



Town of Uxbridge, Massachusetts
South Uxbridge Economic Development and Utilities
Extension Analysis

December 2015

**SOUTH UXBRIDGE ECONOMIC DEVELOPMENT AND
UTILITIES EXTENSION ANALYSIS
TOWN OF UXBRIDGE, MASSACHUSETTS**

Prepared for
UXBRIDGE, MASSACHUSETTS

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December 2015

Project No. 8618738

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List of Common Acronyms

CMRPC	Central Massachusetts Regional Planning Commission
CWMP	Comprehensive Wastewater Management Plan
I/I	Inflow and Infiltration
MassGIS	Massachusetts Geographical Information System
PDA	priority development area
PVC	Polyvinyl Chloride
WWTF	Wastewater Treatment Facility

1. Introduction

1.1 Scope of Services and Report Organization

The Town of Uxbridge is interested in extending water and wastewater utilities to South Uxbridge in order to advance the economic development of the region. The Town retained GHD to perform an economic development and utilities extension analysis for Quaker Highway (Route 146A) bounded by North Smithfield, RI to the south and Route 122 to the North. GHD has teamed with RKG Associates for the economic development analysis.

The Scope of Services for this project comprises the following tasks, which have been organized into two parts for this Report:

RKG Associates Scope of Services

- Development of an economic development analysis of the Study Area consisting of the following tasks:
 - o Public outreach consisting of a community survey about economic development goals, needs for goods and services, and attitudes/opinions about economic development, including housing.
 - o Stakeholder outreach consisting of two days of intensive interviews with local businesses, key community leaders, developers, realtors and design professionals who frequently represent applicants before Town Boards.
 - o Statistical profile and analysis of:
 - Employment base and workforce
 - Housing and residential development
 - o Assessment of the size/capacity of the local government and ability to take on economic development roles and responsibilities including relationships between the Town and existing planning and economic development organizations.
 - o Assessment of recent and anticipated commercial and industrial development in and around Uxbridge. This activity will be cross-referenced to the ongoing Comprehensive Wastewater Management Plan for consistency with the Plan and future funding opportunities for the implementation of that Plan.
 - o Preliminary assessment of potential economic development opportunities in Uxbridge and outline of “next steps” (including additional planning work, if appropriate) for the Town.

GHD Scope of Services

- Development of wastewater flows in Study Area.
 - o Review of available data
 - Wastewater collection system
 - Water distribution system

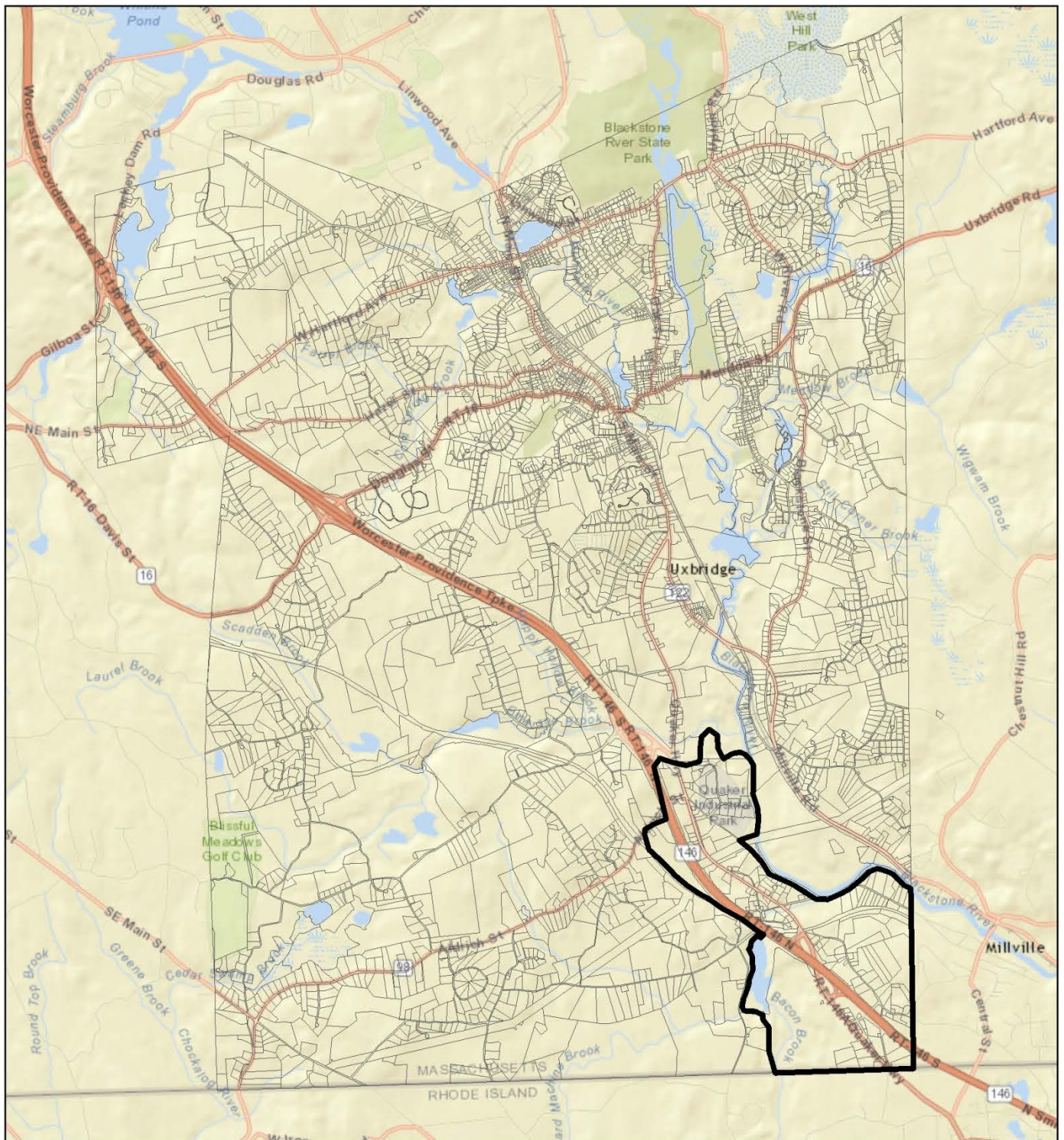
- Development of wastewater flows in Study Area based on the results of the economic development analysis and wastewater industry guidelines.
- Development of a conceptual level gravity sewer infrastructure layout desktop analysis using:
 - o Topographic information for the Town of Uxbridge available through the Office of Geographic Information (MassGIS)
 - o A hydraulic analysis will be conducted based on design guideline minimum slope requirements
 - o The layout will be developed assuming a gravity sewer system will be implemented
 - o A desktop analysis will be used to provide a conceptual design.

This task does not include research or verification of existing utilities that may be buried in Route 146A (drainage, phone cable etc.).

- Development of a conceptual level sewer cost estimate using GHD's cost estimating experience. A contingency that is commensurate with a conceptual design will be applied along with an allowance for fiscal, legal and administrative costs to yield a Total Project cost estimate.
- Development of a water demand for the Study Area. The following assumptions will be used during the development of water demand.
 - o Water demand will be estimated based on the results of the economic development analysis. Water demand will be developed using typical flow rates from design guidelines and cross checked against values obtained as part of the Ongoing Wastewater Management Planning study.
- Conceptual level water infrastructure layout. This task does not include research or verification of existing utility locations that may be buried in Route 146A (drainage, phone, cable, etc.). A desktop analysis will be developed using:
 - o Town-provided flow test data of concurrent operational data and pressure data.
 - o A desktop analysis will be used to provide a conceptual level design.
- Development of a conceptual level water cost estimate. A cost development procedure will be developed using GHD's cost estimating experience. A contingency that is commensurate with a conceptual design will be applied along with an allowance for fiscal, legal and administrative costs to yield a Total Project cost estimate.

1.2 Definition of Study Area

In the Scope of Services the Study Area was defined as the area bounded by the North Smithfield, RI corridor to the south and Route 122 to the North. The Study Area was further refined during the development of the conceptual design in order to concentrate the economic development focus of the Study Area around Route 146A. The Study Area was expanded to include industrial, commercial and agricultural parcels on both sides of Route 146A. The residential parcels across the river from Route 146A and the area north of the Uxbridge WWTF were excluded from the study due to the cost and complexity of running a utility (sewer and water) extension under the river and because residentially zoned properties were not the target of this potential development. The refined Study Area is shown in Figure 1.



Legend

 South Uxbridge Proposed Sewershed

Paper Size ANSI A
 0 1,625 3,250 6,500 Feet
 Map Projection: Mercator Auxiliary Sphere
 Horizontal Datum: WGS 1984
 Grid: WGS 1984 Web Mercator Auxiliary Sphere



Town of Uxbridge, Massachusetts
 Uxbridge Gravity Sewer Extension

Job Number 86-18738
 Revision A
 Date 23 Dec 2015

SOUTH UXBRIDGE STUDY AREA

Figure 1

N:\US\Hyannis\Projects\86\18738\GIS\Maps\MXD_Deliverables\Figure 01 - South Uxbridge Sewershed.mxd 1545 Iyannough Road, Hyannis Massachusetts 02601 USA T 1 508 362 5680 F 1 508 362 5684 E hyamail@ghd.com W www.ghd.com
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I. INTRODUCTION

At the request of GHD, Inc., engineering and environmental consultants for the Town of Uxbridge, RKG Associates, Inc. has conducted an assessment of economic development opportunities that might open up, if any, if sewer service is extended into the southeastern part of town. RKG's major findings include the following:

1. The near-term opportunities for economic development lie primarily in limited industrial uses such as warehouse and distribution facilities or light manufacturing. Warehouse distribution is currently the most in-demand industrial use in Uxbridge's region, defined here as southern Worcester County and north-central Rhode Island. However, these uses do not always require a public sewer connection because they tend to be low water users. Having sewer capacity available in the vicinity of Routes 146-146A-122 in southeast Uxbridge (generally, the lower Route 146 corridor) will not be the most important element to attracting these types of establishments. Installing sewer service could attract interest in multifamily housing development because there is so much unmet demand in the Boston-Worcester-Providence labor market area. The Town may not want to incentivize housing, but the introduction of some moderately dense housing could be key to repositioning the lower Route 146 corridor for higher-value commercial uses.
2. The longer-term opportunities for the lower Route 146 corridor include additional retail and restaurant uses, possibly service establishments, and the potential for multifamily residential development. Both restaurant and moderately dense residential uses directly benefit from access to a public wastewater system.

In order to arrive at these conclusions, RKG Associates conducted an analysis of the demographic and economic conditions of Uxbridge using data from the U.S. Census Bureau, the Town of Uxbridge, the Central Massachusetts Regional Planning Commission (CMRPC), various real estate publications and sources, and area real estate brokers. These findings are described below.

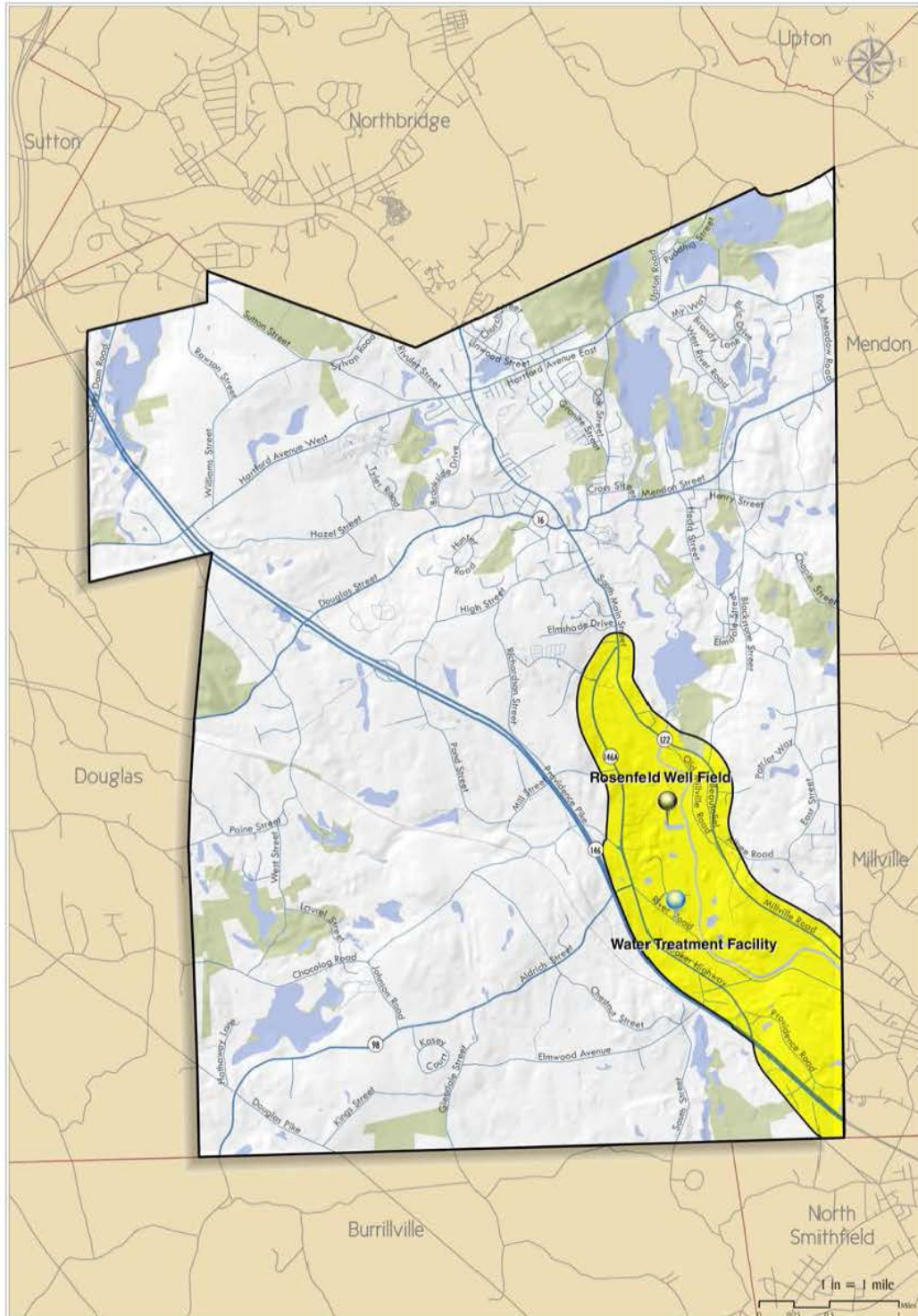
A. Target Area

The area in which wastewater service could be extended is shown on Map 1: Target Area. Its boundaries are conceptual, at best, and loosely defined as the area adjacent and to the right of Route 146, containing the parcels fronting on, and in between, Route 146A and Route 122 in Uxbridge's southeast corner. While the potentially sewered area is the target area for the purpose of this analysis, RKG developed a town-wide socio-economic profile and conducted the market analysis for the community as a whole.

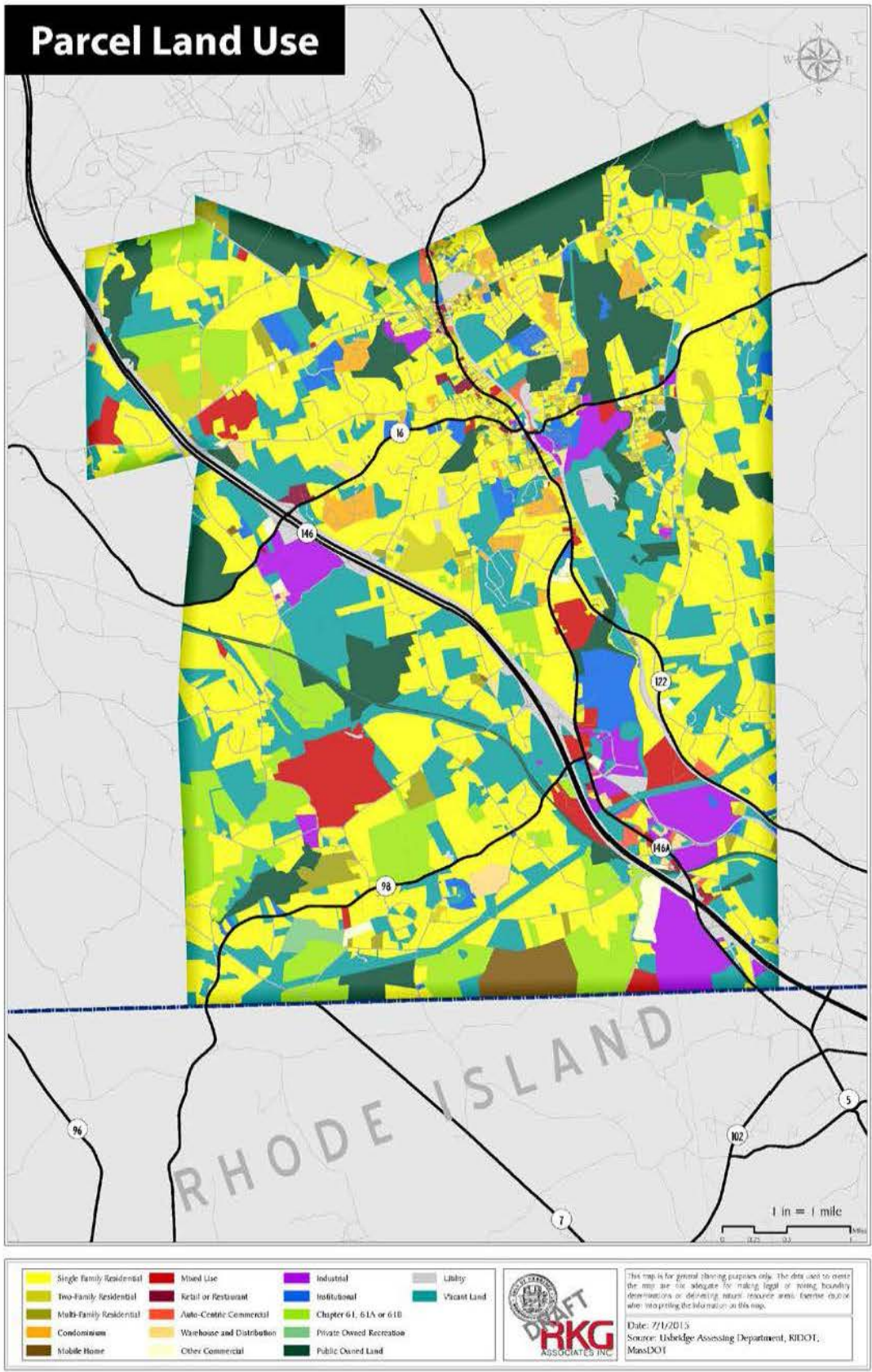


Map 1 also provides guidance as to the current extent of public services provided. Currently, the public sewer line ends at the wastewater treatment plant located on River Road. The Town's water service ends at the Rosenfeld Well Field, just south of the Uxbridge High School. Therefore, only a portion of the Target Area would require additional public water and sewer service.

The target area is primarily zoned industrial and, likewise, one of the predominant land uses is industrial (see Maps 2 and 3). However, existing land use in the target area also consists of mixed-use, institutional (representing the high school and the well-field), vacant land, and some single-family residential. Mapping conducted through the CMRCP's Blackstone Valley Prioritization Project also indicates that portions of the target area are, or should be, protected as critical habitat or natural landscapes. In particular, this is the area in the southern entry to Uxbridge between the rail line and the trail corridor.







II. SOCIO-ECONOMIC PROFILE AND ANALYSIS

This section presents an overview of the baseline demographic and economic conditions in the Town of Uxbridge, Massachusetts as part of the overall Economic Development Analysis.

A. Population and Households

Uxbridge has been identified by the Central Massachusetts Regional Planning Agency (CMRPC) as a high-growth community, expected to grow more rapidly than the region overall.¹ The Town's 2013 population was just under 13,500. Between 2000 and 2013, the population in Uxbridge grew at a rate of 1.6 percent per year, or 21 percent in overall growth, with most of this growth occurring before 2010 (see Table 1). While this represents moderate growth in Uxbridge, this local growth rate is three times the growth rate observed in Worcester County (0.5 percent per year, 7 percent overall).

Table 1: Population Trends

	Population Count			Annual % Change	
	2000	2010	2013	'00-'10	'10-'13
UXBRIDGE	11,156	13,081	13,487	1.73%	1.03%
Worcester County	750,963	791,855	802,688	0.54%	0.46%
Rhode Island	1,048,319	1,056,389	1,051,695	0.08%	-0.15%
Massachusetts	6,349,097	6,477,096	6,605,058	0.20%	0.66%

Source: U.S. Census Bureau and RKG Associates, Inc.

As indicated in Table 2, Uxbridge is projected to continue this pace of population growth through 2035, when the population is projected to reach approximately 20,000. Whereas Worcester County and both states of Rhode Island and Massachusetts are projected to continue experiencing much slower and declining rates of growth. Table 2 also shows that Uxbridge's peak growth rate, 1.88 percent, is anticipated to occur in 2020. Uxbridge is projected to add more than 1,300 persons between 2010 and 2020, increasing its population by 19 percent.

¹ CMRPC, 2012 Regional Transportation Plan, Chapter 2 - Regional Characteristics, p. II-23.

Table 2: Population Projections

	2010	2015	2020	2025	2030	2035
Population Count						
UXBRIDGE	13,457	14,654	16,034	17,473	18,823	19,974
Worcester County	798,552	822,696	844,413	864,691	881,550	893,899
UMDI Central						
Region	693,813	709,911	726,844	741,499	753,049	760,508
Massachusetts	6,547,629	6,792,591	6,950,668	7,105,878	7,231,126	7,319,469
Annual Percent Change						
UXBRIDGE	-	1.78%	1.88%	1.79%	1.55%	1.22%
Worcester County	-	0.60%	0.53%	0.48%	0.39%	0.28%
UMDI Central						
Region	-	0.46%	0.48%	0.40%	0.31%	0.20%
Massachusetts	-	0.75%	0.47%	0.45%	0.35%	0.24%

Source: U.S. Census Bureau and RKG Associates, Inc.

For economic development purposes, *household growth* matters even more than *population growth* because household growth drives both housing demand and consumer spending patterns. Uxbridge has 4,957 households as of 2013. The household growth rate of 2.32 percent (see Table 3) exceeded the population growth rate during the 2000 to 2010 timeframe. However, since 2010, household growth has nearly flattened to 0.3 percent. The Census Bureau estimates that Uxbridge added only 43 households during that time period. This slowdown in household growth is consistent with growth trends in Worcester County (0.17 percent) and Massachusetts (0.23 percent) and represents the slow recovery from the economic recession.

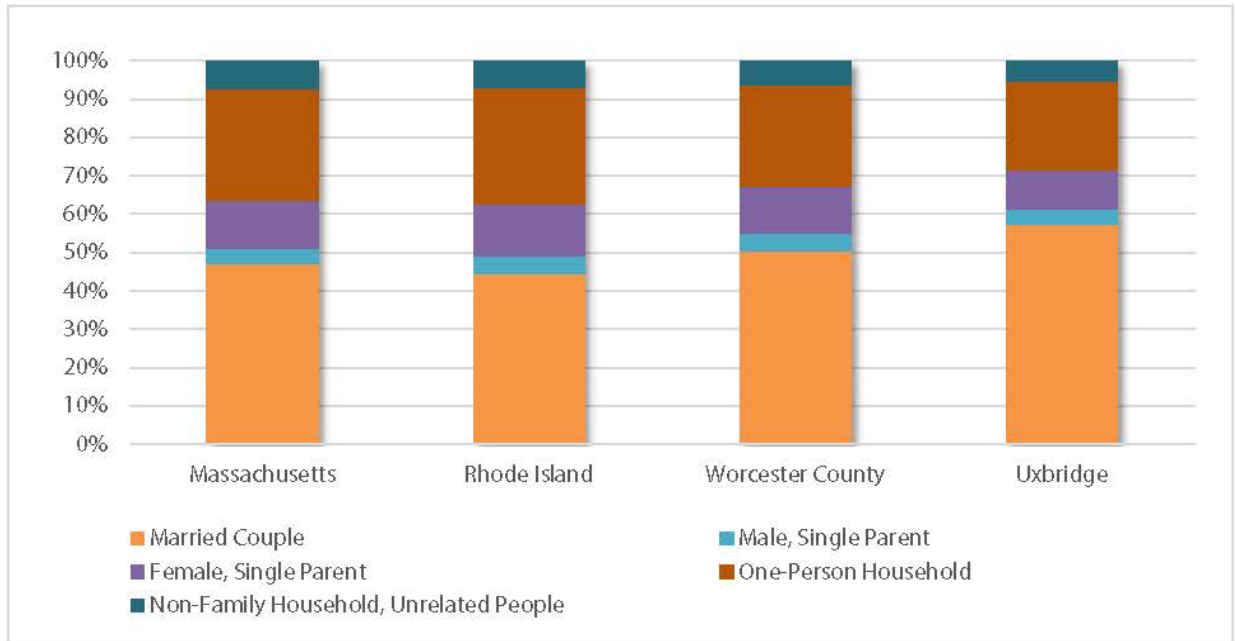
Table 3: Household Formation Trends

	Household Count			Annual % Change	
	2000	2010	2013	'00-'10	'10-'13
UXBRIDGE	3,988	4,913	4,957	2.32%	0.30%
Worcester County	283,927	298,162	299,663	0.50%	0.17%
Rhode Island	408,424	410,305	410,058	0.05%	-0.02%
Massachusetts	2,443,580	2,512,552	2,530,147	0.28%	0.23%

Source: U.S. Census Bureau and RKG Associates, Inc.

Nearly 60 percent of households in Uxbridge are headed by married couples, which is higher than found in the other comparable geographies. Statewide, married couples head less than 50 percent of households.

Chart 1: Household Types, 2013 Profile



Source: U.S. Census Bureau and RKG Associates, Inc.

Migration patterns help us to understand from where new residents come and to where Uxbridge residents move when they leave town. Table 4 shows that more people are leaving Uxbridge than moving in. By far, the highest percentage of people leaving Uxbridge (65 percent) are moving somewhere in Massachusetts outside of Worcester County, which is likely beyond the town's control. The town has greater influence over local relocation, of which an equal number move in to Uxbridge as move out. Brokers in the Providence market noted significant movement from northern Rhode Island across the border into Massachusetts; however, Uxbridge appears to have not received any of this in-migration.

Table 4: Population Migration Patterns

From	To	Count
Indigenous		
UXBRIDGE	Uxbridge	12,472
In Migration		
Rest of Worcester County	Uxbridge	117
Rest of Massachusetts	Uxbridge	393
Rest of New England	Uxbridge	0
Rest of United States	Uxbridge	160
International	Uxbridge	71
	Subtotal	741
Out Migration		
Uxbridge	Rest of Worcester County	117
Uxbridge	Rest of Massachusetts	684
Uxbridge	Rest of New England	116
Uxbridge	Rest of United States	131
Uxbridge	International	N/A
	Subtotal	1,048

Source: U.S. Census Bureau and RKG Associates, Inc.

The highest population wealth is found in stable populations (in place for at least one year) and populations migrating to Uxbridge from other parts of Worcester County.

Uxbridge has experienced accelerated growth in household income since 2010, when compared to the County and Rhode Island. This income growth is partially attributable to household growth. It is also because those in-migrating to Uxbridge exhibit higher levels of wealth than those migrating to other communities, especially those in-migrating from other areas in Worcester County. Household types also influence household wealth; a larger share of family households than the County and the State is another reason why Uxbridge exhibits higher household incomes.

Table 5: Median Household Income Trends

	Median HH Income			Annual % Change	
	2000	2010	2013	'00-'10	'10-'13
UXBRIDGE	\$61,855	\$81,127	\$84,909	3.12%	1.55%
Worcester County	\$47,874	\$64,152	\$65,223	3.40%	0.56%
Rhode Island	\$42,090	\$54,902	\$56,361	3.04%	0.89%
Massachusetts	\$50,502	\$64,509	\$66,866	2.77%	1.22%

Source: U.S. Census Bureau and RKG Associates, Inc.

B. Employment Base and Workforce

Uxbridge has a relatively well-educated population and this also has positive influence on household income. There is a smaller percentage of adults with college or graduate

degrees in Uxbridge compared to the state as a whole, but Uxbridge is consistent with Worcester County.

Table 6: 2013 Education Attainment (Persons Over 25 Years-Old)

	Uxbridge	Worcester County	Rhode Island	Massachusetts
Less than High School	6.3%	10.6%	14.8%	10.6%
High School	33.4%	28.5%	27.2%	25.8%
Some College	17.8%	18.0%	18.4%	16.5%
Associates Degree	9.3%	9.0%	8.3%	7.7%
Bachelors Degree	22.6%	20.7%	18.9%	22.3%
Postgraduate Degree	10.6%	13.1%	12.5%	17.1%

Source: U.S. Census Bureau and RKG Associates, Inc.

The labor force participation rate measures the number of residents, age 16 or older, who are generally available to work. Uxbridge's labor force participation rate has trended upward since 2010 and the Town exhibits a faster labor force growth than the County or the State.

Table 7: Labor Force Participation Trends

	Population Count			Annual % Change	
	2000	2010	2013	'00-'10	'10-'13
Total Population (Over 16 Years-Old)					
UXBRIDGE	8,176	10,278	10,729	2.57%	1.46%
Worcester County	578,707	625,601	641,635	0.81%	0.85%
Rhode Island	827,797	855,547	859,385	0.34%	0.15%
Massachusetts	5,010,241	5,224,911	5,371,252	0.43%	0.93%
Participation Rate					
UXBRIDGE	74.3%	71.3%	73.3%	-0.40%	0.94%
Worcester County	66.3%	68.1%	67.7%	0.27%	-0.20%
Rhode Island	64.6%	66.0%	66.2%	0.22%	0.10%
Massachusetts	66.2%	67.7%	67.7%	0.23%	0.00%

Source: U.S. Census Bureau and RKG Associates, Inc.

Less than 20 percent of the occupations in the Providence Metropolitan Statistical Area (MSA) are considered blue collar, with varying skill levels. One-in-three occupations are high-skilled occupations, whether they be blue or white collar.

Table 8: Providence MSA Occupation Skill Level

	Count	Percent
High Skilled, White Collar	170,140	32.3%
Semi-Skilled, White Collar	136,760	25.9%
Low-Skilled, White Collar	116,590	22.1%
High Skilled, Blue Collar	8,830	1.7%
Semi-Skilled, Blue Collar	52,920	10.0%
Low-Skilled, Blue Collar	42,230	8.0%

Source: U.S. Census Bureau and RKG Associates, Inc.

Unlike Worcester County overall, Uxbridge tends to have a somewhat lower unemployment rate than the statewide average. This was not the case at the height of the recession, however. Unemployment rose significantly in Uxbridge in 2008-2009, but since then the unemployment rate has stabilized and gradually declined.

Table 9: Local Area Unemployment Trends (Not-Seasonally Adjusted)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Average Annual Unemployment										
UXBRIDGE	4.6%	4.8%	4.8%	6.2%	8.9%	8.0%	6.9%	6.5%	6.6%	5.6%
Worcester										
County	5.2%	5.3%	5.1%	6.0%	8.9%	8.9%	7.8%	7.2%	7.3%	6.2%
Rhode Island	5.0%	4.9%	5.2%	7.8%	11.0%	11.2%	11.1%	10.4%	9.3%	7.7%
Massachusetts	4.8%	4.9%	5.6%	5.5%	8.1%	8.3%	7.2%	6.7%	6.7%	5.8%
Year-Over-Year Change										
Uxbridge	-	-0.2%	0.0%	-	-2.7%	0.9%	1.1%	0.4%	-0.1%	1.0%
Worcester										
County	-	-0.1%	0.2%	0.9%	-2.9%	0.0%	1.1%	0.6%	-0.1%	1.1%
Rhode Island	-	0.1%	0.3%	2.6%	-3.2%	-0.2%	0.1%	0.7%	1.1%	1.6%
Massachusetts	-	-0.1%	0.7%	0.1%	-2.6%	-0.2%	1.1%	0.5%	0.0%	0.9%

Source: U.S. Census Bureau and RKG Associates, Inc.

According to 2010 US Census data, more than 5,000 Uxbridge residents commute to places of employment outside of Uxbridge every day. Almost 40 percent commute to jobs in Milford, Westborough, Northbridge, Worcester, Boston, or Hopkinton. Of the 2,244 workers employed but not living in Uxbridge, most commute from Northbridge, Woonsocket (RI), Worcester, Millville, and other southern Worcester County towns. Just over one-third (35 percent) of those employed in Uxbridge also live there.

Table 10: 2010 Journey To Work Data

From	To	Count
LOCAL		
Uxbridge	Uxbridge	1,217
IN COMMUTING		
Rest of Worcester County	Uxbridge	1,371
Rest of Massachusetts	Uxbridge	336
Rhode Island	Uxbridge	467
Rest of New England	Uxbridge	61
Rest of United States	Uxbridge	9
	Subtotal	2,244
OUT COMMUTING		
Uxbridge	Rest of Worcester County	2,935
Uxbridge	Rest of Massachusetts	2,064
Uxbridge	Rhode Island	327
Uxbridge	Rest of New England	16
Uxbridge	Rest of United States	65
	Subtotal	5,407

Source: U.S. Census Bureau and RKG Associates, Inc.

As of 2013, Uxbridge's employment (3,247 people employed) exhibited flat growth relative to employment in 2005. The economic recession led Uxbridge and each of the comparison geographies to experience employment declines between 2005 and 2009. All but Rhode Island were able to recover to post-recession levels of employment. Similarly, Uxbridge's business establishments declined through 2009, but have recovered modestly through 2013 and are now just shy of 350 businesses. Both the County and the State have experienced faster establishment growth during the 2005 to 2013 time period. CMRPC projects that Uxbridge will remain a low-growth community in terms of employment options.²

Table 11. Establishment Trends

	Count			Annual % Change			
	2005	2009	2013	'05-'09	'05-'09	'09-'13	'05-'13
Employment Totals							
Uxbridge	3,246	3,069	3,247	(177)	-1.4%	1.4%	0.0%
Worcester County	316,849	307,842	322,413	(9,007)	-0.7%	1.2%	0.4%
Rhode Island	477,664	448,475	456,108	(29,189)	-1.5%	0.4%	-1.1%
Massachusetts	3,161,766	3,136,539	3,296,932	(25,227)	-0.2%	1.3%	1.1%
Establishment Totals							
Uxbridge	341	330	349	(11)	-0.8%	1.4%	0.6%
Worcester County	20,427	20,660	21,917	233	0.3%	1.5%	1.8%
Rhode Island	35,637	35,383	35,502	(254)	-0.2%	0.1%	-0.1%
Massachusetts	207,788	213,962	223,667	6,174	0.7%	1.1%	1.9%

Source: U.S. Census Bureau and RKG Associates, Inc.

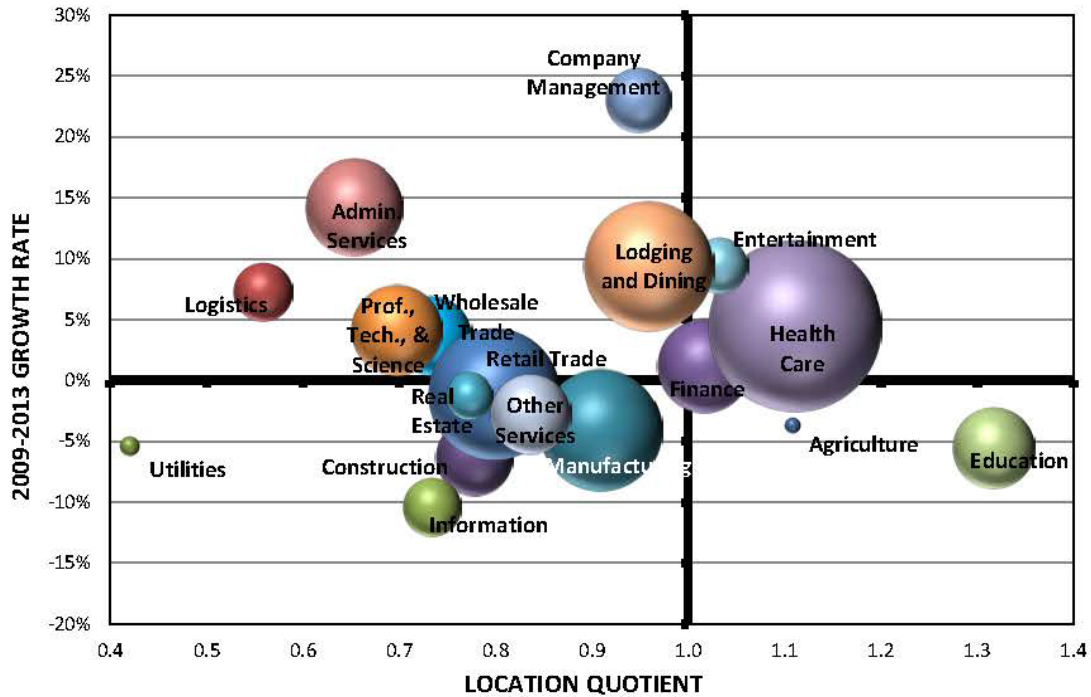
² CMRPC, 2012 Regional Transportation Plan, Chapter 2 - Regional Characteristics, p. II-24.

Uxbridge shares its southern border with Rhode Island. As such, the socio-economic conditions in Rhode Island are equally important to the Town as those in Massachusetts. As shown above, Uxbridge has fared better than Rhode Island in many socio-economic factors. While Uxbridge still performs better in employment and establishment trends (see Table 11), it is likely that the Town is at least partially influenced by the worse-off economic conditions in Rhode Island.

Rhode Island industry sectors experiencing growth greater than ten percent, over the five-year period 2009-2013, include company management and administrative services. In Worcester County, the growing industry sectors include logistics; health care; and professional, scientific and technical services; and, agricultural related industries. Except for health care and agriculture, these growing industries tend to provide primarily white collar job opportunities. In both Worcester County and Rhode Island, the industries employing the most people are: health care; retail trade; lodging and dining; and manufacturing. According to the CMRPC, the strongest employment sectors in the Blackstone Valley (eleven Massachusetts communities, including Uxbridge) as of 2012 are: Trade, Transportation and Utilities; Education and Health Services; and Manufacturing.³ The first two categories comprise nearly 45 percent all the jobs in the Blackstone Valley region.

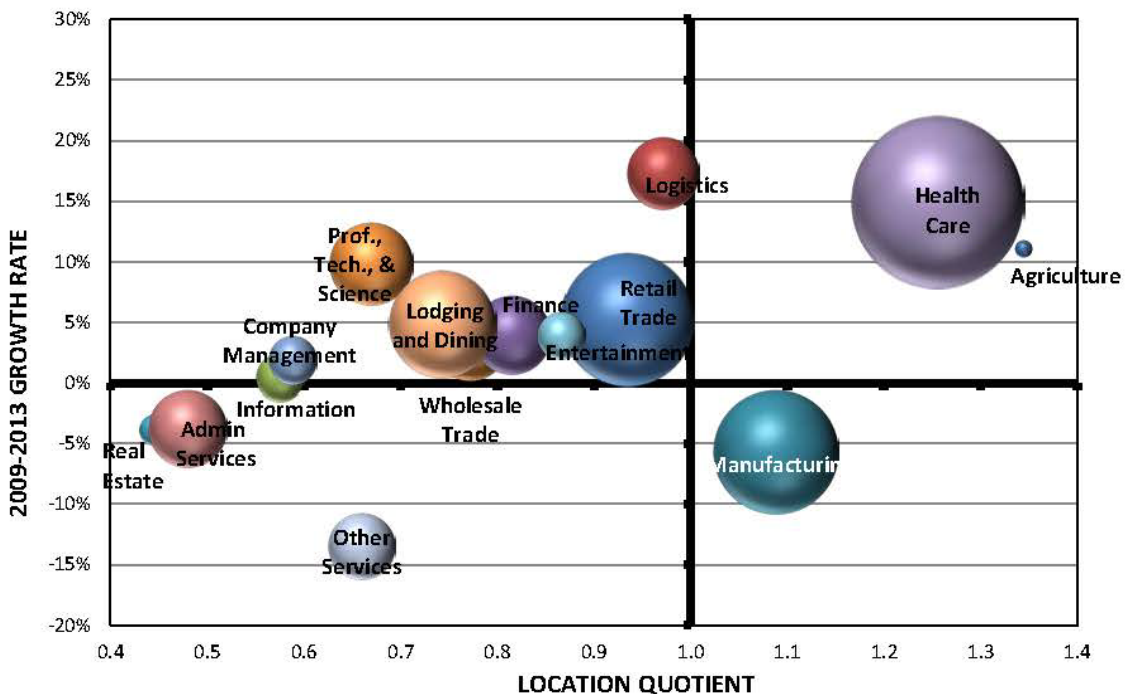
³ CMRPC, Blackstone Valley Prioritization Project, 2012, p. 21.

Chart 2: 2009 – 2013 Industry Strength, Rhode Island



Source: U.S. Census Bureau and RKG Associates, Inc.

Chart 3: 2009 – 2013 Industry Strength, Worcester County



Source: U.S. Census Bureau and RKG Associates, Inc.



Industry location quotient (LQ) measures industry concentration in a region as compared to a larger geographic area. Industries with high LQ are typically export-oriented industries, which means they bring money into the region. In Worcester County, the industries with an LQ greater than 1.0 include manufacturing, health care, and agriculture. However, it's important to note that the manufacturing industry experienced employment decline between 2009 and 2013, which could be a sign of concern. Industries which have both high LQ and relatively high total job numbers typically form a region's economic base. In Worcester County, health care represents the region's economic base.

III. CAPACITY ANALYSIS

According to the Town's FY2015 Town Meeting Warrant, the Administrative Clerk for the Land Use department has been, until recently, a part-time position since 2011 and the Town had experienced considerable turnover in that position. In 2015, that position was returned to full-time and the Town promoted a current staff member. The Town's recognition of the significant role required of a planning clerk to support both the planning and zoning boards is encouraging and a good first step to providing more capacity within the town. However, in light of the strong residential market and the potential to ramp up non-residential activity in Uxbridge, the Town may still lack planning and economic development capacity.⁴

The warrant acknowledges that "the work of the Planning and Zoning Boards is time consuming and requires much attention to detail." Supporting the planning and zoning boards as a single-person department leaves little time for staff to engage in strategic and long-term planning activities. Additionally, in order to promote and achieve economic development in Uxbridge, the Town needs planning staff with some knowledge of economic development. As discussed below, attracting certain non-residential uses into Uxbridge will require some development "know-how." All land developers require certainty that the permitting process will be smooth and timely. Having sites ready for development, making sure the regulatory (zoning and permits) process is efficient and appropriate for the desired uses, and marketing the Town all require someone with a moderate level of experience working in economic development.

Furthermore, the Town should avail itself of resources made available through the Central Massachusetts Regional Planning Commission (CMRPC). The CMRPC provides direct technical assistance to all municipalities within the region and for any range of projects so desired. In the event an in-house hire is not possible, using any available services from CMRPC would build capacity. There are a number of other regional organizations with whom the Town can partner for economic development activities, such as the Blackstone Valley Chamber of Commerce and the Blackstone Valley National Heritage Corridor.

⁴ This is not intended to be a critique on the current staff person's qualifications, as we are not familiar with her background.

IV. DEVELOPMENT AND PIPELINE ANALYSIS

A. Market Overview

A classic bedroom community, the predominant housing type in Uxbridge is single-family. The CMRPC classifies the town as a Country Suburb (see sidebar). Uxbridge has some small retail areas and one industrial area in the southeastern section of the town (within the area being studied for sewer extension). However, Uxbridge is primarily a residential community. The land use mix of Uxbridge has remained similar for the last fifty plus years. Aside from a strong residential resale market and the BJ's distribution center (which is already at least 15 years old), the community has not seen much new development.

Country Suburb: Has very low density, country/rural character, and has room to grow. These communities typically do not have a significant town center and no compact neighborhoods. There is typically a large amount of vacant developable land. New growth is mostly made up of conventional subdivision development on vacant land and population and household growth is rapid.

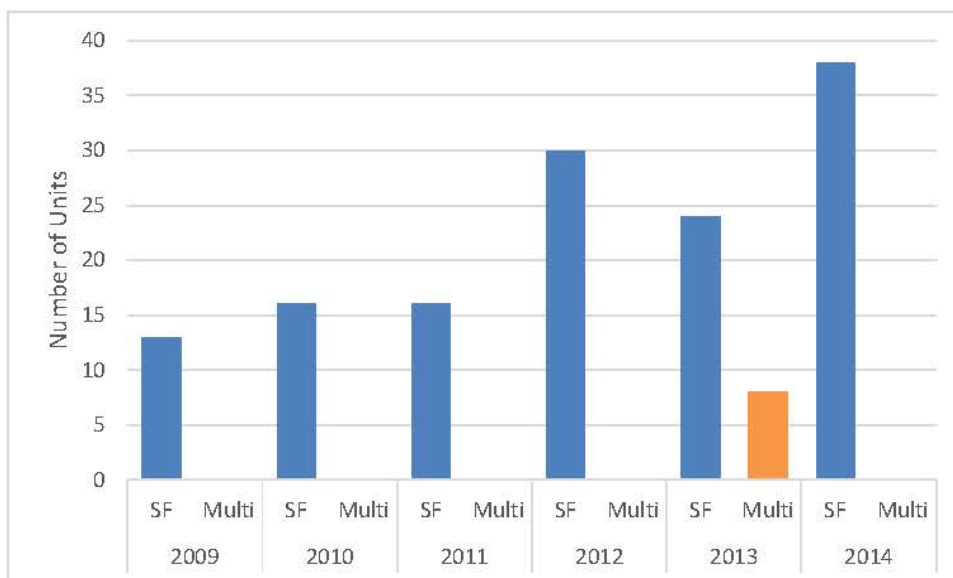
Based on interviews with active area real estate brokers in the residential, commercial, and industrial markets, it appears that the most immediate opportunity for the target area will be in warehouse distribution. There is currently a tight market for such uses in the Worcester and Providence area, as retailers look to expand their distribution networks. The access provided by Route 146 is attractive to such users.

B. Residential

Residential is currently Uxbridge's strongest market. Uxbridge and the surrounding communities in Massachusetts have seen increased residential resale activity lately. In the last five years, the time on market for homes has been very short, confirming a strong market. With the stronger economy, many people are moving out of nearby Woonsocket and acquiring homes in the bedroom communities across the border in Massachusetts. Uxbridge's competing communities include Northbridge, Ledyardville, and Blackstone in Massachusetts and North Smithfield and Burrillville in Rhode Island.

While building activity remained low through 2011, Uxbridge has seen an uptick in residential units receiving building permits since 2012, as shown in Chart 4. In 2014, nearly 40 single-family residential permits were issued. In the last six years, fewer than ten units of multi-family housing have been constructed in Uxbridge; these units were all permitted in 2013. In the region, multi-family residential exists in old mill towns, particularly in downtown areas where mills have been converted. Brokers indicate there is demand for additional multi-family in the region.

Chart 4: Residential Building Permit Activity, 2009 - 2014



Source: U.S. Census Bureau, CenStats, and RKG Associates, Inc.

At the time of this analysis, there were no apartments available for rent in Uxbridge, according to a review of rental websites.⁵ Approximately twenty units were for rent in nearby communities of Bellingham, Douglas, Milford, Northborough, Slatersville (RI), and Woonsocket (RI). The median asking rent is \$1,150/month (\$1.40/SF) and the range is \$670 to \$1,488 per month (\$0.67/SF to \$1.71/SF). Higher rents are being asked for the newer mill conversion at Slatersville Mill in Rhode Island, which ranges from \$1.30/SF to \$1.71/SF.

Table 12: Apartments for Rent

Unit Type	# of Units	Asking Rent		
		Low	High	Median
1-Bed	7	\$670	\$1,263	\$928
2-Bed	9	\$735	\$1,488	\$1,438
3-Bed	2	\$900	\$990	\$945
4-Bed	1	\$1,400	\$1,400	\$1,400

Source: Rent.com and RKG Associates, Inc.

C. Commercial

Uxbridge has sufficient land available to attract new commercial development and a steady flow of automobile traffic. However, the Town's location between Worcester and Providence provides some competition for commercial uses, with major malls in each of those cities, as well as a shopping center in nearby Millville, a Walmart in Northbridge, and a shopping area soon to be built in North Smithfield, RI. Given the location and access, brokers reported they have expected more commercial activity along the Route 146 corridor than has occurred.

⁵ A review of www.rent.com was made for this analysis.

Contrary to common believe, lack of sewer and water may not always be a significant barrier to commercial development, as the new mall being built in North Smithfield, RI is not believed to have sewer access.

A review of land for sale on LoopNet indicates there are currently two parcels available in Uxbridge, ranging from 1.84 acres to 80 acres and at an approximate asking price of \$125,000 to \$135,000 per acre; there use is indicated as commercial. There were no commercial buildings for sale. Asking lease rates for retail are approximately \$15/SF - \$16/SF and asking lease rates for commercial office space are \$10/SF - \$12/SF. Table 13 below shows the amount of leasable space available in Uxbridge per use type.

Table 13: Commercial Properties for Lease

Type	SF Available	Asking Rate / SF
Retail	206,924	\$15-\$16
Industrial	7,840	n/a
Office	20,212	\$10-\$12

Source: LoopNet and RKG Associates, Inc.

D. Industrial

The overall industrial vacancy rate for the Greater Boston Market is approximately 11 percent. When considering specifically post-2000, Class A, distribution space, the vacancy rate is closer to 7 or 8 percent, which is comparable to the national average of 6 percent and represents a tight market for this product. The industrial vacancy rate in Rhode Island is about 6 percent and approaching lows last seen in 2007.

Warehouse distribution is the greatest need in the industrial market currently. Referred to as the “Amazon Effect,” many e-commerce retailers are looking to increase their delivery of product by having distribution centers in more locations. Amazon recently signed for one million square feet in Bedford and 400,000 square feet in Stoughton. These uses are also the quickest industrial products to absorb. Build-to-suit may be another viable opportunity, but absorption takes longer.

Much of the distribution product is older. Demand exists for newer facilities with higher bays, and good access to roadways, and strong power networks. Limited remaining supply of land suitable for warehouse distribution exists along I-495. The next best area in this region is likely to be the Route 146 belt, due to its location between Worcester and Providence and access to major highways such as I-90. One broker suggested that it is more desirable to be located one mile off a road such as Route 146 than five or more miles off an I-90 interchange.

Warehouse distribution centers require large land parcels. Brokers indicate a bare minimum of 40 to 50 acres would be needed to establish a new distribution center, though some are much larger. Amazon, by comparison, recently secured 300 acres for its newest distribution center to be located in southeastern Massachusetts. Therefore, the land area available in Uxbridge's could limit interest to small or mid-size distribution centers. Other requirements for a distribution center include ready permitting and access to power and utilities. Sewer may not be essential to a distribution center as they require less sewer capacity and power than a traditional manufacturer. According to area industrial brokers, having a site ready to go is the most important factor.

A final requirement, or potential barrier, is the demographics of the area. For example, Amazon is looking to hire 500 employees at its new distribution centers. Due to the breadth of corporate headquarters already located in northern Rhode Island (e.g. CVS, Fidelity, Amica), it's more likely that any large employer in Uxbridge will pull from Worcester's employee base.

Possible competition for large footprint (200,000 – 300,000 square foot) distribution centers include North Attleboro, Bellingham, and Holliston (to be constructed). The location of the BJs Wholesale distribution center adjacent to the target area could make the area more attractive for other similar users entering this market because of the expectation that BJs did their homework in regards to marketing and permitting. In terms of smaller footprint industrial product, not many of those parks exist in the Route 146 corridor.

According to local brokers, sales prices for premier sites on I-495 are \$12/SF-\$15/SF. Less valuable land types are \$8/SF-\$9/SF. A review of property for sale on LoopNet indicates two buildings containing approximately 450,000 square feet of industrial space currently for sale in Uxbridge.

E. Pipeline Projects

Based on pipeline data made available by the Town of Uxbridge, there is 25,000 square feet of commercial development and a 7-lot subdivision currently under review. Specific data on any other projects planned, approved, or under construction in the town or surrounding communities was not made available.

V. GAPS AND OPPORTUNITIES

As discussed above in the Introduction, based on the above socio-economic analysis and conversations with area brokers familiar with the regional real estate market, RKG Associates determined that if sewer capacity is extended to the target area, potential opportunity will likely arise in two-phases: warehouse distribution/light industry in the short-term and multi-family residential in the long-term. This plan is consistent with one of the six principles of the Blackstone Valley Prioritization Project (2012), which recognizes that “continued new growth will likely require major transportation and other infrastructure upgrades, beyond what is needed to keep existing systems in good repair.”⁶

A. Industrial Use

According to broker interviews described above, the strongest demand for non-residential land uses in the near term is warehouse distribution. This is confirmed by the lack of available industrial land for sale or lease in Uxbridge, with less than 10,000 square feet currently available for lease. The evolving model of online commerce and next day delivery is leading web-based retailers to open distribution centers in more locations. The primary needs for these types of lower intensity industrial uses include:

- Ready-permitting
- Suitable acreage (30 to 40 acres minimum)
- Access to power and utilities
- Suitable workforce

If the Town wants to encourage this type of industrial / warehouse distribution use to Uxbridge, the most important action to take is to ensure the available sites are ready to go. This includes having the in-house capacity to understand the industrial site selection process and the needs of warehouse distribution facilities. This factor may even be more important than having sewer service, specifically for the warehouse distribution use.

B. Commercial / Retail Use

The commercial market is generally flat everywhere and therefore not expected to provide great opportunity for development options. However, introducing sewer to this area of Town would be attractive to restaurant uses who typically have higher water and sewer demand per square foot than most other uses. As development on this area increase, this could open up greater opportunity for additional retail and restaurant uses, particularly around the interchange with Route 146.

⁶ CMRPC, Blackstone Valley Prioritization Project, 2012, p. 13.

C. Multi-family Residential Use

The market analysis for Uxbridge, broker conversations, and regional planning agency data, indicate that the residential market in the region is strong. The CMRPC has predicted that the Blackstone Valley region will need an additional 10,700 housing units by 2035 to meet continued population growth and evolving housing needs and preferences.⁷ On the other hand, job growth is expected to remain low.

Uxbridge has exhibited less household growth since 2010, suggesting a slow-down in housing demand or insufficient supply. Accounts indicate that there continues to be in-migration to this region from struggling parts of Rhode Island, such as nearby Woonsocket. Additionally, Uxbridge is well-poised as a bedroom community for those working in either Worcester (18 miles) or Providence, Rhode Island (22 miles). With appropriate planning, Uxbridge could be poised to absorb some of these new housing units.

By providing additional sewer capacity in this area of the Town, and with close proximity to the regional routes of travel, there is a strong chance that rising demand for housing will generate multi-family development proposals in the Target Area. The Town should anticipate this and plan accordingly. For example, if multi-family housing is a desirable use in the Target Area, it should be permitted through the Town's zoning ordinance. This should include protections for industrial and light industrial uses that already exist or are likely to begin operation in the short-term, to prevent any challenges of incompatibility. Multi-family residential can be compatible with the type of light industrial and retail uses currently in place in the Target Area. However, should the Town desire not to have multi-family residential in this location, the proper protections should be in place before any sewer extension plan is acted upon.

⁷ CMRPC, Blackstone Valley Prioritization Project, 2012, p. 46.

VI. NEXT STEPS AND STRATEGIES

While the likelihood of development opportunities opening up because of a proposed sewer expansion into the target area, the answer is not as simple as “if you build it, they will come.” Site selection is dependent on a number of factors, including land availability, land price, ease of permitting, access to utilities, access to transport, and the demographics of an area for access to both employees and patrons. The Town has control over some of these factors, but not all. Some factors, such as access to ease of transport, are already in place due to the area’s generally favorable location and highway access. Other factors, such as making the opportunity for economic development in the target area attractive to businesses or developers, will require work beyond extending the sewer line.

The following are suggested next steps and strategies to prepare the Town for market opportunities that could arise from expanding the wastewater treatment system into the target area.

- Establish a consensus-based town vision for the target area that is consistent with regional planning priorities for economic development and preservation of regional character (such as those put forth by the CMRPC’s Blackstone Valley Prioritization Project).
- Review the Town’s zoning to ensure that the desired land uses are permitted in the target area and at the desired density and, ensure any uses not desired are prohibited.
- Review the Town’s permitting and regulatory review process to increase efficiency without decreasing accountability.
- Hire a full or part-time staff person with professional training and experience in economic development.
- Conduct a build-out analysis to anticipate the amount of land and uses that could be developed under any new zoning scenarios, likely through the use of a consultant or the CMRPC.
- It may be useful to conduct economic and/or fiscal impact analyses of the potential built out, resulting from sewer extension or zoning changes, in order to provide assurances to town residents and staff. This will require an economic consultant.
- Prepare potential sites for development, including parcel assemblage as necessary and where possible; acquiring any permits in advance if possible; and, preparing marketing materials for such sites.

3. Development of Utilities Extension Conceptual Design

3.1 Introduction

The purpose of this section is to summarize the development of the conceptual level design for the South Uxbridge Study Area utility (water and sewer) extension through:

- A review of projected growth patterns outlined in available regional planning documents and the conclusions of the economic development analysis from Part 1.
- A discussion of the methodology and assumptions that were used to develop the conceptual level design.
- Presentation of planning level costs for utility extension to the South Uxbridge Study Area.
- Phasing

The Scope of Services is outlined in Section 1.1.

3.2 Codes and Standards

The following design guidelines and standards have been adopted for this project:

- TR-16: Guides for the Design of Wastewater Treatment Works, 2011 Edition

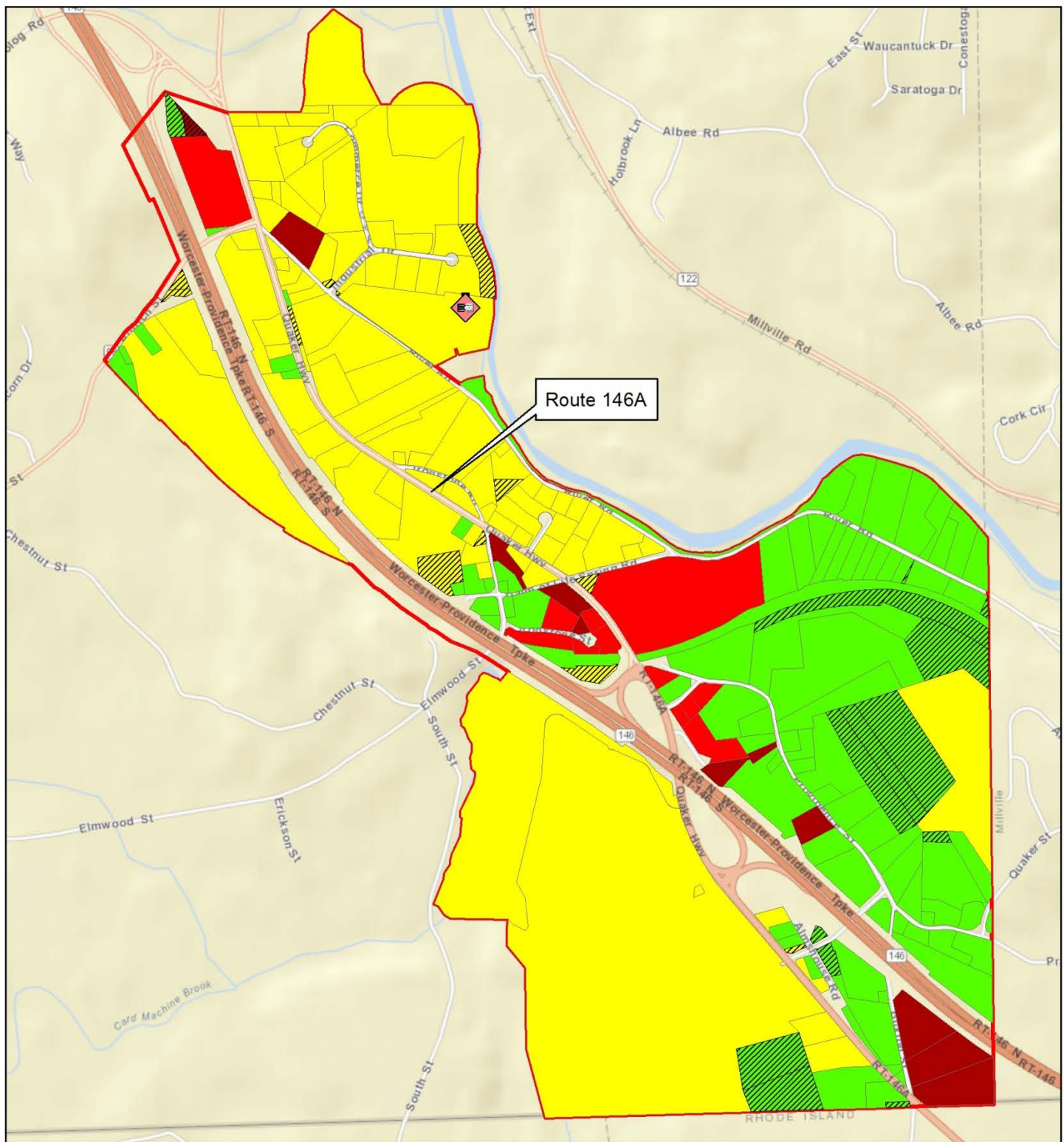
3.3 South Uxbridge Study Area—Current and Future Makeup of the Study Area

3.3.1 Current Makeup of the Study Area

The South Uxbridge Study Area is shown in Figure 2. The Study Area is located off of Route 146, which is a main thoroughfare between Worcester, Massachusetts and Providence, Rhode Island. As discussed in Part 1, the Study Area's proximity to both Worcester and Providence makes the area attractive to either city for commuter residential housing development. The presence of two exits from Route 146 to Uxbridge also makes the Study Area ideal for commercial development. The Study Area is currently primarily industrial and the majority of the area does not have access to public sewer or the public water system.

The Study Area, is bounded by the Blackstone River to the east and contains 226 parcels currently zoned as agricultural, commercial¹, and industrial on either side of Route 146A.

¹ It is assumed that both parcels listed as "C" or "B" in the Uxbridge database are zoned as commercial since there is no Zone "C" in the Town's zoning bylaws.



Parcel Zoning at Buildout

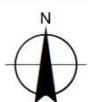


Paper Size ANSI A

0 375 750 1,500
Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983

Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet



Town of Uxbridge, Massachusetts
Uxbridge Gravity Sewer Extension

Job Number 86-18738
Revision A
Date 23 Dec 2015

PARCEL ZONING WITHIN PROPOSED SEWERSHED Figure 2

N:\US\Hyannis\Projects\86\18738\GIS\Maps\MXD_Deliverables\Figure 02 - Zoning within Sewershed.mxd 145 Hyannough Road, Hyannis Massachusetts 02601 USA T 1 508 362 5680 F 1 508 362 5684 E hyamail@ghd.com W www.ghd.com

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Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri

Table 1 – Existing Zoning of Parcels in the South Uxbridge Study Area

Type of Property	Number of Properties	Total Acres
Agricultural (AG)	100	198
Commercial (B or C)	24	34
Industrial (I)	104	58
Total	226	290

3.3.2 Future Makeup of the Study Area

Guidance provided by regional planning documents along with the conclusions of the RKG Economic Development report (Part 1 of this report) were used to develop assumptions on the projected future makeup of the Study Area.

3.3.2.1 Economic Development Analysis—Future Growth Trends

The Economic Development Analysis indicated that development opportunities in the Study Area are likely to develop in two phases:

1. Within the next five years opportunities exist for light industrial uses – such as warehouse distribution centers.
2. In the longer term opportunities exist for additional retail and restaurant development and the potential for multi-family residential housing.

As noted in Part 1, Uxbridge and surrounding communities have seen increased residential resale activity over the past five years. This trend is partially attributable to people moving out of cities with lower socio-economic conditions (such as Woonsocket, Rhode Island) and relocating to “bedroom communities” across the border in Massachusetts. Uxbridge is currently characterized as a classic “bedroom community.” According to the 2010 US Census, almost 40 percent of its residents commute outside of Uxbridge on a daily basis.

As noted in Part 1 there is a documented housing gap in the Blackstone Valley region² with an expected 10,700 housing units required by 2035 to meet the requirements of projected population growth. The Study Area is in an ideal location for development due to its proximity to highway access. The extension of water and sewer utilities to the Study Area would be especially attractive for potential restaurants and residential development, both of which typically have a higher water and sewer demand per square foot than other land uses.

The short-term opportunities in industrial development and longer term opportunities for retail and restaurant development would both increase the employment opportunities within Uxbridge. The development of small lot, single or multifamily housing in the region would provide new housing opportunities in proximity to these new economic opportunities and help fulfill a documented housing need.

² The Blackstone Valley Region is comprised of the following communities – Blackstone, Douglas, Grafton, Hopedale, Mendon, Millbury, Millville, Northbridge, Sutton, Upton and Uxbridge.

3.3.3 Consistency with Future Makeup of Study and with Town, State and Regional Documents

3.3.2.1 Consistency with Comprehensive Wastewater Management Plan (CWMP)

At the time of this report, the Town is completing a Comprehensive Wastewater Management Planning (CWMP) Project. The CWMP recommends that the Regional Priorities Growth Approach, outlined in the Blackstone Valley Prioritization Report (Blackstone Report) be considered for future growth planning. Recommendations of the Blackstone Report are discussed further in Section 3.3.2.3.

3.3.2.2 Consistency with Commonwealth Sustainable Development Principles

The Commonwealth Sustainable Development Principles were developed by the State of Massachusetts to help guide investments in land and infrastructure. The longer term opportunities for retail, restaurants, and residential housing in the Study Area aim to maintain consistency with the following Commonwealth Sustainable Development Principles:

- Concentrate development and mixed uses—Support the revitalization of city and town centers and neighborhoods by promoting development that is compact, conserves land, protects historic resources, and integrates uses. Encourage remediation and reuse of existing site, structures, and infrastructure rather than new construction in undeveloped areas. Create pedestrian friendly districts and neighborhoods that mix commercial, civic, cultural, educational, and recreational activities with open spaces and homes.
- Expand housing opportunities—Support the construction and rehabilitation of homes that meet the needs of people of all abilities, income levels, and household types. Build homes near jobs, transit, and where services are available. Foster the development of housing, particularly multifamily and smaller single-family homes in a way that is compatible with a community's character and vision, and with providing new housing choices for people of all means.
- Increase job and business opportunities—Attract businesses and jobs to locations near housing, infrastructure, and transportation options. Promote economic development in industry clusters. Expand access to education, training, and entrepreneurial opportunities. Support the growth of local businesses, including sustainable natural resource-based businesses such as agriculture, forestry, clean energy technology, and fisheries.

3.3.2.3 Consistency with Regional Use and Development Plans

The Blackstone Valley Prioritization Report (Blackstone Report), produced by the Central Massachusetts Regional Planning Commission (CMRPC) in 2012, focused on developing priorities for regional development and preservation strategies. The Blackstone Report lists the Route 146 Industrial Site (which is in the Study Area) as a locally-identified priority development area (PDA). PDAs are defined as “areas within a city or town that have been identified as capable of supporting additional development or as candidates for redevelopment. Rather than specific projects or sites, PDAs represent general locations where appropriate growth may occur, and where public investments to support that growth will be directed.”

The Blackstone Report notes that “continued new growth will likely require major transportation and other infrastructure upgrades beyond what is needed to keep existing systems in good repair”. The report also states that “a lack of public sanitary sewer may constrain development since the cost of designing, constructing and maintaining an on-site facility for a large-scale development

significantly impacts a development pro-forma, and may make site development cost-prohibitive.” Extending public sewer and public water to the Study Area is consistent with the direction provided in the Blackstone Report.

3.4 Conceptual Design

The development of projected water demand and wastewater flows in the Study Area requires an understanding of possible future land uses in the area for the next 50 to 100 years, which is the expected life of the collection system infrastructure. This may go beyond the typical buildout assumptions of maximum development based on current zoning because the zoning may change in this area.

A broad planning level build-out analysis and estimation of future water consumption was completed for the South Uxbridge Study Area. The buildout analysis was completed through the following steps:

- Review of existing land use and water consumption in the Town.
- Identification of expected future uses (buildout condition) for parcels within the Study Area.
- Development of projected water demand and wastewater flows for the future condition.

The following datasets were used in the development of water demand:

1. Water data (provided by the Town) for years 2011 through 2013.
2. GIS data provided by the Town in 2014.
3. Town assessor's data provided by the Town in 2014.
4. Draft CWMP data and analysis dated 2014.

Three different scenarios were analyzed to determine project future water demand and wastewater flow for the Study Area:

Scenario 1: All developable parcels are rezoned and redeveloped into restaurants, which represent the highest anticipated water usage per acre (buildout scenario).

Scenario 2: All developable parcels are rezoned and redeveloped into small lot, single family residential properties.

Scenario 3: All developable parcels are rezoned and redeveloped into commercial properties (small retail stores and restaurants) maintaining the current ratio of small retail stores to restaurants that exists within the Town.

The projected water demand and wastewater flows for the three scenarios are outlined in Table 2.

Table 2 – Summary of Future Water Demand and Wastewater Flows

		Scenario 1	Scenario 2	Scenario 3
Water Demand (MGD)	Average Annual	0.9	0.4	0.4
	Maximum Month	1.3	0.6	0.6
	Peak 24 Hour	2.8	1.3	1.3
	Peak Hour	3.5	1.7	1.6

		Scenario 1	Scenario 2	Scenario 3
Wastewater Flow (MGD)	Average Annual	0.8	0.4	0.4
	Maximum Month	1.1	0.6	0.5
	Peak 24 Hour	2.5	1.2	1.2
	Peak Hour	3.1	1.5	1.5

The buildout analysis provides a planning tool to help assess the development potential of the Town. The buildout analysis predicts the worst case future condition in the Town when all of the developable space has been developed to its highest water use potential. Once a buildout projection has been established, assumptions about the predicted growth pattern of the Town are typically used to develop a more realistic growth projection.

Scenario 1 represents the buildout scenario for the Town, where each parcel has been developed using the highest water use potential per acre. However, due to economic competition, it is highly unlikely that every parcel in the Study Area will be subdivided and converted to a restaurant.

Scenario 2 and 3 represent two alternative future projections with more likely development patterns, assuming the development in the Study Area is primarily either small lot, single family residential, or business development which maintains a similar retail store to restaurant ratio as the Town's current makeup. Both of these scenarios result in fairly similar flow projections. To be conservative it was decided that the slightly higher flows from Scenario 2 flows be used to size the utility extensions.

3.4.1 Design Parameters

Gravity Sewer

SewerCAD Version 8i by Bentley Systems Inc. was used to develop a proposed layout for the sewer system. The model uses Manning's Equation for gravity pipes and is run assuming a "steady-state" condition under peak flow conditions. Wastewater flows are based on a combination of wastewater from sanitary sources and a conservative estimate of wet-weather flows (inflow and infiltration {I/I}) based on guidance from TR-16. Flows are then adjusted for different scenarios by applying peaking factors to represent different flow conditions (i.e. average annual, maximum month, peak hour) which can be universally applied to one, multiple, or all of the pipes in the model.

Typically, 85% of the total pipe capacity is used to represent the design maximum flow of the pipe. When the wastewater flow exceeds this value, the pipe size is increased in the model. At a minimum, TR-16 requires an 8-inch pipe diameter. The pipe material selected for the model was PVC, currently the most commonly used gravity pipe material because of its smooth interior surface (a Manning's "n" value of 0.013 is used in calculations), durability, and light weight, all of which provides for an easier installation and lower shipping costs than other heavier materials that have been used in the past.

Based on the TR-16 requirements, the following design parameters were used:

- Pipe Slope Minimum: 0.4% or 0.004 ft/ft.
- Manholes at every junction and every 400 feet.
- Minimum drop of 0.10-feet between manhole inlet and outlet.
- Minimum Cover: 8-feet to allow for connection of collection pipes within future development.

- Maximum Cover: 20-feet for extreme locations.

Once these design parameters and proposed manhole elevations are input into the model, a subsequent model run verifies that all the design constraints are being met. At areas where the collection system layout is identified, the slope and cover requirements are adjusted manually so the model can maximize the amount of area covered by gravity sewer systems.

Flows were based on the wastewater design flows established in this report. Flows were assigned to each parcel in the planning area. After the collection system was laid out, individual sewersheds were created that encapsulated groups of parcels. For modelling purposes, the flow of these parcels was summed and then assigned to a nearby manhole in each sewershed. This flow value was entered into each manhole as the sanitary flow. The appropriate peaking factor was applied to simulate peak hour flows and to ensure that pipe sizes were adequate for such flows.

It is noted that minimal I/I will be evident with new infrastructure and proper municipal inspection of service laterals, but experience indicates that I/I increases during the long lifetime of a collection system and the I/I factor used of 500 gpd/in-dia/mile based on TR-16 recommendations takes this into account.

Force Mains

For the calculation of friction loss and velocities in pressure pipes, SewerCAD utilizes the Hazen-Williams equation. When calculating friction loss, the model automatically identifies the length of the line used for the force main and will begin its evaluation using a 4-inch ductile iron pipe. Four inch pipe is the minimum size considered for a force main in the model. Design velocities between 3- and 5-feet per second (ft/s) are considered acceptable. If the velocity exceeds 5 ft/s in the model, a larger pipe size is used. A Hazen-Williams coefficient of 120 was considered for this evaluation. This coefficient represents the roughness of the pipe interior, similar to the Manning's coefficient.

Minor losses are the losses that are developed through bends and other fittings in the force main as well as pipe entrances and contractions and any other interior pipe condition that disrupts uniform flow in the pipe line. When the model calculates head-losses, it factors in the bends in the force main, as well as the other conditions, and calculates loss in feet for each force main.

The total loss or total dynamic head is the sum of the friction loss, minor loss and the static loss. The static loss is simply the difference in elevation of the water surface in the wet well and the invert of the structure it pumps into. The pumping station needs to be able to convey the peak flow rate entering the station at the calculated dynamic head. When this condition is met, the system should function as designed.

Water Main

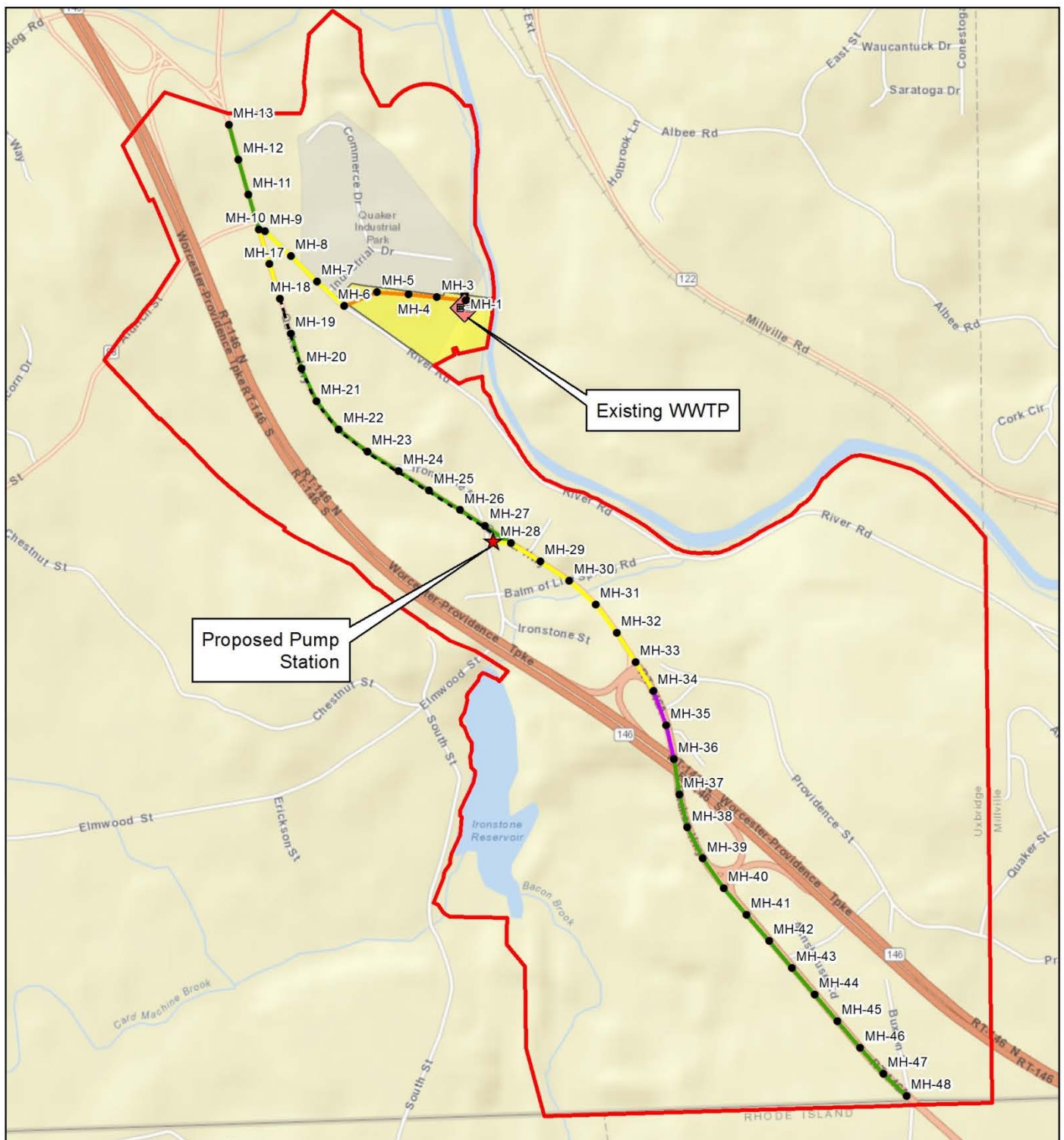
A hydraulic model of the South Uxbridge Study Area was created utilizing WaterCAD Version 8i by Bentley Systems, Inc. This program analyzes pressurized flow from storage structures and pumping systems through pipe networks and is one of the industry standards for hydraulic modeling. The following design parameters were used to develop the model:

- Assumed C value of 110
- Assumed needed fire flow of 1,000 gpm. Fire flow was analyzed at the far end of the system
- Assumed construction in shoulder of road in an existing easement
- Assumed the hydraulic grade of the tank in the pressure zone (source) is 500 feet.

Flows were based on the water demand flows established in this report and were assigned to each parcel in the planning area.

Conceptual Layout

The conceptual layouts for the proposed sewer and public water system are shown in Figures 3 and 4, respectively. The proposed trunk line sewer profile is included in Appendix A and the proposed water main profile is included in Appendix B. The route of the two extensions down 146A allows properties in the immediate vicinity of the highway to connect to the system through a gravity collection system. If areas further from Route 146A are developed, additional pumping stations may be required to provide gravity flow to the trunk line.



LEGEND

- Proposed Sewershed
- ★ Pump Station
- WWTP Parcel
- Manhole
- ◆ Existing WWTP MPS

Sewer Main (Diameter- Inches)

- 8
- 15
- 10
- 30
- 12

Force Main (Diameter - Inches)

- 10

Paper Size ANSI A

0 370 740 1,480 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983

Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet



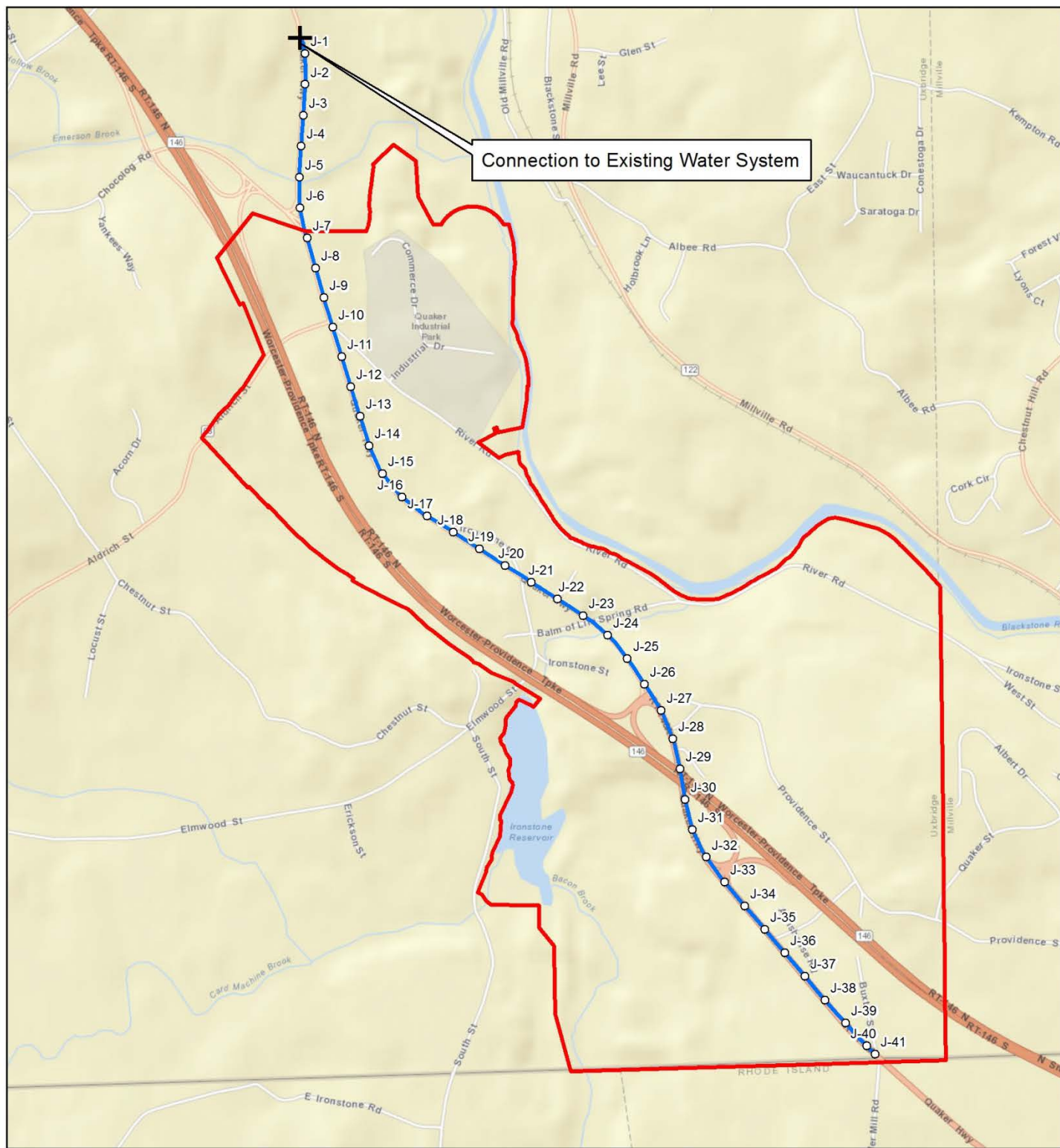
Town of Uxbridge, Massachusetts
Uxbridge Gravity Sewer Extension

PROPOSED SEWER EXTENSION

Job Number 86-18738
Revision A
Date 23 Dec 2015

Figure 3

N:\US\Hyannis\Projects\86\18738\GIS\Maps\MXD_Deliverables\Figure 03 - Proposed Sewer Extension.mxd 1545 Iyannough Road, Hyannis Massachusetts 02601 USA T 1 508 362 5680 F 1 508 362 5684 E hyamail@ghd.com W www.ghd.com
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LEGEND

- Proposed Sewershed
- + Connection to Existing System
- o Junction

Water Main (Diameter - Inches)

—— 12

Paper Size ANSI A
0 450 900 1,800
Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet



Town of Uxbridge, Massachusetts
Uxbridge Gravity Sewer Extension

PROPOSED WATER MAIN

Job Number	86-18738
Revision	A
Date	23 Dec 2015

Figure 4

N:\US\Hyannis\Projects\86\18738\GIS\Maps\MXD_Deliverables\Figure 04 - Proposed Water System.mxd 1545 Iyannough Road, Hyannis Massachusetts 02601 USA T 1 508 362 5680 F 1 508 362 5684 E hyamail@ghd.com W www.ghd.com

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3.5 Cost Considerations and Schedule

3.5.1 Engineer's Estimate of Probable Capital Costs

Capital costs presented in this memo are the total estimated capital costs for the proposed layouts shown in Figures 3 and 4 and in Appendix A. The costs include a 30% construction contingency allowance and a 30% allowance for legal, fiscal, and engineering services during design and construction. The contingency is provided for variability in the bidding climate, project changes before bidding, easements and residential property restoration, and change orders due to unforeseen conditions. The contingency is also intended to cover costs for limited utility power improvements if phase and voltage changes to the existing infrastructure are required, however the actual costs would not be known until final design in these areas. The following basis of design was used for the cost estimates:

- One new pumping station (either submersible or suction lift) will be constructed in the South Uxbridge Sewer Area.
- Sewer system is entirely comprised of a gravity collection system (no low pressure or vacuum).
- A lateral cost was included to connect existing developed properties bordering Route 146A to the trunk line. A lateral cost was not carried for future development for any of the parcels in the Study Area.
- Roads within the sewershed, not in close proximity to Route 146A such as the unpaved portion of River Road, are not included in the cost estimate.

The Engineer's opinion of probable capital cost in 2015 dollars is presented in Table 3. Detailed cost estimates for sewer and water mains are included in Appendix C. The probable construction costs presented assume that both the proposed water main and sewer extension are installed in one project. A 3% inflation factor was used to show the impact of inflation on project costs in different years.

Table 3 – Engineers Opinion of Probable Capital Cost

Capital Costs	Sewers	Water	Total
2015 Dollars	\$10,700,000	\$6,100,000	\$16,800,000
2016 Dollars	\$11,000,000	\$6,300,000	\$17,300,000
2017 Dollars	\$11,300,000	\$6,500,000	\$17,800,000
2018 Dollars	\$11,600,000	\$6,700,000	\$18,300,000
2019 Dollars	\$11,900,000	\$6,900,000	\$18,800,000
2020 Dollars	\$12,300,000	\$7,100,000	\$19,400,000

3.5.2 Potential Phasing Options

Breaking the project into multiple phases may make the entire project more financially viable for the Town. One option for Phase 1 is to install the “backbone” of the South Uxbridge sewer system—as shown in Figure 2 The work would include gravity sewer from the BJs south of Route 146 to the proposed pumping station, construction of the proposed pumping station and the installation of a force main to the WWTF. The force main could potentially be run along Balm of Life Road and River

Road instead of along Route 146A to provide a more direct force main route for this phase of the project.

Subsequent phases would extend the sewer north and south of the backbone. It should be noted that higher costs would be incurred for engineering, contractor overhead, and mobilization/demobilization in a multi-phased project. Additional paving costs will also be incurred both the sewer and water systems are not installed concurrently in the same location. The Engineers Estimate of Probable Capital Costs for a project broken into three phases is shown in Table 4. The proposed work breakdown is shown in Figure 5.

**Table 4 – Engineers Opinion of Probable Capital Cost for Phases 1 through 3
(2015 Dollars)**

Phase	Total \$2015
1	\$7,000,000
2	\$10,600,000
3	\$2,700,000
Total	\$20,300,000

If design for Phase 1 were to start in 2015 it is anticipated that the midpoint of construction would occur in 2017. The capital costs for Phase 1 in 2017 dollars are estimated at \$7,400,000.

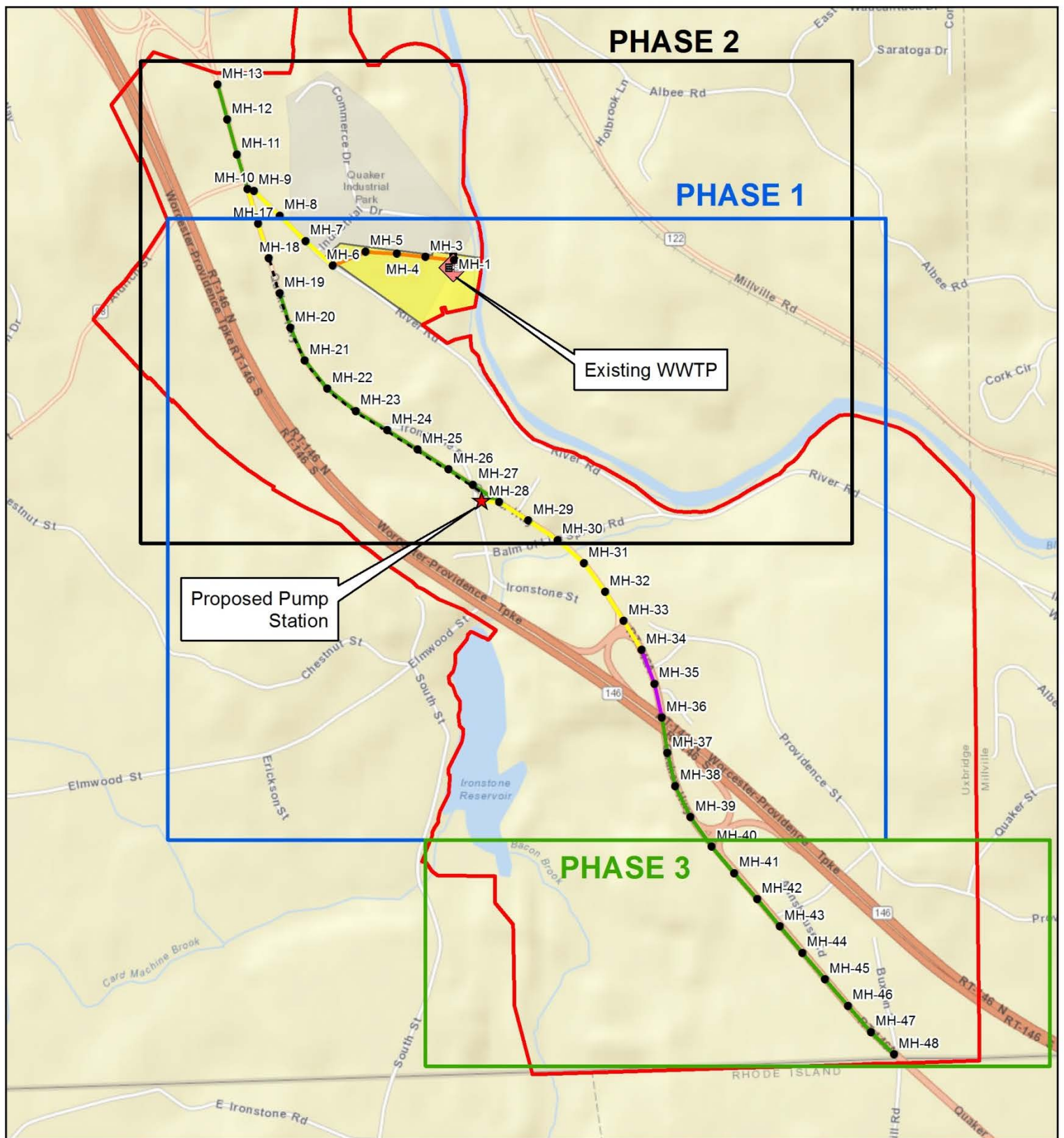


FIGURE 5 - PROPOSED PROJECT PHASING - SEWER

3.6 Summary and Next Steps

As documented in the RKG Associates memorandum potential growth in the Study Area is likely to occur in two phases:

- Short term warehouse distribution/light industrial growth
- Long term multi-family residential growth

Extending water and sewer service to the Study Area may contribute to attracting both residential and commercial growth to the area. The Engineer's opinion of probable capital cost for the extension of water service and sewer service to the Study Area is \$16,800,000. The project could potentially be phased in order to make the entire project more financially feasible for the Town.

The next steps for this project are to seek to project funding and to initiate preliminary design of the proposed utility (water and sewer) extensions.

This report: has been prepared by GHD for Town of Uxbridge, Massachusetts and may only be used and relied on by Town of Uxbridge, Massachusetts for the purpose agreed between GHD and the Town of Uxbridge, Massachusetts.

GHD otherwise disclaims responsibility to any person other than Town of Uxbridge, Massachusetts arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Town of Uxbridge, Massachusetts and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

GHD has prepared the preliminary cost estimate set out in section Section 3 of this report ("Cost Estimate") using information reasonably available to the GHD employee(s) who prepared this report; and based on assumptions and judgments made by GHD as detailed in the report.

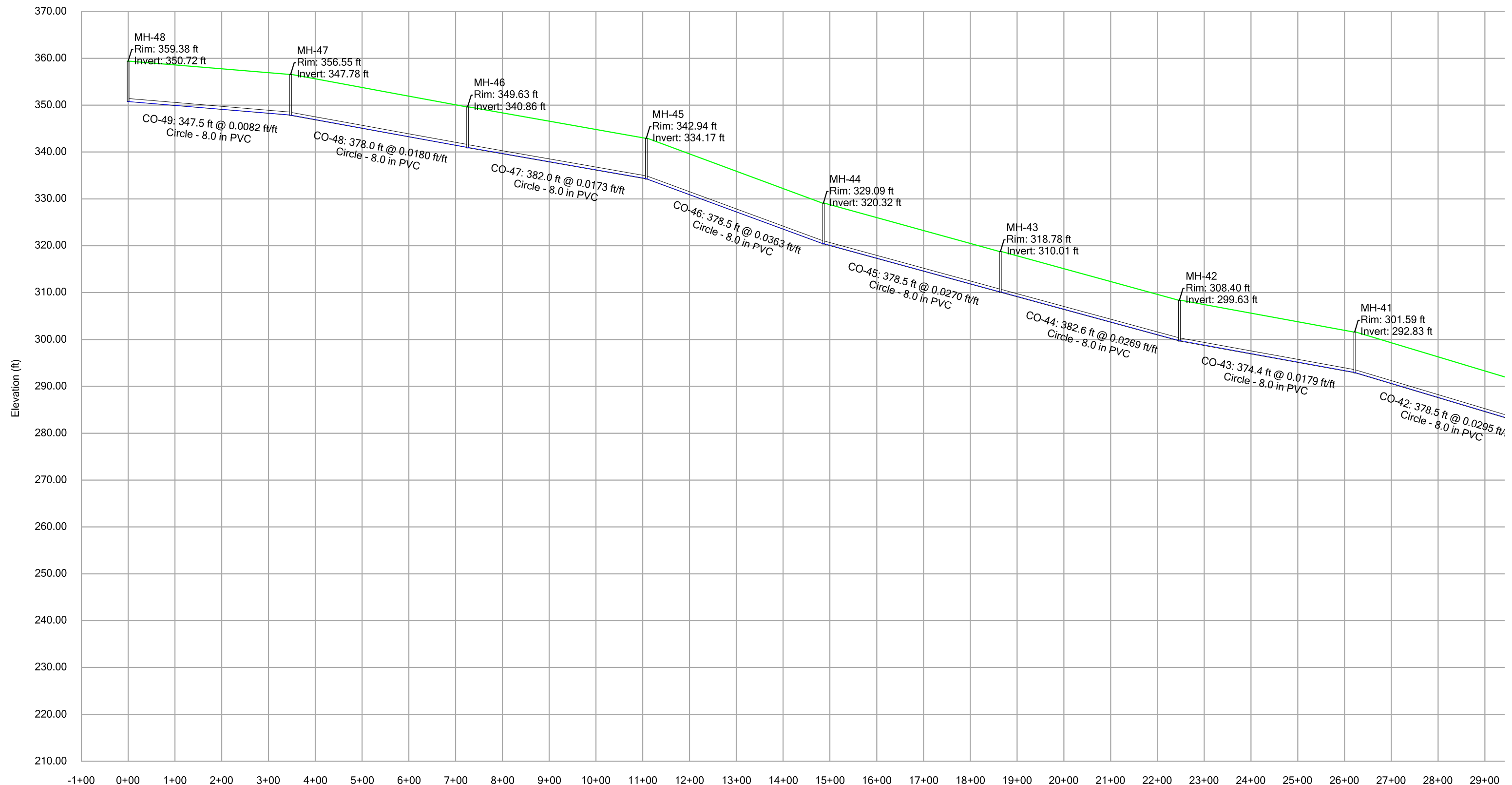
The Cost Estimate has been prepared for the purpose of conceptual level cost estimate and must not be used for any other purpose.

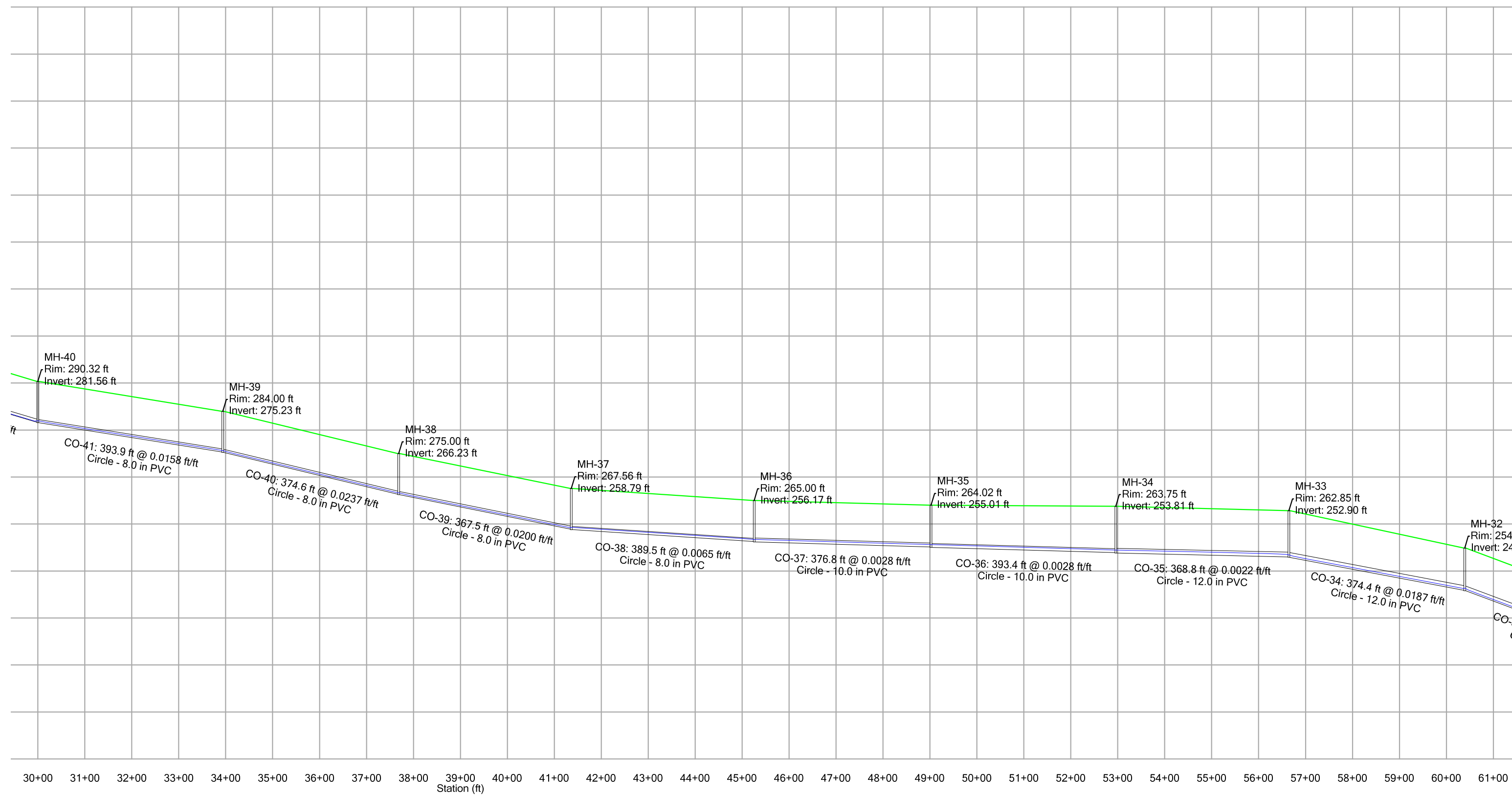
The Cost Estimate is a preliminary estimate only. Actual prices, costs and other variables may be different to those used to prepare the Cost Estimate and may change. Unless as otherwise specified in this report, no detailed quotation has been obtained for actions identified in this report. GHD does not represent, warrant or guarantee that the project can or will be undertaken at a cost which is the same or less than the Cost Estimate. Where estimates of potential costs are provided with an indicated level of confidence, notwithstanding the conservatism of the level of confidence selected as the planning level, there remains a chance that the cost will be greater than the planning estimate, and any funding would not be adequate. The confidence level considered to be most appropriate for planning purposes will vary depending on the conservatism of the user and the nature of the project. The user should therefore select appropriate confidence levels to suit their particular risk profile.

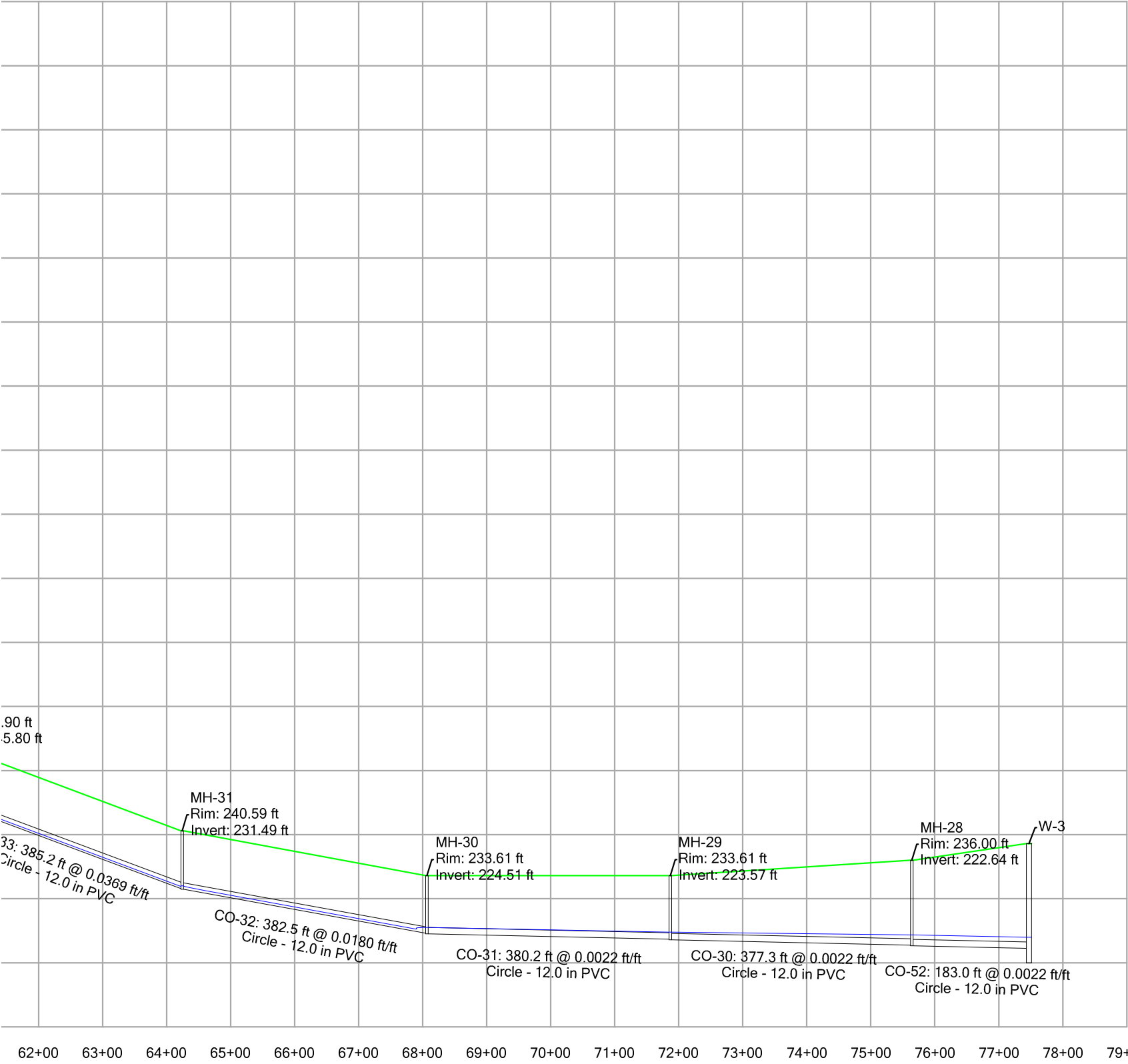
Appendices

Appendix A – Proposed Sewer Profile

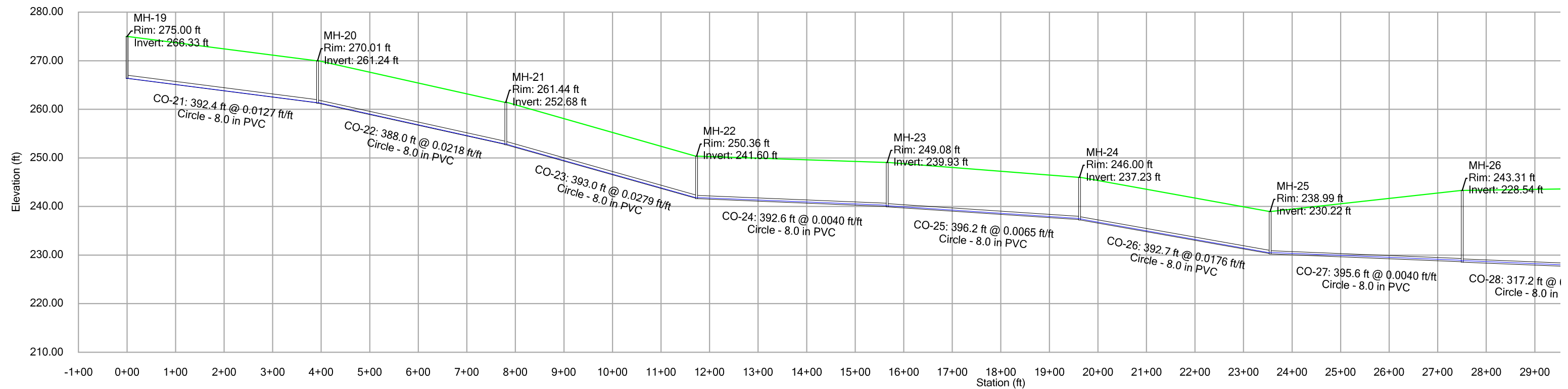
Profile Report
Engineering Profile - 1 - PS Basin - Southern Gravity Pipe (Uxbridge Sewer.stsw)

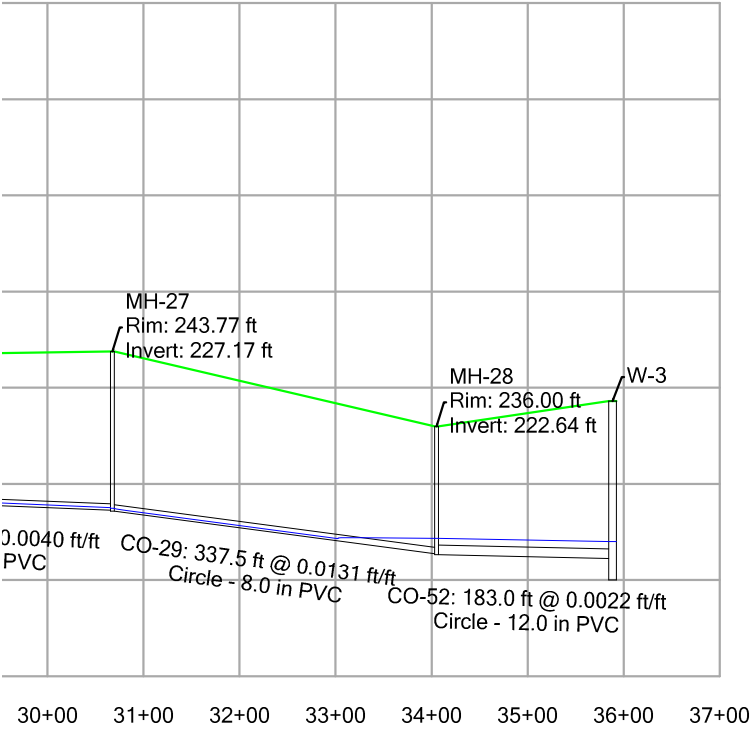




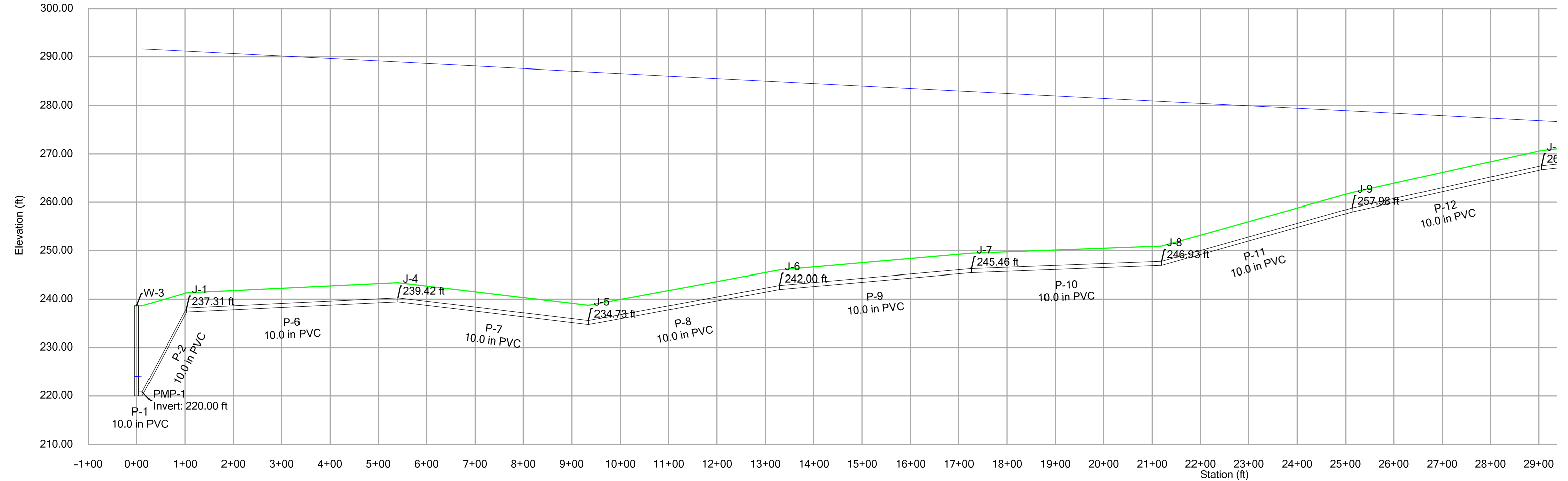


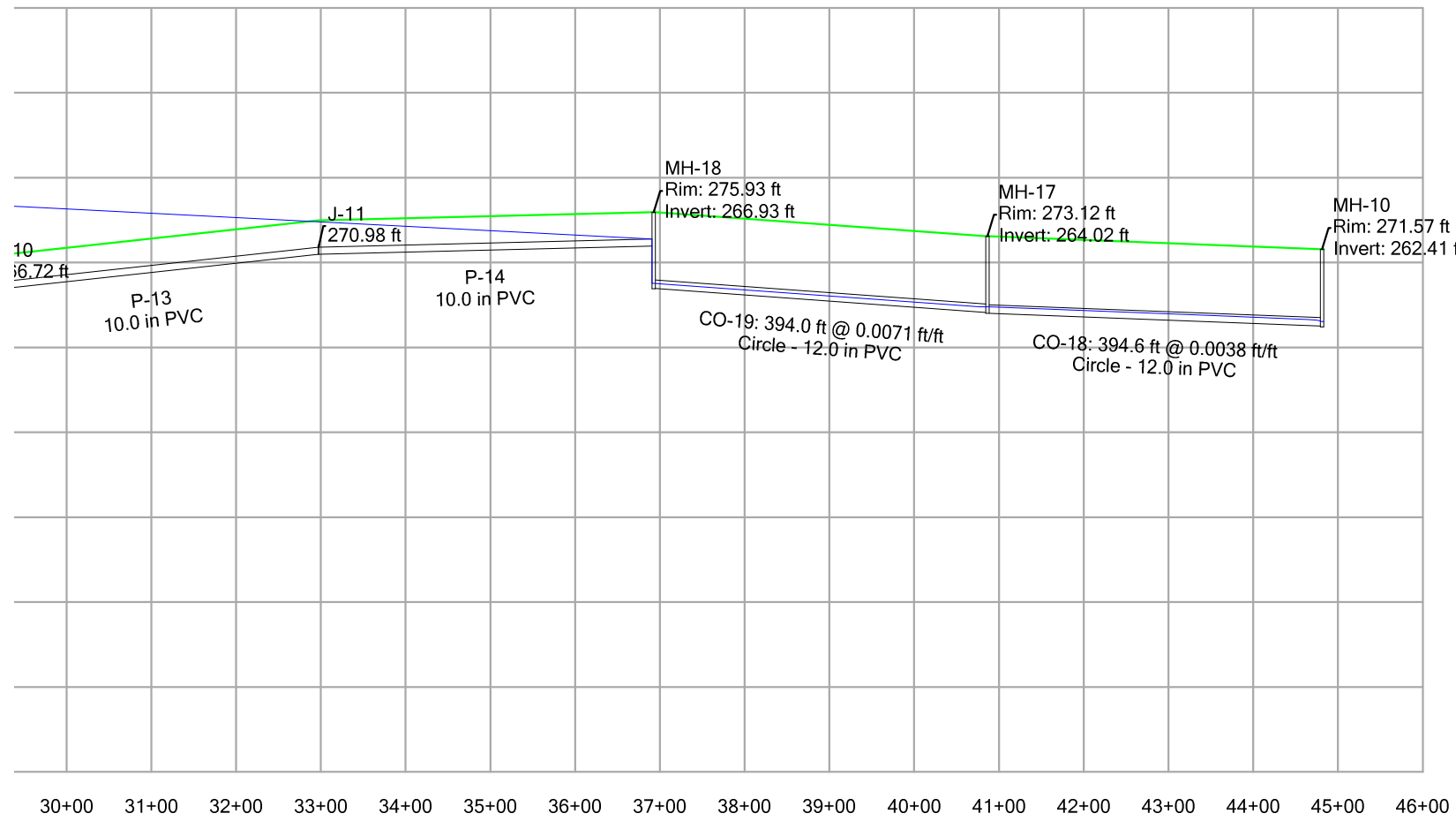
Profile Report
Engineering Profile - 2 - PS Basin - Northern Gravity Pipe (Uxbridge Sewer.stsw)



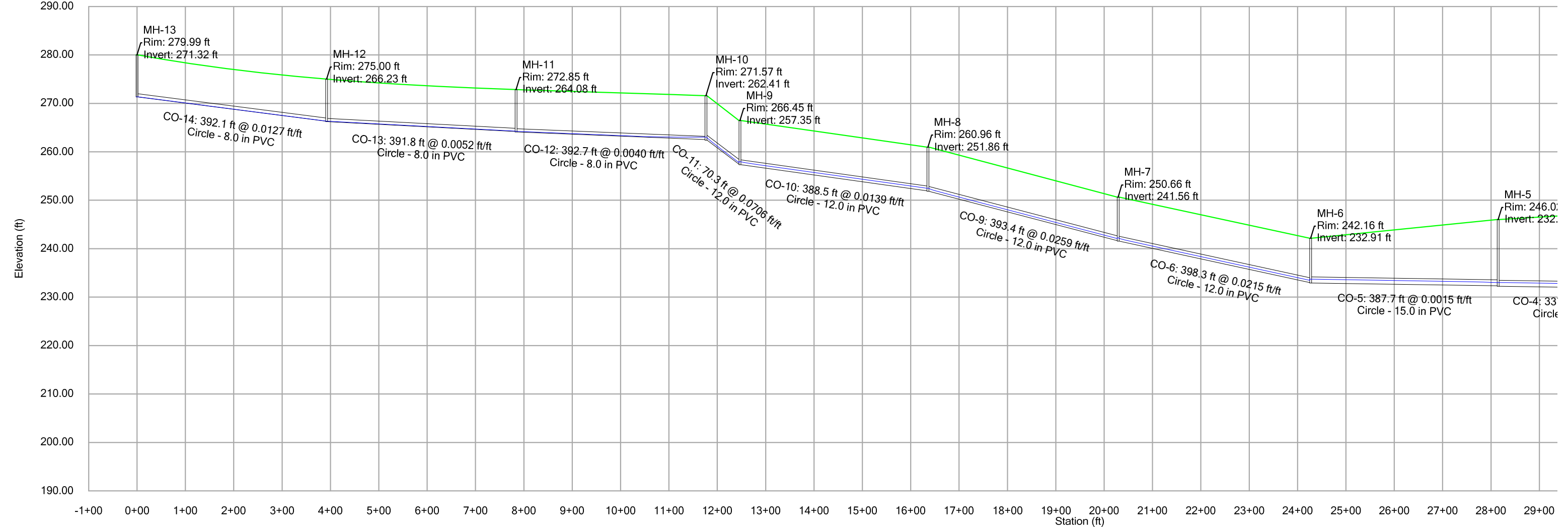


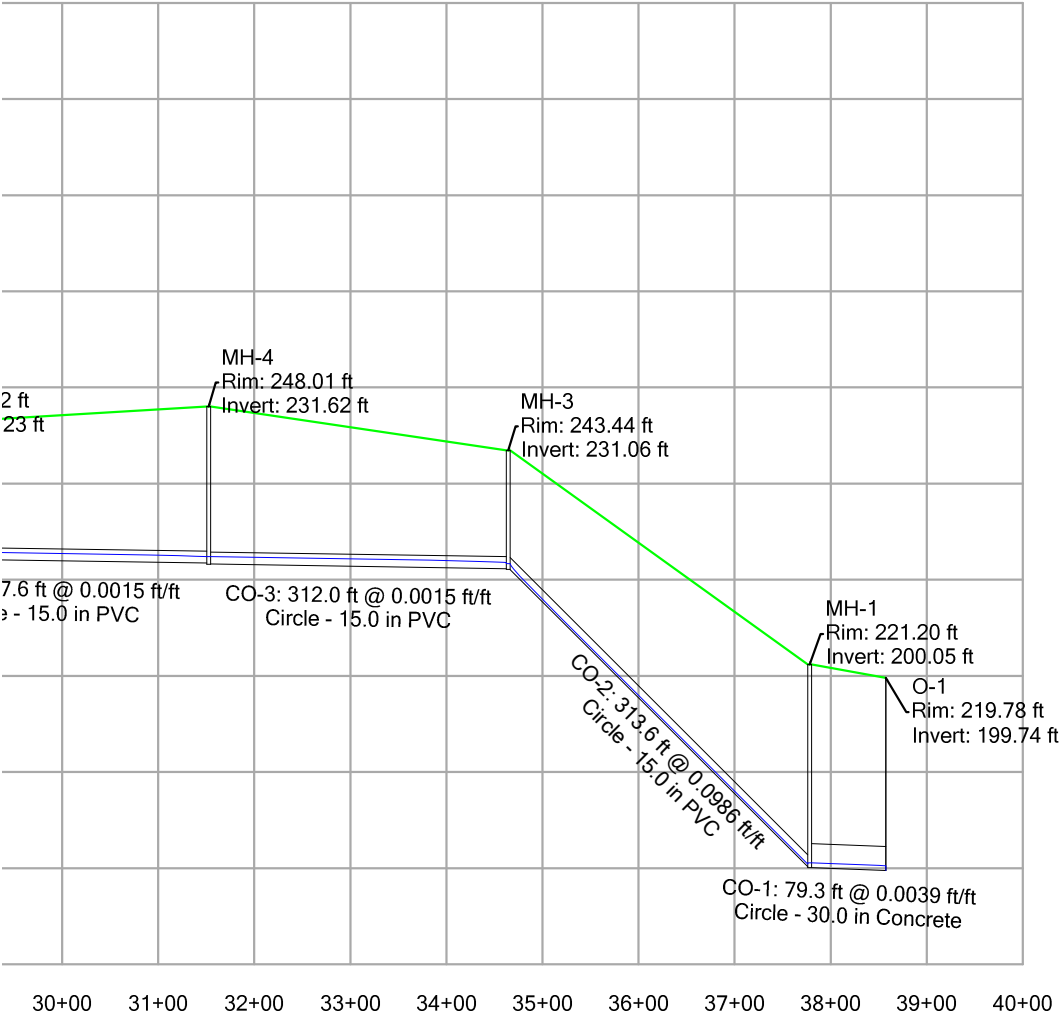
Profile Report
Engineering Profile - 3 - FM and Gravity to Tee (Uxbridge Sewer.stsw)





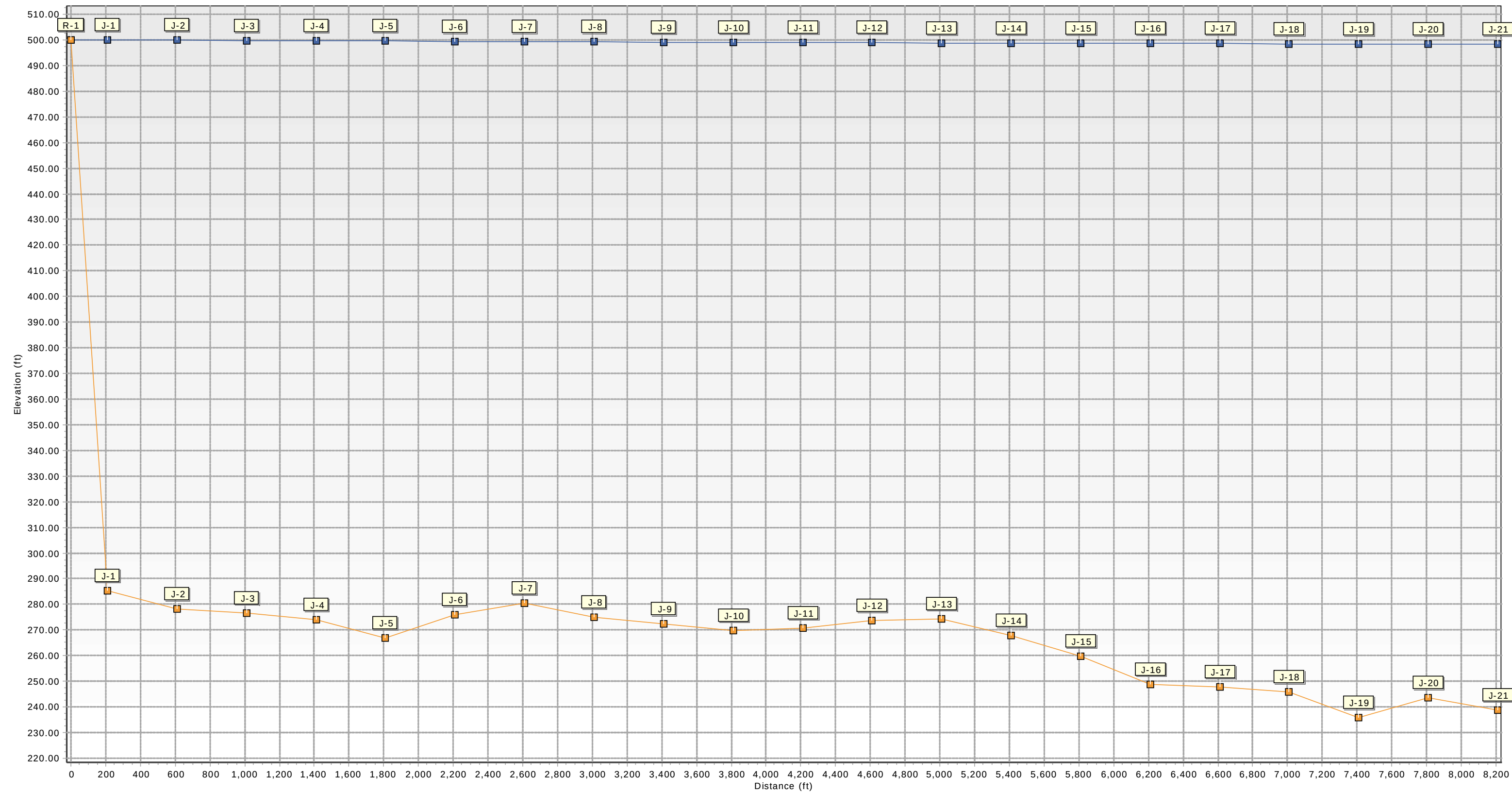
Profile Report
Engineering Profile - 4 - Gravity to WWTP (Uxbridge Sewer.stsw)





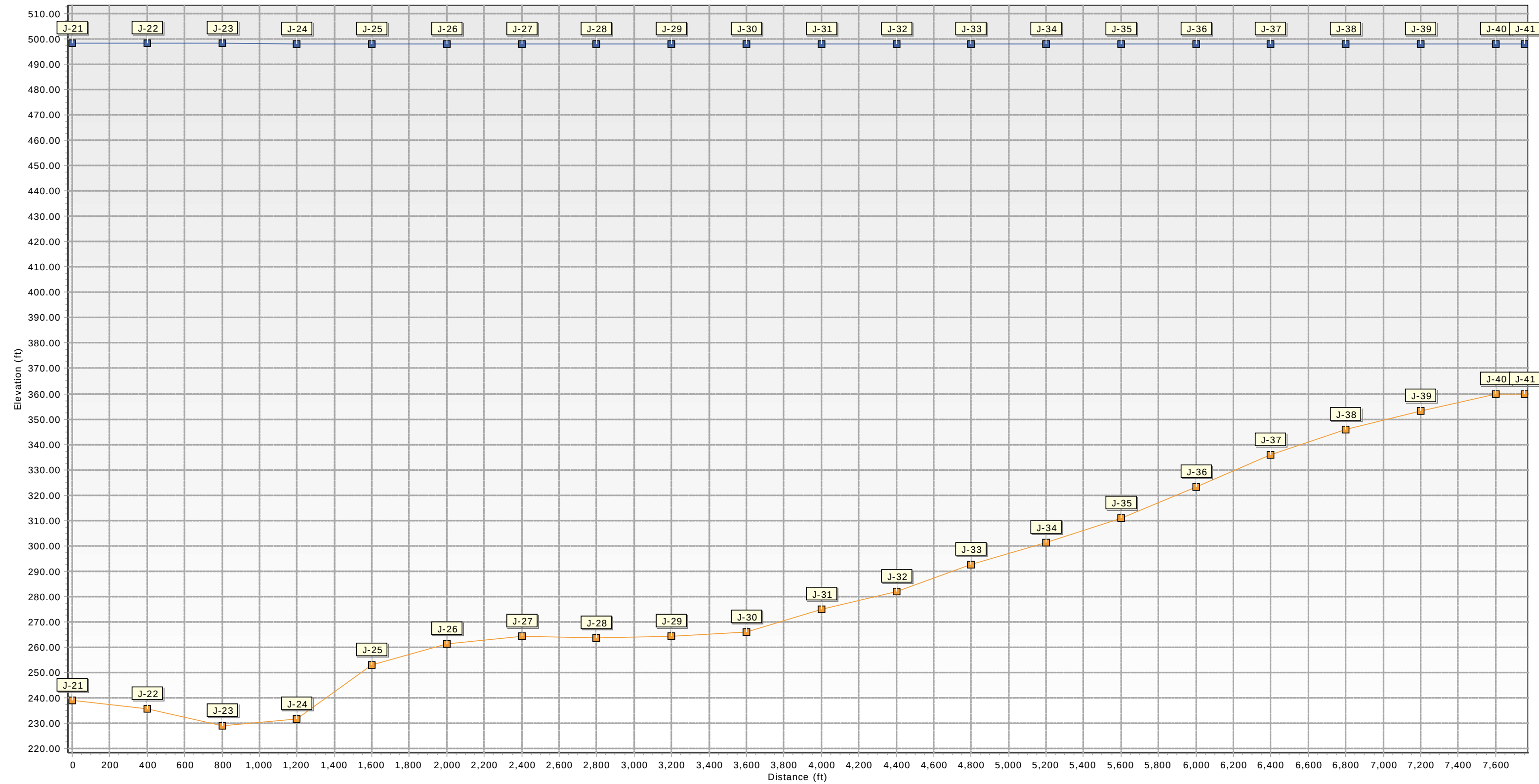
Appendix B – Proposed Water Main Profile

1 - Northern Profile



Base - Hydraulic Grade Base - Elevation

2 - Southern Profile



Base - Hydraulic Grade Base - Elevation

Appendix C – Cost Estimates for Sewer and Water Mains

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Project:	Uxbridge Gravity Sewer Extension		Computed By:	JSR
Location:	Town of Uxbridge, MA		Checked By:	
Owner:	Town of Uxbridge, MA		Design Status.:	PER
Description:	Engineer's Estimate of Probable Construction Cost - Sewer System		Project No:	86-18738
Description	Quantity	Unit	Unit Cost	Cost
Mobilization (5% of base construction cost)	1	LS	\$217,600.00	\$217,600
Maintenance of Traffic	15,750	LF	\$4.79	\$75,600
Preconstruction video documentation	1	LS	\$3,000.00	\$3,000
Sewer - Pipe and Appurtenances				
PVC - 8 in	9,110	LF	\$13.20	\$120,300
PVC - 10 in	780	LF	\$19.95	\$15,600
PVC - 12 in	4,500	LF	\$22.50	\$101,300
PVC - 15 in	1,360	LF	\$25.00	\$34,000
Support existing utilities	895	SF	\$9.59	\$8,600
Undergrnd tape, detectable, reinforced, AI foil core, 6 in, for pipe	158	CLF (100 LF)	\$9.45	\$1,500
Manholes - per VLF w/out Excavation				
4 ft wide manhole (8 ft deep) - installed w/ frame and cover	43	EA	\$2,225.00	\$95,700
Manhole (add'l depth) - installed w/ frame and cover	75	VLF	\$630.00	\$47,300
Sewer - Force Main				
PVC Force Main - 10 in	5,525	LF	\$23.50	\$129,900
Undergrnd tape, detectable, reinforced, AI foil core, 6 in, for pipe	55	CLF (100 LF)	\$9.45	\$600
Air Release Valves	2	EA	\$20,000.00	\$40,000
Sewer Pump Station (900 gpm @ 68 ft TDH)				
Pump Station	1	LS	\$1,000,000.00	\$1,000,000
Excavation				
6 ft W by 10 ft D trenchbox, backfill and bedding	16,450	LF	\$32.65	\$537,100
6 ft W by 16 ft D trenchbox, backfill and bedding	2,650	LF	\$46.00	\$121,900
10 ft W by 20 ft D trenchbox, backfill and bedding	310	LF	\$78.00	\$24,200
Other Work				
Trench Dewatering	177	Days	\$1,167.94	\$206,800
Inspection and testing	1	LS	\$5,000.00	\$5,000
Roadway Work				
Sawcut existing roadway	21,280	LF	\$3.16	\$67,400
State road - full depth repave over 4 ft wide trench for pipe and laterals	9,455	SY	\$100.00	\$945,500
Mill asphalt to 2 in depth, curb to curb, 24 ft wide road	56,728	SY	\$2.25	\$127,700
Haul and dispose of milled asphalt	3,152	CY	\$8.25	\$26,100
2 in overlay milled areas	56,728	SY	\$9.97	\$565,700
Misc. Work				
Laterals	47	EA	\$1,000.00	\$47,000
Storm water and erosion control	1	LS	\$3,000.00	\$3,000
Allowance for rock removal	1	LS	\$600,000.00	\$600,000
Overhead & Profit				\$775,260
Area Cost Factor (Framingham = 110.9)				\$647,859
Subtotal in 2015 dollars				\$6,592,000
Contingency 30%				\$1,980,000
Total Construction				\$8,600,000
Legal, Fiscal & Engineering 30%				\$2,580,000
Total Project Costs at 2015 Dollars				\$11,200,000
Final Project Cost at 2016 Dollars (at 3 percent per year)				\$11,500,000
Final Project Cost at 2017 Dollars (at 3 percent per year)				\$11,800,000
Final Project Cost at 2018 Dollars (at 3 percent per year)				\$12,200,000
Final Project Cost at 2019 Dollars (at 3 percent per year)				\$12,600,000
Final Project Cost at 2020 Dollars (at 3 percent per year)				\$13,000,000

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Project:	Water Main on 146A	Computed By:	DJK	
Location:	Uxbridge, MA	Checked By:		
Owner:	Uxbridge, MA	Design Status:	PER	
Description:	12-inch water main open cut	Project No:	8618738	
Description	Quantity	Unit	Unit Cost	Cost
12-inch Ductile Iron Pipe (DIP) - Open Cut	15,965	LF	\$200.00	\$3,193,000
12-inch Ductile Iron Pipe (DIP) - Auger Boring	0	LF	\$500.00	\$0
Fire Hydrant (every 500 feet)	32	EA	\$5,000.00	\$160,000
Tapping Sleeve (installed)	1	EA	\$10,000.00	\$10,000
Laterals	47	EA	\$1,800.00	\$84,600
	0	LS	\$0.00	\$0
Subtotal				\$3,400,000
Mobilization 5%				\$170,000
Subtotal				\$3,600,000
Contingency 30%				\$1,080,000
Subtotal				\$4,700,000
Administration, Engineering, and Inspection 30%				\$1,410,000
TOTAL (2015 Dollars)				\$6,100,000
TOTAL (2016 Dollars)				\$6,300,000
TOTAL (2017 Dollars)				\$6,500,000
TOTAL (2018 Dollars)				\$6,700,000
TOTAL (2019 Dollars)				\$6,900,000
TOTAL (2020 Dollars)				\$7,100,000

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