	0.1	27	6.8	N/A	13	1.4
81	Bridge Road	5/24/2011	Raw	2.1	190	0.8	13	0.1	23	5.8	N/A	N/A	1.2
81	Bridge Road	7/20/2011	Raw	2.2	230	1.2	15	0.1	26	7.2	ND	19	1.5
81	Bridge Road	9/19/2011	Raw	2	210	0.84	14	ND	24	6.4	ND	8.3	1.4
81	Bridge Road	10/24/2011	Raw	1.4	160	0.67	10	ND	16	3.9	ND	4.2	2.2
81	Bridge Road	11/22/2011	Raw	1.9	220	1.1	12	ND	22	4.8	ND	12	1.7
81	Bridge Road	12/20/2011	Raw	1.7	180	0.59	11	ND	19	4.6	ND	14	1.6
81	Bridge Road	1/27/2012	Raw	2.2	220	0.8	13	ND	24	6	ND	12	1.3
81	Bridge Road	3/21/2012	Raw	2.3	200	0.75	15	ND	25	6.4	ND	21	1.2
81	Bridge Road	5/14/2012	Raw	2.2	240	0.74	14	ND	26	6	ND	21	1.1
81	Bridge Road	6/15/2012	Raw	2.2	260	0.82	16	ND	27	5.9	ND	19	1
81	Bridge Road	7/19/2012	Raw	1.8	200	0.66	13	ND	24	5.5	ND	19	1.2
81	Bridge Road	10/5/2012	Raw	1.6	180	0.64	12	ND	18	4.5	ND	17	1.1
81	Bridge Road	1/24/2013	Raw	2.1	230	0.69	14	ND	24	5.7	ND	19	1.1
81	Bridge Road	4/3/2013	Raw	1.8	190	0.52	12	ND	20	4.8	ND	17	1.1
81	Bridge Road	10/8/2013	Raw	1.6	180	ND	12	ND	21	4.4	ND	18	1.4
81	Bridge Road	1/30/2014	Raw	1.5	180	ND	11	ND	18	4.6	ND	3.3	1.8
81	Bridge Road	5/27/2014	Raw	1.4	140	ND	12	ND	17	4.5	ND	16	1.7
81	Bridge Road	8/24/2014	Raw	1.5	190	ND	15	ND	23	5.7	ND	21	1.1
81	Bridge Road	11/7/2014	Raw	1.2	160	ND	12	ND	17	4	ND	14	1.5
81	Bridge Road	2/24/2015	Raw	1.3	160	ND	12	ND	18	4.4	ND	18	1.1
81	Bridge Road	4/27/2015	Raw	0.9	130	ND	11	ND	12	3.5	ND	14	1.2
81	Bridge Road	7/30/2015	Raw	1.3	95	ND	10	ND	11	4.5	ND	16	0.69
81	Bridge Road	11/13/2015	Raw	1.3	110	ND	12	ND	16	4.7	ND	15	0.74
81	Bridge Road	3/2/2016	Raw	0.73	82	ND	7	ND	11	7	ND	8.4	1.9
81	Bridge Road	6/6/2016	Raw	N/A	69	0.74	8.5	N/A	8.6	2.7	N/A	12	1.3
81	Bridge Road	9/15/2016	Raw	0.81	81	ND	9.9	ND	10	3.2	ND	11	1.5
81	Bridge Road	12/21/2016	Raw	0.86	99	ND	11	ND	17	3.4	ND	13	1.3
81	Bridge Road	3/21/2017	Raw	0.7	110	ND	8.2	ND	12	2.6	ND	9.2	1.3
82	Bridge Road	1/7/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	3.1
82	Bridge Road	3/22/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	3.2
85	Bridge Road	2/23/2010	Raw	0.1	0.1	ND	ND	ND	ND	ND	ND	N/A	140
85	Bridge Road	10/19/2010	Raw	0.1	0.1	ND	ND	ND	ND	ND	ND	N/A	210
85	Bridge Road	3/22/2011	Raw	0.1	0.1	ND	ND	ND	ND	ND	ND	N/A	190
85	Bridge Road	10/25/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	180
85	Bridge Road	1/18/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	220
85	Bridge Road	4/9/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	175
85	Bridge Road	7/17/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	179
85	Bridge Road	10/10/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	201
85	Bridge Road	1/21/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	181
85	Bridge Road	4/8/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	215
85	Bridge Road	7/8/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	231
85	Bridge Road	10/2/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	246
85	Bridge Road	1/21/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	188
85	Bridge Road	4/29/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	192

Appendix B - Table B.4
Study Area Raw Well Water Analytical Results 2010-2017

				Tetrachloroethene (PCE) (µg/L)	Trichloroethene (TCE) (µg/L)	1,1,1-Trichloroethane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)	1,1-Dichloroethene (µg/L)	1,1-Dichloroethane (µg/L)	Vinyl Chloride (µg/L)	1,4-Dioxane (µg/L)	Methyl T-Butyl Ether (µg/L)
		US EPA MCL		**5**	**5**	**200**	**70**	**100**	**7**	**--**	**2**	**---**	**---**
		CT DPH DWAL		**5**	**1**	**200**	**--**	**--**	**7**	**25**	**0.5**	**3**	**70**
		CT DPH B/SAL		**---**	**---**	**--**	**--**	**--**	**---**	**--**	**--**	**50**	**---**
Street #	**Street Address**	**Sample Date**	**Sample_Pt**	**Tetrachloroethene (µg/L)**	**Trichloroethene (µg/L)**	**1,1,1-Trichloroethane (µg/L)**	**cis-1,2-Dichloroethene (µg/L)**	**trans-1,2-Dichloroethene (µg/L)**	**1,1-Dichloroethene (µg/L)**	**1,1-Dichloroethane (µg/L)**	**Vinyl Chloride (µg/L)**	**1,4-Dioxane (µg/L)**	**Methyl T-Butyl Ether (µg/L)**
95	Bridge Road	2/23/2010	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.5**
95	Bridge Road	3/22/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.1**
95	Bridge Road	10/25/2011	Raw	ND	ND	**0.53**	ND	ND	ND	ND	ND	N/A	ND
95	Bridge Road	1/18/2012	Raw	ND	ND	ND	ND	**2.01**	ND	ND	ND	N/A	ND
95	Bridge Road	4/9/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
95	Bridge Road	7/16/2012	Raw	ND	ND	**0.55**	ND	ND	ND	ND	ND	N/A	ND
95	Bridge Road	10/9/2012	Raw	ND	ND	**0.64**	ND	ND	ND	ND	ND	N/A	ND
95	Bridge Road	1/21/2013	Raw	ND	**0.57**	**0.74**	ND	ND	ND	ND	ND	N/A	ND
95	Bridge Road	4/8/2013	Raw	ND	**0.6**	**1**	ND	ND	ND	ND	ND	N/A	ND
95	Bridge Road	7/8/2013	Outside Tap	ND	**0.92**	**1.43**	ND	ND	ND	ND	ND	N/A	ND
95	Bridge Road	10/2/2013	Raw - entry to bldg 4	ND	**0.81**	**1.17**	ND	ND	**0.56**	ND	ND	N/A	ND
95	Bridge Road	1/20/2014	Raw	ND	**1.04**	**1.39**	ND	ND	ND	ND	ND	N/A	ND
95	Bridge Road/Market	10/19/2010	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.5**
98	Bridge Road	2/23/2010	Raw	**0.1**	**0.1**	ND	ND	ND	ND	ND	ND	N/A	**330**
98	Bridge Road	10/19/2010	Raw	**0.1**	**0.1**	ND	ND	ND	ND	ND	ND	N/A	**360**
98	Bridge Road	3/22/2011	Raw	**0.1**	**0.1**	ND	ND	ND	ND	ND	ND	N/A	**330**
98	Bridge Road	8/23/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**436**
98	Bridge Road	10/25/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**299**
98	Bridge Road	1/18/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**341**
98	Bridge Road	4/9/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**222**
98	Bridge Road	7/16/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**263**
98	Bridge Road	10/9/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**211**
98	Bridge Road	1/21/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**196**
98	Bridge Road	4/8/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**201**
98	Bridge Road	7/8/2013	Before Tank	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**225**
98	Bridge Road	10/2/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**180**
98	Bridge Road	1/20/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**198**
98	Bridge Road	4/28/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**165**
98	Bridge Road	7/10/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**155**
98	Bridge Road	10/8/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**124**
98	Bridge Road	1/26/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**82**
98	Bridge Road	4/27/2015	Before Tank	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	**84.4**
98	Bridge Road	7/27/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**87.7**
98	Bridge Road	10/13/2015	Before Tank	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**84.3**
98	Bridge Road	1/19/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**77**
98	Bridge Road	4/11/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**74.5**
98	Bridge Road	7/19/2016	Before Tank	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**67.4**
98	Bridge Road	10/10/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**57.7**
98	Bridge Road	1/24/2017	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**54.8**
98	Bridge Road	4/5/2017	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**43.7**
100	Bridge Road	2/22/2010	Raw	**0.1**	**0.1**	ND	ND	ND	ND	ND	ND	N/A	**590**
100	Bridge Road	3/22/2011	Raw	**0.1**	ND	ND	ND	ND	ND	ND	ND	N/A	**530**
100	Bridge Road	10/25/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**222**
100	Bridge Road	1/18/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**406**
100	Bridge Road	4/9/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**222**
100	Bridge Road	7/16/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**159**
100	Bridge Road	10/9/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**123**
100	Bridge Road	1/21/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**117**
100	Bridge Road	4/8/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**176**
100	Bridge Road	7/8/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**146**
100	Bridge Road	10/2/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**120**
100	Bridge Road	1/20/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**133**
100	Bridge Road	4/28/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**79.6**
100	Bridge Road	7/10/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**90.8**
100	Bridge Road	10/8/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**85.4**
100	Bridge Road	1/26/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**61.3**
100	Bridge Road	4/27/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**69.4**
100	Bridge Road	7/27/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**53.8**
100	Bridge Road	10/14/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**45.8**
100	Bridge Road	1/19/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**55.6**
100	Bridge Road	4/12/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**48.6**
100	Bridge Road	7/19/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**45.6**
100	Bridge Road	10/10/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**40.8**
100	Bridge Road	1/24/2017	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**43.3**
105	Bridge Road	7/7/2010	Unknown	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**140**
105	Bridge Road	7/13/2010	Unknown	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**140**
105	Bridge Road	7/20/2010	Unknown	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**140**
105	Bridge Road	7/27/2010	Unknown	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**150**
105	Bridge Road	7/18/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**114**
105	Bridge Road	11/12/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**102**

Appendix B - Table B.4
Study Area Raw Well Water Analytical Results 2010-2017

				Tetrachloroethene (PCE) (µg/L)	Trichloroethene (TCE) (µg/L)	1,1,1-Trichloroethane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)	1,1-Dichloroethene (µg/L)	1,1-Dichloroethane (µg/L)	Vinyl Chloride (µg/L)	1,4-Dioxane (µg/L)	Methyl T-Butyl Ether (µg/L)
		US EPA MCL		5	5	200	70	100	7	--	2	---	---
		CT DPH DWAL		5	1	200	--	--	7	25	0.5	3	70
		CT DPH B/SAL		---	---	--	--	--	---	--	--	50	---
Street #	**Street Address**	**Sample Date**	**Sample_Pt**	**Tetrachloroethene (µg/L)**	**Trichloroethene (µg/L)**	**1,1,1-Trichloroethane (µg/L)**	**cis-1,2-Dichloroethene (µg/L)**	**trans-1,2-Dichloroethene (µg/L)**	**1,1-Dichloroethene (µg/L)**	**1,1-Dichloroethane (µg/L)**	**Vinyl Chloride (µg/L)**	**1,4-Dioxane (µg/L)**	**Methyl T-Butyl Ether (µg/L)**
106	Bridge Road	2/23/2010	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.1**
106	Bridge Road	12/14/2010	Unknown	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
106	Bridge Road	3/22/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
106	Bridge Road	10/25/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
106	Bridge Road	1/18/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
106	Bridge Road	4/9/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
106	Bridge Road	7/16/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
106	Bridge Road	10/9/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
106	Bridge Road	10/2/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
106	Bridge Road	10/8/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.8**
106	Bridge Road	10/14/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**5.17**
106	Bridge Road	10/10/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**7.49**
112	Bridge Road	2/23/2010	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**1.1**
112	Bridge Road	12/14/2010	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.6**
112	Bridge Road	3/22/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.9**
116	Bridge Road	2/23/2010	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.1**
116	Bridge Road	3/22/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.1**
116	Bridge Road	7/18/2011	Bathroom Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
116	Bridge Road	10/25/2011	Bathroom Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
116	Bridge Road	1/18/2012	Bathroom Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
116	Bridge Road	4/9/2012	Bathroom Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
116	Bridge Road	4/8/2013	Bathroom Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.53**
116	Bridge Road	7/8/2013	Bathroom Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
116	Bridge Road	10/2/2013	Bathroom Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
116	Bridge Road	1/21/2014	Bathroom Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
116	Bridge Road	4/28/2014	Bathroom Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
116	Bridge Road	7/10/2014	Bathroom Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
116	Bridge Road	10/8/2014	Bathroom Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
116	Bridge Road	10/16/2015	Bathroom Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
116	Bridge Road	10/11/2016	Bathroom Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
Camp Bethel Road													
115	Camp Bethel Road	5/18/2011	Outside Tap	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	**1.6**
115	Camp Bethel Road	8/20/2013	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
115	Camp Bethel Road	10/8/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**3.2**
117	Camp Bethel Road	5/16/2011	Outside Tap	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	**1.6**
117	Camp Bethel Road	10/8/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**3.1**
121	Camp Bethel Road	5/20/2011	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**1.3**
121	Camp Bethel Road	10/8/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**2.4**
121	Camp Bethel Road	6/1/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**2.4**
125	Camp Bethel Road	5/16/2011	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
129	Camp Bethel Road	5/18/2011	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
129	Camp Bethel Road	5/18/2011	Raw	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	N/A
129	Camp Bethel Road	10/8/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
129	Camp Bethel Road	5/11/2015	Outside Tap	ND	**1.5**	ND	ND	ND	ND	ND	ND	ND	ND
129	Camp Bethel Road	6/16/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
137	Camp Bethel Road	3/10/2010	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
137	Camp Bethel Road	6/8/2011	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
137	Camp Bethel Road	9/20/2012	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
143	Camp Bethel Road	5/16/2011	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.1**
149	Camp Bethel Road	5/16/2011	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.1**
149	Camp Bethel Road	8/30/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
149	Camp Bethel Road	11/14/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
149	Camp Bethel Road	5/11/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.61**
156	Camp Bethel Road	9/19/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
156	Camp Bethel Road	5/13/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
160	Camp Bethel Road	1/6/2010	Raw	ND	**3.6**	ND	ND	ND	**0.1**	ND	ND	N/A	**0.1**
160	Camp Bethel Road	5/3/2010	Raw	**0.1**	**4**	ND	ND	ND	**0.1**	ND	ND	N/A	**0.1**
160	Camp Bethel Road	5/10/2011	Raw	ND	**3.5**	ND	ND	ND	**0.1**	ND	ND	N/A	ND
160	Camp Bethel Road	6/15/2012	Raw	ND	**3.5**	ND	ND	ND	ND	ND	ND	ND	ND
160	Camp Bethel Road	11/2/2012	Raw	ND	**2.9**	ND	ND	ND	ND	ND	ND	ND	ND
160	Camp Bethel Road	10/23/2013	Raw	ND	**3.7**	ND	ND	ND	ND	ND	ND	ND	ND
160	Camp Bethel Road	9/17/2014	Raw	ND	**3.4**	ND	ND	ND	ND	ND	ND	**0.62**	ND
160	Camp Bethel Road	4/30/2015	Raw	ND	**3**	ND	ND	ND	ND	ND	ND	**0.56**	ND
160	Camp Bethel Road	12/10/2015	Raw	ND	**2.2**	ND	ND	ND	ND	ND	ND	ND	ND
160	Camp Bethel Road	12/21/2016	Raw	ND	**1.2**	ND	ND	ND	ND	ND	ND	ND	ND
168	Camp Bethel Road	8/4/2010	Unknown	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
168	Camp Bethel Road	5/13/2011	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
168	Camp Bethel Road	8/30/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
168	Camp Bethel Road	10/14/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
180	Camp Bethel Road	2/4/2010	Raw	ND	**1.5**	**0.1**	ND	ND	ND	ND	ND	ND	**0.1**
180	Camp Bethel Road	5/10/2010	Raw	ND	**1.6**	**0.1**	ND	ND	ND	ND	ND	N/A	**0.1**
180	Camp Bethel Road	5/9/2011	Raw	ND	**1.2**	**0.1**	ND	ND	ND	ND	ND	ND	**0.1**
180	Camp Bethel Road	7/6/2012	Raw	ND	**1.2**	ND	ND	ND	ND	ND	ND	ND	ND
180	Camp Bethel Road	11/30/2012	Raw	ND	**1.4**	ND	ND	ND	ND	ND	ND	ND	ND
180	Camp Bethel Road	2/26/2015	Raw	ND	**2.1**	ND	ND	ND	ND	ND	ND	ND	ND
180	Camp Bethel Road	11/24/2015	Raw	ND	**1**	ND	ND	ND	ND	ND	ND	ND	ND
180	Camp Bethel Road	11/7/2016	Raw	ND	**1.2**	ND	ND	ND	ND	ND	ND	ND	ND

Appendix B - Table B.4
Study Area Raw Well Water Analytical Results 2010-2017

				Tetrachloroethene (PCE) (µg/L)	Trichloroethene (TCE) (µg/L)	1,1,1-Trichloroethane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)	1,1-Dichloroethene (µg/L)	1,1-Dichloroethane (µg/L)	Vinyl Chloride (µg/L)	1,4-Dioxane (µg/L)	Methyl T-Butyl Ether (µg/L)
		US EPA MCL		5	5	200	70	100	7	--	2	---	---
		CT DPH DWAL		5	1	200	--	--	7	25	0.5	3	70
		CT DPH B/SAL		---	---	--	--	--	---	--	--	50	---
Street #	**Street Address**	**Sample Date**	**Sample_Pt**	**Tetrachloroethene (µg/L)**	**Trichloroethene (µg/L)**	**1,1,1-Trichloroethane (µg/L)**	**cis-1,2-Dichloroethene (µg/L)**	**trans-1,2-Dichloroethene (µg/L)**	**1,1-Dichloroethene (µg/L)**	**1,1-Dichloroethane (µg/L)**	**Vinyl Chloride (µg/L)**	**1,4-Dioxane (µg/L)**	**Methyl T-Butyl Ether (µg/L)**
124	Camp Bethel Road - East Well	9/29/2010	East Well	ND	ND	ND	ND	ND	ND	ND	ND		ND
124	Camp Bethel Road - East Well	5/20/2011	East Well - outside tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
124	Camp Bethel Road - East Well	8/30/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.69**
124	Camp Bethel Road - East Well	10/31/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
124	Camp Bethel Road - East Well	5/27/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
124	Camp Bethel Road - West Well	9/29/2010	West Well	ND	ND	ND	ND	ND	ND	ND	ND		**1.9**
124	Camp Bethel Road - West Well	5/20/2011	West Well - outside tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**1.2**
124	Camp Bethel Road - West Well	8/30/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.58**
124	Camp Bethel Road - West Well	10/31/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
124	Camp Bethel Road - West Well	5/27/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Harpers Landing													
4	Harpers Landing	8/20/2013	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Little Meadow Road													
14	Little Meadow Road	11/17/2011	Raw	**3.8**	**250**	**30**	**3.4**	ND	**24**	**3**	ND	**15**	**0.58**
14	Little Meadow Road	7/26/2012	Raw	**4.1**	**160**	**42**	**3.6**	ND	**39**	**3.6**	ND	**10**	ND
14	Little Meadow Road	4/19/2013	Raw	**5.6**	**210**	**35**	**3.7**	ND	**20**	**4**	ND	**9.3**	**0.56**
14	Little Meadow Road	11/19/2013	Raw	**5.5**	**210**	**34**	**3.5**	ND	**37**	**3.8**	ND	**10**	**0.51**
14	Little Meadow Road	9/9/2014	Raw	**5.3**	**210**	**31**	**3.3**	ND	**37**	**3.7**	ND	**11**	ND
14	Little Meadow Road	5/11/2015	Outside Tap	**4.8**	**84**	**28**	**2.9**	ND	**28**	**3.2**	ND	**9.6**	ND
14	Little Meadow Road	9/28/2015	Raw	**4.8**	**130**	**30**	**2.6**	ND	**28**	**3.1**	ND	**8.5**	ND
14	Little Meadow Road	10/18/2016	Outside Tap	**4.4**	**140**	**19**	**2.4**	ND	**23**	**2.7**	ND	**6.2**	ND
69	Little Meadow Road	8/16/2010	Raw	**0.1**	**27**	**6.1**	**0.1**	ND	**4.6**	**0.7**	ND	ND	ND
69	Little Meadow Road	5/18/2011	Raw	**0.1**	**23**	**3.4**	**0.8**	ND	**4**	**1.4**	ND	**1.3**	ND
69	Little Meadow Road	9/20/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
69	Little Meadow Road	9/9/2014	Raw	ND	**27**	**4.8**	ND	ND	**5.4**	**1.5**	ND	**1.5**	ND
69	Little Meadow Road	7/18/2017	Raw	N/A	**16**	**2.6**	ND	ND	**2.9**	**0.8**	ND	**0.75**	N/A
71	Little Meadow Road	3/10/2010	Raw	**1**	**104**	**22**	**2.6**	ND	**17**	**0.9**	ND	**3.6**	ND
71	Little Meadow Road	5/4/2010	Raw	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**4**	N/A
71	Little Meadow Road	6/4/2010	Raw	**0.9**	**91**	**18**	**1.4**	ND	**13**	**0.6**	ND	**4**	ND
71	Little Meadow Road	8/9/2010	Raw	**0.9**	**76**	**15**	**2.2**	ND	**13**	**0.8**	ND	N/A	ND
71	Little Meadow Road	11/4/2010	Raw	**1.2**	**110**	**27**	**3.3**	ND	**22**	**1.1**	ND	N/A	ND
71	Little Meadow Road	4/15/2011	Raw	**1.3**	**120**	**23**	**1**	ND	**11**	**0.6**	ND	**4**	ND
71	Little Meadow Road	5/31/2011	Raw	**1.2**	**99**	**17**	**0.9**	ND	**14**	**0.5**	ND	**3.9**	ND
71	Little Meadow Road	6/25/2012	Raw	**1**	**82**	**18**	**0.75**	ND	**12**	ND	ND	**4.7**	ND
71	Little Meadow Road	11/30/2012	Raw	**1.1**	**83**	**15**	**1.8**	ND	**13**	**0.92**	ND	**4.9**	ND
71	Little Meadow Road	6/27/2013	Raw	**0.84**	**66**	**12**	**0.91**	ND	**12**	**0.54**	ND	**3.3**	ND
71	Little Meadow Road	1/30/2014	Raw	**0.8**	**60**	**11**	**1.6**	ND	**11**	**0.79**	ND	**16**	ND
71	Little Meadow Road	4/24/2014	Raw	**0.92**	**72**	**14**	**1.4**	ND	**11**	**0.8**	ND	**4.9**	ND
71	Little Meadow Road	9/11/2014	Raw	**0.9**	**74**	**13**	**0.69**	ND	**12**	**0.5**	ND	**4**	ND
71	Little Meadow Road	12/30/2014	Raw	**0.79**	**56**	**12**	**1.6**	ND	**12**	**0.75**	ND	**4.2**	ND
71	Little Meadow Road	4/29/2015	Raw	**0.87**	**62**	**9.1**	**1.3**	ND	**11**	**0.8**	ND	**4.5**	N/A
71	Little Meadow Road	8/26/2015	Raw	**1.1**	**37**	**7.1**	**1.6**	ND	**8**	**0.91**	ND	**3.7**	ND
71	Little Meadow Road	11/13/2015	Raw	**0.81**	**40**	**8.9**	**1.9**	ND	**11**	**0.9**	ND	**3**	ND
71	Little Meadow Road	5/9/2016	Raw	**0.95**	**40**	**11**	**0.93**	ND	**12**	**0.66**	ND	**3.2**	ND
75	Little Meadow Road	5/11/2011	Outside Tap	**0.1**	**42**	**7.4**	**0.1**	ND	**6.9**	**1.1**	ND	**2.7**	ND
75	Little Meadow Road	7/28/2011	Raw	**0.1**	**45**	**7.4**	**0.1**	ND	**6.6**	**1**	ND	**1.9**	ND
75	Little Meadow Road	8/11/2011	Raw	ND	**48**	**5.1**	ND	ND	**5.7**	**1.4**	ND	**1.4**	ND
75	Little Meadow Road	7/6/2012	Raw	ND	**41**	**8**	ND	ND	**6.3**	**0.55**	ND	**1.8**	ND
75	Little Meadow Road	10/16/2013	Raw	ND	**24**	**3.7**	ND	ND	**3.8**	**0.71**	ND	**1.4**	ND
75	Little Meadow Road	6/4/2014	Raw	ND	**15**	**2.5**	ND	ND	**2.5**	ND	ND	**0.98**	ND
75	Little Meadow Road	9/9/2014	Raw	ND	**22**	**1.8**	ND	ND	**4.8**	**1.3**	ND	**2**	ND
75	Little Meadow Road	5/20/2015	Raw	ND	**16**	**1.7**	ND	ND	**2.8**	**0.85**	ND	**1.2**	ND
75	Little Meadow Road	9/30/2015	Raw	ND	**21**	**1.4**	ND	ND	**3.4**	**0.9**	ND	**1.6**	ND
75	Little Meadow Road	8/4/2016	Raw	ND	**13**	ND	ND	ND	**3**	**1**	ND	**1.3**	ND
75	Little Meadow Road	7/11/2017	Raw	ND	**14**	**1**	ND	ND	**2.5**	**0.99**	ND	**0.85**	ND
76	Little Meadow Road	8/11/2010	Raw	**0.1**	**41**	**6.1**	**1.5**	ND	**7.2**	**0.8**	ND	N/A	ND
76	Little Meadow Road	5/11/2011	Raw	**0.1**	**30**	**5.1**	**0.5**	ND	**4**	**1**	ND	**1.8**	ND
76	Little Meadow Road	7/6/2012	Raw	ND	**38**	**7.9**	ND	ND	**5.7**	ND	ND	**2.7**	ND
76	Little Meadow Road	10/16/2013	Raw	ND	**32**	**6.6**	**0.62**	ND	**6.1**	ND	ND	**1.8**	ND
76	Little Meadow Road	6/4/2014	Raw	ND	**14**	**1.3**	**1**	ND	**2.6**	**1.1**	ND	**1.1**	ND
76	Little Meadow Road	9/9/2014	Raw	ND	**23**	**6.2**	**0.72**	ND	**6.4**	**0.5**	ND	**2.5**	ND
76	Little Meadow Road	6/1/2015	Raw	ND	**9.8**	**1.3**	**0.91**	ND	**2.6**	**0.98**	ND	**1.4**	N/A
76	Little Meadow Road	9/30/2015	Raw	ND	**34**	**4.9**	ND	ND	**6.3**	ND	ND	**2.3**	ND
76	Little Meadow Road	8/8/2016	Raw	ND	**17**	**0.61**	**0.55**	ND	**3**	**1.7**	ND	**1.4**	ND
76	Little Meadow Road	7/11/2017	Raw	ND	**17**	ND	**0.69**	ND	**3.2**	**1.5**	ND	**1.2**	ND

Appendix B - Table B.4
Study Area Raw Well Water Analytical Results 2010-2017

				Tetrachloroethene (PCE) (µg/L)	Trichloroethene (TCE) (µg/L)	1,1,1-Trichloroethane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)	1,1-Dichloroethene (µg/L)	1,1-Dichloroethane (µg/L)	Vinyl Chloride (µg/L)	1,4-Dioxane (µg/L)	Methyl T-Butyl Ether (µg/L)
		US EPA MCL		5	5	200	70	100	7	--	2	---	---
		CT DPH DWAL		5	1	200	--	--	7	25	0.5	3	70
		CT DPH B/SAL		---	---	--	--	--	---	--	--	50	---
Street #	**Street Address**	**Sample Date**	**Sample_Pt**	**Tetrachloroethene (µg/L)**	**Trichloroethene (µg/L)**	**1,1,1-Trichloroethane (µg/L)**	**cis-1,2-Dichloroethene (µg/L)**	**trans-1,2-Dichloroethene (µg/L)**	**1,1-Dichloroethene (µg/L)**	**1,1-Dichloroethane (µg/L)**	**Vinyl Chloride (µg/L)**	**1,4-Dioxane (µg/L)**	**Methyl T-Butyl Ether (µg/L)**
77	Little Meadow Road	1/6/2010	Raw	ND	290	0.1	120	13	64	23	0.9	N/A	ND
77	Little Meadow Road	2/4/2010	Raw	ND	350	0.1	120	14	68	24	1	26	ND
77	Little Meadow Road	3/2/2010	Raw	ND	330	0.1	97	12	54	19	0.7	33	ND
77	Little Meadow Road	5/3/2010	Raw	ND	250	0.1	ND	ND	26	ND	ND	N/A	ND
77	Little Meadow Road	6/4/2010	raw	ND	260	0.1	100	15	67	23	0.9	55	ND
77	Little Meadow Road	11/4/2010	Raw	ND	220	0.1	92	15	31	19	0.7	32	ND
77	Little Meadow Road	3/29/2011	Raw	ND	260	ND	82	17	53	20	0.6	48	ND
77	Little Meadow Road	4/28/2011		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	N/A
77	Little Meadow Road	7/28/2011	Raw	ND	310	0.1	82	20	56	22	0.8	33	0.1
77	Little Meadow Road	2/3/2012	Raw	ND	340	ND	86	27	72	24	0.8	62	ND
77	Little Meadow Road	5/14/2012	Raw	ND	250	ND	88	19	48	18	0.66	48	ND
77	Little Meadow Road	8/28/2012	Raw	ND	280	ND	85	21	52	19	0.69	N/A	ND
77	Little Meadow Road	12/6/2012	Raw	ND	310	ND	91	31	69	23	0.62	55	ND
77	Little Meadow Road	3/14/2013	Raw	ND	280	ND	79	31	66	21	0.71	49	ND
77	Little Meadow Road	10/31/2013	Raw	ND	240	ND	81	23	44	19	0.61	61	ND
77	Little Meadow Road	3/26/2014	Raw	ND	220	ND	73	30	61	20	0.58	48	ND
77	Little Meadow Road	10/23/2014	Raw	ND	190	ND	73	25	39	16	0.66	42	ND
77	Little Meadow Road	1/29/2015	Raw	ND	240	ND	86	38	69	22	0.77	59	ND
77	Little Meadow Road	4/29/2015	Raw	ND	240	ND	84	35	67	20	0.75	45	N/A
77	Little Meadow Road	9/4/2015	Raw	ND	120	ND	50	17	28	12	0.53	41	ND
77	Little Meadow Road	1/27/2016	Raw	ND	120	ND	60	22	35	13	0.72	45	ND
77	Little Meadow Road	9/15/2016	Raw	N/A	100	ND	64	18	27	11	0.74	36	ND
78	Little Meadow Road	3/19/2010	Raw	0.1	42	9.1	0.8	ND	6.5	0.6	ND	1.2	ND
78	Little Meadow Road	9/27/2010	Raw	0.1	41	8.1	0.7	ND	5.9	0.5	ND	N/A	ND
78	Little Meadow Road	5/16/2011	Raw	0.5	42	9.8	1.3	ND	6.7	0.1	ND	2.2	ND
78	Little Meadow Road	7/18/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
78	Little Meadow Road	10/5/2012	Raw	ND	27	6.4	1.1	ND	4.8	ND	ND	1.8	ND
78	Little Meadow Road	12/6/2012	Raw	ND	36	7.9	1.7	ND	6	0.6	ND	1.8	ND
78	Little Meadow Road	3/15/2013	Raw	ND	36	6.8	1.3	ND	5.9	0.58	ND	2	ND
78	Little Meadow Road	10/23/2013	Raw	ND	31	7.2	0.71	ND	5.7	ND	ND	2.2	ND
78	Little Meadow Road	4/8/2014	Raw	ND	31	6.5	ND	ND	5.6	ND	ND	1.9	ND
78	Little Meadow Road	10/15/2014	Raw	ND	28	6.8	ND	ND	4.7	ND	ND	1.9	ND
78	Little Meadow Road	1/21/2015	Raw	ND	25	5.2	ND	ND	5.2	ND	ND	2.1	ND
78	Little Meadow Road	4/29/2015	Raw	ND	27	6.2	ND	ND	4.2	ND	ND	2	ND
78	Little Meadow Road	8/28/2015	Raw	ND	16	4.8	ND	ND	3.4	ND	ND	1.6	ND
78	Little Meadow Road	1/27/2016	Raw	ND	17	5.1	ND	ND	2.5	ND	ND	1.8	ND
78	Little Meadow Road	8/4/2016	Raw	ND	22	5.8	ND	ND	4.6	ND	ND	1.6	ND
84	Little Meadow Road	3/2/2010	Raw	ND	0.1	ND	ND	ND	ND	ND	ND	ND	7.7
84	Little Meadow Road	8/4/2010	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	8.7
84	Little Meadow Road	8/11/2011	Raw	ND	3.7	0.75	1.4	ND	0.71	ND	ND	ND	ND
84	Little Meadow Road	8/2/2012	Raw	ND	1.5	0.61	3.2	ND	0.74	ND	ND	ND	ND
84	Little Meadow Road	8/31/2012	Raw	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	N/A
84	Little Meadow Road	3/15/2013	Raw	ND	1.5	ND	3.8	ND	0.82	ND	ND	ND	ND
84	Little Meadow Road	10/23/2013	Raw	ND	1.9	ND	4.1	ND	0.95	ND	ND	0.6	ND
84	Little Meadow Road	4/8/2014	Raw	ND	1.3	ND	2.6	ND	0.62	ND	ND	ND	ND
84	Little Meadow Road	10/15/2014	Raw	ND	2.1	ND	3.3	ND	0.76	ND	ND	0.62	ND
84	Little Meadow Road	1/21/2015	Raw	ND	1.1	ND	2.5	ND	0.54	ND	ND	0.58	ND
84	Little Meadow Road	4/29/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	0.6	ND
84	Little Meadow Road	9/4/2015	Raw	ND	0.88	ND	ND	ND	ND	ND	ND	ND	1.4
84	Little Meadow Road	8/8/2016	Raw	ND	1	ND	1.9	ND	0.51	ND	ND	0.62	ND
98	Little Meadow Road	7/31/2012	Outside Tap	ND	2.2	ND	ND	ND	ND	ND	ND	ND	ND
98	Little Meadow Road	6/5/2013	Outside Tap	ND	2.8	ND	ND	ND	ND	ND	ND	ND	ND
98	Little Meadow Road	10/16/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
98	Little Meadow Road	6/23/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
98	Little Meadow Road	9/10/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
98	Little Meadow Road	5/12/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
98	Little Meadow Road	9/22/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
98	Little Meadow Road	5/23/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
98	Little Meadow Road	9/13/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
98	Little Meadow Road	7/11/2017	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
102	Little Meadow Road	7/20/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
102	Little Meadow Road	7/5/2012	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
102	Little Meadow Road	8/22/2013	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
102	Little Meadow Road	5/26/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
104	Little Meadow Road	5/13/2011	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
104	Little Meadow Road	8/31/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
104	Little Meadow Road	10/14/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
104	Little Meadow Road	5/26/2015	Outside Tap	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	N/A
106	Little Meadow Road	5/10/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
106	Little Meadow Road	7/19/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
106	Little Meadow Road	8/6/2013	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
106	Little Meadow Road	10/8/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
106	Little Meadow Road	5/5/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Appendix B - Table B.4
Study Area Raw Well Water Analytical Results 2010-2017

				Tetrachloroethene (PCE) (µg/L)	Trichloroethene (TCE) (µg/L)	1,1,1-Trichloroethane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)	1,1-Dichloroethene (µg/L)	1,1-Dichloroethane (µg/L)	Vinyl Chloride (µg/L)	1,4-Dioxane (µg/L)	Methyl T-Butyl Ether (µg/L)
		US EPA MCL		5	5	200	70	100	7	--	2	---	---
		CT DPH DWAL		5	1	200	--	--	7	25	0.5	3	70
		CT DPH B/SAL		---	---	--	--	--	---	--	--	50	---
Street #	**Street Address**	**Sample Date**	**Sample_Pt**	**Tetrachloroethene (µg/L)**	**Trichloroethene (µg/L)**	**1,1,1-Trichloroethane (µg/L)**	**cis-1,2-Dichloroethene (µg/L)**	**trans-1,2-Dichloroethene (µg/L)**	**1,1-Dichloroethene (µg/L)**	**1,1-Dichloroethane (µg/L)**	**Vinyl Chloride (µg/L)**	**1,4-Dioxane (µg/L)**	**Methyl T-Butyl Ether (µg/L)**
109	Little Meadow Road	5/18/2011	Outside Tap	ND	**0.1**	ND	ND	ND	ND	ND	ND	ND	ND
109	Little Meadow Road	7/31/2012	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
109	Little Meadow Road	10/17/2013	Outside Tap	ND	**3.1**	ND	ND	ND	ND	ND	ND	ND	ND
109	Little Meadow Road	12/12/2013	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
109	Little Meadow Road	9/17/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
109	Little Meadow Road	5/8/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
109	Little Meadow Road	9/22/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
109	Little Meadow Road	9/26/2016	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
110	Little Meadow Road	8/4/2010	Raw	ND	**8.7**	ND	ND	ND	ND	ND	ND	N/A	ND
110	Little Meadow Road	6/8/2011	Outside Tap	ND	**110**	ND	ND	ND	ND	ND	ND	ND	ND
110	Little Meadow Road	7/20/2011	Outside Tap	ND	**3.5**	ND	ND	ND	ND	ND	ND	N/A	ND
110	Little Meadow Road	7/19/2012	Raw	ND	**22**	ND	ND	ND	ND	ND	ND	ND	ND
110	Little Meadow Road	10/25/2013	Raw	ND	**5.5**	ND	ND	ND	ND	ND	ND	ND	ND
110	Little Meadow Road	9/9/2014	Raw	ND	**10**	ND	ND	ND	ND	ND	ND	ND	ND
110	Little Meadow Road	5/26/2015	Raw	ND	**7.2**	ND	ND	ND	ND	ND	ND	ND	N/A
110	Little Meadow Road	9/22/2015	Raw	ND	**1.6**	ND	ND	ND	ND	ND	ND	ND	ND
110	Little Meadow Road	5/23/2016	Raw	ND	**2.4**	ND	ND	ND	ND	ND	ND	ND	ND
110	Little Meadow Road	9/13/2016	Raw	ND	**4.8**	ND	ND	ND	ND	ND	ND	ND	ND
116	Little Meadow Road	1/28/2010	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.1**
116	Little Meadow Road	8/9/2010	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.8**
116	Little Meadow Road	5/10/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.7**
116	Little Meadow Road	7/18/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
116	Little Meadow Road	7/23/2013	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
116	Little Meadow Road	9/22/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
116	Little Meadow Road	5/13/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
116	Little Meadow Road	6/20/2016	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
120	Little Meadow Road	8/31/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
128	Little Meadow Road	5/9/2011	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
128	Little Meadow Road	7/31/2012	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
130	Little Meadow Road	5/13/2011	Outside Tap	ND	**0.1**	ND	**1.5**	**2.2**	**0.1**	**0.1**	ND	ND	ND
130	Little Meadow Road	5/13/2011	Raw	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	N/A
130	Little Meadow Road	8/11/2011	Raw	ND	**0.95**	ND	**12**	**11**	**1.9**	**0.98**	ND	**2.3**	ND
130	Little Meadow Road	7/18/2012	Raw	ND	**6.2**	ND	**21**	**34**	**6.7**	**2.5**	ND	**11**	ND
130	Little Meadow Road	10/31/2013	Raw	ND	ND	ND	**20**	**24**	**5.4**	**2.2**	**0.67**	**11**	ND
130	Little Meadow Road	6/11/2014	Raw	ND	ND	ND	**2.2**	**5.4**	**1.1**	ND	**1.7**	**0.54**	ND
130	Little Meadow Road	9/11/2014	Raw	ND	**1.2**	ND	**10**	**19**	**3.5**	**1.1**	**0.68**	**3.3**	ND
130	Little Meadow Road	5/6/2015	Raw	ND	ND	ND	**7.3**	**12**	**1.6**	**0.82**	**3.4**	**2.3**	ND
130	Little Meadow Road	8/28/2015	Raw	ND	**1.1**	ND	**33**	**55**	**9.5**	**3.4**	**2**	**13**	ND
130	Little Meadow Road	5/18/2016	Raw	ND	**0.54**	ND	**8.2**	**8.3**	**3.2**	**4.3**	**68**	**17**	ND
130	Little Meadow Road	9/13/2016	Raw	ND	**0.4**	ND	**19**	**35**	**8.3**	**4.2**	**27**	**13**	ND
130	Little Meadow Road	7/11/2017	Raw	ND	ND	ND	**7.2**	**14**	**2.4**	**1.4**	**5.1**	**4.2**	ND
134	Little Meadow Road	5/13/2011	Raw	ND	**5.5**	ND	**26**	**42**	**7**	**3.3**	**0.1**	**10**	ND
134	Little Meadow Road	7/6/2012	Raw	ND	**10**	ND	**31**	**49**	**11**	**4.7**	ND	**20**	ND
134	Little Meadow Road	10/18/2013	Raw	ND	**1.3**	ND	**61**	**91**	**17**	**6.5**	**1.8**	**20**	ND
134	Little Meadow Road	6/11/2014	Raw	ND	**4.9**	ND	**40**	**77**	**15**	**4.6**	**3**	**13**	ND
134	Little Meadow Road	9/11/2014	Raw	ND	**3.8**	ND	**70**	**110**	**20**	**7.8**	**3.6**	**28**	ND
134	Little Meadow Road	5/6/2015	Raw	ND	**4.1**	ND	**40**	**61**	**10**	**4.7**	**13**	**15**	ND
134	Little Meadow Road	8/28/2015	Raw	ND	**3.3**	ND	**33**	**69**	**6.6**	**5.2**	**29**	**17**	ND
134	Little Meadow Road	5/18/2016	Raw	ND	**3.4**	ND	**33**	**32**	**2.4**	**5.2**	**35**	**21**	ND
134	Little Meadow Road	9/13/2016	Raw	ND	**8.4**	ND	**50**	**69**	**14**	**7.4**	**21**	**20**	ND
134	Little Meadow Road	7/12/2017	Raw	ND	**3.6**	ND	**49**	**35**	**11**	**4.5**	**17**	**14**	ND
Saybrook Road													
1557	Saybrook Road	5/18/2011	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.6**
1557	Saybrook Road	10/25/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1557	Saybrook Road	10/6/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1557	Saybrook Road	5/13/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
1572	Saybrook Road	10/25/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1573	Saybrook Road	5/20/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1583	Saybrook Road	8/23/2011	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1583	Saybrook Road	10/26/2011	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1583	Saybrook Road	4/10/2012	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1583	Saybrook Road	7/17/2012	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1583	Saybrook Road	10/10/2012	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1583	Saybrook Road	7/10/2013	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1583	Saybrook Road	10/3/2013	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1583	Saybrook Road	4/29/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1583	Saybrook Road	7/30/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1583	Saybrook Road	10/9/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1583	Saybrook Road	10/13/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND

Appendix B - Table B.4
Study Area Raw Well Water Analytical Results 2010-2017

				Tetrachloroethene (PCE) (µg/L)	Trichloroethene (TCE) (µg/L)	1,1,1-Trichloroethane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)	1,1-Dichloroethene (µg/L)	1,1-Dichloroethane (µg/L)	Vinyl Chloride (µg/L)	1,4-Dioxane (µg/L)	Methyl T-Butyl Ether (µg/L)
		US EPA MCL		5	5	200	70	100	7	--	2	---	---
		CT DPH DWAL		5	1	200	--	--	7	25	0.5	3	70
		CT DPH B/SAL		---	---	--	--	--	---	--	--	50	---
Street #	**Street Address**	**Sample Date**	**Sample_Pt**	**Tetrachloroethene (µg/L)**	**Trichloroethene (µg/L)**	**1,1,1-Trichloroethane (µg/L)**	**cis-1,2-Dichloroethene (µg/L)**	**trans-1,2-Dichloroethene (µg/L)**	**1,1-Dichloroethene (µg/L)**	**1,1-Dichloroethane (µg/L)**	**Vinyl Chloride (µg/L)**	**1,4-Dioxane (µg/L)**	**Methyl T-Butyl Ether (µg/L)**
1586	Saybrook Road	10/25/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1586	Saybrook Road	1/19/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1586	Saybrook Road	4/10/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1586	Saybrook Road	7/16/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1586	Saybrook Road	10/9/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1586	Saybrook Road	1/22/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1586	Saybrook Road	4/9/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1586	Saybrook Road	7/9/2013	Before Tank	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1586	Saybrook Road	10/3/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1586	Saybrook Road	1/21/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1586	Saybrook Road	4/29/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1586	Saybrook Road	7/11/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1586	Saybrook Road	10/9/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1586	Saybrook Road	1/26/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1586	Saybrook Road	7/27/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1586	Saybrook Road	1/19/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1586	Saybrook Road	10/10/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1586	Saybrook Road	1/24/2017	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1588	Saybrook Road	10/26/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**1.08**
1588	Saybrook Road	1/19/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.75**
1588	Saybrook Road	4/10/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.67**
1588	Saybrook Road	7/17/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.63**
1588	Saybrook Road	10/10/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1588	Saybrook Road	1/22/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1588	Saybrook Road	4/9/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1588	Saybrook Road	1/19/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1588	Saybrook Road	4/12/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1592	Saybrook Road	10/26/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1592	Saybrook Road	1/19/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1592	Saybrook Road	4/10/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1592	Saybrook Road	4/9/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1592	Saybrook Road	4/29/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1592	Saybrook Road	4/12/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1592	Saybrook Road	4/5/2017	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1598	Saybrook Road	2/23/2010	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.5**
1598	Saybrook Road	3/22/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.1**
1609	Saybrook Road	3/3/2010	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.1**
1609	Saybrook Road	3/3/2010	Unknown	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.1**
1609	Saybrook Road	3/22/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.1**
1617	Saybrook Road	3/22/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1617	Saybrook Road	10/25/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1618	Saybrook Road	2/23/2010	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**12**
1618	Saybrook Road	12/21/2010	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	**11**
1618	Saybrook Road	3/22/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**8.2**
1618	Saybrook Road	7/18/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**5.31**
1618	Saybrook Road	10/26/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**3.84**
1618	Saybrook Road	1/19/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**3.61**
1618	Saybrook Road	4/10/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**3.58**
1618	Saybrook Road	7/17/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**4.51**
1618	Saybrook Road	10/10/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**4.96**
1618	Saybrook Road	1/22/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**2.38**
1618	Saybrook Road	4/9/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**2.41**
1618	Saybrook Road	7/9/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**2.1**
1618	Saybrook Road	10/3/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**1.85**
1618	Saybrook Road	1/21/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**1.29**
1618	Saybrook Road	4/29/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**1.52**
1618	Saybrook Road	7/11/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**1.39**
1618	Saybrook Road	10/9/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1618	Saybrook Road	1/26/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.53**
1618	Saybrook Road	4/27/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.55**
1618	Saybrook Road	7/27/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.65**
1618	Saybrook Road	10/28/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.67**
1618	Saybrook Road	1/19/2016	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1640	Saybrook Road	12/26/2013	Raw	ND	**1.8**	ND	ND	ND	ND	ND	ND	N/A	ND
1640	Saybrook Road	12/30/2014	Raw	ND	**7.6**	ND	**0.9**	ND	**1.3**	**0.59**	ND	**1.2**	ND
1640	Saybrook Road	5/1/2015	Raw	ND	**2.9**	ND	ND	ND	**0.55**	ND	ND	ND	ND
1640	Saybrook Road	11/10/2015	Raw	ND	**3.3**	ND	ND	ND	**0.56**	ND	ND	**0.5**	ND
1610	Saybrook Road - Consignment	6/17/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**49**
1610	Saybrook Road - Consignment	8/22/2011	Well #2-Consignment bldg	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**14.6**
1610	Saybrook Road - Consignment	10/26/2011	Well #2-Consignment	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**11.3**
1610	Saybrook Road - Consignment	1/19/2012	Well #2-Consignment	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**5.42**
1610	Saybrook Road - Consignment	4/10/2012	Well #2-Consigment	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**20.5**
1610	Saybrook Road - Consignment	7/17/2012	Well #2-Consignment	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**108**
1610	Saybrook Road - Consignment	8/1/2012	Well #2-Consignment	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**52.6**
1610	Saybrook Road - Consignment	9/25/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**120**
1610	Saybrook Road - Consignment	3/20/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**41**
1610	Saybrook Road - Consignment	9/23/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**13**
1610	Saybrook Road - Consignment	9/17/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**1**

Appendix B - Table B.4
Study Area Raw Well Water Analytical Results 2010-2017

				Tetrachloroethene (PCE) (µg/L)	Trichloroethene (TCE) (µg/L)	1,1,1-Trichloroethane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)	1,1-Dichloroethene (µg/L)	1,1-Dichloroethane (µg/L)	Vinyl Chloride (µg/L)	1,4-Dioxane (µg/L)	Methyl T-Butyl Ether (µg/L)
		US EPA MCL		**5**	**5**	**200**	**70**	**100**	**7**	**--**	**2**	**---**	**---**
		CT DPH DWAL		**5**	**1**	**200**	**--**	**--**	**7**	**25**	**0.5**	**3**	**70**
		CT DPH B/SAL		**---**	**---**	**--**	**--**	**--**	**---**	**--**	**--**	**50**	**---**
Street #	**Street Address**	**Sample Date**	**Sample_Pt**	**Tetrachloroethene (µg/L)**	**Trichloroethene (µg/L)**	**1,1,1-Trichloroethane (µg/L)**	**cis-1,2-Dichloroethene (µg/L)**	**trans-1,2-Dichloroethene (µg/L)**	**1,1-Dichloroethene (µg/L)**	**1,1-Dichloroethane (µg/L)**	**Vinyl Chloride (µg/L)**	**1,4-Dioxane (µg/L)**	**Methyl T-Butyl Ether (µg/L)**
1610	Saybrook Road - Cooking Company	2/23/2010	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.1**
1610	Saybrook Road - Cooking Company	3/22/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1610	Saybrook Road - Cooking Company	6/17/2011	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1610	Saybrook Road - Cooking Company	8/22/2011	Well #1-Cooking Company	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1610	Saybrook Road - Cooking Company	10/26/2011	Well #1-Cooking Company	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1610	Saybrook Road - Cooking Company	1/19/2012	Well #1-Cooking Company	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1610	Saybrook Road - Cooking Company	4/10/2012	Well #1-Cooking Co.	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1610	Saybrook Road - Cooking Company	7/17/2012	Well #1-Cooking Company	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1610	Saybrook Road - Cooking Company	8/1/2012	Well #1-Cooking Company	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1610	Saybrook Road - Cooking Company	8/30/2012	Bathroom Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1610	Saybrook Road - Cooking Company	9/25/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1610	Saybrook Road - Cooking Company	10/10/2012	Bathroom Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1610	Saybrook Road - Cooking Company	3/20/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1610	Saybrook Road - Cooking Company	6/26/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1610	Saybrook Road - Cooking Company	9/17/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.99**
1610	Saybrook Road - Cooking Company	12/9/2013	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
1610	Saybrook Road - Cooking Company	9/23/2014	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.94**
1610	Saybrook Road - Cooking Company	9/17/2015	Raw	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**2**
South Side Bluff													
16	South Side Bluff	2/18/2010	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.1**
16	South Side Bluff	5/10/2010	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	**0.1**
16	South Side Bluff	5/10/2011	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.1**
16	South Side Bluff	7/5/2012	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
16	South Side Bluff	10/7/2013	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
16	South Side Bluff	10/16/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
16	South Side Bluff	5/18/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
22	South Side Bluff	2/18/2010	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.1**
22	South Side Bluff	5/10/2010	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	N/A	ND
22	South Side Bluff	5/10/2011	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
22	South Side Bluff	8/2/2012	Raw	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
22	South Side Bluff	11/7/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
22	South Side Bluff	5/18/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
26	South Side Bluff	9/19/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
26	South Side Bluff	5/16/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
30	South Side Bluff	5/18/2011	Outside Tap	ND	ND	**0.1**	ND	ND	ND	ND	ND	ND	ND
30	South Side Bluff	7/31/2012	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
30	South Side Bluff	10/17/2014	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
30	South Side Bluff	5/13/2015	Outside Tap	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

	Value exceeds both US EPA MCL and CT DPH DWAL
	Value exceeds CT DPH DWAL or CT B/SAL
BOLD	Detected compound
ND	Non detect
N/A	Not sampled

1. 79 Bridge Road is also considered 81 Bridge Road (two separate houses served by one well)
2. 4 Harpers Landing is also considered 12 Andrews Marina.

Appendix B - Table B-5
Potable Wells Exceeding Drinking Water Action Level for Arsenic
Tylerville Study Area, Haddam
Arsenic DWAL = 10 ug/L
2/18/2016

Address	Sample Date	Sample Point	As (ug/L)
61 Bridge Rd	3/3/2015	Raw	16
	5/5/2015	Raw	17
	11/20/2015	Raw	17
	11/20/2015	After 2nd GAC	17
71 Bridge Rd	4/23/2015	Raw	15
	11/18/2015	Raw	15
	11/18/2015	After 2nd GAC	15
76 Bridge Rd	2/23/2015	Raw	8.8
	5/11/2015	Raw	17
	9/14/2015	Raw	8.6
	9/14/2015	After 2nd GAC	8.9
129 Camp Bethel Rd	5/11/2015	Raw	12
160 Camp Bethel Rd	4/30/2015	Raw	34
	12/10/2015	Raw	34
	2/4/2016	Raw	34
	2/4/2016	After 2nd GAC	34
	2/4/2016	Refrigerator tap	33
130 Little Meadow Rd	5/6/2015	Raw	140
	8/28/2015	Raw	140
	8/28/2015	After 2nd GAC	7.7
134 Little Meadow Rd	5/6/2015	Raw	13
	8/28/2015	Raw	7.3
	8/28/2015	After 2nd GAC	ND<3
1 Bridge Rd	5/20/2015	Raw	ND<3
4 Harper's Landing	4/30/2015	Raw	ND<3
14 Old Chester Road	8/20/2015	Raw	ND<3
16 South Side Bluff	5/18/2015	Raw	6.7
18 Bethel Lane	6/1/2015	Raw	3.6
22 Bridge Road	4/30/2015	Raw	ND<3
22 South Side Bluff	5/18/2015	Raw	4.4
26 South Side Bluff	5/14/2015	Raw	ND<3
28 Old Chester Road	9/4/2015	Raw	ND<3
30 South Side Bluff	5/13/2015	Raw	ND<3
64 Bridge Road	4/20/2015	Raw	5.1
66 Old Chester Road	9/7/2015	Raw	3.4
71 Little Meadow Road	4/29/2015	Raw	ND<3
	8/26/2015	Raw	ND<3
	8/26/2015	After 2nd GAC	ND<3
	11/12/2015	Raw	ND<3
	11/12/2015	After 2nd GAC	ND<3

Potable Wells Exceeding Drinking Water Action Level for Arsenic
Tylerville Study Area, Haddam
Arsenic DWAL = 10 ug/L
2/18/2016

75 Little Meadow Road	5/20/2015	Raw	ND<3
	9/30/2015	Raw	ND<3
76 Little Meadow Road	6/1/2015	Raw	ND<3
	9/30/2015	Raw	ND<3
76 Old Chester Road	8/18/2015	Raw	ND<3
77 Little Meadow Road	4/29/2015	Raw	8.4
	9/4/2015	Raw	9.1
	9/4/2015	After 2nd GAC	7.9
	1/27/2016	Raw	9
	1/27/2016	After 2nd GAC	7.8
78 Bridge Road	5/20/2015	Raw	6
78 Little Meadow Road	1/27/2015	Raw	ND<3
	1/27/2015	After 2nd GAC	ND<3
	4/29/2015	Raw	ND<3
	8/28/2015	Raw	ND<3
	8/28/2015	After 2nd GAC	ND<3
80 Bridge Road	5/5/2015	Raw	ND<3
	11/18/2015	Raw	ND<3
81 Bridge Road	4/24/2015	Raw	5.9
	4/27/2015	Raw	4.7
	7/30/2015	Raw	6.9
	11/13/2015	Raw	6.8
	11/13/2015	After 2nd GAC	6.3
84 Little Meadow Road	4/29/2015	Raw	ND<3
	9/4/2015	Raw	ND<3
	9/4/2015	After 2nd GAC	ND<3
96 Camp Bethel Road	6/11/2015	Raw	3.9
98 Little Meadow Road	5/12/2015	Raw	ND<3
	9/22/2105	Raw	ND<3
	9/22/2015	After 2nd GAC	ND<3
102 Little Meadow Road	5/26/2015	Raw	ND<3
104 Little Meadow Road	5/26/2015	Raw	ND<3
106 Little Meadow Road	5/5/2015	Raw	ND<3
109 Little Meadow Road	5/7/2015	Raw	ND<3
	9/22/2015	Raw	ND<3
110 Little Meadow Road	5/26/2015	Raw	ND<3
	9/22/2015	Raw	ND<3
	9/22/2015	After 2nd GAC	ND<3
116 Little Meadow Road	5/13/2015	Raw	ND<3
121 Camp Bethel Road	6/1/2015	Raw	ND<3
124 Camp Bethel Road	5/27/2015	Raw	ND<3
134 Old Chester Road	8/18/2015	Raw	ND<3
136 Old Chester Road	8/18/2015	Raw	ND<3

Potable Wells Exceeding Drinking Water Action Level for Arsenic
Tylerville Study Area, Haddam
Arsenic DWAL = 10 ug/L
2/18/2016

142 Old Chester Road	8/20/2015	Raw	ND<3
149 Camp Bethel Road	5/11/2015	Raw	ND<3
156 Camp Bethel Road	5/13/2015	Raw	ND<3
168 Camp Bethel Road	5/7/2015	Raw	3.4
180 Camp Bethel Road	2/26/2015	Raw	5.2
	11/24/2015	Raw	ND<3
1557 Saybrook Road	5/13/2015	Raw	ND<3
1640 Saybrook Road	5/1/2015	Raw	7.2
1709 Saybrook Road	8/7/2015	Raw	3.9
1721 Saybrook Road	8/7/2015	Raw	ND<3
1773 Saybrook Road	8/7/2015	Raw	7.4
1783 Saybrook Road	8/20/2015	Raw	ND<3
14 Little Meadow Road	5/11/2015	Raw	ND<3
	9/28/2015	Raw	ND<3

Appendix C

Water Supply Evaluation – Insurance Service Office PPC^{TM} Program

ISO's Public Protection Classification (PPC™) Program
Technical Subjects Overview
Needed Fire Flow
Monitoring Emergency Circuits for Integrity
Criteria for Distribution of Companies
Response-Time Considerations
Engine-Company Equipment
Service-Company Equipment
Ladder-Company Equipment
FSRS Equivalency List
Maximum Age for Apparatus
Automatic Aid
Training
Water-Supply Evaluations
Alternative Water Supplies
Relative-Value Tables
Divergence Factors

Water-Supply Evaluations

Forty percent of your community's Public Protection Classification (PPC™) grading is based on your water supply. ISO looks at whether you have sufficient water for fire suppression beyond your community's daily maximum consumption for other purposes.

Minimum criteria
For your community to be eligible for a PPC of Class 8 or better, your water supply system must be able to deliver at least 250 gpm for a period of two hours. That flow is in addition to the community's maximum daily rate of consumption for purposes other than firefighting.

If the fire department delivers the 250 gpm through tanker shuttle, large-diameter hose, or other alternative water supply, the water must be available within five minutes of the arrival of the first-due apparatus, and the department must maintain the flow, without interruption, for the two-hour duration.

Class 8B
If a community has superior fire-protection services and fire-alarm facilities, but lacks the water supply required for a PPC of Class 8 or better, the community may be eligible for a Class 8B rating. For more information, see Minimum Criteria for Class 8B.

Evaluation of systems that exceed the minimum requirement
If your water supply meets the 250-gpm minimum, ISO will evaluate your system — together with factors relating to your fire department and your fire-alarm and communications systems — to determine whether you qualify for a PPC of Class 8 or better.

Within the Fire Suppression Rating Schedule (FSRS), a section called "Needed Fire Flow" outlines the methodology for determining the amount of water necessary for providing fire protection at representative locations throughout the community. To evaluate your community's water supply ISO calculates the needed fire flow for selected locations. We then determine the water-flow capabilities at those locations and calculate a ratio considering the need (needed fire flow) and the availability (water-flow capability). We use that ratio in calculating the credit points identified in the FSRS.

ISO calculates the needed fire flow for an individual building based on the building's area, construction, occupancy, and exposure. To get full credit, the water supply must be able to deliver water, at 20 psi residual pressure and at the specified rate of flow, for a specified period of time. Needed fire flows for individual buildings range from a minimum of 500 gpm to a maximum of 12,000 gpm. For more information, see the Guide for Determination of Needed Fire Flow.

Residential areas
For residential areas with one- and two-family dwellings, ISO determines the needed fire flows by considering the distance between buildings:

Distance	Needed Fire Flow
more than 100 feet	500 gpm
31 to 100 feet	750 gpm
11 to 30 feet	1,000 gpm
10 feet or less	1,500 gpm

Buildings not considered in the community's PPC
For purposes of calculating your community's PPC, ISO does not normally consider the needed fire flow at certain high-demand properties. Those properties include:

- buildings graded and coded by ISO as protected by an automatic sprinkler system meeting applicable National Fire Protection Association standards
- buildings with a needed fire flow in excess of 3,500 gpm

ISO individually grades the protection of buildings with a needed fire flow in excess of 3,500 gpm, and their PPC can differ from that of the community or district that provides their fire protection.

Evaluation method
ISO analyzes three primary factors in the evaluation of the water supply at each representative site in your community:

- capacity of the supply works
- capacity of the water mains or distribution system
- distribution of hydrants

We analyze each of those factors according to applicable standards of the National Fire Protection Association (NFPA) and the American Water Works Association (AWWA).

We determine the capacity of the supply works for each service (pressure) zone through an analysis of such factors as water source (wells, springs, impoundments, stream-flow diversions, and the like); treatment facilities; transmission facilities (suction storage, booster pumps, transmission mains, pressure-reducing valves, and the like); and gravity storage. We calculate the flow — sustainable for the needed duration — from both suction storage tanks and gravity storage tanks, based on the capacity of the tanks at their average daily minimum levels.

We determine supply-works capacity, in gpm, for a duration of 2 hours for needed fire flows less than 3,000 gpm; for a duration of 3 hours for needed fire flows of 3,000 gpm to 3,500 gpm; and for a duration of 4 hours for needed fire flows in excess of 3,500 gpm. We credit only supply-works capacity in excess of the maximum daily consumption rate, based on records for the last 3 years.

We determine capacity of the water mains or distribution system by observing actual hydrant flow tests at each representative location.

Those tests produce results calculated in gpm at a residual pressure of 20 psi. Under certain circumstances, ISO may accept tests witnessed by outside agencies, if conducted according to industry-accepted practices, or flows determined from a valid and balanced computer model.

ISO evaluates hydrant distribution by examining the number and type of hydrants within 1,000 feet of each representative building. We also look at the distance from each such hydrant to the subject building, measured as apparatus can lay hose.

Hydrants with at least one large pumper outlet may receive credit for up to 1,000 gpm. Hydrants with at least two hose outlets, but no pumper outlet, may receive credit for up to 750 gpm. And hydrants with only one hose outlet may receive credit for up to 500 gpm.

Hydrants within 300 feet of the subject building may receive credit for up to 1,000 gpm (but not more than the credit that would apply based on the number and type of outlets). Hydrants from 301 feet to 600 feet from the subject building may receive credit for up to 670 gpm (but not more than the credit that would apply based on the number and type of outlets). And hydrants from 601 feet to 1,000 feet from the subject building receive credit for 250 gpm. Under certain circumstances, when all fire department pumpers carry sufficient large-diameter hose, ISO may allow maximum credit for hydrants up to 1,000 feet from the subject building.

For each representative location, ISO credits the least of the rates of flow determined for supply-works capacity, water-main or distribution-system capacity, or hydrant distribution. (The credit rate of flow cannot exceed the needed fire flow for that location.)

To determine the grading points that go into the calculation of your community's PPC, ISO considers the percentage of the needed fire flows that the credited rates of flow can provide. You receive that percentage of the available grading points. For example, if your community's credited flow could supply 75 percent of the needed fire flows at the representative locations, you would receive 75 percent of the available credit points.

In addition, ISO evaluates the type and installation of hydrants and/or suction points throughout your community or district, along with any program of hydrant inspections and maintenance. You receive additional credit points based on that evaluation.

For more information . . .
. . . on any topic related to the PPC™ program or the Fire Suppression Rating Schedule, click Talk to ISO Mitigation or call the ISO mitigation specialists at 1-800-444-4554.

Appendix D

Water Quality Study to Evaluate Disinfection Byproducts (DBPs) Formation

TYLERVILLE CENTER WATER MAIN EXTENSION

WATER QUALITY STUDY TO EVALUATE DISINFECTION BYPRODUCTS (DBPs) FORMATION

April 2017

Prepared for:
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Bureau of Water Protection and Land Reuse
Connecticut Department of Energy and Environmental Protection
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1. Project Background and Understanding:

Groundwater is the primary drinking water supply to residences and commercial properties in the Tylerville section of Haddam, Connecticut. Groundwater in Tylerville has been impacted by historic releases of chlorinated solvents, 1,4-dioxane (a solvent stabilizer), gasoline constituents, and sodium chloride. To address these concerns, AECOM completed a draft report "Tylerville Center Water Supply Alternatives Evaluation, Draft Final dated May 2013" (2013 Report). These alternatives included the following:

- Extension of the existing Connecticut Water Company (CWC) water distribution system which currently terminates in the Town of Chester,
- Development of a local groundwater supply and distribution system,
- Development of new individual wells, and
- The continued use of individual water treatment systems in the Proposed Water Supply Area

These alternatives were evaluated based on effectiveness in protecting human health, reliability, typical cost, and implementation. Based on review of the evaluation criteria, the extension of the CWC distribution system using either an 8″ or 12″ water main is the recommended alternative.

The CWC's EP Williams Water Treatment Plant (WTP) supplies potable water to the Chester System, Shoreline Region. Chester lies directly south of Tylerville but the existing water main terminates as a dead-end on Middlesex Turnpike near Denlar Drive as shown in Figure 1. The concept of extending the existing water line to Tylerville will require approximately 2.5 miles of piping as shown in Figure 1 below, which is included as Figure 7A in the Tylerville Water Supply Study Report. Clark Creek outlet to the Connecticut River prevents tie-in of the water main extension which would have created a practical loop at that location. Instead, there will be a dead end termination point at the southern end of Little Meadow Road.

A review of recent disinfection by-product (DBP) results indicate that the levels of total Trihalomethanes (TTHMs) in the vicinity of the current termination point (near Denlar Drive) can be elevated at certain times of year. The proposed water main extension will eliminate the dead end by extending the water main to provide service to a greater demand area, likely improving the water quality at the current sampling locations in Chester. However, there is concern that the new water main termination point in Tylerville will experience greater impacts due to the

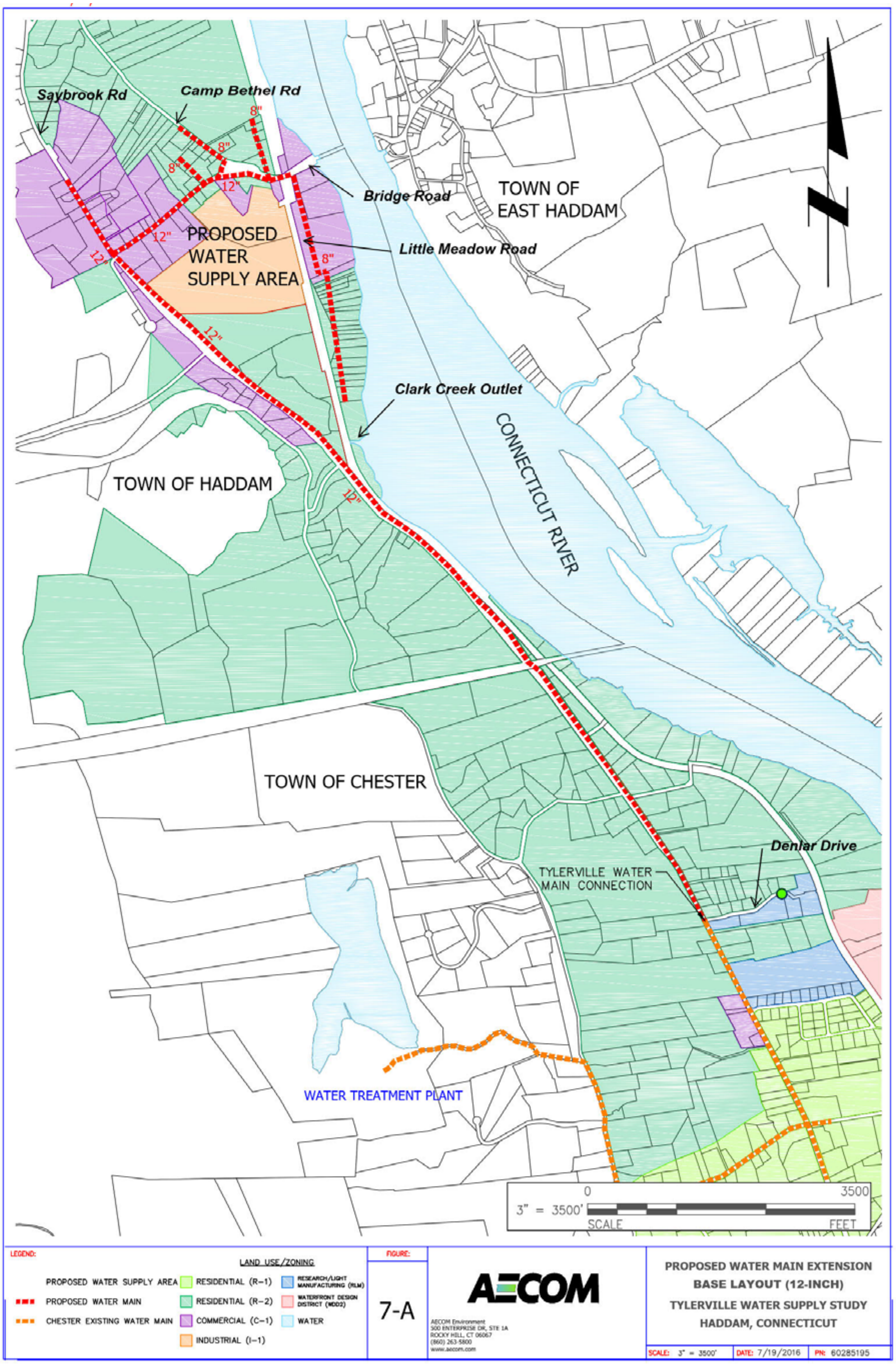

Figure 1. Proposed Water Main Extension to Tylerville Center

increase water age in the system. The purpose of this study is to simulate the potential impacts, and to assess the need for a means (if any) of mitigating TTHMs at Tylerville Center and the new termination point at Little Meadow Road.

2. Water Quality Modeling

The hydraulic model of the Chester water distribution system can be used to simulate the water age in the system. Water age results from the model can be used as a surrogate for other water quality parameters like chlorine and disinfection by-products (DBPs). Water age modeling does not require complex kinetic parameters that would be needed to simulate chlorine or DBP growth. However, there is a direct relationship between water age and constituent water quality so that model results with higher water age may be more likely to have experienced chlorine decay or DBP formation. Water quality modeling of the simulated pipeline was performed in order to estimate the impact that elevated water ages could have on the quality of the supply to Tylerville and to assess whether additional measures would be necessary to maintain adequate chlorine residual or manage potentially high TTHMs formation.

Introduction. The water quality as delivered by the Connecticut Water Company EP Williams WTP in Chester is well in compliance with the Connecticut Department of Public Health (CTDPH) requirements for potable water. The issue of water quality in this context is with respect to a potential increase in water age which will result with the extension of the water supply system. Water age impacts water quality in the following ways:

- Loss of residual disinfectant through chlorine decay over time and subsequent exposure to bacterial risk
- Development of disinfection by-products as water age increases
- Potential for stagnation and taste & odor issues

The need for disinfection and control of disinfection by-products (DBPs) represents a case of competing objectives with which many municipal water suppliers struggle. While disinfection can be easily assured by use of additional chlorine, this additional chlorine will provide an opportunity for the formation of DBPs which are formed when chlorine reacts with organic compounds. The formation of DBPs is also directly proportional to increased water age and elevated water temperatures.

DBPs are regulated as primary drinking water standards and suppliers must strike a balance between the application of disinfectants and the formation of DBPs. There are two main categories of DBPs: total Trihalomethanes (TTHMs) and haloacetic acids (HAAs). Presently, CWC samples for DBPs in the vicinity of the proposed new water line extension to Tylerville, namely, at Greenwald Industries and Chester Mobil. See Figure 2 for locations of sampling sites relative to the water treatment plant. These two sites are located on a hydraulic "dead-end" because the existing transmission main in Middlesex Turnpike is only supplied from one end near this location and water movement is low.

The dead end and low demands in this location leads to long residence times which likely affects water quality. As expected, higher DBPs are often measured at these sample sites, particularly at Greenwald Industries.

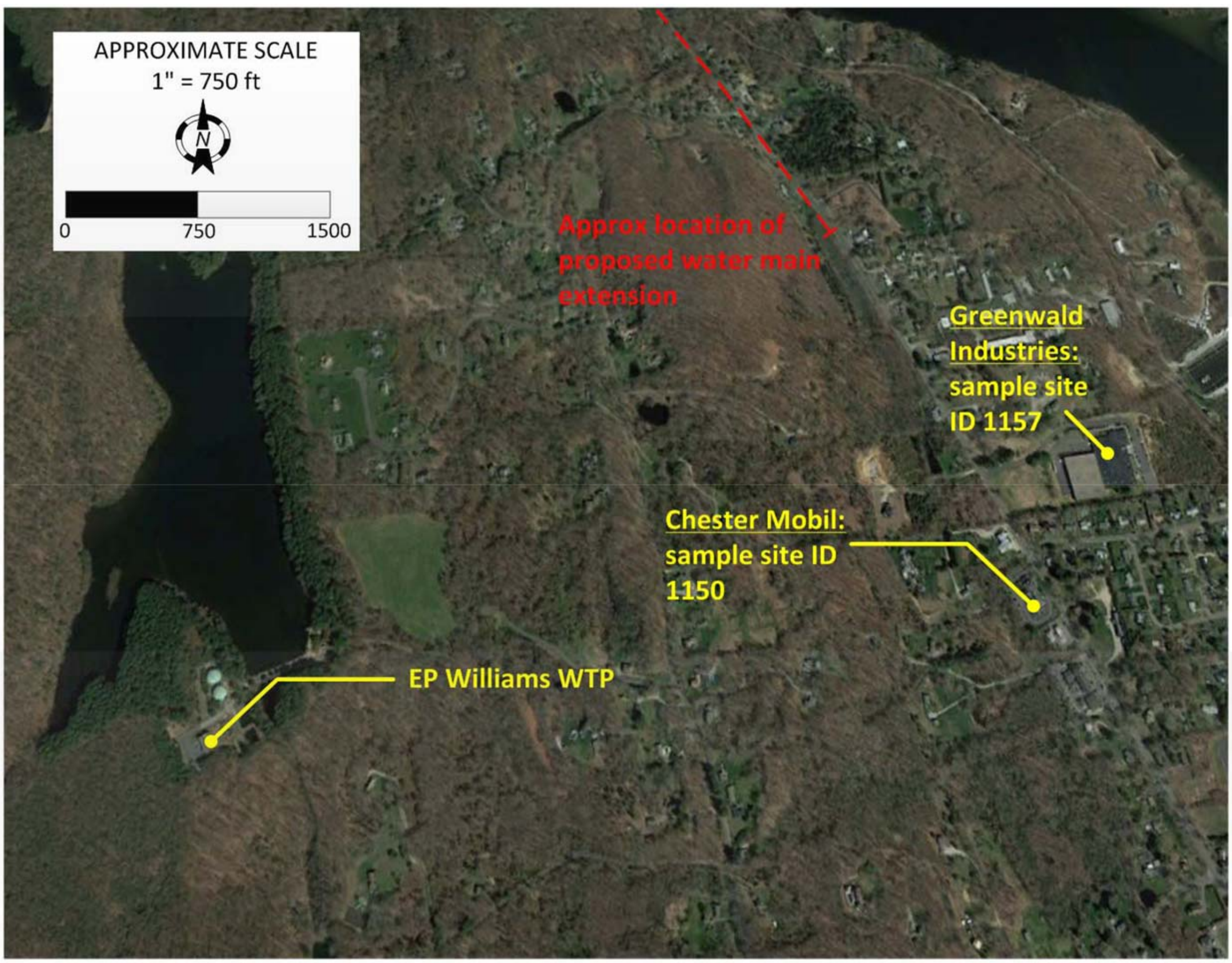

Figure 2. Existing DBP sampling Sites at Chester Mobil and Greenwald Industries.

Compliance with the disinfection by-product rule (DBPR) is based on a locational running annual average (LRAA), calculated quarterly. The results from each sampling site are averaged with the results from that same site from the previous three quarters, such that each sampling site is its own compliance location. The compliance value for TTHMs is 80 ug/L and for HAAs, compliance is achieved at 60 ug/L.

Table 1 shows the DBPs results from 2014 through 2016, as quarterly values and as LRAAs at the Chester Mobil and Greenwald Industries locations. As shown, both locations are presently in compliance with the DBP rule. The LRAAs for TTHMs at Chester Mobil and Greenwald Industries were found to be 55 and 64 ug/L, respectively. Seasonally, however, individual quarterly results have at times exceeded the MCL at the Greenwald Industries sampling site. For example, in the third and fourth quarters of 2014, and again in 2016, the Greenwald Industries location showed TTHM values that were above 80 ug/L. While this is not a violation, because the results can be averaged with the previous three results, it does indicate that conditions are sometimes suitable for high TTHM formation. The third and fourth quarters TTHM results are often problematic for utilities because water demands often drop in late summer and into fall, creating longer water age, coupled with still slightly warmer water temperatures and the presence of total organic carbon (TOC) in source water. All of these conditions are favorable for elevated DBPs. Once the transition to colder water is made, DBPs historically are minimized. This is shown by the drop in TTHMs from 90 ug/l in 2014 Quarter 4 to 36 ug/L first quarter 2015. The shift towards colder water that occurs in winter is often a major improvement with respect to DBP compliance.

The Greenwald sampling location is particularly problematic due to the nature of the distribution system in this location. Although the Chester Mobil sampling location is not far from the Greenwald sampling site, the Mobil station service connection is served off of a larger diameter pipeline with much better water movement compared to the smaller diameter, closed network serving the Greenwald sampling site. As a result, the Greenwald sampling site is likely exposed to older water. The extension of the water supply pipeline to Tylerville may potentially improve the water quality in the Greenwald Industries areas by reducing water age with the additional demands. However, this age reduction may be offset somewhat by the need to raise the chlorine slightly as it leaves the Chester WTP to provide a detectable level of residual chlorine throughout the new Tylerville service area.

Table 1. DBP Results from Chester Mobil and Greenwald Industries (2014-2016).

TTHMs*				
	Chester Mobil, 201 Middlesex Ave Chester	LRAA	Greenwald Industries 211 Middlesex Ave Chester	LRAA
2014 Q1	43	-	70	-
2014 Q2	46	45	63	67
2014 Q3	68	52	74	69
2014 Q4	62	55	90	74
2015 Q1	32	52	36	66
2015 Q2	42	51	49	62
2015 Q3	59	49	63	60
2015 Q4	47	45	56	51
2016 Q1	38	47	48	54
2016 Q2	46	48	50	54
2016 Q3	79	53	91	61
2016 Q4	56	55	67	64

* MCL <= 80 ug/L based on locational running annual average (LRAA)

HAAs**				
	Chester Mobil, 201 Middlesex Ave Chester	LRAA	Greenwald Industries 211 Middlesex Ave Chester	LRAA
2014 Q1	52	-	21	-
2014 Q2	23	38	10	16
2014 Q3	41	39	16	16
2014 Q4	25	35	17	16
2015 Q1	25	29	23	17
2015 Q2	19	28	16	18
2015 Q3	34	26	34	23
2015 Q4	31	27	29	26
2016 Q1	16	25	15	24
2016 Q2	23	26	16	24
2016 Q3	51	30	36	24
2016 Q4	26	29	29	24

** MCL <= 60 ug/L based on locational running annual average (LRAA)

The additional travel time in the Tylerville water main extension, coupled with the added chlorine, could be enough to create higher levels of DBPs, not necessarily in Chester, but for the users at the far reaches of the new system in Tylerville. Therefore, to assess the potential for elevated DBPs created by additional residence time and higher chlorine concentrations, a water quality modeling program was recommended. This was conducted in three steps, first by developing a baseline chlorine decay model, and then by conducting two rounds of simulated distribution system (SDS) DBPs testing. A third party laboratory (Alpha Analytical Laboratory in Westborough, MA) conducted the chlorine decay and SDS laboratory testing.

Baseline Chlorine Decay Sampling. Water sampling and chlorine decay testing was conducted on October 5, 2016 to evaluate the existing water quality with respect to chlorine decay and the potential for additional DBP formation. The water sampling was conducted at the EP Williams Water Treatment Plant in Chester. This is the water that enters the distribution system and therefore represents the initial water quality before water age takes effect. The first step in the chlorine decay modeling was to collect a sample of the WTP finished water and measure the initial temperature, pH, and chlorine residual as collected from the WTP. The WTP finished water is currently dosed with approximately 0.5 to 1.5 mg/l of chlorine. The baseline data collected on October 5, 2016 measured a temperature of 21 C, a pH of 7.1 s.u., and a chlorine residual of 1.2 mg/L.

Then, the lab was instructed to boost two samples of the WTP finished water with chlorine to achieve a starting chlorine residual value of approximately 1.25 mg/L of chlorine in Sample 1 (S1), and 2.25 mg/L of chlorine in Sample 2 (S2). The purpose of this exercise was to determine how much chlorine should be added to the WTP finished water to overcome the chlorine demand and still have the necessary chlorine residual of at least 0.2 mg/L after the representative water age of up to 7 days, as calculated in the water age modeling for the 12″ water main alternative for Tylerville. The results of the chlorine decay model were needed to prepare for the simulated distribution system testing in subsequent modeling, which occurred later in October of 2016 and again in November 2016.

The laboratory results of the initial chlorine residual measurements are provided in Appendix A, and the summary of the chlorine decay modeling are shown in Figure 3. The results indicate that a dose of 1.25 mg/L of free chlorine was adequate to sustain a free residual of 0.5 mg/L after up to 5-days of hold time, and by extrapolation, after a hold time of up to 7-days, needed for the farthest reaches of the proposed Tylerville water main extension at the south end of Little Meadow Road, a free chlorine minimum of 0.2 mg/L required by CT DPH, could be sustained. This low chlorine demand is indicative of a finished water that is low in TOC, metals, and other constituents that would otherwise consume chlorine. For this reason, the dose of 2.25 mg/L resulted in excess free chlorine in the range of 1.3 – 1.5 mg/L after the 5-days of hold time. For perspective, the chlorine residual in the distribution system as measured at 201 Middlesex Street (the Mobil station) is presented in Figure 4, showing residual levels that range from 0.2 to 1.2 mg/L with typical chlorine dosing in the range of 1.0 – 1.5 mg/L at the WTP.

The variability of the chlorine residual shown in Figure 4 underscores the differences between the lab environment and the actual treatment system and pipeline environment. While chlorine demand (and simulated distribution system) modeling can accurately simulate water age, temperature, and chlorine residual, it cannot account for the internal condition of the actual pipeline, which often consists of biofilms, scale, and/or corrosion products, all which impact water quality. Therefore, the results of lab scale chlorine decay modeling must be considered in relative terms, rather than a perfectly predictive model of expected water quality.

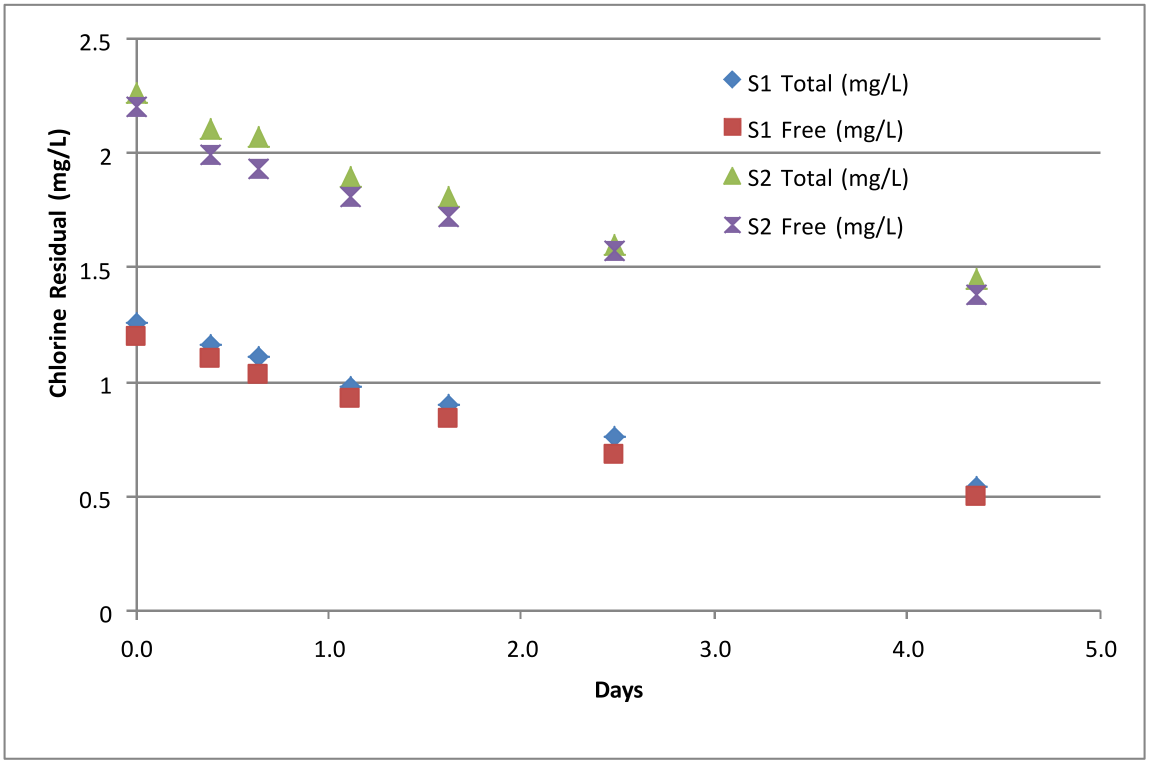

Figure 3. Results of Lab Scale Chlorine Demand Experiment.

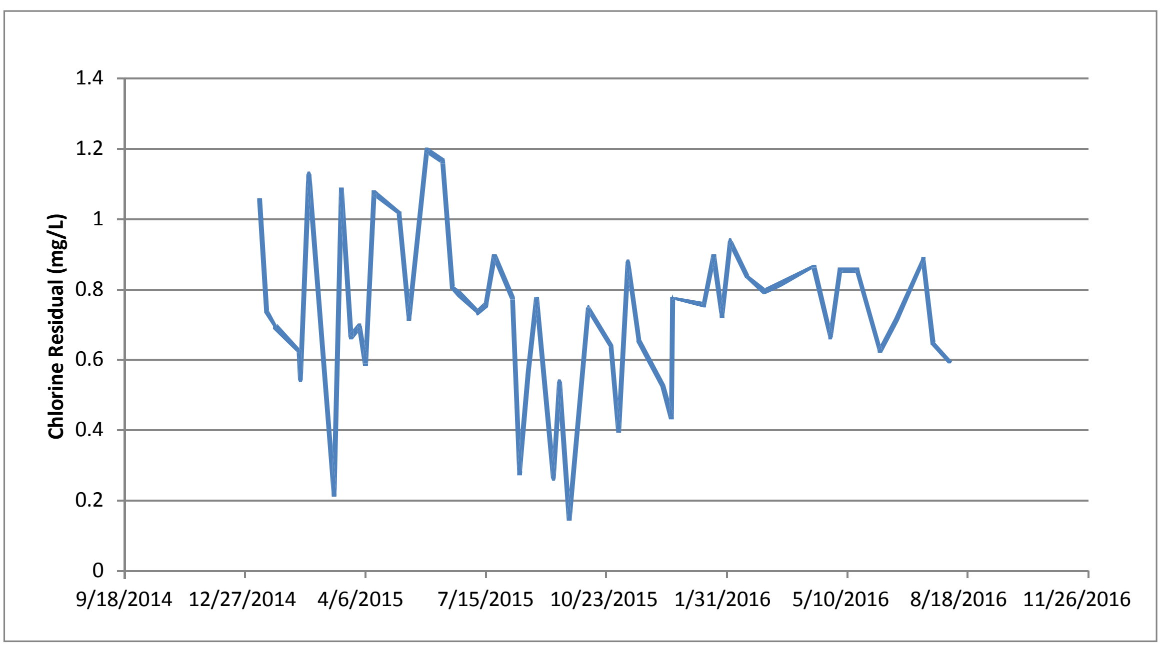

Figure 4. Distribution System Chlorine Residual, 201 Middlesex Street Chester Mobil.

First Simulated Distribution System (SDS) Modeling – October 17, 2016. With the baseline chlorine decay sampling completed, two simulated distribution system (SDS) studies were conducted, in order to assess how much additional TTHMs formation can be expected as a result of adding the chlorine to the sample and holding it for a period of time simulating the water age of up to 7 days expected at the dead end of the proposed Tylerville 12″ water main extension at Little Meadow Road. Sampling for both SDS studies was conducted at the Williams WTP, by collecting grab samples of the finished water for several analyses. All samples were analyzed by Alpha Analytical Laboratory, Westborough, MA. The SDS studies followed the process outlined below:

1. Alpha Labs provided CWC labeled bottles for sampling as follows:
    - TOC
    - Ultraviolet absorbance at 254 nm (UV-254)
    - TTHM (ambient)
    - SDS-1
    - SDS-2

2. CWC sampled WTP effluent using all 5 labeled bottles and recorded the following:
    - Time
    - Water Temperature
    - pH
    - Free Chlorine residual
    - WTP flow

    All samples were kept in a cooler for transport and stored at sample temperature.

3. Upon receipt at the lab, the staff measured and recorded the following:
    - Noted WTP flow
    - Recorded: Time, Temperature, pH, Free chlorine, Total chlorine
    - Measured TTHMs – from respective sample bottle. This is the ambient TTHMs from WTP.
    - Measured TOC – from respective sample bottle
    - Measure UV-254 - from respective sample bottle
    - Lab held ambient sample SDS-1 at required location, temperature, and duration specified by AECOM based on the water age modeling (7 days).
    - Lab spiked sample SDS-2 with chlorine to create a specified Free Chlorine residual either 2.0 mg/L or 1.5 mg/L, per AECOM direction and held as specified.

4. Lab re-sampled bottles SDS-1 and SDS-2 after 7-day hold time specified by AECOM and recorded, for each sample:
   - Time, Temperature, pH
   - Free chlorine, Total chlorine
   - TTHMs

In summary, the first SDS sample (SDS-1) measured the TTHMs of the water sample as collected from the WTP effluent, thus serving as the control sample. The sample labeled as SDS-2 had additional chlorine added to bring the initial free chlorine to 2.0 mg/L. The lab results of the October 17, 2016 SDS testing are provided in Appendix B and summarized in Table 2 below.

Table 2. Results of First SDS Testing - October 17, 2016.

Sample No.	Water Temp (F)	Initial TTHMs (ug/L)	Initial Free Chlorine (mg/L)	Final TTHMs after 7 days (ug/L)	Final Free Chlorine after 7 days (mg/L)
SDS-1 (baseline)	64.4	39	0.87	59	0.14
SDS-2 (dosed)	64.4	39	2.0	81	1.0

After the initial data were collected, both samples were held for 7-days at a temperature of 18 C (64.4 F) and at a pH of 7.1, which were consistent with the distribution system water temperature and pH at the time of testing. The data show that after 7-days hold time, SDS-1, which was not adjusted for additional chlorine, showed a much lower final TTHMs level compared to SDS-2 which started off with a higher chlorine dose of 2.0 mg/L. This outcome was expected and illustrates the need to apply additional chlorine judiciously. The dose of 2.0 mg/L initial chlorine was obviously too high, and resulted in TTHMs formation that is unacceptable. The existing chlorine dose of approximately 1 mg/L used at the WTP appeared to be more forgiving with respect to TTHMs formation, and was still able to provide a measurable free chlorine residual at the end of the 7-day hold time, but the residual was not within the desired lower range of 0.2 (minimum) to 0.5 mg/L (after at least 24 hours) per CTDPH. It should be noted that HAAs were not measured as part of the first test. However, baseline analysis of finished TOC and UV-254 were made, and the results were found to be 2.34 mg/L and 0.025 cm-1, respectively. This is indicative of a low organic finished water quality.

Second Simulated Distribution System (SDS) Modeling November 17, 2016. The second round of SDS tests were conducted using a lower initial chlorine dose for the SDS-2 sample, to determine the impact of a lower chlorine dose on TTHMs formation potential. In this test, the chlorine dose was lowered from the 2.0 mg/L used in the first SDS test to 1.5 mg/L. The results of the second SDS test were favorable, with the maximum TTHMs formation at 65 ug/l after the hold time of 7-days. Yet, in addition to the lower applied dose, the water temperature was 10-degrees cooler, and the finished water TOC was also lower (at 2.02 mg/L compared to 2.34 mg/L in the first round of SDS testing in October). Combined, the lower TOC, water temperature, and applied chlorine are all responsible for providing a lower TTHMs result. Interestingly, the TTHMs value itself was essentially the same for each sample, despite the difference in the amount of final free chlorine. This may indicate that the low water temperature and lower TOC had more of an impact on TTHMs formation than did the presence of free chlorine. In other words, the water was less reactive in the presence of free chlorine than was the case in the first test due to the lower water temperature and TOC.

The second round of testing also included analysis for HAAs as well as TTHMs, and again, as with the TTHMs, there was essentially no difference in the HAAs value between the two samples despite the greater difference in free chlorine after the 7 day analysis period. The lab results of the November testing are provided in Appendix C, and summarized in Table 3 below.

Table 3. Results of Second SDS Testing - November 9, 2016.

Sample No.	Water Temp (F)	Initial Free Chlorine (mg/L)	Final TTHMs after 7 days (ug/L)	Final HAAs after 7days (ug/L)	Final Free Chlorine after 7 days (mg/L)
SDS-1 (baseline)	54	0.95	64	46.7	0.37
SDS-2 (dosed)	54	1.5	65	47.1	0.84

The final free chlorine values as listed in Table 3 are meaningful because it shows that the chlorine demand of the finished water to which the chlorine was dosed was low enough such that a residual chlorine was sustainable, even after the 7-day hold time. Had the free chlorine been reduced to below detection in the SDS samples, the DBP values from the SDS tests would have been stunted by the early consumption of chlorine yielding unrealistically low DBP results and rendering the test invalid. Furthermore, it is desirable to maintain a low, but measurable chlorine residual (typically above 0.5 mg/L) in distribution in all locations for achieving reliable secondary disinfection. This suggests that under the test conditions, secondary disinfection can be achieved.

3. Water Distribution System Water Age Modeling

The Tylerville, CT water distribution model was previously analyzed by Connecticut Water Company using Bentley/Haestad Methods' WATERGEMS software. For this study, Connecticut Water Company provided the WaterGEMS model to AECOM to estimate water age at the connection point to Tylerville and in the proposed Tylerville system. Using the model to examine existing conditions, AECOM estimated the water age at the water main terminus on Middlesex Turnpike to be about 170 hours (7.1 days). With the water main extension in the model, the baseline water age was estimated to be reduced to 13.5 hours (0.56 days) at the Tylerville connection point in Chester, with estimated water ages in the Tylerville system as high as 149.2 hours (6.2 days) with a 12-inch main to Tylerville. If an 8-inch main is used, the water age at the Tylerville connection point would not be changed but the estimated water age in Tylerville would be as high as 108.2 hours (4.5 days). While the 8-inch main may provide a slight benefit in terms of water age, the water age would still exceed the 3-day threshold, and the chlorine decay and DBP formation issues would not be completely mitigated.

Based on the findings of the water quality sampling and simulated distribution system chemical analysis, reducing chlorine residual loss and potential TTHMs formation in Tylerville could be helped by reducing the water age. The model was re-run to estimate how a flushing system might affect a reduction in water age. A flushing system was simulated by adding a second demand to the base demand on the furthest point in the Tylerville system (at the south end of Little Meadow Road). These analyses were conducted for both an 8-inch and a 12-inch water main design. While these results would indicate lower flushing volume requirements with an 8-inch main compared with the 12-inch main, the need for flushing would not be eliminated with an 8-inch main.

In the first flushing analyses, a continuously running flusher was simulated using fixed demands of 5, 10, 25, 50 and 75 gpm added at this location and the water age was estimated with the model. Next, intermittent flushing was simulated as being added to the base demand using several different patterns (in terms of time on and time off per hour) and a range of flushing rates by creating new diurnal demand patterns to represent when the flushing demand was active and when it was not.

The results indicate that a flushing system is capable of reducing water age in Tylerville when conditions (like high TOC and TTHMs) indicate a need. Several of the options were indicated to be able to reduce water age from the baseline of 6.2 days to below a threshold of 3.0 days. The threshold of 3.0 days is based loosely on the SDS results and represents a target maximum water age to maintain an adequate chlorine residual without leading to excessive DBP formation when the seasonal conditions are conducive to chlorine decay and DBP formation. Water age is not measureable directly but is a representative value of chlorine decay and DBP formation which are functions of time but of also many other factors. Water age is used as a simple method of analysis for the potential for water quality degradation. Other than pipe velocity and system demands, no other factors affect water age so there is a higher level of confidence in the results.

The need for flushing would be dependent on a number of factors including temperature and TOC concentrations. As indicated in the water quality analysis, these conditions are most likely to occur in the fall. If system monitoring indicates a downward trend in chlorine residual in Tylerville or if TTHM levels at the WTP are noted to be elevated, then flushing should be considered if treatment process adjustments have been made to optimize water quality produced. Currently the CWC performs its annual system flushing during the fall of each year in accordance with the Regulations of Connecticut State Agencies (RCSA) Sec. 19-13-B102, Standards for quality of public drinking water. It is noted that maintenance flushing is typically performed only in the spring and/or fall because of freezing issues in the winter and high water demands in the summer. For the Chester system the fall schedule has the benefit of mitigating the highest potential for seasonal DBP formation and should be maintained. It is also noted that for maintenance flushing, water system operators prefer to utilize a blow off device instead of a fire hydrant to avoid operating the larger hydrant valves at partial range.

The results of the model runs are summarized in Table 4 below for a 12-inch main and in Table 5 for an 8-inch main. These tables list the water age at the end of the Tylerville system and the approximate amount of water flushed per day. A graph of these results is shown below in Figure 5 for the 12-inch option and in Figure 6 for the 8-inch option. Based on the results of the sampling and simulated distribution system analysis, a threshold of 3.0 days (72 hours) was used as a goal below which the water age should be maintained. A number of possible flushing schemes that meet the 3-day goal are highlighted in green on Tables 4 and 5.

Rows highlighted in green indicate that the flushing strategy in that row is predicted by the model to keep water age below the 3 day threshold.

Table 4. Theoretical Water Age with Flushing Options at End of Little Meadow Road, 12″ Proposed Water Main Alternative

Demand Added (gpm)	Pattern or Fixed	Water Age, days	Amount Flushed/ day, gallons
0 – Baseline run	-	6.2	0
2	Fixed	4.9	7,200
4	Fixed	4.1	14,400
10	Fixed	3.0	36,000
20	Fixed	2.2	72,000
30	Fixed	1.8	108,000
2	30-Minute On/30 Minute Off	5.4	3,600
4	30-Minute On/30 Minute Off	4.8	7,200
10	30-Minute On/30 Minute Off	3.8	18,000
20	30-Minute On/30 Minute Off	3.0	36,000
30	30-Minute On/30 Minute Off	2.5	54,000
2	5-Minute On/55 Minute Off	6.1	600
4	5-Minute On/55 Minute Off	5.9	1,200
10	5-Minute On/55 Minute Off	5.6	3,000
20	5-Minute On/55 Minute Off	5.0	6,000
30	5-Minute On/55 Minute Off	4.7	9,000
2	5-Minute On/25 Minute Off	5.9	1,200
4	5-Minute On/25 Minute Off	5.7	2,400
10	5-Minute On/25 Minute Off	5.0	6,000
20	5-Minute On/25 Minute Off	4.4	12,000
30	5-Minute On/25 Minute Off	3.9	18,000
40	5-Minute On/25 Minute Off	3.6	24,000
50	5-Minute On/25 Minute Off	3.3	30,000
20	10-Minute On/20 Minute Off	3.5	12,000
26	10-Minute On/20 Minute Off	3.2	15,600
32	10-Minute On/20 Minute Off	2.9	19,200
38	10-Minute On/20 Minute Off	2.7	22,800
44	10-Minute On/20 Minute Off	2.5	26,400
20	15-Minute On/45 Minute Off	3.9	12,000
26	15-Minute On/45 Minute Off	3.5	15,600
32	15-Minute On/45 Minute Off	3.3	19,200
38	15-Minute On/45 Minute Off	3.1	22,800
44	15-Minute On/45 Minute Off	2.9	26,400

Table 5. Theoretical Water Age with Flushing Options at End of Little Meadow Road , 8” Proposed Water Main Alternative

Demand Added (gpm)	Pattern or Fixed	Water Age, days	Amount Flushed/ day, gallons
0 – Baseline run	-	4.5	0
2	Fixed	3.4	2,880
4	Fixed	2.8	5,760
10	Fixed	2.0	14,400
2	30-Minute On/30 Minute Off	3.8	1,440
4	30-Minute On/30 Minute Off	3.4	2,880
10	30-Minute On/30 Minute Off	2.6	7,200
20	30-Minute On/30 Minute Off	2.0	14,400
30	5-Minute On/55 Minute Off	3.2	3,600
40	5-Minute On/55 Minute Off	3.0	4,800
50	5-Minute On/55 Minute Off	2.8	6,000
10	5-Minute On/25 Minute Off	3.5	2,400
20	5-Minute On/25 Minute Off	3.0	4,800
30	5-Minute On/25 Minute Off	2.6	7,200
4	10-Minute On/20 Minute Off	3.7	960
10	10-Minute On/20 Minute Off	2.9	2,400
20	10-Minute On/20 Minute Off	2.4	4,800
10	15-Minute On/45 Minute Off	3.2	2,400
20	15-Minute On/45 Minute Off	2.6	4,800

Another option would be to flush for a period long enough to reduce the water age. For example, opening a hydrant with a flow of 1,500 gallons per minute for 15 minutes would be sufficient to reduce water age to 72 hours or less (with a 12-inch main). At 22,500 gallons total, this is comparable to the lowest volume of flushed water from the automatic flushing analysis and would need to be performed when specific conditions warrant such as downward trending chlorine residual or upward trending TTHM levels (most likely to occur in the fall). A dechlorinating diffuser (Vita D-Chlor or similar) will be needed to strip residual chlorine prior to discharging to the environment. These portable diffusers can be mounted to the hydrant or blow-off with a fire hose to direct flows and typically cost about $1,000 each. The device is equipped with a feed tube to contain the sodium sulfite dechlorinating tablets which cost about $200 per pail for multiple flushing events depending on the volume.

Other alternatives include permanent installations that would need to be designed for freeze protection, but could include automatic flushing equipment that can be operated on a timer or a more intelligent arrangement based on a feedback from a chlorine residual monitor. These arrangements could cost in the range of $5,000-$10,000 respectively, but can be an advantage when more regular flushing is desired to maintain water quality in low use dead end areas. The advantage of a permanent arrangement is that the flushing valve connection can be made directly to the water main and the integral timer can be programmed to flush on a set daily, weekly, or other schedule for a set duration at a specific time that will not affect local service. For the Tylerville water main extension, it appears that the flushing requirements will depend on seasonal conditions and may not require this level of equipment.

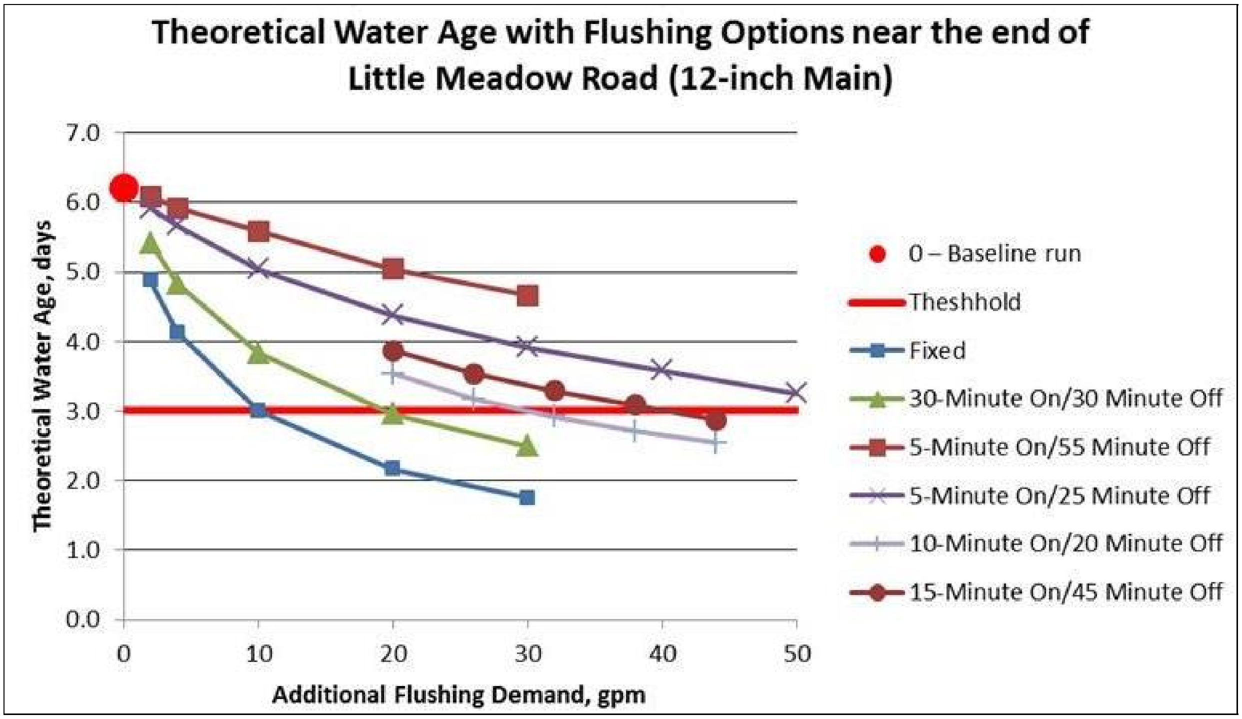

Figure 5. Theoretical Water Age with Flushing (12 inch option)

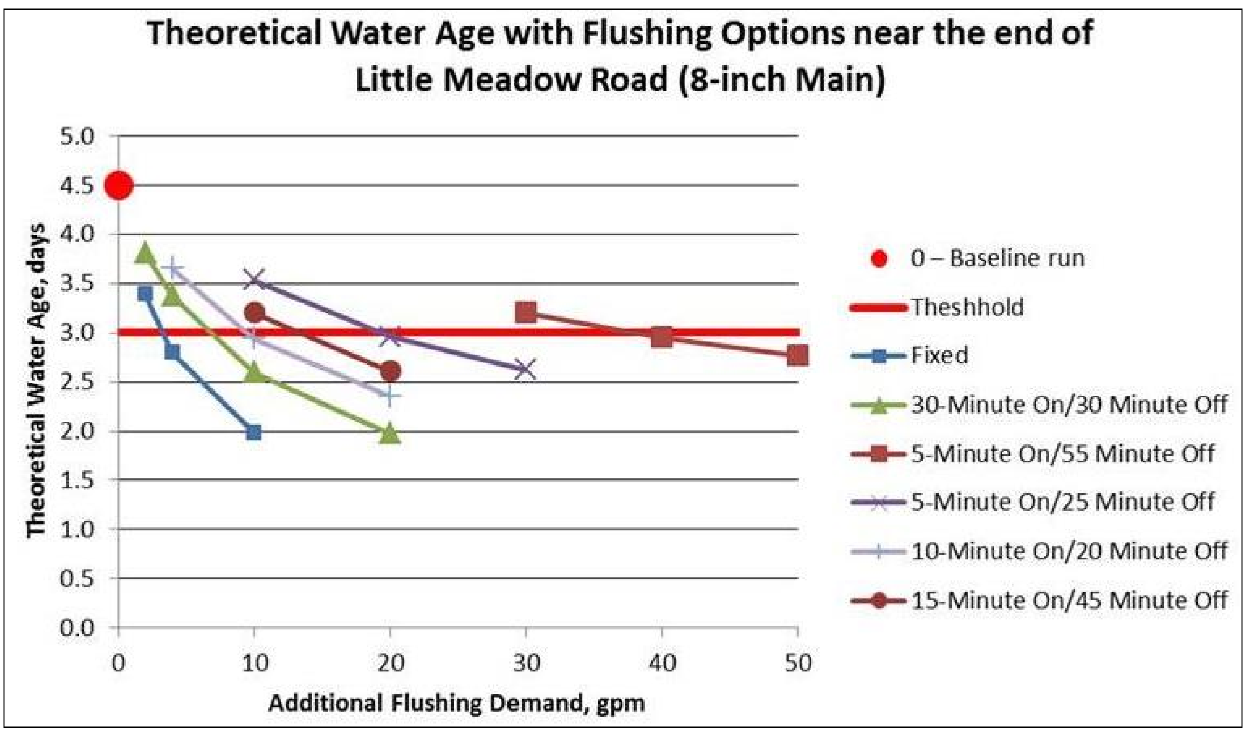

Figure 6. Theoretical Water Age with Flushing (8-inch option)

4. Conclusions

The SDS testing indicated that doses of chlorine between 1.0 and 1.5 mg/L were adequate for maintaining measurable free chlorine residual after the 7-day hold time for the 12″ proposed water main alternative, without creation of TTHMs or HAAs that were above the MCL of 80 and 60 ug/L, respectively. This is encouraging because the formation of excessive levels of DBPs can be difficult to control, and often the only practical option is to convert to combined chlorine (chloramines) for secondary disinfection. This is not considered necessary for the subject project, and this can introduce other concerns, such as nitrification, that are equally problematic. It should be noted that the SDS testing was conservatively conducted during the time of year (early to mid-autumn) in which DBPs formation is typically most prevalent. Therefore, the DBPs concentrations modeled by the SDS studies are considered higher than would occur during other times of year. At this time, it does not appear that significant capital investment in chlorine booster dosing stations or aeration equipment is warranted. These systems could cost in the range of $25,000 to $100,000 and may require additional infrastructure. It should be recognized, however, that modeling studies cannot directly reflect in-situ conditions or predict future operating strategies.

Distribution system modeling results indicate that water ages would exceed the recommended 3-day threshold in Tylerville based on water demand estimated in AECOM's 2013 Report. This threshold would be exceeded regardless of whether a 12-inch or an 8-inch water main extension is constructed. If conditions warrant concern for low chlorine residuals and/or elevated DBPs levels, simple flushing practices in Tylerville would aid in keeping residual levels above minimum levels and in keeping DBPs levels reduced.

To address potential issues at the system's dead end at Little Meadow Road there are several alternate locations to consider for hydrant or blow-off locations that are identified in Figure 7. These sites are located near existing drainage areas, and relatively accessible for operational access:

1. At the intersection of Bridge Road and Little Meadow Road
2. At the bend in Little Meadow Road near the surface water body
3. At the entrance to the private road at the end of Little Meadow Road
4. At the culvert crossing on the private road
5. At the end of the private road

Due to the seasonal nature of the Eagle Landing State Park and the residences on Little Meadow Road, the first location on Bridge Road may be acceptable. Other locations along Little Meadow Road will allow a greater length of pipe to be kept fresh. Locations along the private road may allow flushing of the longest pipe length, but would require access to private property.

Figure 7. Possible Flushing Hydrant (or blow-off) Locations

5. Recommendations

Despite the encouraging results of the SDS testing, it will still be important to monitor water quality after completion of the proposed water main extension to assess in-situ conditions. Should future operating conditions require additional measures to manage DBPs some of the following strategies could be employed if necessary:

1) **Minimize water age as much as possible (when conditions dictate).** This can be accomplished by routine flushing, especially during the early autumn time frame. This is particularly important where hydraulic dead ends may occur, such as the north end of the water main proposed on Saybrook Road and Camp Bethel Road, as well as the south end of the proposed water main on Little Meadow Road. Automatic “bleeders” are sometimes installed in these locations for a continual release of low volumes of distribution system water, effectively controlling water age. While the focus on flushing was related to the system termination point at Little Meadow Road, the short dead end extensions at Saybrook Road and others

to the north would be designed with blow offs or local hydrants as appropriate. For the Chester system the current fall maintenance flushing has the benefit of mitigating the highest potential for seasonal DBP formation and should be scheduled in the Tylerville area based on seasonal trends and water quality testing.

2) **Utilize only as much chlorine as is necessary to obtain a low but measurable residual.** This can require frequent monitoring of chlorine residual from the distribution system, but the only way to ensure the DBPs formation does not become an issue is to manage this concentration closely. If necessary, booster chlorination systems could be considered. These are typically used where adding a high chlorine dose at the entry point (i.e., the water plant) is considered undesirable due to DBPs formation concerns. Instead, lower doses of chlorine can be added in strategic locations, designed to provide residual only where a boost of chlorine may be needed.

3) **Optimize treated water quality.** Reducing TOC and other constituents that exert a chlorine demand is another key strategy for ensuring that DBPs formation is minimized. The EP Williams WTP is capable of producing finished water with TOC as low as 2 mg/L, which is considered excellent for a conventional surface water treatment plant. It will be important to continue with this level of performance and make adjustments as needed to ensure that DBP formation is minimized.

Appendix A

Appendix A-1

Sampling and Analysis Protocol for October 3, 2016
Field Sampling at Williams WTP

APPENDIX A-1
Sampling and Analysis Protocol for October 3, 2016 Field Sampling at Williams WTP

1. Week 1 – Determine baseline chlorine demand
   a. CWC to sample WTP effluent using two 1-L bottles and record the following:
      - Time
      - Temperature
      - pH
      - Free Chlorine residual
      - WTP flow
   b. All samples to be kept in a cooler for transport and stored at sample temperature
   c. Lab to bring sample(s) back to testing facility to do the following tests from Sample S-1 of the identical sample bottles, while identifying time and temperature:
      - Temperature, pH
      - Free chlorine , Total chlorine
      - UV-254
      - TOC
   d. Lab to hold* ambient sample bottle S-1 in dark enclosure at required location, temperature, and duration specified by AECOM based on the water age modeling. (in the dark and at field temp)
   e. Lab to spike bottle S-2 with chlorine to create a specified Free Chlorine residual, per AECOM direction.
   f. Lab to re-sample bottles S-1 and S-2 after hold time specified by AECOM and record:
      - Time, Temperature, pH
      - Free chlorine, Total chlorine

2. Week 2 – Determine TTHM Formation Potential
   a. CWC to sample WTP effluent using <u>three</u> 1-L bottles (1 for TTHM and 2 for SDS/chlorine decay testing) and record the following:
      - Time
      - Temperature
      - pH
      - Free Chlorine residual
      - WTP flow
   b. Lab to bring samplesTTHM-1, SDS-1 and SDS-2 to testing facility to do the following tests:
      - Time, Temperature, pH
      - Free chlorine , Total chlorine
   c. Lab to measure TTHM for sample TTHM-1 (this is the TTHM leaving the WTP)
   d. Lab to hold ambient sample SDS-1 at required location, temperature, and duration specified by AECOM based on the water age modeling.
   e. Lab to spike sample SDS-2 with chlorine to create a specified Free Chlorine residual, per AECOM direction and hold as specified.
   f. Lab to re-sample bottles SDS-1 and SDS-2 after hold time specified by AECOM and record:
      - Time, Temperature, pH
      - Free chlorine, Total chlorine
      - TTHM

**Note the hold time(s) will be based on the initial distribution system hydraulic analysis conducted by AECOM in item 2 of the proposed scope of services.*

Appendix A-2

Analytical Report L1631649 10-12-16

ANALYTICAL REPORT

Lab Number:	L1631649
Client:	The Connecticut Water Company 93 West Main Street Clinton, CT 06413
ATTN:	David Peeling
Phone:	(860) 644-6412
Project Name:	Not Specified
Project Number:	Not Specified
Report Date:	10/12/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1631649
Report Date: 10/12/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1631649-01	S-1 INITIAL	WATER	Not Specified	10/05/16 14:35	10/05/16
L1631649-02	S-2 DOSE	WATER	Not Specified	10/05/16 14:35	10/05/16
L1631649-03	S-1 THURSDAY AM	WATER	Not Specified	10/05/16 14:35	10/05/16
L1631649-04	S-2 DOSE THURSDAY AM	WATER	Not Specified	10/05/16 14:35	10/05/16
L1631649-05	S-1 THURSDAY PM	WATER	Not Specified	10/05/16 14:35	10/05/16
L1631649-06	S-2 DOSE THURSDAY PM	WATER	Not Specified	10/05/16 14:35	10/05/16
L1631649-07	S-1 FRIDAY AM	WATER	Not Specified	10/05/16 14:35	10/05/16
L1631649-08	S-2 DOSE FRIDAY AM	WATER	Not Specified	10/05/16 14:35	10/05/16
L1631649-09	S-1 FRIDAY PM	WATER	Not Specified	10/05/16 14:35	10/05/16
L1631649-10	S-2 DOSE FRIDAY PM	WATER	Not Specified	10/05/16 14:35	10/05/16
L1631649-11	S-1 SATURDAY	WATER	Not Specified	10/05/16 14:35	10/05/16
L1631649-12	S-2 SATURDAY	WATER	Not Specified	10/05/16 14:35	10/05/16
L1631649-13	S-1 MONDAY	WATER	Not Specified	10/05/16 14:35	10/05/16
L1631649-14	S-2 MONDAY	WATER	Not Specified	10/05/16 14:35	10/05/16

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1631649
Report Date: 10/12/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Case Narrative (continued)

Report Submission

The requested analyses were provided by the client.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Cristin Walker Cristin Walker

Title: Technical Director/Representative Date: 10/12/16

INORGANICS
&
MISCELLANEOUS

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1631649
Report Date: 10/12/16

SAMPLE RESULTS

Lab ID: L1631649-01
Client ID: S-1 INITIAL
Sample Location: Not Specified
Matrix: Water
Date Collected: 10/05/16 14:35
Date Received: 10/05/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Simulated Distribution System - Westborough Lab										
Chlorine Dose	ND		mg Cl2/L	-	--	1	10/06/16 09:30	10/06/16 09:30	8,5710C	JO
Incubation Time	ND		hours	-	--	1	10/06/16 09:30	10/06/16 09:30	8,5710C	JO
pH, Initial	7.1		SU	-	--	1	10/06/16 09:30	10/06/16 09:30	8,5710C	JO
pH, Final	7.1		SU	-	--	1	10/06/16 09:30	10/06/16 09:30	8,5710C	JO
Incubation Temp, Initial	20		deg. C	-	--	1	10/06/16 09:30	10/06/16 09:30	8,5710C	JO
Incubation Temp, Final	20		deg. C	-	--	1	10/06/16 09:30	10/06/16 09:30	8,5710C	JO
Residual Chlorine, Initial	1.26		mg/l	0.050	--	1	10/06/16 09:30	10/06/16 09:30	8,5710C	JO
Residual Chlorine, Final (as Total)	1.26		mg/l	0.050	--	1	10/06/16 09:30	10/06/16 09:30	8,5710C	JO
Residual Chlorine, Final (as Free)	1.20		mg/l	0.050	--	1	10/06/16 09:30	10/06/16 09:30	8,5710C	JO

Project Name: Not Specified
Lab Number: L1631649
Project Number: Not Specified
Report Date: 10/12/16

SAMPLE RESULTS

Lab ID: L1631649-02
Date Collected: 10/05/16 14:35
Client ID: S-2 DOSE
Date Received: 10/05/16
Sample Location: Not Specified
Field Prep: Not Specified
Matrix: Water

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Simulated Distribution System - Westborough Lab										
Chlorine Dose	ND		mg Cl2/L	-	--	1	10/06/16 09:30	10/06/16 09:30	8,5710C	JO
Incubation Time	ND		hours	-	--	1	10/06/16 09:30	10/06/16 09:30	8,5710C	JO
pH, Initial	7.1		SU	-	--	1	10/06/16 09:30	10/06/16 09:30	8,5710C	JO
pH, Final	7.1		SU	-	--	1	10/06/16 09:30	10/06/16 09:30	8,5710C	JO
Incubation Temp, Initial	20		deg. C	-	--	1	10/06/16 09:30	10/06/16 09:30	8,5710C	JO
Incubation Temp, Final	20		deg. C	-	--	1	10/06/16 09:30	10/06/16 09:30	8,5710C	JO
Residual Chlorine, Initial	1.26		mg/l	0.050	--	1	10/06/16 09:30	10/06/16 09:30	8,5710C	JO
Residual Chlorine, Final (as Total)	1.26		mg/l	0.050	--	1	10/06/16 09:30	10/06/16 09:30	8,5710C	JO
Residual Chlorine, Final (as Free)	1.20		mg/l	0.050	--	1	10/06/16 09:30	10/06/16 09:30	8,5710C	JO

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1631649
Report Date: 10/12/16

SAMPLE RESULTS

Lab ID: L1631649-03
Client ID: S-1 THURSDAY AM
Sample Location: Not Specified
Matrix: Water

Date Collected: 10/05/16 14:35
Date Received: 10/05/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Simulated Distribution System - Westborough Lab										
Chlorine Dose	ND		mg Cl2/L	-	--	1	10/06/16 09:30	10/06/16 18:45	8,5710C	JO
Incubation Time	9.25		hours	-	--	1	10/06/16 09:30	10/06/16 18:45	8,5710C	JO
pH, Initial	7.1		SU	-	--	1	10/06/16 09:30	10/06/16 18:45	8,5710C	JO
pH, Final	7.0		SU	-	--	1	10/06/16 09:30	10/06/16 18:45	8,5710C	JO
Incubation Temp, Initial	20		deg. C	-	--	1	10/06/16 09:30	10/06/16 18:45	8,5710C	JO
Incubation Temp, Final	20		deg. C	-	--	1	10/06/16 09:30	10/06/16 18:45	8,5710C	JO
Residual Chlorine, Initial	1.26		mg/l	0.050	--	1	10/06/16 09:30	10/06/16 18:45	8,5710C	JO
Residual Chlorine, Final (as Total)	1.16		mg/l	0.050	--	1	10/06/16 09:30	10/06/16 18:45	8,5710C	JO
Residual Chlorine, Final (as Free)	1.10		mg/l	0.050	--	1	10/06/16 09:30	10/06/16 18:45	8,5710C	JO

Project Name: Not Specified | **Lab Number:** L1631649
Project Number: Not Specified | **Report Date:** 10/12/16

SAMPLE RESULTS

Lab ID: L1631649-04 | Date Collected: 10/05/16 14:35
Client ID: S-2 DOSE THURSDAY AM | Date Received: 10/05/16
Sample Location: Not Specified | Field Prep: Not Specified
Matrix: Water

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Simulated Distribution System - Westborough Lab										
Chlorine Dose	1.0		mg Cl2/L	-	--	1	10/06/16 09:30	10/06/16 18:45	8,5710C	JO
Incubation Time	9.25		hours	-	--	1	10/06/16 09:30	10/06/16 18:45	8,5710C	JO
pH, Initial	7.1		SU	-	--	1	10/06/16 09:30	10/06/16 18:45	8,5710C	JO
pH, Final	7.2		SU	-	--	1	10/06/16 09:30	10/06/16 18:45	8,5710C	JO
Incubation Temp, Initial	20		deg. C	-	--	1	10/06/16 09:30	10/06/16 18:45	8,5710C	JO
Incubation Temp, Final	20		deg. C	-	--	1	10/06/16 09:30	10/06/16 18:45	8,5710C	JO
Residual Chlorine, Initial	2.26		mg/l	0.050	--	1	10/06/16 09:30	10/06/16 18:45	8,5710C	JO
Residual Chlorine, Final (as Total)	2.11		mg/l	0.050	--	1	10/06/16 09:30	10/06/16 18:45	8,5710C	JO
Residual Chlorine, Final (as Free)	1.99		mg/l	0.050	--	1	10/06/16 09:30	10/06/16 18:45	8,5710C	JO

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1631649
Report Date: 10/12/16

SAMPLE RESULTS

Lab ID: L1631649-05
Client ID: S-1 THURSDAY PM
Sample Location: Not Specified
Matrix: Water

Date Collected: 10/05/16 14:35
Date Received: 10/05/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Simulated Distribution System - Westborough Lab										
Chlorine Dose	ND		mg Cl2/L	-	--	1	10/06/16 09:30	10/07/16 00:50	8,5710C	JO
Incubation Time	15.3		hours	-	--	1	10/06/16 09:30	10/07/16 00:50	8,5710C	JO
pH, Initial	7.1		SU	-	--	1	10/06/16 09:30	10/07/16 00:50	8,5710C	JO
pH, Final	6.6		SU	-	--	1	10/06/16 09:30	10/07/16 00:50	8,5710C	JO
Incubation Temp, Initial	20		deg. C	-	--	1	10/06/16 09:30	10/07/16 00:50	8,5710C	JO
Incubation Temp, Final	20		deg. C	-	--	1	10/06/16 09:30	10/07/16 00:50	8,5710C	JO
Residual Chlorine, Initial	1.26		mg/l	0.050	--	1	10/06/16 09:30	10/07/16 00:50	8,5710C	JO
Residual Chlorine, Final (as Total)	1.11		mg/l	0.050	--	1	10/06/16 09:30	10/07/16 00:50	8,5710C	JO
Residual Chlorine, Final (as Free)	1.03		mg/l	0.050	--	1	10/06/16 09:30	10/07/16 00:50	8,5710C	JO

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1631649
Report Date: 10/12/16

SAMPLE RESULTS

Lab ID: L1631649-06
Client ID: S-2 DOSE THURSDAY PM
Sample Location: Not Specified
Matrix: Water

Date Collected: 10/05/16 14:35
Date Received: 10/05/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Simulated Distribution System - Westborough Lab										
Chlorine Dose	1.0		mg Cl2/L	-	--	1	10/06/16 09:30	10/07/16 00:50	8,5710C	JO
Incubation Time	15.3		hours	-	--	1	10/06/16 09:30	10/07/16 00:50	8,5710C	JO
pH, Initial	7.1		SU	-	--	1	10/06/16 09:30	10/07/16 00:50	8,5710C	JO
pH, Final	7.2		SU	-	--	1	10/06/16 09:30	10/07/16 00:50	8,5710C	JO
Incubation Temp, Initial	20		deg. C	-	--	1	10/06/16 09:30	10/07/16 00:50	8,5710C	JO
Incubation Temp, Final	20		deg. C	-	--	1	10/06/16 09:30	10/07/16 00:50	8,5710C	JO
Residual Chlorine, Initial	2.26		mg/l	0.050	--	1	10/06/16 09:30	10/07/16 00:50	8,5710C	JO
Residual Chlorine, Final (as Total)	2.07		mg/l	0.050	--	1	10/06/16 09:30	10/07/16 00:50	8,5710C	JO
Residual Chlorine, Final (as Free)	1.93		mg/l	0.050	--	1	10/06/16 09:30	10/07/16 00:50	8,5710C	JO

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1631649
Report Date: 10/12/16

SAMPLE RESULTS

Lab ID: L1631649-07
Client ID: S-1 FRIDAY AM
Sample Location: Not Specified
Matrix: Water

Date Collected: 10/05/16 14:35
Date Received: 10/05/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Simulated Distribution System - Westborough Lab										
Chlorine Dose	ND		mg Cl2/L	-	--	1	10/06/16 09:30	10/07/16 12:15	8,5710C	JO
Incubation Time	26.8		hours	-	--	1	10/06/16 09:30	10/07/16 12:15	8,5710C	JO
pH, Initial	7.1		SU	-	--	1	10/06/16 09:30	10/07/16 12:15	8,5710C	JO
pH, Final	7.3		SU	-	--	1	10/06/16 09:30	10/07/16 12:15	8,5710C	JO
Incubation Temp, Initial	20		deg. C	-	--	1	10/06/16 09:30	10/07/16 12:15	8,5710C	JO
Incubation Temp, Final	20		deg. C	-	--	1	10/06/16 09:30	10/07/16 12:15	8,5710C	JO
Residual Chlorine, Initial	1.26		mg/l	0.050	--	1	10/06/16 09:30	10/07/16 12:15	8,5710C	JO
Residual Chlorine, Final (as Total)	0.980		mg/l	0.050	--	1	10/06/16 09:30	10/07/16 12:15	8,5710C	JO
Residual Chlorine, Final (as Free)	0.930		mg/l	0.050	--	1	10/06/16 09:30	10/07/16 12:15	8,5710C	JO

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1631649
Report Date: 10/12/16

SAMPLE RESULTS

Lab ID: L1631649-08
Client ID: S-2 DOSE FRIDAY AM
Sample Location: Not Specified
Matrix: Water

Date Collected: 10/05/16 14:35
Date Received: 10/05/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Simulated Distribution System - Westborough Lab										
Chlorine Dose	1.0		mg Cl2/L	-	--	1	10/06/16 09:30	10/07/16 12:15	8,5710C	JO
Incubation Time	26.8		hours	-	--	1	10/06/16 09:30	10/07/16 12:15	8,5710C	JO
pH, Initial	7.1		SU	-	--	1	10/06/16 09:30	10/07/16 12:15	8,5710C	JO
pH, Final	7.2		SU	-	--	1	10/06/16 09:30	10/07/16 12:15	8,5710C	JO
Incubation Temp, Initial	20		deg. C	-	--	1	10/06/16 09:30	10/07/16 12:15	8,5710C	JO
Incubation Temp, Final	20		deg. C	-	--	1	10/06/16 09:30	10/07/16 12:15	8,5710C	JO
Residual Chlorine, Initial	2.26		mg/l	0.050	--	1	10/06/16 09:30	10/07/16 12:15	8,5710C	JO
Residual Chlorine, Final (as Total)	1.90		mg/l	0.050	--	1	10/06/16 09:30	10/07/16 12:15	8,5710C	JO
Residual Chlorine, Final (as Free)	1.81		mg/l	0.050	--	1	10/06/16 09:30	10/07/16 12:15	8,5710C	JO

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1631649
Report Date: 10/12/16

SAMPLE RESULTS

Lab ID: L1631649-09
Client ID: S-1 FRIDAY PM
Sample Location: Not Specified
Matrix: Water
Date Collected: 10/05/16 14:35
Date Received: 10/05/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Simulated Distribution System - Westborough Lab										
Chlorine Dose	ND		mg Cl2/L	-	--	1	10/06/16 09:30	10/08/16 00:35	8,5710C	JO
Incubation Time	39.0		hours	-	--	1	10/06/16 09:30	10/08/16 00:35	8,5710C	JO
pH, Initial	7.1		SU	-	--	1	10/06/16 09:30	10/08/16 00:35	8,5710C	JO
pH, Final	7.2		SU	-	--	1	10/06/16 09:30	10/08/16 00:35	8,5710C	JO
Incubation Temp, Initial	20		deg. C	-	--	1	10/06/16 09:30	10/08/16 00:35	8,5710C	JO
Incubation Temp, Final	20		deg. C	-	--	1	10/06/16 09:30	10/08/16 00:35	8,5710C	JO
Residual Chlorine, Initial	1.26		mg/l	0.050	--	1	10/06/16 09:30	10/08/16 00:35	8,5710C	JO
Residual Chlorine, Final (as Total)	0.900		mg/l	0.050	--	1	10/06/16 09:30	10/08/16 00:35	8,5710C	JO
Residual Chlorine, Final (as Free)	0.840		mg/l	0.050	--	1	10/06/16 09:30	10/08/16 00:35	8,5710C	JO

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1631649
Report Date: 10/12/16

SAMPLE RESULTS

Lab ID: L1631649-10
Client ID: S-2 DOSE FRIDAY PM
Sample Location: Not Specified
Matrix: Water

Date Collected: 10/05/16 14:35
Date Received: 10/05/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Simulated Distribution System - Westborough Lab										
Chlorine Dose	1.0		mg Cl2/L	-	--	1	10/06/16 09:30	10/08/16 00:35	8,5710C	JO
Incubation Time	39.0		hours	-	--	1	10/06/16 09:30	10/08/16 00:35	8,5710C	JO
pH, Initial	7.1		SU	-	--	1	10/06/16 09:30	10/08/16 00:35	8,5710C	JO
pH, Final	7.5		SU	-	--	1	10/06/16 09:30	10/08/16 00:35	8,5710C	JO
Incubation Temp, Initial	20		deg. C	-	--	1	10/06/16 09:30	10/08/16 00:35	8,5710C	JO
Incubation Temp, Final	20		deg. C	-	--	1	10/06/16 09:30	10/08/16 00:35	8,5710C	JO
Residual Chlorine, Initial	2.26		mg/l	0.050	--	1	10/06/16 09:30	10/08/16 00:35	8,5710C	JO
Residual Chlorine, Final (as Total)	1.81		mg/l	0.050	--	1	10/06/16 09:30	10/08/16 00:35	8,5710C	JO
Residual Chlorine, Final (as Free)	1.72		mg/l	0.050	--	1	10/06/16 09:30	10/08/16 00:35	8,5710C	JO

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1631649
Report Date: 10/12/16

SAMPLE RESULTS

Lab ID: L1631649-11
Client ID: S-1 SATURDAY
Sample Location: Not Specified
Matrix: Water

Date Collected: 10/05/16 14:35
Date Received: 10/05/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Simulated Distribution System - Westborough Lab										
Chlorine Dose	ND		mg Cl2/L	-	--	1	10/06/16 09:30	10/08/16 21:00	8,5710C	JO
Incubation Time	59.5		hours	-	--	1	10/06/16 09:30	10/08/16 21:00	8,5710C	JO
pH, Initial	7.1		SU	-	--	1	10/06/16 09:30	10/08/16 21:00	8,5710C	JO
pH, Final	7.1		SU	-	--	1	10/06/16 09:30	10/08/16 21:00	8,5710C	JO
Incubation Temp, Initial	20		deg. C	-	--	1	10/06/16 09:30	10/08/16 21:00	8,5710C	JO
Incubation Temp, Final	20		deg. C	-	--	1	10/06/16 09:30	10/08/16 21:00	8,5710C	JO
Residual Chlorine, Initial	1.26		mg/l	0.050	--	1	10/06/16 09:30	10/08/16 21:00	8,5710C	JO
Residual Chlorine, Final (as Total)	0.760		mg/l	0.050	--	1	10/06/16 09:30	10/08/16 21:00	8,5710C	JO
Residual Chlorine, Final (as Free)	0.680		mg/l	0.050	--	1	10/06/16 09:30	10/08/16 21:00	8,5710C	JO

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1631649
Report Date: 10/12/16

SAMPLE RESULTS

Lab ID: L1631649-12
Client ID: S-2 SATURDAY
Sample Location: Not Specified
Matrix: Water

Date Collected: 10/05/16 14:35
Date Received: 10/05/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Simulated Distribution System - Westborough Lab										
Chlorine Dose	1.0		mg Cl2/L	-	--	1	10/06/16 09:30	10/08/16 21:00	8,5710C	JO
Incubation Time	59.5		hours	-	--	1	10/06/16 09:30	10/08/16 21:00	8,5710C	JO
pH, Initial	7.1		SU	-	--	1	10/06/16 09:30	10/08/16 21:00	8,5710C	JO
pH, Final	7.0		SU	-	--	1	10/06/16 09:30	10/08/16 21:00	8,5710C	JO
Incubation Temp, Initial	20		deg. C	-	--	1	10/06/16 09:30	10/08/16 21:00	8,5710C	JO
Incubation Temp, Final	20		deg. C	-	--	1	10/06/16 09:30	10/08/16 21:00	8,5710C	JO
Residual Chlorine, Initial	2.26		mg/l	0.050	--	1	10/06/16 09:30	10/08/16 21:00	8,5710C	JO
Residual Chlorine, Final (as Total)	1.68		mg/l	0.050	--	1	10/06/16 09:30	10/08/16 21:00	8,5710C	JO
Residual Chlorine, Final (as Free)	1.57		mg/l	0.050	--	1	10/06/16 09:30	10/08/16 21:00	8,5710C	JO

Project Name: Not Specified **Lab Number:** L1631649
Project Number: Not Specified **Report Date:** 10/12/16

SAMPLE RESULTS

Lab ID: L1631649-13
Client ID: S-1 MONDAY
Sample Location: Not Specified
Matrix: Water

Date Collected: 10/05/16 14:35
Date Received: 10/05/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Simulated Distribution System - Westborough Lab										
Chlorine Dose	ND		mg Cl2/L	-	--	1	10/06/16 09:30	10/10/16 18:00	8,5710C	JO
Incubation Time	104.5		hours	-	--	1	10/06/16 09:30	10/10/16 18:00	8,5710C	JO
pH, Initial	7.1		SU	-	--	1	10/06/16 09:30	10/10/16 18:00	8,5710C	JO
pH, Final	7.2		SU	-	--	1	10/06/16 09:30	10/10/16 18:00	8,5710C	JO
Incubation Temp, Initial	20		deg. C	-	--	1	10/06/16 09:30	10/10/16 18:00	8,5710C	JO
Incubation Temp, Final	20		deg. C	-	--	1	10/06/16 09:30	10/10/16 18:00	8,5710C	JO
Residual Chlorine, Initial	1.26		mg/l	0.050	--	1	10/06/16 09:30	10/10/16 18:00	8,5710C	JO
Residual Chlorine, Final (as Total)	0.540		mg/l	0.050	--	1	10/06/16 09:30	10/10/16 18:00	8,5710C	JO
Residual Chlorine, Final (as Free)	0.500		mg/l	0.050	--	1	10/06/16 09:30	10/10/16 18:00	8,5710C	JO

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1631649
Report Date: 10/12/16

SAMPLE RESULTS

Lab ID: L1631649-14
Client ID: S-2 MONDAY
Sample Location: Not Specified
Matrix: Water

Date Collected: 10/05/16 14:35
Date Received: 10/05/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Simulated Distribution System - Westborough Lab										
Chlorine Dose	1.0		mg Cl2/L	-	--	1	10/06/16 09:30	10/10/16 18:00	8,5710C	JO
Incubation Time	104.5		hours	-	--	1	10/06/16 09:30	10/10/16 18:00	8,5710C	JO
pH, Initial	7.1		SU	-	--	1	10/06/16 09:30	10/10/16 18:00	8,5710C	JO
pH, Final	7.2		SU	-	--	1	10/06/16 09:30	10/10/16 18:00	8,5710C	JO
Incubation Temp, Initial	20		deg. C	-	--	1	10/06/16 09:30	10/10/16 18:00	8,5710C	JO
Incubation Temp, Final	20		deg. C	-	--	1	10/06/16 09:30	10/10/16 18:00	8,5710C	JO
Residual Chlorine, Initial	2.26		mg/l	0.050	--	1	10/06/16 09:30	10/10/16 18:00	8,5710C	JO
Residual Chlorine, Final (as Total)	1.45		mg/l	0.050	--	1	10/06/16 09:30	10/10/16 18:00	8,5710C	JO
Residual Chlorine, Final (as Free)	1.38		mg/l	0.050	--	1	10/06/16 09:30	10/10/16 18:00	8,5710C	JO

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1631649
Report Date: 10/12/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Cooler	**Custody Seal**
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1631649-01A	Plastic 950ml unpreserved	A	7	3.0	Y	Absent	SDS(1)
L1631649-02A	Plastic 950ml unpreserved	A	7	3.0	Y	Absent	SDS(1)
L1631649-03A	Plastic 950ml unpreserved	A	N/A	3.0	Y	Absent	SDS(1)
L1631649-04A	Plastic 950ml unpreserved	A	N/A	3.0	Y	Absent	SDS(1)
L1631649-05A	Plastic 950ml unpreserved	A	N/A	3.0	Y	Absent	SDS(1)
L1631649-06A	Plastic 950ml unpreserved	A	N/A	3.0	Y	Absent	SDS(1)
L1631649-07A	Plastic 950ml unpreserved	A	N/A	3.0	Y	Absent	SDS(1)
L1631649-08A	Plastic 950ml unpreserved	A	N/A	3.0	Y	Absent	SDS(1)
L1631649-09A	Plastic 950ml unpreserved	A	N/A	3.0	Y	Absent	SDS(1)
L1631649-10A	Plastic 950ml unpreserved	A	N/A	3.0	Y	Absent	SDS(1)
L1631649-11A	Plastic 950ml unpreserved	A	N/A	3.0	Y	Absent	SDS(1)
L1631649-12A	Plastic 950ml unpreserved	A	N/A	3.0	Y	Absent	SDS(1)
L1631649-13A	Plastic 950ml unpreserved	A	N/A	3.0	Y	Absent	SDS(1)
L1631649-14A	Plastic 950ml unpreserved	A	N/A	3.0	Y	Absent	SDS(1)

*Values in parentheses indicate holding time in days

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the

Project Name: Not Specified **Lab Number:** L1631649
Project Number: Not Specified **Report Date:** 10/12/16

Data Qualifiers

reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the reporting limit (RL) for the sample.

REFERENCES

8 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. 19th Edition. 1995.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 300: DW: Bromide
EPA 6860: NPW and SCM: Perchlorate
EPA 9010: NPW and SCM: Amenable Cyanide Distillation
EPA 9012B: NPW: Total Cyanide
EPA 9050A: NPW: Specific Conductance
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
SM 2540D: TSS
EPA 3005A NPW
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: ***EPA 3050B***

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F, EPA 353.2**: Nitrate-N**, EPA 351.1, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

Mansfield Facility:

Drinking Water
EPA 200.7: Ba, Be, Cd, Cr, Cu, Ni, Na, Ca. **EPA 200.8:** Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, TL. **EPA 245.1** Hg.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY RECORD

L1631649

Page # ____ of ____ pages

ConnecticutWater

CONNECTICUT WATER COMPANY
93 West Main Street, Clinton, Connecticut 06413
Email: dshah@ctwater.com
Phone: (860) 664-6074 Cell: (860) 853-0447

SELECT LOCATION

Sampler Name: Evan Beaughn

Sample Date: 10-5-2016

Temp: 20 °C

Lab Identification	Sample Identification	Date Sampled	Time Sampled	Required Analyses: pH	Temp	Free & Total Cl2	UV 254	TOC			Comments	Number of bottles
	Williams POE	10/5/16	2:35	X	X	X	X	X				2

Relinquished by:	Evan Beaughn	Received by:	[illegible]
Date/Time:	10-5-16	Date/Time:	10/5/16 1457

Special comments:

* For TC/EC, please use "C" to denote a compliance sample and "N" to denote a non-compliance sample

[illegible] 10/5/16 1824   Rec'd [illegible] 10/5/16 16:26

Appendix B

Appendix B-1

Sampling and Analysis Protocol for October 17, 2016

Field Sampling at Williams WTP

APPENDIX B-1
Sampling and Analysis Protocol for October 17, 2016 Field Sampling at Williams WTP

1. Alpha Lab to send CWC labeled bottles for use on 10/17 as follows:
   - TOC
   - UV-254
   - TTHM
   - SDS-1
   - SDS-2
2. CWC to sample WTP effluent using all 5 labeled bottles and record the following:
   - Time
   - Water Temperature – call in temp to lab so they can set incubator
   - pH
   - Free Chlorine residual
   - WTP flow

   All samples to be kept in a cooler for transport and stored at sample temperature

3. Lab courier to bring 5 samples back to testing facility to do the following:
   a. Record: Time, Temperature, pH, Free chlorine, Total chlorine
   b. Measure TTHM – from respective sample bottle (this is the ambient TTHM from WTP))
   c. Measure TOC – from respective sample bottle
   d. Measure UV-254 from respective sample bottle
   e. Lab to hold ambient sample SDS-1 at required location, temperature, and duration specified by AECOM based on the water age modeling.
   f. Lab to spike sample SDS-2 with chlorine to create a specified Free Chlorine residual, per AECOM direction and hold as specified.
   g. Lab to re-sample bottles SDS-1 and SDS-2 after hold time specified by AECOM and record:
      - Time, Temperature, pH
      - Free chlorine, Total chlorine
      - TTHM

November Field Sampling - Procedure to follow the above protocol except the TOC and UV-254 testing.

**Note the hold time(s) will be based on the initial distribution system hydraulic analysis conducted by AECOM.*

Appendix B-2

Analytical Report L1633177 11-02-16

ANALYTICAL REPORT

Lab Number:	L1633177
Client:	The Connecticut Water Company 93 West Main Street Clinton, CT 06413
ATTN:	Ryan Flemming
Phone:	(860) 853-0447
Project Name:	Not Specified
Project Number:	Not Specified
Report Date:	11/02/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1633177
Report Date: 11/02/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1633177-01	WILLIAMS TREATMENT PLANT	DW	73 GOOSE HILL RD.	10/17/16 11:05	10/17/16
L1633177-02	WILLIAMS TREATMENT PLANT-SDS 1	DW	73 GOOSE HILL RD.	10/17/16 11:05	10/17/16
L1633177-03	WILLIAMS TREATMENT PLANT-SDS 2-FINAL	DW	73 GOOSE HILL RD.	10/17/16 11:05	10/17/16

Project Name:	Not Specified	**Lab Number:**	L1633177
Project Number:	Not Specified	**Report Date:**	11/02/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY

For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name:	Not Specified	**Lab Number:**	L1633177
Project Number:	Not Specified	**Report Date:**	11/02/16

Case Narrative (continued)

Sample Receipt

The sample collection times were specified by the client.

L1633177-01: The sample was received without the container for Total THMs analysis. An aliquot was taken from an unpreserved plastic container and preserved appropriately.

L1633177-02 and -03: The sample was received in an unpreserved plastic container for the SDS analysis.

Volatile Organics by Method 524

The WG948189-6 MS recovery, performed on L1633177-03, is above the acceptance criteria for chloroform (150%); however, the associated LCS recoveries are within overall method allowances. The results of the native sample are considered to have a potentially high bias for this compound.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Michelle M. Morris

Title: Technical Director/Representative Date: 11/02/16

ORGANICS

VOLATILES

Project Name: Not Specified **Lab Number:** L1633177
Project Number: Not Specified **Report Date:** 11/02/16

SAMPLE RESULTS

Lab ID: L1633177-01
Client ID: WILLIAMS TREATMENT PLANT
Sample Location: 73 GOOSE HILL RD.
Matrix: Dw
Analytical Method: 16,524.2
Analytical Date: 10/19/16 15:01
Analyst: GT

Date Collected: 10/17/16 11:05
Date Received: 10/17/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Chloroform	28		ug/l	0.50	--	1
Bromodichloromethane	9.5		ug/l	0.50	--	1
Dibromochloromethane	1.7		ug/l	0.50	--	1
Bromoform	ND		ug/l	0.50	--	1
THMs, Total	39		ug/l	0.50	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	106		80-120
4-Bromofluorobenzene	95		80-120

Project Name:	Not Specified	**Lab Number:**	L1633177
Project Number:	Not Specified	**Report Date:**	11/02/16

SAMPLE RESULTS

Lab ID:	L1633177-02	Date Collected:	10/17/16 11:05
Client ID:	WILLIAMS TREATMENT PLANT-SDS 1	Date Received:	10/17/16
Sample Location:	73 GOOSE HILL RD.	Field Prep:	Not Specified
Matrix:	Dw		
Analytical Method:	16,524.2		
Analytical Date:	11/01/16 16:19		
Analyst:	GT		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Chloroform	47		ug/l	0.50	--	1
Bromodichloromethane	9.8		ug/l	0.50	--	1
Dibromochloromethane	1.7		ug/l	0.50	--	1
Bromoform	ND		ug/l	0.50	--	1
THMs, Total	59		ug/l	0.50	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	105		80-120
4-Bromofluorobenzene	97		80-120

Project Name: Not Specified **Lab Number:** L1633177

Project Number: Not Specified **Report Date:** 11/02/16

SAMPLE RESULTS

Lab ID:	L1633177-03	Date Collected:	10/17/16 11:05
Client ID:	WILLIAMS TREATMENT PLANT-SDS 2-FINAL	Date Received:	10/17/16
Sample Location:	73 GOOSE HILL RD.	Field Prep:	Not Specified
Matrix:	Dw		
Analytical Method:	16,524.2		
Analytical Date:	11/01/16 16:54		
Analyst:	GT		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Chloroform	67		ug/l	0.50	--	1
Bromodichloromethane	12		ug/l	0.50	--	1
Dibromochloromethane	2.0		ug/l	0.50	--	1
Bromoform	ND		ug/l	0.50	--	1
THMs, Total	81		ug/l	0.50	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	102		80-120
4-Bromofluorobenzene	96		80-120

Project Name: Not Specified
Lab Number: L1633177
Project Number: Not Specified
Report Date: 11/02/16

Method Blank Analysis
Batch Quality Control

Analytical Method: 16,524.2
Analytical Date: 10/19/16 12:06
Analyst: GT

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01 Batch: WG942822-10					
Chloroform	ND		ug/l	0.50	--
Bromodichloromethane	ND		ug/l	0.50	--
Dibromochloromethane	ND		ug/l	0.50	--
Bromoform	ND		ug/l	0.50	--
THMs, Total	ND		ug/l	0.50	--

No Tentatively Identified Compounds	ND	ug/l

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	102		80-120
4-Bromofluorobenzene	94		80-120

Project Name:	Not Specified	**Lab Number:**	L1633177
Project Number:	Not Specified	**Report Date:**	11/02/16

Method Blank Analysis
Batch Quality Control

Analytical Method: 16,524.2
Analytical Date: 11/01/16 12:13
Analyst: GT

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 02-03 Batch: WG948189-4					
Chloroform	ND		ug/l	0.50	--
Bromodichloromethane	ND		ug/l	0.50	--
Dibromochloromethane	ND		ug/l	0.50	--
Bromoform	ND		ug/l	0.50	--
THMs, Total	ND		ug/l	0.50	--

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	99		80-120
4-Bromofluorobenzene	95		80-120

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1633177
Report Date: 11/02/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 Batch: WG942822-9								
Dichlorodifluoromethane	75		-		70-130	-		20
Chloromethane	80		-		70-130	-		20
Vinyl chloride	92		-		70-130	-		20
Bromomethane	88		-		70-130	-		20
Chloroethane	105		-		70-130	-		20
Trichlorofluoromethane	90		-		70-130	-		20
1,1-Dichloroethene	92		-		70-130	-		20
Methylene chloride	105		-		70-130	-		20
Methyl tert butyl ether	105		-		70-130	-		20
trans-1,2-Dichloroethene	98		-		70-130	-		20
1,1-Dichloroethane	100		-		70-130	-		20
2,2-Dichloropropane	112		-		70-130	-		20
cis-1,2-Dichloroethene	102		-		70-130	-		20
Chloroform	98		-		70-130	-		20
Bromochloromethane	105		-		70-130	-		20
1,1,1-Trichloroethane	92		-		70-130	-		20
1,1-Dichloropropene	98		-		70-130	-		20
Carbon tetrachloride	88		-		70-130	-		20
1,2-Dichloroethane	98		-		70-130	-		20
Benzene	100		-		70-130	-		20
Trichloroethene	98		-		70-130	-		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1633177
Report Date: 11/02/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 Batch: WG942822-9								
1,2-Dichloropropane	105		-		70-130	-		20
Bromodichloromethane	92		-		70-130	-		20
Dibromomethane	105		-		70-130	-		20
cis-1,3-Dichloropropene	102		-		70-130	-		20
Toluene	98		-		70-130	-		20
trans-1,3-Dichloropropene	118		-		70-130	-		20
1,1,2-Trichloroethane	102		-		70-130	-		20
1,3-Dichloropropane	102		-		70-130	-		20
Tetrachloroethene	98		-		70-130	-		20
Dibromochloromethane	88		-		70-130	-		20
1,2-Dibromoethane	98		-		70-130	-		20
Chlorobenzene	100		-		70-130	-		20
1,1,1,2-Tetrachloroethane	95		-		70-130	-		20
Ethylbenzene	98		-		70-130	-		20
p/m-Xylene	106		-		70-130	-		20
o-Xylene	100		-		70-130	-		20
Styrene	98		-		70-130	-		20
Isopropylbenzene	98		-		70-130	-		20
Bromoform	112		-		70-130	-		20
1,1,2,2-Tetrachloroethane	102		-		70-130	-		20
1,2,3-Trichloropropane	100		-		70-130	-		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1633177
Report Date: 11/02/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 Batch: WG942822-9								
n-Propylbenzene	98		-		70-130	-		20
Bromobenzene	100		-		70-130	-		20
1,3,5-Trimethylbenzene	100		-		70-130	-		20
o-Chlorotoluene	100		-		70-130	-		20
p-Chlorotoluene	98		-		70-130	-		20
tert-Butylbenzene	98		-		70-130	-		20
1,2,4-Trimethylbenzene	102		-		70-130	-		20
sec-Butylbenzene	95		-		70-130	-		20
p-Isopropyltoluene	95		-		70-130	-		20
1,3-Dichlorobenzene	100		-		70-130	-		20
1,4-Dichlorobenzene	92		-		70-130	-		20
n-Butylbenzene	90		-		70-130	-		20
1,2-Dichlorobenzene	95		-		70-130	-		20
1,2-Dibromo-3-chloropropane	102		-		70-130	-		20
1,2,4-Trichlorobenzene	92		-		70-130	-		20
Hexachlorobutadiene	90		-		70-130	-		20
Naphthalene	102		-		70-130	-		20
1,2,3-Trichlorobenzene	100		-		70-130	-		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1633177
Report Date: 11/02/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 Batch: WG942822-9								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichlorobenzene-d4	93				80-120
4-Bromofluorobenzene	100				80-120

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1633177
Report Date: 11/02/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 02-03 Batch: WG948189-3								
Chloroform	110		-		70-130	-		20
Bromodichloromethane	95		-		70-130	-		20
Dibromochloromethane	88		-		70-130	-		20
Bromoform	82		-		70-130	-		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichlorobenzene-d4	102				80-120
4-Bromofluorobenzene	98				80-120

Matrix Spike Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1633177
Report Date: 11/02/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 QC Batch ID: WG942822-6 QC Sample: L1632672-02 Client ID: MS Sample												
Dichlorodifluoromethane	ND	4	3.8	95		-	-		70-130	-		20
Chloromethane	ND	4	3.8	95		-	-		70-130	-		20
Vinyl chloride	ND	4	4.3	108		-	-		70-130	-		20
Bromomethane	ND	4	4.0	100		-	-		70-130	-		20
Chloroethane	ND	4	4.4	110		-	-		70-130	-		20
Trichlorofluoromethane	ND	4	4.4	110		-	-		70-130	-		20
1,1-Dichloroethene	ND	4	4.3	108		-	-		70-130	-		20
Methylene chloride	ND	4	4.5	113		-	-		70-130	-		20
Methyl tert butyl ether	ND	4	4.4	110		-	-		70-130	-		20
trans-1,2-Dichloroethene	ND	4	4.4	110		-	-		70-130	-		20
1,1-Dichloroethane	ND	4	4.5	113		-	-		70-130	-		20
2,2-Dichloropropane	ND	4	4.4	110		-	-		70-130	-		20
cis-1,2-Dichloroethene	ND	4	4.6	115		-	-		70-130	-		20
Chloroform	ND	4	4.5	113		-	-		70-130	-		20
Bromochloromethane	ND	4	4.5	113		-	-		70-130	-		20
1,1,1-Trichloroethane	ND	4	4.3	108		-	-		70-130	-		20
1,1-Dichloropropene	ND	4	4.3	108		-	-		70-130	-		20
Carbon tetrachloride	ND	4	4.1	103		-	-		70-130	-		20
1,2-Dichloroethane	ND	4	4.5	113		-	-		70-130	-		20
Benzene	ND	4	4.5	113		-	-		70-130	-		20
Trichloroethene	ND	4	4.5	113		-	-		70-130	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1633177
Report Date: 11/02/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 QC Batch ID: WG942822-6 QC Sample: L1632672-02 Client ID: MS Sample												
1,2-Dichloropropane	ND	4	4.6	115		-	-		70-130	-		20
Bromodichloromethane	ND	4	4.2	105		-	-		70-130	-		20
Dibromomethane	ND	4	4.4	110		-	-		70-130	-		20
cis-1,3-Dichloropropene	ND	4	4.2	105		-	-		70-130	-		20
Toluene	ND	4	4.4	110		-	-		70-130	-		20
trans-1,3-Dichloropropene	ND	4	4.7	118		-	-		70-130	-		20
1,1,2-Trichloroethane	ND	4	4.4	110		-	-		70-130	-		20
1,3-Dichloropropane	ND	4	4.4	110		-	-		70-130	-		20
Tetrachloroethene	ND	4	4.3	108		-	-		70-130	-		20
Dibromochloromethane	ND	4	4.0	100		-	-		70-130	-		20
1,2-Dibromoethane	ND	4	4.2	105		-	-		70-130	-		20
Chlorobenzene	ND	4	4.6	115		-	-		70-130	-		20
1,1,1,2-Tetrachloroethane	ND	4	4.4	110		-	-		70-130	-		20
Ethylbenzene	ND	4	4.5	113		-	-		70-130	-		20
p/m-Xylene	ND	8	9.2	115		-	-		70-130	-		20
o-Xylene	ND	4	4.5	113		-	-		70-130	-		20
Styrene	ND	4	4.6	115		-	-		70-130	-		20
Isopropylbenzene	ND	4	4.5	113		-	-		70-130	-		20
Bromoform	ND	4	5.0	125		-	-		70-130	-		20
1,1,2,2-Tetrachloroethane	ND	4	4.5	113		-	-		70-130	-		20
1,2,3-Trichloropropane	ND	4	4.4	110		-	-		70-130	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1633177
Report Date: 11/02/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 QC Batch ID: WG942822-6 QC Sample: L1632672-02 Client ID: MS Sample												
n-Propylbenzene	ND	4	4.6	115		-	-		70-130	-		20
Bromobenzene	ND	4	4.6	115		-	-		70-130	-		20
1,3,5-Trimethylbenzene	ND	4	4.5	113		-	-		70-130	-		20
o-Chlorotoluene	ND	4	4.7	118		-	-		70-130	-		20
p-Chlorotoluene	ND	4	4.5	113		-	-		70-130	-		20
tert-Butylbenzene	ND	4	4.5	113		-	-		70-130	-		20
1,2,4-Trimethylbenzene	ND	4	4.6	115		-	-		70-130	-		20
sec-Butylbenzene	ND	4	4.5	113		-	-		70-130	-		20
p-Isopropyltoluene	ND	4	4.4	110		-	-		70-130	-		20
1,3-Dichlorobenzene	ND	4	4.4	110		-	-		70-130	-		20
1,4-Dichlorobenzene	ND	4	4.7	118		-	-		70-130	-		20
n-Butylbenzene	ND	4	4.7	118		-	-		70-130	-		20
1,2-Dichlorobenzene	ND	4	4.8	120		-	-		70-130	-		20
1,2-Dibromo-3-chloropropane	ND	4	4.5	113		-	-		70-130	-		20
1,2,4-Trichlorobenzene	ND	4	4.3	108		-	-		70-130	-		20
Hexachlorobutadiene	ND	4	4.4	110		-	-		70-130	-		20
Naphthalene	ND	4	4.2	105		-	-		70-130	-		20
1,2,3-Trichlorobenzene	ND	4	4.6	115		-	-		70-130	-		20

ALPHA ANALYTICAL

Matrix Spike Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1633177
Report Date: 11/02/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 QC Batch ID: WG942822-6 QC Sample: L1632672-02 Client ID: MS Sample												

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	101				80-120
4-Bromofluorobenzene	99				80-120

Matrix Spike Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1633177
Report Date: 11/02/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 02-03 QC Batch ID: WG948189-6 QC Sample: L1633177-03 Client ID: WILLIAMS TREATMENT PLANT-SDS 2-FINAL												
Chloroform	67	4	73	**150**	Q	-	-		70-130	-		20
Bromodichloromethane	12	4	16	100		-	-		70-130	-		20
Dibromochloromethane	2.0	4	5.9	98		-	-		70-130	-		20
Bromoform	ND	4	3.4	85		-	-		70-130	-		20

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	105				80-120
4-Bromofluorobenzene	101				80-120

Lab Duplicate Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1633177
Report Date: 11/02/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 QC Batch ID: WG942822-5 QC Sample: L1632672-01 Client ID: DUP Sample						
Dichlorodifluoromethane	ND	ND	ug/l	NC		20
Chloromethane	ND	ND	ug/l	NC		20
Vinyl chloride	ND	ND	ug/l	NC		20
Bromomethane	ND	ND	ug/l	NC		20
Chloroethane	ND	ND	ug/l	NC		20
Trichlorofluoromethane	ND	ND	ug/l	NC		20
1,1-Dichloroethene	ND	ND	ug/l	NC		20
Methylene chloride	ND	ND	ug/l	NC		20
Methyl tert butyl ether	ND	ND	ug/l	NC		20
trans-1,2-Dichloroethene	ND	ND	ug/l	NC		20
1,1-Dichloroethane	ND	ND	ug/l	NC		20
2,2-Dichloropropane	ND	ND	ug/l	NC		20
cis-1,2-Dichloroethene	ND	ND	ug/l	NC		20
Chloroform	ND	ND	ug/l	NC		20
Bromochloromethane	ND	ND	ug/l	NC		20
1,1,1-Trichloroethane	ND	ND	ug/l	NC		20
1,1-Dichloropropene	ND	ND	ug/l	NC		20
Carbon tetrachloride	ND	ND	ug/l	NC		20
1,2-Dichloroethane	ND	ND	ug/l	NC		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1633177
Report Date: 11/02/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 QC Batch ID: WG942822-5 QC Sample: L1632672-01 Client ID: DUP Sample					
Benzene	ND	ND	ug/l	NC	20
Trichloroethene	ND	ND	ug/l	NC	20
1,2-Dichloropropane	ND	ND	ug/l	NC	20
Bromodichloromethane	ND	ND	ug/l	NC	20
Dibromomethane	ND	ND	ug/l	NC	20
cis-1,3-Dichloropropene	ND	ND	ug/l	NC	20
Toluene	ND	ND	ug/l	NC	20
trans-1,3-Dichloropropene	ND	ND	ug/l	NC	20
1,1,2-Trichloroethane	ND	ND	ug/l	NC	20
1,3-Dichloropropane	ND	ND	ug/l	NC	20
Tetrachloroethene	ND	ND	ug/l	NC	20
Dibromochloromethane	ND	ND	ug/l	NC	20
1,2-Dibromoethane	ND	ND	ug/l	NC	20
Chlorobenzene	ND	ND	ug/l	NC	20
1,1,1,2-Tetrachloroethane	ND	ND	ug/l	NC	20
Ethylbenzene	ND	ND	ug/l	NC	20
p/m-Xylene	ND	ND	ug/l	NC	20
o-Xylene	ND	ND	ug/l	NC	20
Styrene	ND	ND	ug/l	NC	20

Lab Duplicate Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1633177
Report Date: 11/02/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 QC Batch ID: WG942822-5 QC Sample: L1632672-01 Client ID: DUP Sample					
Isopropylbenzene	ND	ND	ug/l	NC	20
Bromoform	ND	ND	ug/l	NC	20
1,1,2,2-Tetrachloroethane	ND	ND	ug/l	NC	20
1,2,3-Trichloropropane	ND	ND	ug/l	NC	20
n-Propylbenzene	ND	ND	ug/l	NC	20
Xylene (Total)[1]	ND	ND	ug/l	NC	20
Bromobenzene	ND	ND	ug/l	NC	20
Trihalomethanes, Total	ND	ND	ug/l	NC	20
1,3,5-Trimethylbenzene	ND	ND	ug/l	NC	20
o-Chlorotoluene	ND	ND	ug/l	NC	20
p-Chlorotoluene	ND	ND	ug/l	NC	20
tert-Butylbenzene	ND	ND	ug/l	NC	20
1,2,4-Trimethylbenzene	ND	ND	ug/l	NC	20
sec-Butylbenzene	ND	ND	ug/l	NC	20
p-Isopropyltoluene	ND	ND	ug/l	NC	20
1,3-Dichlorobenzene	ND	ND	ug/l	NC	20
1,4-Dichlorobenzene	ND	ND	ug/l	NC	20
n-Butylbenzene	ND	ND	ug/l	NC	20
1,2-Dichlorobenzene	ND	ND	ug/l	NC	20

Lab Duplicate Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1633177
Report Date: 11/02/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 QC Batch ID: WG942822-5 QC Sample: L1632672-01 Client ID: DUP Sample					
1,2-Dibromo-3-chloropropane	ND	ND	ug/l	NC	20
1,2,4-Trichlorobenzene	ND	ND	ug/l	NC	20
Hexachlorobutadiene	ND	ND	ug/l	NC	20
Naphthalene	ND	ND	ug/l	NC	20
1,2,3-Trichlorobenzene	ND	ND	ug/l	NC	20

Surrogate	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	110		108		80-120
4-Bromofluorobenzene	94		97		80-120

Lab Duplicate Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1633177
Report Date: 11/02/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 02-03 QC Batch ID: WG948189-5 QC Sample: L1633177-02 Client ID: WILLIAMS TREATMENT PLANT-SDS 1					
Chloroform	47	48	ug/l	2	20
Bromodichloromethane	9.8	9.7	ug/l	1	20
Dibromochloromethane	1.7	1.6	ug/l	6	20
Bromoform	ND	ND	ug/l	NC	20
THMs, Total	59	59	ug/l	0	20

Surrogate	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	105		103		80-120
4-Bromofluorobenzene	97		94		80-120

INORGANICS
&
MISCELLANEOUS

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1633177
Report Date: 11/02/16

SAMPLE RESULTS

Lab ID: L1633177-01
Client ID: WILLIAMS TREATMENT PLANT
Sample Location: 73 GOOSE HILL RD.
Matrix: Dw

Date Collected: 10/17/16 11:05
Date Received: 10/17/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
UV Absorbance @ 254nm	0.025		Abs/cm	0.005	NA	1	-	10/18/16 21:50	121,5910B	MR
Total Organic Carbon	2.34		mg/l	0.500	--	1	-	10/20/16 07:28	121,5310C	DW

Project Name: Not Specified | **Lab Number:** L1633177

Project Number: Not Specified | **Report Date:** 11/02/16

SAMPLE RESULTS

Lab ID: L1633177-02
Client ID: WILLIAMS TREATMENT PLANT-SDS 1
Sample Location: 73 GOOSE HILL RD.
Matrix: Dw
Date Collected: 10/17/16 11:05
Date Received: 10/17/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Simulated Distribution System - Westborough Lab										
Chlorine Dose	ND		mg Cl2/L	-	--	1	10/19/16 16:30	10/26/16 16:30	8,5710C	JO
Incubation Time	168		hours	-	--	1	10/19/16 16:30	10/26/16 16:30	8,5710C	JO
pH, Initial	6.7		SU	-	--	1	10/19/16 16:30	10/26/16 16:30	8,5710C	JO
pH, Final	6.9		SU	-	--	1	10/19/16 16:30	10/26/16 16:30	8,5710C	JO
Incubation Temp, Initial	18		deg. C	-	--	1	10/19/16 16:30	10/26/16 16:30	8,5710C	JO
Incubation Temp, Final	18		deg. C	-	--	1	10/19/16 16:30	10/26/16 16:30	8,5710C	JO
Residual Chlorine, Initial	0.870		mg/l	0.050	--	1	10/19/16 16:30	10/26/16 16:30	8,5710C	JO
Residual Chlorine, Final (as Total)	0.140		mg/l	0.050	--	1	10/19/16 16:30	10/26/16 16:30	8,5710C	JO
Residual Chlorine, Final (as Free)	0.120		mg/l	0.050	--	1	10/19/16 16:30	10/26/16 16:30	8,5710C	JO

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1633177
Report Date: 11/02/16

SAMPLE RESULTS

Lab ID: L1633177-03
Client ID: WILLIAMS TREATMENT PLANT-SDS 2
Sample Location: 73 GOOSE HILL RD.
Matrix: Dw

Date Collected: 10/17/16 11:05
Date Received: 10/17/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Simulated Distribution System - Westborough Lab										
Chlorine Dose	2.00		mg Cl2/L	-	--	1	10/19/16 16:30	10/26/16 16:30	8,5710C	JO
Incubation Time	168		hours	-	--	1	10/19/16 16:30	10/26/16 16:30	8,5710C	JO
pH, Initial	6.8		SU	-	--	1	10/19/16 16:30	10/26/16 16:30	8,5710C	JO
pH, Final	7.1		SU	-	--	1	10/19/16 16:30	10/26/16 16:30	8,5710C	JO
Incubation Temp, Initial	18		deg. C	-	--	1	10/19/16 16:30	10/26/16 16:30	8,5710C	JO
Incubation Temp, Final	18		deg. C	-	--	1	10/19/16 16:30	10/26/16 16:30	8,5710C	JO
Residual Chlorine, Initial	0.830		mg/l	0.050	--	1	10/19/16 16:30	10/26/16 16:30	8,5710C	JO
Residual Chlorine, Final (as Total)	1.06		mg/l	0.050	--	1	10/19/16 16:30	10/26/16 16:30	8,5710C	JO
Residual Chlorine, Final (as Free)	1.00		mg/l	0.050	--	1	10/19/16 16:30	10/26/16 16:30	8,5710C	JO

Project Name:

Project Number: Not Specified

Lab Number: L1633177

Report Date: 11/02/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG943380-1										
UV Absorbance @ 254nm	ND		Abs/cm	0.005	NA	1	-	10/18/16 21:50	121,5910B	MR
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG943621-1										
Total Organic Carbon	ND		mg/l	0.500	--	1	-	10/20/16 07:28	121,5310C	DW

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1633177
Report Date: 11/02/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG943380-2								
UV Absorbance @ 254nm	111		-			-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG943621-2								
Total Organic Carbon	104		-		90-110	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1633177
Report Date: 11/02/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG943621-4 QC Sample: L1633666-01 Client ID: MS Sample												
Total Organic Carbon	35.1	80	116	101		-	-		80-120	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1633177
Report Date: 11/02/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG943380-3 QC Sample: L1633177-01 Client ID: WILLIAMS TREATMENT PLANT						
UV Absorbance @ 254nm	0.025	0.025	Abs/cm	0		
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG943621-3 QC Sample: L1633666-01 Client ID: DUP Sample						
Total Organic Carbon	35.1	35.0	mg/l	0		20

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1633177
Report Date: 11/02/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1633177-01A	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	TOC-5310(28)
L1633177-01B	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	TOC-5310(28)
L1633177-01C	Vial H2SO4 preserved	A	N/A	5.1	Y	Absent	TOC-5310(28)
L1633177-01D	Vial HCl preserved split	A	N/A	5.1	Y	Absent	524-THM(14)
L1633177-01F	Amber 250ml unpreserved	A	7	5.1	Y	Absent	UV-254(2)
L1633177-02A	Plastic 950ml unpreserved	A	7	5.1	Y	Absent	SDS(1)
L1633177-02Y	Vial Ascorbic Acid/HCl preserved	A	N/A	5.1	Y	Absent	524-THM(14)
L1633177-02Z	Vial Ascorbic Acid/HCl preserved	A	N/A	5.1	Y	Absent	524-THM(14)
L1633177-03A	Plastic 950ml unpreserved	A	7	5.1	Y	Absent	SDS(1)
L1633177-03Y	Vial Ascorbic Acid/HCl preserved	A	N/A	5.1	Y	Absent	524-THM(14)
L1633177-03Z	Vial Ascorbic Acid/HCl preserved	A	N/A	5.1	Y	Absent	524-THM(14)

*Values in parentheses indicate holding time in days

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the

Project Name: Not Specified **Lab Number:** L1633177

Project Number: Not Specified **Report Date:** 11/02/16

Data Qualifiers

reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the reporting limit (RL) for the sample.

REFERENCES

8 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. 19th Edition. 1995.

16 Methods for the Determination of Organic Compounds in Drinking Water - Supplement II. EPA/600/R-92/129, August 1992.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 300: DW: Bromide
EPA 6860: NPW and SCM: Perchlorate
EPA 9010: NPW and SCM: Amenable Cyanide Distillation
EPA 9012B: NPW: Total Cyanide
EPA 9050A: NPW: Specific Conductance
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
SM 2540D: TSS
EPA 3005A NPW
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: ***EPA 3050B***

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F, EPA 353.2**: Nitrate-N**, EPA 351.1, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

Mansfield Facility:

Drinking Water
EPA 200.7: Ba, Be, Cd, Cr, Cu, Ni, Na, Ca. **EPA 200.8:** Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, TL. **EPA 245.1** Hg.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL

8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Date Rec'd in Lab: 10/17/16

ALPHA Job #: L1633177

Client Information

Client: CT Water

Address: 73 Goose Hill Rd Chester

Phone:

Email:

Project Information

Project Name:

Project Location: 73 Goose Hill Rd

Project #:

Project Manager: Ryan Fleming

ALPHA Quote #:

Turn-Around Time

☐ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due:

Report Information - Data Deliverables

☐ ADEx ☐ EMAIL

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program ______ Criteria ______

Additional Project Information:

ANALYSIS

VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; TOC; UV-254; TTHM; SDS-1; SDS-2

SAMPLE INFO: Filtration ☐ Field ☐ Lab to do; Preservation ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	TOC	UV-254	TTHM	SDS-1	SDS-2	Sample Comments	TOTAL # BOTTLES
33177-01	Williams Treatment Plant	10/17	11:05		CS	✓	✓	✓			CL2 - .74	
		10/17	11:35		CS						Temp 18°C	
02,03	Williams Treatment Plant	10/17	11:35		CS				✓	✓	Flow .500 MGD	
											PH - 7.10	

Container Type:

Preservative:

Container Type	Preservative
P= Plastic	A= None
A= Amber glass	B= HCl
V= Vial	C= HNO_3
G= Glass	D= H_2SO_4
B= Bacteria cup	E= NaOH
C= Cube	F= MeOH
O= Other	G= $NaHSO_4$
E= Encore	H = $Na_2S_2O_3$
D= BOD Bottle	I= Ascorbic Acid
	J = NH_4Cl
	K= Zn Acetate
	O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Colin Stegman	10/17 11:20	[signature]	10/17/16 11:20
[signature]	10/17/16 15:20	[signature]	10/17/16 15:20

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

Appendix C

Appendix C-1

Sampling and Analysis Protocol for October 17, 2016
Field Sampling at Williams WTP

APPENDIX C-1
Sampling and Analysis Protocol for October 17, 2016 Field Sampling at Williams WTP

1. Alpha Lab to send CWC labeled bottles for use as follows:
    - TOC
    - SDS-1
    - SDS-2
2. CWC to sample WTP effluent using all 3 labeled bottles and record the following:
    - Time
    - Water Temperature – call in temp to lab so they can set incubator
    - pH
    - Free Chlorine residual
    - WTP flow

    All samples to be kept in a cooler for transport and stored at sample temperature

3. Lab courier to bring 3 samples back to testing facility to do the following:
    a. Record: Time, Temperature, pH, Free chlorine, Total chlorine
    b. Measure TOC – from respective sample bottle
    c. Lab to hold ambient sample SDS-1 at required location, temperature, and duration specified by AECOM based on the water age modeling.
    d. Lab to spike sample SDS-2 with chlorine to create a specified Free Chlorine residual, per AECOM direction and hold as specified. (1.5 mg/l)
    e. Lab to re-sample bottles SDS-1 and SDS-2 after hold time specified by AECOM and record:
        - Time, Temperature, pH
        - Free chlorine, Total chlorine
        - TTHM
        - HAA

**Note the hold time(s) is 7 days based on the initial distribution system hydraulic analysis conducted by AECOM*

Appendix C-2

Analytical Report L1636251 11-30-16

ANALYTICAL REPORT

Lab Number:	L1636251
Client:	The Connecticut Water Company 93 West Main Street Clinton, CT 06413
ATTN:	Ryan Flemming
Phone:	(860) 853-0447
Project Name:	Not Specified
Project Number:	Not Specified
Report Date:	11/30/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1636251
Report Date: 11/30/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1636251-01	WILLIAMS TREATED EFFLUENT	DW	Not Specified	11/09/16 10:30	11/09/16
L1636251-02	WILLIAMS TREATED EFFLUENT-SDS1	DW	Not Specified	11/09/16 10:30	11/09/16
L1636251-03	WILLIAMS TREATED EFFLUENT-SDS2	DW	Not Specified	11/09/16 10:30	11/09/16
L1636251-04	TRIP BLANK	WATER	Not Specified	11/07/16 00:00	11/09/16

Project Name:	Not Specified	**Lab Number:**	L1636251
Project Number:	Not Specified	**Report Date:**	11/30/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY

For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Case Narrative (continued)

Report Submission

The analysis of HAA was subcontracted. A copy of the laboratory report is included as an addendum. Please note: This data is only available in PDF format and is not available on Data Merger.

Sample Receipt

A Trip Blank was received in the laboratory, but not listed on the Chain of Custody, and was not analyzed.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Kelly Stenstrom

Title: Technical Director/Representative Date: 11/30/16

ORGANICS

VOLATILES

Project Name:	Not Specified	**Lab Number:**	L1636251
Project Number:	Not Specified	**Report Date:**	11/30/16

SAMPLE RESULTS

Lab ID:	L1636251-02	Date Collected:	11/09/16 10:30
Client ID:	WILLIAMS TREATED EFFLUENT-SDS1	Date Received:	11/09/16
Sample Location:	Not Specified	Field Prep:	Not Specified
Matrix:	Dw		
Analytical Method:	16,524.2		
Analytical Date:	11/17/16 17:35		
Analyst:	GT		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Chloroform	50		ug/l	0.50	--	1
Bromodichloromethane	12		ug/l	0.50	--	1
Dibromochloromethane	1.6		ug/l	0.50	--	1
Bromoform	ND		ug/l	0.50	--	1
THMs, Total	64		ug/l	0.50	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	104		80-120
4-Bromofluorobenzene	97		80-120

Project Name: Not Specified **Lab Number:** L1636251

Project Number: Not Specified **Report Date:** 11/30/16

SAMPLE RESULTS

Lab ID:	L1636251-03	Date Collected:	11/09/16 10:30
Client ID:	WILLIAMS TREATED EFFLUENT-SDS2	Date Received:	11/09/16
Sample Location:	Not Specified	Field Prep:	Not Specified
Matrix:	Dw		
Analytical Method:	16,524.2		
Analytical Date:	11/17/16 18:10		
Analyst:	GT		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Chloroform	52		ug/l	0.50	--	1
Bromodichloromethane	11		ug/l	0.50	--	1
Dibromochloromethane	1.7		ug/l	0.50	--	1
Bromoform	ND		ug/l	0.50	--	1
THMs, Total	65		ug/l	0.50	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	103		80-120
4-Bromofluorobenzene	98		80-120

Project Name:	Not Specified	**Lab Number:**	L1636251
Project Number:	Not Specified	**Report Date:**	11/30/16

Method Blank Analysis
Batch Quality Control

Analytical Method: 16,524.2
Analytical Date: 11/17/16 10:37
Analyst: GT

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 02-03 Batch: WG953825-4					
Chloroform	ND		ug/l	0.50	--
Bromodichloromethane	ND		ug/l	0.50	--
Dibromochloromethane	ND		ug/l	0.50	--
Bromoform	ND		ug/l	0.50	--
THMs, Total	ND		ug/l	0.50	--

Tentatively Identified Compounds		
No Tentatively Identified Compounds	ND	ug/l

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	104		80-120
4-Bromofluorobenzene	97		80-120

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1636251
Report Date: 11/30/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 02-03 Batch: WG953825-3								
Dichlorodifluoromethane	102		-		70-130	-		20
Chloromethane	108		-		70-130	-		20
Vinyl chloride	110		-		70-130	-		20
Bromomethane	100		-		70-130	-		20
Chloroethane	100		-		70-130	-		20
Trichlorofluoromethane	108		-		70-130	-		20
1,1-Dichloroethene	108		-		70-130	-		20
Methylene chloride	95		-		70-130	-		20
Methyl tert butyl ether	98		-		70-130	-		20
trans-1,2-Dichloroethene	102		-		70-130	-		20
1,1-Dichloroethane	105		-		70-130	-		20
2,2-Dichloropropane	98		-		70-130	-		20
cis-1,2-Dichloroethene	100		-		70-130	-		20
Chloroform	105		-		70-130	-		20
Bromochloromethane	100		-		70-130	-		20
1,1,1-Trichloroethane	105		-		70-130	-		20
1,1-Dichloropropene	110		-		70-130	-		20
Carbon tetrachloride	100		-		70-130	-		20
1,2-Dichloroethane	100		-		70-130	-		20
Benzene	105		-		70-130	-		20
Trichloroethene	100		-		70-130	-		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1636251
Report Date: 11/30/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 02-03 Batch: WG953825-3								
1,2-Dichloropropane	100		-		70-130	-		20
Bromodichloromethane	98		-		70-130	-		20
Dibromomethane	98		-		70-130	-		20
cis-1,3-Dichloropropene	95		-		70-130	-		20
Toluene	105		-		70-130	-		20
trans-1,3-Dichloropropene	95		-		70-130	-		20
1,1,2-Trichloroethane	98		-		70-130	-		20
1,3-Dichloropropane	98		-		70-130	-		20
Tetrachloroethene	100		-		70-130	-		20
Dibromochloromethane	95		-		70-130	-		20
1,2-Dibromoethane	95		-		70-130	-		20
Chlorobenzene	100		-		70-130	-		20
1,1,1,2-Tetrachloroethane	98		-		70-130	-		20
Ethylbenzene	102		-		70-130	-		20
p/m-Xylene	102		-		70-130	-		20
o-Xylene	100		-		70-130	-		20
Styrene	102		-		70-130	-		20
Isopropylbenzene	102		-		70-130	-		20
Bromoform	85		-		70-130	-		20
1,1,2,2-Tetrachloroethane	95		-		70-130	-		20
1,2,3-Trichloropropane	98		-		70-130	-		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1636251
Report Date: 11/30/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 02-03 Batch: WG953825-3								
n-Propylbenzene	102		-		70-130	-		20
Bromobenzene	102		-		70-130	-		20
1,3,5-Trimethylbenzene	100		-		70-130	-		20
o-Chlorotoluene	105		-		70-130	-		20
p-Chlorotoluene	100		-		70-130	-		20
tert-Butylbenzene	105		-		70-130	-		20
1,2,4-Trimethylbenzene	102		-		70-130	-		20
sec-Butylbenzene	102		-		70-130	-		20
p-Isopropyltoluene	102		-		70-130	-		20
1,3-Dichlorobenzene	102		-		70-130	-		20
1,4-Dichlorobenzene	100		-		70-130	-		20
n-Butylbenzene	100		-		70-130	-		20
1,2-Dichlorobenzene	100		-		70-130	-		20
1,2-Dibromo-3-chloropropane	102		-		70-130	-		20
1,2,4-Trichlorobenzene	100		-		70-130	-		20
Hexachlorobutadiene	100		-		70-130	-		20
Naphthalene	92		-		70-130	-		20
1,2,3-Trichlorobenzene	98		-		70-130	-		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1636251
Report Date: 11/30/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits

Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 02-03 Batch: WG953825-3

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichlorobenzene-d4	97				80-120
4-Bromofluorobenzene	100				80-120

Matrix Spike Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1636251
Report Date: 11/30/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab	Associated sample(s): 02-03	QC Batch ID: WG953825-6	QC Sample: L1637370-02	Client ID: MS Sample								
Dichlorodifluoromethane	ND	4	4.8	120		-	-		70-130	-		20
Chloromethane	ND	4	4.3	108		-	-		70-130	-		20
Vinyl chloride	ND	4	4.4	110		-	-		70-130	-		20
Bromomethane	ND	4	3.4	85		-	-		70-130	-		20
Chloroethane	ND	4	4.4	110		-	-		70-130	-		20
Trichlorofluoromethane	ND	4	4.7	118		-	-		70-130	-		20
1,1-Dichloroethene	ND	4	4.6	115		-	-		70-130	-		20
Methylene chloride	ND	4	4.2	105		-	-		70-130	-		20
Methyl tert butyl ether	ND	4	4.5	113		-	-		70-130	-		20
trans-1,2-Dichloroethene	ND	4	4.4	110		-	-		70-130	-		20
1,1-Dichloroethane	ND	4	4.4	110		-	-		70-130	-		20
2,2-Dichloropropane	ND	4	3.9	98		-	-		70-130	-		20
cis-1,2-Dichloroethene	ND	4	4.5	113		-	-		70-130	-		20
Chloroform	ND	4	4.4	110		-	-		70-130	-		20
Bromochloromethane	ND	4	4.5	113		-	-		70-130	-		20
1,1,1-Trichloroethane	ND	4	4.5	113		-	-		70-130	-		20
1,1-Dichloropropene	ND	4	4.5	113		-	-		70-130	-		20
Carbon tetrachloride	ND	4	4.5	113		-	-		70-130	-		20
1,2-Dichloroethane	ND	4	4.5	113		-	-		70-130	-		20
Benzene	ND	4	4.4	110		-	-		70-130	-		20
Trichloroethene	ND	4	4.6	115		-	-		70-130	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1636251
Report Date: 11/30/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab	Associated sample(s): 02-03	QC Batch ID: WG953825-6	QC Sample: L1637370-02	Client ID: MS Sample								
1,2-Dichloropropane	ND	4	4.3	108		-	-		70-130	-		20
Bromodichloromethane	ND	4	4.2	105		-	-		70-130	-		20
Dibromomethane	ND	4	4.4	110		-	-		70-130	-		20
cis-1,3-Dichloropropene	ND	4	3.9	98		-	-		70-130	-		20
Toluene	ND	4	4.4	110		-	-		70-130	-		20
trans-1,3-Dichloropropene	ND	4	3.8	95		-	-		70-130	-		20
1,1,2-Trichloroethane	ND	4	4.5	113		-	-		70-130	-		20
1,3-Dichloropropane	ND	4	4.4	110		-	-		70-130	-		20
Tetrachloroethene	ND	4	4.4	110		-	-		70-130	-		20
Dibromochloromethane	ND	4	4.0	100		-	-		70-130	-		20
1,2-Dibromoethane	ND	4	4.3	108		-	-		70-130	-		20
Chlorobenzene	ND	4	4.6	115		-	-		70-130	-		20
1,1,1,2-Tetrachloroethane	ND	4	4.4	110		-	-		70-130	-		20
Ethylbenzene	ND	4	4.5	113		-	-		70-130	-		20
p/m-Xylene	ND	8	9.1	114		-	-		70-130	-		20
o-Xylene	ND	4	4.5	113		-	-		70-130	-		20
Styrene	ND	4	4.5	113		-	-		70-130	-		20
Isopropylbenzene	ND	4	4.6	115		-	-		70-130	-		20
Bromoform	ND	4	4.2	105		-	-		70-130	-		20
1,1,2,2-Tetrachloroethane	ND	4	4.9	123		-	-		70-130	-		20
1,2,3-Trichloropropane	ND	4	4.8	120		-	-		70-130	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1636251
Report Date: 11/30/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab	Associated sample(s): 02-03	QC Batch ID: WG953825-6	QC Sample: L1637370-02	Client ID: MS Sample								
n-Propylbenzene	ND	4	4.5	113		-	-		70-130	-		20
Bromobenzene	ND	4	4.5	113		-	-		70-130	-		20
1,3,5-Trimethylbenzene	ND	4	4.6	115		-	-		70-130	-		20
o-Chlorotoluene	ND	4	4.5	113		-	-		70-130	-		20
p-Chlorotoluene	ND	4	4.3	108		-	-		70-130	-		20
tert-Butylbenzene	ND	4	4.6	115		-	-		70-130	-		20
1,2,4-Trimethylbenzene	ND	4	4.6	115		-	-		70-130	-		20
sec-Butylbenzene	ND	4	4.7	118		-	-		70-130	-		20
p-Isopropyltoluene	ND	4	4.7	118		-	-		70-130	-		20
1,3-Dichlorobenzene	ND	4	4.4	110		-	-		70-130	-		20
1,4-Dichlorobenzene	ND	4	4.4	110		-	-		70-130	-		20
n-Butylbenzene	ND	4	4.5	113		-	-		70-130	-		20
1,2-Dichlorobenzene	ND	4	4.5	113		-	-		70-130	-		20
1,2-Dibromo-3-chloropropane	ND	4	4.9	123		-	-		70-130	-		20
1,2,4-Trichlorobenzene	ND	4	4.4	110		-	-		70-130	-		20
Hexachlorobutadiene	ND	4	4.6	115		-	-		70-130	-		20
Naphthalene	ND	4	4.5	113		-	-		70-130	-		20
1,2,3-Trichlorobenzene	ND	4	4.4	110		-	-		70-130	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1636251
Report Date: 11/30/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 02-03 QC Batch ID: WG953825-6 QC Sample: L1637370-02 Client ID: MS Sample												

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	104				80-120
4-Bromofluorobenzene	105				80-120

Lab Duplicate Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1636251
Report Date: 11/30/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 02-03 QC Batch ID: WG953825-5 QC Sample: L1637370-01 Client ID: DUP Sample						
Dichlorodifluoromethane	ND	ND	ug/l	NC		20
Chloromethane	ND	ND	ug/l	NC		20
Vinyl chloride	ND	ND	ug/l	NC		20
Bromomethane	ND	ND	ug/l	NC		20
Chloroethane	ND	ND	ug/l	NC		20
Trichlorofluoromethane	ND	ND	ug/l	NC		20
1,1-Dichloroethene	ND	ND	ug/l	NC		20
Methylene chloride	ND	ND	ug/l	NC		20
Methyl tert butyl ether	ND	ND	ug/l	NC		20
trans-1,2-Dichloroethene	ND	ND	ug/l	NC		20
1,1-Dichloroethane	ND	ND	ug/l	NC		20
2,2-Dichloropropane	ND	ND	ug/l	NC		20
cis-1,2-Dichloroethene	ND	ND	ug/l	NC		20
Chloroform	ND	ND	ug/l	NC		20
Bromochloromethane	ND	ND	ug/l	NC		20
1,1,1-Trichloroethane	ND	ND	ug/l	NC		20
1,1-Dichloropropene	ND	ND	ug/l	NC		20
Carbon tetrachloride	ND	ND	ug/l	NC		20
1,2-Dichloroethane	ND	ND	ug/l	NC		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1636251
Report Date: 11/30/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 02-03 QC Batch ID: WG953825-5 QC Sample: L1637370-01 Client ID: DUP Sample					
Benzene	ND	ND	ug/l	NC	20
Trichloroethene	ND	ND	ug/l	NC	20
1,2-Dichloropropane	ND	ND	ug/l	NC	20
Bromodichloromethane	ND	ND	ug/l	NC	20
Dibromomethane	ND	ND	ug/l	NC	20
cis-1,3-Dichloropropene	ND	ND	ug/l	NC	20
Toluene	ND	ND	ug/l	NC	20
trans-1,3-Dichloropropene	ND	ND	ug/l	NC	20
1,1,2-Trichloroethane	ND	ND	ug/l	NC	20
1,3-Dichloropropane	ND	ND	ug/l	NC	20
Tetrachloroethene	ND	ND	ug/l	NC	20
Dibromochloromethane	ND	ND	ug/l	NC	20
1,2-Dibromoethane	ND	ND	ug/l	NC	20
Chlorobenzene	ND	ND	ug/l	NC	20
1,1,1,2-Tetrachloroethane	ND	ND	ug/l	NC	20
Ethylbenzene	ND	ND	ug/l	NC	20
p/m-Xylene	ND	ND	ug/l	NC	20
o-Xylene	ND	ND	ug/l	NC	20
Styrene	ND	ND	ug/l	NC	20

Lab Duplicate Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1636251
Report Date: 11/30/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 02-03 QC Batch ID: WG953825-5 QC Sample: L1637370-01 Client ID: DUP Sample					
Isopropylbenzene	ND	ND	ug/l	NC	20
Bromoform	ND	ND	ug/l	NC	20
1,1,2,2-Tetrachloroethane	ND	ND	ug/l	NC	20
1,2,3-Trichloropropane	ND	ND	ug/l	NC	20
n-Propylbenzene	ND	ND	ug/l	NC	20
Xylene (Total)[1]	ND	ND	ug/l	NC	20
Bromobenzene	ND	ND	ug/l	NC	20
Trihalomethanes, Total	ND	ND	ug/l	NC	20
1,3,5-Trimethylbenzene	ND	ND	ug/l	NC	20
o-Chlorotoluene	ND	ND	ug/l	NC	20
p-Chlorotoluene	ND	ND	ug/l	NC	20
tert-Butylbenzene	ND	ND	ug/l	NC	20
1,2,4-Trimethylbenzene	ND	ND	ug/l	NC	20
sec-Butylbenzene	ND	ND	ug/l	NC	20
p-Isopropyltoluene	ND	ND	ug/l	NC	20
1,3-Dichlorobenzene	ND	ND	ug/l	NC	20
1,4-Dichlorobenzene	ND	ND	ug/l	NC	20
n-Butylbenzene	ND	ND	ug/l	NC	20
1,2-Dichlorobenzene	ND	ND	ug/l	NC	20

Lab Duplicate Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1636251
Report Date: 11/30/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 02-03 QC Batch ID: WG953825-5 QC Sample: L1637370-01 Client ID: DUP Sample					
1,2-Dibromo-3-chloropropane	ND	ND	ug/l	NC	20
1,2,4-Trichlorobenzene	ND	ND	ug/l	NC	20
Hexachlorobutadiene	ND	ND	ug/l	NC	20
Naphthalene	ND	ND	ug/l	NC	20
1,2,3-Trichlorobenzene	ND	ND	ug/l	NC	20

Surrogate	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	105		108		80-120
4-Bromofluorobenzene	99		100		80-120

INORGANICS
&
MISCELLANEOUS

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1636251
Report Date: 11/30/16

SAMPLE RESULTS

Lab ID: L1636251-01
Client ID: WILLIAMS TREATED EFFLUENT
Sample Location: Not Specified
Matrix: Dw

Date Collected: 11/09/16 10:30
Date Received: 11/09/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Total Organic Carbon	2.02		mg/l	0.500	--	1	-	11/16/16 07:10	121,5310C	DW

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1636251
Report Date: 11/30/16

SAMPLE RESULTS

Lab ID: L1636251-02
Client ID: WILLIAMS TREATED EFFLUENT-SDS1
Sample Location: Not Specified
Matrix: Dw

Date Collected: 11/09/16 10:30
Date Received: 11/09/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Simulated Distribution System - Westborough Lab										
Chlorine Dose	ND		mg Cl2/L	-	--	1	11/10/16 14:45	11/17/16 14:45	8,5710C	JO
Incubation Time	168		hours	-	--	1	11/10/16 14:45	11/17/16 14:45	8,5710C	JO
pH, Initial	7.1		SU	-	--	1	11/10/16 14:45	11/17/16 14:45	8,5710C	JO
pH, Final	6.8		SU	-	--	1	11/10/16 14:45	11/17/16 14:45	8,5710C	JO
Incubation Temp, Initial	12		deg. C	-	--	1	11/10/16 14:45	11/17/16 14:45	8,5710C	JO
Incubation Temp, Final	12		deg. C	-	--	1	11/10/16 14:45	11/17/16 14:45	8,5710C	JO
Residual Chlorine, Initial	0.950		mg/l	0.050	--	1	11/10/16 14:45	11/17/16 14:45	8,5710C	JO
Residual Chlorine, Final (as Total)	0.410		mg/l	0.050	--	1	11/10/16 14:45	11/17/16 14:45	8,5710C	JO
Residual Chlorine, Final (as Free)	0.370		mg/l	0.050	--	1	11/10/16 14:45	11/17/16 14:45	8,5710C	JO

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1636251
Report Date: 11/30/16

SAMPLE RESULTS

Lab ID: L1636251-03
Client ID: WILLIAMS TREATED EFFLUENT-SDS2
Sample Location: Not Specified
Matrix: Dw

Date Collected: 11/09/16 10:30
Date Received: 11/09/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Simulated Distribution System - Westborough Lab										
Chlorine Dose	1.5		mg Cl2/L	-	--	1	11/10/16 14:45	11/17/16 14:45	8,5710C	JO
Incubation Time	168		hours	-	--	1	11/10/16 14:45	11/17/16 14:45	8,5710C	JO
pH, Initial	7.1		SU	-	--	1	11/10/16 14:45	11/17/16 14:45	8,5710C	JO
pH, Final	6.7		SU	-	--	1	11/10/16 14:45	11/17/16 14:45	8,5710C	JO
Incubation Temp, Initial	12		deg. C	-	--	1	11/10/16 14:45	11/17/16 14:45	8,5710C	JO
Incubation Temp, Final	12		deg. C	-	--	1	11/10/16 14:45	11/17/16 14:45	8,5710C	JO
Residual Chlorine, Initial	0.950		mg/l	0.050	--	1	11/10/16 14:45	11/17/16 14:45	8,5710C	JO
Residual Chlorine, Final (as Total)	0.890		mg/l	0.050	--	1	11/10/16 14:45	11/17/16 14:45	8,5710C	JO
Residual Chlorine, Final (as Free)	0.840		mg/l	0.050	--	1	11/10/16 14:45	11/17/16 14:45	8,5710C	JO

Project Name:

Lab Number: L1636251

Project Number: Not Specified

Report Date: 11/30/16

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG952743-1										
Total Organic Carbon	ND		mg/l	0.500	--	1	-	11/16/16 07:10	121,5310C	DW

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified

Project Number: Not Specified

Lab Number: L1636251

Report Date: 11/30/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG952743-2								
Total Organic Carbon	90		-		90-110	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L1636251
Report Date: 11/30/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG952743-4 QC Sample: L1637138-01 Client ID: MS Sample												
Total Organic Carbon	18.3	40	56.4	95		-	-		80-120	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1636251
Report Date: 11/30/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG952743-3 QC Sample: L1637138-01 Client ID: DUP Sample						
Total Organic Carbon	18.3	18.2	mg/l	1		20

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1636251
Report Date: 11/30/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	**Custody Seal**
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1636251-01A	Vial H2SO4 preserved	A	N/A	2.4	Y	Absent	TOC-5310(28)
L1636251-01B	Vial H2SO4 preserved	A	N/A	2.4	Y	Absent	TOC-5310(28)
L1636251-02A	Amber 1000ml unpreserved	A	7	2.4	Y	Absent	SDS(1)
L1636251-02B	Amber 1000ml unpreserved	A	7	2.4	Y	Absent	SDS(1)
L1636251-02C	Vial Ascorbic Acid/HCl preserved	A	N/A	2.4	Y	Absent	524-THM(14)
L1636251-02D	Vial Ascorbic Acid/HCl preserved	A	N/A	2.4	Y	Absent	524-THM(14)
L1636251-02E	Vial NH4Cl preserved split	A	N/A	2.4	Y	Absent	SUB-HAA(9)
L1636251-02F	Vial NH4Cl preserved split	A	N/A	2.4	Y	Absent	SUB-HAA(9)
L1636251-03A	Amber 1000ml unpreserved	A	7	2.4	Y	Absent	SDS(1)
L1636251-03B	Amber 1000ml unpreserved	A	7	2.4	Y	Absent	SDS(1)
L1636251-03C	Vial Ascorbic Acid/HCl preserved	A	N/A	2.4	Y	Absent	524-THM(14)
L1636251-03D	Vial Ascorbic Acid/HCl preserved	A	N/A	2.4	Y	Absent	524-THM(14)
L1636251-03E	Vial NH4Cl preserved split	A	N/A	2.4	Y	Absent	SUB-HAA(9)
L1636251-03F	Vial NH4Cl preserved split	A	N/A	2.4	Y	Absent	SUB-HAA(9)
L1636251-04A	Vial Ascorbic Acid/HCl preserved	A	N/A	2.4	Y	Absent	HOLD-524.2(14)
L1636251-04B	Vial Ascorbic Acid/HCl preserved	A	N/A	2.4	Y	Absent	HOLD-524.2(14)

*Values in parentheses indicate holding time in days

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the

Project Name: Not Specified **Lab Number:** L1636251
Project Number: Not Specified **Report Date:** 11/30/16

Data Qualifiers

reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the reporting limit (RL) for the sample.

REFERENCES

8 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. 19th Edition. 1995.

16 Methods for the Determination of Organic Compounds in Drinking Water - Supplement II. EPA/600/R-92/129, August 1992.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 300: DW: Bromide
EPA 6860: NPW and SCM: Perchlorate
EPA 9010: NPW and SCM: Amenable Cyanide Distillation
EPA 9012B: NPW: Total Cyanide
EPA 9050A: NPW: Specific Conductance
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
SM 2540D: TSS
EPA 3005A NPW
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: ***EPA 3050B***

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F, EPA 353.2**: Nitrate-N**, EPA 351.1, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

Mansfield Facility:

Drinking Water
EPA 200.7: Ba, Be, Cd, Cr, Cu, Ni, Na, Ca. **EPA 200.8:** Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, TL. **EPA 245.1** Hg.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

SUB COURIER: Microbac, Dayville, Ct.

CHAIN OF CUSTODY

ALPHA ANALYTICAL

PAGE OF

Westborough, MA
TEL: 508-898-9220
FAX: 508-898-9193

Mansfield, MA
TEL: 508-822-9300
FAX: 508-822-3288

Client Information

Client: Alpha Analytical Lab

Address: 8 Walkup Drive

Westborough, Ma 01581

Phone: 508-898-9220

Fax:

Email: subreports@alphalab.com

☐ These samples have been Previously analyzed by Alpha

Project Information

Project Name:

Project Location: MA

Project #:

Project Manager: Karyn Raymond

ALPHA Quote #:

Turn-Around Time

X Standard ☐ Rush (ONLY IF PRE-APPROVED)

Due Date: Time:

Date Rec'd in Lab:

ALPHA Job #: L1636251

Report Information Data Deliverables

☐ FAX ☐ EMAIL

☐ ADEx ☐ Add'l Deliverables

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements/Report Limits

State/Fed Program *Criteria*

MCP PRESUMPTIVE CERTAINTY-CT REASONABLE CONFIDENCE PROTOCOLS

☐ Yes ☐ No Are MCP Analytical Methods Required?

☐ Yes ☐ No Are CT RCP (Reasonable Confidence Protocols) Required?

Other Project Specific Requirements/Comments/Detection Limits:

Please reference Alpha Job #L1636251 on this report.

ANALYSIS

SAMPLE HANDLING
Filtration
☐ Done
☐ Not Needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	HAA	Sample Specific Comments	TOTAL # BOTTLES
	WILLIAMS TREATED EFFLUENT-SDS1	11/17/16	15:00	DW		X		2
	WILLIAMS TREATED EFFLUENT-SDS2	11/17/16	15:00	DW		X		2

PLEASE ANSWER QUESTIONS ABOVE!

	HAA											
Container Type	V	-	-	-	-	-	-	-	-	-	-	-
Preservative	J	-	-	-	-	-	-	-	-	-	-	-

IS YOUR PROJECT MA MCP *or* CT RCP?

Relinquished By:	Date/Time	Received By:	Date/Time

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms.

FORM NO: 01-01(I)
(rev. 30-JUL-07)

CHAIN OF CUSTODY

PAGE ____ OF ____

Date Rec'd in Lab: 11/9/16

ALPHA Job #: L1636251

ALPHA ANALYTICAL — World Class Chemistry
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Client Information

Client: CT Water Company
Address: 93 West Main Street
Clinton CT 06413
Phone: (860) 304-2297
Email: PAndraus@ctwater.com

Additional Project Information:

Project Information

Project Name:
Project Location:
Project #:
Project Manager:
ALPHA Quote #:

Turn-Around Time

☐ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due:

Report Information - Data Deliverables

☐ ADEx ☐ EMAIL

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program ____ Criteria ____

ANALYSIS

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	VOC: ☐ 8260 ☐ 624 ☐ 524.2	SVOC: ☐ ABN ☐ PAH	METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15	METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13	EPH: ☐ Ranges & Targets ☐ Ranges Only	VPH: ☐ Ranges & Targets ☐ Ranges Only	☐ PCB ☐ PEST	TPH: ☐ Quant Only ☐ Fingerprint	TOC	SDS						SAMPLE INFO: Filtration ☐ Field ☐ Lab to do; Preservation ☐ Lab to do — Sample Comments	TOTAL # BOTTLES
36251-01	Williams Treated effluent	11/9/16	10^30	DW	AC									2								2
-02/-03	Williams Treated effluent	11/9/16	10^30	DW	AC										4							4
Container Type														V	A							
Preservative														D	A							

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Anthony P. Cimini	11-9-16/11:10	[signature]	11/9/16 1100
[signature]	11/9/16 1652	[signature]	11/9/16 1652

FORM NO: 01-01 (rev. 12-Mar-2012)

11-9-16

- Williams Treated eff.
- Time 10:30
- Water Temp. 54°
- PH 7.30
- Free Cl2 .91
- WTP flow .300

Mari
(978) [illegible]

61 Louisa Viens Drive
Dayville, CT 06241
Fax: 860-774-2689
Phone: 860-774-6814
Toll-Free: 800-334-0103

ANALYTICAL DATA REPORT

prepared for:

Alpha Analytical - Reports
8 Walkup Dr.
Westborough, MA 01581
Karyn Raymond

Report Number: E611L32
Project: MA Dinking Water

Received Date: 11/18/2016
Report Date: 11/28/2016

David Dickinson
Technical Director

61 Louisa Viens Drive
Dayville, CT 06241
Fax: 860-774-2689
Phone: 860-774-6814
Toll-Free: 800-334-0103

Report No: E611L32
Client: Alpha Analytical
Project: MA Dinking Water

CASE NARRATIVE / METHOD CONFORMANCE SUMMARY

The results presented in this report relate only to the samples received.

This report is incomplete unless all pages indicated in the pagination at the bottom of the page are included, along with a copy of the chain of custody and any subcontracted analyses reports, if applicable, for the sample(s) in this report. Subcontractor results are identified by 'SUB' next to the analysis.

Microbac Laboratories, Inc. received two samples from Alpha Analytical on 11/18/2016. The samples were analyzed for the following list of analyses in accordance with MA DEP regulations unless otherwise indicated:

Haloacetic Acids5 by 552 in DW
552.2[552.2]

Non-Conformances:

Work Order:

None

Sample:

None

Analysis:

None

Microbac Laboratories, Inc.
Analytical Data Report

Report No: E611L32
Sample No: 1
Sample Description: L1636251 - Williams Treated Effluent SDS1

Customer: Alpha Analytical
Project: MA Dinking Water

Date Collected: 11/17/2016 15:00
Date Received: 11/18/2016 11:34
Date Extracted: 11/22/2016 10:10 By: JCR
Date Analyzed: 11/23/2016 10:33 By: CDT
Preparation Method: 552.2
Analytical Method: 552.2

Matrix: Aqueous
Percent Moisture: N/A
Sample Weight/Volume: 40
Dilution Factor: 1
Extract Volume: 4
Lab Data File: G112277.D
QC Batch#: 147416

CAS No.	Parameter	Result	DL	Units
79-11-8	Monochloroacetic Acid	2.7	1.0	ug/L
79-43-6	Dichloroacetic Acid	19	0.50	ug/L
76-03-9	Trichloroacetic Acid	25	0.50	ug/L
79-08-3	Monobromoacetic Acid	ND	0.50	ug/L
631-64-1	Dibromoacetic Acid	ND	0.50	ug/L

Sample QC

Surrogate	Recovery	QC Limits
2,3-Dibromopropionic acid	118%	70%-130%

Microbac Laboratories, Inc.
Analytical Data Report

Report No: E611L32
Sample No: 2
Sample Description: L1636251 - Williams Treated Effluent SDS2

Customer: Alpha Analytical
Project: MA Dinking Water

Date Collected: 11/17/2016 15:00
Date Received: 11/18/2016 11:34
Date Extracted: 11/22/2016 10:10 By: JCR
Date Analyzed: 11/23/2016 10:47 By: CDT
Preparation Method: 552.2
Analytical Method: 552.2

Matrix: Aqueous
Percent Moisture: N/A
Sample Weight/Volume: 40
Dilution Factor: 1
Extract Volume: 4
Lab Data File: G112278.D
QC Batch#: 147416

CAS No.	Parameter	Result	DL	Units
79-11-8	Monochloroacetic Acid	2.1	1.0	ug/L
79-43-6	Dichloroacetic Acid	19	0.50	ug/L
76-03-9	Trichloroacetic Acid	26	0.50	ug/L
79-08-3	Monobromoacetic Acid	ND	0.50	ug/L
631-64-1	Dibromoacetic Acid	ND	0.50	ug/L

Sample QC

Surrogate	Recovery	QC Limits
2,3-Dibromopropionic acid	114%	70%-130%

FORM 2
Water 552.2 Surrogate Recovery

Lab Name: Microbac Laboratories, Inc.

Project No.: E611L32 Project: MA Dinking Water

Batch No.: 147416 Location: , MA

	Lab Sample No.	S1 %Rec #	S2 %Rec #	S3 %Rec #	S4 %Rec #	S5 %Rec #	S6 %Rec #	Tot Out
1	E611L32-1	118	108					0
2	E611L32-2	114	105					0
3	LCS1122A-2	102	97					0
4	V1122BA-2	96	94					0

		QC Limits
S1 =	2,3-Dibromopropionic acid	(70-130)
S2 =	2,3-Dibromopropionic acid #2	(70-130)

Column to be used to flag recovery values
* Values outside of QC limits
D Surrogate diluted out

FORM 3
Water 552.2 Lab Control Sample

Lab Name: Microbac Laboratories, Inc. Date Analyzed 11/23/2016

Project No.: E611L32 Project: MA Dinking Water

Sample No.: LCS1122A-2 Location: , MA

Lab File ID: G112255.D Batch No.: 147416

Compound	Spike Added (ug/L)	Sample Concentration (ug/L)	% Rec #	QC Limits Rec
Bromochloroacetic Acid	25.00	22.97	92	70-130
Dibromoacetic Acid	25.00	23.73	95	70-130
Dichloroacetic Acid	25.00	21.88	88	70-130
Monobromoacetic Acid	25.00	22.26	89	70-130
Monochloroacetic Acid	50.00	48.27	96	70-130
Trichloroacetic Acid	25.00	23.72	95	70-130
Bromochloroacetic Acid #2	25.00	22.91	92	70-130
Dibromoacetic Acid #2	25.00	23.76	95	70-130
Dichloroacetic Acid #2	25.00	22.21	89	70-130
Monobromoacetic Acid #2	25.00	22.41	90	70-130
Monochloroacetic Acid #2	50.00	47.59	95	70-130
Trichloroacetic Acid #2	25.00	22.61	90	70-130

FORM 4
552.2 Method Blank Summary

Project No.: E611L32

Project: MA Dinking Water

Lab File ID: G112257.D

Lab Sample ID: V1122BA-2

Matrix: Water

Date Analyzed: 11/23/2016

Instrument ID: GC16

Batch No.: 147416

Time Analyzed: 0541

This Method Blank Applies To The Following Samples, MS and MSD:

	Lab Sample No.	Client Sample ID	Lab File ID	Date Analyzed
1	E611L32-1	L1636251 - Wil	G112277.D	11/23/2016
2	E611L32-2	L1636251 - Wil	G112278.D	11/23/2016
3	E611K68-8B MS	E611K68-8B MS	G112260.D	11/23/2016
4	LCS1122A-2	LCS1122A-2	G112255.D	11/23/2016

SUB COURIER: Microbac, Dayville, Ct. 61 Louisa Viens Dr. E611L32

CHAIN OF CUSTODY

PAGE OF

ALPHA ANALYTICAL
Westborough, MA TEL: 508-898-9220 FAX: 508-898-9193
Mansfield, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab:

ALPHA Job #: L1636251

Client Information

Client: Alpha Analytical Lab
Address: 8 Walkup Drive
Westborough, Ma 01581
Phone: 508-898-9220
Fax:
Email: subreports@alphalab.com

☐ These samples have been Previously analyzed by Alpha

Project Information

Project Name:
Project Location: MA
Project #:
Project Manager: Karyn Raymond
ALPHA Quote #:

Turn-Around Time

X Standard ☐ Rush (ONLY IF PRE-APPROVED)

Due Date: Time:

Report Information Data Deliverables

☐ FAX ☐ EMAIL
☐ ADEx ☐ Add'l Deliverables

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements/Report Limits

State/Fed Program | Criteria

MCP PRESUMPTIVE CERTAINTY-CT REASONABLE CONFIDENCE PROTOCOLS

☐ Yes ☐ No Are MCP Analytical Methods Required?
☐ Yes ☐ No Are CT RCP (Reasonable Confidence Protocols) Required?

Other Project Specific Requirements/Comments/Detection Limits:
Please reference Alpha Job #L1636251 on this report.

ANALYSIS

SAMPLE HANDLING
Filtration
☐ Done
☐ Not Needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	HAA	Sample Specific Comments	TOTAL # BOTTLES
	WILLIAMS TREATED EFFLUENT-SDS1	11/17/16	15:00	DW		X		2
	WILLIAMS TREATED EFFLUENT-SDS2	11/17/16	15:00	DW		X		2

PLEASE ANSWER QUESTIONS ABOVE!

	HAA
Container Type	V
Preservative	J

Relinquished By:	Date/Time	Received By:	Date/Time
[signature] AAL	11/18/16 9:32	[signature] AAL	11/18/16 9:32
[signature]	11/18/16 1134	[signature]	11/18/16 1134

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms.

IS YOUR PROJECT MA MCP or CT RCP?

FORM NO: 01-01(I) (rev. 30-JUL-07)

5.8°C on ice

Serial_No:11301612:40

Appendix E

Connection to Connecticut Water Company Water Distribution System Cost Estimates

Appendix E
Tylerville Center Water Supply Estimate - (8-Inch) Base Layout
Route 154, Chester Section
CWC Connection to Chester/Haddam Line

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Concrete Pavement	$10.00	LF	1280	$12,800.00
Removal of Concrete Pavement	$15.00	SY	249	$3,733.33
Cut Bituminous Concrete Pavement	$4.00	LF	1840	$7,360.00
Removal of Bituminous Sidewalk	$4.18	SY	3	$11.15
Removal of Existing Curbing	$2.50	LF	400	$1,000.00
Trench Excavation 0-10' Deep (No Bedrock)	$30.00	CY	2748	$82,433.00
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	485	$48,490.00
Processed Aggregate Subbase	$46.00	CY	99	$4,571.60
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	97	$15,226.38
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	194	$18,426.83
Material for Tack Coat	$9.00	Gal	72	$644.00
Mill and Overlay (2.5-inches)	$20.00	SY	1700	$34,000.00
Class "A" Concrete	$300.00	CY	9	$2,820.00
Bedding Material	$30.00	CY	1058	$31,748.89
8" Ductile Iron Pipe	$75.00	LF	4082	$306,150.00
Paved Apron	$60.00	SY	190	$11,400.00
Bituminous Concrete Lip Curbing	$6.50	LF	400	$2,600.00
Rebuild Stone Wall	$125.00	LF	20	$2,500.00
Remove and Reset Metal Beam Rail	$30.00	LF	300	$9,000.00
Bituminous Concrete Sidewalk	$50.00	SY	3	$133.33
Trafficperson (Municipal Police Officer)	$75.00	HR	328	$24,600.00
8" Gate Valve	$2,000.00	EA	4	$8,000.00
Subtotal				$627,648.52
Minor Items (3%)				$18,829.46
Subtotal				$646,477.98
M&P of Traffic (4%)				$25,859.12
Mobilization (7.5%)				$48,485.85
Subtotal				$720,822.95
Incidentals (10%)				$72,082.29
Subtotal				$792,905.24
Contingency (25%)				$198,226.31
Total				$991,131.55
Say				$992,000.00

AECOM

Appendix E
Tylerville Center Water Supply Estimate - (8-Inch) Base Layout
Route 154, Haddam Section
Chester/Haddam Line to Bridge Road Area

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Concrete Pavement	$10.00	LF	9726	$97,262.00
Removal of Concrete Pavement	$15.00	SY	1891	$28,368.08
Cut Bituminous Concrete Pavement	$4.00	LF	9726	$38,904.80
Removal of Existing Curbing	$2.50	LF	1325	$3,312.50
Trench Excavation 0-10' Deep (No Bedrock)	$30.00	CY	6033	$180,998.15
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	1065	$106,469.50
Processed Aggregate Subbase	$46.00	CY	525	$24,165.40
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	513	$80,486.33
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	1025	$97,403.84
Material for Tack Coat	$9.00	Gal	378	$3,404.17
Mill and Overlay (2.5-inches)	$20.00	SY	8272	$165,436.67
Concrete for Steps and Copings	$1,500.00	CY	1	$1,467.00
Class "A" Concrete	$300.00	CY	19	$5,685.00
Bedding Material	$30.00	CY	2298	$68,935.22
8" Ductile Iron Pipe	$75.00	LF	8863	$664,732.50
Paved Apron	$60.00	SY	165	$9,880.00
Bituminous Concrete Lip Curbing	$6.50	LF	1325	$8,612.50
Remove and Reset Metal Beam Rail	$30.00	LF	1450	$43,500.00
Trafficperson (Municipal Police Officer)	$75.00	HR	712	$53,400.00
8" Gate Valve	$2,000.00	EA	13	$26,000.00
Subtotal				$1,708,423.67
Minor Items (3%)				$51,252.71
Subtotal				$1,759,676.38
M&P of Traffic (4%)				$70,387.06
Mobilization (7.5%)				$131,975.73
Subtotal				$1,962,039.16
Incidentals (10%)				$196,203.92
Subtotal				$2,158,243.08
Contingency (25%)				$539,560.77
Total				$2,697,803.85
Say				$2,698,000.00

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Appendix E
Tylerville Center Water Supply Estimate - (8-Inch) Base Layout
Bridge Road (Route 82) Section

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	5470	$21,880.00
Removal of Existing Curbing	$2.50	LF	185	$462.50
Trench Excavation 0-10' Deep (No Bedrock)	$30.00	CY	1842	$55,264.17
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	325	$32,508.33
Processed Aggregate Subbase	$46.00	CY	295	$13,590.59
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	288	$45,265.39
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	577	$54,779.77
Material for Tack Coat	$9.00	Gal	213	$1,914.50
Mill and Overlay (2.5-inches)	$20.00	SY	4725	$94,500.00
Class "A" Concrete	$300.00	CY	3	$840.00
Bedding Material	$30.00	CY	709	$21,272.22
8" Ductile Iron Pipe	$75.00	LF	2735	$205,125.00
Bituminous Concrete Lip Curbing	$6.50	LF	185	$1,202.50
Remove and Reset Metal Beam Rail	$30.00	LF	165	$4,950.00
Trafficperson (Municipal Police Officer)	$75.00	HR	224	$16,800.00
8" Gate Valve	$2,000.00	EA	9	$18,000.00
Pipe Jacking	$150,000.00	LS	1	$150,000.00
Subtotal				$738,354.97
Minor Items (3%)				$22,150.65
Subtotal				$760,505.62
M&P of Traffic (4%)				$30,420.22
Mobilization (7.5%)				$57,037.92
Subtotal				$847,963.76
Incidentals (10%)				$84,796.38
Subtotal				$932,760.14
Contingency (25%)				$233,190.04
Total				$1,165,950.18
Say				$1,166,000.00

Appendix E
Tylerville Center Water Supply Estimate - (8-Inch) Base Layout
Bridge Lane Section

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Trench Excavation 0-10' Deep (No Bedrock)	$25.00	CY	298	$7,437.50
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	53	$5,250.00
Processed Aggregate Subbase	$46.00	CY	158	$7,283.33
Bedding Material	$30.00	CY	117	$3,500.00
8" Ductile Iron Pipe	$75.00	LF	450	$33,750.00
Trafficperson (Municipal Police Officer)	$75.00	HR	40	$3,000.00
8" Gate Valve	$2,000.00	EA	1	$2,000.00
Subtotal				$62,220.83
Minor Items (3%)				$1,866.63
Subtotal				$64,087.46
M&P of Traffic (4%)				$2,563.50
Mobilization (7.5%)				$4,806.56
Subtotal				$71,457.52
Incidentals (10%)				$7,145.75
Subtotal				$78,603.27
Contingency (25%)				$19,650.82
Total				$98,254.08
Say				$99,000.00

AECOM

Appendix E
Tylerville Center Water Supply Estimate - (8-Inch) Base Layout
Little Meadow Road Section

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	660	$2,640.00
Trench Excavation 0-10' Deep (No Bedrock)	$25.00	CY	2620	$65,496.67
Processed Aggregate Subbase	$46.00	CY	917	$42,162.07
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	17	$2,730.82
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	29	$2,754.01
Material for Tack Coat	$9.00	Gal	26	$231.00
Class "A" Concrete	$300.00	CY	1	$150.00
Bedding Material	$30.00	CY	873	$26,198.67
8" Ductile Iron Pipe	$75.00	LF	3368	$252,630.00
Remove and Reset Metal Beam Rail	$30.00	LF	260	$7,800.00
Trafficperson (Municipal Police Officer)	$75.00	HR	272	$20,400.00
8" Gate Valve	$2,000.00	EA	5	$10,000.00
Encasing Water Line to Cross Septic Field	$20,000.00	EA	5	$100,000.00
Subtotal				$533,193.23
Minor Items (3%)				$15,995.80
Subtotal				$549,189.03
M&P of Traffic (4%)				$21,967.56
Mobilization (7.5%)				$41,189.18
Subtotal				$612,345.76
Incidentals (10%)				$61,234.58
Subtotal				$673,580.34
Contingency (25%)				$168,395.09
Total				$841,975.43
Say				$842,000.00

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Appendix E
Tylerville Center Water Supply Estimate - (8-Inch) Base Layout
Camp Bethel Road Section

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	1500	$6,000.00
Trench Excavation 0-10' Deep (No Bedrock)	$30.00	CY	661	$19,833.33
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	117	$11,666.67
Processed Aggregate Subbase	$46.00	CY	97	$4,472.22
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	40	$6,206.41
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	66	$6,259.11
Material for Tack Coat	$9.00	Gal	58	$525.00
Class "A" Concrete	$300.00	CY	1	$225.00
Bedding Material	$30.00	CY	259	$7,777.78
8" Ductile Iron Pipe	$75.00	LF	1000	$75,000.00
Trafficperson (Municipal Police Officer)	$75.00	HR	80	$6,000.00
8" Gate Valve	$2,000.00	EA	1	$2,000.00
Subtotal				$145,965.52
Minor Items (3%)				$4,378.97
Subtotal				$150,344.49
M&P of Traffic (4%)				$6,013.78
Mobilization (7.5%)				$11,275.84
Subtotal				$167,634.10
Incidentals (10%)				$16,763.41
Subtotal				$184,397.51
Contingency (25%)				$46,099.38
Total				$230,496.89
Say				$231,000.00

AECOM

Appendix E
Tylerville Center Water Supply Estimate - (8-Inch) Base Layout
South Side Bluff Section

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	100	$400.00
Trench Excavation 0-10' Deep (No Bedrock)	$25.00	CY	583	$14,583.33
Processed Aggregate Subbase	$46.00	CY	253	$11,627.78
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	3	$413.76
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	4	$417.27
Material for Tack Coat	$9.00	Gal	4	$35.00
Class "A" Concrete	$300.00	CY	0.25	$75.00
Bedding Material	$30.00	CY	194	$5,833.33
8" Ductile Iron Pipe	$75.00	LF	750	$56,250.00
Trafficperson (Municipal Police Officer)	$75.00	HR	64	$4,800.00
8" Gate Valve	$2,000.00	EA	1	$2,000.00
Subtotal				$96,435.48
Minor Items (3%)				$2,893.06
Subtotal				$99,328.54
M&P of Traffic (4%)				$3,973.14
Mobilization (7.5%)				$7,449.64
Subtotal				$110,751.33
Incidentals (10%)				$11,075.13
Subtotal				$121,826.46
Contingency (25%)				$30,456.61
Total				$152,283.07
Say				$153,000.00

AECOM

Appendix E
Tylerville Center Water Supply Estimate - (8-Inch) Base Layout
Brookes Court Section

	Estimated By:		MT	5/25/2017
	Checked By:		MJD	5/28/2017
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	510	$2,040.00
Trench Excavation 0-10' Deep (No Bedrock)	$25.00	CY	583	$14,583.33
Processed Aggregate Subbase	$46.00	CY	253	$11,627.78
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	3	$413.76
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	4	$417.27
Material for Tack Coat	$9.00	Gal	40	$357.00
Class "A" Concrete	$300.00	CY	1.00	$300.00
Bedding Material	$30.00	CY	194	$5,833.33
8" Ductile Iron Pipe	$75.00	LF	510	$38,250.00
Trafficperson (Municipal Police Officer)	$75.00	HR	64	$4,800.00
8" Gate Valve	$2,000.00	EA	3	$6,000.00
Subtotal				$84,622.48
Minor Items (3%)				$2,538.67
Subtotal				$87,161.15
M&P of Traffic (4%)				$3,486.45
Mobilization (7.5%)				$6,537.09
Subtotal				$97,184.69
Incidentals (10%)				$9,718.47
Subtotal				$106,903.15
Contingency (25%)				$26,725.79
Total				$133,628.94
Say				$134,000.00

Appendix E
Tylerville Center Water Supply Estimate - (8-Inch) Alternate Layout
Route 154, Chester Section
CWC Connection to Chester/Haddam Line

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Concrete Pavement	$10.00	LF	1280	$12,800.00
Removal of Concrete Pavement	$15.00	SY	249	$3,733.33
Cut Bituminous Concrete Pavement	$4.00	LF	1840	$7,360.00
Removal of Bituminous Sidewalk	$4.18	SY	3	$11.15
Removal of Existing Curbing	$2.50	LF	400	$1,000.00
Trench Excavation 0-10' Deep (No Bedrock)	$30.00	CY	2748	$82,433.00
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	485	$48,490.00
Processed Aggregate Subbase	$46.00	CY	99	$4,571.60
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	97	$15,226.38
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	194	$18,426.83
Material for Tack Coat	$9.00	Gal	72	$644.00
Mill and Overlay (2.5-inches)	$20.00	SY	1700	$34,000.00
Class "A" Concrete	$300.00	CY	9	$2,820.00
Bedding Material	$30.00	CY	1058	$31,748.89
8" Ductile Iron Pipe	$75.00	LF	4082	$306,150.00
Paved Apron	$60.00	SY	190	$11,400.00
Bituminous Concrete Lip Curbing	$6.50	LF	400	$2,600.00
Rebuild Stone Wall	$125.00	LF	20	$2,500.00
Remove and Reset Metal Beam Rail	$30.00	LF	300	$9,000.00
Bituminous Concrete Sidewalk	$50.00	SY	3	$133.33
Trafficperson (Municipal Police Officer)	$75.00	HR	328	$24,600.00
8" Gate Valve	$2,000.00	EA	4	$8,000.00
Subtotal				$627,648.52
Minor Items (3%)				$18,829.46
Subtotal				$646,477.98
M&P of Traffic (4%)				$25,859.12
Mobilization (7.5%)				$48,485.85
Subtotal				$720,822.95
Incidentals (10%)				$72,082.29
Subtotal				$792,905.24
Contingency (25%)				$198,226.31
Total				$991,131.55
Say				$992,000.00

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Appendix E
Tylerville Center Water Supply Estimate - (8-Inch) Alternate Layout
Route 154, Haddam Section
Chester/Haddam Line to Little Meadow Road Connector & Route 154 Section within Water Supply Area

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Concrete Pavement	$10.00	LF	6506	$65,060.00
Removal of Concrete Pavement	$15.00	SY	1265	$18,975.83
Cut Bituminous Concrete Pavement	$4.00	LF	6506	$26,024.00
Removal of Existing Curbing	$2.50	LF	855	$2,137.50
Trench Excavation 0-10' Deep (No Bedrock)	$30.00	CY	3801	$114,030.33
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	671	$67,076.67
Processed Aggregate Subbase	$46.00	CY	351	$16,164.60
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	343	$53,838.51
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	686	$65,154.88
Material for Tack Coat	$9.00	Gal	253	$2,277.10
Mill and Overlay (2.5-inches)	$20.00	SY	5588	$111,766.67
Class "A" Concrete	$300.00	CY	10	$3,015.00
Bedding Material	$30.00	CY	1457	$43,695.56
8" Ductile Iron Pipe	$75.00	LF	5618	$421,350.00
Paved Apron	$60.00	SY	41	$2,440.00
Bituminous Concrete Lip Curbing	$6.50	LF	855	$5,557.50
Remove and Reset Metal Beam Rail	$30.00	LF	335	$10,050.00
Trafficperson (Municipal Police Officer)	$75.00	HR	456	$34,200.00
8" Gate Valve	$2,000.00	EA	7	$14,000.00
Subtotal				$1,076,814.14
Minor Items (3%)				$32,304.42
Subtotal				$1,109,118.56
M&P of Traffic (4%)				$44,364.74
Mobilization (7.5%)				$83,183.89
Subtotal				$1,236,667.20
Incidentals (10%)				$123,666.72
Subtotal				$1,360,333.92
Contingency (25%)				$340,083.48
Total				$1,700,417.40
Say				$1,701,000.00

Appendix E
Tylerville Center Water Supply Estimate - (8-Inch) Alternate Layout
Bridge Road (Route 82) Section

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	5470	$21,880.00
Removal of Existing Curbing	$2.50	LF	185	$462.50
Trench Excavation 0-10' Deep (No Bedrock)	$30.00	CY	1842	$55,264.17
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	325	$32,508.33
Processed Aggregate Subbase	$46.00	CY	295	$13,590.59
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	288	$45,265.39
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	577	$54,779.77
Material for Tack Coat	$9.00	Gal	213	$1,914.50
Mill and Overlay (2.5-inches)	$20.00	SY	4725	$94,500.00
Class "A" Concrete	$300.00	CY	3	$840.00
Bedding Material	$30.00	CY	709	$21,272.22
8" Ductile Iron Pipe	$75.00	LF	2735	$205,125.00
Bituminous Concrete Lip Curbing	$6.50	LF	185	$1,202.50
Remove and Reset Metal Beam Rail	$30.00	LF	165	$4,950.00
Trafficperson (Municipal Police Officer)	$75.00	HR	224	$16,800.00
8" Gate Valve	$2,000.00	EA	9	$18,000.00
Pipe Jacking	$150,000.00	LS	1	$150,000.00
Subtotal				$738,354.97
Minor Items (3%)				$22,150.65
Subtotal				$760,505.62
M&P of Traffic (4%)				$30,420.22
Mobilization (7.5%)				$57,037.92
Subtotal				$847,963.76
Incidentals (10%)				$84,796.38
Subtotal				$932,760.14
Contingency (25%)				$233,190.04
Total				$1,165,950.18
Say				$1,166,000.00

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Appendix E
Tylerville Center Water Supply Estimate - (8-Inch) Alternate Layout
Bridge Lane Section

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Trench Excavation 0-10' Deep (No Bedrock)	$25.00	CY	298	$7,437.50
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	53	$5,250.00
Processed Aggregate Subbase	$46.00	CY	158	$7,283.33
Bedding Material	$30.00	CY	117	$3,500.00
8" Ductile Iron Pipe	$75.00	LF	450	$33,750.00
Trafficperson (Municipal Police Officer)	$75.00	HR	40	$3,000.00
8" Gate Valve	$2,000.00	EA	1	$2,000.00
Subtotal				$62,220.83
Minor Items (3%)				$1,866.63
Subtotal				$64,087.46
M&P of Traffic (4%)				$2,563.50
Mobilization (7.5%)				$4,806.56
Subtotal				$71,457.52
Incidentals (10%)				$7,145.75
Subtotal				$78,603.27
Contingency (25%)				$19,650.82
Total				$98,254.08
Say				$99,000.00

Appendix E
Tylerville Center Water Supply Estimate - (8-Inch) Alternate Layout
Little Meadow Road Section & Route 154 Connector

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	660	$2,640.00
Trench Excavation 0-10' Deep (No Bedrock)	$25.00	CY	3631	$90,774.44
Processed Aggregate Subbase	$46.00	CY	909	$41,834.10
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	35	$5,461.64
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	70	$6,609.63
Material for Tack Coat	$9.00	Gal	26	$231.00
Class "A" Concrete	$300.00	CY	1	$375.00
Bedding Material	$30.00	CY	1210	$36,309.78
8" Ductile Iron Pipe	$75.00	LF	4668	$350,130.00
Remove and Reset Metal Beam Rail	$30.00	LF	260	$7,800.00
Trafficperson (Municipal Police Officer)	$75.00	HR	376	$28,200.00
8" Gate Valve	$2,000.00	EA	5	$10,000.00
Encasing Water Line to Cross Septic Field	$20,000.00	EA	5	$100,000.00
Pipe Jacking	$150,000.00	LS	1	$150,000.00
Subtotal				$830,365.59
Minor Items (3%)				$24,910.97
Subtotal				$855,276.56
M&P of Traffic (4%)				$34,211.06
Mobilization (7.5%)				$64,145.74
Subtotal				$953,633.36
Incidentals (10%)				$95,363.34
Subtotal				$1,048,996.70
Contingency (25%)				$262,249.17
Total				$1,311,245.87
Say				$1,312,000.00

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Appendix E
Tylerville Center Water Supply Estimate - (8-Inch) Alternate Layout
Camp Bethel Road and Bethel Lane Section

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	3100	$12,400.00
Trench Excavation 0-10' Deep (No Bedrock)	$30.00	CY	496	$14,875.00
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	88	$8,750.00
Processed Aggregate Subbase	$46.00	CY	97	$4,472.22
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	40	$6,206.41
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	66	$6,259.11
Material for Tack Coat	$9.00	Gal	121	$1,085.00
Class "A" Concrete	$300.00	CY	1	$225.00
Bedding Material	$30.00	CY	194	$5,833.33
8" Ductile Iron Pipe	$75.00	LF	1550	$116,250.00
Trafficperson (Municipal Police Officer)	$75.00	HR	64	$4,800.00
8" Gate Valve	$2,000.00	EA	1	$2,000.00
Subtotal				$183,156.08
Minor Items (3%)				$5,494.68
Subtotal				$188,650.76
M&P of Traffic (4%)				$7,546.03
Mobilization (7.5%)				$14,148.81
Subtotal				$210,345.60
Incidentals (10%)				$21,034.56
Subtotal				$231,380.16
Contingency (25%)				$57,845.04
Total				$289,225.19
Say				$290,000.00

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Appendix E
Tylerville Center Water Supply Estimate - (8-Inch) Alternate Layout
South Side Bluff Section

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	100	$400.00
Trench Excavation 0-10' Deep (No Bedrock)	$25.00	CY	583	$14,583.33
Processed Aggregate Subbase	$46.00	CY	253	$11,627.78
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	3	$413.76
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	4	$417.27
Material for Tack Coat	$9.00	Gal	4	$35.00
Class "A" Concrete	$300.00	CY	0.25	$75.00
Bedding Material	$30.00	CY	194	$5,833.33
8" Ductile Iron Pipe	$75.00	LF	750	$56,250.00
Trafficperson (Municipal Police Officer)	$75.00	HR	64	$4,800.00
8" Gate Valve	$2,000.00	EA	1	$2,000.00
Subtotal				$96,435.48
Minor Items (3%)				$2,893.06
Subtotal				$99,328.54
M&P of Traffic (4%)				$3,973.14
Mobilization (7.5%)				$7,449.64
Subtotal				$110,751.33
Incidentals (10%)				$11,075.13
Subtotal				$121,826.46
Contingency (25%)				$30,456.61
Total				$152,283.07
Say				$153,000.00

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Appendix E
Tylerville Center Water Supply Estimate - (8-Inch) Alternate Layout
Brookes Court Section

	Estimated By:		MT	5/25/2017
	Checked By:		MJD	5/28/2017
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	510	$2,040.00
Trench Excavation 0-10' Deep (No Bedrock)	$25.00	CY	583	$14,583.33
Processed Aggregate Subbase	$46.00	CY	253	$11,627.78
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	3	$413.76
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	4	$417.27
Material for Tack Coat	$9.00	Gal	40	$357.00
Class "A" Concrete	$300.00	CY	1.00	$300.00
Bedding Material	$30.00	CY	194	$5,833.33
8" Ductile Iron Pipe	$75.00	LF	510	$38,250.00
Trafficperson (Municipal Police Officer)	$75.00	HR	64	$4,800.00
8" Gate Valve	$2,000.00	EA	3	$6,000.00
Subtotal				$84,622.48
Minor Items (3%)				$2,538.67
Subtotal				$87,161.15
M&P of Traffic (4%)				$3,486.45
Mobilization (7.5%)				$6,537.09
Subtotal				$97,184.69
Incidentals (10%)				$9,718.47
Subtotal				$106,903.15
Contingency (25%)				$26,725.79
Total				$133,628.94
Say				$134,000.00

Appendix E
Tylerville Center Water Supply Estimate - (12-Inch) Base Layout
Route 154, Chester Section
CWC Connection to Chester/Haddam Line

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Concrete Pavement	$10.00	LF	1280	$12,800.00
Removal of Concrete Pavement	$15.00	SY	249	$3,733.33
Cut Bituminous Concrete Pavement	$4.00	LF	1840	$7,360.00
Removal of Bituminous Sidewalk	$4.18	SY	3	$11.15
Removal of Existing Curbing	$2.50	LF	400	$1,000.00
Trench Excavation 0-10' Deep (No Bedrock)	$30.00	CY	2748	$82,433.00
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	485	$48,490.00
Processed Aggregate Subbase	$46.00	CY	99	$4,571.60
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	97	$15,226.38
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	194	$18,426.83
Material for Tack Coat	$9.00	Gal	72	$644.00
Mill and Overlay (2.5-inches)	$20.00	SY	1700	$34,000.00
Class "A" Concrete	$300.00	CY	9	$2,820.00
Bedding Material	$30.00	CY	1058	$31,748.89
12" Ductile Iron Pipe	$95.00	LF	4082	$387,790.00
Paved Apron	$60.00	SY	190	$11,400.00
Bituminous Concrete Lip Curbing	$6.50	LF	400	$2,600.00
Rebuild Stone Wall	$125.00	LF	20	$2,500.00
Remove and Reset Metal Beam Rail	$30.00	LF	300	$9,000.00
Bituminous Concrete Sidewalk	$50.00	SY	3	$133.33
Trafficperson (Municipal Police Officer)	$75.00	HR	328	$24,600.00
12" Gate Valve	$2,800.00	EA	4	$11,200.00
Subtotal				$712,488.52
Minor Items (3%)				$21,374.66
Subtotal				$733,863.18
M&P of Traffic (4%)				$29,354.53
Mobilization (7.5%)				$55,039.74
Subtotal				$818,257.45
Incidentals (10%)				$81,825.74
Subtotal				$900,083.19
Contingency (25%)				$225,020.80
Total				$1,125,103.99
Say				$1,126,000.00

Appendix E
Tylerville Center Water Supply Estimate - (12-Inch) Base Layout
Route 154, Haddam Section
Chester/Haddam Line to Bridge Road Area

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Concrete Pavement	$10.00	LF	9726	$97,262.00
Removal of Concrete Pavement	$15.00	SY	1891	$28,368.08
Cut Bituminous Concrete Pavement	$4.00	LF	9726	$38,904.80
Removal of Existing Curbing	$2.50	LF	1325	$3,312.50
Trench Excavation 0-10' Deep (No Bedrock)	$30.00	CY	6033	$180,998.15
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	1065	$106,469.50
Processed Aggregate Subbase	$46.00	CY	525	$24,165.40
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	513	$80,486.33
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	1025	$97,403.84
Material for Tack Coat	$9.00	Gal	378	$3,404.17
Mill and Overlay (2.5-inches)	$20.00	SY	8272	$165,436.67
Concrete for Steps and Copings	$1,500.00	CY	1	$1,467.00
Class "A" Concrete	$300.00	CY	19	$5,685.00
Bedding Material	$30.00	CY	2298	$68,935.22
12" Ductile Iron Pipe	$95.00	LF	8863	$841,994.50
Paved Apron	$60.00	SY	165	$9,880.00
Bituminous Concrete Lip Curbing	$6.50	LF	1325	$8,612.50
Remove and Reset Metal Beam Rail	$30.00	LF	1450	$43,500.00
Trafficperson (Municipal Police Officer)	$75.00	HR	712	$53,400.00
12" Gate Valve	$2,800.00	EA	13	$36,400.00
Subtotal				$1,896,085.67
Minor Items (3%)				$56,882.57
Subtotal				$1,952,968.24
M&P of Traffic (4%)				$78,118.73
Mobilization (7.5%)				$146,472.62
Subtotal				$2,177,559.59
Incidentals (10%)				$217,755.96
Subtotal				$2,395,315.54
Contingency (25%)				$598,828.89
Total				$2,994,144.43
Say				$2,995,000.00

Appendix E
Tylerville Center Water Supply Estimate - (12-Inch) Base Layout
Bridge Road (Route 82) Section

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	5470	$21,880.00
Removal of Existing Curbing	$2.50	LF	185	$462.50
Trench Excavation 0-10' Deep (No Bedrock)	$30.00	CY	1842	$55,264.17
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	325	$32,508.33
Processed Aggregate Subbase	$46.00	CY	295	$13,590.59
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	288	$45,265.39
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	577	$54,779.77
Material for Tack Coat	$9.00	Gal	213	$1,914.50
Mill and Overlay (2.5-inches)	$20.00	SY	4725	$94,500.00
Class "A" Concrete	$300.00	CY	3	$840.00
Bedding Material	$30.00	CY	709	$21,272.22
12" Ductile Iron Pipe	$95.00	LF	2735	$259,825.00
Bituminous Concrete Lip Curbing	$6.50	LF	185	$1,202.50
Remove and Reset Metal Beam Rail	$30.00	LF	165	$4,950.00
Trafficperson (Municipal Police Officer)	$75.00	HR	224	$16,800.00
12" Gate Valve	$2,800.00	EA	9	$25,200.00
Pipe Jacking	$170,000.00	LS	1	$170,000.00
Subtotal				$820,254.97
Minor Items (3%)				$24,607.65
Subtotal				$844,862.62
M&P of Traffic (4%)				$33,794.50
Mobilization (7.5%)				$63,364.70
Subtotal				$942,021.82
Incidentals (10%)				$94,202.18
Subtotal				$1,036,224.00
Contingency (25%)				$259,056.00
Total				$1,295,280.00
Say				$1,296,000.00

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Appendix E Tylerville Center Water Supply Estimate - (12-Inch) Base Layout Bridge Lane Section				
	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Trench Excavation 0-10' Deep (No Bedrock)	$25.00	CY	298	$7,437.50
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	53	$5,250.00
Processed Aggregate Subbase	$46.00	CY	158	$7,283.33
Bedding Material	$30.00	CY	117	$3,500.00
8" Ductile Iron Pipe	$75.00	LF	450	$33,750.00
Trafficperson (Municipal Police Officer)	$75.00	HR	40	$3,000.00
8" Gate Valve	$2,000.00	EA	1	$2,000.00
Subtotal				$62,220.83
Minor Items (3%)				$1,866.63
Subtotal				$64,087.46
M&P of Traffic (4%)				$2,563.50
Mobilization (7.5%)				$4,806.56
Subtotal				$71,457.52
Incidentals (10%)				$7,145.75
Subtotal				$78,603.27
Contingency (25%)				$19,650.82
Total				$98,254.08
Say				$99,000.00

Appendix E
Tylerville Center Water Supply Estimate - (12-Inch) Base Layout
Little Meadow Road Section

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	660	$2,640.00
Trench Excavation 0-10' Deep (No Bedrock)	$25.00	CY	2620	$65,496.67
Processed Aggregate Subbase	$46.00	CY	917	$42,162.07
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	17	$2,730.82
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	29	$2,754.01
Material for Tack Coat	$9.00	Gal	26	$231.00
Class "A" Concrete	$300.00	CY	1	$150.00
Bedding Material	$30.00	CY	873	$26,198.67
8" Ductile Iron Pipe	$75.00	LF	3368	$252,630.00
Remove and Reset Metal Beam Rail	$30.00	LF	260	$7,800.00
Trafficperson (Municipal Police Officer)	$75.00	HR	272	$20,400.00
8" Gate Valve	$2,000.00	EA	5	$10,000.00
Encasing Water Line to Cross Septic Field	$20,000.00	EA	5	$100,000.00
Subtotal				$533,193.23
Minor Items (3%)				$15,995.80
Subtotal				$549,189.03
M&P of Traffic (4%)				$21,967.56
Mobilization (7.5%)				$41,189.18
Subtotal				$612,345.76
Incidentals (10%)				$61,234.58
Subtotal				$673,580.34
Contingency (25%)				$168,395.09
Total				$841,975.43
Say				$842,000.00

Appendix E

Tylerville Center Water Supply Estimate - (12-Inch) Base Layout

Camp Bethel Road and Bethel Lane Section

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	3100	$12,400.00
Trench Excavation 0-10' Deep (No Bedrock)	$30.00	CY	496	$14,875.00
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	88	$8,750.00
Processed Aggregate Subbase	$46.00	CY	97	$4,472.22
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	40	$6,206.41
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	66	$6,259.11
Material for Tack Coat	$9.00	Gal	121	$1,085.00
Class "A" Concrete	$300.00	CY	1	$225.00
Bedding Material	$30.00	CY	194	$5,833.33
8" Ductile Iron Pipe	$75.00	LF	1550	$116,250.00
Trafficperson (Municipal Police Officer)	$75.00	HR	64	$4,800.00
8" Gate Valve	$2,000.00	EA	1	$2,000.00
Subtotal				$183,156.08
Minor Items (3%)				$5,494.68
Subtotal				$188,650.76
M&P of Traffic (4%)				$7,546.03
Mobilization (7.5%)				$14,148.81
Subtotal				$210,345.60
Incidentals (10%)				$21,034.56
Subtotal				$231,380.16
Contingency (25%)				$57,845.04
Total				$289,225.19
Say				$290,000.00

Appendix E

Tylerville Center Water Supply Estimate - (12-Inch) Base Layout

South Side Bluff Section

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	100	$400.00
Trench Excavation 0-10' Deep (No Bedrock)	$25.00	CY	583	$14,583.33
Processed Aggregate Subbase	$46.00	CY	253	$11,627.78
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	3	$413.76
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	4	$417.27
Material for Tack Coat	$9.00	Gal	4	$35.00
Class "A" Concrete	$300.00	CY	0	$75.00
Bedding Material	$30.00	CY	194	$5,833.33
8" Ductile Iron Pipe	$75.00	LF	750	$56,250.00
Trafficperson (Municipal Police Officer)	$75.00	HR	64	$4,800.00
8" Gate Valve	$2,000.00	EA	1	$2,000.00
Subtotal				$96,435.48
Minor Items (3%)				$2,893.06
Subtotal				$99,328.54
M&P of Traffic (4%)				$3,973.14
Mobilization (7.5%)				$7,449.64
Subtotal				$110,751.33
Incidentals (10%)				$11,075.13
Subtotal				$121,826.46
Contingency (25%)				$30,456.61
Total				$152,283.07
Say				$153,000.00

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Appendix E Tylerville Center Water Supply Estimate - (12-Inch) Base Layout Brookes Court Section				
	Estimated By:		MT	5/25/2017
	Checked By:		MJD	5/28/2017
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	510	$2,040.00
Trench Excavation 0-10' Deep (No Bedrock)	$25.00	CY	583	$14,583.33
Processed Aggregate Subbase	$46.00	CY	253	$11,627.78
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	3	$413.76
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	4	$417.27
Material for Tack Coat	$9.00	Gal	40	$357.00
Class "A" Concrete	$300.00	CY	1.00	$300.00
Bedding Material	$30.00	CY	194	$5,833.33
8" Ductile Iron Pipe	$75.00	LF	510	$38,250.00
Trafficperson (Municipal Police Officer)	$75.00	HR	64	$4,800.00
8" Gate Valve	$2,000.00	EA	1	$2,000.00
12" Gate Valve	$2,800.00	EA	2	$5,600.00
Subtotal				$86,222.48
Minor Items (3%)				$2,586.67
Subtotal				$88,809.15
M&P of Traffic (4%)				$3,552.37
Mobilization (7.5%)				$6,660.69
Subtotal				$99,022.21
Incidentals (10%)				$9,902.22
Subtotal				$108,924.43
Contingency (25%)				$27,231.11
Total				$136,155.53
Say				$137,000.00

AECOM

Appendix E
Tylerville Center Water Supply Estimate - (12-Inch) Alternate Layout
Route 154, Chester Section
CWC Connection to Chester/Haddam Line

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Concrete Pavement	$10.00	LF	1280	$12,800.00
Removal of Concrete Pavement	$15.00	SY	249	$3,733.33
Cut Bituminous Concrete Pavement	$4.00	LF	1840	$7,360.00
Removal of Bituminous Sidewalk	$4.18	SY	3	$11.15
Removal of Existing Curbing	$2.50	LF	400	$1,000.00
Trench Excavation 0-10' Deep (No Bedrock)	$30.00	CY	2748	$82,433.00
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	485	$48,490.00
Processed Aggregate Subbase	$46.00	CY	99	$4,571.60
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	97	$15,226.38
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	194	$18,426.83
Material for Tack Coat	$9.00	Gal	72	$644.00
Mill and Overlay (2.5-inches)	$20.00	SY	1700	$34,000.00
Class "A" Concrete	$300.00	CY	9	$2,820.00
Bedding Material	$30.00	CY	1058	$31,748.89
12" Ductile Iron Pipe	$95.00	LF	4082	$387,790.00
Paved Apron	$60.00	SY	190	$11,400.00
Bituminous Concrete Lip Curbing	$6.50	LF	400	$2,600.00
Rebuild Stone Wall	$125.00	LF	20	$2,500.00
Remove and Reset Metal Beam Rail	$30.00	LF	300	$9,000.00
Bituminous Concrete Sidewalk	$50.00	SY	3	$133.33
Trafficperson (Municipal Police Officer)	$75.00	HR	328	$24,600.00
12" Gate Valve	$2,800.00	EA	4	$11,200.00
Subtotal				$712,488.52
Minor Items (3%)				$21,374.66
Subtotal				$733,863.18
M&P of Traffic (4%)				$29,354.53
Mobilization (7.5%)				$55,039.74
Subtotal				$818,257.45
Incidentals (10%)				$81,825.74
Subtotal				$900,083.19
Contingency (25%)				$225,020.80
Total				$1,125,103.99
Say				$1,126,000.00

Appendix E
Tylerville Center Water Supply Estimate - (12-Inch) Alternate Layout
Route 154, Haddam Section
Chester/Haddam Line to Little Meadow Road Connector & Route 154 Section within Water Supply Area

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Concrete Pavement	$10.00	LF	6506	$65,060.00
Removal of Concrete Pavement	$15.00	SY	1265	$18,975.83
Cut Bituminous Concrete Pavement	$4.00	LF	6506	$26,024.00
Removal of Existing Curbing	$2.50	LF	855	$2,137.50
Trench Excavation 0-10' Deep (No Bedrock)	$30.00	CY	3801	$114,030.33
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	671	$67,076.67
Processed Aggregate Subbase	$46.00	CY	351	$16,164.60
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	343	$53,838.51
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	686	$65,154.88
Material for Tack Coat	$9.00	Gal	253	$2,277.10
Mill and Overlay (2.5-inches)	$20.00	SY	5588	$111,766.67
Class "A" Concrete	$300.00	CY	10	$3,015.00
Bedding Material	$30.00	CY	1457	$43,695.56
12" Ductile Iron Pipe	$95.00	LF	5618	$533,710.00
Paved Apron	$60.00	SY	41	$2,440.00
Bituminous Concrete Lip Curbing	$6.50	LF	855	$5,557.50
Remove and Reset Metal Beam Rail	$30.00	LF	335	$10,050.00
Trafficperson (Municipal Police Officer)	$75.00	HR	456	$34,200.00
12" Gate Valve	$2,800.00	EA	7	$19,600.00
Subtotal				$1,194,774.14
Minor Items (3%)				$35,843.22
Subtotal				$1,230,617.36
M&P of Traffic (4%)				$49,224.69
Mobilization (7.5%)				$92,296.30
Subtotal				$1,372,138.36
Incidentals (10%)				$137,213.84
Subtotal				$1,509,352.20
Contingency (25%)				$377,338.05
Total				$1,886,690.24
Say				$1,887,000.00

Appendix E
Tylerville Center Water Supply Estimate - (12-inch) Alternate Layout
Bridge Road (Route 82) Section

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	5470	$21,880.00
Removal of Existing Curbing	$2.50	LF	185	$462.50
Trench Excavation 0-10' Deep (No Bedrock)	$30.00	CY	1842	$55,264.17
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	325	$32,508.33
Processed Aggregate Subbase	$46.00	CY	295	$13,590.59
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	288	$45,265.39
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	577	$54,779.77
Material for Tack Coat	$9.00	Gal	213	$1,914.50
Mill and Overlay (2.5-inches)	$20.00	SY	4725	$94,500.00
Class "A" Concrete	$300.00	CY	3	$840.00
Bedding Material	$30.00	CY	709	$21,272.22
12" Ductile Iron Pipe	$95.00	LF	2735	$259,825.00
Bituminous Concrete Lip Curbing	$6.50	LF	185	$1,202.50
Remove and Reset Metal Beam Rail	$30.00	LF	165	$4,950.00
Trafficperson (Municipal Police Officer)	$75.00	HR	224	$16,800.00
12" Gate Valve	$2,800.00	EA	9	$25,200.00
Pipe Jacking	$170,000.00	LS	1	$170,000.00
Subtotal				$820,254.97
Minor Items (3%)				$24,607.65
Subtotal				$844,862.62
M&P of Traffic (4%)				$33,794.50
Mobilization (7.5%)				$63,364.70
Subtotal				$942,021.82
Incidentals (10%)				$94,202.18
Subtotal				$1,036,224.00
Contingency (25%)				$259,056.00
Total				$1,295,280.00
Say				$1,296,000.00

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Appendix E
Tylerville Center Water Supply Estimate - (12-inch) Alternate Layout
Bridge Lane Section

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Trench Excavation 0-10' Deep (No Bedrock)	$25.00	CY	298	$7,437.50
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	53	$5,250.00
Processed Aggregate Subbase	$46.00	CY	158	$7,283.33
Bedding Material	$30.00	CY	117	$3,500.00
8" Ductile Iron Pipe	$75.00	LF	450	$33,750.00
Trafficperson (Municipal Police Officer)	$75.00	HR	40	$3,000.00
8" Gate Valve	$2,000.00	EA	1	$2,000.00
Subtotal				$62,220.83
Minor Items (3%)				$1,866.63
Subtotal				$64,087.46
M&P of Traffic (4%)				$2,563.50
Mobilization (7.5%)				$4,806.56
Subtotal				$71,457.52
Incidentals (10%)				$7,145.75
Subtotal				$78,603.27
Contingency (25%)				$19,650.82
Total				$98,254.08
Say				$99,000.00

Appendix E
Tylerville Center Water Supply Estimate - (12-inch) Alternate Layout
Little Meadow Road Section & Route 154 Connector

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	660	$2,640.00
Trench Excavation 0-10' Deep (No Bedrock)	$25.00	CY	3631	$90,774.44
Processed Aggregate Subbase	$46.00	CY	917	$42,162.07
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	17	$2,730.82
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	29	$2,754.01
Material for Tack Coat	$9.00	Gal	26	$231.00
Class "A" Concrete	$300.00	CY	1	$375.00
Bedding Material	$30.00	CY	1210	$36,309.78
12" Ductile Iron Pipe	$95.00	LF	4668	$443,498.00
Remove and Reset Metal Beam Rail	$30.00	LF	260	$7,800.00
Trafficperson (Municipal Police Officer)	$75.00	HR	376	$28,200.00
12" Gate Valve	$2,800.00	EA	5	$14,000.00
Encasing Water Line to Cross Septic Field	$20,000.00	EA	5	$100,000.00
Pipe Jacking	$170,000.00	LS	1	$170,000.00
Subtotal				$941,475.12
Minor Items (3%)				$28,244.25
Subtotal				$969,719.37
M&P of Traffic (4%)				$38,788.77
Mobilization (7.5%)				$72,728.95
Subtotal				$1,081,237.10
Incidentals (10%)				$108,123.71
Subtotal				$1,189,360.81
Contingency (25%)				$297,340.20
Total				$1,486,701.01
Say				$1,487,000.00

Appendix E

Tylerville Center Water Supply Estimate - (12-inch) Alternate Layout

Camp Bethel Road and Bethel Lane Section

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	3100	$12,400.00
Trench Excavation 0-10' Deep (No Bedrock)	$30.00	CY	496	$14,875.00
Trench Excavation 0-10' Deep (Bedrock)	$100.00	CY	88	$8,750.00
Processed Aggregate Subbase	$46.00	CY	97	$4,472.22
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	40	$6,206.41
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	66	$6,259.11
Material for Tack Coat	$9.00	Gal	121	$1,085.00
Class "A" Concrete	$300.00	CY	1	$225.00
Bedding Material	$30.00	CY	194	$5,833.33
8" Ductile Iron Pipe	$75.00	LF	1550	$116,250.00
Trafficperson (Municipal Police Officer)	$75.00	HR	64	$4,800.00
8" Gate Valve	$2,000.00	EA	1	$2,000.00
Subtotal				$183,156.08
Minor Items (3%)				$5,494.68
Subtotal				$188,650.76
M&P of Traffic (4%)				$7,546.03
Mobilization (7.5%)				$14,148.81
Subtotal				$210,345.60
Incidentals (10%)				$21,034.56
Subtotal				$231,380.16
Contingency (25%)				$57,845.04
Total				$289,225.19
Say				$290,000.00

Appendix E
Tylerville Center Water Supply Estimate - (12-inch) Alternate Layout
South Side Bluff Section

	Estimated By:		PHG	2/4/2013
	Checked By:		WAB	2/25/2013
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	100	$400.00
Trench Excavation 0-10' Deep (No Bedrock)	$25.00	CY	583	$14,583.33
Processed Aggregate Subbase	$46.00	CY	253	$11,627.78
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	3	$413.76
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	4	$417.27
Material for Tack Coat	$9.00	Gal	4	$35.00
Class "A" Concrete	$300.00	CY	0	$75.00
Bedding Material	$30.00	CY	194	$5,833.33
8" Ductile Iron Pipe	$75.00	LF	750	$56,250.00
Trafficperson (Municipal Police Officer)	$75.00	HR	64	$4,800.00
8" Gate Valve	$2,000.00	EA	1	$2,000.00
Subtotal				$96,435.48
Minor Items (3%)				$2,893.06
Subtotal				$99,328.54
M&P of Traffic (4%)				$3,973.14
Mobilization (7.5%)				$7,449.64
Subtotal				$110,751.33
Incidentals (10%)				$11,075.13
Subtotal				$121,826.46
Contingency (25%)				$30,456.61
Total				$152,283.07
Say				$153,000.00

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Appendix E

Tylerville Center Water Supply Estimate - (12-Inch) Alternate Layout

Brookes Court Section

	Estimated By:		MT	5/25/2017
	Checked By:		MJD	5/28/2017
Description	Unit Cost	Unit	Quantity	Cost
Cut Bituminous Concrete Pavement	$4.00	LF	510	$2,040.00
Trench Excavation 0-10' Deep (No Bedrock)	$25.00	CY	583	$14,583.33
Processed Aggregate Subbase	$46.00	CY	253	$11,627.78
Bituminous Concrete, Class 1 0 to 249	$157.00	Ton	3	$413.76
Bituminous Concrete, Class 4 250 to 499	$95.00	Ton	4	$417.27
Material for Tack Coat	$9.00	Gal	40	$357.00
Class "A" Concrete	$300.00	CY	1.00	$300.00
Bedding Material	$30.00	CY	194	$5,833.33
8" Ductile Iron Pipe	$75.00	LF	510	$38,250.00
Trafficperson (Municipal Police Officer)	$75.00	HR	64	$4,800.00
8" Gate Valve	$2,000.00	EA	1	$2,000.00
12" Gate Valve	$2,800.00	EA	2	$5,600.00
Subtotal				$86,222.48
Minor Items (3%)				$2,586.67
Subtotal				$88,809.15
M&P of Traffic (4%)				$3,552.37
Mobilization (7.5%)				$6,660.69
Subtotal				$99,022.21
Incidentals (10%)				$9,902.22
Subtotal				$108,924.43
Contingency (25%)				$27,231.11
Total				$136,155.53
Say				$137,000.00

Appendix E
Tylerville Center Water Supply Estimate
Service Connections and Well Abandonment Costs

Item Description	Unit	Quantity	Unit Cost	Total
1" Copper Water Service Connection*	EA	58	$1,000.00	$58,000
2" Copper Water Service Connection	EA	42	$1,400.00	$58,800
1" Supply from Property Line to House	LF	2500	$45.00	$112,500
2" Supply from Property Line to House	LF	2250	$50.00	$112,500
1" Water Meter	EA	58	$350.00	$20,300
2" Water Meter	EA	42	$1,400.00	$58,800
Individual System Removal	EA	24	$1,200.00	$28,800
Well Abandonment	EA	74	$2,800.00	$207,200
Total				**$656,900**

Note:
*79/81 Bridge Road will receive two water service connections

Appendix F

CWC Rate Tables

ConnecticutWater

Fact Sheet

Connecticut Water Rates

Pay your bill online by check or credit card at www.ctwater.com

Rates and any applicable surcharges for water service for Connecticut Water are approved by the Public Utilities Regulatory Authority (PURA). Approved rates for all of the Connecticut Water systems are available on our Web site www.ctwater.com.

The charges for all customers include a **Basic Service Charge** and a **Commodity Charge** and any **Applicable Charges or Credits**.

- **Basic Service Charge i**s applied each billing period to help cover certain fixed costs such as meter reading, testing and replacement, bill preparation and processing, etc. The basic service charge is based on the meter size at your account. *These Basic Service Charges are applied even if there is no consumption at a premise during a particular billing period.*
- **Commodity Charge** is based on the amount of water used during the billing period times the applicable charge for your customer class (residential, commercial, industrial). The commodity charge shows on the bill in units of gallons or cubic feet depending on how the meter installed at your premises records the usage.
- **Applicable Charges or Credits** are those PURA approved charges applied on a percentage basis to the total of the Basic Service Charge and Commodity Charge. These may include the Water Infrastructure and Conservation Adjustment (WICA), the Water Revenue Adjustment (WRA) and the Repair Tax Adjustment (RTA). The WICA recovers the costs for eligible infrastructure projects; the WRA ensures that water utilities do not over-collect or under-collect the revenues that were approved in rates by PURA; and the RTA is a credit to customers over a 2 year period starting April 2014 to return the benefits of a federal tax refund. The WICA may be adjusted every 6 months. The WRA is reviewed annually and may be a charge or credit on customers' bills based on actual revenues collected in the prior year.

Most customer bills are issued once per quarter, though larger volume users including commercial and industrial customers may be billed once per month. The number of days in a billing cycle may vary slightly, but your service charge and consumption reflect the actual usage and days in the billing period for your account.

Year Round Basic Service Charges

Meter Size	Quarterly	Monthly	Daily Rate
5/8"	$ 31.06	$ 10.35	$0.340
3/4"	$ 46.58	$ 15.53	$0.511
1"	$ 77.62	$ 25.87	$0.851
1-1/2"	$ 155.28	$ 51.76	$1.702
2"	$ 248.44	$ 82.81	$2.723
3"	$ 465.82	$ 155.27	$5.105
4"	$ 776.37	$ 258.79	$8.508
6"	$1,552.74	$ 517.58	$17.017
8"	$2,484.39	$ 828.13	$27.226
10"	$3,727.17	$1,242.39	$40.845

Year Round Commodity Charges All Consumption

Connecticut Water		
Customer Class	Per 1,000 gallons	Per 100 cubic feet
Residential	$7.907	$5.915
Commercial	$6.920	$5.177
Industrial	$5.886	$4.403
Public Authority	$6.490	$4.855

Seasonal Service Charges

Meter Size	Connecticut Water	Masons Island
5/8"	$ 124.29	$247.29
3/4"	$ 186.29	---
1"	$ 310.58	$576.73
1-1/2"	$ 621.17	
2"	$ 993.47	
3"	$1,864.42	
4"	$3,107.37	

Seasonal Commodity Charges

Customers	Per 1,000 gallons	Per 100 cubic feet
Connecticut Water	$7.907	$5.915
Masons Island	$7.097	$5.308

Seasonal Flat Rate Charges Soundview, Point of Woods White Sands Beach and Hawk's Nest Systems

Unit Type	Rate Per Season
Single	$404.00

Schedule of Special Charges

The PURA Decision authorizes separate Fire Protection Charges as well as a number of Special Charges for various non-routine services.

Service Turn On / Off & Meter Charges	
Service Turn Off – Normal Hours	$43
Service Turn On – Normal Hours	$43
Service Turn Off – After Hours	$65
Service Turn On – After Hours	$65
Service Turn On – Large Meter ≥ 2” – Normal Hours	$43
Service Turn On – Large Meter ≥ 2” – After Hours	$65
Turn On Service at Curb – Normal Hours	$43
Turn On Service at Curb – After Hours	$65
Frozen Meter Charge – Normal Hours	$54
Frozen Meter – After Hours	$81
Miscellaneous Fees & Charges	
Bulk Water Account Activation	$54
Bulk Water Commodity Charge	Commercial Metered Rate
Unauthorized Hydrant Use	$215
Unauthorized Water Use	$215
Curb Box Repairs – Equipment Required	$323
Curb Box Repairs – Hand Dug	$108
Cross Connection Notice Fee	$43
Collection Fees	
Returned Check Fee	$30
Late Payment/Interest Fee*	1.5% per month

Private Fire Protection Charges	
Service Connection Size	**Per Quarter Per Connection**
2” Service Connection	$ 45.12 each
3” Service Connection	$101.74 each
4” Service Connection	$141.50 each
6” Service Connection	$332.13 each
8” Service Connection	$587.03 each
10” Service Connection	$906.17 each
12” Service Connection	$1,289.58 each
Bradley Field	
60% of Regular Connecticut Water Division Rates	

Public Fire Protection Charges	
Hydrant Charge (per month)	$18.80 each
Linear Foot Charge (per month)	$0.09522
Private Right of Way - Linear Foot Charge (per month)	$0.07618
Bradley Field	
Hydrant Charge (per month)	$11.28 each
Linear Foot Charge (per month)	$0.05713

*Note: Late payment/interest charges are applied to amounts past due 30 days or more at a rate of 1.5 percent per month. Interest charges will appear on customer notices and subsequent bills based on the amount outstanding and time past due.

If you need additional information on this topic or have specific questions, please feel free to contact the Connecticut Water customer service team at 1-800-286-5700.

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Appendix G

Fire Suppression Cost Estimates

.

Appendix G
Tylerville Center Water Supply Estimate
Fire Hydrants

ESTIMATE FOR 8 INCH MAIN

Item Description	Unit	Quantity	Unit Cost	Total
6" CL 52 Cement Lined Ductile Iron Pipe	LF	15	$21.00	$315
Fire Hydrant (includes 6" gate valve and valve box w/ accessories)	EA	1	$3,350.00	$3,350
8" x 6" Tee (Cement Lined Ductile Iron w/ accessories)	EA	1	$365.00	$365
Pipe Bedding	CY	1.5	$28.00	$42
Installation Labor - 2 Laborers	Hrs	16	$77.00	$1,232
Installation Labor - Equipment Operator	Hrs	8	$110.00	$880
Installation Equipment	Days	1	$840.00	$840
Police Detail	Hrs	8	$80.00	$640
Surface Restoration (Estimated average for pavement and grass)	EA	1	$525.00	$525
Total per hydrant				**$8,189**
Subtotal	EA	13	$8,189	$106,457
Contingency (10%)				$10,646
Total				**$117,103**

ESTIMATE FOR 12 INCH MAIN

Item Description	Unit	Quantity	Unit Cost	Total
6" CL 52 Cement Lined Ductile Iron Pipe	LF	15	$21.00	$315
Fire Hydrant (includes 6" gate valve and valve box w/ accessories)	EA	1	$3,350.00	$3,350
12" x 6" Tee (Cement Lined Ductile Iron w/ accessories)	EA	1	$625.00	$625
Pipe Bedding	CY	1.5	$28.00	$42
Installation Labor - 2 Laborers	Hrs	16	$77.00	$1,232
Installation Labor - Equipment Operator	Hrs	8	$110.00	$880
Installation Equipment	Days	1	$840.00	$840
Police Detail	Hrs	8	$80.00	$640
Surface Restoration (Estimated average for pavement and grass)	EA	1	$525.00	$525
Total per hydrant				**$8,449**
Subtotal	EA	13	$8,449	**$109,837**
Contingency (10%)				$10,984
Total				**$120,821**

Note: The number of hydrants is based on the Insurance Service Office's Public Protection Classification (PPCTM) Program and the current CWC July 2010 Plans plus expanded Study Area limits.

Appendix H

Connecticut Department of Public Health and Connecticut Water Company Correspondence Regarding Additional Capacity in the Chester Water System to Serve Tylerville

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

Jewel Mullen, M.D., M.P.H., M.P.A.
Commissioner

Dannel P. Malloy
Governor
Nancy Wyman
Lt. Governor

Drinking Water Section

June 7, 2012

Mr. Pat Bowe, Director
Remediation Division
CT Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106

RE: Technical Supply Adequacy Review Comments-Draft Tylerville Water Supply Alternatives Evaluation

Dear Mr. Bowe:

The Department of Public Health (DPH) Drinking Water Section (DWS) has completed a technical supply adequacy review of the Connecticut Water Company (CWC) - Chester System to determine its current and future ability to provide safe and adequate public water supply to Tylerville Center and the Route 154 corridor. A CWC water main extension was a primary water supply option evaluated in the draft preliminary Tylerville Center Water Supply Alternatives Evaluation engineering report prepared by AECOM for DEEP's Water Protection and Land Reuse Remediation Division pursuant to CGS Section 22a-471. The attached review, conducted by Steve Messer of my staff, is provided to enhance, update, and supplement previous DPH comments for the Chester System. The review indicates a continuing marginalization of available supply over time as CWC projected system demands increase in conjunction with distribution system deficiencies that may be exacerbated by adding demand. An executive summary is provided below that highlights key regulatory conclusions of the completed technical review:

I) **Regulatory Requirement**: RCSA 19-13-B102(o) requires the "supply capacity of each community water system shall be maintained in excess of the demand of the system, with sufficient margin of safety (MOS) to properly allow for: (1) Sudden increases in consumption which may occur during a dry period; (2) The time required to bring new sources of supply on line; and (3) Increases or growth in the service area which may be reasonably expected."

Status: CWC Chester Division currently has the ability to safely and adequately serve existing customers, the Tylerville Water Study Area (WSA), and the Route 154 corridor. By calendar year 2020, due to CWC's projected growth in system demand, the CWC Chester System is projected to fall short of meeting this regulatory requirement for certain system demand conditions.

Action Item: The 2010 CWC Shoreline Region water supply plan states an interconnection of CWC's Chester and Guilford systems will be completed by the company during calendar years 2011-2012. CWC's Guilford System has an existing interconnection, with all requisite regulatory permits, with the Regional Water Authority which has considerable available excess supply. The Chester System requires additional supply by calendar year 2020 for certain demand conditions; CWC's planned interconnection of their Chester and Guilford systems is the most effective available short term supply. This planned project should be required to be completed by CWC if a

State regulatory decision is made to select CWC's water main extension option as the preferred long term Tylerville water supply solution. Completion of the planned interconnection would eliminate any possible concerns over current or future CWC - Chester System supply adequacy. Company officials informed DPH at an April 19, 2012 meeting that the interconnection planned for construction in 2011-2012 has not yet been initiated or budgeted to date. ***Tylerville added demands would result in a projected CWC-Chester System regulatory non-compliance status by calendar year2020 for RSCA Section 19-13-B102(o)(1-3).***

II) **Regulatory Requirement**: RCSA section 19-13-B102(p) requires "sources of supply, treatment, pumping, transmission, and storage facilities of sufficient capacity be maintained to provide flows in excess of maximum flows experienced in the CWS, and in individual service zones in integrated systems. When peak period consumption interrupts service to consumers under normal conditions, conservation measures to effectively reduce consumption shall be promptly instituted for the CWS, and a program to provide sufficient supply, treatment, pumping, transmission and storage capacity to meet existing and projected peak period consumption shall be implemented."

Status: The 2010 CWC Shoreline Region water supply plan states additional distribution system capacity is needed in the Chester system which can be accomplished by paralleling or replacing existing Middlesex Turnpike water mains; CWC's water supply plan system "Improvement Schedule" states the Middlesex Turnpike water main replacement project is to be completed in the 20 year planning period (by 2020). CWC's plan further states in Table 2.4.2 that the Middlesex Turnpike water main replacement project will be completed by December 2011 as part of the company's Water Main Replacement Program already approved by CT's Public Utility Regulatory Authority (PURA) through the Water Infrastructure Conservation Act (WICA) which funds critical infrastructure projects via approved surcharges to customer bills. The plan also states potential for situations that may occur during heavy CWC - Chester System demand periods when excessive head losses in existing 10" mains prevent CWC's Essex tank from refilling; such situations require set up of a portable pump with hydrant to hydrant fire hose connections in a "secure" location near Route 9. Company officials informed DPH at the above April 19, 2012 meeting that completion of the PURA approved WICA project would successfully resolve both identified existing distribution system deficiencies.

Action Item: CWC officials have stated that identified existing CWC - Chester System distribution system deficiencies would be successfully resolved by CWC's completion of their PURA approved Water Main Replacement Program WICA project. The project entails installation of 10,500' of new 16" diameter water main to replace existing CWC Middlesex Turnpike mains. The approved WICA Water Main Replacement Program project slated for Middlesex Turnpike should be required to be completed by the company if a State regulatory decision is made to select the CWC water main extension option as the preferred Tylerville long term water supply solution. It is our understanding that the project has yet to be initiated by the company.

It is my understanding that a final draft report will be completed which encompasses our comments and that a public hearing will be scheduled shortly thereafter. Thank you and if you have any questions or comments, please do not hesitate to contact me direct at (860) 509-7343.

Sincerely,

LMathieu

Lori Mathieu
Public Health Section Chief
Drinking Water Section

Cc: Steve Messer, DWS Statewide Planning Unit
Cam Walden, DWSRF/Capacity Development Unit
David Cooley, DWS Compliance Unit

CWC Shoreline Region/Chester Division Supply Adequacy Evaluation

I) Sources of Supply/Safe Yield:

A) Surface Water:

Source	Status	Usable Storage (MG)	Safe Yield (MGD)	DEEP Diversion (MGD)	Available Supply (MGD)	Intake Size/Elev. (USGS)	WTP Capacity Firm/Nominal (MGD)
Turkey Hill	Active	136.0	*	*	*	10"/302.9'	
Wilcox	Active	65.0	*	*	*	12"/209.9'	
Dueses Pond	Active	1.3	*	1.3	*	16"/151.5'	
U. Chester	Active	5.8	*	*	*	14"/292.0	
L. Chester	Active	108.0	1.2	2.0	1.2	16"/283.0'	
Total:		316.1 MG	1.2 MGD	2.0 MGD	1.2 MGD		**1.0 MGD/1.5 MGD***

*best determined from all available DWS reference sources

1) Available Surface Water Supply: Average Day Demand (ADD) = **1.0 MGD**: DPH approved safe yield of a reservoir system is a typical limiting factor; however, Williams WTP firm capacity of 1.0 MGD is more restrictive than the 1.0 MGD total approved safe yield of the Chester Reservoir system.
2) Available Surface Water Supply: Max. Month Average Day Demand (MMADD) = **1.0 MGD**: Firm WTP capacity (one filter train removed: Williams WTP = 1.0 MGD) can be used to meet MMADD.
3) Available Surface Water Supply: Maximum Day Demand (MDD) = **1.5 MGD**: Nominal treatment plant capacity (maximum; all filters operating) is allowed; Williams WTP nominal treatment capacity = 1.5 MGD.
4) Surface Water Supply System Restrictions/Limitations: **ADD** - Firm treatment capacity = **1.0 MGD; MMADD** - Firm treatment capacity = **1.0 MGD; MDD**- Nominal treatment capacity = **1.5 MGD**

B) Ground Water:

Source	**Status**	**Const. Date**	**Type**	**Depth**	**Diameter**	**Safe Yield (MGD)**	**DEEP Div. (MGD)**	**Pump Cap. (MGD)**	**ADD/ MMADD Supply (MGD)**	**MDD Supply (MGD)**
Dennison	Active	July '62	GP	51'	24" x 18"	***0.14*** **	0.25	0.25*	0.167	0.223
Total:						0.14 MGD**			**0.14 MGD**	**0.19 MGD**

* = installed pump capacity exceeds estimated safe yield; ** = CWC data; 1981 seven hour yield test at 155 gpm

1) Available Ground Water Supply: Average Day Demand (ADD)/ Maximum Month Average Day Demand (MMADD) = 0.14** MGD: Total *estimated* safe yield after 75% critical dry period adjustment (18 hour pumping day). ** Not properly yield tested per RCSA Section 25-32d-4.
2) Available Ground Water Supply: Maximum Day Demand (MDD) = 0.19 MGD: Total *estimated* safe yield of a ground water supply = a 24 hour pumping day. (One calendar day per year)
3) Ground Water Supply System Restrictions/Limitations: **ADD** – *estimated* safe yield after 75% critical dry period adjustment (18 hour pumping day); **MMADD** - *estimated* safe yield after 75% critical dry period adjustment (18 hour pumping day); **MDD**- *estimated* total safe yield (24 hour pumping day)

II) Total Available Water (AW): AW = Maximum water dependably supplied after limitations/restrictions (system hydraulics, treatment/pumping capacities, permit/legal restrictions, bulk sales) applied to safe yield.

A) Total Available Water: Average Day Demand (ADD) = 1.0 MGD (Available Surface Supply) + 0.14 MGD (Available Ground Water Supply) = **1.14 MGD**
B) Total Available Water: Maximum Month Average Day Demand (MMADD) = 1.0 MGD (Available Surface Supply) + 0.14 MGD (Available Ground Water Supply) = **1.14 MGD**
C) Total Available Water: Maximum Day Demand (MDD) = 1.5 MGD (Available Surface Supply) + 0.19 MGD (Available Ground Water Supply) = **1.69 MGD**

III) Tylerville Center Study Area Projected Demands: *Demands* taken from March 2012 AECOM "Tylerville Center Water Supply Alternatives Evaluation" final draft report.* ***(The 10% contingency factor added by AECOM to Tylerville demands is not utilized within this supply adequacy evaluation.)***

Study Area	Average Day Demand (ADD)	Maximum Month Average Day Demand (MMADD)	Maximum Day Demand (MDD)
Water Supply Area (WSA)	0.07 MGD	0.09 MGD*	0.11 MGD
WSA & Rt. 154 Corridor	0.09 MGD	0.12 MGD*	0.13 MGD

* = MMADD demands for Tylerville not provided in AECOM report; estimated by 1.3 x AECOM report ADD.

IV) CWC Shoreline Region/Chester Division Projected Demands and Margin of Safety (MOS): MOS is Available Water/System Demand; DPH recommends minimum adequate 15 % MOS for all demands.

SCENARIO I: CWC Chester Division Historic/Projected Demands Only (2010 CWC water supply plan)

Year	Average Day Demand (ADD)	ADD MOS	Maximum Month Average Day Demand (MMADD)	MMADD MOS	Maximum Day Demand (MDD)	MDD MOS
2005 (CWC)	0.62 MGD	1.84	0.91 MGD	1.25	1.02 MGD	1.66
2006 (CWC)	0.45 MGD	2.53	0.74 MGD	1.54	1.02 MGD	1.66
2007 (CWC)	0.59 MGD	1.93	0.73 MGD	1.56	0.97 MGD	1.74
2008 (CWC)	0.56 MGD	2.04	0.78 MGD	1.46	1.01 MGD	1.67
2009 (CWC)	0.55 MGD	2.07	0.69 MGD	1.65	0.83 MGD	2.04
2014 (CWC)	0.58 MGD	1.97	0.80 MGD	1.43	1.02 MGD	1.66
2020 (CWC)	0.66 MGD	1.72	0.92 MGD	1.24	1.17 MGD	1.44
2050 (CWC)	0.79 MGD	1.44	1.10 MGD	1.04	1.40 MGD	1.21

ORANGE = BELOW DPH RECOMMENDED 15% MOS; **RED = MARGIN OF SAFETY BELOW 1.0**

SCENARIO II: CWC Chester Division Demands with added Tylerville WSA Projected Demands

Year	Average Day Demand (ADD)	ADD MOS	Maximum Month Average Day Demand (MMADD)	MMADD MOS	Maximum Day Demand (MDD)	MDD MOS
2005 (CWC)	0.62 MGD	1.84	0.91 MGD	1.25	1.02 MGD	1.66
2006 (CWC)	0.45 MGD	2.53	0.74 MGD	1.54	1.02 MGD	1.66
2007 (CWC)	0.59 MGD	1.93	0.73 MGD	1.56	0.97 MGD	1.74
2008 (CWC)	0.56 MGD	2.04	0.78 MGD	1.46	1.01 MGD	1.67
2009 (CWC)	0.55 MGD	2.07	0.69 MGD	1.65	0.83 MGD	2.04
2014 (CWC)	0.65 MGD	1.75	0.89 MGD	1.28*	1.13 MGD	1.50
2020 (CWC)	0.73 MGD	1.56	1.01 MGD	1.13*	1.28 MGD	1.32
2050 (CWC)	0.86 MGD	1.33	1.19 MGD	**0.96 ***	1.51 MGD	**1.12**

ORANGE = BELOW DPH RECOMMENDED 15% MOS; **RED = MARGIN OF SAFETY BELOW 1.0**

SCENARIO III: CWC Shoreline Region/Chester Div. & Tylerville WSA/Rt. 154 Projected Demands

Year	Average Day Demand (ADD)	ADD MOS	Maximum Month Average Day Demand (MMADD)	MMADD MOS	Maximum Day Demand (MDD)	MDD MOS
2005 (CWC)	0.62 MGD	1.84	0.91 MGD	1.25	1.02 MGD	1.66
2006 (CWC)	0.45 MGD	2.53	0.74 MGD	1.54	1.02 MGD	1.66
2007 (CWC)	0.59 MGD	1.93	0.73 MGD	1.56	0.97 MGD	1.74
2008 (CWC)	0.56 MGD	2.04	0.78 MGD	1.46	1.01 MGD	1.67
2009 (CWC)	0.55 MGD	2.07	0.69 MGD	1.65	0.83 MGD	2.04
2014 (CWC)	0.67 MGD	1.70	0.92 MGD	1.24*	1.15 MGD	1.47
2020 (CWC)	0.75 MGD	1.52	1.05 MGD	1.09*	1.30 MGD	1.30
2050 (CWC)	0.88 MGD	1.30	1.23 MGD	**0.93***	1.53 MGD	**1.10**

ORANGE = BELOW DPH RECOMMENDED 15% MOS; **RED = MARGIN OF SAFETY BELOW 1.0**

V) Technical Conclusions:

A. Dennison Well was not yield tested per specified requirements of RCSA Section 25-32d-4(b); data provided for safe yield verification was 155 gpm for 7 hours falling well short of 72 hour requirement.

B. CWC states Dennison Well has 0.140 MGD safe yield (SY) without technical substantiation and credits AW of 0.140/0.190 MGD for ADD/MMADD and MDD, respectively. A minimum 72 hour yield test at sustained pumping rates with stabilized drawdown meeting RCSA Section 25-32d-4(b) requirements typically required to obtain a DPH approved safe yield. Given the stated safe yield/AW is slightly lower than 155 gpm (1981 short test) pumping rate results; the plan's 0.140 stated safe yield is used herein.

C. Level A Aquifer Mapping is slated for the Dennison Well in the Short Term Improvement plan; CWC should ensure minimum yield test requirements are met at this time. Dennison Well pumping capacity is stated to be 0.250 MGD which is considerably oversized regardless of stated safe yield. The same pattern of oversized pumps was evident during CWC's Western Region/Northern Division supply adequacy evaluation. Such practices are not sound water supply engineering or environmentally friendly.

D. Chester System demand projections provided in the plan appear to be reasonably determined in accordance with standard water supply planning practices based upon historic observed system demands.

E. AECOM's report provided a second parallel demand set for Average Day Demand (ADD) and Maximum Day Demand (MDD) with a 10% contingency factor; however, did not provide Maximum Month Average Day Demand (MMADD) projections which are critical here. This review used the standard demand sets without a 10% contingency which could skew MOS results and be subject to criticism. MMADD demands were observed to be critical so MMADD was calculated by applying a 1.30 multiplication factor to AECOM's standard ADD set which is reasonable based on observed statewide data and may be low due to larger rural lots and associated lawn/gardening activities.

VI) Results/Final Recommendations:

A. CWC Shoreline Region Chester Division has the current ability to safely and adequately serve existing customers, Tylerville "water service area", and the Route 154 corridor.

B. CWC Chester Division currently does not have short and long term future ability to safely and adequately serve existing customers, Tylerville "water service area", and the Route 154 corridor. In both the Tylerville WSA and the Tylerville WSA/Route 154 corridor scenarios, MMADD MOS dips below minimum 1.15 by calendar year 2020 and falls below 1.0 in the long term planning period.

C. Additional supply is required to safely and adequately provide future water service.

D. The plan states Short Term Improvements include Level A mapping for Dennison Well (proper yield testing should be conducted at this time) and completion of an interconnection with CWC's Guilford System along Route 153 which has an existing interconnection with Regional Water Authority complete with all requisite permitting requirements. This interconnection appears the most reasonable and available supply in a short term period and should be made a requirement of any State regulatory determination made to resolve Tylerville contamination areas.

E. CWC Shoreline Region plan also states additional distribution capacity is needed from Chester down through Deep River which can be accomplished by paralleling and/or replacing the existing Middlesex Turnpike water main. The plan also indicates potential for disconcerting situations during Chester System heavy demand periods; full technical details of this existing deficiency are found in Section 2 - Existing Sources/System Operation, page 22 in the plan. It is stated heavy demand can cause excessive head loss in existing 10" mains preventing Essex tank from completely filling requiring a portable pump with hydrant to hydrant fire hose connections to be set up in a "secure" location near Route 9.

Connecticut Water Company
93 West Main Street
Clinton, CT 06413-1600

Office: 860.669.8636
Fax: 860.669.9326
Customer Service: 800.286.5700

ConnecticutWater

September 10, 2012

Ms. Lori Mathieu
Public Health Section Chief
Dept. of Public Health
410 Capitol Avenue
Hartford, CT 06134-0308

Mr. Patrick Bowe, Director
Remediation Division
CT Dept. of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

Re: Tylerville (Haddam, CT) Water Supply Alternative

Dear Ms. Mathieu and Mr. Bowe:

I write to make sure that all stakeholders are working from the same set of facts concerning Connecticut Water's interest and ability to provide drinking water and fire protection services to the Tylerville area of Haddam, CT. In so doing, I also wish to correct certain errors contained in the Department of Public Health's Technical Supply Adequacy Review letter dated June 7, 2012, a copy of which was obtained by the Company in early August (the "Technical Review").

The Company has long viewed the extension of water service to Tylerville as a practical, permanent solution to localized contamination issues and identified the same in our October 2004 individual water supply plan and July 2010 plan update. We have similarly identified a connection of the Chester and Guilford distribution systems as likely occurring within the near-term planning period. However, an interconnection of the two distribution systems is not, and never has been, a prerequisite to our ability to provide water to Tylerville. A brief discussion of system available supply, demand and margin of safety is attached.

Upon review of the accompanying data and analysis it is clear the Chester System currently has sufficient capacity to safely and adequately serve Tylerville. This fact is noted by DPH in the Technical Review. However, by discounting available supply and inflating demand, the Technical Review erroneously concludes that *"Tylerville added demands would result in a projected CWC-Chester System regulatory non-compliance status by calendar year 2020."*

To address this perceived shortfall, the Technical Review advocates that a connection of the Guilford and Chester distribution systems *"should be required to be completed by CWC if a State regulatory decision is made to select CWC's water main extension option as the preferred long term Tylerville water supply solution."* This is needlessly prescriptive.

As noted, a connection between the Guilford and Chester systems is planned by the Company. However, such a project should not be speculatively mandated, but undertaken at the appropriate time, for the appropriate reason, and for the benefit of our customers. Moreover, the use of extraordinary contracts or orders to effect such a connection is not necessary or warranted; in the unlikely event that the Company does not move quickly enough to bring needed supplies to our customers, the Departments (DPH and PURA) have adequate legal and regulatory tools to remedy the situation.

Any concern regarding the future failure on the part of the Company to meet its water service obligation would have no grounding in the facts that make up the long history of our Company. We have never failed to meet our obligations as a public service company. We understand and embrace our responsibility to provide an adequate supply of water to all customers – now and in the future. If additional supply is needed in the Chester System, we will undertake a connection between systems at the appropriate time, or pursue some other viable alternative to ensure our continued ability to provide service.

Very truly yours,

David L. Radka
Director of Water Resources

Cc: E. Blaschinski, DPH
T. Caruso, PURA
P. DeStefano, Haddam
E. Thornburg, CWC

Review of Available Supply and Margin of Safety for CT Water Company's Chester System

Available Supply: In the Chester System, peak available supply is 1.69 million gallons per day (mgd), with the bulk of this (1.5 mgd) coming from the Williams surface water treatment plant and the remaining 0.19 mgd from groundwater. Average day available water is naturally somewhat less; Williams water treatment plant yield is considered equal to the supply available during a critical dry period, while groundwater is discounted by an 18-hour pumping day. For the Chester System, this equals 1.34 mgd.

Maximum month average day available supply is somewhat less than peak day and can be computed as either the reservoir safe yield multiplied by the maximum monthly peaking factor used in the safe yield analysis, or using full treatment plant capacity while adjusting for volume lost when a filter is out of service for backwashing and the amount used to backwash. For the Williams WTP, both methodologies result in an available supply of some 1.4 mgd. The addition of groundwater brings the maximum month available supply to 1.54 mgd.[1]

The Technical Review makes use of a so-called "firm" water treatment plant capacity value and assumes a filter is completely off line when evaluating available supply for average day and maximum month average day purposes, respectively. This approach, which does not appear supported by water supply planning regulation, results in a surface water available supply that is 0.2 mgd less than the department has historically acknowledged through the water supply planning process.

Demand and Margin of Safety: Water supply demands associated with the Tylerville area and water main extension along CT Route 154 were projected in the Company's 2010 water supply plan update. Demands were calculated using historic per capita, commercial and industrial customer demand for the system, and multiplied by the anticipated service area. The Technical Review appears to have ignored these projections and layered additional demand associated with the Tylerville project over them. Such an error inflates system demand above reasonably expected levels.

For the Chester System, recent demand, as expressed by surface water treatment plant and well production, is as follows:

CHESTER SYSTEM						
	2011	MOS	2010	MOS	2009	MOS
ADD	535,342	2.50	547,411	2.45	536,463	2.50
MMADD	716,252	2.15	752,548	2.05	693,083	2.22
MDD	883,000	1.91	1,016,148	1.66	829,700	2.04

These data indicate an excess system capacity more than adequate to serve the Tylerville area. In fact, even during a hot, dry year such as 2010, the Chester System maintained an available supply of at least 0.5 mgd above demand, including a 15 percent margin of safety.

[1] In the past, Connecticut Water has also used the reservoir system safe yield of 1.2 mgd as a limiting factor when computing available supply for maximum month planning purposes. This results in a somewhat more conservative system-wide available supply of 1.34 mgd.

STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC HEALTH

Jewell Mullen, M.D., M.P.H., M.P.A.
Commissioner

Dannel Malloy
Governor

October 12, 2012

Mr. David L. Radka, Director of Water Resources
Connecticut Water Company
93 West Main Street
Clinton, CT 06413-1600

Re: DPH Technical Review - Connecticut Water Company (CWC) Tylerville Supply Alternative

Dear Mr. Radka:

Thank you for your September 10, 2012 correspondence. The Department of Public Health Drinking Water Section (DWS) has reviewed your clarifying information on available water supply and finds that the CWC Chester System has sufficient supply to serve the Tylerville area. Your commitment to serve the Tylerville area is consistent with the CWC Shoreline Region individual water supply plan and the South Central Connecticut Water Utility Coordinating Committee (WUCC) plan dated April 1990 which identifies the entire town of Haddam as the exclusive service area (ESA) of CWC and with the individual Water Supply Plan for the Connecticut Water Company Shoreline system.

In order to facilitate public water service to Tylerville, the DWS suggests that you supply all relevant water supply data to the Department of Energy and Environmental Protection (DEEP) directly so that your technical data and level of commitment can be incorporated into the AECOM engineering study. Further we offer the more detailed comments on your correspondence for your consideration.

- The Tylerville and Route 154 corridor demand in the June 2012 DPH adequacy review was derived from AECOM's Tylerville engineering study. DWS notes that a 'non-specific' Tylerville area demand was included in CWC water supply plan demand projections. We recommend that you provide specific detailed projections for the service areas to DEEP for inclusion in AECOM's Tylerville study. We agree with CWC's comment that one set of consistent technical data is critical in supply evaluations.

- Using CWC's technical data provided in the September 10, 2012 correspondence, DWS staff updated our supply adequacy technical review. Results indicate you have sufficient supply to serve existing customers and the Tylerville/Route 154 corridor for all system demand conditions through the 2020 planning period.

Ample supply and system redundancy are key components of DPH public drinking water supply planning. With CWC's commitments expressed in your September 10 , 2012 correspondence, the DWS finds CWC's plan to serve the Tylerville area consistent with long standing water supply planning documents and that CWC is well positioned and committed to assuring a safe and adequate supply for the existing and expanded Chester System.

If you have further questions or concerns, please do not hesitate to contact me direct at (860) 509-7343.

Sincerely,

Lori Mathieu
Public Health Section Chief
Drinking Water Section

Cc: Paul DeStefano, Honorable First Selectman - Town Of Haddam
Ellen Blaschinski, Branch Chief of Regulatory Services – DPH
Patrick Bowe, Director, DEEP Remediation Division
Eric Thornburg, CEO – Connecticut Water Company
Thomas Caruso, PURA
Liz Glidden, Town Planner – Town of Haddam
Thad King, Health Director – Chatham Health District

Appendix I

Tylerville Public Hearing Comments and Correspondence and Responses

.

APPENDIX I

Public Hearing on Draft Water Supply Alternatives Evaluation
Responses to Comments and Correspondence Received

Comments received at Public Hearing, Haddam Fire House, June 21, 2017:

Comment
Jackie Gardell - Asked DEEP to consider putting in shut-off valves for homes that do not have basements.

Response
Thank you for your comment. Necessary shut-off valves will be included in the design documents.

Comment

Stephen Gephard – Representing Camp Bethel on Camp Bethel Road. Thanked everyone for their presentations that were very good, very informative. Many of their questions have been answered. Will probably submit written comments. Camp Bethel has been doing a lot of testing regularly through not only DEEP but also the Dept. of Public Health. Our water is clean right now. We value our wells. We are very interested in the system and are very happy that clean water is coming to our neighbors. We have some concern about being hooked up into this system while we have clean water. I'll leave it at that for now. We'll continue to gather more information from all the parties. Thank you.

Response

Thank you for your comment.

Comment

Jeffrey Muthersbaugh – My wife and I own the nearby Brainerd House on Saybrook Road in Haddam. I wanted to thank you. I think that if there ever was a function of government, this is it – to provide, to have a segment of our population without potable water for 40 years, it's unacceptable. To be able to remedy this problem is long overdue and we need this. This is what separates us from third world countries, so to be able to have potable water for our people is pretty basic. Thank you.

Response

Thank you for your comment.

Comment

Ed Veselak – I'm at 1618 Saybrook Road. I'd like to thank everybody from Connecticut Water Company, DEEP, Public Health, and all of that. I know most of you folks and I've talked to you a few times on the phone and over the years. I think Tylerville really needs to get on board with this project because it's all needed. I rent buildings and sometimes not having water and then it kind of weighs on the septic system, too. It's a double-edged sword. If you have water, clean water is great because then your septic system is probably not required as much. The other thing is that it's going to bring people to Tylerville. Maybe bring a laundromat and other types of things that couldn't go into Tylerville. And I think that would be good. We had stuff in the past but unfortunately, it didn't work because of water or sewer or just other things. I think that bringing the line up from Chester is a great idea because I own property in Chester also and it's close by. Fire protection is a great thing, I also think, because I've seen too many times we'll have a fire and the guys have to run for water down. It's down at the Connecticut River. From there, you'll have an emergency or something. I've seen it time and time again. The other thing is, I feel that if you could bring a 12" pipe up, that would be great to the fire crew and if it could cross over the railroad tracks down with an 8" and go around the other way, that would be nice. Could save that way. Fire hydrants are important in Chester, too, if that will be along the line at some other point, maybe. Who knows? In Haddam, it would be a great thing because I'm sure that the fire department needs it. And I'm in favor of this. I do a lot for the water at my place to make safe drinking water to do all of the tests we have to pay for. All in all, thanks for all of this and hopefully it comes to be, because I've signed up several times for this to do the study, and I said I would hook up to it. I appreciate the time that everybody has put into this. Thanks very much.

<u>Response</u>

Thank you for your comment. As detailed in the Tylerville Center Water Supply Alternatives Evaluation Report, the study included analysis of an 8" and 12" diameter water mains. The 8" water main will provide adequate water supply as well as provide fire protection flows as noted. In addition, the selected 8" water main alternative is consistent with the State Conservation and Development Policies Plan as well as the Town of Haddam and Town of Chester Plans of Conservation and Development.

<u>Comment</u>

Polly Champ – My comment was already made. She agrees with the previous comment.

<u>Response</u>

Thank you for your comment.

<u>Comment</u>

Arthur Collins, Jr. – Once again everybody is speaking in here, it's so good to see this water coming in. It's a shame we have to be here to do this because a lack of regulations or enforcing regulations allows a company to just deposit this pollution that is the cause of this. Now these people are going to have fresh water in their homes and will cause their values to go up. I know four years ago when I was looking for a home with my three daughters, that was one thing I checked out was the well water. I saw a home and how beautiful it was but when I saw all the filters and stuff like that, I said forget it. I ain't going to buy that. I'll go to some other place. That's going to be a good thing, it's going to add to the value. As far as rules and regulations, they always can change and then someone all of the sudden comes in and don't like something, they'll take them to court and they file lawsuits and it's not good. And as I said, coming down the road where we have all these restaurants and stuff and 20 years down the road something along this line you have laundromats, all of the sudden the 8" line may have some problems because it sounded like as long as everything's a certain way, it will be okay. Well, if not, we'll run into some problems. Gee whiz, why didn't 20 years ago they change this? My comment is, with the cost of the increase, maybe it's worthwhile looking into the cost of the 12" line. (Inaudible) Thank you.

Response

Thank you for your comment. As detailed in the Tylerville Center Water Supply Alternatives Evaluation Report, the study included analysis of an 8" and 12" diameter water mains. The 8" water main will provide adequate water supply as well as provide fire protection flows as noted. In addition, the selected 8" water main alternative is consistent with the State Conservation and Development Policies Plan as well as the Town of Haddam and Town of Chester Plans of Conservation and Development.

Comment

Maryanne Muthersbaugh – I want to say that I'm for this 100%. I think the presentation was terrific. I'd like to see some sensitive businesses along that route. It would be terrific to have restaurants, laundromats. I'm repeating what everyone else said, but I think that's great.

Response

Thank you for your comment.

Comment

William Robbins – I'm the Fire Marshal for the Town of Haddam. From a public safety standpoint, this is a no-brainer. A minimum of an 8" pipe if it's an engineering issue, 8" vs. 12", but if 8" pipe is adequate and gives us a fair amount of fire flow, the fire department is very much in favor of it. I also wanted to point out one thing I noted in the back, you call for 21 hydrants. We can do it for a lot less than that. You won't need 21 hydrants, so that's something you can consider.

Response

Thank you for your comment. As detailed in the Tylerville Center Water Supply Alternatives Evaluation Report, the study included analysis of an 8" and 12" diameter water mains. The 8" water main will provide adequate water supply as well as provide fire protection flows as noted. Final selection of hydrant locations will be made in conjunction with the Town of Chester and Town of Haddam and Connecticut Water Company. A preliminary discussion with regard to hydrant locations indicates less than 21 hydrants may be acceptable.

Comment

Marge Supple – I live at 116 Little Meadow Road. I want to thank the CT DEEP for coming down ever since we lived there to test the water here. Thank goodness we're one of the ones that don't have pollution yet so right now. I did want to bring to everyone's attention that Little Meadow Road is a private road and the property owners take care of the road. My concern was if, you know, the construction company comes in and puts in the water way, what's going to happen to our road? Are we going to have to restore it? I know Haddam does not take care of our road at all. Like I said, the property owners do. There's also a right of way that we have with Little Meadow Road. I know when we purchased our home 25 years ago, we did not have any running water or electricity. We had to buy the lot ahead of us who was blocking the power from going down the road, and my husband would not let the electricity go down the road until all the property owners took a (inaudible) to it. So it's been 25 years ago since electricity went down the road. I don't know if there might be an issue with all of the property owners not allowing the water to go down. Also, Little Meadow Road has about 6-7 year-round homes on the road as well. Our home is year-round. We haven't the past couple years lived there year-round but we are farther on down the road. The year-round homes aren't just at the end of the road.

Response

Thank you for your comment. The intent of the project will be to replace and restore any areas disturbed as a result of the water main installation, including roadways. Resolution of property access and/or rights-of-way will be addressed during the final design process.

Comment

Doug Dole – I live on Camp Bethel Road and my property is the first property north of the Study Area, so the line won't make it to where my property is located. But there was a mention of an unpredictability in the plume. TCE, which I believe, at one time, had been detected at Camp Bethel, in one of their wells. That's how it looks like on the map. My concern is for future contamination from either the currently known sources or from potential unknown sources and having the line move north more on Camp Bethel Road. Otherwise, I support this anyway. I think the ability to have fire hydrants on Camp Bethel Road is good even though I'm a few hundred feet north of where the line is, I'll benefit from that so I appreciate that. And it will be nice to have the property values go up a little bit. Thank you again for the presentation you all did and thanks for taking our comments.

Response

Thank you for your comment. The limits of the Water Supply Study Area, as shown on Figures 2 and 3 from the Water Supply Alternatives Evaluation Report, have been conservatively established. Based on the historic collection of groundwater laboratory data and the current understanding of the impacts to groundwater in the area, it is highly unlikely that the Tylerville Center groundwater contamination would migrate outside of the Study Area limits.

Comment

Sharon Botelle – I live at 81 Bridge Road. I live across the street from Dunkin' Donuts, and I've been living with this from 38 years. I just want to say thank you.

Response

Thank you for your comment.

Comment

Representative Bob Siegrist – I want to echo some of Jeff's comments. State government, local government, and private sector coming together is a good thing and this is a prime example of it. It's good, most important for health, public safety, as well as economic development. It really is good to see everybody here. I want to thank everybody, all parties involved, Shannon – I don't know how many conference calls we've been on with a bunch of people, so thank you. This is a great community and it's good that we're all sticking together. Thanks again.

Response

Thank you for your comment.

Comment

First Selectman Lizz Milardo - I just want to, first of all, thank everyone involved. Shannon, I think we've spent countless times in meetings with everyone from AECOM to Connecticut Water. This is something that I have to give kudos to Liz Glidden, our Town Planner. She has really helped me with this project. She is the one with the history. I'm really happy that we're getting to come to a resolution for the residents of Tylerville. I think it's a great thing for Haddam. I just want to thank everyone for their support.

Response

Thank you for your comment.

Comment

First Selectman Lauren Gister – Thank you. I just want to say, although it's been said about five times already, that watching agencies be able to coordinate this depth of investigation is really wonderful. As Haddam's neighbor we appreciate that it doesn't look like Chester has great big part in this and that there's not a lot of obvious benefit to the Town of Chester. But I can tell you that I see a huge benefit in doing the right thing and this is clearly the right thing to do. As First Selectwoman, my concern is for the residents and tax payers of Chester and I know that some of their concerns will be some of the things that were talked about tonight, both with regard to hydrants, which not only saves them money on insurance but also costs them money in their taxes. Also the ability to tie into the public water or not tie into the public water, and the design and timing parallel to what Chester has planned in other areas. I appreciate the opportunity to be a part of this, and nice work everybody.

Response

Thank you for your comment.

Written Comments Received During Public Comment Period, June 10, 2017 – July 10, 2017:

Lisa Wadge - Thank you for the presentation last night. I have a comment that the maps are extremely misleading because they depict all contamination over a 30 year period. Our site is clean, is not an establishment and has not had MTBE in the water supply well it for many years. When it was detected it was only at trace levels, yet our entire site is shown as a contaminated site. In addition we are in a different aquifer yet that is not discussed or mapped either. We request that the maps be edited to depict 1) current and historic contamination separately, 2) the mtbe and tce plumes separately and 3) the aquifer divides to better document current conditions.

While we are looking forward to the potential of city water for our site, we object to our site being mapped as having groundwater contamination as this is having an adverse effect on our ability to develop our property as planned and approved by the town of Haddam. Maps need to reflect our site as in the area of city water but not in the contamination area in a clearer and more scientifically correct manner. Thank you Lisa Wadge DBP LLC

Response

Thank you for your comment. Historic detections and exceedances of relevant regulatory criteria of contaminants have been depicted on the figures included in the Tylerville Center Water Supply Alternatives Evaluation Report. Distinction between contaminants is depicted on Figures 2 and 3 in the Report. The properties you reference appear to be up- or cross-gradient from the groundwater plume but as noted in the Report, the bedrock aquifer is complex.

Comment

Ed Schwing

The following are my comments/concerns (page number references are to the AECOM report)

1. On page 1.1 under documented release areas:

It is quite unfair and misleading to list all those releases without a brief qualifier indicating their current status and proportional contributions.

For example the Botelle property has been remediated and currently no indications of TCA (their release). Mobil (MTBE) has entered into a consent order, remediated and provides water to neighbors and plume is dissipating. Luke Oil (MTBE) release was terminated. CTDOT 105 Bridge Rd: (Sodium, VOC): some remediation has occurred (septic removed and surrounding area) current sampling indicates only presence of as from natural source. Camelot Cruise: wells in area have highest concentration of TCE but no documented releases of that magnitude if any; only that contaminated soil was removed in 1983. Possibility of an external source affecting these high readings should be clearly stated (this is like making the victim responsible for the crime).

By listing all as equal potential sources it gives the false impression that they have contributed, or continue to contribute, in equal proportion to the pollution.

In fact MTBE should be listed as separate issue affecting fewer properties and bound to go away before TCE is resolved.

2. Community Groundwater Supply Alternative page 3.1

This is one of the weakest parts of the report. The consultants did not even bother to investigate this alternative thoroughly and just copied and pasted what was in the Weston and Sampson Engineers, Inc. (WSE) 1999 report.

That 1999 report only looked at one potential property for a local supply of water, ignoring the advice of resident and Wesleyan Geology Professor Jelle deBoer at the time regarding the possibility of locating those wells upgradient of water running towards Tylerville, namely the west side of RT 154. (Sadly Dr. deBoer passed away in 2016).

The state owns most of the land surrounding RT 82 connector in that area, which we would think would help facilitate a local water source. But what is even more troubling in this report, the consultant statement on page 3.2: "there is no suitable land under the ownership or direct control of the Town of Haddam" is false. Indeed the Town of Haddam owns about 63 acres of open space land west of 154 and South of RT 82 connector. Close to the Chester border and about a mile from the intersection of 154 with 82 (see attached PDF with GIS map with lot 67 - 003 in red). The consultants owe the residents to investigate this possibility more thoroughly with specific detailed costs and estimates rather than simply updating the unlikely scenario of 1999.

Limiting water distribution only to affected properties in Tylerville and having local municipal control of that water distribution would be meet high public acceptance.

The dismissal of the Community Groundwater Supply Alternative early in the study process gives the impression that this study had a predetermined conclusion, namely that the extension of the Connecticut Water Company was the only viable option.

3. The 12 Inch vs 8 Inch issue.

The 12 Inch option as discussed on page 5-6, is a red herring. 12 inch main is not needed and 8 inch main will be sufficient for fire protection as indicated by our fire marshal at the hearing. The water company just wants the taxpayers to foot the bill for their future expansion. This would be corporate welfare pure and simple.

4. How about Water Company Contribution?

Talking about corporate welfare, how come there are no provisions for the water company to participate financially in this project. They make good profits and they should be asked to contribute substantially to a project that will create even more profits for them down the line. In a capitalistic society that is what profits are for.

5. The Pollution Source

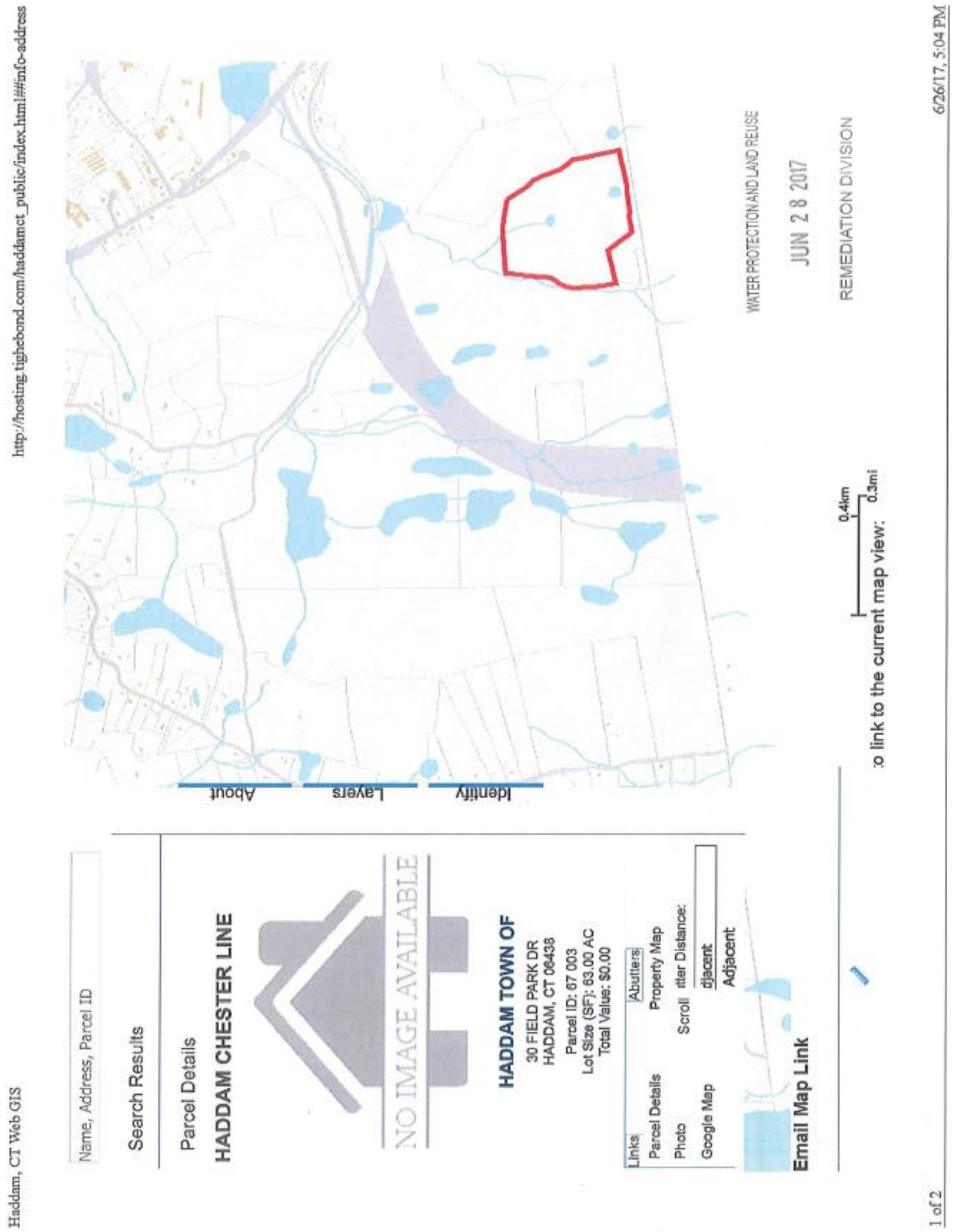
TCE does not fall from the sky. Very disturbing is the fact that in the total price estimates there are no provisions made for the polluter(s) to help defray any of the costs once a determination is made of who is responsible. In fact the polluter(s), in the current scenario, are bound to benefit financially, turning the concept of environmental justice on its head.

I forgot to send this GIS map with my letter. Could you please add this as well as my description below to the record? This is for my comment on the community well supply option

GIS Map for Community Well Option

The area in red is the 63 acres owned by the town of Haddam parcel ID 67 003

It is abutted by State of Connecticut lots 65 016 2A (39 acres) and lot 64 008 (260+acres) up to RT 82 connector. Thank you



Response

Thank you for your comments. The following responses are offered to the numbered comments:

1. *The intent of the Tylerville Center Water Supply Alternatives Evaluation Report is to present the historic contamination of groundwater in the Tylerville Center area and to evaluate alternatives for water supply to the properties within the Study Area. A detailed evaluation of the releases or relative contributions of releases is beyond the scope of the current Report. DEEP is evaluating potential sources of pollution to the groundwater in a separate study.*

2. *The alternatives presented within the Report were evaluated fairly and without bias to a pre-determined selection. The development of a community groundwater supply is a complex and time consuming alternative. In addition, as presented in the Report, identification of a groundwater source capable of meeting demand and quality requirements is highly uncertain. The parcel owned by the Town of Haddam that is referenced in the comment is protected open space located in an upland area that is not readily accessible (no nearby roads or infrastructure). The overburden in this area is mapped as thin till deposits; therefore, bedrock wells would be the water supply source. Typically, stratified drift and sand and gravel deposits found in river valleys are preferred for locating community water supply wells based on high water yields. The water yield in bedrock wells is uncertain, as is the water quality. As noted in the Report, area bedrock contains naturally occurring arsenic, which may adversely impact water quality in a new bedrock well and require expensive treatment to remove. Further, Connecticut Water Company holds the exclusive services rights to the Study Area. As such, any new water supply system developed to serve Tylerville would ultimately be managed by Connecticut Water Company. Leveraging Connecticut Water Company's existing water supply and infrastructure in the Town of Chester with available water quantity of known quality is the prudent and economical alternative given the unique characteristics of the current conditions.*

3. *As detailed in the Water Supply Evaluation Report, the study included analysis of an 8" and 12" diameter water mains. The 8" water main will provide adequate water supply as well as provide fire protection flows as noted. In addition, the selected 8" water main alternative is consistent with the State Conservation and Development Policies Plan as well as the Town of Haddam and Town of Chester Plans of Conservation and Development.*

4. *The intent of the project is to provide an adequate water supply to those properties that have been impacted or are at-risk of becoming impacted by historic groundwater pollution in the Study Area. Section 22a-471-1 of the Regulations of CT State Agencies (RCSA) establishes the regulatory framework for "Grants to Municipalities and Water Companies for Potable Water Supplies" for situations "where groundwater pollution has rendered existing supplies unusable for potable drinking water." Connecticut Water Company has contributed significant expertise to the planning of the project and, as the holder of the Exclusive Service Provider rights, will operate and maintain the system upon project implementation. Service rates will be set in accordance with the Connecticut Public Utility Regulatory Authority and are summarized in the Report and detailed in Appendix E.*
5. *Extension of the Connecticut Water Company water main, to be funded in part by the State of Connecticut, does not preclude the State from seeking restitution from responsible parties associated with the contamination in the Tylerville Center area.*

Comment

Please see attached Connecticut Water Company June 28, 2017 correspondence.

Connecticut Water Company
93 West Main Street
Clinton, CT 06413-1600

Office: 860 669 8636
Fax: 860 669 9326
Customer Service: 800 286 5700

ConnecticutWater

June 28, 2017

WATER PROTECTION AND LAND REUSE

JUN 2 8 2017

REMEDIATION DIVISION

Via Electronic Mail

Ms. Shannon Pociu
Department of Energy and Environmental Protection
Remediation Division
79 Elm Street
Hartford, CT 06106

Re: **Tylerville Center Water Supply Alternatives Evaluation**

Dear Ms. Pociu:

Connecticut Water has long supported the extension of water service to Tylerville as a practical, permanent solution to localized contamination issues and is cautiously optimistic such a solution is at hand. We applaud the efforts of all parties – state agencies, municipal leaders, and legislators – to arrive at this point, and are pleased Connecticut Water is identified as the recommended alternative. We take pride in our ability to provide high quality water service throughout our 56 service towns and look forward to serving the families and businesses of Tylerville.

As you know, Connecticut Water cooperated with AECOM throughout the preparation of their "*Tylerville Center Water Supply Alternatives Evaluation Draft Final*" report of June 2017. There are a few items, however, that bear comment.

Section 5.2.7 *Capital Cost and Operating and Maintenance Cost Estimates* (page 5-10) and Appendix G identify estimated capital costs of $225,200 and $232,400 for the installation of hydrants on an 8-inch and 12-inch main, respectively. As noted during the public hearing of June 21, the 22a-471 program does not cover such costs and fire protection would be at the municipality's discretion and potential expense to install. While correct that the placement of hydrants resides with the local fire marshal, it is Connecticut Water's practice to pay for the material and installation costs of any public fire hydrants installed along a water main such as this. Therefore, while unallowed for state funding purposes, the installation of hydrants under either an 8-inch or 12-inch scenario would not be borne by Haddam (or Chester). Similarly, Connecticut Water would assume any incremental expense associated with the installation of a 12-inch water main alternative, was that to be the Town's preference, as some suggested at the public hearing. Future fire protection charges would be the town's responsibility.

Section 6.1 *Recommended Alternative* notes that properties within the Study Area would be authorized to connect to the proposed distribution water main. However, as proposed, properties along Route 154 from Denlar Drive in Chester to the Study Area in Haddam would only be authorized to connect to the water main if a local health department, CT DPH, and/or CT DEEP determines that the property must be connected to correct a public health problem on the property (Page 6-2).

Ms. Shannon Pociu
Page 2

June 28, 2017

While this limitation is recommended to ensure consistency with state and local plans of conservation and development, it is too restrictive. As currently drafted, the language precludes existing property owners with no planned change or expansion of their current use – owners who simply want the safety, reliability, and confidence that public water supply affords – from connecting to the system.

A similar need to maintain consistency with state and local plans of conservation and development recently arose when the extension of water from the Company's Northern Western system in Tolland to Mansfield and the University of Connecticut was contemplated. That project, for which an Environmental Impact Evaluation was completed, does allow for water main to be installed in areas that are designated as conservation and other lands outside of Priority Funding Areas (PFAs).

Outside PFAs, the State Plan's policies <u>do</u> support the introduction or expansion of public water and/or sewer services at an appropriate scale when there is a demonstrated environmental, public health, public safety, economic, social, or general welfare concern. For the Mansfield/UConn project, service connections are thus allowed when one or more of these criteria are met. This allows for a reasonable level of water service, while ensuring consistency is maintained with applicable conservation and development plans.

Connecticut Water suggests that similar language be employed for that portion of the Tylerville water main extension outside the Study Area, e.g., that *"connections to the water main would be allowed, but only upon a determination by a state or local agency, within their applicable authority, that the connection is necessary to address a demonstrated environmental, public health, public safety, economic, social, or general welfare concern, and that any such water service connection is consistent with the state plan of conservation and development prepared pursuant to C.G.S. §16a-24 et seq."*

Such language achieves the appropriate balance between meeting the public's expectations for water service and mitigating concerns over potential inconsistency with conservation and development plans.

We appreciate the opportunity to comment and – more importantly – the opportunity to be part of the solution to providing potable water to Tylerville.

Very truly yours,

David L. Radka
Director of Water Resources & Planning

Cc: L. Milardo, First Selectman, Haddam
Lauren Gister, First Selectwoman, Chester
L. Mathieu, DPH

<u>Response</u>

Thank you for your comment letter. The Town of Haddam has selected the water supply alternative that includes installation of 8" diameter water mains. Discussions with the Towns of Chester and Haddam resulted in the conclusion that there is not a strong need for public water to be provided in the transmission corridor as identified on Figures 5-A and 5-B of the Water Supply Alternatives Evaluation Report. The selected alternative is consistent with the State Conservation and Development Policies Plan as well as the Town of Haddam and Town of Chester Plans of Conservation and Development. Properties within the transmission corridor will be allowed to connect to the water main if a local health *department, CT DPH, and/or CT DEEP determines that the property must be connected to the water main to correct a public health problem.*

Comment

Please see attached APEX Companies July 10, 2017 correspondence.

APEX

VIA EMAIL (Shannon.pociu@ct.gov) ***AND U.S. MAIL***

July 10, 2017

Ms. Shannon Pociu
Environmental Analyst 3
Connecticut Department of Energy and Environmental Protection
Waste Management Bureau
Remediation Section
79 Elm Street
Hartford, CT 06106-5127

RE: Draft AECOM Report "Tylerville Center Water Supply Alternatives Evaluation" (June 2017)

Dear Ms. Pociu:

On behalf of Mercury Fuel Service, Inc. (Mercury), this is to provide comments regarding the above-referenced draft report, and to request clarifications and corrections regarding certain points.

As you know, Mercury owns and operates the gas station/convenience store at 1598 Saybrook Road (Tylerville Mobil), and has incurred significant costs in investigating and remediating MTBE and other petroleum release impacts or potential impacts at and in the vicinity of its facility. Mercury has done so even though there are multiple other known or potential sources of MTBE in the vicinity which have received little or no investigation. Also as you know, Mercury's investigation and remediation efforts have been very effective. MTBE levels are now encountered in only a few monitoring wells, all of them on-site, and in all cases below applicable remedial standards. In addition, of the remaining eight potable wells still voluntarily monitored by Mercury under DEEP oversight, none have an exceedance of CTDPH action levels for any petroleum constituents.

While much of the draft report addresses substances or locations not relevant to Mercury, certain other points in the draft relevant to Mercury are not accurate or complete as stated, and should be corrected in the final report. These points include:

1. Correct the reference to Mercury's monitoring of drinking water wells as non-voluntary.
2. Include the additional documented release sources in the Study Area.
3. Distinguish between releases with significant investigation and remediation versus releases with limited or no investigation and remediation.
4. Distinguish between historic and residual MTBE impacts at the western border of the Study Area versus ongoing (or increasing) impacts of other substances elsewhere in the Study Area.

5. Distinguish between the cost of continuing to maintain already-installed individual water treatment systems for declining residual MTBE impacts, versus the cost of new individual water treatment systems for other substances in other parts of the Study Area.

Comments on each of these points follows.

1. <u>The reference in the draft report to Mercury's drinking water well monitoring should be corrected to reflect that Mercury has been conducting this monitoring voluntarily.</u>

As DEEP is aware, in addition to its investigation and remediation work, Mercury has been monitoring under DEEP oversight up to 19 drinking water wells in the vicinity of its facility and other confirmed petroleum release sources. As you appropriately noted at the recent public meeting in Haddam, Mercury has done this work voluntarily in response to DEEP's request, as part of Mercury's good-faith cooperation with DEEP. However, the draft report (section 2.3.1, p. 2-4) states that DEEP has "required" Mercury to conduct this monitoring. This is inaccurate and should be corrected.

2. <u>The final report should include additional documented gasoline or other petroleum release sources in the Study Area that are omitted in the draft report.</u>

The list of release sources in draft sections 1.1 (Study Area Description) and 2.3.1 (Documented Release Areas) omits several documented gasoline or other petroleum releases. These should be included:

- <u>112 Bridge Road: Former gasoline service station (operated as Texaco, Amoco, then Marta's MiniMart/Berkshire General Store)</u>: As documented in an DEP Emergency Incident Report and Inspector's Report dated April 16, 1990 (attached), release impacts were found in site soils when the on-site USTs were excavated on April 14, 1990. One of the excavated USTs was found to have holes, which had been fitted with plugs. An unknown volume of impacted soils was reportedly excavated from the tank grave at that time.

  In addition, as documented in an internal DEP/LUST Trust Program memo dated January 21, 1998 (attached), approximately 20 gallons of diesel fuel were released to the ground at this site on October 6, 1997. A limited volume of soils were excavated two months later.

- <u>Corner of Saybrook Road and Bridge Road: Motor vehicle accident</u>: In December 2005, approximately 15 gallons of gasoline were reportedly released due to a motor vehicle accident. There is no indication that any of it was recovered, or otherwise of any investigation or remediation efforts.

In addition, for a complete picture of the Study Area, the report should also note the other potential releases or release sources of MTBE in this vicinity, and in the area generally. These include the septic system leach field at 112 Bridge Road and the reported former gasoline storage and dispensing system at the marina at 4 Harper's Landing Drive.

3. <u>The final report should distinguish between releases with significant investigation and remediation versus releases with limited or no investigation and remediation</u>.

After listing certain release locations in the Study Area, section 1.1 of the draft report states briefly that "limited remedial activities may have been conducted" at these locations, and that "additional investigation/remediation work may still be necessary." To Mercury's knowledge, this is accurate as to the other release areas noted in the report, but it is significant inaccurate and incomplete as to the 1598 Saybrook Road (Tylerville Mobil) site. The site has been the subject of several years of intensive investigation, utilizing approximately 34 monitoring wells on or in the vicinity of the site, and remediation via air sparging and soil vapor extraction. These efforts have been successful. Since 2014, DEEP has approved discontinuance of monitoring at all but 8 monitoring wells on or immediately adjacent to the site. In the most recent sampling round, MTBE was detected in only 5 of these monitoring wells, and in all cases below CTDEEP-established Remediation Standard Regulations numeric criteria. Monitoring is continuing to ensure that the residual contamination plume remains stable and groundwater quality continues to be below RSR numeric criteria.

4. The final report should clearly distinguish between historic conditions no longer present (particularly regarding MTBE impacts at the western edge of the Study Area) versus the current environmental conditions (particularly regarding ongoing or increasing impacts of other substances elsewhere in the Study Area).

As noted above, **historic MTBE impacts at the western edge of the Study Area have greatly diminished or are no longer present**. The source area identified at 1598 Saybrook Road has been successfully abated. Residual MTBE impacts are limited in scope and scale, and continue to be monitored to ensure continued attenuation. This is demonstrated by the monitoring data in Appendix B to the draft report. However, the text of the draft report and various graphic depictions in the Figures fail to distinguish historic from current conditions (e.g., the MTBE color-coding of various Saybrook Road/Bridge Roads lots on the map at Figure 2 and 3). This creates the impression of a continuing issue across several properties that needs resolution. This is not supported by the data, and should be corrected.

Equally importantly, **none of the Saybrook Road/Bridge Road potable wells still monitored by Mercury remain above CTDPH action levels for any petroleum constituents**. As noted above, several years ago CTDEEP requested that Mercury perform sampling of up to 19 potable wells due to MTBE impact at the western edge of the Study Area, and Mercury voluntarily agreed to perform the sampling as a demonstration of good-faith cooperation and with no admission of liability. It is important to note that some of these potable wells are located at properties where releases of MTBE were previously documented. In 2014 and 2016, based on years of monitoring data showing no MTBE or other gasoline constituent impacts in several wells, CTDEEP approved removing these wells from the monitoring program. Of the 8 potable wells still remaining the monitoring program, none have MTBE or other gasoline constituents above CTDPH action levels. Again, this is demonstrated by the monitoring data in Appendix B to the draft report, but is not reflected in the draft report text and color-coded maps.

In addition, for the 5 potable wells monitored that are equipped with a GAC water treatment system, monitoring demonstrates that these systems have been 100% effective: over the several years of the monitoring program, there has been no indication of breakthrough of MTBE or other petroleum constituents.

Therefore, the final report should clarify that the decision to construct a public drinking water line to Tylerville is driven by environmental conditions in the Study Area other than residual MTBE impacts at the western edge.

5. The final report should clearly distinguish between the cost of continuing to maintain already-installed individual water treatment systems for declining residual MTBE impacts at the western edge of the Study Area versus costs of new individual water treatment systems for other substances in other parts of the Study Area.

The draft report's discussion of the option of individual water treatment systems and monitoring seems to amalgamate costs for all existing or potential future such systems across the Study Area. However, the limited and decreasing residual presence of MTBE at the western edge of the Study Area, as noted above, indicates that the need for such treatment systems and monitoring there will likewise be limited and decreasing in the future.

The draft report also states that in the absence of inspection of existing individual treatment systems, the draft report assumes that all existing individual treatment systems would be replaced (sec. 5.1.2/p. 5-3). This is not appropriate as to those systems that Mercury continues to support, most of which were installed within the past several years.

The draft report also suggests that granular activated carbon (GAC) treatment systems have uncertain effectiveness against MTBE, particularly due to potential interference effects from chlorinated VOCs and/or 1,4-dioxane. As noted above, there has been no indication of breakthrough of MTBE in any of the GACs supported by Mercury at the western edge of the Study Area over several years of use. While the draft report indicates that these other substances present an issue elsewhere in the Study Area, there is no basis shown for undercutting the value of the GAC usage for the remaining MTBE impacts in the western edge of the Study Area.

This highlights that consideration of public drinking water supply options and the proposed decision to extend a public water line to Tylerville are driven by issues other than the residual or now-past MTBE impacts in the western edge of the Study Area.

In summary, Mercury appreciates the time and attention that DEEP has devoted to a persistent and apparently in some respects expanding drinking water quality issues in the Tylerville Study Area. However, these issues are essentially distinct from the limited, decreasing or resolved issues concerning MTBE at the western edge of the Study Area. The text and attachments to the final report should clarify this throughout, and that the decision to construct a public drinking water line to Tylerville is driven by other environmental conditions.

Thank you for your consideration of these comments. If any questions, please feel free to contact me.

Very truly yours,
APEX ENVIRONMENTAL

David Sherman, LEP, LSP
Program Manager

Attachments
cc: Michael Devino, Jr.
Brian Freeman, Esq.

Response

Thank you for your comments. The following responses are offered to the numbered comments:

1. *The reference to Mercury's monitoring of nearby drinking water wells will be corrected to indicate voluntary involvement.*
2. *Multiple documented release areas are noted in the Tylerville Center Water Supply Alternatives Evaluation Report. This Report is not a comprehensive Phase I/II Environmental Site Assessment. CT DEEP is currently preparing a more comprehensive report to evaluate known and possible sources of contamination to groundwater in the Study Area.*
3. *An updated summary of investigation and (where applicable) remediation activities are summarized in the Report.*
4. *Comments have been noted. This Report is not a comprehensive Phase I/II Environmental Site Assessment. CT DEEP is currently preparing a more comprehensive report to evaluate contamination to groundwater in the Study Area.*
5. *Cost estimates associated with evaluation of water supply alternatives were prepared to be conservative. Rather than evaluating the possibility of continued use of in-place individual water treatment systems at select properties, it was determined to be more prudent and conservative to assume that all properties within the Study Area would receive new treatment systems.*

Comment

Please see the attached State of Connecticut Office of Policy and Management July 10, 2017 correspondence.

State of Connecticut

OFFICE OF POLICY AND MANAGEMENT

Division of Transportation, Conservation, and Development Policy and Planning

July 10, 2017

Shannon Pociu
DEEP, Remediation Division
79 Elm St
Hartford, CT 06106

Re: Notice of Scoping for the Tylerville (Haddam) Water Main Extension

Dear Shannon:

The Office of Policy and Management (OPM) has reviewed the Notice of Scoping for the Tylerville (Haddam) Water Main Extension and submits the following comments:

- The Scoping Notice says:

  DEEP has determined that the 8-inch minimum pipe size is the preferred alternative to provide a reliable, long-term source of potable water to the area...

  It is OPM's understanding that an 8" main has been determined to be adequate to provide water to the contaminated and at-risk properties. OPM believes that an 8" main is consistent with the State C&D Plan, since it will serve the stated need while minimizing the risk of inducing development across a broader area. Given the modest level of water use in the area to be served, furthermore, installation of a larger diameter main could increase the risk of public exposure to water disinfection byproducts, due to the longer period of time water would spend traveling through a larger pipe.

- The Proposed Water Main Parcels Map provided with the scoping notice classifies the proposed water main as a distribution main beginning at the Rt 82 – Rt 154 intersection and extending into Tylerville. Doing so implies that water would be available to several parcels outside the study area shown in Figure 2 of the draft Tylerville Water Supply Alternatives Evaluation report.

  Given that those parcels do not appear to have been identified as contaminated or at-risk properties, OPM believes the section of main passing them should be identified as transmission main comparable to the length of main further south. If, in the future, a local health department, DPH, and/or DEEP determines that a property along the route of the transmission main must be connected to that main to correct a public health problem existing on that property, such a connection should be authorized at that time. Fire hydrants would also be appropriate along the transmission main if the town chooses to install them.

Thank you for the opportunity to respond to this Notice of Scoping and please feel free to contact me if you have any questions.

Sincerely:

Bruce Wittchen
Office of Policy & Management
450 Capitol Ave, MS# 54ORG
Hartford, CT 06106
(860) 418-6323
bruce.wittchen@ct.gov

Response

Thank you for your comments.

Comment

Jackie Gardell

1. Install a homeowner water shut off for houses without basements.

2. Use a western line assignment for the water main near 110 Little Meadow Road to protect the trees and roots along the road on this property closest to the Connecticut River.

Sincerely, Jackie Gardell

110 Little Meadow Rd

Mailing address 81 Clarence Court

Middletown, CT 06457

Response

Thank you for your comments. The following responses are offered to the numbered comments:

1. *Necessary shut-off valves will be included in the design documents.*
2. *The final routing and consideration for the protection of trees will be addressed during the final design process.*

Comment

ED VESELAK - Subject: Tylerville drinking water - July 8, 2017

On June 21, 2017, I attended the public hearing on the Tylerville drinking water issue and wish to make the following comments in support of the proposed water line extension from Chester to Tylerville.

As the owner of a business at 1618 Saybrook Road, Haddam, I found out that there was a problem with the water being polluted in the mid- 1990s and ended up putting in a water purification system to make the water potable. There has been a ongoing battle to correct this issue and adding city water will rectify the situation permanently. Also, it would make more opportunities for different businesses since there will no longer be a concern over the mixing of well water and septic systems.

This will make the community a better place to work and live, Also make property more valuable. I'm 100 % in support of this plan to bringing the water line to Tylerville under the public roads and then to the private sectors, as I have done I n the past and I do in the future.

I would to thank the state DEEP, DPH , state reps and town selectwoman, all others who have work hard over the years to resolving this issue make it appositive outcome for all involved to this plaguing problem.

Edward Veselak, Member Veselak LLC

1618 Saybrook Road Haddam,Conn

Response

Thank you for your comments.

Comment

Please see the attached correspondence from Camp Bethel.

Camp Bethel
Helping strengthen churches in Connecticut and beyond since 1878

124 Camp Bethel Road, Haddam, Connecticut 06438

To: Shanon Pociu
CT DEEP
Bureau of Water Protection and Land Use, Remediation Division
79 Elm Street
Hartford, CT 06106
RE: Public Comment: Water Supply for Tylerville

Dear Shanon,

Camp Bethel is a non-profit Christian campground that has occupied land in Tylerville for 141 years. In addition to supporting its own programs, the Camp Bethel Association rents its facilities to other groups and uses a considerable volume of water from its two drilled wells on its property. The quality and quantity of its water supply is very important to the Association. It has a long history of cooperating with the State's Departments of Public Health and Energy and Environmental Protection and has a routine semi-annual water testing program. The results of this testing has never documented contamination by any of the chemicals that have been identified as problems with the Tylerville groundwater pollution problem. This is important to stress because during the recent public meeting in Haddam, a neighbor erroneously stated that such contamination had been documented at Camp Bethel. It has not.

As a long-term part of the Tylerville community, the membership of the Association has been very concerned for the well-being of our neighbors whose wells have been affected by the pollution. Representatives from the Association attended the recent public meeting and have reported back to the Association. The Association appreciates the work done by the DEEP, the DPH, and the consultant and supports the recommended option of extending a Connecticut Water Company waterline from Chester north to Tylerville to provide good quality water to the residents. We also support the installation of fire hydrants in the village as a means of enhanced public safety.

A number of officials have told us that Camp Bethel would not be mandated to hook up to the water distribution system if it chooses not to do so. This is an important feature of this plan to the Association. At this time, the Association would exercise this right not to make a connection to the system since our water supply currently has high quality and quantity. To connect and use Connecticut Water Company water would be an unnecessary financial burden on the campground. We will continue to perform rigorous water testing at both of our wells and if the results ever detect contamination, we will then pursue connection.

We appreciate the opportunity to provide comments.

Sincerely,

Connie Schenenga

Connie Schenenga
President

<u>Response</u>

Thank you for your comments. The position with regard to connection to the proposed water main extension is noted. While we highly encourage connection to the water main, this connection will not be required. Although, please note, the State of Connecticut plans to discontinue the groundwater treatment and monitoring program following installation of the water main extension. Costs associated with future connection to the Connecticut Water Company system water main will not be reimbursed by *the State of Connecticut and will become the responsibility of individual property owners if they choose to connect to the water main in the future.*