



*Volume 1 of 2*  
*Regional Master Plan*

# **Regional Master Plan for the Efficient Delivery of Water and Sewer Services in Cayuga County**

Prepared for  
**Cayuga County Water and Sewer Authority**

7413 County House Road  
Auburn, New York

Revision 1  
March 2019

**Barton&Loguidice**



Regional Master Plan for the Efficient Delivery of Water and Sewer Services in Cayuga County  
Cayuga County Water and Sewer Authority, Cayuga County

Regional Master Plan

Volume 1 of 2

March 2019

Prepared for:

Cayuga County Water and Sewer Authority

7413 County House Road

Auburn, New York 13021

Prepared by:

Barton & Loguidice, D.P.C.

443 Electronics Parkway

Liverpool, New York 13088

This document is printed on recycled paper





**TABLE OF CONTENTS**

<b><u>Section</u></b>	<b><u>Page</u></b>
EXECUTIVE SUMMARY .....	iii
ACKNOWLEDGEMENT .....	v
ABBREVIATIONS .....	vii
1.0 INTRODUCTION .....	1
2.0 BACKGROUND INFORMATION AND SCOPE OF STUDY .....	3
2.1. Municipal Assessments.....	3
2.2. Alternative Source Evaluation.....	3
2.3. Serving the Unserved .....	3
2.1. Cost of Labor .....	4
3.0 ASSESSMENT OF CURRENT CONDITIONS.....	5
3.1. Water Asset Condition.....	6
3.2. Wastewater Asset Condition .....	9
3.3. Regional Observations.....	10
4.0 WASTEWATER ALTERNATIVES ANALYSIS .....	15
4.1. Cato-Meridian Joint Wastewater Project .....	15
4.2. Aurora Regional Wastewater Treatment Plant.....	19
5.0 POTABLE WATER ALTERNATIVES ANALYSIS .....	27
5.1. Cato-Meridian Joint County Water District .....	27
5.2. Village and Town of Moravia Joint County Water District .....	31
5.3. Central Cayuga Regional Water Project .....	32
6.0 EVALUATION OF REGIONAL SOURCE WATER ALTERNATIVES .....	35
7.0 RECOMMENDED APPROACH TO REGIONAL WATER SUPPLY .....	37
7.1. Central Cayuga Regional Water Project .....	37
8.0 IMPLEMENTATION STRATEGY .....	51
8.1. Organization.....	51
8.2. Plan of Finance .....	54
REFERENCES .....	57

**Tables**

Table 4-1: Cato-Meridian Joint Wastewater Costs.....	19
Table 4-2: Aurora-Honoco Wastewater Project Costs .....	25
Table 5-1: Cato-Meridian Water Project Costs .....	31
Table 6-1: Hypothetical Water Rates from Various Alternative Sources .....	35

**TABLE OF CONTENTS**

<b><u>Section</u></b>	<b><u>Page</u></b>
<b>Figures</b>	
Figure 3-1: O&M Charge Model .....	8
Figure 3-2: County Rate Diagram .....	11
Figure 4-1: Cato-Meridian Joint Wastewater Project.....	17
Figure 4-2: Aurora-Honoco Wastewater Project .....	23
Figure 5-1: Cato-Meridian Joint Water Project.....	29
Figure 5-2: Village/Town of Moravia Joint Water Project .....	33
Figure 7-1: Proposed County Water District (1970) .....	39
Figure 7-2: Proposed Central Cayuga Water District.....	41
Figure 7-3: Aurelius Looping Improvements.....	43
Figure 7-4: Transmission Spine Segments .....	45
Figure 7-5: Spine with Pumping and Storage Facilities .....	47
Figure 8-1: Recommended Organizational Structure.....	52
<b>Appendices</b>	
Appendix A – Source Water Alternatives Analysis	
Appendix B – Central Cayuga Water Project Hydraulic Model	
Appendix C – Farm Bureau Interest Survey Results	

## EXECUTIVE SUMMARY

This study has identified several critical needs for public water and sewer infrastructure within Cayuga County. Generally, most municipalities are rural towns and villages. Residents and municipal leaders take great pride in where they live and are self-reliant. This Regional Master Plan identifies opportunities for cooperation among municipalities where efficiencies can be realized and identifies a role the CCWSA can play in development of these “regional improvement” projects and municipal service consolidations.

Regional improvements and recommended consolidations include:

1. Cato-Meridian sewer systems.
2. Aurora-Honoco sewer systems.
3. Cato-Meridian water system.
4. Village/Town Moravia water system.

Each of these improvements were identified due to the municipalities’ proximity, shared issues, and concerns these issues pose to long-term public health and water quality within Cayuga County. This Regional Master Plan identifies the issues, quantifies the cost to improve and recommends a strategy for the municipalities to proceed jointly on improvements. For each of these improvements, the CCWSA should be providing planning, technical, and operational support to the municipalities once such services have been consolidated. This Regional Master Plan also considers development of a second source to Owasco Lake and formation of a County water district to further realize operational efficiencies.

This study concludes that Cayuga County local governments may collectively realize savings estimated of approximately **\$38 million** in identified capital and operating costs over the next 30 years if the joint and consolidation concepts presented in this Plan are implemented. These savings reflect the increased efficiency and economy of scale realized by delivering water and sewer services under a single administrative entity such as the Cayuga County Water and Sewer Authority. Detailed within this plan is a creative approach for Cayuga County to respond to changes in social, environmental, and economic forces it faces. This Plan details the role of the Water and Sewer Authority and an overall strategy for implementation. By implementing this plan, Cayuga County residents can continue to enjoy a comfortable quality of life and remain protective of water quality at a reasonable cost. Further, implementation of these recommendations will develop the robust water and sewer infrastructure necessary to support economic development within Cayuga County.



**ACKNOWLEDGEMENT**

The author would like to acknowledge the assistance and support received from all of the partner communities that participated in this study, the Citizen Advisory Committee, and the staff and Board of the Cayuga County Water and Sewer Authority. The author also acknowledges the New York State Department of State and the Cayuga County Legislature who, together, provided grant and matching funds to conduct this study.



**ABBREVIATIONS**

ADD	Average Daily Demand
CCI	Construction Cost Index (ENR)
cfs	Cubic feet per second
CT	concentration X time
DEC	New York State Department of Environmental Conservation
DOT	New York State Department of Transportation
DWSRF	Drinking Water State Revolving Fund
ECL	Environmental Conservation Law
EDU	Equivalent Dwelling Unit
EFC	New York State Environmental Facilities Corporation
ENR	Engineering News-Record
EPA	United States Environmental Protection Agency
GAC	Granular activated carbon
gpd	Gallons per day
GML	General Municipal Law
gpm	Gallons per minute
HGL	Hydraulic Grade Line
hp	Horsepower
HPGN	High Precision Geodetic Network (1998)
IUP	Intended Use Plan
LF	linear feet
MHI	Median Household Income
MGD	Million gallons per day
NAD83	North American Datum (1983)
NAVD88	North American Vertical Datum (1988)
NYSCC	New York State Canal Corporation
NYSDOH	New York State Department of Health
NYSOPRHP	New York State Office of Parks, Recreation, and Historic Preservation
OMB	Office of Management and Budget
PER	Preliminary Engineering Report
TDH	Total dynamic head
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service



## **1.0 INTRODUCTION**

Cayuga County is endowed with abundant water resources. With Lake Ontario to the north, Cayuga Lake to the west, and Owasco Lake in the County's heart, Cayuga County is surrounded by water. The summer of 2016 was exceptionally hot, forming extensive harmful algal blooms (HABs) in Owasco Lake. During this HAB period, both the City of Auburn and Town of Owasco detected cyanotoxins within the clear wells of their respective water treatment plants. The events of 2016 were the first time in New York State that cyanotoxins from a HAB escaped treatment and were detected in finished water. Over 75% of the County's population relies on Owasco Lake for drinking water. Although the concept of developing a second water source within Cayuga County has been considered in the past, the events of 2016 exposed the risk of having such a large population reliant on one source and reinforced the wisdom in developing an alternate source to improve the resilience of the water systems that currently serve central Cayuga County.

As a result of these events, the Cayuga County Water and Sewer Authority (CCWSA) has prepared this Regional Master Plan to examine more efficient means of delivering public water and sewer services within Cayuga County. This study was made possible by a \$100,000 Local Government Efficiency grant from the New York State Department of State with matching funds provided by the Cayuga County Legislature.

Master planning efforts have taken a holistic approach of soliciting feedback not just from municipal stakeholders, but also private business interests. The effort undertook an assessment of municipal infrastructure across the county, evaluation of alternative sources of water, and identification of underserved population areas. The effort also undertook an examination of constraints under which the partner communities operate, and identified approaches to improve levels of service at lower costs to the end user.

This Master Plan documents the methods and rationale for evaluation, and makes recommendations for improving the efficiency of the delivery of water and sewer services within Cayuga County. This Plan also identifies the reasonable roles the CCWSA can assume for implementing this Plan.



## 2.0 BACKGROUND INFORMATION AND SCOPE OF STUDY

This Master Plan focused on three main interest areas:

### 2.1. Municipal Assessments

This task included the condition assessment of physical water and wastewater assets of ten (10) participating municipalities. The purpose of this work was to develop a baseline condition assessment of asset condition within the County. Each assessment generated a Municipality Operations Efficiency and Capital Improvement Plan report. Each plan identified current deficiencies, recommended strategies to improve operational efficiency, and outlined a suggested structure for capital improvement plans. The City of Auburn has a well-established maintenance and improvement program, therefore it was not included in the Municipal Assessment Program.

### 2.2. Alternative Source Evaluation

After the algal bloom season of 2016, Cayuga County became keenly aware of the vulnerability of Owasco Lake as the sole source of drinking water for 75% of the County's population. This master planning effort evaluated the feasibility of eight possible alternative drinking water sources. Intangible factors were evaluated in a series of workshops with the Citizen Advisory Committee through multi-criteria decision analysis methodology.

### 2.3. Serving the Unserved

Within the course of the master planning, effort was made to identify those areas where public health or water quality are threatened as a result of insufficient water or sewer service. Where improvements were already recommended in nearby communities, the feasibility of extending service was evaluated. Such unserved areas include the Honoco Road lakeside neighborhood in the Town of Ledyard, and the Misty Meadows subdivision in the Town of Ira.

A substantial effort was made in community engagement during the investigation phase of the study to better understand local priorities and assist in decision-making. The study team conducted several workshops with municipal partners, a select group of private industry interests comprising the Citizen Advisory Committee, surveying the agricultural community for interest in municipal water and sewer services, and engagement with the general public through newsletters, press releases, project website, radio interviews, and public meetings. The information gathered as a result of this outreach informed the final conclusions and recommendations.

The last master planning effort conducted for Cayuga County was conducted in 1970 and had a 20-year planning horizon. Few of the recommendations made in the 1970 master plan have been implemented. Examination of current water supply and wastewater management infrastructure condition and needs within Cayuga County identified similar issues and trends that could be addressed by some of the same recommendations and strategies developed nearly 50-years ago. It was with specific purpose that this Regional Master Plan develop feasible and affordable capital improvement plans supported by

implementation recommendations related to project structure, administration, funding and financing strategies.

### 2.1. Cost of Labor

The cost of labor is an important factor when evaluating structural changes to an organization. In FY2018, the CCWSA's approved budget included \$310,585 for Payroll expenses. The CCWSA maintains a staff of four full-time employees and two part-time employees, estimated to be 5 full-time equivalent (FTE) employees. For the purposes of evaluating labor savings, this study estimates the 2018 annual (average) cost of labor to be:

$$\frac{\$310,585}{5 \text{ FTE employees}} = \$62,117/\text{employee}$$

Labor costs were escalated 3% per year ( $E = 0.03$ ). For calculation of present worth costs, annual costs were amortized over 30 years at a real interest rate of 0.7% ( $i = 0.007$ ), as recommended in Appendix C of OMB Circular A-94 for Real Discount Rates (OMB, 2017).

In considering the annual cost escalation and time value of money, this study calculates present worth of labor costs over 30 years ( $n = 30$ ) according to the following (Blank & Tarquin, 1989):

$$P = \$62,117 \frac{(1 + E)^n / (1 + i)^n - 1}{(E - i)}$$

In evaluating this expression for the project conditions defined above, this study estimates a savings of approximately \$2,617,000 in labor cost over 30 years for each labor position saved as a result of consolidation.

There were several items beyond the scope of this study that will require further analysis and consideration during the various phases of implementation. Such items include detailed buried utility mapping, detailed design and specification of improvements.

### 3.0 ASSESSMENT OF CURRENT CONDITIONS

As is common in rural areas across New York State, small towns and villages have lost taxation base in the form of population, industry, and manufacturing shifts. While losing revenue, municipalities have experienced concomitant cost increases associated with labor, pension, healthcare, and other debt obligations. These conditions have forced municipal leaders to make hard choices and assume a reactive posture to operation and maintenance of municipal water and wastewater services. By law, wastewater revenues must be dedicated to operation, maintenance, and debt service of wastewater obligations (GMU §453). Of the facilities examined as a part of this Master Plan, wastewater treatment plants and conveyances have generally been better-maintained than the water systems. It is presumed to be the case as a result of GMU §453.

There is no such restriction on revenues generated by water sales. Although not a widespread practice, there is no restriction preventing a local government to divert water revenues to other funds to subsidize other municipal services. This practice contributes to the deferred maintenance and increased risk of catastrophic failures in the water system, threatening public health. Small water purveyors are frequently reluctant to cede water operations to an Authority in that the municipality loses a source of revenue as a result. The avoided costs of not operating a water system is generally not considered in these decisions, as municipalities frequently are not investing in their water systems anyway. This philosophy, in turn, leads to under-valuing the water utility.

Changes in drinking water quality standards over the past 20 years coupled with changes in raw water quality have raised the stakes on municipalities who supply drinking water. Finished water quality standards have become more stringent, monitoring and reporting requirements have increased, and raw water quality has degraded. Over the last 20 years, new regulations related to disinfection byproducts, enhanced surface water treatment requirements, corrosion control requirements, and unregulated contaminant monitoring have been promulgated at the Federal and State level making the business of operating a water system more complex. Deleterious changes in raw water quality have only further compounded the complexity and risk associated with operating a water system. These changes require an increased level of skill, training, and specialization. Once a fixture in local governments, the jack-of-all-trades DPW employee who plows the roads, fixes potholes, paints fire hydrants, and operates the water system are becoming rare.

In addition to deferred maintenance, municipalities across the water and wastewater industry are facing an aging workforce. The industry as a whole is ill-prepared for the wave of operations, maintenance, and administrative/billing staff of the “Baby Boom” generation that will be retiring over the next generation. As further described herein, municipal leaders are being forced into a reactive posture that prevents leaders from planning ahead for the labor succession that will be required to manage these retirements. Much of the institutional knowledge of a local water system will be lost with these retirements.

Furthermore, municipalities cannot afford to staff the levels at which they may have historically staffed due to escalating salary and benefit costs. In short, municipalities continue to find themselves doing “more with less”. Municipalities within Cayuga County cannot afford to continue staffing under the current organizational structures. These constraints are forcing small municipalities toward consolidation as a sustainable means of maintaining level of service, and for protecting the health, welfare, and safety of their constituents.

The municipal assessments conducted as a part of this Regional Master Plan collectively identify a necessary, minimum investment of approximately \$70 million (2018) within the County to renew assets and maintain water and wastewater systems, with no changes in operational or management philosophies. Each municipality would maintain its own operations, maintenance, and administrative staff with no consideration for consolidation of redundant functions.

### 3.1. Water Asset Condition

As identified in the ten municipal assessments, water infrastructure within Cayuga County is generally in a substandard state of repair. For many areas, such as the Town of Moravia and Village of Meridian, water is distributed through under-sized mains. There is no capacity for fire protection which can create low pressure issues within the distribution system. Low pressure may appear to customers as an inconvenience, but it is also a public health concern as it increases the tendency for back-siphonage and drawing contaminants into the water system. This condition risks infection of the water system and proliferation of water-borne illness to the customer base.

As identified in this study, some water mains serving rural areas of the County are not mapped, or have been privately installed with no municipal oversight or management. These conditions create issues around ownership, responsibility for maintenance, and right of entry to maintain and repair leaking mains. Also, if illegal taps are made on a municipality’s main, there is no way for the municipality to appropriately meter and bill for the usage.

As noted previously, owning a water system represents a source of revenue for a municipality. Frequently, water revenues are diverted to municipal general funds to pay for other municipal obligations. This philosophy, although understandable, directs revenue away from maintenance and repair of water infrastructure. The result is years of deferred maintenance on water treatment, storage, and distribution infrastructure, which will lead to eventual failures in the water system.

#### 3.1.1. Water Rates

Water is conveyed within Cayuga County through a series of wholesalers that re-sell water purchased from an upstream supplier to a downstream buyer. This economic model is common in the electrical transmission and distribution utility market through a practice called “wheeling” a commodity through an intermediary to an end user. The

“wheeling fee” is the intermediary’s charge for an outside customer’s use of their infrastructure.

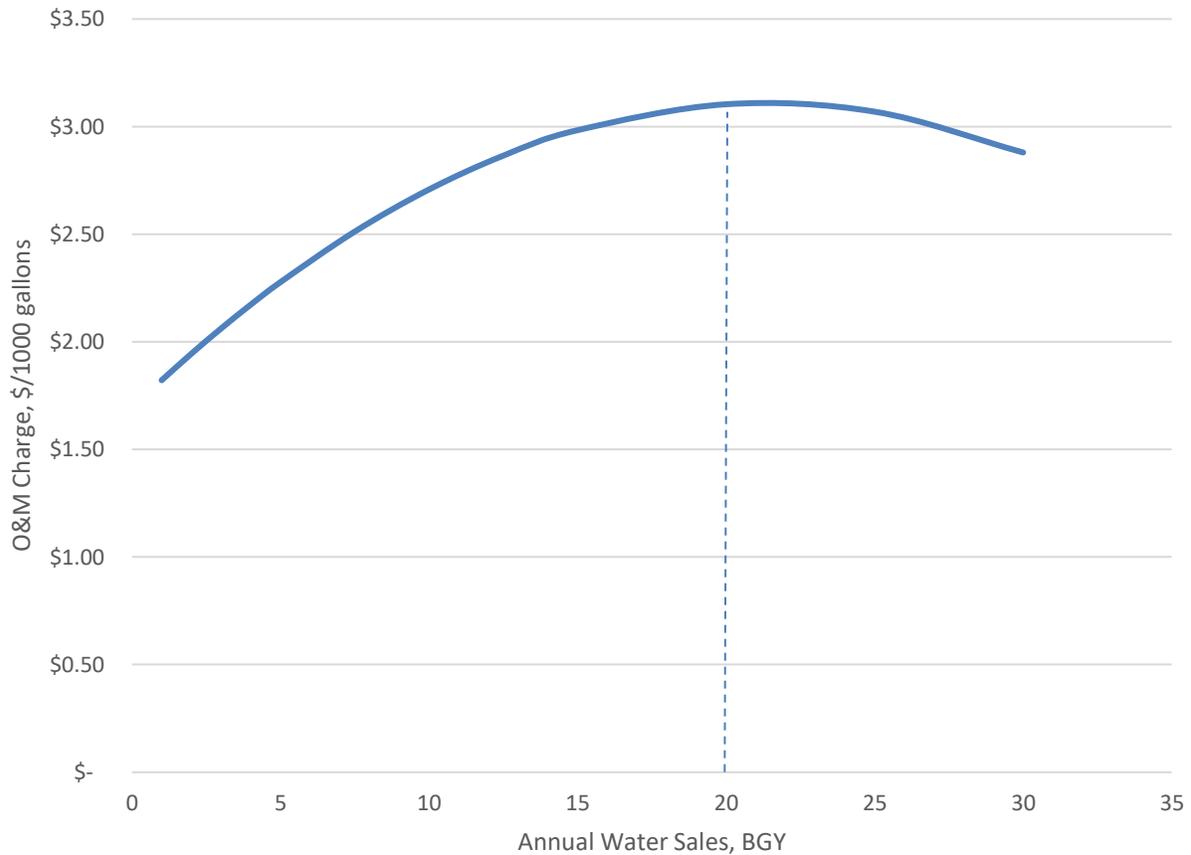
Water rates should be set sufficiently to cover three basic costs: annual operational costs associated with delivering the water, annual debt service on capital improvements, and annual depreciation of existing assets. Expressed algebraically:

$$Rate = \frac{O\&M + Debt + Depreciation}{Annual\ Water\ Volume\ Produced}$$

Each rate component is define further below.

#### 3.1.1.1 O&M Charge

The magnitude of the O&M charge is directly proportional to the size of the utility and how much water it produces. Larger utilities have the advantage of scale and realize a decreasing marginal cost in producing additional water. For this study, the operational costs for a sampling of water utilities across New York State were surveyed and O&M charges estimated, based on published operating budgets and volume of water produced annually. This normalized data is presented in Figure 3-1.



**Figure 3-1: O&M Charge Model**

The data indicates that for utilities selling less than 20 billion gallons of water per year, there is a direct relationship between O&M cost and volume of water produced. The data model suggests that the marginal cost of water production begins to decrease when selling over 20 billion gallons of water per year, presumed to be due to the economies of scale.

**3.1.1.2 Debt Service**

Debt service is the utility’s capital recovery of money borrowed to finance improvements to its system. Larger water utilities include the cost of debt service in the overall water rate, although Village’s and Town water districts frequently levy assessments on property tax for the improvement. Although public water is an improvement to a property and would increase the assessed value of the property *ad valorem*, this practice also has the effect of reducing the apparent water bill the customer pays.

**3.1.1.3 Depreciation**

Depreciation is a cost factor that is frequently overlooked in rate-setting. Depreciation is the decrease in value of an asset over time. This represents a cost to the utility that must be recovered if it is to be responsibly operated.

Analyses in this Master Plan utilize a straight-line depreciation model for all capital assets, a 30-year service life, and no salvage value ( $SV = 0$ ). Expressed algebraically,

$$D_{SL} = \frac{\text{Capital Cost}}{\text{Service Life}} - SV$$

Where  $D_{SL}$  is the annual loss in asset value that the utility must recover in planning for the asset's eventual replacement. This annual cost is distributed across the users on an equivalent dwelling unit (EDU) basis.

### 3.2. Wastewater Asset Condition

Wastewater infrastructure within Cayuga County is in comparatively better condition than municipally-owned water infrastructure. Centralized wastewater operations within Cayuga County are generally smaller operations and collection systems are generally more local. Due to operational constraints such as septicity of the raw sewage and practical limits on gravity conveyance, wastewater collection systems are generally not as regionally extensive as water systems. Municipalities are constrained by GMU §453 to apply sewer revenues to operation, maintenance, and debt service of wastewater infrastructure. The results of this constraint are evident in the level of repair observed in the wastewater infrastructure across Cayuga County.

Municipalities such as the Village of Weedsport and the Cayuga-Aurelius Joint Sewer District have implemented asset management philosophies and strategies for the operation and maintenance of their facilities, and are considered leaders in this regard. Municipalities such as the Village of Aurora operate and maintain a wastewater treatment plant that operates largely as it did when it was constructed in 1967. The facility is well-maintained, but there is need for asset renewal. Furthermore, the excess capacity at this facility presents the opportunity to serve unserved areas along Lake Road and Honoco Road. Such improvements would increase property values in these communities and improve water quality in Cayuga Lake.

The following municipalities within Cayuga County operate their own wastewater treatment plants that are permitted under New York's State Pollutant Discharge Elimination System (SPDES):

- City of Auburn (serves portions of the Towns of Owasco, Fleming, Aurelius, and Sennett)
- Village of Aurora
- Village of Cayuga (joint wastewater plant with Town of Aurelius Lakeshore Sewer District)
- Village of Moravia
- Village of Port Byron
- Village of Union Springs (joint wastewater plant with Town of Springport Sewer District)
- Village of Weedsport

The Village of Cato and Village of Meridian each rely on private, on-site waste treatment systems, or septic systems. The CCWSA owns and operates the Village of Fair Haven Sewer District No. 2; Fair

Haven's sewage is pumped to the Wayne County Water and Sewer Authority WWTP in Red Creek for treatment. The Village of Moravia operates its own wastewater treatment plant, but is geographically isolated from other population centers.

### 3.3. Regional Observations

#### 3.3.1. Water Utility Rate and Billing Philosophy across the County

There are two primary water supply sources within Cayuga County: City of Auburn and Town of Owasco. Owasco supplies the town, portions of the Town of Niles and portions of the Town of Fleming. All other water users are supplied either directly or indirectly from the City of Auburn. Auburn's largest outside user is the CCWSA. CCWSA wholesales water it buys from Auburn to Village of Port Byron who subsequently sells to Town of Mentz. CCWSA also wholesales to Town of Montezuma and the Port Byron Thruway Service Plaza. CCWSA also wholesales water to Town of Brutus. Brutus retails water to its customers. The Town of Throop purchases directly from the City of Auburn at Throop's connection to Auburn at Division Street. The Village of Weedsport buys water from the Town of Sennett who, in turn, buys water from Auburn at Grant Avenue/Route 5; Weedsport sells water to several adjacent parcels in the surrounding Town of Brutus.

Every intermediate seller in each of these water transactions adds a charge to the subsequent buyer. This surcharge may be a few cents as is the case between Owasco and Fleming. Or it may be two times (2x) the in-district water rate, as is the case with Weedsport. When Auburn raises its rates, all downstream users raise their respective rates accordingly. To both the end-user and local leadership, the disparity in water rates within the County appears arbitrary, giving the impression that the water supplier is taking advantage. The water buyer feels it has no bargaining power, and feels it must "take it or leave it". This perception foments distrust and discourages cooperation among municipalities. The diagram in Figure 3-2 schematically depicts water transmission within Cayuga County and associated rates.

At best, the breakdown in such relationships are unproductive. At worst, such breakdowns place the integrity of the water system in jeopardy. Such is the current case between the Village and Town of Moravia. The Village operates a water system, services have been extended into the Town under "self-help", but other than the





Glenside Water District, outside users are not included within a water district, reportedly due in part to disagreements and misunderstandings over the Village's development of an outside water rate. Without a special improvement district or master metering in place, mains in the Town may leak or break and there is no financial incentive for the Town to repair, forcing the Village to make the repair beyond their municipal boundary with no way to recover its cost.

Predictability and transparency in a water rate will build trust and understanding among municipalities and provide private business certainty when evaluating potential development sites within Cayuga County.

### 3.3.2. Infrastructure Age

Most of the infrastructure surveyed within the County was originally constructed as early as the 1960s, and most recently in the 1990s. With upgrades limited to reactive repairs, the older infrastructure is approaching 60 years of service; well beyond a reasonable service life.

### 3.3.3. Aging Workforce

As noted previously, the municipal utility industry is facing an aging workforce and labor shortage. Cayuga County municipalities are no different. Young people entering the workforce are not entering municipal labor and operations positions that they once were. Additionally, most local leaders cannot afford to think ahead and develop plans of succession within their municipal departments as there are more pressing priorities, and elected officials have a finite term in office within which to develop and pass-on succession planning strategies.

### 3.3.4. Deferred Maintenance

Whereas the workforce is aging, municipal operating costs are increasing faster than water and sewer revenues. Due to the current water wholesale and retail structure within the County, water rates are exceptionally high for "end-of-the-line" customers. The more rural areas and customers are frequently the most unable to afford such high costs.

As a result of deferred maintenance, many municipalities are unable to provide a reasonable level of service. Customers must endure water service outage due to persistent breaks, colored water, "Do Not Drink" advisories, and boil water advisories due to State Sanitary Code violations. Residential and commercial customers who will not accept the substandard level of service eventually leave the area. The maintenance of basic public amenities such as public water and wastewater have a direct impact on the overall health of the local economy.



#### 4.0 WASTEWATER ALTERNATIVES ANALYSIS

As noted in Section 3.0, wastewater regionalization opportunities are limited within Cayuga County. Most sewage is conveyed and treated by the City of Auburn or through on-site (septic) disposal systems. Efficient consolidation is also hampered by distance between communities who could otherwise benefit from consolidation. Two “regional” opportunities were identified for wastewater management, described below.

##### 4.1. Cato-Meridian Joint Wastewater Project

As indicated in the respective Municipality Operations Efficiency and Capital Improvement Plans for both Cato and Meridian, residents in both Villages manage wastewater through on-site waste disposal systems (i.e. septic tanks/leach fields). Residential lots are densely spaced and would not meet current septic system siting criteria. Considering the density of development and the system age, this condition may present a public health risk should the septic systems begin fail.

No issues have been reported with the existing septic systems within either village. However, as the systems age, they may begin to fail. The villages should have plans in place for this eventuality. Neither village currently has wastewater operations staff. Therefore, both villages’ plans should include the CCWSA’s capacity to provide planning, technical and operational services.

To start the process, it is suggested that the villages and participating towns (i.e., Cato and Ira) should begin by developing and ratifying a memorandum of understanding (MOU) memorializing each municipality’s intent to cooperate toward a common goal of developing a jointly-owned municipal wastewater collection system and treatment plant for the mutual benefit of members of the MOU.

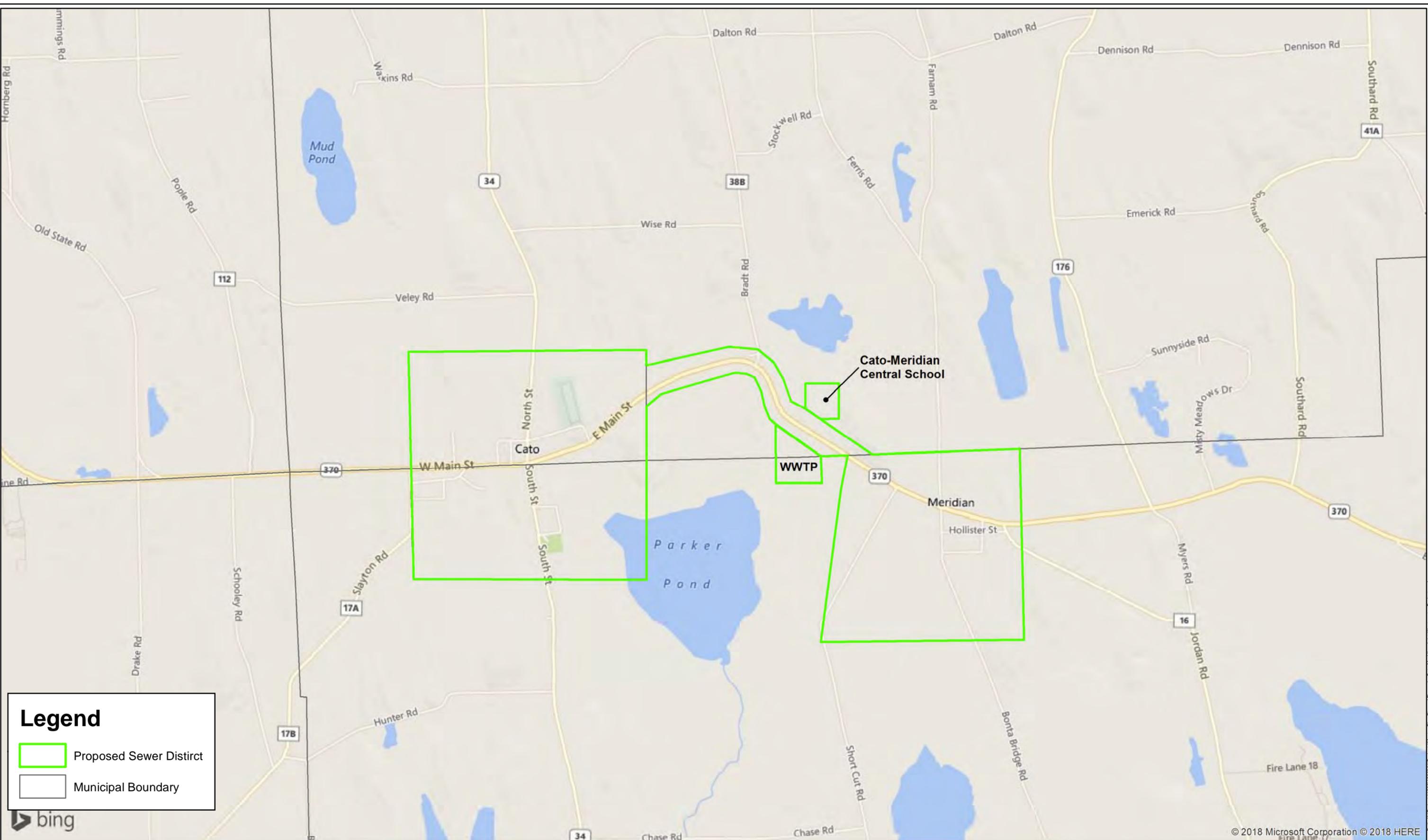
##### 4.1.1. Implementation Strategy

Both Cato and Meridian villages are eligible for Engineering Planning Grants (EPGs) through the NYSEFC/NYSDEC. The EPG is a grant which will fund the preliminary engineering studies for each municipality. Each engineering report will study wastewater collection and treatment alternatives. If the independent studies find that a joint or shared wastewater treatment plant is the most efficient for the villages and adjacent town areas, then, guided by the MOU, participating municipalities may take administrative actions associated with district formation (town only), SEQR, bond resolutions, and (joint) funding applications. Under program rules, it is noted that both Cato and Meridian may be eligible for up to \$5,000,000 (or 25% of project cost) in WIIA grant. Cato may also be eligible for 0% hardship financing under NYSEFCs Clean Water State Revolving Fund (CWSRF) program.

Since the villages currently have no wastewater operations capacity, it is suggested that both villages engage the CCWSA early in the process to discuss operational support that

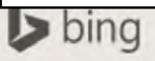
CCWSA may be able to provide. Ideally, the villages would construct the improvements with planning and technical guidance from CCWSA, then the villages and CCWSA would enter into a term lease of the facilities for CCWSA to operate and maintain. This strategy is advantageous to all parties in that the villages maximize their respective funding opportunities, but are not directly encumbered with the on-going cost of operation and maintenance of the facilities. Additionally, the CCWSA is not carrying debt service in its sewer charges to the villages. The debt service remains with the villages, and would be shared with any Town sewer district(s) that benefit from the joint sewer project.

Conceptual joint sewer service area, town sewer district, and wastewater treatment plant location are depicted in Figure 4-1.



**Legend**

- Proposed Sewer District
- Municipal Boundary



© 2018 Microsoft Corporation © 2018 HERE



  
 1 inch = 2,000 feet

Cayuga County Water/Sewer Authority <b>Cato-Meridian Joint Wastewater Project</b>		Figure 4-1 Project No. 1980.001
Cayuga County	December 2018	New York



The wastewater plant location is sited at a relative low point and generally equidistant between the two villages in the Towns of Ira and/or Cato. This concept does present some challenges related to plant effluent and the likely receiving water body. Topography in the area is relatively flat, with the landscape punctuated with wetlands and small ponds, indicating poor surface drainage in the area. The likely receiving waterbody would be Cross Lake, which is connected to the Seneca River and Canal. Final effluent limits should be evaluated during preliminary engineering. Estimated planning-level costs for these improvements are tabulated below. The tabulated costs compare the (recommended) joint project capital costs with estimated capital costs if the Villages were to pursue their own wastewater projects.

**Table 4-1: Cato-Meridian Joint Wastewater Costs**

<b>Item</b>	<b>Estimated Cost (Joint Project)</b>	<b>Estimated Cost (Separate Projects)</b>
Cato public sewer	\$2,500,000	\$2,500,000
Meridian public sewer	\$2,000,000	\$2,000,000
Joint wastewater treatment plant	\$6,000,000	\$10,000,000
<b>Subtotal</b>	<b>\$10,500,000</b>	<b>\$14,500,000</b>
Contingency (15%)	\$1,575,000	\$2,175,000
Engineering, Legal, Administrative (20%)	\$2,100,000	\$2,900,000
<b>Total (2018)</b>	<b>\$14,175,000</b>	<b>\$19,575,000</b>

The joint project is estimated to represent approximately \$5,400,000 in capital cost savings over the *status quo* operating philosophy of each Village operating independently. If approached separately, it is reasonable to expect each facility to employ a minimum of one operator, one technician, and one mechanic for a total of six staff between the two Villages. Given the scale of the joint operation, a joint facility could be operated with a staff of three. Estimated labor savings therefore is estimated to be \$7,851,000 over 30 years. Other savings would be expected in the form of chemical purchase costs, lab analyses, and other incidental operating costs.

#### 4.2. Aurora Regional Wastewater Treatment Plant

As noted in the municipal assessment and CIP, the Village of Aurora wastewater treatment plant is well-maintained, but operating beyond its useful service life. The plant was originally constructed in 1967 and most of the original equipment is still in service. There have been many advances in process operational control, aeration efficiency, electric motor efficiency, and electric motor control that could improve the overall efficiency of the plant's operation. Replacement parts are no longer available for much of the equipment currently in use at this facility. When these components fail, the operator is frequently refurbishing the part or developing another work-around, which further increases risk relative to achieving consistent SPDES permit compliance.

Evaluation of Aurora's wastewater treatment plant concluded that major upgrade and asset renewal is recommended for the facility. Through public outreach efforts conducted under this master planning effort, it was identified that unserved residents along Honoco Road within the Towns of Ledyard and Genoa are seeking improved wastewater management in their lakeshore neighborhood. Therefore, while Aurora is planning wastewater improvements, it should consider and plan for the additional flows and load from Honoco Road and other intermediary communities. Once the wastewater conveyance between Honoco and Aurora is complete, the Village and Town(s) may find that other residents along the alignment may wish to connect. Residents along Lake Road and Sunset Beach have not publicly expressed an interest in public sewers at this time; however, their participation should be encouraged and supported via an interest survey, as connecting these residents would eliminate a potential source of nutrient pollutant to Cayuga Lake and further spread capital and operating costs across a larger benefitting user base.

The cost of the Village's wastewater treatment plant improvements is estimated to be approximately \$18 million. Addition of outside users would be beneficial to the Village ratepayers and would provide public sewage service to densely developed lakeshore areas of the Town(s) at a reasonable rate. Therefore, joint cooperation between the Village and the Towns on improving wastewater conveyance and treatment benefits both communities and water quality in Cayuga Lake.

#### 4.2.1. Implementation Strategy

At the outset, the Village, and the Towns of Ledyard and Genoa should agree to cooperate toward the common goal of developing a public wastewater collection and treatment system for the mutual benefit of the municipalities and their potential lakeshore communities in the towns. This agreement should be memorialized and ratified by both governing boards in a Memorandum of Understanding (MOU). The MOU should provide the "road map" that each municipality will follow to achieve the shared goal of developing the necessary public wastewater improvements. Once the MOU is finalized, the municipalities should conduct independent yet closely coordinated preliminary engineering reports, which would examine alternatives to wastewater collection, conveyance and treatment, quantify costs, and make recommendations. If the independent PERs find that it is most efficient for Honoco to convey sewage to Aurora, then, guided by the MOU, the municipalities may take administrative actions associated with (town) sewer district formation, SEQR, bond resolutions, and joint/coordinated funding applications. Under program rules, it is noted that both Aurora and Ledyard may be eligible for up to \$5,000,000 (or 25% of project cost) in WIIA grant.

The Village currently employs one DPW/wastewater operator. It does not appear that the Village has a plan of succession once this operator retires. Therefore, as the wastewater treatment plant owner, the Village may wish to consider engaging the

CCWSA for operational support into the future. Ideally, the Village and the Town(s) would plan, design and construct the improvements with involvement and technical guidance from CCWSA, then the Village and Town(s) would enter into a term lease of the facilities with CCWSA for CCWSA to operate and maintain the assets. This strategy is advantageous to all parties in that the municipalities maximize their respective funding opportunities, but are not directly encumbered with the on-going cost of operation and maintenance of the facilities. Additionally, the CCWSA is not carrying the debt service in its sewer charges to the municipalities. The debt service remains with the respective municipality, in this case the Village and new town sewer districts.







Conceptual sewer district, low-pressure sewer, lift station and force main to Aurora are depicted in Figure 4-2.

Two conveyance alignments are available for the Honoco Road area as shown – the first being the NYS Route corridor, the second being Lake Road. From a water quality benefit standpoint, and potential to substantially increase the sewer user base, the Lake Road alignment appears to be the better of the two shown. Estimated planning-level costs for these improvements are tabulated below; costs do not include serving any users north of the Honoco Road pump station via individual grinder pumps connected to the Ledyard force main.

**Table 4-2: Aurora-Honoco Wastewater Project Costs**

<b>Item</b>	<b>Estimated Cost</b>
Honoco low-pressure sewer	\$250,000
Ledyard lift station	\$150,000
Ledyard force main	\$1,500,000
Aurora WWTP	\$8,800,000
<b>Subtotal</b>	<b>\$10,700,000</b>
Contingency (15%)	\$1,605,000
Engineering, Legal, Administrative (20%)	\$2,140,000
<b>Total (2018)</b>	<b>\$14,445,000</b>

Comparable *status quo* alternatives were not considered for this alternatives, given the practical infeasibility of Honoco Road Association developing and constructing its own wastewater treatment plant. Additionally, preliminary discussions with the Town of Ledyard indicate no interest from the Town in developing a sewer district and operating its own wastewater treatment plant.



## 5.0 POTABLE WATER ALTERNATIVES ANALYSIS

### 5.1. Cato-Meridian Joint County Water District

The villages of Cato and Meridian operate as a joint water district, *de facto*. Water within Meridian is supplied by Dudley Water Service, a private water company. The Village of Cato maintains one municipal well and purchases additional water from Dudley in Meridian. In 2012, Cato constructed an 8-inch transmission main from one of Dudley's wells and connected it into the Cato water system. The transmission main, however, acts as a distribution main through Meridian, as the main is equipped with fire hydrants and water services to the approximately 10 residential properties in Meridian which it passes and fronts. There does not appear to be a water district, intermunicipal agreement, or other water purchase contract between Cato and Dudley that would define how the debt on this main is serviced and which entity performed the billing and maintenance on the transmission main. The Villages have discussed joint water projects in the past, but agreements were never consummated.

Through discussion, Dudley Water has expressed an interest in divesting from retail water sales within Meridian. Dudley Water would maintain ownership of its wellfield and water rights thereto, and would maintain its water hauling business. The CCWSA is the likely entity with the operational and technical capacity to take over and operate the retail water operation in Meridian. Through the municipal evaluation process conducted under this master planning effort, it has been determined that much of the Meridian water system is of substandard construction. Water mains are typically 1-inch or 1-1/2 inch diameter and are frequently installed through private (Dudley) property to customers' homes. There is no need for easement or right-of-way since Dudley owns both the water main and property.

Considerable upgrades to the Meridian water system would need to be implemented before the CCWSA can and should consider taking over the water system. CCWSA cannot assume ownership of sub-standard water mains installed on private property. The Capital Improvement Plan (CIP) for Meridian recommended installation of new water mains installed in public rights-of-way such that it may be accessed for maintenance. Water mains and system storage would be designed to current standards and engineering practices to provide adequate flow and pressure for normal and fire flow demands.

With improved capacity, the Meridian system could be expanded to serve the Misty Meadows subdivision, located east of the Village in the Town of Ira. This residential development in the Town of Ira is currently reliant on private water wells for supply. Quality and quantity is reported to be poor. Main extension and district formation would improve water service to this unserved area. This joint concept is depicted in Figure 5-1.

#### 5.1.1. Implementation Strategy

Most of the work in the short-term should focus on bringing Meridian's water system up to current standard, such that the CCWSA is in a position to assume operation. The

scope of these improvements are detailed in the Capital Improvement Plan for Meridian, generally described as installation of new 8-inch ductile iron water mains installed throughout the Village, elevated storage, fire hydrants, installation of new water services, and metering to residents.

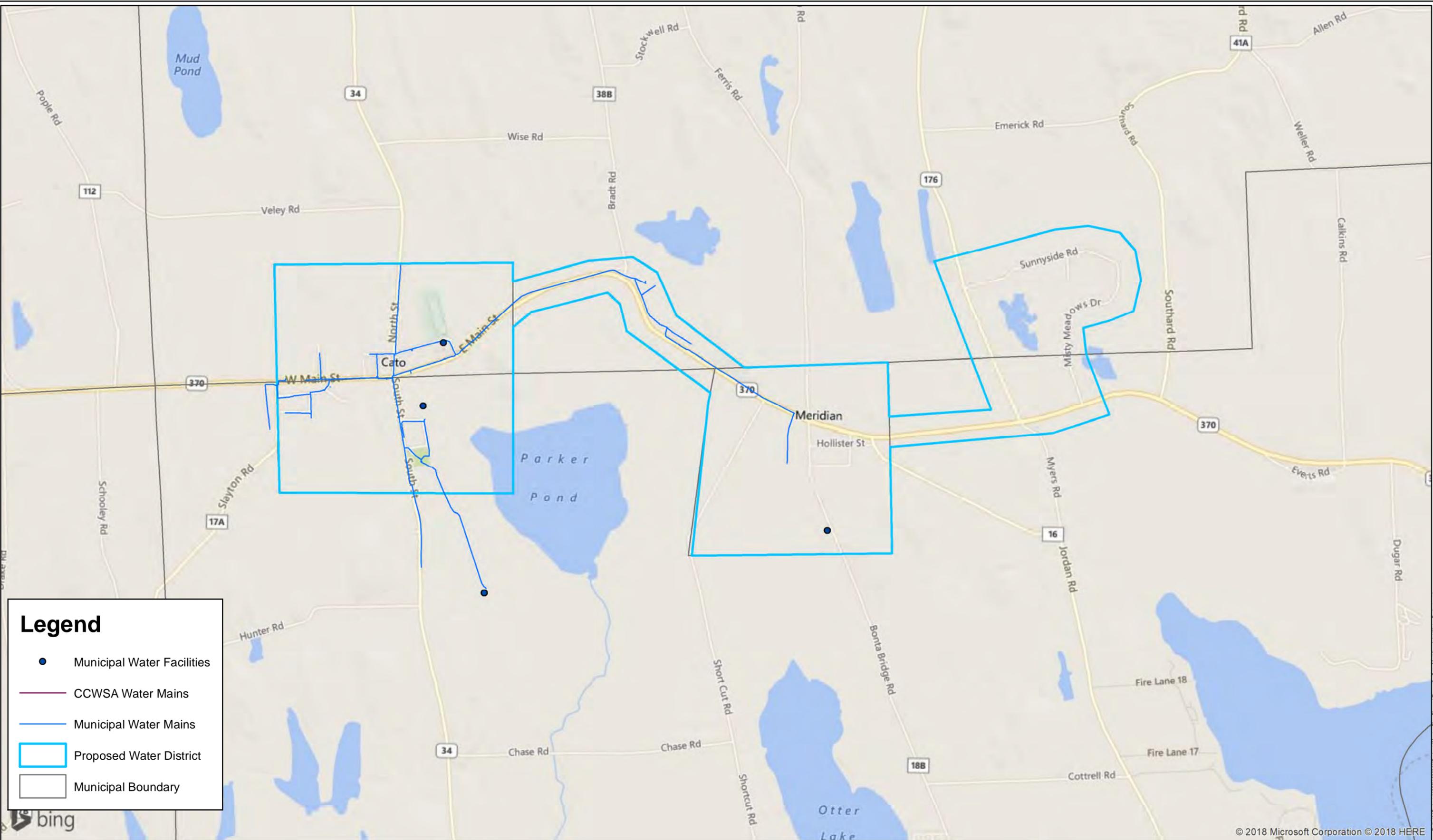
To initiate the process, the Meridian village board should commission a detailed engineering study, or PER, to examine the feasibility and the costs associated with what will be essentially an all-new water system within the Village. The engineering study should also consider the feasibility of including Misty Meadows subdivision and other outside users, while still respecting the towns' pro-agricultural comprehensive plan.

If the village is financially unable to undertake this effort, then it should request assistance from the CCWSA to conduct the engineering study and prepare the PER on its behalf. If the CCWSA agrees to perform the study, then the Village would have to accept it becoming part of a County water district with a portion of the Town of Ira.

The preliminary engineering report will support an application for listing the improvement project on the NYSEFC Drinking Water State Revolving Fund's (DWSRF) Intended Use Plan (IUP), which scores and prioritizes projects based on public water needs driven by health and safety. Per the program rules, Meridian would be eligible for a maximum grant of the lesser of \$3 million or 60% of the project costs through the State's WIIA grant program. The Village is not eligible for hardship (0% interest) financing, as the Village's census MHI data exceeds NYSEFC's program rules threshold. The Village may wish to conduct an income survey of the project area if it has reason to believe the census data is skewed.

Water system improvements within the Village may be completed separately or in concert with extensions to Misty Meadows in Ira. The additional work would include a memorandum of understanding between Meridian and Ira. Ira would form a Town district for special assessment. The district and the Village would then enter into a water purchase agreement / IMA. Alternatively, CCWSA may form a County district through action of the County Legislature and operate the Meridian / Misty Meadows system as a County Water District. Regardless of the final operational arrangement, the debt service for Meridian and for Misty Meadows should remain with those properties. CCWSA's operational responsibilities should be limited to long-term operation and maintenance of the facilities.

The water system in Cato appears to be in comparably better condition than Meridian. Therefore in the short-term, the work in Cato should focus on memorializing the intermunicipal arrangement that allows Meridian residents to connect to Cato's water (transmission) main. Long-term, if Cato does not develop a succession plan for its water system operation, then it should consider requesting operational assistance from the



**Legend**

- Municipal Water Facilities
- CCWSA Water Mains
- Municipal Water Mains
- ▭ Proposed Water District
- ▭ Municipal Boundary



1 inch = 2,000 feet

Cayuga County Water/Sewer Authority <b>Cato-Meridian Joint Water Project</b> Cayuga County      December 2018      New York		Figure 5-1 Project No. 1980.001
---	--	---

© 2018 Microsoft Corporation © 2018 HERE



CCWSA. For the CCWSA, this operational assistance should take the form of a long-term lease of the operation and maintenance of Cato’s water assets. With one entity operating Meridian, Misty Meadows district in Ira, and eventually the Cato system, CCWSA could optimize operational efficiency with consolidated labor, billing, purchasing, and water management.

**Table 5-1: Cato-Meridian Water Project Costs**

<b>Item</b>	<b>Estimated Cost</b>
Meridian / Misty Meadows water mains	\$775,000
Ground storage	\$375,000
3/4" water service	\$46,000
3/4" water meter	\$230,000
Main line valves	\$30,000
Fire hydrants	\$176,000
<b>Subtotal</b>	<b>\$1,632,000</b>
Contingency (15%)	\$245,000
Engineering, Legal, Administrative (20%)	\$325,000
<b>Total (2018)</b>	<b>\$2,202,000</b>

Investment in Meridian’s distribution system is needed whether it continues to operate under its current structure or a joint district is formed. However, savings in operational costs will be realized under a joint scenario. Specifically, savings is estimated in the saving of one operator position and one administrative/billing position. Based on average cost of labor, savings under a joint water scenario is estimated \$5,234,000 over 30 years.

## 5.2. Village and Town of Moravia Joint County Water District

As noted previously, the Town of Moravia is an outside customer to the Village water system. The Town’s system suffers from undersized mains and inadequate materials (e.g. galvanized steel mains). Additionally, there are no accurate maps of the Town’s water system, making system maintenance difficult. The conditions within the Town have a negative impact on the Village to effectively operate the water system. The Village has chronically suffered from unaccounted water loss reported to be as high as 52%, reportedly costing the Village as much as \$100,000 per year (The Citizen, 2018). Amortized over 30 years, this represents \$4,220,000 of lost revenue. The Village is prompt in repairing known leaks; however, despite its efforts, the magnitude of the water loss does not significantly improve with each repair. This magnitude of water loss is financially unsustainable. Given the reported condition, the illicit water main extensions into the Town are a suspected culprit in contributing to the Village’s unaccounted for water issues and higher operating expenses. Estimated service areas are depicted in Figure 5-2.

### 5.2.1. Implementation Strategy

The Village’s water loss is unsustainable. Out-of-district extensions further into the Town are illegal, place an undue financial burden on the Village, and threaten public

health and the integrity of the water system. The Village should engage the Cayuga County Health Department for regulatory support. Typically, a water supplier has no obligation to supply water to a user outside of an established district or permissive service area, unless each party agrees with the terms of and executes a legally binding agreement for said water supply.

The first course of action, therefore, should be for the Town of Moravia to take an accounting of those residents currently connected to the Village distribution system, and, at a minimum, form a new Town water district incorporating all of those currently connected. Water mains within the district should be properly designed, constructed, and mapped in accordance with current standards. Existing substandard mains and illegal connections should be disconnected and abandoned. Service to each Town user should be metered and billed for consumption at the agreed-upon outside rate. If the Town and Village are unable to agree on terms, then both parties should engage the CCWSA to form an inclusive County water district encompassing both the Village and the Town. Under this arrangement, both Village and Town residents would pay the same rate, eliminating concern over outside rates and inside rates.

To initiate the process, the Village, the Town, CCWSA, and CCHD should meet to discuss concerns, respective needs and course of action in the best interest of all parties. Costs to improve the efficiency and decrease the water loss in the Village/Town subarea cannot be determined at this time without knowing the extent and condition of the out-of-district mains and services. In the interim period, the Village should consider construction of master metering facilities at each main crossing the Village boundary. This approach would give the Village information on how much water is being delivered to the Town. The capital improvement plan has an estimated cost of \$200,000 for construction of four (4) master meter pits.

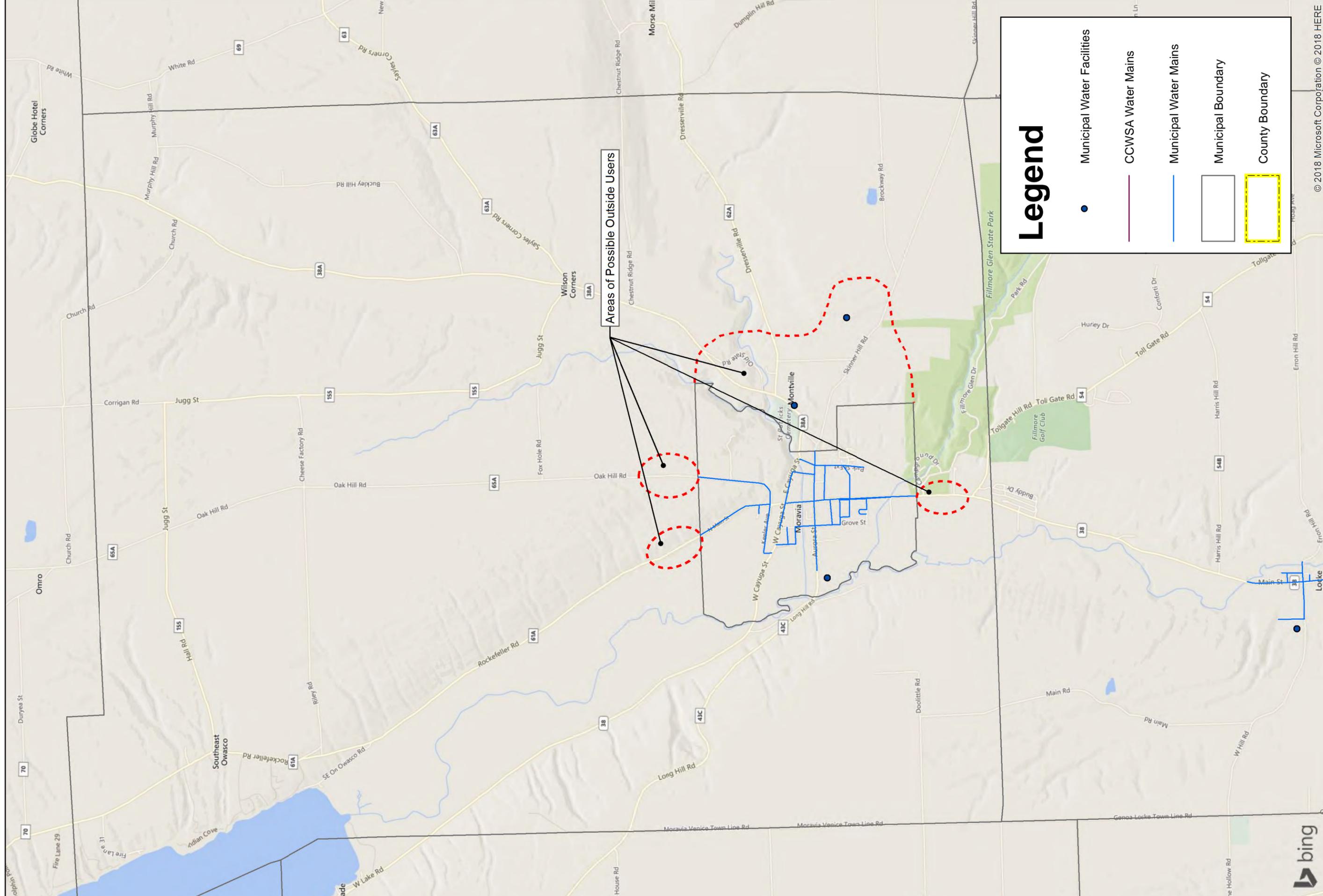
### 5.3. Central Cayuga Regional Water Project

Analysis conducted as a part of this study recognizes that although Cayuga County is surrounded by water, it limits itself to one source of water supply: Owasco Lake. The summer of 2016 exposed the County's risk of relying on a single water source. The primary objective of the Central Cayuga Regional Water Project is for the CCWSA to develop an alternative source of potable water to serve the population centers of Central Cayuga County with a source other than Owasco Lake.

The Central Cayuga Water Project is structured to achieve two main objectives:

1. Develop a northeast-southwest water Transmission Spine to more efficiently move water through the County, and into and out of the City of Auburn.
2. Develop an Alternate Source Supply.

This strategy is developed further in Section 7.0.



## Legend

- Municipal Water Facilities
- CCWSA Water Mains
- Municipal Water Mains
- Municipal Boundary
- County Boundary

© 2018 Microsoft Corporation © 2018 HERE



1 inch = 3,000 feet



## 6.0 EVALUATION OF REGIONAL SOURCE WATER ALTERNATIVES

The *Source Water Alternatives Analysis*, dated November 2018 evaluated the technical feasibility and affordability for implementing six possible alternative water supply sources. This analysis is included in Appendix A. Building upon this analysis, this aspect of the Regional Master Plan evaluates the economic viability of each of these alternatives, hypothetical water rates, and compares these rates to existing sources of supply.

For the end user, potable water is a commodity. Quality and quantity being equal, users will select the lower-cost alternative. Therefore in order for an alternative source to be feasible, it must be economically attractive. The alternative source must cost no more than existing sources of supply. Table 6-1 summarizes capital cost, annual debt service, depreciation, and estimated O&M costs based on the O&M model developed in Section 3.0. Debt service is calculated on a 30-year term and an estimated market rate interest rate of 3.75%. O&M charge is \$1.90 / 1000 gallons at an average daily production rate of 4.54 MGD, the projected demand for the Central Cayuga Water Project service area. This demand corresponds to approximately 27,500 EDUs and an average annual demand of 60,000 gallons per year per EDU.

**Table 6-1: Hypothetical Water Rates from Various Alternative Sources**

Source Alternative	Capital Cost	Debt Service	Depreciation	Estimated Water Rate (\$/1000)
OCWA North <sup>1</sup>	\$30,767,000	\$1,725,648	\$1,025,567	\$4.57
OCWA South <sup>1</sup>	\$35,576,000	\$1,995,373	\$1,185,867	\$4.83
Cayuga Lake	\$39,210,000	\$2,199,196	\$1,307,000	\$4.03
Lake Ontario	\$74,658,000	\$4,187,390	\$2,488,600	\$5.95
Bolton Point <sup>2</sup>	\$50,048,000	\$2,807,073	\$1,668,267	\$8.50

<sup>1</sup>O&M charge includes wholesale water purchase rate per Rate Schedule 7A at \$2.90/1,000 gallons metered.

<sup>2</sup>O&M charge includes wholesale water purchase rate of \$5.79/1,000 gallons master metered.

Outside sources such as Bolton Point and OCWA are advantageous in that they represent an efficiency in utilizing existing treatment infrastructure and excess capacity at existing facilities. However, the outside user rate charge is typically higher than if a water purveyor within the County treated and distributed water.

In the case of water purchase from Bolton Point, CCWSA has two options:

1. Under Article 18 of the Commission's Agreement of Municipal Cooperation (Restated), CCWSA may become a member of the Southern Cayuga Lake Intermunicipal Water Commission, by essentially "buying in" and making payment to the Commission for its proportionate share of the Commission's assets, among other stipulations. Since the Commission formation, no new outside members have joined the Commission. The "buy-in" cost is not reflected in the costs tabulated in Table 6-1.

2. CCWSA may become an outside user to an existing Commission member. CCWSA would likely become an outside customer of the Town of Lansing which shares the County's southern border. The Town's current rate is \$5.79/1,000 gallons. The Town may charge a rate higher than its inside rate, subject to Commission approval. There is precedent for this arrangement, such as between the Town of Ithaca (Supplier) and Town of Ulysses (Receiver).

Under either purchase arrangement, the CCWSA's water purchase cost would be higher than the estimated cost to operate its own filtration plant. Considering all of the public outreach and analysis, if Cayuga County is to develop a secondary source to Owasco Lake, this second source should be developed on Cayuga Lake at Long Point State Park. Location and configuration of this potential County-owned water treatment plant is described and quantified further by Teter, et al (K. Teter Consulting, 2018). This facility will be referred to as the Cayuga Lake Water Plant within this Master Plan.

## 7.0 RECOMMENDED APPROACH TO REGIONAL WATER SUPPLY

As noted elsewhere in this study, municipalities within Cayuga County and across the country are strained to supply basic services at reasonable cost. The value proposition of providing consolidated public municipal services such as water and sewer is still valid. However, in the face of declining revenues, declining tax bases, declining taxable manufacturing base, aging infrastructure and work force, and increasing public health regulations, the concept of consolidation must be broadened and be considered regionally. This is the challenge of this generation's municipal leaders, a challenge that is more acute within smaller, rural communities such as Cayuga County.

Under Public Authority Law (PBA §1199), the Cayuga County Water and Sewer Authority is authorized to own, operate, construct, and dispose of water and wastewater facilities across municipal jurisdictions within Cayuga County. It is the only existing water and sewer entity within Cayuga County that may consolidate individual water and sewer operations across the County jurisdictions.

The CCWSA does not have the power nor authority to directly assess and levy taxes to its users. This is a power reserved solely for publicly-elected governmental bodies (e.g. Counties, Towns, and Villages) through special improvement (e.g. water and sewer) districts and NYS Village Law, respectively. Water and sewer tax assessments may be made only through county special improvement districts formed by the Cayuga County Legislature. This restriction on the CCWSA's authority must be considered in shaping the recommended strategies within this Master Plan where the understood goal is to optimize use of existing governing entities and authorities.

As depicted in Section 6.0, financing the Cayuga Lake Water Plant requires all central Cayuga County communities to participate in a County water district in order to be economically viable. Consolidation of County water services under the operating purview of the CCWSA incorporating all jurisdictions within the Central Cayuga Water District would save redundant operating labor from all of the participating communities. Total estimated staff under the *status quo* operational philosophy is approximate 12 full-time equivalents. Consolidating under the CCWSA, the operation and maintenance force could conservatively be reduced by six employees, representing an estimated savings of over \$15 million over 30 years.

### 7.1. Central Cayuga Regional Water Project

Objectives of the Central Cayuga Regional Water Project may be achieved by structuring the Regional Project into two main infrastructure projects: the Transmission Spine and Water Source Development on Cayuga Lake. The project would be structured such that components may be advanced and funded independently without risk of compromising the overall strategy. Elements of this concept were developed as early as 1970 when Cayuga County developed its previous water system Master Plan. The previous plan included a recommendation for Cayuga County to form a county water district in the central portion of the county, as depicted in Figure 7-1.

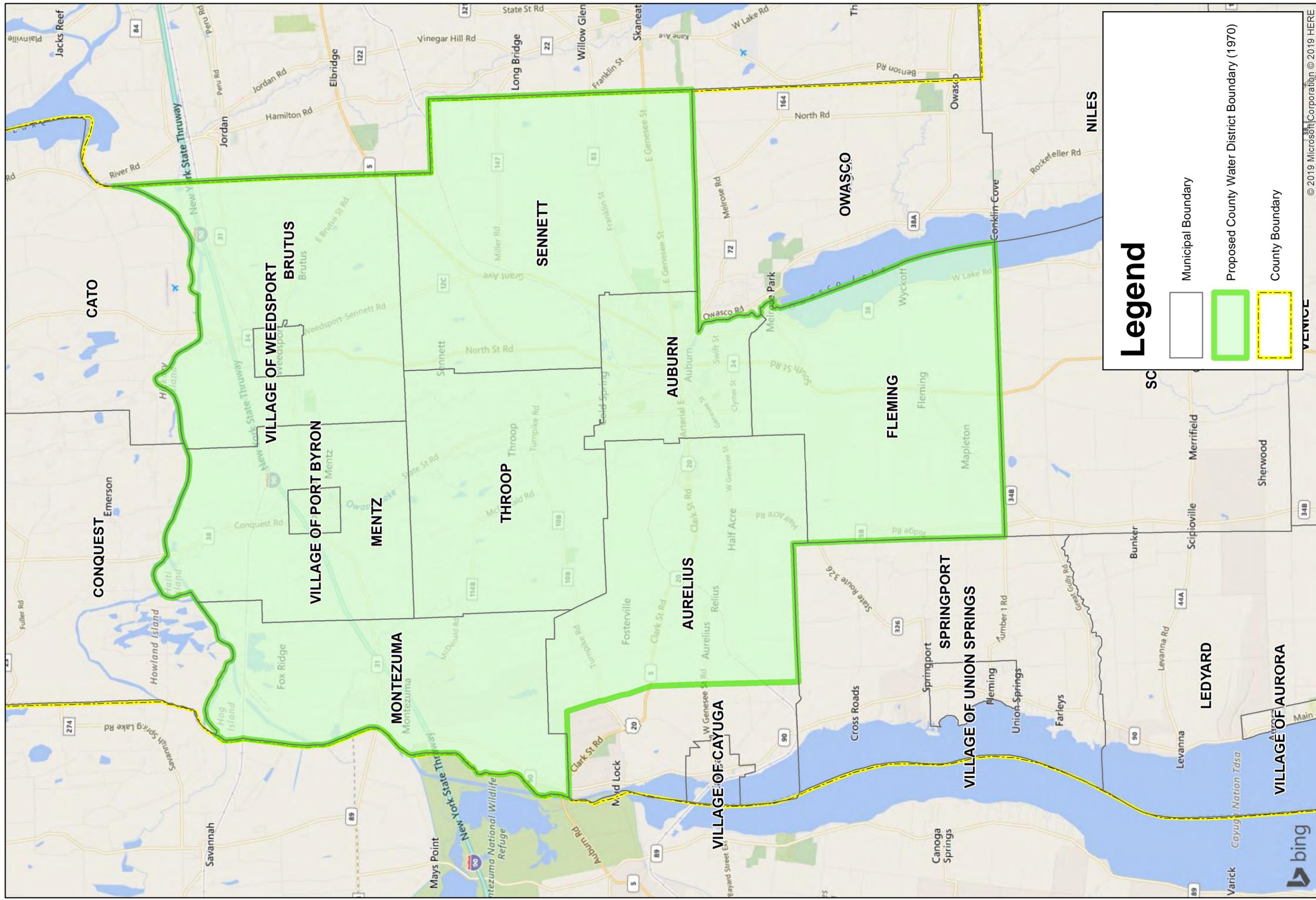
New elements to this concept include development of the Transmission Spine and development of a new water supply on Cayuga Lake. When both the Transmission Spine and the Cayuga Lake Water Plant are completed, the CCWSA may better balance its wholesale water purchases from the City of Auburn and its own water supply, providing more competitive and uniform rates to CCWSA customers through streamlined operations.

#### 7.1.1. Transmission Spine

The Transmission Spine will consist of the CCWSA's existing 12-inch State Street transmission main to the north and extend the 12-inch trunk main running through Springport south to Aurora. These segments will be connected within the Town of Aurelius and Town of Throop. Once completed, this trunk main will be critical infrastructure to distribute water within the County. During detailed design of these improvements, the CCWSA should be involved to provide coordination, guidance, and consistency with the Master Plan, but much of this work can be undertaken at the local level. Where there is a need for a pipe or facility to be sized greater than what the local municipality needs, CCWSA should be prepared to fund the incremental cost of the larger size to satisfy regional needs. Description of each major segment is described below in the following subsections; Figure 7-3 shows the entirety of the transmission spine and the locations of each of the major segments described below.

##### 7.1.1.1 Aurora-Springport Improvements

As recommended in the Village's 2018 Preliminary Engineering Report, an 8-inch water main from the Village's existing water system installed north on Route 90 and connected to the 12-inch trunk main in Springport would be sufficient to satisfy the Village's immediate needs, and would allow Wells College to cease its water system operations and supply to the Village. Regardless of the CCWSA's final plans, this segment of pipe will be installed to satisfy an immediate critical need in and around the Village of Aurora. Accommodating the regional concept, the size of this main would be increased to 12-inch diameter. Until the Cayuga Lake Water Plant is commissioned, Aurora would receive Owasco Lake water from the City of Auburn.



## Legend

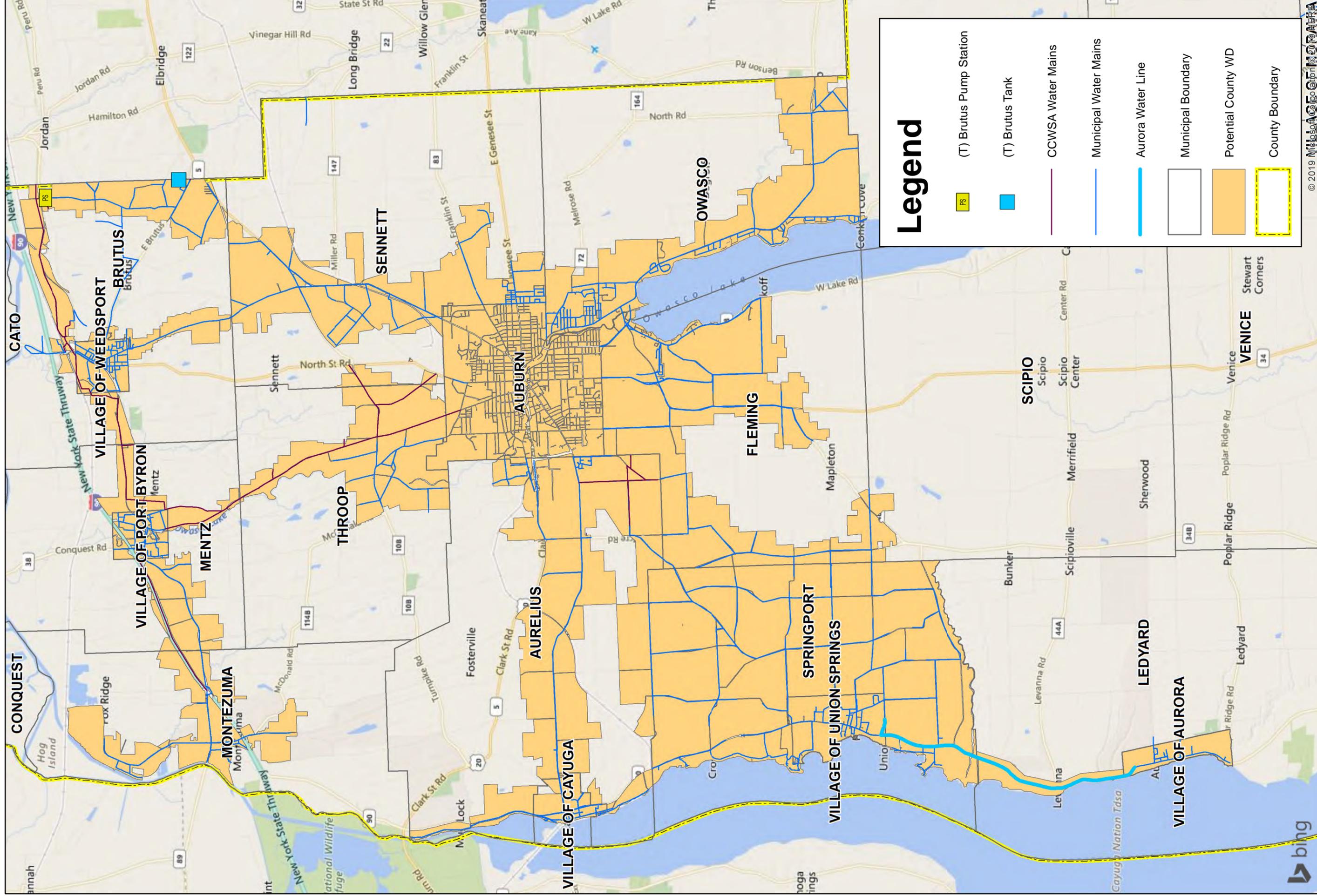
	Municipal Boundary
	Proposed County Water District Boundary (1970)
	County Boundary



1 inch = 9,000 feet

© 2019 Microsoft Corporation © 2019 HERE





## Legend

	(T) Brutus Pump Station
	(T) Brutus Tank
	CCWSA Water Mains
	Municipal Water Mains
	Aurora Water Line
	Municipal Boundary
	Potential County WD
	County Boundary

© 2019 Microsoft Corporation

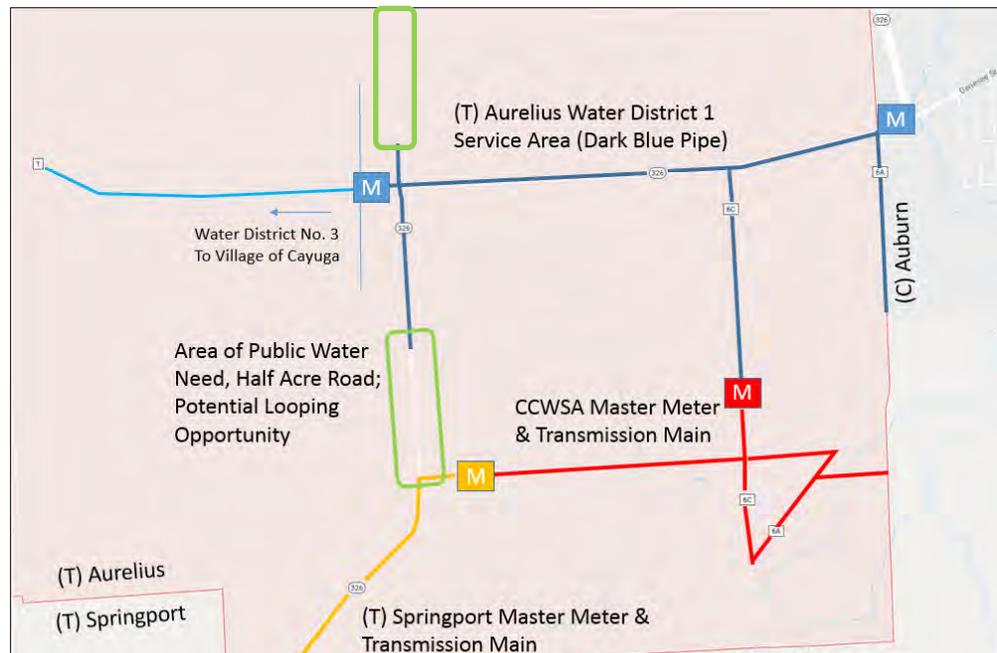


1 inch = 8,500 feet



### 7.1.1.2 Aurelius Looping Improvements

The Cayuga-Aurelius CIP identified a deficiency between Aurelius WD-1, and WD-3. The Town identified and the CIP recommended closing a loop on Half



**Figure 7-3: Aurelius Looping Improvements**

Acre Road for improved flow and pressure to service the Cayuga County Industrial Park, thereby connecting the Springport trunk main to Aurelius WD-1 system.

This concept is depicted in Figure 7-3. Much like the Aurora-Springport segment, this segment can be undertaken at the local level with CCWSA providing guidance, coordination, and consistency with the Master Planning concept. Again, the CCWSA should be prepared to fund the incremental cost of up-sizing pipe and facilities to meet regional needs to the south. This link represents approximately 2,500 linear feet of 12-inch pipe with an estimated construction cost of \$375,000, plus engineering, legal and contingency.

### 7.1.1.3 Aurelius-Throop Improvements

The final segment of the Transmission Spine would close the loop on Beech Tree Road between Canoga Road in Aurelius to just south of Whitehead Lane in Throop. This segment is approximately 1.5-miles of 12-inch water main, representing an estimated construction cost of \$1,125,000, plus engineering, legal, and contingency.

Once complete, CCWSA could control and direct water transmission from Brutus in the northeast to Aurora in the southwest, serving the central population hub of the County.

### 7.1.2. Hydraulic Analysis of the Transmission Spine

A basic hydraulic model of the Transmission Spine was developed to evaluate the feasibility and efficiency of moving water from north to south (Alternative 1) and from south to north (Alternative 2). The purpose of this model was to estimate hydraulic grade, the need for booster pumping stations, pressure-reducing valves, elevated storage, and to verify the feasibility of bi-directional pumping. The optimum design would locate booster stations and tanks such that water could be pumped in either direction to maximize flexibility and source. Model output is included in Appendix B.

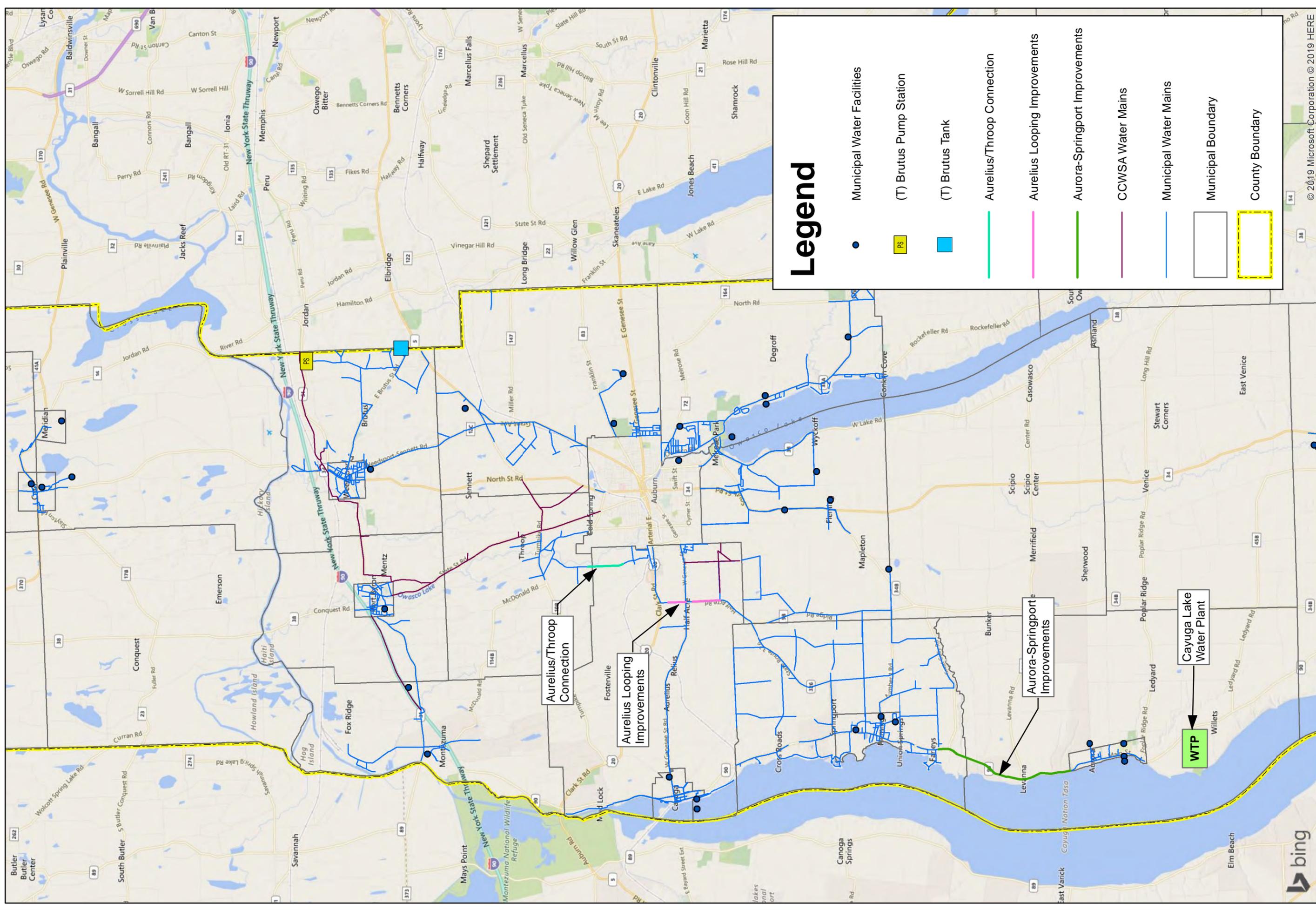
#### 7.1.2.1 Alternative 1 - North to South Flow Regime

This model scenario considers the extreme case of moving water approximately 33 miles from Brutus to Aurora, such as considered in Source Alternative 1 (OCWA North). Although the OCWA option is not being considered for the final source alternative, this scenario examines the boundary condition of water flowing from the northeast extreme of the system to the southwest extreme. This scenario is used to examine the performance of the Aurora-Springport connector with water flowing north to south, as it is likely that the pipeline will operate in this flow regime during the interim period when Aurora is supplied from Owasco Lake at Auburn, until the Cayuga Lake Water Plant is constructed and placed into service.

#### 7.1.2.2 South to North Flow Regime

This model scenario considers the opposite extreme case of moving water from the proposed Cayuga Lake Water Plant south of Aurora north approximately 33 miles to Brutus. This scenario simulates the operation of the completed Transmission Spine and Cayuga Lake Water Plant with the Owasco Lake supply at Auburn off-line.

Analysis of the two flow scenarios indicates an elevated storage tank is recommended on Beech Tree Road near the Aurelius-Throop town line. At a minimum, this tank would be a 500,000 gallon elevated storage tank with an overflow elevation of 100 feet above grade. Additionally, a booster station is recommended in the Town of Springport on Number 1 Road near Davis Road. This pump station would be sized for 1200 gpm at 180 feet TDH. This equates to approximately 75 hp pump station. Another similarly-sized pump station is recommended on Route 90 in Ledyard north of Levanna Road. This concept and these facilities are illustrated in Figure 7-4.



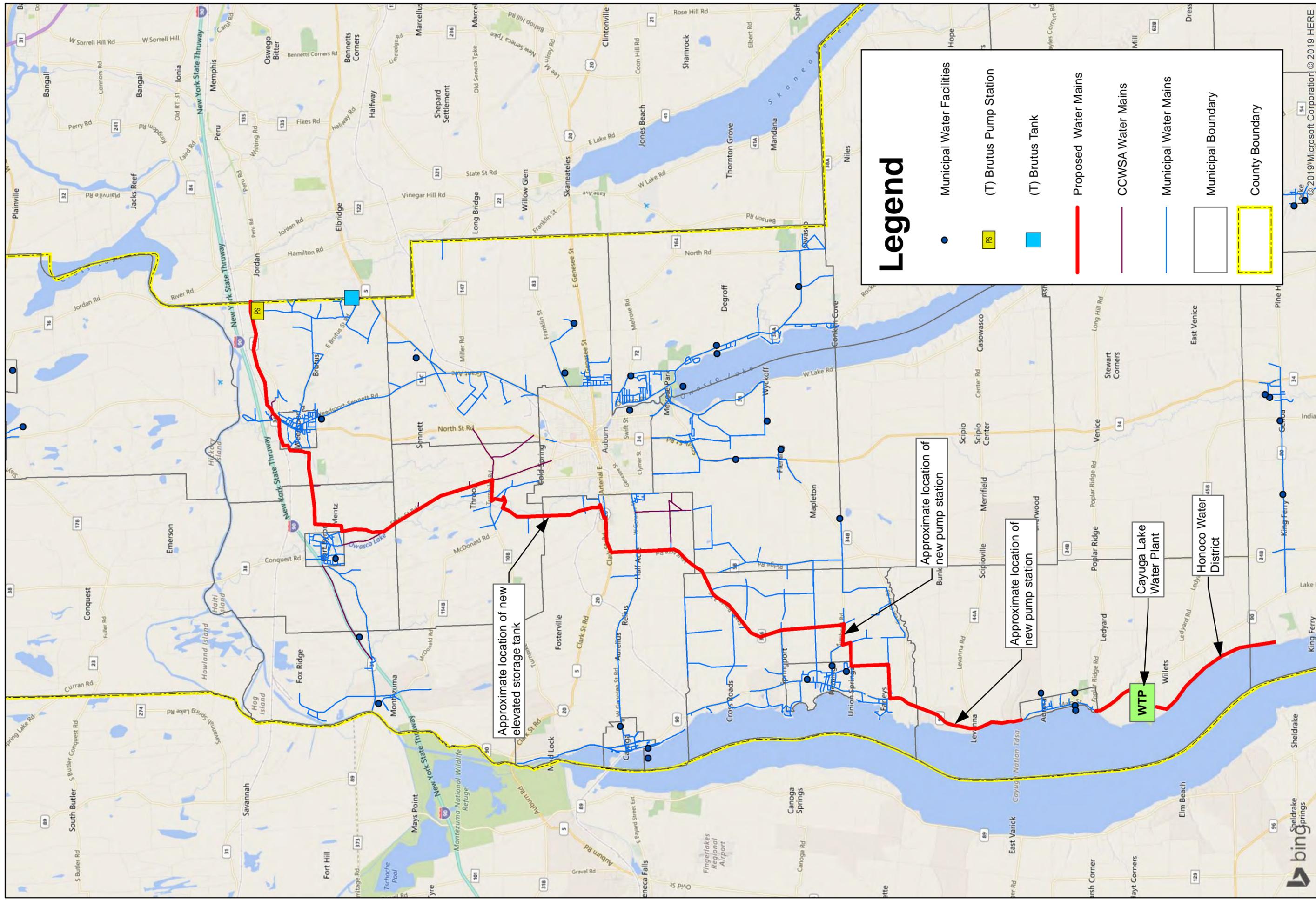
## Legend

- Municipal Water Facilities
- (T) Brutus Pump Station
- (T) Brutus Tank
- Aurelius/Throop Connection
- Aurelius Looping Improvements
- Aurora-Springport Improvements
- CCWSA Water Mains
- Municipal Water Mains
- Municipal Boundary
- County Boundary



1 inch = 12,000 feet





# Legend

- Municipal Water Facilities
- (T) Brutus Pump Station
- (T) Brutus Tank
- Proposed Water Mains
- CCWSA Water Mains
- Municipal Water Mains
- Municipal Boundary
- County Boundary



1 inch = 12,000 feet

© 2019 Microsoft Corporation © 2019 HERE



### 7.1.3. Cayuga Lake Water Plant

As noted in the Section 6.0, and the *Source Water Alternatives Analysis*, the most cost-effective and attractive source alternative is development of a new source on Cayuga Lake south of Aurora, and construction of a new 4.5 MGD (ADD) water plant, referred to in this Plan as the Cayuga Lake Water Plant.

Harmful algal blooms (HABs) and other contaminants of emerging concern (CECs) are a well-documented reality. The designs of existing filtration plants never contemplated the need to treat and remove exotic contaminants such as cyanotoxins, pharmaceuticals, endocrine disruptors, and other CECs. This is reflected in the need to retrofit both the Auburn and Owasco filtration plants with GAC to address the seasonal concern with cyanotoxins and the reoccurring threat these toxins pose to system customers. With the opportunity to design a new treatment plant, CCWSA has the opportunity to consider treating for such contaminants and to address such concerns proactively in the Plant design. Preliminary steps to siting, study, and design are briefly described below.

#### 7.1.3.1 Bathymetry and Water Quality Analysis

The Aurora preliminary engineering report by Teter, et al recommended a preferred intake location near Long Point State Park. This area of Cayuga Lake should be bathymetrically mapped and sampled seasonally for water quality parameters at depth. The CCWSA should also open a dialog with the Erie Canal Corporation and the NYSDEC to discuss the feasibility of water withdrawal and approvals. Environmental clearances of jurisdictional resources should also commence such that any required mitigation measures can be identified early and incorporated into the Plant project with minimal impact.

#### 7.1.3.2 Intake Design

Special consideration should be given to liberal sizing of the intake to maximize flexibility in expanding the Plant far into the future. Construction of the intake will be a substantial investment. A majority of this cost will be in the labor, equipment, and incidentals associated with the installation. The incremental cost of increasing pipe size will be modest. Intake capacity will increase exponentially with each increase in intake diameter.

#### 7.1.3.3 Plant Siting

CCWSA should begin discussion with NYSOPRHP to discuss the feasibility of constructing a water plant within Park bounds. Considerations to be discussed will likely include grant of easement, architectural treatments of superstructures, and other coordination items related to access. It is noted that Parks currently owns and operates a small water treatment plant that serves the Park. This plant could ultimately be removed from service and replaced with the larger Regional Water Plant.

With completion of the Aurora water improvements and the Springport improvements, the CCWSA would be positioned to serve the City of Auburn, Town of Owasco and all their respective outside users. CCWSA's water distribution reach would extend as far south as Aurora and Honoco Road in the Town of Ledyard. Beyond the horizon of this planning effort, consideration should be given to providing capacity to serve Town of Genoa/King Ferry, Moravia, and Locke. A liberal intake sizing philosophy and modular design of the facility will preserve sufficient flexibility for possible plant expansion into the future.

## 8.0 IMPLEMENTATION STRATEGY

The recommendations presented in this Master Plan would most efficiently be implemented by a Public Authority. The legal structure and legislation forming the Cayuga County Water and Sewer Authority is already in-place, and the CCWSA is therefore the entity recommended to lead and undertake the recommendations included in this Master Plan. However, in order to successfully execute undertakings such as construction and operation of a new filtration plant, the CCWSA organization would need to be augmented with additional skilled staff.

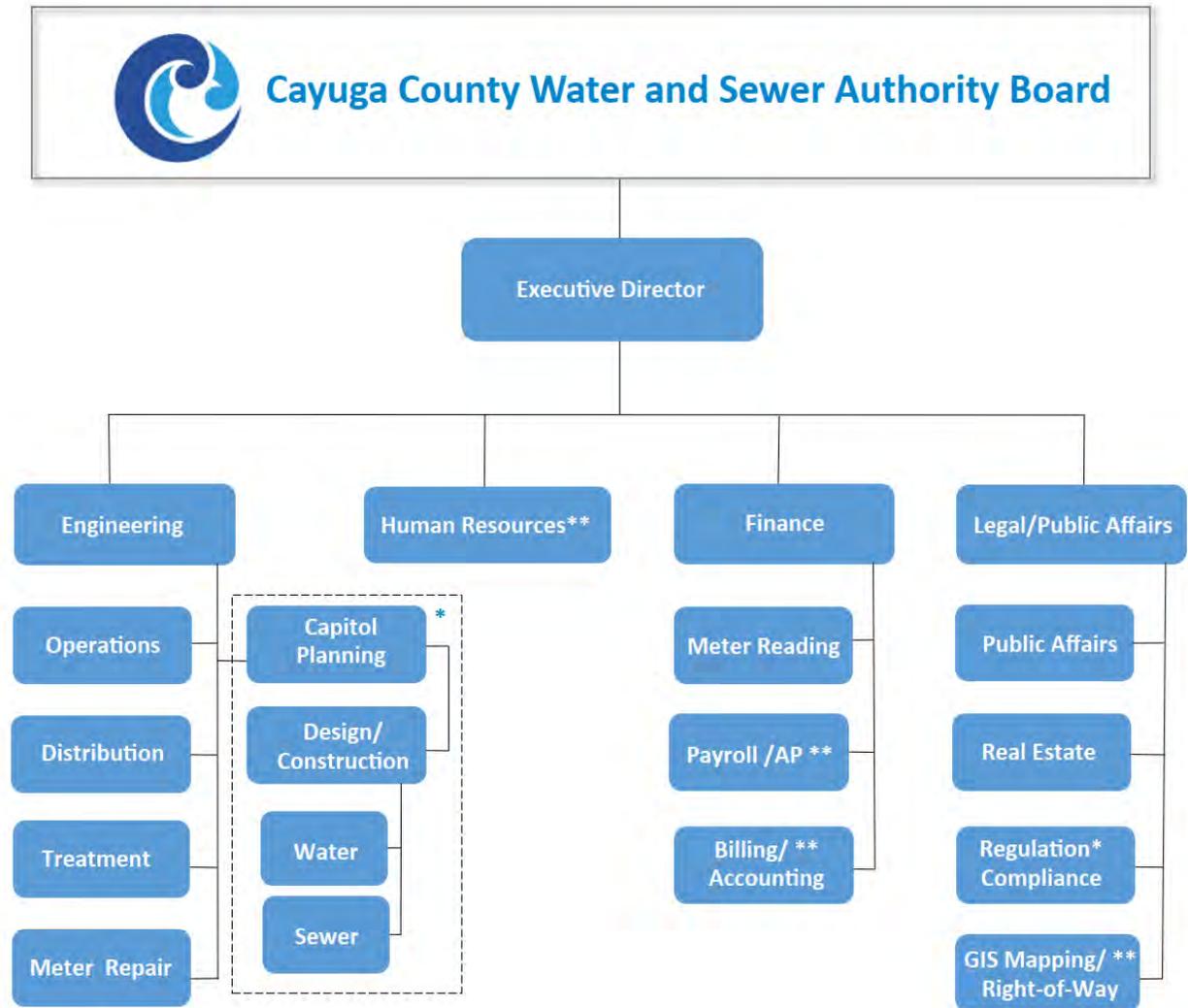
### 8.1. Organization

The CCWSA organization is currently based around operations. This structure pairs reasonably well with its current obligations to the communities it serves. The Authority currently has four full-time staff, including the Operations Director. Legal, financial, and engineering functions are generally completed as outside services performed under contract, *ad hoc*. To execute this Master Plan, the CCWSA should consider reorganization to reflect its increased responsibilities to water system operations. CCWSA will still need water and wastewater operations capacity, but will be assuming a larger role in capital planning and finance, greater legal exposure, a larger staff, and greater visibility to the public. Considering all of these factors, the CCWSA should plan to augment its current organizational structure to accommodate these additional business functions, and expanded roles and responsibilities. These recommendations are consistent with organization structures of other similarly-sized utility authorities. A brief description of each of these functions is described below. The organization is depicted graphically in Figure 8-1.

#### 8.1.1. Engineering

The Engineering department is typically responsible for operations, technical compliance, planning, and management of physical assets. This includes improvement to and operation and maintenance of water mains, sewer collection systems, pump stations, filtration plants, booster stations and allied facilities. Engineering departments are frequently divided into Operations and Capital Planning divisions. Depending on the size of the organization, Operations may be further subdivided into Distribution / Collection Operations and Treatment Operations.

The CCWSA already maintains an Operations division. The Capital Planning division would be responsible for scheduling, planning, and managing capital improvements to the CCWSA's assets. With major capital projects, such as construction of a new water plant and associated conveyances, some utilities will engage an engineering program manager under contract, rather than hire and train staff to undertake the improvements. Typically, the program manager is contracted to be responsible for coordinating several inter-related capital improvement projects on behalf of an Owner. There is advantage to the CCWSA in pursuing this concept in that CCWSA can have access to experienced engineering staff dedicated to the CCWSA project. Once the capital plan is executed and the contract discharged, program management staff would move on to other projects.



\* In-house staff or external Program Manager

\*\* In-house staff or County Shared Services

Figure 8-1: Recommended Organizational Structure

Whether the CCWSA self-performs or contracts the Capital Planning function, an internal Engineering position separate from Operations should be considered to lead the capital planning process and project delivery process. Under a program management delivery model, this individual would act as the program manager's liaison to the CCWSA.

#### 8.1.2. Finance

This department would be headed by a chief fiscal officer (CFO) and would be responsible for CCWSA's financial planning and performance. The Finance department would be responsible for not only billing and administrative functions, but also working with bond counsel and municipal advisors when securing financing for projects, managing grant funding, and financial management. For capital project planning, the Finance department would work closely with Engineering and the Executive Director for responsible planning of capital projects.

#### 8.1.3. Human Resources

In the near-term, the CCWSA may continue to leverage existing County human resources capacity under a "shared services" arrangement to fulfill this function for its own staff. However, as the CCWSA mission continues to grow in breadth, it should plan to hire its own in-house human resources director. Typically, this function will be responsible for traditional HR functions, in addition to labor relations, employee licensing, staff development, benefits, training, and retention.

#### 8.1.4. Legal

As the CCWSA's responsibility expands, it will have increased responsibility to maintain and assert its rights to its buried and exposed assets through right-of-way, easements, and other legal instruments. CCWSA currently meets these needs through outside legal counsel. This arrangement may be suitable for a period of time, but as the CCWSA maintains more easement, right-of-way, owns more property and assets, and plays a more active and visible role with associated risk exposure, it may be in CCWSA's interest to retain full-time legal counsel. Additionally, as the CCWSA operations expand into operation of a filtration plant, it will be subject to additional legal considerations related to regulatory compliance.

All of these activities present unique risk and legal exposure to the CCWSA and as its role within the County expands, the Board should give due consideration to eventually retaining full-time legal counsel and staff to manage these facets of the CCWSA's operation.

For similarly-sized organizations, the legal department can also serve a public affairs function, keeping those in elected office abreast of the CCWSA's operations and mission. This function would be coordinated with the Executive Director and the CCWSA board.

#### 8.1.5. Executive

The heads of each of these departments would typically be accountable to an Executive Director. The Executive Director would ultimately be responsible to the CCWSA Board for overall CCWSA operation and performance of its mission.

### 8.2. Plan of Finance

As stated in Section 7.0, much of the Transmission Spine can be completed at the local level with CCWSA support. However, with an estimated cost of nearly \$40 million, the success of developing the Cayuga Lake Water Plant is dependent on participation from all jurisdictions who would ultimately benefit from the reliability of a redundant water supply source. As noted in Section 6.0, the water rate analysis was based on 27,500 participating EDUs. This count includes Auburn and all of its outside customers, Owasco and all of its outside customers, Aurora and Honoco Road. Union Springs was not included in this EDU count, as it currently operates its own water system. In the future, Union Springs could join the Central Cayuga Water Project and would add an estimated 480 EDUs, thereby further lowering the annual cost for all users.

#### 8.2.1. Central Cayuga County Water District

To make the project affordable to ratepayers, the cost of operation, debt service, and depreciation would need to be distributed over all 27,500 EDUs. This could be accomplished through formation of a County water district. This approach was recommended in the 1970 Master Plan, but a water district was never formed. As a result, municipalities have since developed their own water systems without cooperation or coordination. The result has been redundancy, wasteful spending, and the current haphazard rate structures that both ratepayers and elected officials dislike. Formation of a County water district with one water utility operating the water system would normalize the water rates, would improve reliability, accountability, and transparency in operation, effectively dropping the corporate boundary lines which currently dictate the County's municipal water supply.

#### 8.2.2. Water Fund

In light of the events of 2016 and the current condition of water and sewer infrastructure identified in this report, Cayuga County should make water a priority. Other NYS County Legislatures have taken a proactive approach of financially planning for water improvements and establishment of a county water fund. For example, the Genesee County Legislature allocates \$515,000 of collected sales tax revenue per year for water and assesses a \$1.20/1000 gallon surcharge to keep its water fund solvent.

The Cayuga County Legislature should consider similar actions to provide a ready source of funding to the CCWSA to undertake the recommendations made within this Regional Master Plan.

### 8.2.3. Suggested Steps for Implementation

In addition to other sources of funding within the County, CCWSA and Cayuga County may consider seeking additional funding for implementation from NYS DOS. The CCWSA may be eligible for funding under the NYSDOS Municipal Restructuring Fund (MRF). The MRF is designed to stimulate permanent property tax reductions resulting from shared services and municipal consolidations. The MRF can be used to assist local governments in implementing changes to municipal structure, such as the consolidation of water and sewer services contemplated within this Master Plan. Funding under the MRF is organized into four implementation Phases. Funding is released on completion of each phase and acceptance by NYSDOS. The four phases are described briefly below and depicted in the graphic taken from the NYSDOS MRR website

(<https://www.dos.ny.gov/lg/lge/municipal-restructuring-fund.html>):



#### 8.2.3.1 Project Charter

The Project Charter Phase provides the initial framework for evaluating a project's viability and ultimate return on investment. NYSDOS will review and score the complete set of Project Charter documents to determine the project's ranking on the Project Priority List. The Project Charter must identify the following:

- Required resources and impediments to project success.
- An estimate of the total project cost and potential property tax reductions.
- A Tax Levy Impact and Implementation Award Calculation Worksheet.
- A Work Plan and Budget Form for the project.

#### 8.2.3.2 Project Development

In the Project Development phase, applicants will build a Project Plan based on the information contained in the approved Project Charter. The Project Plan will address risk/issues management, change management, organizational change and communications. The Project Plan should describe how the applicant(s) will mitigate issues and changes throughout the project and identify the location of the project repository. Additionally, a list of assumptions (that will be tested in subsequent phases with pilot projects) and potential legal impediments for

project implementation should be provided, along with a methodology for evaluating the severity of such impediments.

#### 8.2.3.3 Small-Scale Implementation

In the Small Scale Implementation phase, the applicant will pilot small elements of the project in order to test the assumptions identified in the prior phase. Once the assumptions identified in the prior phase have been verified, they will be reviewed and evaluated by DOS.

The results of the Small Scale Implementation will be incorporated into a revised plan for “full-scale implementation”.

#### 8.2.3.4 Full-Scale Implementation

Full-scale implementation is the complete execution of the project, as described in the revised Project Plan and Work Plan.

Upon final adoption of this plan by the CCWSA Board, it is recommended that the CCWSA and Cayuga County engage with the NYSDOS in an effort to secure additional funding under the MRF in order to continue with more detailed planning, development, and implementation of the Central Cayuga County Water District.

**REFERENCES**

- Blank, L., & Tarquin, A. (1989). *Engineering Economy, 3rd Edition*. New York: McGraw-Hill, Inc.
- K. Teter Consulting. (2018). *Preliminary Engineering Report for Village of Aurora Water System Improvement Project*. Homer: K. Teter Consulting.
- OMB. (2017). *Guidelines and Discount Rates for Benefit-Cost Analyses for Federal Programs*. Washington, D.C.: Office of Management and Budget.
- The Citizen. (2018, March 1). *Village of Moravia Experiencing Significant Water Loss, cause remains unknown*. Retrieved from auburnpub.com: [https://auburnpub.com/news/local/village-of-moravia-experiencing-significant-water-loss-cause-remains-unknown/article\\_338f4daf-bc09-5bc6-88eb-6b292ecebec0.html](https://auburnpub.com/news/local/village-of-moravia-experiencing-significant-water-loss-cause-remains-unknown/article_338f4daf-bc09-5bc6-88eb-6b292ecebec0.html)



**APPENDIX A**  
**SOURCE WATER ALTERNATIVES ANALYSIS**



**Regional Master Plan for Efficient Delivery of Water and  
Sewer Service in Cayuga County**

**Cayuga County Water and Sewer Authority  
Cayuga County, New York**

**Source Water Alternatives Analysis**

**November 2018**





Regional Master Plan for Efficient Delivery of Water and Sewer Service in Cayuga County  
Cayuga County Water and Sewer Authority, Cayuga County

Source Water Alternatives Analysis

November 2018

Prepared for:

Cayuga County Water and Sewer Authority  
7413 County House Road  
Auburn, New York 13021

Prepared by:

Barton & Loguidice, D.P.C.  
443 Electronics Parkway  
Liverpool, New York 13088





## TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
ABBREVIATIONS .....	iii
1.0 INTRODUCTION.....	1
2.0 PLANNING LEVEL DEMANDS .....	3
2.1. City of Auburn.....	3
2.2. Town of Owasco.....	3
2.3. Village of Aurora.....	3
2.4. Honoco Road Community.....	4
2.5. Other Demands .....	4
3.0 COMMUNITY OUTREACH.....	5
4.0 SOURCE ALTERNATIVES EVALUATION.....	7
4.1. Infeasible Sources.....	7
4.2. Alternative 1, Onondaga County Water Authority (North) .....	7
4.3. Alternative 2, Onondaga County Water Authority (South) .....	11
4.4. Alternative 3, Skaneateles Lake .....	14
4.5. Alternative 4, Cayuga Lake at Aurora .....	17
4.6. Alternative 5, Lake Ontario .....	20
4.7. Alternative 6, Bolton Point Water System.....	23
5.0 SUMMARY OF EVALUATIONS .....	27
5.1. Funding Strategies .....	27
<b>Tables</b>	
Table 3-1: MCDA Weighting Factors.....	6
Table 4-1: Alternative 1 Features .....	8
Table 4-2: Criteria Scores for Alternative 1 .....	11
Table 4-3: Alternative 2 Features .....	12
Table 4-4: Criteria Scores for Alternative 2 .....	14
Table 4-5: Alternative 3 Features .....	15
Table 4-6: Criteria Scores for Alternative 3 .....	17
Table 4-7: Alternative 4 Features .....	17
Table 4-8: Criteria Scores for Alternative 4 .....	20
Table 4-9: Alternative 5 Features .....	20
Table 4-10: Criteria Scores for Alternative 5 .....	23
Table 4-11: Alternative 6 Features .....	23
Table 4-12: Criteria Scores for Alternative 6 .....	25

**TABLE OF CONTENTS**

<b><u>Section</u></b>	<b><u>Page</u></b>
Table 5-1: Summary of Alternatives.....	27

**Appendices**

- Appendix A – Ground Water Alternative Analysis
- Appendix B – Source Alternative 1 Data, OCWA (North)
- Appendix C – Source Alternative 2 Data, OCWA (South)
- Appendix D – Source Alternative 3 Data, Skaneateles Lake
- Appendix E – Source Alternative 4 Data, Cayuga Lake at Aurora
- Appendix F – Source Alternative 5 Data, Lake Ontario at Sterling
- Appendix G – Source Alternative 6 Data, Bolton Point Water System

**ABBREVIATIONS**

ADD	Average Daily Demand
BMP	Best Management Practice
C	Celsius
CCI	Construction Cost Index (ENR)
cfs	Cubic feet per second
CT	concentration x time
DEC	New York State Department of Environmental Conservation
DMR	Discharge Monitoring Report
DO	Dissolved oxygen
DOT	New York State Department of Transportation
DWSRF	Drinking Water State Revolving Fund
ECL	Environmental Conservation Law
EDU	Equivalent Dwelling Unit
EFC	New York State Environmental Facilities Corporation
ENR	Engineering News-Record
EPA	United States Environmental Protection Agency
F	Fahrenheit
fps	Feet per second
gpd	Gallons per day
GML	General Municipal Law
gpm	Gallons per minute
HGL	Hydraulic Grade Line
hp	Horsepower
HPGN	High Precision Geodetic Network (1998)
IUP	Intended Use Plan
ISO	Insurance Services Office
LF	linear feet
MHI	Median Household Income
MGD	Million gallons per day
NAD83	North American Datum (1983)
NAVD88	North American Vertical Datum (1988)
NPSHa	Net positive suction head available
NPSHr	Net positive suction head required

**ABBREVIATIONS (cont'd)**

NYSDOH	New York State Department of Health
NYSOPRHP	New York State Office of Parks, Recreation, and Historic Preservation
OMB	Office of Management and Budget
PAC	Powdered activated carbon
PACl	Polyaluminum chloride
PER	Preliminary Engineering Report
PHF	Peak Hourly Flow
ppm	parts per million
psig	Pounds per square inch (gauge)
Q	Volumetric flow rate (gpm, MGD)
scfm	Standard cubic feet per minute (68 degrees F and 1 atmosphere)
SEQR	State Environmental Quality Review
SPDES	State Pollutant Discharge Elimination System
SWPPP	Storm Water Pollution Prevention Plan
TDH	Total dynamic head
THM	Trihalomethane
TSS	Total suspended solids
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service

## 1.0 INTRODUCTION

In the late summer of 2016, Owasco Lake experienced an algal bloom of unprecedented intensity. Decaying cyanobacteria release intercellular material that contain compounds known as cyanotoxins. Cyanotoxins are a class of chemicals including various strains of microcystin, saxitoxins, anatoxins, and cylindrospermopsin. Cyanotoxins are known for human and animal toxicity, including neurotoxicity, hepatotoxicity, and cytotoxicity, among other forms of toxicity. The 2016 bloom in Owasco Lake was unprecedented in that it was the first HAB occurrence in New York State in which cyanotoxins were been detected in finished, potable water at a water plant. Owasco Lake is a source of drinking water for approximately 60,000 people in Cayuga County. This population currently has no alternative source to public drinking water.

Auburn and Owasco have since taken remedial measures to retrofit their respective treatment processes with the addition of GAC to augment their plants' capacity to remove cyanotoxins from the finished water. Nonetheless, the Cayuga County Legislature recognizes the vulnerability to public health and economic sustainability for the county with reliance on a single source of water. As a part of the *Regional Master Plan for the Efficient Delivery of Water and Sewer Services in Cayuga County*, the Cayuga County Water and Sewer Authority (CCWSA) is investigating feasible alternatives to supplement Owasco Lake as a source of potable water.

This report documents evaluation of six alternative sources to Owasco Lake and the methodology used for evaluating each of the alternatives, and provides a rational basis for the recommended source alternative to Owasco Lake.



## 2.0 PLANNING LEVEL DEMANDS

The analysis of an alternative water source considers average daily demand for those municipalities supplied by City of Auburn, Town of Owasco, Village of Aurora, and the Honoco Road lakefront community. A summary of planning level demands is included in Table 2-1. Planning level demands were based on average daily demands (ADDs) for the anticipated service area. This approach recognizes that two separate water supplies exist within the service area, each connected to extensive transmission, distribution, pumping, and storage facilities. Peak demands would likely be met through existing storage facilities, regardless of the source of supply. Planning the new source for peak demand at this level of analysis would unreasonably oversize the facility and overstate the costs to construct.

### 2.1. City of Auburn

Average daily demand for the City of Auburn includes demands from outside customers including the Town of Throop, Town of Sennett, Town of Aurelius, and Town of Sennett, who subsequently sells water to the Village of Weedsport. The Town of Aurelius subsequently sells to Village of Cayuga.

The Cayuga County Water and Sewer Authority (CCWSA) is also an Auburn outside customer, who subsequently supplies water to portions of the Town of Throop, Town of Springport, Town of Brutus, and Village of Port Byron. Port Byron subsequently sells to the Town of Mentz and Town of Montezuma. In consultation with the City of Auburn, the cumulative average daily demand on the Auburn water system is approximately 4 MGD.

### 2.2. Town of Owasco

The Town of Owasco supplies treated water water to portions of the Town of Fleming and Fire Lane 15 within the Town of Niles. Average daily demand on the Owasco water system is approximately 0.4 MGD based on discussions with the Plant superintendent and operating records.

### 2.3. Village of Aurora

As noted in other studies, the Village of Aurora is currently supplied by a private water supply owned and operated by Wells College. Long-term, Wells College intends to divest from the water supply business and become a customer to a municipally-owned water system. Average daily demand within the Village is approximately 0.10 MGD.

#### 2.4. Honoco Road Community

The Honoco Road community is located along Cayuga Lake's eastern shoreline within the Town of Ledyard, south of Long Point State Park. Most residents are seasonal; however, the Honoco Road Association reports that there is an appreciable number of year-round residents. As indicated in other studies under this master planning effort, and through community outreach and workshops, there is interest from the Association in development of a water district and public water distribution system within this community. The Association reports 143 residents within the community. This corresponds with an estimated average daily demand of 0.04 MGD.

**Table 2-1: Planning-Level Demand Summary**

<b>Source</b>	<b>Average Daily Demand (MGD)</b>
Auburn, City	4.0
Owasco, Town	0.4
Aurora, Village	0.1
Honoco Road Community	0.04
<b>Total</b>	<b>4.54</b>

#### 2.5. Other Demands

There are other potential public water demands within the County that are not considered in the planning-level demand. These demands include potential future agricultural and municipal demands not currently anticipated or foreseen. A reasonable strategy to expand the secondary source will be developed within the final Master Planning efforts.

### 3.0 COMMUNITY OUTREACH

As a part of the source alternative evaluation, CCWSA held a series of workshops with a stakeholder group comprised of private business and community interests across Cayuga County. The intent of this outreach was to solicit feedback specifically from non-municipal entities to provide input on how reliable public water service, or the lack thereof, impacts their interests. Committee members included members from local manufacturing, dairy production, agricultural, travel and tourism, economic development, healthcare, higher education, and watershed protection.

Over several sessions, CCWSA educated the committee on issues related to finance and construction of public water improvements and challenges to implementation in rural jurisdictions. This outreach culminated in a facilitated workshop that provided input from this representative community of private and business interest groups into a multi-criteria decision analysis (MCDA) of qualitative characteristics for each alternative. This MCDA evaluated the following criteria:

- Capital cost
- Operating cost
- Source reliability
- Source quality
- Timing

Each of these criteria have a unique affect on the decision-making process. Frequently, the alternative with the lowest first cost (capital cost) is selected from a position of financial responsibility. From an elected official's position, it is difficult to justify any alternative other than the lowest first cost, even though those alternatives with a higher capital cost may pay dividends for years to come and may more truly represent the better value when considered over a longer planning period. These criteria are defined more fully below:

Capital Cost: The estimated cost of planning, designing, permitting, and constructing the proposed alternative. Capital cost includes all "soft" costs for professional services, administration, and permitting, and "hard" costs associated with construction of the improvements. Estimates for this study should be considered Class 5 estimates, as defined by ACE International. Class 5 estimates are used for concept screening and at the 0% to 2% design development phase (ACEI, 2011).

Operating Cost: Operating costs have been developed based on the estimated operating complexity of each alternative, and are based on the estimated pumping horsepower, treatment chemical usage, and estimated labor.

**Source Reliability:** In consideration of each source, subjective judgements of each source's reliability was considered relative to competing source alternatives. Generally considered were the levels of watershed protection, watershed size, existence of or potential for contamination, current allocation of safe yield, and propensity to suffer from harmful algal blooms.

**Source Quality:** Source alternatives were ranked comparing relative source water quality. Poor source quality criterion is tied to both the cost of treatment (operating cost) and source reliability.

**Timing:** Consideration for when an alternative could be implemented is an important consideration. An otherwise attractive alternative may be rendered infeasible if the time to implement the alternative is excessive. This is a subjective criterion and the timing of each alternative was considered relative to the other alternatives, generally grouped as 3 to 5 years, 5 to 10 years, and greater than 10 years.

The result of these workshops provided a relative weighting of these criteria and is a reflection of what aspects are most important to this community with respect to public water supply. The MCA provides a rational method of weighting and comparing competing or otherwise subjective aspects of an alternative, and therefore, in theory, provides a uniform basis for comparison. The outcome of these workshops is summarized in Table 3-1.

**Table 3-1: MCDA Weighting Factors**

<b>Criterion</b>	<b>Relative Weight</b>
Capital Cost	0.13
Operating Cost	0.12
Source Reliability	0.33
Source quality	0.23
Timing	0.19
	1.00

It is notable that the aspect considered most important to public water supply is source reliability, followed closely by source quality, and timing. When questioned, the committee noted that business investment decisions are frequently made on these criteria and from a business perspective, capital and operating cost is frequently considered the "cost of doing business". As a result, this committee viewed cost with lesser importance.

The source water alternatives analysis evaluated each of the six feasible alternative for technical implementation and planning level costs. Each alternative was then ranked and weighting factors applied to develop an overall criterion score for each alternative. The alternative with the overall lowest criterion score would therefore be the most favorable alternative. This overall criterion score provides the basis for recommendation and should be the most consistent representation of what this committee values; and, by extension, what the entire county values.

## 4.0 SOURCE ALTERNATIVES EVALUATION

This analysis assumes each alternative will provide water of equivalent quality. Each alternative was evaluated on cost and technical feasibility, in addition to qualitative aspects such as timeliness, feasibility, source water quality, and source water quantity.

### 4.1. Infeasible Sources

In addition to the six (6) surface water sources evaluated in this analysis, CCWSA also evaluated the feasibility of developing a regional ground water source, and feasibility of developing a surface water source on the Seneca River.

#### 4.1.1. Ground Water Source

The ground water alternative was deemed infeasible due to the sporadic occurrence and low-quality and quantity ground water encountered within Cayuga County. Details of this analysis are included in Appendix A.

#### 4.1.2. Seneca River Source

The Seneca River alternative was deemed infeasible due largely to this source's low water quality relative to other available sources. The potential source water segment of the Seneca River is an integral part of the Cayuga-Seneca Canal and the Erie Canalway system. The Seneca River drains Cayuga Lake, the Montezuma National Wildlife Refuge, and Seneca Lake, through connection of the Cayuga-Seneca Canal.

The Water Body Classification for this segment of the Seneca River is Standard "C", Classification "C" (NYSDEC, 2017). Best use for this classification is fishing. This classification may be suitable for primary and secondary contact recreation (6 NYCRR 701.8); however, it is not suitable as a drinking water source. Generally, the raw water is high in suspended solids, organics, color, taste, and odor. The water accumulates these characteristics as it flows through areas such as Montezuma National Wildlife Refuge and the northern end of Cayuga and Seneca Lakes.

Dissolved organics in raw water present unique challenges, making treatment to potable standards costly relative to other possible sources available to Cayuga County. For these reasons, the Seneca River was eliminated from further consideration as an alternative regional surface water source.

### 4.2. Alternative 1, Onondaga County Water Authority (North)

#### 4.2.1. Description

This alternative considers a connection to the existing Onondaga County Water Authority (OCWA) system and the construction of a transmission main that

would convey water to the existing 12-inch Cayuga County Water and Sewer Authority (CCWSA) water main in Brutus. The water source would be Lake Ontario water drawn from OCWA's Western Reservoir in the hamlet of Warners, Town of Camillus. Refer to Appendix B for a conceptual routing of this alternative transmission main, which would terminate at the CCWSA water main on Route 31 in the Town of Brutus, upstream of the Town's pump station on Pump Road. Details of this alternative are summarized in Table 4-1.

**Table 4-1: Alternative 1 Features**

<b>Feature</b>	<b>Characteristic</b>
Transmission main	59,700 LF of 16" ductile iron pipe
Elevated Storage Tank	500,000 gallons (useable)
Booster Pumping Station	Duplex, 250 hp

A booster pumping station and elevated storage tank would be required to provide storage and pressure for the water to reach the connection point in Brutus. The proposed pump station would be located along NY-31 near Cross Lake at a ground elevation of approximately 375 feet. The pump station would be rated for a flow of 4.54 MGD and a TDH of 240 feet.

A 500,000 gallon elevated storage tank is proposed to be constructed near NY-31 in the area of Cross Lake to regulate pressure, provide fire flow and to provide a hydraulic break between the OCWA system and the Cayuga County system. The storage tank would be located near Cooper Road at a ground elevation of 511 feet and would have an overflow elevation of 651 feet. The high level overflow would ensure that the water can flow into the connection point which has a hydraulic head of 563 feet. Water would then flow from the connection point to an existing pump station owned by the Town of Brutus. The existing pump station is located at an elevation of 415 feet with the water main coming from the west at a hydraulic head of 563 feet and the water main going south out of the pump station at a hydraulic head of 814 feet. The existing pump station pumps water to an existing 300,000 tank located on East Brutus Street in the Town of Brutus. The Brutus tank has an overflow elevation of 800 feet. With the installation of the new pump station and storage tank, it is projected that about 1.5 acres of land will need to be acquired.

#### 4.2.2. Advantages

This alternative offers several advantages. Specifically, a ready source of treated water. OCWA has indicated that demand on the western branch of the Lake Ontario system is relatively low, and that Western Reservoir has sufficient capacity to deliver an additional 4.54 MGD to Cayuga County. Once

intermunicipal agreements and plan of finance have been secured, preliminary and detailed design could proceed without delay. Ideally, this alternative could be implemented within the next five years.

This alternative would also diversify source water within Cayuga County, effectively bringing Lake Ontario water into Cayuga County. Finger Lakes watersheds have similar levels of consistency within the watershed. All Finger Lakes tend to be high-quality water, low in alkalinity, turbidity, hardness, and slightly acidic pH. All Finger Lakes are, however, at risk of experiencing harmful algal blooms. Introducing water from a larger watershed may provide an additional level of resiliency that the current water supply strategy cannot provide.

This alternative leverages the excess capacity within existing infrastructure at OCWA's Lake Ontario Water Treatment Plant (LOWTP) in Oswego and associated conveyance and storage connecting the LOWTP to Western Reservoir. New facility construction is limited to conveyance to the Onondaga-Cayuga County line at the Town of Brutus, described above.

OCWA water rates for the various service types (e.g. residential, commercial, municipal wholesale, etc) are published publicly and are applied uniformly across all the counties within which OCWA provides water. Water sold under this alternative would likely be supplied under OCWA's Rate Schedule 7A. This rate schedule is structured as a declining block structure. OCWA routinely reviews its cost of service and updates its rates to accurately reflect its costs. Applying the 2018 Schedule 7A rate structure would cost Cayuga County approximately \$260,000 per month or \$3,120,000 per year to purchase 4.54 MGD of water, excluding base system fee and debt service. The 2018 Rate Schedule 7A is included in Appendix B.

This alternative also provides the opportunity to support improvement along the transmission corridor within the Town of Van Buren and Town of Elbridge in Onondaga County. If connected, these additional users within Onondaga County would help to off-set debt service costs for Cayuga County residents. A "joint" regional project such of such magnitude may attract additional funding in the form of grants that target government shared/consolidated services, or resiliency and hardening of public infrastructure, ultimately leading to lower annual debt service costs to the end user.

#### 4.2.3. Disadvantages

Much of the water supply within Cayuga County is not fluoridated, whereas OCWA's finished water is fluoridated. To distribute fluoridated water within

Cayuga County, either the fluoride would need to be removed or the benefiting municipalities would need to be notified of receiving fluoridated water. Fluoridation is encouraged by the New York State Department of Health, the American Dental Association, and other health-centered organizations. Nonetheless, skepticism of fluoridation persists within many communities. Distribution of un-fluoridated water is mandated by City of Auburn charter. Removal of fluoride is frequently achieved with treatment via activated alumina. Costs to de-fluoridate are not included in the capital cost estimate for this alternative.

Another disadvantage to this alternative is that it represents significant infrastructure investment outside of Cayuga County. This may seem like a parochial concern, but is a concern that the Cayuga County Legislature should keep in mind. As an “end-of-the-line” beneficiary for this infrastructure, Cayuga County will bear a proportionate share of the cost. Users along the corridor would pay a “proportionate share” of the relative benefit. However, as a major user of the water conveyed, the majority of the cost would be borne by Cayuga County and the investment would be made almost exclusively outside of Cayuga County within Onondaga County.

There is a perceived disadvantage that wholesale water purchase from an outside purveyor gives Cayuga County users a lack of control in the cost of its water. All water purveyors need to operate their water systems in a financially responsible manner, whether located within or beyond Cayuga County. The suppliers’ cost of service will necessitate periodic adjustment in water rates. This perception is not rational based on the magnitude of the OCWA customer base which numbers nearly 500,000 customers, but nonetheless has been expressed as a perceived disadvantage of this alternative.

#### 4.2.4. Regulatory Considerations

The water main alignment proposed for Alternative 1 would require review and approval from multiple local and state agencies. The proposed route crosses the New York State Thruway (Interstate 90) and NYS Department of Transportation (NYSDOT) public right-of-way along state highway. A Use and Occupancy Permit would be needed from the NYS Thruway Authority, along with a Highway Work Permit from the NYSDOT.

The proposed water main route passes through multiple municipalities in Onondaga County. Environmental permits from the NYS Department of Environmental Conservation (NYSDEC) and the U.S. Army Corps of Engineers (USACE) are also anticipated given the likelihood for state and federal Waters of

the U.S. to be crossed as part of the project. State Pollution Discharge Elimination System (SPDES) permitting would also be required to ensure that erosion and sediment is controlled during construction.

Compliance with the State Environmental Quality Review Act (SEQRA) regulations (6 NYCRR Part 617) will be needed. It is assumed that the project would warrant classification as a Type I Action, necessitating a Long Environmental Assessment Form and Coordinated Review Process with other Involved and Interested Agencies. It is anticipated that either Cayuga County or OCWA would serve as the lead agency for the SEQRA process.

#### 4.2.5. Evaluation

Through a series of meetings, this alternative was evaluated and ranked relative to other alternatives considered. Applying the weighting factors outlined in Section 3.0, this Alternative scores as follows:

**Table 4-2: Criteria Scores for Alternative 1**

<b>Criteria</b>	<b>Weighted Score</b>
Capital Cost	0.27
Operating Cost	0.64
Source Reliability	0.33
Water Quality	0.23
Timing	0.19
	1.66

The estimated capital cost for this alternative is \$35,315,000, which includes the estimated cost for the transmission main from the Western Reservoir to Brutus. This cost opinion also includes \$4.5 million to construct an 8-inch main from Springport to Aurora to serve the Village of Aurora water needs.

This alternative has the potential to create a new Town of Elbridge water district that would serve the Cross Lake area just north of the Village of Jordan, representing a possible 296 new water customers. These additional customers have not been factored into the cost analysis, as this potential district's participation in the project is speculative at this stage of analysis.

### 4.3. Alternative 2, Onondaga County Water Authority (South)

#### 4.3.1. Description

Similar to Alternative 1, Alternative 2 also considers connecting to OCWA's Western Reservoir, but routing the transmission main further south along NY-5 through the Village of Elbridge and connecting to the East Brutus Street Tank.

Table 4-3 summarizes features of Alternative 2; refer to Appendix C for conceptual plan, profile, and estimated cost for this alternative.

**Table 4-3: Alternative 2 Features**

<b>Feature</b>	<b>Characteristic</b>
Transmission main	67,600 LF of 18" ductile iron pipe
Elevated Storage Tank	500,000 gallons (useable)
Booster PS 1	Duplex, 350 hp
Booster PS 2	Duplex, 250 hp

The alternative would require the construction of two pump stations in order to provide enough pressure for the water to reach the 800 ft overflow elevation of the Brutus tank. Pump Station No. 1 would be constructed near Whiting Road in the Town of Van Buren at a location with a ground elevation of 440 feet. PS No. 1 would be a duplex booster pump station rated for 4.54 MGD and a TDH of 305 feet. Pump Station No. 2 would be constructed near Locust Lane in the Town of Elbridge at a ground elevation of 532 feet. PS No. 2 would also be a duplex booster pump station rated for 4.54 MGD and a TDH of 228 feet.

A 500,000 gallon elevated storage tank would be required in the Village of Elbridge, next to the existing storage tank. The new tank would need to be equipped with an altitude valve vault to balance hydraulic grades between the Elbridge system and the main conveyance to Cayuga County. The Elbridge tank overflows at 720 feet, while overflow in the new tank is estimated to be 875 feet to supply sufficient pressure for water to reach the 800 foot overflow elevation at the East Brutus Street tank. The addition of two pump stations and a storage tank to the transmission system will require approximately 2 acres of land to be acquired.

#### 4.3.2. Advantages

Advantages of this alternative are similar to Alternative 1. This alternative has an additional benefit for the Village of Elbridge, Town of Elbridge, and Village of Jordan. These municipalities are currently supplied water via the City of Syracuse conduit system at the Village of Elbridge. The City's intakes are in approximately 80 feet of water. Nonetheless, even at this depth, the 2017 algal bloom in Skaneateles Lake proved that the Syracuse water system is not immune to cyanotoxin contamination. This Alternative 2 would provide the Village of Elbridge, the Town of Elbridge, and Village of Jordan an alternative source of water, or an opportunity for an emergency interconnect should they seek to divest from the Syracuse water system.

Water sold under this alternative would be supplied under OCWA's Rate Schedule 7A, similar to Alternative 1. The estimated cost to Cayuga County would be approximately \$260,000 per month or \$3,120,000 per year to purchase 4.54 MGD of water, excluding base system fee and debt service. The 2018 Rate Schedule 7A is included in Appendix C.

#### 4.3.3. Disadvantages

Similar to Alternative 1, OCWA water is fluoridated, whereas most of Cayuga County water is not fluoridated. To implement this alternative, either the fluoride must be removed or Cayuga County officials would provide community outreach educating the consuming public of the benefits of fluoridation. The cost of de-fluoridation is not included in the capital cost estimate of this alternative.

Also, this alternative represents significant investment outside of Cayuga County. As an "end-of-the-line" beneficiary for this infrastructure, Cayuga County will bear a proportionate share of the cost. Users along the corridor would pay a proportionate share of the relative benefit. However, as the major user of the water conveyed, the majority of the cost would be borne by Cayuga County and the investment would be made almost exclusively outside of Cayuga County within Onondaga County.

There is a perceived disadvantage that wholesale water purchase from an outside purveyor gives Cayuga County users a lack of control in the cost of its water. All water purveyors need to operate their water systems in a financially responsible manner, whether located within or beyond Cayuga County. The suppliers' cost of service will necessitate periodic adjustment in water rates. This perception is not rational based on the magnitude of the OCWA customer base which numbers nearly 500,000 customers, but nonetheless has been expressed as a perceived disadvantage of this alternative.

#### 4.3.4. Regulatory Considerations

Alternative 2 also proposes to cross the New York State Thruway, which would require the issuance of a Use and Occupancy Permit from the Thruway Authority. A Highway Work Permit would also be required from the NYSDOT, as will a Utility Permit from CSX for the installation of water main beneath their railroad. As with Alternative 1, multiple municipalities within Onondaga County would be interested in this option, including the Towns of Van Buren and Elbridge, and Villages of Jordan and Elbridge. Environmental permits from the NYSDEC and the USACE are also anticipated given the likelihood for state and federal Waters of the U.S. to be crossed as part of the project. SPDES permit issued by the New

York State Department of Environmental Conservation would also be required to ensure that erosion and sediment is controlled during construction.

Compliance with the State Environmental Quality Review Act (SEQRA) regulations (6 NYCRR Part 617) would be needed. It is assumed that the project would warrant classification as a Type I Action, necessitating a Long Environmental Assessment Form and Coordinated Review Process with other Involved Agents. It is anticipated that either Cayuga County or OCWA would serve as the lead agency for the SEQRA process.

#### 4.3.5. Evaluation

Application of the weighting factors developed in stakeholder workshops resulted in the scoring summarized in Table 4-4.

**Table 4-4: Criteria Scores for Alternative 2**

Criteria	Weighted Score
Capital Cost	0.54
Operating Cost	0.66
Source Reliability	0.33
Water Quality	0.23
Timing	0.19
Total	1.95

The estimated capital cost for this alternative is \$40,124,000 which includes the estimated cost for the transmission main, tank and the two pump stations. This cost opinion also includes \$4.5 million to construct an 8-inch main from Springport to Aurora to serve the Village of Aurora water needs.

#### 4.4. Alternative 3, Skaneateles Lake

##### 4.4.1. Description

Alternative 3 considers connecting a new transmission main from the City of Syracuse conduit system within the Village of Skaneateles and connecting to the City of Auburn's Franklin Street Reservoir. This alternative would take advantage of existing distribution infrastructure within the County with Auburn continuing to serve as a centralized "hub" for water distribution within the County.

**Table 4-5: Alternative 3 Features**

<b>Feature</b>	<b>Characteristic</b>
Transmission main	26,400 LF of 18" ductile iron pipe
Storage Tank	500,000 gallon
Booster pumping station	Duplex, 150 hp
UV Disinfection facility	4.54 MGD, dose: 40 mJ/cm <sup>2</sup>

This alternative considers connecting a new transmission main into an existing Syracuse conduit on Jordan Road in the Town of Skaneateles at an elevation of 931 feet. The transmission main would run along Old Seneca Turnpike and Franklin Street Road and discharge into Auburn's Franklin Street Reservoir. This reservoir has an overflow elevation of 860 feet. Refer to Appendix D for conceptual plan, profile, and estimated cost. Alternative features are summarized in Table 4-5.

To provide sufficient pressure for the water to be able to reach the Auburn Reservoir, a pump station would be required near the intersection of Old Seneca Turnpike and Mill Rd in the Town of Skaneateles at an elevation of 861 feet. This booster pump station would have two pumps that would supply the necessary 4.54 MGD flow and 139 feet TDH required for the water to reach the Franklin Street Reservoir.

Additionally, as this is an unfiltered source discharging directly into finished water storage, EPA's Long Term 2 Enhanced Surface Water Treatment Rule (LT-2-ESWTR) would require a second form of disinfection before it could be consumed for potable uses. This alternative therefore considers the addition of UV disinfection to meet this requirement.

A 500,000 gallon tank is proposed to be constructed near the county line at Clapp Road, in the Town of Skaneateles to provide water storage. The tank would be located at an approximate ground elevation of 1,021 feet and would have an overflow elevation of 1,041 feet. A pressure reducing valve would be needed along the transmission line near County RT-87A to help regulate pressure before the water reaches the Franklin Street Reservoir. The construction of a pump station, UV facility, and storage tank would require land acquisition which is estimated to be about 1.5 acres.

#### 4.4.2. Advantages

There are few advantages associated with this alternative. Of all the alternatives considered, this alternative represents the lowest costs. This is the shortest pipeline and Skaneateles Lake is the closest water supply to the City of Auburn.

#### 4.4.3. Disadvantages

There are several strategic considerations associated with this alternative, namely source quality, resiliency, and reliability. The safe yield of the Skaneateles Lake watershed is estimated to be 51.5 MGD. The City of Syracuse has a right to approximately 50 MGD by legislative authority. The remaining 1.5 MGD is required to maintain minimum flow in Skaneateles Creek. To access Skaneateles Lake water, Cayuga County would need to convince the New York State legislature to amend the legislation to grant Cayuga County a legal right to an apportionment of Skaneateles Lake water.

Water from Skaneateles flows under force of gravity into the Syracuse water system. Cayuga County would not have this same advantage; water from Skaneateles would need to be pumped into the Auburn water system.

Furthermore, as an unfiltered source, this water would need a second form of disinfection before it could be used for potable purposes. Additionally, Skaneateles Lake is not immune from HABs, cyanotoxin contamination, and the vagaries of turbidity events that force frequent intake closures, resulting in an unreliable supply. Discharging this water into Auburn's finished water system is not recommended.

This alternative also unfavorably links the operation and reliability of both the Syracuse water system and the Cayuga County systems. Owasco Lake has exhibited HABs during the hot, dry days of late summer and early fall. This is also typically a period of greatest demand on Skaneateles from Syracuse. This alternative would place even greater demand on Skaneateles Lake, making the reliability of water systems throughout the region more tenuous and less resilient, and therefore unsustainable over the long-term.

#### 4.4.4. Regulatory Considerations

Aside from the substantial coordination required with the City of Syracuse and other State agencies for withdrawal from Skaneateles, this alternative would need to secure environmental permits from the NYSDEC and the USACE, given the likelihood for state and federal Waters of the U.S. to be crossed as part of the project. A water withdrawal permit from the NYSDEC would be required to withdraw 100,000 million gallons of water per day or greater. SPDES permitting would also be required to ensure that erosion and sediment is controlled during construction.

Compliance with the State Environmental Quality Review Act (SEQRA) regulations (6 NYCRR Part 617) will be needed. It is assumed that the project

would warrant classification as a Type I Action, necessitating a Long Environmental Assessment Form and Coordinated Review Process with other Involved Agents. It is anticipated that Cayuga County would serve as the lead agency for the SEQRA process.

#### 4.4.5. Evaluation

By applying the weighting factored developed in stakeholder workshops, scoring of this alternative breaks down as summarized in Table 4-6.

**Table 4-6: Criteria Scores for Alternative 3**

Criteria	Weighted Score
Capital Cost	0.13
Operating Cost	0.65
Source Reliability	1.63
Water Quality	1.15
Timing	0.96
Total	4.52

The estimated capital cost of this proposed alternative is \$23,041,000. This cost opinion also includes \$4.5 million to construct an 8-inch main from Springport to Aurora to serve the Village of Aurora water needs.

#### 4.5. Alternative 4, Cayuga Lake at Aurora

##### 4.5.1. Description

The fourth alternative considers connecting a new transmission main from Aurora to the CCWSA water main in Springport, to effectively “back-feed” drinking water into the Auburn water system. This alternative would require the construction of a new water treatment plant and deep water intake which would be located in or near the Village of Aurora. This plant would replace the existing Wells College water treatment plant and intake pipe. Refer to Appendix E for conceptual plan and transmission main profile. Details of this alternative are summarized in Table 4-7.

**Table 4-7: Alternative 4 Features**

Feature	Characteristic
Transmission main	28,271 LF of 18” ductile iron pipe
Storage Tank	500,000 gallon
Booster PS 1	Duplex, 200 hp
Booster PS 2	Duplex, 250 hp

The new treatment plant would draw and treat water from Cayuga Lake. Finished water would be conveyed to the Village of Aurora and north to Springport, connecting to the CCWSA transmission main in Springport. The new transmission main would connect to the Aurora distribution system on the northern side of the Village boundary, at an elevation of 392 feet. A transmission main owned by CCWSA would connect at the Village boundary and run along NY-90 to the Village of Springport. A pump station would be required near Gully Road. The booster pump station would need to have two pumps, each rated for 4.54 MGD and 189 feet of TDH to be able to reach the location of a new water storage tank. A 0.5 MG water storage tank would be required at a location off of NY-90, near County RT-46, with a ground elevation of approximately 516 feet and an overflow of 536 feet. A tank is recommended to be installed between the pump station at Gully Road and Springport to regulate pressure in the transmission main. A second pump station would be installed near Carrs Cove Road to provide the required pressure for the water to be able to reach the overflow elevation of the Grove Street Tank located in Springport. The second pump station would require two pumps rated for a flow of 4.54 MGD and 226 feet of TDH.

There are two existing storage tanks that are located near the proposed transmission main, one located in the Village of Aurora the second located in the Town of Springport. The storage tank located in the Village of Aurora on Sherwood Road could be used to supply Aurora residents with water after being treated at the new treatment facility. The Aurora tank is at a ground elevation of 590.50 feet and has a hydraulic gradient of 637 feet. The Grove Street tank located in the Town of Springport can be used to serve the surrounding area and allows for additional water storage for Springport residents. The ground elevation of the Grove Street tank is 570 feet with a hydraulic gradient of 671 feet.

#### 4.5.2. Advantages

This alternative has the advantage of representing significant water infrastructure investment within Cayuga County. This alternative would diversify water supply within Cayuga County and improve the resiliency of water supply for the County. Moreover, Cayuga Lake is a high-quality source with a large watershed and has sufficient yield to meet the anticipated demands of 4.54 MGD. Like other Finger Lakes, Cayuga Lake is subject to HABs. However, if Cayuga County constructs a new treatment facility and associated deep water intake, treatment for cyanotoxins – and other contaminants of emerging concern – could be included in the final treatment design. This alternative, therefore, presents the opportunity to ensure the highest-quality finished water is produced and positions Cayuga County to provide this service.

#### 4.5.3. Disadvantages

This alternative is based on developing a new source and treatment plant, rather than taking advantage of existing treatment capacity elsewhere in the region. This alternative also would require development and staffing of an operational entity. It is presumed that the CCWSA would fill this role. However, the CCWSA cannot undertake such an operation with current staffing levels and expertise. This alternative is also quite costly compared to other feasible alternatives. Accordingly, there would be little economic incentive for users to buy water from this source when lower-cost sources are and would continue to be available, such as continuing to buy from Auburn.

#### 4.5.4. Regulatory Considerations

Cayuga Lake falls under jurisdiction of the New York State Canal Corporation since the lake was part of the canal system that connected Seneca Lake to the Erie Canal, via the Cayuga-Seneca Canal. Water withdrawal would need to be approved and permitted by both the Canal Corporation, as well as the NYSDEC under a water withdrawal permit. In addition, environmental permits from NYSDEC and USACE would be needed to permit the new intake and permitting impacts to wetlands and/or waters that may also be incurred during project construction.

SPDES permitting would also be required to ensure that erosion and sediment is controlled during construction. A Highway Work Permit would be needed from the NYSDOT for utility installation along a state highway.

Additional compliance with the State Environmental Quality Review Act (SEQRA) regulations (6 NYCRR Part 617) would be needed. It is assumed that the project would warrant classification as a Type I Action, necessitating a Long Environmental Assessment Form and Coordinated Review Process with other Involved Agents. It is anticipated that Cayuga County would serve as the lead agency for the SEQRA process.

#### 4.5.5. Evaluation

Application of the weighting factors developed in stakeholder workshops resulted in the scoring summarized in Table 4-8.

**Table 4-8: Criteria Scores for Alternative 4**

<b>Criteria</b>	<b>Weighted Score</b>
Capital Cost	0.40
Operating Cost	0.66
Source Reliability	0.98
Water Quality	0.69
Timing	0.58
Total	3.31

The capital cost for this proposed alternative is \$39,017,000 which includes the cost of a new water treatment facility near the Village of Aurora. This alternative directly addresses the needs of the Village of Aurora and the County.

#### 4.6. Alternative 5, Lake Ontario

##### 4.6.1. Description

This alternative considers development of a new water supply on Lake Ontario in the Town of Sterling. This alternative considers construction of a new filtration plant and conveyance south to CCWSA's Route 31 transmission main at a location just north of Weedsport in the Town of Brutus. This alternative alignment is illustrated in Appendix F.

Raw water from Lake Ontario would be treated at a new County water plant in the Town of Sterling and pumped via 18-inch transmission main that would generally follow a vacated railroad right-of-way and NY-34 south to Brutus.

Characteristics of this alternative are summarized in Table 4-9.

**Table 4-9: Alternative 5 Features**

<b>Feature</b>	<b>Characteristic</b>
Transmission main	109,500 LF of 18" ductile iron pipe
Storage Tank	500,000 gallon, overflow elevation: 606 feet.
High service pumps	Duplex, 350 hp
Booster PS 1	Duplex, 350 hp
Booster PS 2	Duplex, 250 hp

The existing CCWSA water main in Brutus is constructed at an elevation of 404 feet and has a hydraulic gradient of 628 feet at the proposed point of connection. The proposed treatment facility in Fair Haven would be located at an elevation of 290 feet. A pump station would be required just south of the Village of Cato at an elevation of 606 feet to boost the pressure of the water and ensure that it reaches the connection point on the Brutus water system. The pump station would need to

be rated for 4.54 MGD at 203 feet of TDH. Refer to the preliminary hydraulic profile in Appendix F.

A 500,000 gallon elevated water storage tank would be installed next to the pump station located south of the village of Cato at a ground elevation of 506 feet. The tank would have an overflow elevation of 606 feet. The construction of this storage tank and pump station is estimated to require approximately 2 acres of land to support the facilities.

#### 4.6.2. Advantages

An advantage to this alternative is that Lake Ontario is a very large supply of water that can supply water for a large region, which creates an opportunity for smart growth in the system. The CCWSA would be able to expand its business to more customers and treat as much water as they need to supply, similar to the system that OCWA currently operates. Smart growth within Cayuga County is possible through the connections of new villages and towns to the system. The transmission main alignment is proposed to be installed through the Village of Cato and therefore would create an opportunity for the Villages of Cato and Meridian to connect to the transmission main in the future. Adding these users would reduce the overall capital, operation and maintenance costs of the project.

#### 4.6.3. Disadvantages

The long transmission main from Lake Ontario has the potential of creating water age and quality issues. The water from the treatment plant in the Village of Fair Haven would travel approximately 21-miles before reaching the existing main in Brutus, meaning that the water would potentially lose any disinfection residual that the water was treated with at the water treatment plant, and would therefore present a concern with the quality of the water as it reaches Brutus in the form of disinfection byproducts.

#### 4.6.4. Regulatory Considerations

The proposed water main route travels through multiple Cayuga County municipalities on its way from Lake Ontario to the Town of Brutus. Environmental permits from the NYSDEC and the USACE should be anticipated given the likelihood for state and federal Waters of the U.S. to be crossed as part of the project. In addition, the proposed water main route would cross the NYS Thruway and the Seneca River/Canal. Reviews and approvals from the Thruway Authority and the Canal Corporation should be anticipated. A water withdrawal permit from the NYSDEC would be required to withdraw 100,000 gallons of water per day or greater. SPDES permitting would also be required to ensure that erosion and sediment is controlled during construction.

The withdrawal of water from Lake Ontario poses a unique set of considerations. The proposed intake structure and portion of the water main would be installed within the New York State Coastal Zone, which would require a state and federal coastal consistency review to ensure compliance with New York State's coastal policies. The consistency reviews would be completed in conjunction with the New York State Department of State. The New York State Office of General Services (OGS) oversees actions that involve state-owned lands under water. The bed of Lake Ontario falls under OGS jurisdiction; structures and fill are regulated under the Public Lands Law and would require authorization from OGS' Bureau of Land Management.

Additionally, Lake Ontario, as one of the Great Lakes, is included in the Great Lakes – St. Lawrence River Basin Water Resources Compact. This Compact represents an agreement between the Great Lakes States (Illinois, Indiana, Michigan, Minnesota, Ohio, New York, Pennsylvania, and Wisconsin) and the Canadian Provinces of Ontario and Quebec to cooperatively manage, conserve, and restore the waters of the St. Lawrence River Basin. In-basin water withdrawals and consumptive uses are managed and regulated under this Compact and new withdrawals would require regional review and assessment before being granted approval by the states and provinces that entered into this Agreement.

This alternative would be subject to regulation under The Boundary Waters Treaty of 1909. This treaty is enforced by the International Joint Commission (IJC) that includes representatives from the United States and Canada. The IJC approves projects and actions that affect the natural level or flow of boundary waters on each side of the international line. Lake Ontario meets the definition of boundary water under this treaty. Further assessment and consideration of the project under this treaty may be needed if this alternative is advanced.

Compliance with the State Environmental Quality Review Act (SEQRA) regulations (6 NYCRR Part 617) will be needed. It is assumed that the project would warrant classification as a Type I Action, necessitating a Long Environmental Assessment Form and Coordinated Review Process with other Involved Agents, and most likely a detailed Environmental Impact Statement. It is anticipated that Cayuga County would serve as the lead agency for the SEQRA process.

#### 4.6.5. Evaluation

By applying the weighting factored developed in stakeholder workshops, scoring of this alternative breaks down as summarized in Table 4-10.

**Table 4-10: Criteria Scores for Alternative 5**

<b>Criteria</b>	<b>Weighted Score</b>
Capital Cost	0.81
Operating Cost	1.02
Source Reliability	0.33
Water Quality	0.23
Timing	0.96
Total	3.35

The total estimated capital cost for this project is \$79,206,000 which includes the construction of a new water treatment facility and the cost for a transmission main to the Village of Aurora from Auburn.

#### 4.7. Alternative 6, Bolton Point Water System

##### 4.7.1. Description

This alternative considers construction of a transmission main from the south connecting southwestern Cayuga County to the Bolton Point Water System in Tompkins County. The Bolton Point Water System is owned, operated, and maintained by the Southern Cayuga Lake Intermunicipal Water Commission (SCLIWC), which treats water from Cayuga Lake and distributes it to customers in the region. The SCLIWC is comprised of elected officials from the City of Ithaca, Towns of Ithaca, Dryden, Lansing, and the Villages of Cayuga Heights and Lansing. The SCLIWC bylaws include procedures for additional municipalities joining the Commission.

Adding the CCWSA supply to the system would require connecting to an existing Bolton Point water main located near Milliken Station power plant and running the transmission main north along NY-34B and NY-90 to the Village of Aurora. From the Village of Aurora, the system would continue north along the same route of Alternative 4. This option would eliminate the need for constructing a new treatment plant in the Village of Aurora, and the need to have a transmission main from Auburn to the village. Details of Alternative 6 are summarized in Table 4-11.

**Table 4-11: Alternative 6 Features**

<b>Feature</b>	<b>Characteristic</b>
Transmission main	100,800 LF of 18" ductile iron pipe
Storage Tank	500,000 gallon, overflow elevation: 606 feet.
Booster PS 1	Duplex, 300 hp
Booster PS 2	Duplex, 75 hp

The first section of the transmission line from Milliken Station to Aurora would require a pumping station to overcome grade changes. The pump station would be rated for 4.54 MGD at a TDH of 263 feet, located near Milliken Station. The ground elevation of the proposed pump station site is 824 feet. A 500,000 gallon storage tank is proposed to be installed in King Ferry at a ground elevation of 968 feet with an overflow elevation of 993 feet. The tank would help to provide the pressure required to reach the Village of Union Springs and regulate pressure in the transmission system. A second pump station would be required in Union Springs near Carrs Cove Road on NY-90 to provide the required pressure for the water to reach the Grove Street tank in the Town of Springport. Booster PS 2 would be constructed at a ground elevation of 419 feet with a required TDH of 70 feet.

#### 4.7.2. Advantages

An advantage of this alternative is that parcels located along the transmission main alignment have the potential to connect to the transmission main and also become water customers. Adding these new users would reduce the overall capital, operation and maintenance costs of the transmission main, pump stations and tank. This alternative also takes advantage of existing intake and treatment capacity at the Bolton Point WTP on Cayuga Lake. The incremental cost to supply water to Cayuga County is marginal to the overall plant operation.

The proposed transmission main is located near three existing storage tanks along the route, including two in the Village of Aurora and one in the Town of Springport. The Sherwood Road storage tank in the Village could be maintained to supply the Village with water. This tank is located at a ground elevation of 590.50 feet with an overflow elevation of 637 feet. The second tank in the village is located on the Wells College campus at an elevation of 611.50 feet and overflow of 646 feet. This tank could be maintained to continue to supply Wells College with water. The Grove Street tank located in the Town of Springport could be maintained to serve the surrounding area and allows for additional water storage; the elevation of this storage tank is 570 feet with an overflow elevation of 671 feet.

#### 4.7.3. Disadvantages

A disadvantage of this alternative is the 19-mile long transmission main between the tank proposed in King Ferry to proposed Booster PS 2 in Union Springs. This length of main causes concern with water quality and water age, particularly at the low demands. This alternative also necessitates a long pipeline through largely agricultural districts. There may be unanticipated agricultural demands on this main. But for planning purposes, there appears to be no significant users between

Milliken Station and Aurora. With a small benefitting population and low density, the cost of debt service to finance this alternative would be substantial.

There is a perceived disadvantage that wholesale water purchase from an outside purveyor gives Cayuga County users a lack control in the cost of its water. All water purveyors need to operate their water systems in a financially responsible manner, whether located within or beyond Cayuga County. The suppliers' cost of service will necessitate periodic adjustment in water rates. This perception is not rational, but has been expressed as a perceived disadvantage of this alternative.

#### 4.7.4. Regulatory Considerations

Similar to the other alternatives, this option would involve multiple municipalities and include lands in an adjacent County (Tompkins County). Coordination with the NYSDOT would be needed to obtain a Highway Work Permit for construction of the water main within state highways ROWs. The Southern Cayuga Lake Intermunicipal Commission would be involved in this alternative scenario based on the source of water; either the Commission or Cayuga County would serve as the lead agency for the SEQRA process.

It is assumed that the project would warrant classification as a Type I Action, necessitating a Long Environmental Form and Coordinated Review Process with other Involved Agents. Environmental permits from the NYSDEC and the USACE are also anticipated given the likelihood for state and federal Waters of the U.S. to be crossed as part of the project. SPDES permitting would also be required to ensure that erosion and sediment is controlled during construction.

#### 4.7.5. Evaluation

By applying the weighting factored developed in stakeholder workshops, scoring of this alternative is summarized in Table 4-12.

**Table 4-12: Criteria Scores for Alternative 6**

<b>Criteria</b>	<b>Weighted Score</b>
Capital Cost	0.67
Operating Cost	0.87
Source Reliability	0.98
Water Quality	0.69
Timing	0.58
Total	3.79

The total estimated capital cost of this alternative is \$50,048,000, this includes the cost of the transmission main from the Milliken Station connection to the Grove Street tank in Springport.

## 5.0 SUMMARY OF EVALUATIONS

A summary of each alternative scoring is tabulated in Table 5-1. Based on the weighting criteria, the most attractive alternative is Alternative 1, OCWA (North).

**Table 5-1: Summary of Alternatives**

Alternative		Capital Cost	Operating Cost	Source Reliability	Source Quality	Timing	Total
1	OCWA (North)	0.27	0.64	0.33	0.23	0.19	1.66
2	OCWA (South)	0.54	0.66	0.33	0.23	0.19	1.95
3	Skaneateles	0.13	0.65	1.63	1.15	0.96	4.52
4	Cayuga Lake	0.40	0.66	0.98	0.69	0.58	3.31
5	Lake Ontario	0.81	1.02	0.33	0.23	0.96	3.35
6	Bolton Point Water System	0.67	0.87	0.98	0.69	0.58	3.79

Alternative 3, Skaneateles Lake is considered not feasible due to the factors of practicality noted within this report. It is suggested that Alternative 3 be eliminated from any further consideration by the County.

From the perspective of local government efficiency and smart growth, those alternatives that make use of excess capacity within existing water systems to supply Cayuga County are considered to be more attractive in that they represent a more efficiently run government service. Alternative 1 (OCWA, North), Alternative 2 (OCWA, South), and Alternative 6 (Bolton Point) are alternatives that take advantage of existing excess capacity, compliance sampling, and operational staff to improve overall efficiency.

Alternative 4 (Cayuga Lake) and Alternative 5 (Lake Ontario) contemplate development of a new source within the County. This approach would increase the resiliency of the water system within Cayuga County and may position the County water system for municipal restructuring which may include the City of Auburn's water system and possibly the Town of Owasco water system. These remaining five alternatives will be considered in the final Master Plan for Cayuga County.

### 5.1. Funding Strategies

In evaluating any alternative, consideration of short- and long-term project financing must be considered. Under current municipal infrastructure funding programs within New York State, inter-municipal projects and projects that consolidate and reduce local government administrative functions and improve the efficiency of the delivery of local government services generally receive more favorable State funding aid in the form of low interest loans and/or grants. This study was funded in part through a NYS DOS Local Government Efficiency (LGE) Study Grant. The DOS also offers "Implementation

Grants” for funding infrastructure projects that may be recommended under an LGE funded study.

If, in the future, the City of Auburn or Town of Owasco are interested in consolidating water utility operations with the CCWSA, these efforts to consolidate could be eligible for funding under the Department of State Municipal Restructuring Fund (MRF). Under this program, participating entities may be eligible for funding from Department of State to support consolidation efforts. The value of funding is typically proportional to the cost savings to taxpayers. The MRF incentivizes participation at varying levels of project readiness, anywhere from the idea stage to the implementation stage.

**APPENDIX A**  
**GROUND WATER ALTERNATIVE ANALYSIS**



## POTENTIAL ALTERNATIVE WATER SOURCES - GROUNDWATER

### GROUNDWATER RESOURCES IN CAYUGA COUNTY

Groundwater resources for community water supplies in Cayuga County vary relative to a physiographic province divide, roughly orientated parallel to NYS Route 5. The Ontario Lowlands province north of NYS Route 5 contain flat-lying topography and sediments deposited predominately in a near-shore lake environment in areas overlain with glacial till, drumlins and other glacial deposits. The Allegheny Plateau province south of NYS Route 5 contains deep glacier carved valleys and uplands of shallow bedrock with a mantle of glacial till. Groundwater resources in this area can be withdrawn from bedrock aquifer or unconsolidated aquifers as discussed in the following sections. Reliable groundwater resources depend on presence of permeable formations that are large enough in horizontal and vertical extent to transmit water from recharge features and to store sufficient water for periods when aquifer recharge declines.

**Bedrock Groundwater Resources:** Bedrock groundwater withdrawals are not a common community water supply source in central NYS due to abundant unconsolidated deposits. Cayuga County is underlain by shale and carbonate (limestone and dolostone) bedrock units that have been documented to contain elevated iron, manganese, sulfates and chloride due to their mineral composition. Water treatment is often required for shale and carbonate bedrock groundwater to meet NYSDOH water quality standards for community water supply wells.

Bedrock groundwater withdrawals are dependent on secondary porosity features such as open bedding planes, fractures and faults. Success of intercepting these features varies significantly. USGS reports (Kantrowitz, 1969) that shale units typically have well yields under 10 gallons per minute (gpm) and limestone and dolostone units have well yields as high as 50 to 150 gpm.

Bedrock groundwater resources for community supplies are not considered to be a significant alternative source in Cayuga County. Natural water quality concerns will likely result in elevated treatment costs. Bedrock water quantity may not be sufficient to meet community water supply demands.

**Unconsolidated Deposits Groundwater Resources:** Unconsolidated deposits in central NYS are commonly utilized for community water supplies. Water quality often meets NYSDOH water quality standards with minimal treatment, although water quality can vary significantly dependent on parent rock composition and cultural sources (road salt impacts, industrial contamination, agricultural practices, etc).

Figure 1 depicts mapped aquifers across Cayuga County. The mapping does not provide detailed data on aquifer characteristics such as saturated thickness, permeability, or recharge conditions, but does depict potential aquifer areas based on surficial lithology and topographic features. Potentially large aquifers are mapped as being present across the following general areas:

- North Victory extending south to Westbury, Spring Lake and Willow Grove.
- Port Byron extending east to the county line parallel to the NYS Thruway
- South end of Owasco Lake extending south to the county line
- Niles extending south to Moravia and southeast to Summer Hill
- Venice Center extending south to the county line.

- Smaller, less continuous mapped aquifers are found in the vicinity of Cato and an area northeast of Auburn in the Town of Sennett.

Figure 2 presents general surficial geology available from the NYS Museum and Science Service GIS website. It should be noted that the NYS Geologic Service has published more detailed surficial geology maps for several quadrangles in Cayuga County. Map units labeled og (outwash sand and gravel), alf (alluvial fan), k (kame deposits), km (kame moraine) and al (recent alluvium) are indicative of course-grained permeable sediments that can transmit and store groundwater. Map units lb (lacustrine beach), and ls (lacustrine sand) also can be sources of groundwater but are often associated with fine-grained sediments that can make groundwater withdrawals difficult due to sand production. Map unit tm (till moraine) may have high to low permeability sediments. The remaining mapped units, r (bedrock), t (till), pm (swamp/peat deposits), lsc (lacustrine silt and clay) are not considered sources of groundwater for community supplies.

Surficial geologic units that may be sources of groundwater withdrawals were located at the following general areas:

- North Victory extending south to Spring Lake
- Port Byron extending east to the county line parallel to the NYS Thruway
- Town of Sennett northeast of Auburn
- South end of Owasco Lake extending south to the county line
- Niles extending south to Moravia and southeast to Summer Hill
- Venice Center extending south to the county line.

## **GROUNDWATER USERS**

Water supplies in New York State are regulated by the NYSDOH and NYSDEC. The NYSDOH regulates water treatment, distribution and consumption for all public water systems, and these public water systems are listed on the NYSDOH website. The NYSDEC specifically regulates systems that have the withdrawal capacity exceeding 100,000 gallons per day (groundwater or surface water) and requires annual water use reporting for these facilities (reported data is available on NYSDEC's website).

The NYSDOH lists ninety-seven (97) public water systems in Cayuga County (includes both groundwater and surface water sources). Thirty-three (33) of these public water systems are classified as community water supplies and sixty-four (64) are classified as non-community water supplies. Of the thirty-three community sources, seven (7) are groundwater sources regulated by NYSDEC as having withdrawal capacity exceeding 100,000 gallons per day. These seven community sources serve a reported 9 % of Cayuga County's population. The total average daily groundwater withdrawal from these public water sources are 1,040,000 gpd.

<b>NYSDEC Regulated Public Water Supply Groundwater Withdrawals in Cayuga County (Systems with Withdrawal Capacity Exceeding 100,000 gpd)</b>			
<b>Water Supplier</b>	<b>Population Served</b>	<b>Average Daily Use (gpd)</b>	<b>Maximum Daily Use (gpd)</b>
Village of Fair Haven	1001	140,000	230,000
Village of Cato	601	20,000	20,000
Dudley Water	200	50,000	110,000
Village of Union Springs	2000	280,000	Not Reported
Village of Moravia	1950	450,000	490,000
Genoa/Kings Ferry WD	900	80,000	200,000
Town of Locke	600	20,000	20,000
<b>Totals</b>	<b>7,252</b>	<b>1,040,000</b>	<b>1,070,000</b>

The NYSDEC also lists agricultural facilities that are permitted to utilize over 100,000 gpd. Many of these facilities utilize both ponds and wells and the source listed in the permits are both groundwater and surface water. The ten (10) agricultural facilities listed in Cayuga County withdraw a daily average of 1,130,000 gpd. The majority of these facilities are located south of the NYS Thruway between Cayuga Lake and Owasco Lake in the Alleghany Plateau physiographic province.

<b>NYSDEC Regulated Agricultural Groundwater Withdrawals in Cayuga County (Systems with Withdrawals Exceeding 100,000 gpd)</b>			
<b>Permittee</b>	<b>Source</b>	<b>Average Daily Use (gpd)</b>	<b>Maximum Daily Use (gpd)</b>
Robert Snyder	GW & SW	20,000	100,000
Oakwood Dairy	GW	140,000	150,000
Lincoln Dairy	GW	100,000	140,000
Greenhill Dairy	GW & SW	50,000	50,000
Aurora Ridge Dairy	GW & SW	110,000	Not Reported
Vansridge Dairy	GW & SW	80,000	90,000
Sunnyside Farm	GW & SW	130,000	200,000
Roach Farm	GW	120,000	130,000
Ridge Crest Dairy	GW & SW	80,000	120,000
Willet Farm	GW & SW	300,000	300,000
<b>Totals</b>		<b>1,130,000</b>	<b>1,390,000</b>

Cumulative groundwater withdrawals at other facilities or at individual residential homes are not anticipated to be significant when evaluating potential alternative groundwater sources as the withdrawals are not anticipated to locally “stress” high capacity aquifers that would be targeted for new community withdrawals. The converse relationship does require study as new community withdrawals may stress an aquifer by lowering water levels and impacted other water users. An assessment of water withdrawal impacts to other users is required during performance and analyses of aquifer pumping tests (a required component of permitting a new groundwater supply source).

## POTENTIAL FOR ADDITIONAL GROUNDWATER WITHDRAWALS IN CAYUGA COUNTY

Aquifers in unconsolidated deposits with capacity to supplement existing community supplies or to create new independent supply systems are present in multiple areas in Cayuga County. Water quality and distance of distribution to users will be factors to consider when groundwater exploration projects are initiated.

Groundwater Resources in the Ontario Lowlands (north of NYS Route 5): There are multiple large mapped aquifers with surficial geology indicative of highly permeable sediments in the Ontario Lowlands. Selection of specific groundwater exploration locations within these large areas would be a function of land use, land ownership, accessibility for drilling equipment, potential contaminant sources, and localized hydrogeology. Naturally occurring chloride, iron, manganese, sulfate and other inorganic compounds can be elevated in lacustrine sediments and associated treatment may be required in Ontario Lowland wells to meet drinking water standards. Ontario Lowland potential groundwater exploration source areas include the following:

1. Alternative GW Source Area No. 1: Zone of lacustrine sand and kame deposits from North Victory extending south to Westbury and Spring Lake. Water quality in these deposits may vary, but treatment for naturally occurring compounds should be anticipated.
2. Alternative GW Source Area No. 2: Zone of outwash sand and gravel deposits from Port Byron extending east to the county line parallel to the NYS Thruway. The presence of the NYS Thruway is a potential source of groundwater contamination due to roadway deicing chemical applications. This source area is also one of the most heavily populated areas in Cayuga County and cultural sources of groundwater contamination should be evaluated during initial studies.

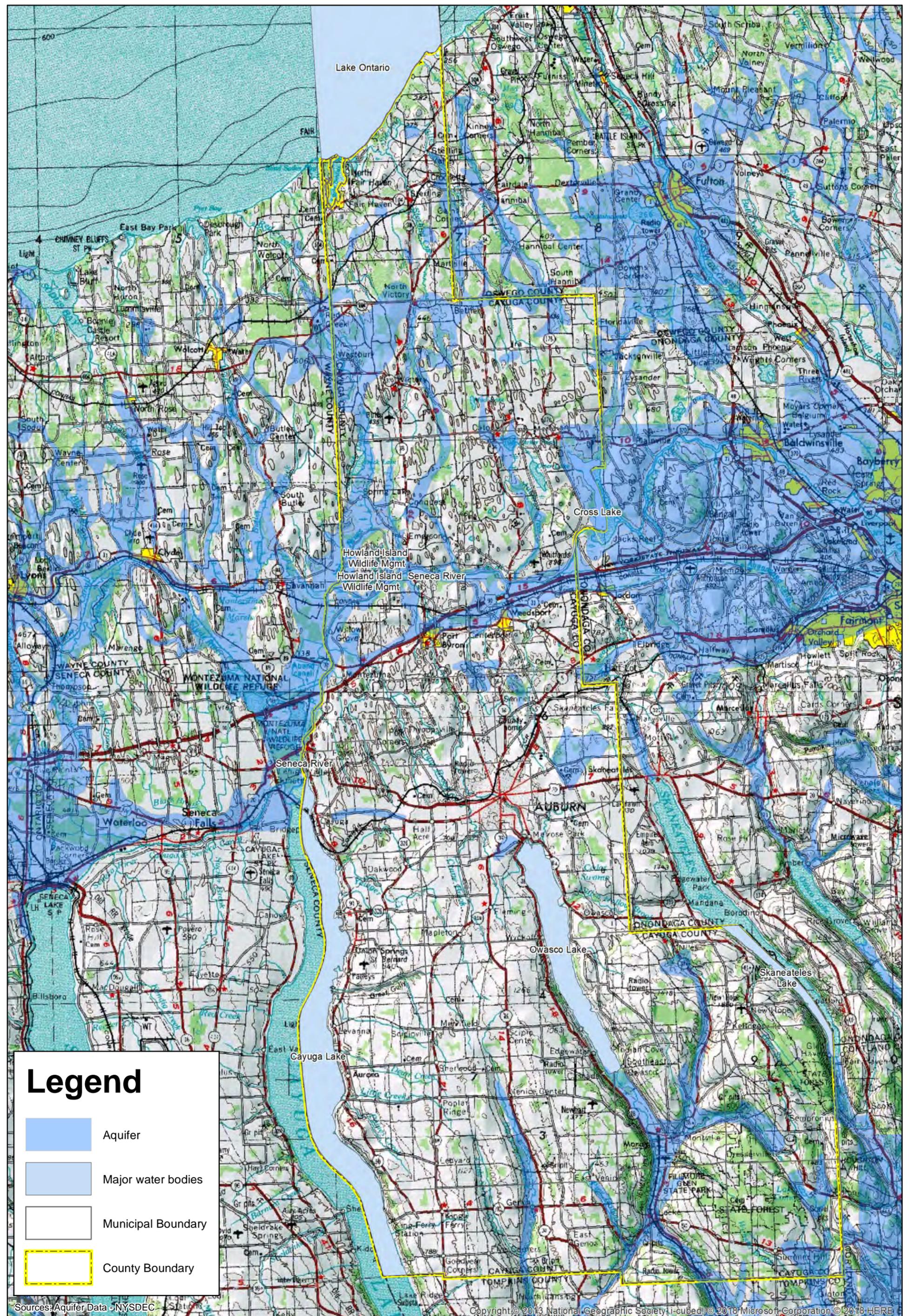
Groundwater Resources in the Allegany Plateau (south of NYS Route 5): There are multiple large mapped aquifers with surficial geology indicative of highly permeable sediments in the Allegany Plateau. A majority of these are located in glacial valleys in the southern-most portion of the county. Selection of specific groundwater exploration locations would be a function of land use, land ownership, accessibility for drilling equipment, potential contaminant sources, and localized hydrogeology. Naturally occurring total dissolved solids, chloride and other inorganic compounds can be elevated in this region but these concerns are largely dependent on underlying bedrock composition. Treatment may be required to meet drinking water standards. Allegany Plateau potential groundwater source areas include the following:

3. Alternative GW Source Area No. 3: Zone of kame, outwash and lacustrine sand in the central portion of the Town of Sennett, northeast of Auburn. Aquifer saturated depth may be limited in some areas.
4. Alternative GW Source Area No. 4: Zone of alluvium, outwash sand and gravel, and kame deposits from south end of Owasco Lake extending south to the county line. The Village of Moravia and Town of Locke water systems are within this area and localized knowledge on groundwater quantity and quality should be obtained.
5. Alternative GW Source Area No. 5: Zone of outwash sand and gravel, kame moraine, and kame deposits from Niles to Moravia and southeast to Summer Hill.

6. Alternative GW Source Area No. 6: Zone of outwash sand and gravel from Venice Center extending south the county line. Withdrawals from the upper reaches of this glacial valley may be susceptible to seasonal declines in water levels or recharge due to the limited aquifer zone of contribution and minimal aquifer storage. Aquifer saturated depth may also be limited in some areas of this valley.

Groundwater withdrawals of 200 gallons per minute (gpm) (288,000 gpd) from properly installed individual production wells at each listed potential source area above may be a very conservative estimate of potential withdrawals with some aquifers capable of significantly higher withdrawals. Assuming groundwater studies result in one successful well in each area, an estimated 1,728,000 gpd can be used to supplement existing water systems or create new water systems in Cayuga County. Analyses of treatment and distribution costs would be needed to determine cost-effectiveness of developing groundwater sources at these areas.





### Legend

- Aquifer
- Major water bodies
- Municipal Boundary
- County Boundary

Sources: Aquifer Data - NYSDEC

Copyright © 2013 National Geographic Society, i-cubed, © 2018 Microsoft Corporation © 2018 HERE

**Barton & Loguidice, D.P.C.**  
 Engineers • Environmental Scientists • Planners • Landscape Architects

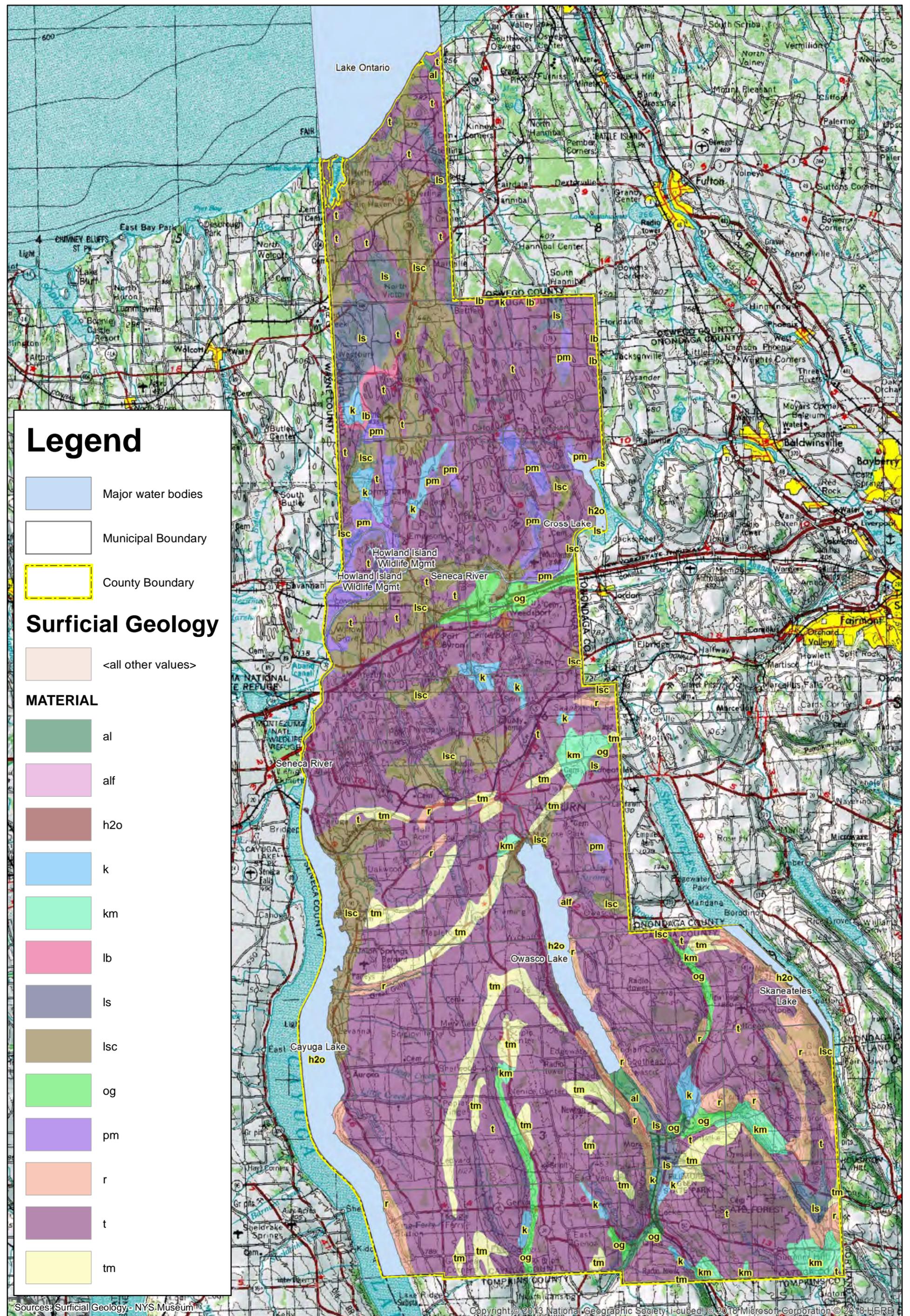


1 inch = 20,000 feet

CCWSA  
**Aquifer Limits Map**  
 Cayuga County      March 2018      New York

Figure  
 1  
 Project No.  
 1980.001





# Legend

- Major water bodies
- Municipal Boundary
- County Boundary

# Surficial Geology

<all other values>

# MATERIAL

- al
- alf
- h2o
- k
- km
- lb
- ls
- lsc
- og
- pm
- r
- t
- tm

Sources: Surficial Geology - NYS Museum

Copyright © 2013 National Geographic Society, i-cubed, © 2018 Microsoft Corporation © 2018 HERE



1 inch = 20,000 feet

CCWSA

## Surficial Geology Map

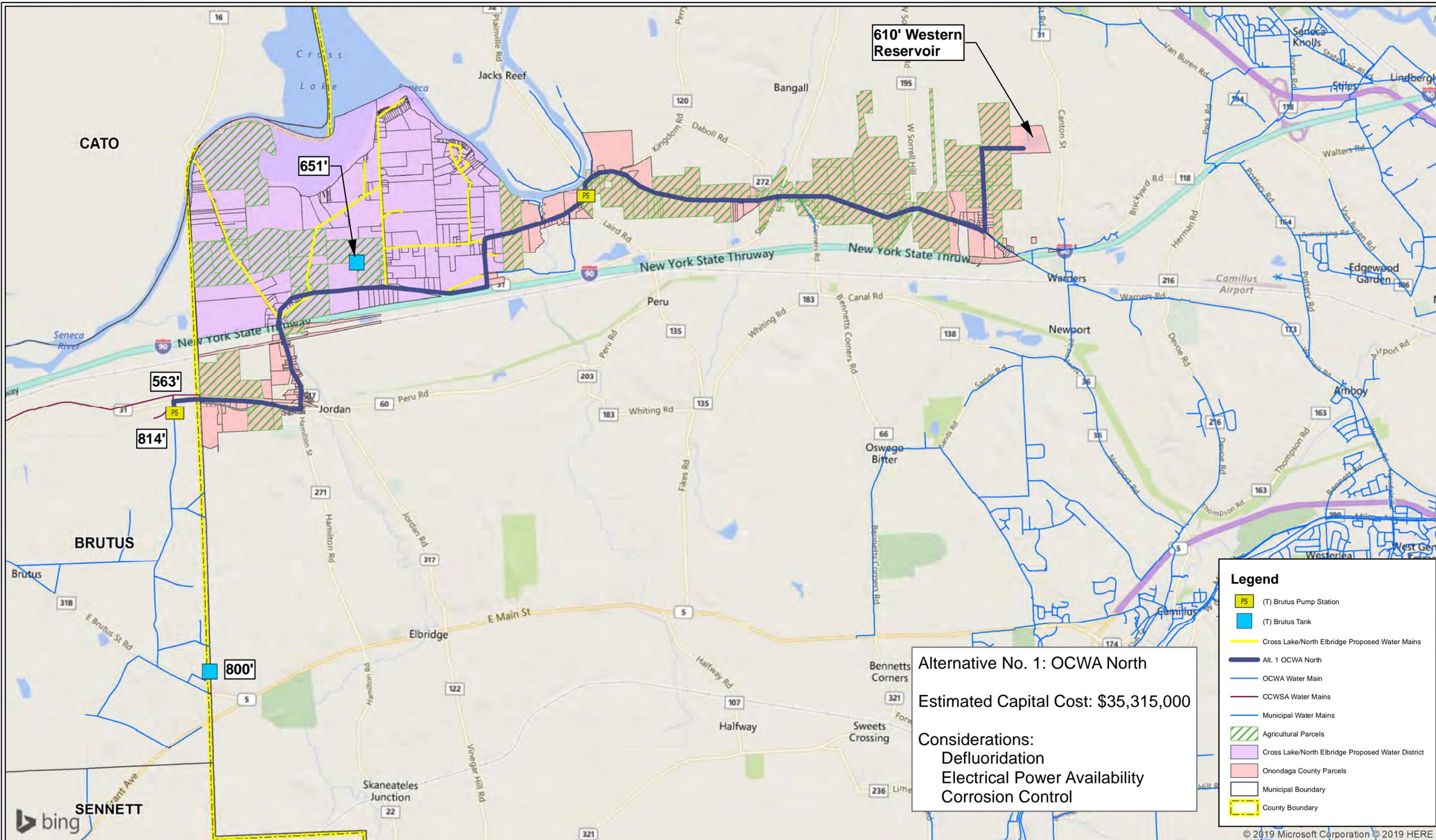
Cayuga County March 2018 New York

Figure  
2  
Project No.  
1980.001



**APPENDIX B**  
**SUPPLY ALTERNATIVE 1 DATA**  
**OCWA (NORTH)**





610' Western Reservoir

651'

563'

814'

800'

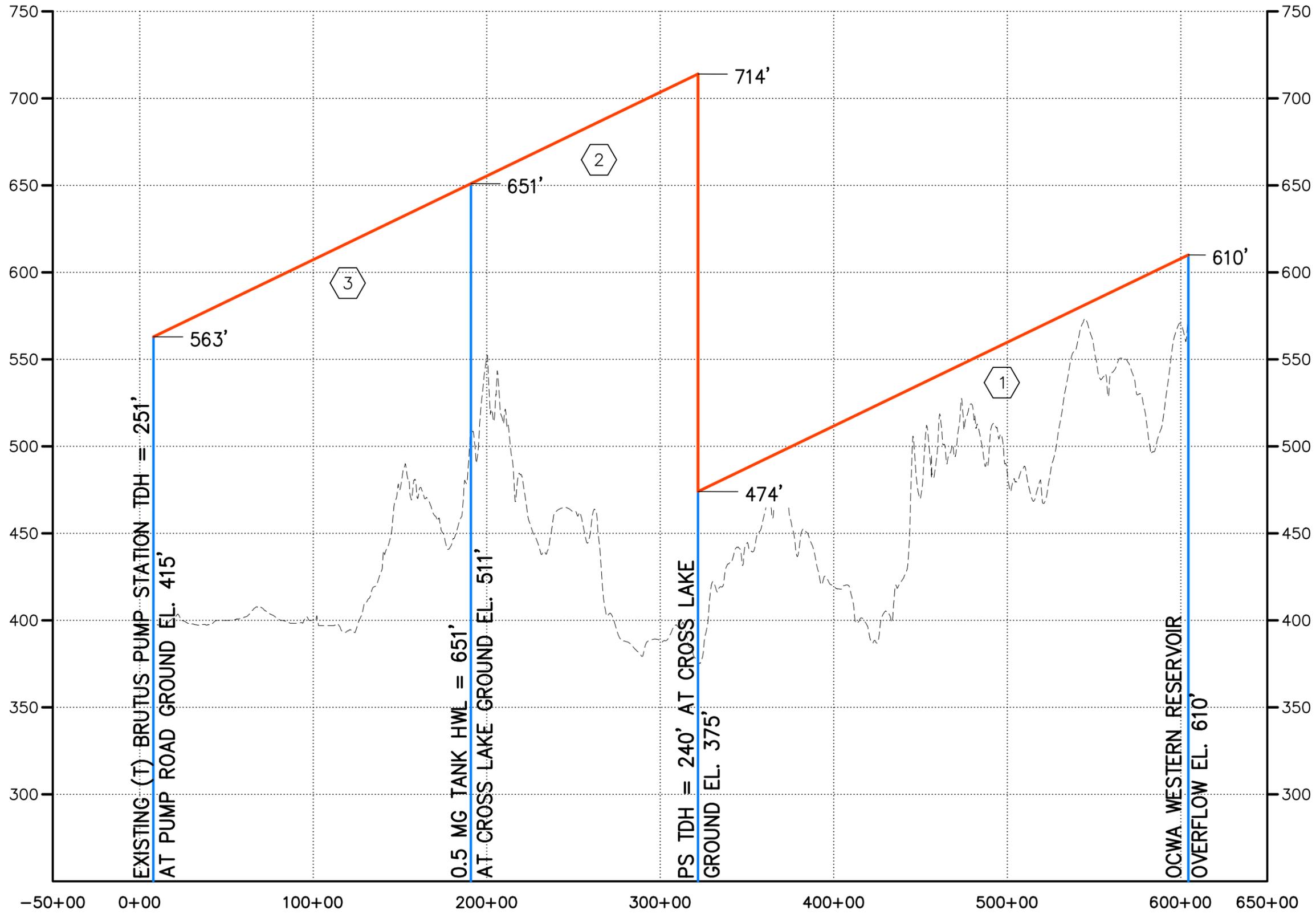
Alternative No. 1: OCWA North  
 Estimated Capital Cost: \$35,315,000  
 Considerations:  
 Defluoridation  
 Electrical Power Availability  
 Corrosion Control

**Legend**

- (T) Brutus Pump Station
- (T) Brutus Tank
- Cross Lake/North Elbridge Proposed Water Mains
- Alt. 1 OCWA North
- OCWA Water Main
- CCWSA Water Mains
- Municipal Water Mains
- Agricultural Parcels
- Cross Lake/North Elbridge Proposed Water District
- Onondaga County Parcels
- Municipal Boundary
- County Boundary



Plotted: Sep 28, 2018 - 2:46PM SYR By: lp  
 C:\Users\lp\appdata\local\temp\AcPublish\_14952\1980.001.001 HYDRAULIC PROFILES (ID 1585226).dwg



- ① APPROXIMATE PIPE LENGTH = 28,260' HEADLOSS = 136'
- ② APPROXIMATE PIPE LENGTH = 13,088' HEADLOSS = 63'
- ③ APPROXIMATE PIPE LENGTH = 18,306' HEADLOSS = 88'

CAYUGA COUNTY WATER AND SEWER AUTHORITY  
 REGIONAL MASTER PLAN  
 ALTERNATIVE 1: OCWA NORTH  
 HYDRAULIC PROFILE



Date	SEPTEMBER 2018
Scale	NO SCALE
Figure Number	1
Project Number	1980.001.001

CAYUGA COUNTY, NEW YORK



Item	Description	Quantity	Unit	Unit Cost	Estimated Cost
1	18-INCH DUCTILE IRON PIPE	59,654	LF	\$ 202	\$ 12,076,100
2	18-INCH BFV AND VALVE BOX	75	EA	\$ 8,000	\$ 596,600
3	SUBBASE	1,105	CY	\$ 30	\$ 33,200
4	SAW CUTTING ASPHALT PAVEMENT AND/OR CONCRETE PAVEMENT BASE	11,931	LF	\$ 2.00	\$ 23,900
5	NYS DOT PAVEMENT RESTORATION	1,790	TON	\$ 140	\$ 250,600
6	TOPSOIL AND SEEDING	4,971	CY	\$ 85	\$ 422,549
7	HYDRANT ASSEMBLY	99	EA	\$ 7,334	\$ 729,200
8	AIR RELEASE VALVE AND MANHOLE	18	EA	\$ 12,500	\$ 225,000
9	CONNECTION TO EXISTING WATER MAIN	2	EA	\$ 3,900	\$ 7,800
10	NYS DOT ROADWAY CROSSING	1	EA	\$ 49,400	\$ 49,400
11	NYS DOT THRUWAY CROSSING	1	EA	\$ 131,600	\$ 131,600
12	MASTER METER PIT	1	EA	\$ 65,000	\$ 65,000
13	LAND ACQUISITION - TRANSMISSION MAIN	27	AC	\$ 5,000	\$ 137,000
14	DEWATERING	NEC	LS	\$ 200,000	\$ 200,000
15	LAND ACQUISITION - PUMP STATION AND STORAGE TANK	1.50	AC	\$ 5,000	\$ 7,500
16	CHEMICAL FEED EQUIPMENT FOR DISINFECTION AND CORROSION CONTROL	NEC	LS	\$ 25,000	\$ 100,000
17	PACKAGED BOOSTER PUMP STATION	1	EA	\$ 687,500	\$ 687,500
18	EMERGENCY GENERATOR	1	EA	\$ 40,000	\$ 40,000
19	0.5 MGD ELEVATED COMPOSITE WATER STORAGE TANK	NEC	LS	\$ 1,185,000	\$ 1,185,000
20	ELECTRICAL	NEC	LS	\$ 100,000	\$ 100,000
21	WORK ZONE TRAFFIC CONTROL	NEC	LS	\$ 100,000	\$ 100,000
22	EROSION AND SEDIMENT CONTROL	NEC	LS	\$ 40,000	\$ 40,000
23	MOBILIZATION	NEC	LS	\$ 516,300	\$ 516,300
<b>SUBTOTAL</b>					<b>\$ 17,724,300</b>
				BONDS, INSURANCE, GENERAL CONDITIONS	1.75% \$ 310,200
				ENGINEERING, LEGAL, ADMINISTRATION	25% \$ 4,431,100
				CONSTRUCTION CONTINGENCY	30% \$ 5,317,300
TOTAL OPINION OF PROBABLE COST					\$ 27,782,900
<b>ESCALATE TO MID-POINT OF CONSTRUCTION (2021)</b>					<b>3% \$ 30,360,000</b>





Effective January 1, 2018



**RATE SCHEDULE NO. 7A**  
**General Municipal Service – Monthly (Alternate Capacity Charge)**

**AVAILABILITY:** Service to any customer within the Authority’s service area receiving service from an Authority-owned water main and using over 500,000 gallons per month. Customer must provide dry pit or enclosure with a 115-volt power outlet within 5 feet of the register location. Customer shall pay for power consumed.

**APPLICABILITY:** Wholesale Municipal Metered Purpose

**BASE SYSTEM FEE:** The base system fee for services hereunder shall be:

<b><u>Size of Meter:</u></b>	<b><u>Base System Fee:</u></b>
1”	\$ 25.00
1-1/2”	\$ 50.00
2”	\$ 80.00
3”	\$ 160.00
4”	\$ 250.00
6”	\$ 550.00
8”	\$ 850.00
10”	\$ 1,250.00

**WATER USE RATE:**

First	4,000,000 gallons per month @	\$2.37 per 1,000 gallons
Next	23,000,000 gallons per month @	\$2.10 per 1,000 gallons
Over	27,000,000 gallons per month @	\$1.84 per 1,000 gallons

**BILLING:** Based on the total of the Base System fee plus the applicable usage rate for all water used during the billing cycle.

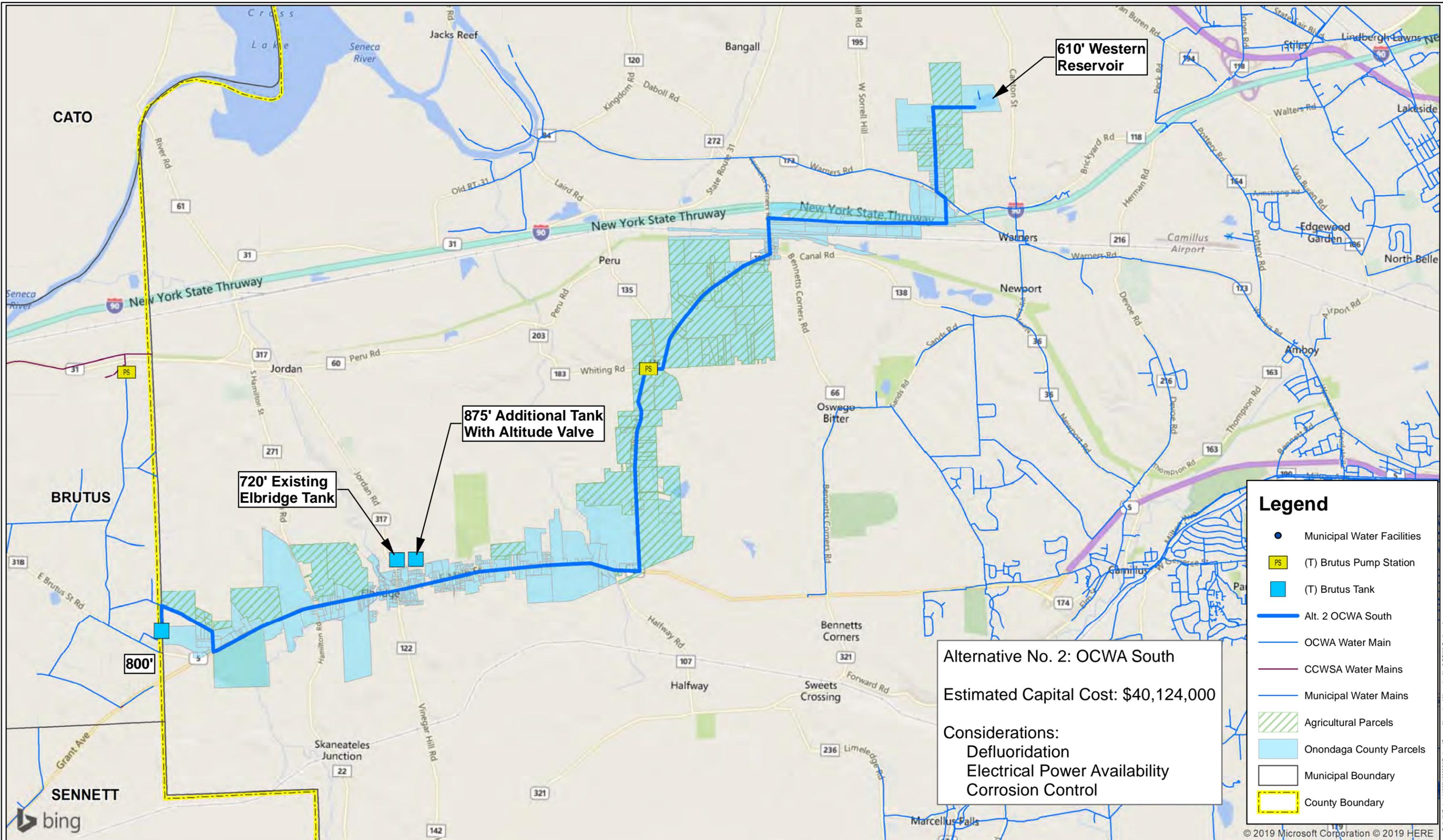
**PAYMENT:** Bills are rendered net and are payable within fifteen (15) days after presentation, in accordance with Article VIII of the Customer Rules.

**TERMS AND CONDITIONS:** Any customer electing to buy water on this schedule must continue to do so for twelve months before being allowed to change to Rate Schedule No. 1. Service hereunder is subject to the Customer Rules of Authority.

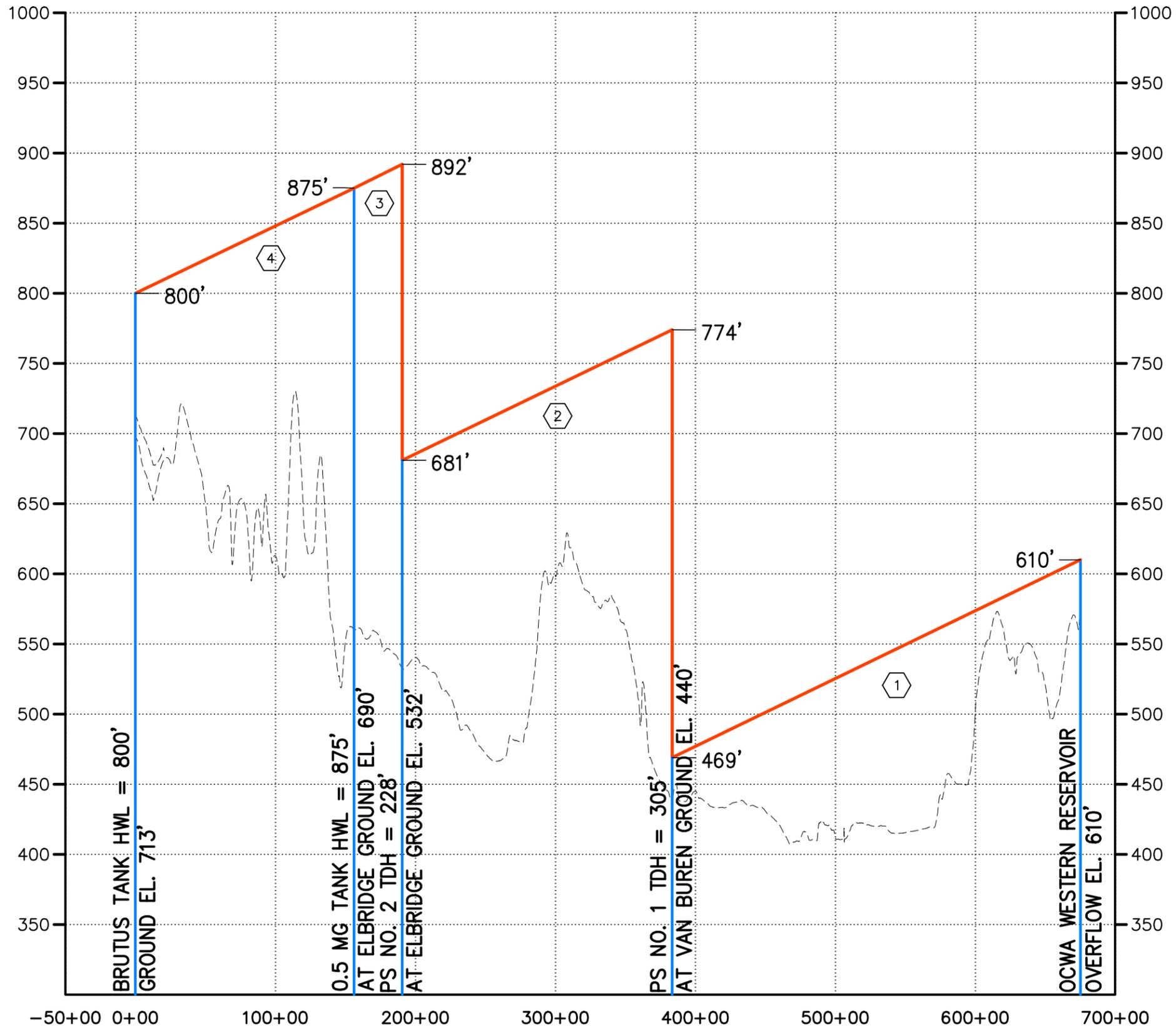


**APPENDIX C**  
**SOURCE ALTERNATIVE 2 DATA**  
**OCWA (SOUTH)**









- ① APPROXIMATE PIPE LENGTH = 29,169' HEADLOSS = 141'
- ② APPROXIMATE PIPE LENGTH = 19,288' HEADLOSS = 93'
- ③ APPROXIMATE PIPE LENGTH = 3,500' HEADLOSS = 17'
- ④ APPROXIMATE PIPE LENGTH = 15,628' HEADLOSS = 75'



Item	Description	Quantity	Unit	Unit Cost	Estimated Cost
1	18-INCH DUCTILE IRON PIPE	67,585	LF	\$ 202	\$ 13,681,700
2	18-INCH BFV AND VALVE BOX	84	EA	\$ 8,000	\$ 675,900
3	SUBBASE	1,252	CY	\$ 30	\$ 37,600
4	SAW CUTTING ASPHALT PAVEMENT AND/OR CONCRETE PAVEMENT BASE	13,517	LF	\$ 2.00	\$ 27,100
5	NYS DOT PAVEMENT RESTORATION	2,028	TON	\$ 140	\$ 283,900
6	TOPSOIL AND SEEDING	5,632	CY	\$ 85	\$ 478,727
7	HYDRANT ASSEMBLY	113	EA	\$ 7,334	\$ 826,200
8	AIR RELEASE VALVE AND MANHOLE	19	EA	\$ 12,500	\$ 237,500
9	CONNECTION TO EXISTING WATER MAIN	2	EA	\$ 3,900	\$ 7,800
10	NYS DOT ROADWAY CROSSING	1	EA	\$ 49,400	\$ 49,400
11	NYS DOT THRUWAY CROSSING	1	EA	\$ 131,600	\$ 131,600
12	MASTER METER PIT	1	EA	\$ 65,000	\$ 65,000
13	LAND ACQUISITION - TRANSMISSION MAIN	31	AC	\$ 5,000	\$ 155,200
14	DEWATERING	NEC	LS	\$ 200,000	\$ 200,000
15	LAND ACQUISITION - PUMP STATION AND STORAGE TANK	2.00	AC	\$ 5,000	\$ 10,000
16	CHEMICAL FEED EQUIPMENT FOR DISINFECTION AND CORROSION CONTROL	NEC	LS	\$ 25,000	\$ 100,000
17	PACKAGED BOOSTER PUMP STATION NO. 1 (VAN BUREN)	NEC	LS	\$ 718,750	\$ 718,750
18	PACKAGED BOOSTER PUMP STATION NO. 2 (ELBRIDGE)	NEC	LS	\$ 656,250	\$ 656,250
19	EMERGENCY GENERATOR	2	EA	\$ 40,000	\$ 80,000
20	0.5 MGD ELEVATED COMPOSITE WATER STORAGE TANK	NEC	LS	\$ 1,185,000	\$ 1,185,000
21	ELECTRICAL	NEC	LS	\$ 150,000	\$ 150,000
22	WORK ZONE TRAFFIC CONTROL	NEC	LS	\$ 100,000	\$ 100,000
23	EROSION AND SEDIMENT CONTROL	NEC	LS	\$ 45,000	\$ 45,000
24	MOBILIZATION	NEC	LS	\$ 597,100	\$ 597,100
<b>SUBTOTAL</b>					<b>\$ 20,499,800</b>
BONDS, INSURANCE, GENERAL CONDITIONS				1.75%	\$ 358,800
ENGINEERING, LEGAL, ADMINISTRATION				25%	\$ 5,125,000
CONSTRUCTION CONTINGENCY				30%	\$ 6,150,000
TOTAL OPINION OF PROBABLE COST					\$ 32,133,600
<b>ESCALATE TO MID-POINT OF CONSTRUCTION (2021)</b>					<b>3% \$ 35,114,000</b>





Effective January 1, 2018



**RATE SCHEDULE NO. 7A**  
**General Municipal Service – Monthly (Alternate Capacity Charge)**

**AVAILABILITY:** Service to any customer within the Authority’s service area receiving service from an Authority-owned water main and using over 500,000 gallons per month. Customer must provide dry pit or enclosure with a 115-volt power outlet within 5 feet of the register location. Customer shall pay for power consumed.

**APPLICABILITY:** Wholesale Municipal Metered Purpose

**BASE SYSTEM FEE:** The base system fee for services hereunder shall be:

<b><u>Size of Meter:</u></b>	<b><u>Base System Fee:</u></b>
1”	\$ 25.00
1-1/2”	\$ 50.00
2”	\$ 80.00
3”	\$ 160.00
4”	\$ 250.00
6”	\$ 550.00
8”	\$ 850.00
10”	\$ 1,250.00

**WATER USE RATE:**

First	4,000,000 gallons per month @	\$2.37 per 1,000 gallons
Next	23,000,000 gallons per month @	\$2.10 per 1,000 gallons
Over	27,000,000 gallons per month @	\$1.84 per 1,000 gallons

**BILLING:** Based on the total of the Base System fee plus the applicable usage rate for all water used during the billing cycle.

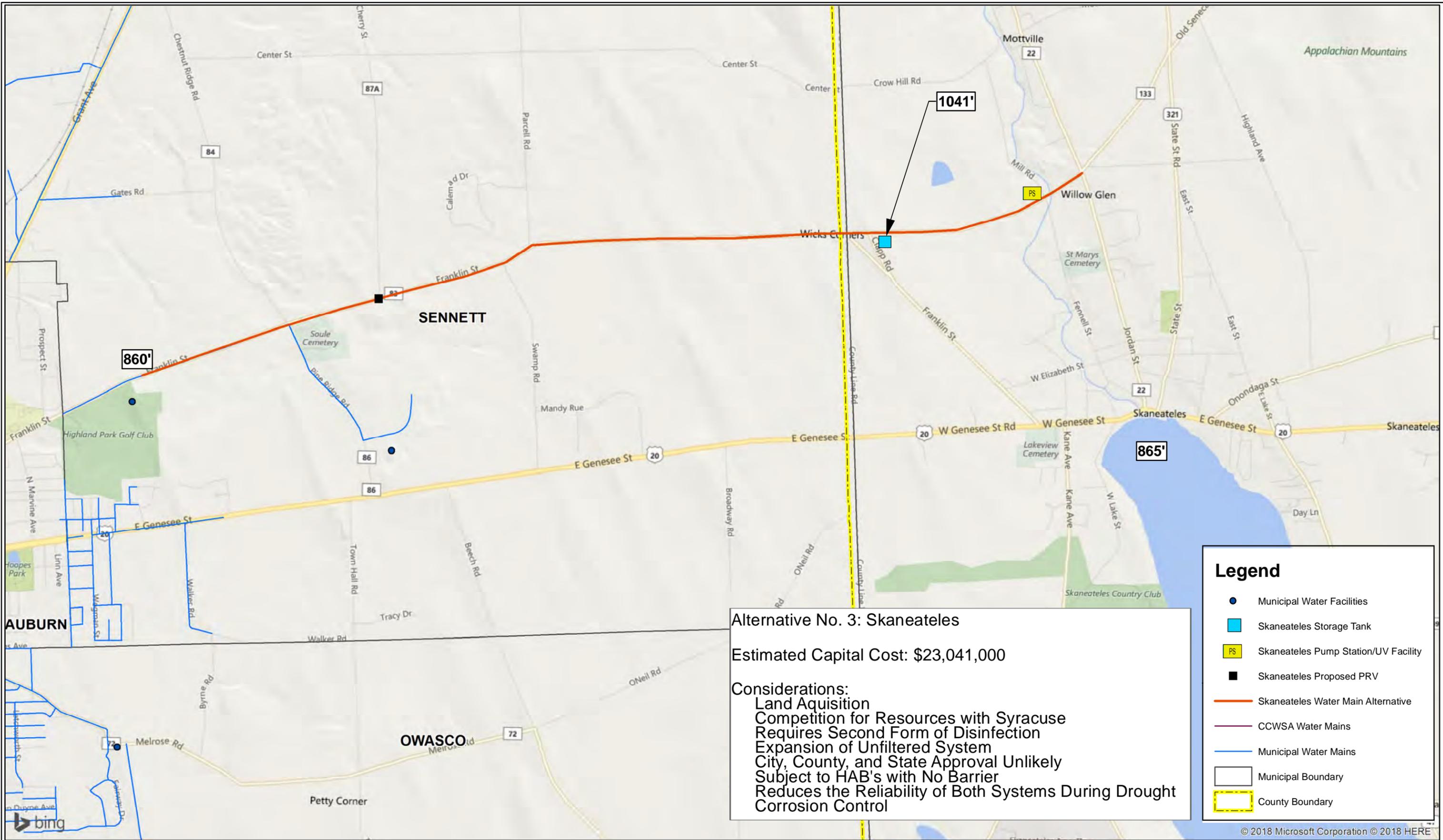
**PAYMENT:** Bills are rendered net and are payable within fifteen (15) days after presentation, in accordance with Article VIII of the Customer Rules.

**TERMS AND CONDITIONS:** Any customer electing to buy water on this schedule must continue to do so for twelve months before being allowed to change to Rate Schedule No. 1. Service hereunder is subject to the Customer Rules of Authority.



**APPENDIX D**  
**SOURCE ALTERNATIVE 3 DATA**  
**SKANEATELES LAKE**





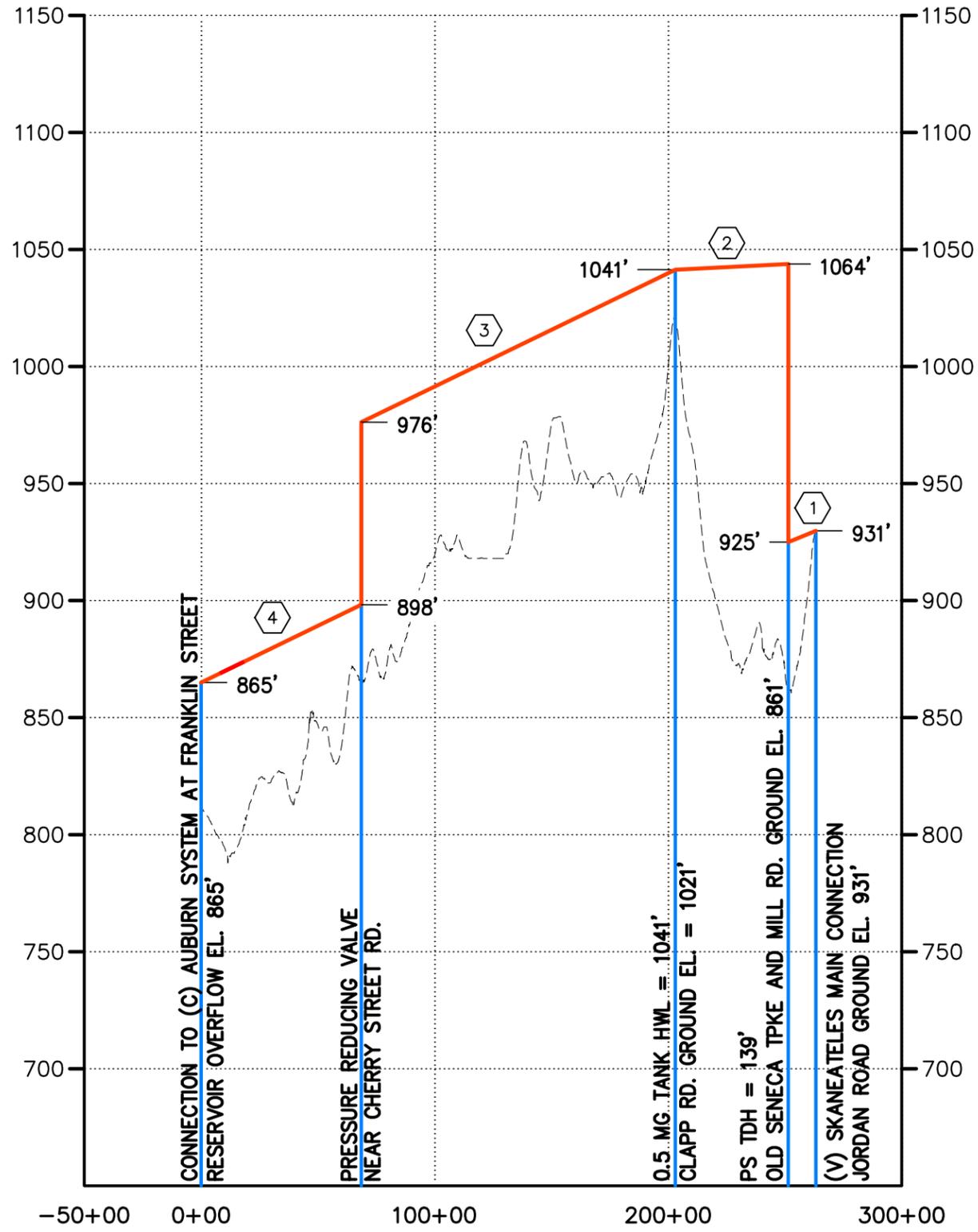
**Alternative No. 3: Skaneateles**  
**Estimated Capital Cost: \$23,041,000**

**Considerations:**  
 Land Aquisition  
 Competition for Resources with Syracuse  
 Requires Second Form of Disinfection  
 Expansion of Unfiltered System  
 City, County, and State Approval Unlikely  
 Subject to HAB's with No Barrier  
 Reduces the Reliability of Both Systems During Drought  
 Corrosion Control

**Legend**

- Municipal Water Facilities
- Skaneateles Storage Tank
- PS Skaneateles Pump Station/UV Facility
- Skaneateles Proposed PRV
- Skaneateles Water Main Alternative
- CCWSA Water Mains
- Municipal Water Mains
- Municipal Boundary
- County Boundary





- ① APPROXIMATE PIPE LENGTH = 1,182' HEADLOSS = 6'
- ② APPROXIMATE PIPE LENGTH = 4,839' HEADLOSS = 23'
- ③ APPROXIMATE PIPE LENGTH = 13,443' HEADLOSS = 65'
- ④ APPROXIMATE PIPE LENGTH = 6,864' HEADLOSS = 33'



Date  
 SEPTEMBER 2018

Scale  
 NO SCALE

Figure Number  
**3**

Project Number  
 1980.001.001

ALTERNATIVE 3: SKANEATELES HYDRAULIC PROFILE

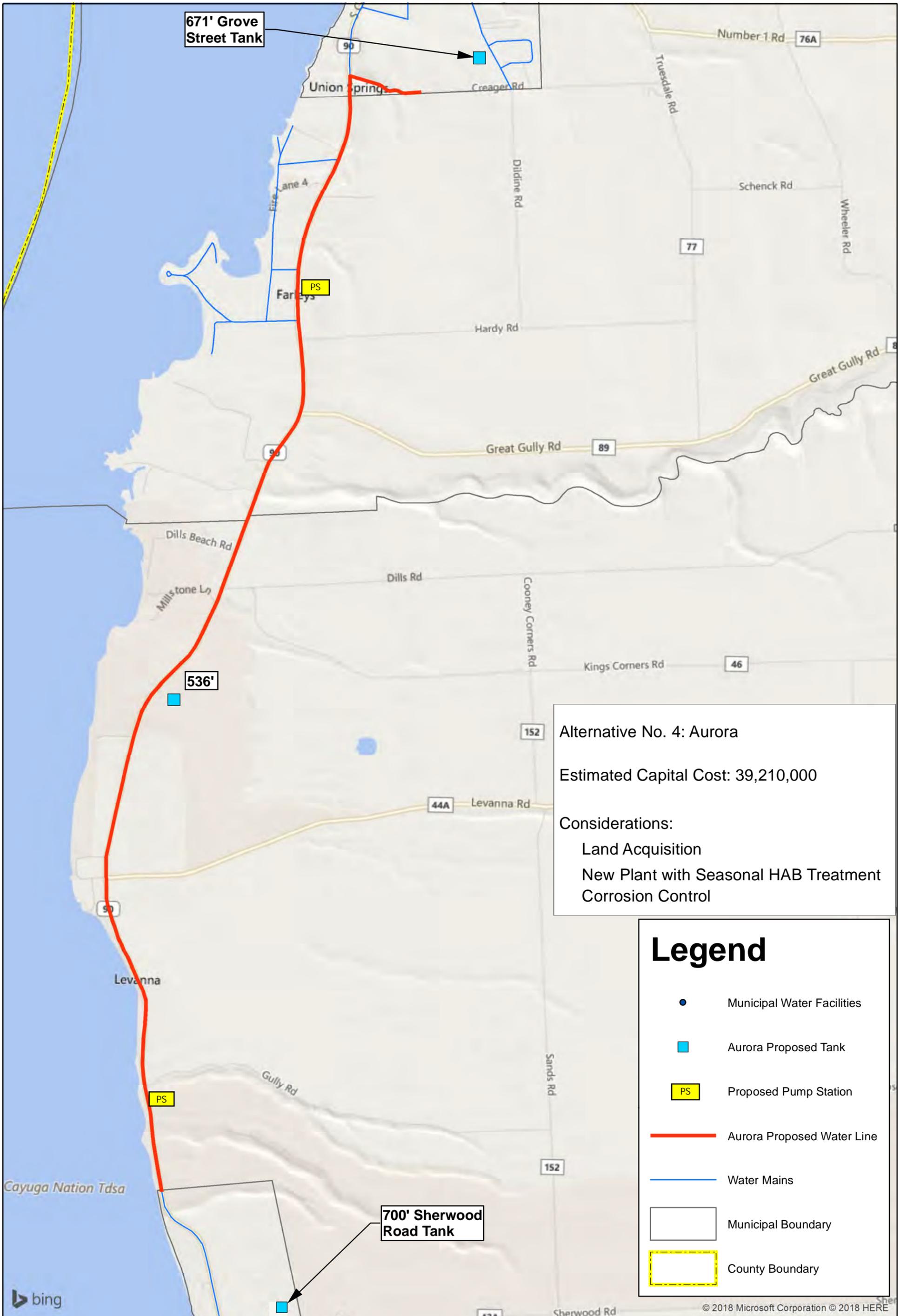


Item	Description	Quantity	Unit	Unit Cost	Estimated Cost
1	18-INCH DUCTILE IRON PIPE	26,328	LF	\$ 202	\$ 5,329,800
2	18-INCH BFV AND VALVE BOX	33	EA	\$ 8,000	\$ 263,300
3	SUBBASE	488	CY	\$ 30	\$ 14,700
4	SAW CUTTING ASPHALT PAVEMENT AND/OR CONCRETE PAVEMENT BASE	5,266	LF	\$ 2.00	\$ 10,600
5	NYSDOT PAVEMENT RESTORATION	790	TON	\$ 140	\$ 110,600
6	TOPSOIL AND SEEDING	2,194	CY	\$ 85	\$ 186,490
7	HYDRANT ASSEMBLY	44	EA	\$ 7,334	\$ 321,900
8	AIR RELEASE VALVE AND MANHOLE	11	EA	\$ 12,500	\$ 137,500
9	CONNECTION TO EXISTING WATER MAIN	2	EA	\$ 3,900	\$ 7,800
10	NYSDOT ROADWAY CROSSING	1	EA	\$ 49,400	\$ 49,400
11	MASTER METER PIT	1	EA	\$ 65,000	\$ 65,000
12	LAND ACQUISITION - TRANSMISSION MAIN	12	AC	\$ 5,000	\$ 60,500
13	DEWATERING	NEC	LS	\$ 200,000	\$ 200,000
14	LAND ACQUISITION - PUMP STATION AND STORAGE TANK	1.50	AC	\$ 5,000	\$ 7,500
15	CHEMICAL FEED EQUIPMENT FOR DISINFECTION AND CORROSION CONTROL	NEC	LS	\$ 25,000	\$ 100,000
16	UV DISINFECTION SYSTEM	NEC	LS	\$ 189,000	\$ 189,000
17	PACKAGED BOOSTER PUMP STATION	NEC	LS	\$ 625,000	\$ 625,000
18	EMERGENCY GENERATOR	1	EA	\$ 40,000	\$ 40,000
19	0.5 MGD GROUND SUPPORTED CONCRETE WATER STORAGE TANK	NEC	LS	\$ 1,185,000	\$ 1,185,000
20	ELECTRICAL	NEC	LS	\$ 100,000	\$ 100,000
21	WORK ZONE TRAFFIC CONTROL	NEC	LS	\$ 50,000	\$ 50,000
22	EROSION AND SEDIMENT CONTROL	NEC	LS	\$ 15,000	\$ 15,000
23	MOBILIZATION	NEC	LS	\$ 272,100	\$ 272,100
<b>SUBTOTAL</b>					<b>\$ 9,341,200</b>
BONDS, INSURANCE, GENERAL CONDITIONS				1.75%	\$ 163,500
ENGINEERING, LEGAL, ADMINISTRATION				25%	\$ 2,335,300
CONSTRUCTION CONTINGENCY				30%	\$ 2,802,400
TOTAL OPINION OF PROBABLE COST					\$ 14,642,400
ESCALATE TO MID-POINT OF CONSTRUCTION (2021)				3%	\$ 16,001,000



**APPENDIX E**  
**SOURCE ALTERNATIVE 4 DATA**  
**CAYUGA LAKE AT AURORA**





Alternative No. 4: Aurora

Estimated Capital Cost: 39,210,000

Considerations:  
 Land Acquisition  
 New Plant with Seasonal HAB Treatment  
 Corrosion Control

### Legend

- Municipal Water Facilities
- Aurora Proposed Tank
- PS Proposed Pump Station
- Aurora Proposed Water Line
- Water Mains
- Municipal Boundary
- County Boundary

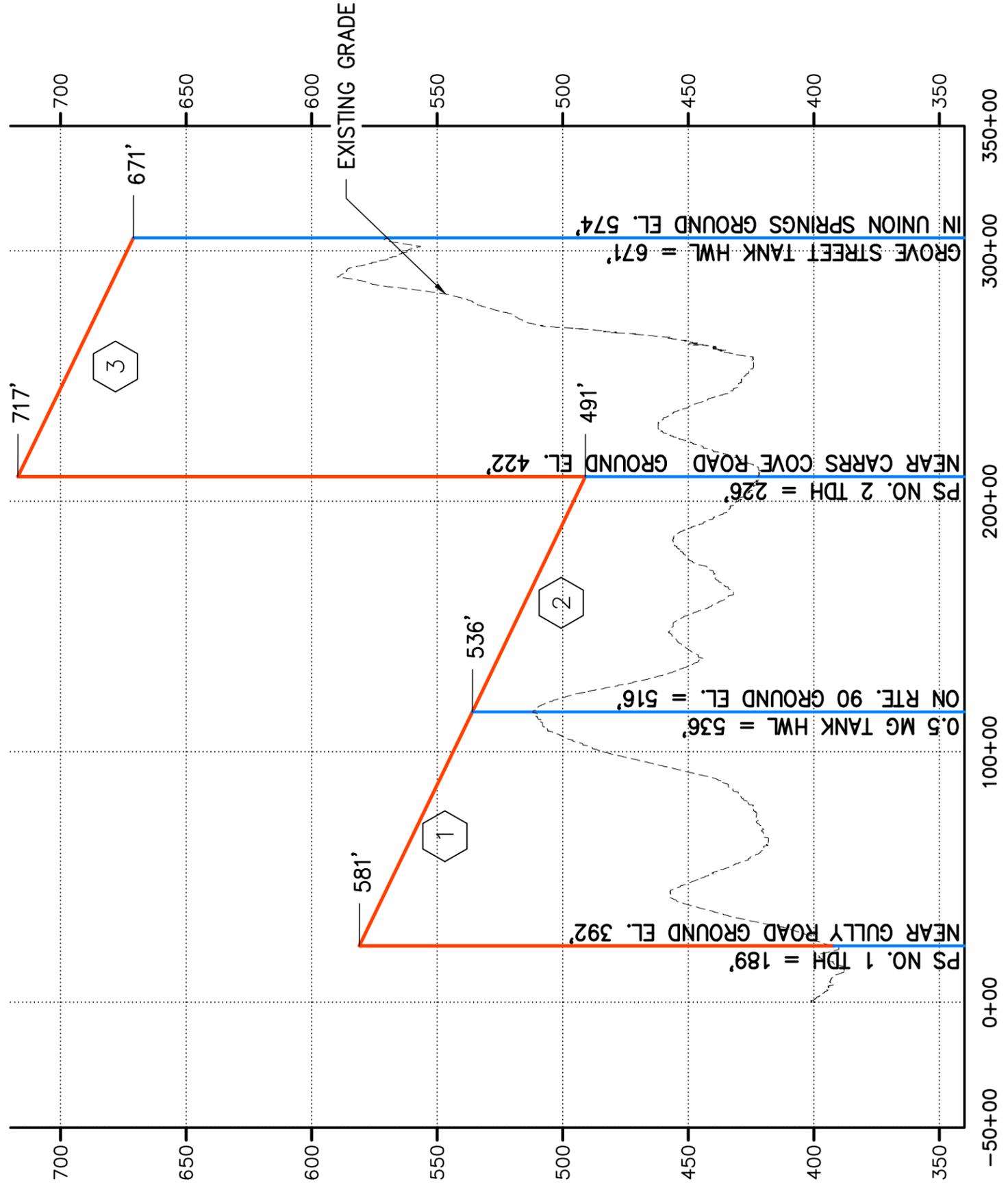


CAYUGA COUNTY WATER AND SEWER AUTHORITY  
 REGIONAL MASTER PLAN  
 ALTERNATIVE 4: CAYUGA LAKE/AURORA  
 HYDRAULIC PROFILE

CAYUGA COUNTY, NEW YORK



Date	SEPTEMBER 2018
Scale	NO SCALE
Figure Number	4
Project Number	1980.001.001



- 1 APPROXIMATE PIPE LENGTH = 9,345' HEADLOSS = 45'
- 2 APPROXIMATE PIPE LENGTH = 9,390' HEADLOSS = 45'
- 3 APPROXIMATE PIPE LENGTH = 9,536' HEADLOSS = 46'

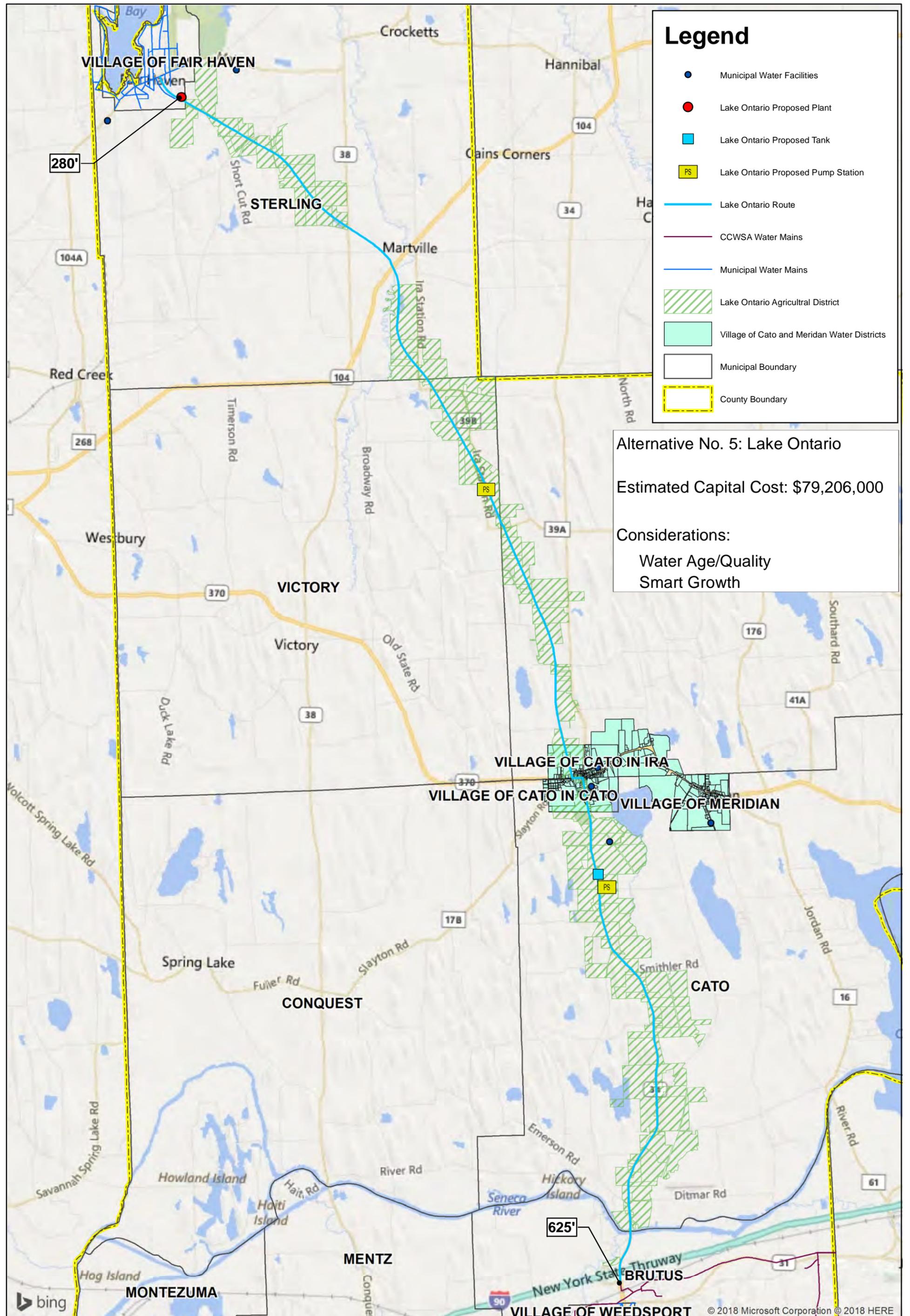


Item	Description	Quantity	Unit	Unit Cost	Estimated Cost
1	18-INCH DUCTILE IRON PIPE	28,271	LF	\$ 202	\$ 5,723,100
2	18-INCH BFV AND VALVE BOX	35	EA	\$ 8,000	\$ 282,800
3	SUBBASE	524	CY	\$ 30	\$ 15,800
4	SAW CUTTING ASPHALT PAVEMENT AND/OR CONCRETE PAVEMENT BASE	5,654	LF	\$ 2.00	\$ 11,400
5	NYSDOT PAVEMENT RESTORATION	848	TON	\$ 140	\$ 118,800
6	TOPSOIL AND SEEDING	2,356	CY	\$ 85	\$ 200,253
7	HYDRANT ASSEMBLY	47	EA	\$ 7,334	\$ 345,600
8	AIR RELEASE VALVE AND MANHOLE	7	EA	\$ 12,500	\$ 87,500
9	CONNECTION TO EXISTING WATER MAIN	2	EA	\$ 3,900	\$ 7,800
10	NYSDOT ROADWAY CROSSING	1	EA	\$ 49,400	\$ 49,400
11	MASTER METER PIT	1	EA	\$ 65,000	\$ 65,000
12	LAND ACQUISITION - TRANSMISSION MAIN	13	AC	\$ 5,000	\$ 65,000
13	DEWATERING	NEC	LS	\$ 200,000	\$ 200,000
14	LAND ACQUISITION - PUMP STATION AND STORAGE TANK	2.00	AC	\$ 5,000	\$ 10,000
15	CHEMICAL FEED EQUIPMENT FOR DISINFECTION AND CORROSION CONTROL	NEC	LS	\$ 25,000	\$ 100,000
16	PACKAGED BOOSTER PUMP STATION NO. 1 (GULLY ROAD)	NEC	LS	\$ 625,000	\$ 625,000
17	PACKAGED BOOSTER PUMP STATION NO. 2 (CARRS COVE ROAD)	NEC	LS	\$ 687,500	\$ 687,500
18	EMERGENCY GENERATOR	2	EA	\$ 60,000	\$ 120,000
19	0.5 MGD GROUND SUPPORTED CONCRETE WATER STORAGE TANK	NEC	LS	\$ 1,185,000	\$ 1,185,000
20	ELECTRICAL	NEC	LS	\$ 150,000	\$ 150,000
21	WORK ZONE TRAFFIC CONTROL	NEC	LS	\$ 50,000	\$ 50,000
22	EROSION AND SEDIMENT CONTROL	NEC	LS	\$ 15,000	\$ 15,000
23	NEW WATER TREATMENT PLANT	NEC	LS	\$ 12,000,000	\$ 12,000,000
24	MOBILIZATION	NEC	LS	\$ 663,500	\$ 663,500
<b><i>SUBTOTAL</i></b>					<b>\$ 22,778,500</b>
				BONDS, INSURANCE, GENERAL CONDITIONS	1.75% \$ 398,700
				ENGINEERING, LEGAL, ADMINISTRATION	25% \$ 5,694,700
				CONSTRUCTION CONTINGENCY	30% \$ 6,833,600
TOTAL OPINION OF PROBABLE COST					\$ 35,705,500
<b>ESCALATE TO MID-POINT OF CONSTRUCTION (2021)</b>					<b>3% \$ 39,017,000</b>



**APPENDIX F**  
**SOURCE ALTERNATIVE 5 DATA**  
**LAKE ONTARIO AT STERLING**





### Legend

- Municipal Water Facilities
- Lake Ontario Proposed Plant
- Lake Ontario Proposed Tank
- PS Lake Ontario Proposed Pump Station
- Lake Ontario Route
- CCWSA Water Mains
- Municipal Water Mains
- Lake Ontario Agricultural District
- Village of Cato and Meridan Water Districts
- Municipal Boundary
- County Boundary

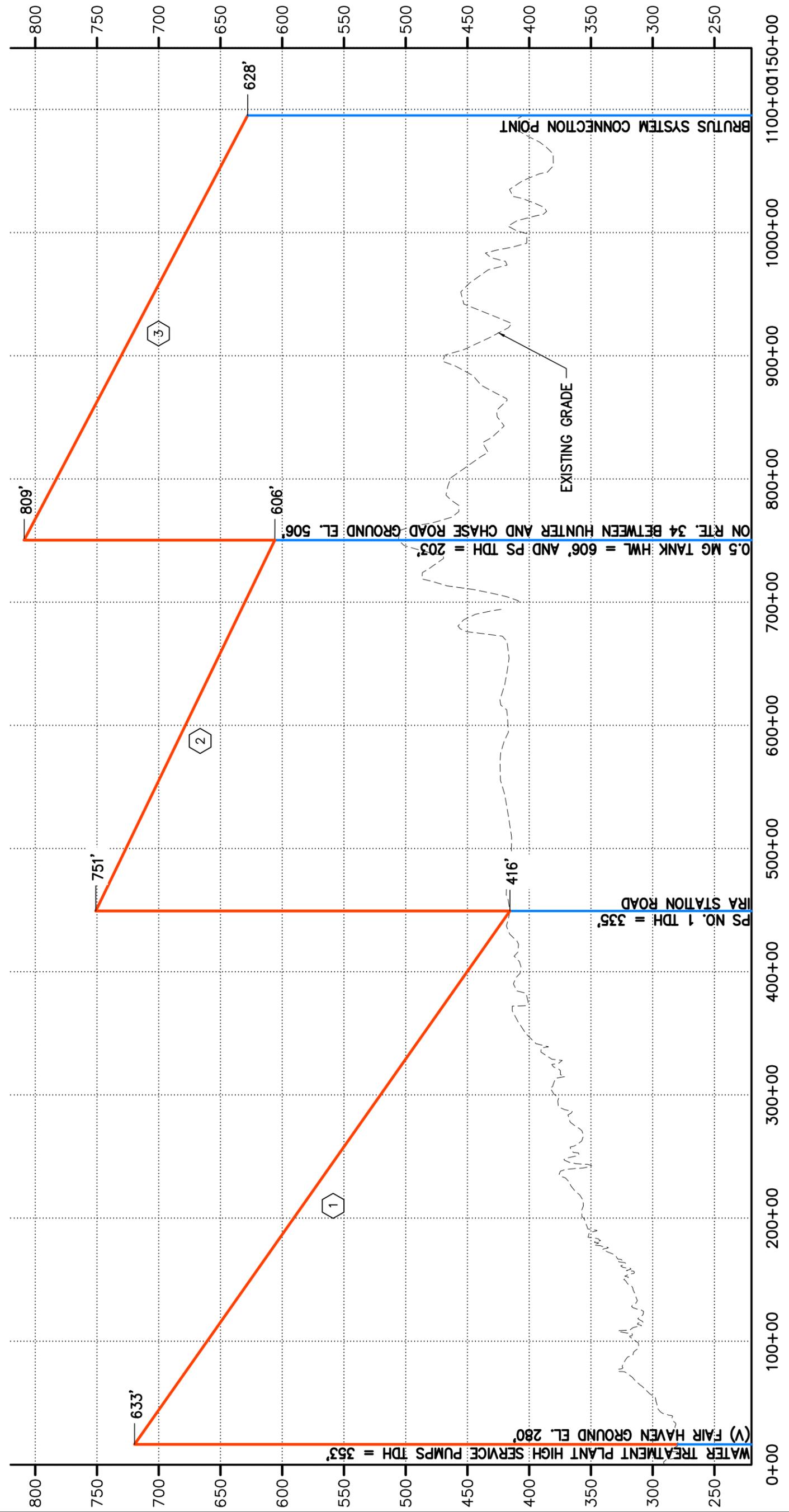
**Alternative No. 5: Lake Ontario**

**Estimated Capital Cost: \$79,206,000**

**Considerations:**

- Water Age/Quality
- Smart Growth





- ① APPROXIMATE PIPE LENGTH = 44,956' HEADLOSS = 217'
- ② APPROXIMATE PIPE LENGTH = 30,103' HEADLOSS = 145'
- ③ APPROXIMATE PIPE LENGTH = 34,650' HEADLOSS = 181'



## Alternative No. 5: Lake Ontario Water Supply

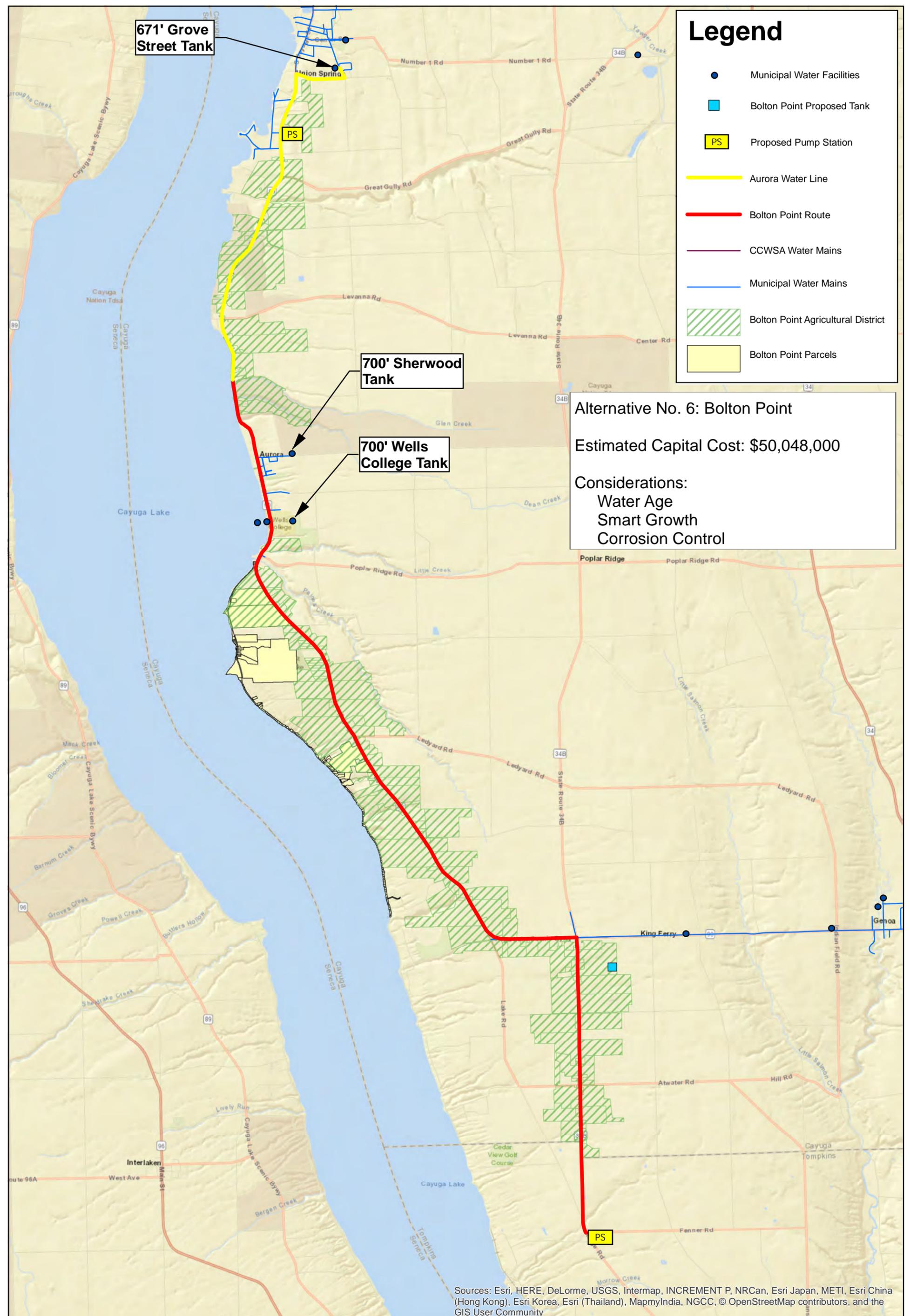
9/12/2018

Item	Description	Quantity	Unit	Unit Cost	Estimated Cost
1	18-INCH DUCTILE IRON PIPE	109,709	LF	\$ 202	\$ 22,209,100
2	18-INCH BFV AND VALVE BOX	137	EA	\$ 8,000	\$ 1,097,100
3	SUBBASE	2,032	CY	\$ 30	\$ 61,000
4	SAW CUTTING ASPHALT PAVEMENT AND/OR CONCRETE PAVEMENT BASE	21,942	LF	\$ 2.00	\$ 43,900
5	NYS DOT PAVEMENT RESTORATION	3,291	TON	\$ 140	\$ 460,800
6	TOPSOIL AND SEEDING	9,142	CY	\$ 85	\$ 777,105
7	HYDRANT ASSEMBLY	183	EA	\$ 7,334	\$ 1,341,100
8	AIR RELEASE VALVE AND MANHOLE	10	EA	\$ 12,500	\$ 125,000
9	CONNECTION TO EXISTING WATER MAIN	2	EA	\$ 3,900	\$ 7,800
10	NYS DOT ROADWAY CROSSING	1	EA	\$ 49,400	\$ 49,400
11	MASTER METER PIT	1	EA	\$ 65,000	\$ 65,000
12	LAND ACQUISITION - TRANSMISSION MAIN	50	AC	\$ 5,000	\$ 251,900
13	DEWATERING	NEC	LS	\$ 200,000	\$ 200,000
14	LAND ACQUISITION - PUMP STATION AND STORAGE TANK	1.50	AC	\$ 5,000	\$ 7,500
15	CHEMICAL FEED EQUIPMENT FOR DISINFECTION AND CORROSION CONTROL	NEC	LS	\$ 25,000	\$ 50,000
16	PACKAGED BOOSTER PUMP STATION	1	EA	\$ 625,000	\$ 625,000
17	EMERGENCY GENERATOR	1	EA	\$ 60,000	\$ 60,000
18	0.5 MGD ELEVATED COMPOSITE WATER STORAGE TANK	NEC	LS	\$ 2,160,000	\$ 2,160,000
19	ELECTRICAL	NEC	LS	\$ 100,000	\$ 100,000
20	WORK ZONE TRAFFIC CONTROL	NEC	LS	\$ 150,000	\$ 150,000
21	EROSION AND SEDIMENT CONTROL	NEC	LS	\$ 50,000	\$ 50,000
22	NEW WATER TREATMENT PLANT	NEC	LS	\$ 12,000,000	\$ 12,000,000
23	MOBILIZATION	NEC	LS	\$ 1,256,800	\$ 1,256,800
<b><i>SUBTOTAL</i></b>					<b>\$ 43,148,600</b>
				BONDS, INSURANCE, GENERAL CONDITIONS	1.75% \$ 755,200
				ENGINEERING, LEGAL, ADMINISTRATION	25% \$ 10,787,200
				CONSTRUCTION CONTINGENCY	30% \$ 12,944,600
TOTAL OPINION OF PROBABLE COST					\$ 67,635,600
<b>ESCALATE TO MID-POINT OF CONSTRUCTION (2021)</b>					<b>3% \$ 73,908,000</b>



**APPENDIX G**  
**SOURCE ALTERNATIVE 6 DATA**  
**BOLTON POINT WATER SYSTEM**





### Legend

- Municipal Water Facilities
- Bolton Point Proposed Tank
- PS Proposed Pump Station
- Aurora Water Line
- Bolton Point Route
- CCWSA Water Mains
- Municipal Water Mains
- Bolton Point Agricultural District
- Bolton Point Parcels

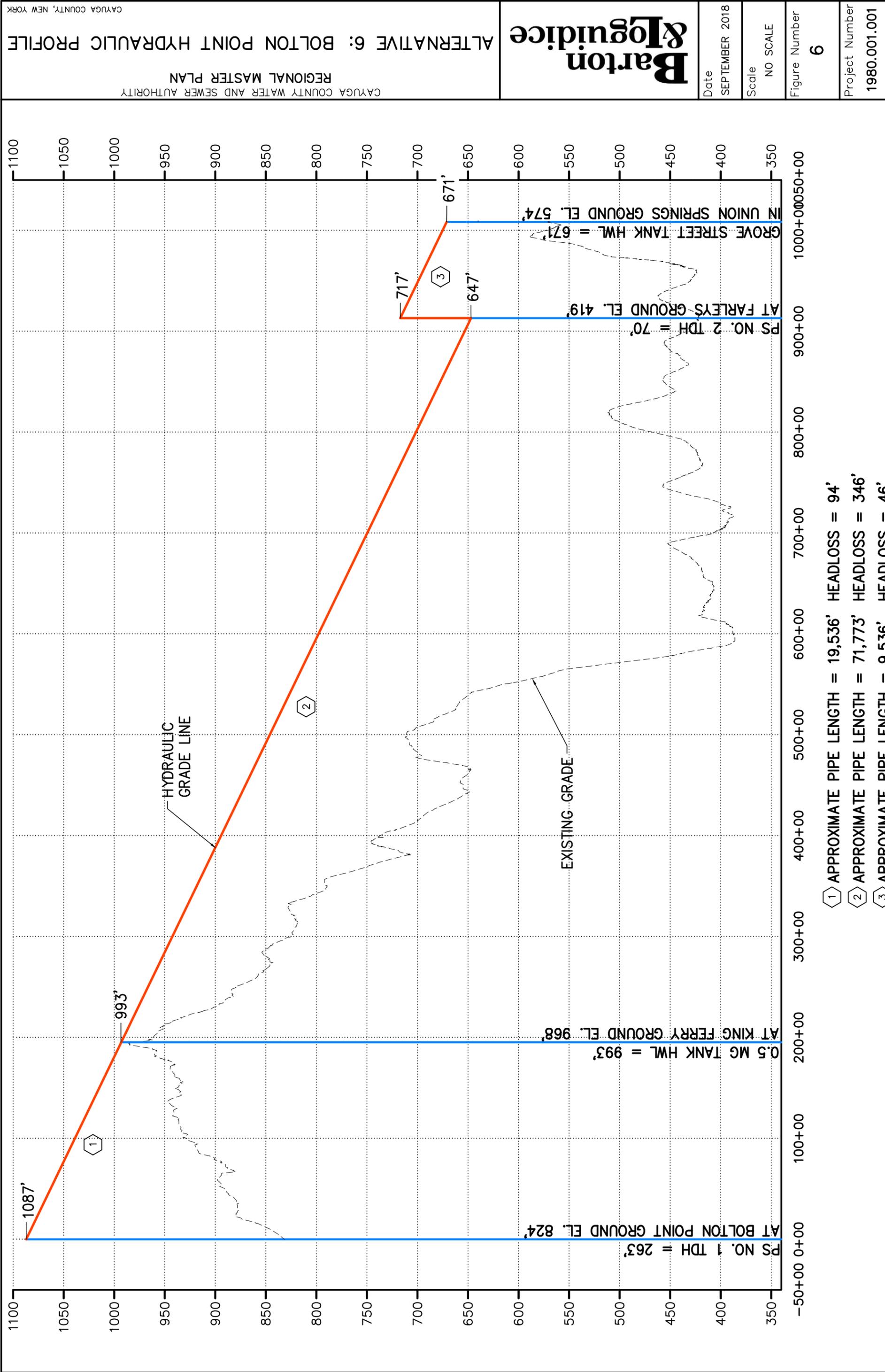
**Alternative No. 6: Bolton Point**  
**Estimated Capital Cost: \$50,048,000**  
**Considerations:**  
 Water Age  
 Smart Growth  
 Corrosion Control

Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community



1 inch = 6,056 feet





- ① APPROXIMATE PIPE LENGTH = 19,536' HEADLOSS = 94'
- ② APPROXIMATE PIPE LENGTH = 71,773' HEADLOSS = 346'
- ③ APPROXIMATE PIPE LENGTH = 9,536' HEADLOSS = 46'

CAYUGA COUNTY WATER AND SEWER AUTHORITY  
 REGIONAL MASTER PLAN  
 ALTERNATIVE 6: BOLTON POINT HYDRAULIC PROFILE  
 CAYUGA COUNTY, NEW YORK

Date: SEPTEMBER 2018

Scale: NO SCALE

Figure Number: **6**

Project Number: 1980.001.001



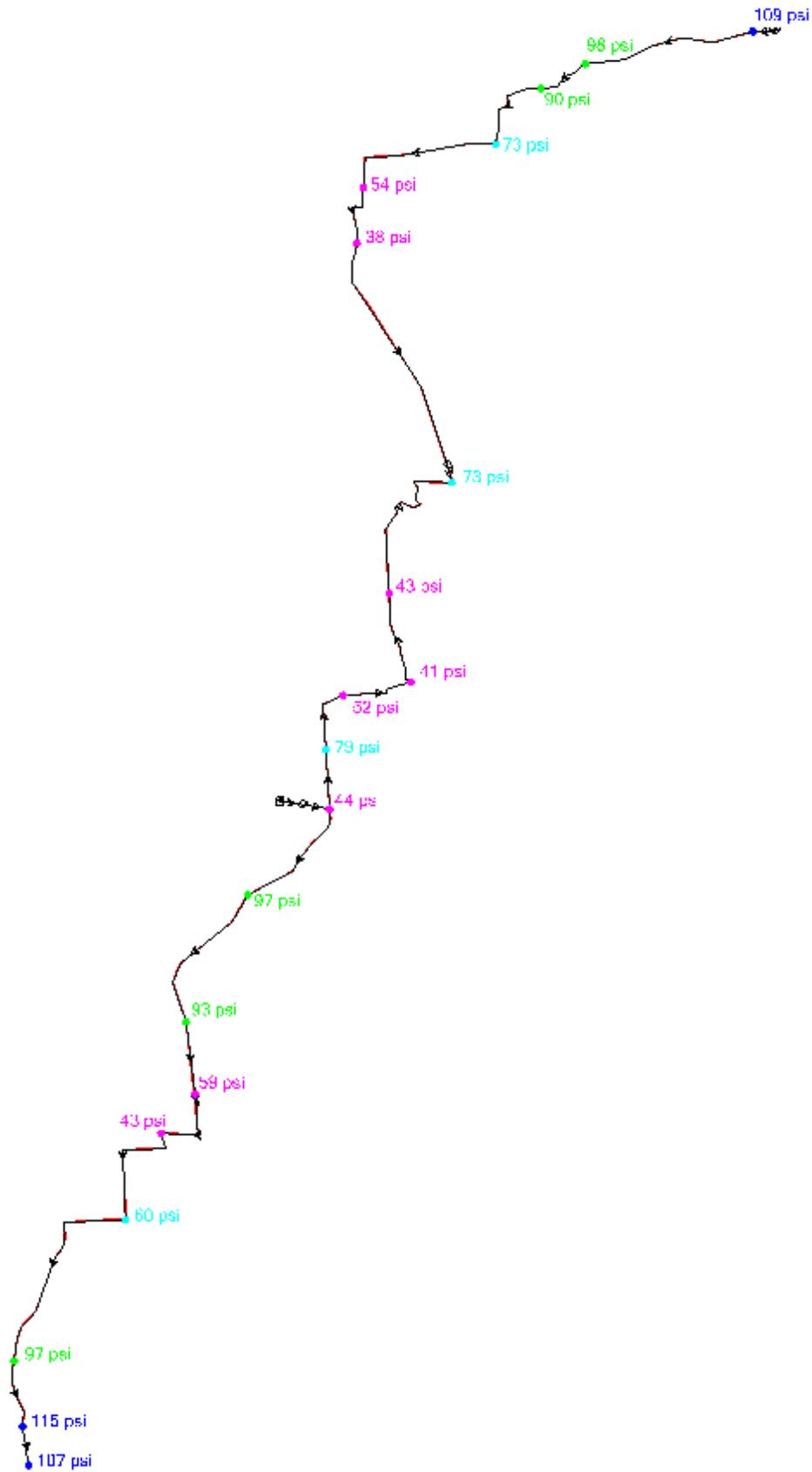
Item	Description	Quantity	Unit	Unit Cost	Estimated Cost
1	18-INCH DUCTILE IRON PIPE	100,845	LF	\$ 202	\$ 20,414,700
2	18-INCH BFV AND VALVE BOX	126	EA	\$ 8,000	\$ 1,008,500
3	SUBBASE	1,868	CY	\$ 30	\$ 56,100
4	SAW CUTTING ASPHALT PAVEMENT AND/OR CONCRETE PAVEMENT BASE	20,169	LF	\$ 2.00	\$ 40,400
5	NYS DOT PAVEMENT RESTORATION	3,025	TON	\$ 140	\$ 423,600
6	TOPSOIL AND SEEDING	8,404	CY	\$ 85	\$ 714,319
7	HYDRANT ASSEMBLY	168	EA	\$ 7,334	\$ 1,232,800
8	AIR RELEASE VALVE AND MANHOLE	15	EA	\$ 12,500	\$ 187,500
9	CONNECTION TO EXISTING WATER MAIN	2	EA	\$ 3,900	\$ 7,800
10	NYS DOT ROADWAY CROSSING	3	EA	\$ 49,400	\$ 148,200
11	NYS DOT THRUWAY CROSSING	1	EA	\$ 131,600	\$ 131,600
12	MASTER METER PIT	1	EA	\$ 65,000	\$ 65,000
13	LAND ACQUISITION - TRANSMISSION MAIN	46	AC	\$ 5,000	\$ 231,600
14	DEWATERING	NEC	LS	\$ 200,000	\$ 200,000
15	LAND ACQUISITION - PUMP STATION AND STORAGE TANK	2.00	AC	\$ 5,000	\$ 10,000
16	CHEMICAL FEED EQUIPMENT FOR DISINFECTION AND CORROSION CONTROL	NEC	LS	\$ 25,000	\$ 100,000
17	PACKAGED BOOSTER PUMP STATION NO. 1 (FARLEY'S)	NEC	LS	\$ 687,500	\$ 687,500
18	PACKAGED BOOSTER PUMP STATION NO. 2 (KING FERRY)	NEC	LS	\$ 612,500	\$ 612,500
19	EMERGENCY GENERATOR	2	EA	\$ 60,000	\$ 120,000
20	0.5 MGD GROUND SUPPORTED CONCRETE WATER STORAGE TANK	NEC	LS	\$ 1,185,000	\$ 1,185,000
21	ELECTRICAL	NEC	LS	\$ 150,000	\$ 150,000
22	WORK ZONE TRAFFIC CONTROL	NEC	LS	\$ 175,000	\$ 175,000
23	EROSION AND SEDIMENT CONTROL	NEC	LS	\$ 75,000	\$ 75,000
24	MOBILIZATION	NEC	LS	\$ 839,400	\$ 839,400
<b>SUBTOTAL</b>					<b>\$ 28,816,600</b>
BONDS, INSURANCE, GENERAL CONDITIONS				1.75%	\$ 504,300
ENGINEERING, LEGAL, ADMINISTRATION				25%	\$ 7,204,200
CONSTRUCTION CONTINGENCY				30%	\$ 8,645,000
TOTAL OPINION OF PROBABLE COST					\$ 45,170,100
ESCALATE TO MID-POINT OF CONSTRUCTION (2021)					3% \$ 49,359,000

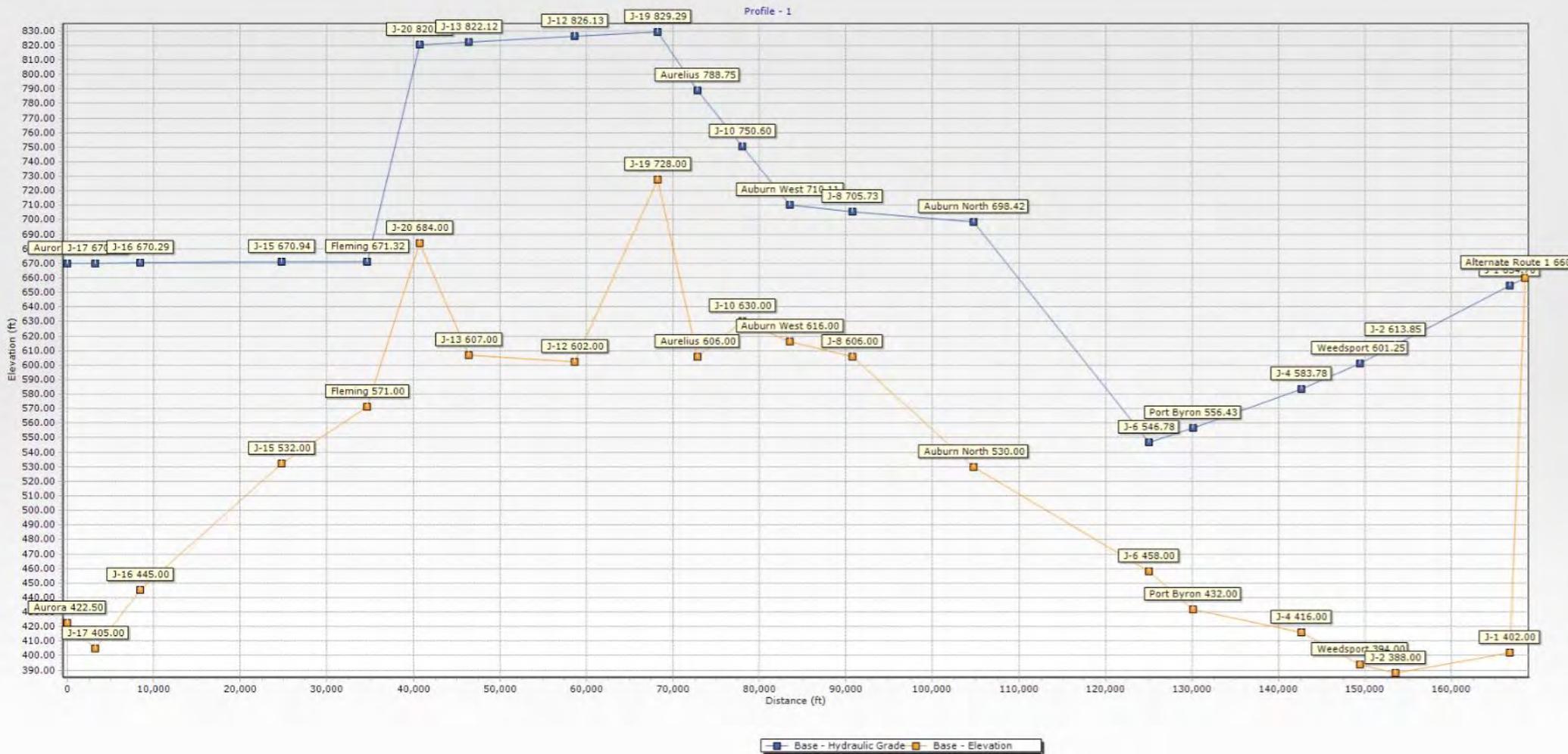


**APPENDIX B**  
**TRANSMISSION SPINE HYDRAULIC MODEL**



**Alternative No. 1**  
**System Fed from North**





Elevation (ft)

Profile - 1

Distance (ft)

■ Base - Hydraulic Grade ■ Base - Elevation

Aurora

Aurora

Alternate Route 1

J-17 674.00 J-16 670.29 J-15 670.94 Fleming 671.32 J-20 684.00 J-13 822.12 J-12 826.13 J-19 829.29 Aurelius 788.75 J-10 750.60 J-19 728.00 Auburn West 710.44 J-8 705.73 Auburn North 698.42 J-20 684.00 J-13 607.00 J-12 602.00 Aurelius 606.00 J-10 630.00 Auburn West 616.00 J-8 606.00 J-6 546.78 Port Byron 556.43 Auburn North 530.00 J-6 458.00 Port Byron 432.00 J-4 583.78 Weedsport 601.25 J-2 613.85 J-4 416.00 Weedsport 394.00 J-2 388.00 J-1 402.00

**Scenario: Base**  
**Current Time Step: 0.000 h**  
**FlexTable: Junction Table**

ID	Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
31	J-1	402.00	<None>	<Collection: 1 item>	0	654.70	109
33	J-2	388.00	<None>	<Collection: 1 item>	0	613.85	98
35	Weedsport	394.00	<None>	<Collection: 1 item>	97	601.25	90
37	J-4	416.00	<None>	<Collection: 1 item>	0	583.78	73
39	Port Byron	432.00	<None>	<Collection: 1 item>	139	556.43	54
41	J-6	458.00	<None>	<Collection: 1 item>	0	546.78	38
43	Auburn North	530.00	<None>	<Collection: 1 item>	1,215	698.42	73
45	J-8	606.00	<None>	<Collection: 1 item>	0	705.73	43
47	Auburn West	616.00	<None>	<Collection: 1 item>	1,215	710.11	41
49	J-10	630.00	<None>	<Collection: 1 item>	0	750.60	52
51	Aurelius	606.00	<None>	<Collection: 1 item>	181	788.75	79
53	J-12	602.00	<None>	<Collection: 1 item>	0	826.13	97
55	J-13	607.00	<None>	<Collection: 1 item>	0	822.12	93
57	Fleming	571.00	<None>	<Collection: 1 item>	208	671.32	43
59	J-15	532.00	<None>	<Collection: 1 item>	0	670.94	60
61	J-16	445.00	<None>	<Collection: 1 item>	0	670.29	97
63	J-17	405.00	<None>	<Collection: 1 item>	0	670.09	115
65	Aurora	422.50	<None>	<Collection: 1 item>	97	669.96	107
67	J-19	728.00	<None>	<Collection: 1 item>	0	829.29	44
70	J-20	684.00	<None>	<Collection: 1 item>	0	820.29	59

\\bfilsvr1\GIS\Projects\1900\1980001\Projects\Cayuga County Water Model\Cayuga\_County\_Model.wtg

Scenario: Base  
 Current Time Step: 0.000 h  
 FlexTable: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
32	P-1	1,719	Alternate Route 1	J-1	12.0	Ductile Iron	120.0	1,026	2.91	0.003
34	P-2	13,260	J-1	J-2	12.0	Ductile Iron	120.0	1,026	2.91	0.003
36	P-3	4,089	J-2	Weedspport	12.0	Ductile Iron	120.0	1,026	2.91	0.003
38	P-4	6,821	Weedspport	J-4	12.0	Ductile Iron	120.0	928	2.63	0.003
42	P-6	5,083	Port Byron	J-6	12.0	Ductile Iron	120.0	790	2.24	0.002
48	P-9	7,243	J-8	Auburn West	12.0	Ductile Iron	120.0	-426	1.21	0.001
50	P-10	5,505	Auburn West	J-10	12.0	Ductile Iron	120.0	-1,641	4.66	0.007
52	P-11	5,186	J-10	Aurelius	12.0	Ductile Iron	120.0	-1,641	4.66	0.007
56	P-13	12,255	J-12	J-13	12.0	Ductile Iron	120.0	306	0.87	0.000
60	P-15	9,862	Fleming	J-15	12.0	Ductile Iron	120.0	97	0.28	0.000
62	P-16	16,344	J-15	J-16	12.0	Ductile Iron	120.0	97	0.28	0.000
64	P-17	5,222	J-16	J-17	12.0	Ductile Iron	120.0	97	0.28	0.000
66	P-18	3,205	J-17	Aurora	12.0	Ductile Iron	120.0	97	0.28	0.000
68	P-19	4,541	Aurelius	J-19	12.0	Ductile Iron	120.0	-1,822	5.17	0.009
69	P-20	9,650	J-19	J-12	12.0	Ductile Iron	120.0	306	0.87	0.000
71	P-21	5,602	J-13	J-20	12.0	Ductile Iron	120.0	306	0.87	0.000
95	P-33	12,382	Port Byron	J-4	12.0	Ductile Iron	130.0	-928	2.63	0.002
102	P-38	14,014	J-8	Auburn North	12.0	Ductile Iron	130.0	426	1.21	0.001
108	P-42	1,776	T-2	PMP-6	12.0	Ductile Iron	130.0	2,127	6.03	0.010
109	P-43	2,072	PMP-6	J-19	12.0	Ductile Iron	130.0	2,127	6.03	0.010
111	P-44	18,956	J-6	PMP-7	12.0	Ductile Iron	120.0	790	2.24	0.002
112	P-45	1,383	PMP-7	Auburn North	12.0	Ductile Iron	120.0	790	2.24	0.002
129	P-56	590	J-20	PRV-5	12.0	Ductile Iron	120.0	306	0.87	0.000
130	P-57	5,548	PRV-5	Fleming	12.0	Ductile Iron	120.0	306	0.87	0.000

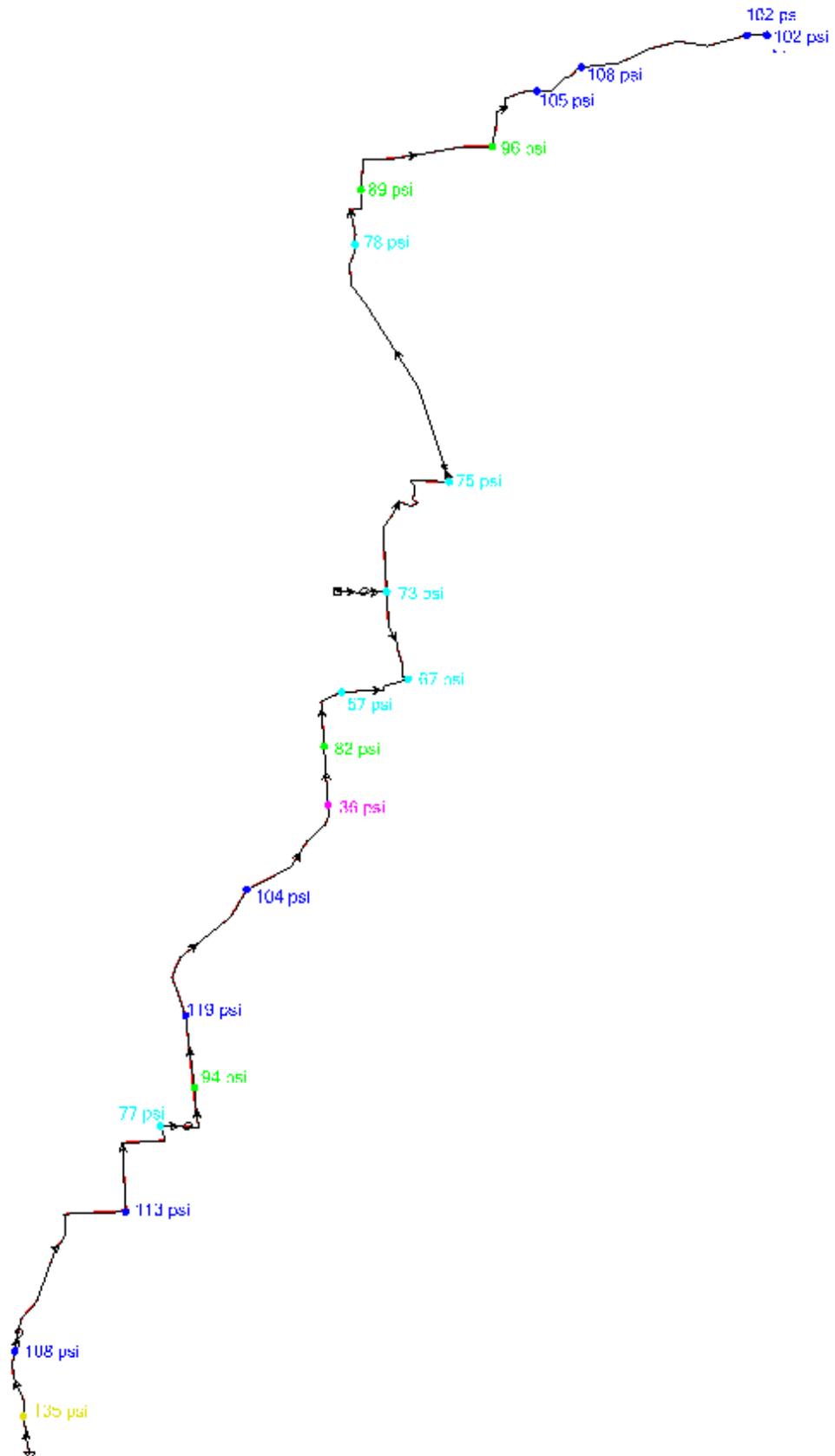
\\blfilsrv1\GIS\Projects\1900\1980001\Projects\Cayuga County Water Model\Cayuga\_County\_Model.wtg

**Scenario: Base**  
**Current Time Step: 0.000 h**  
**FlexTable: Tank Table**

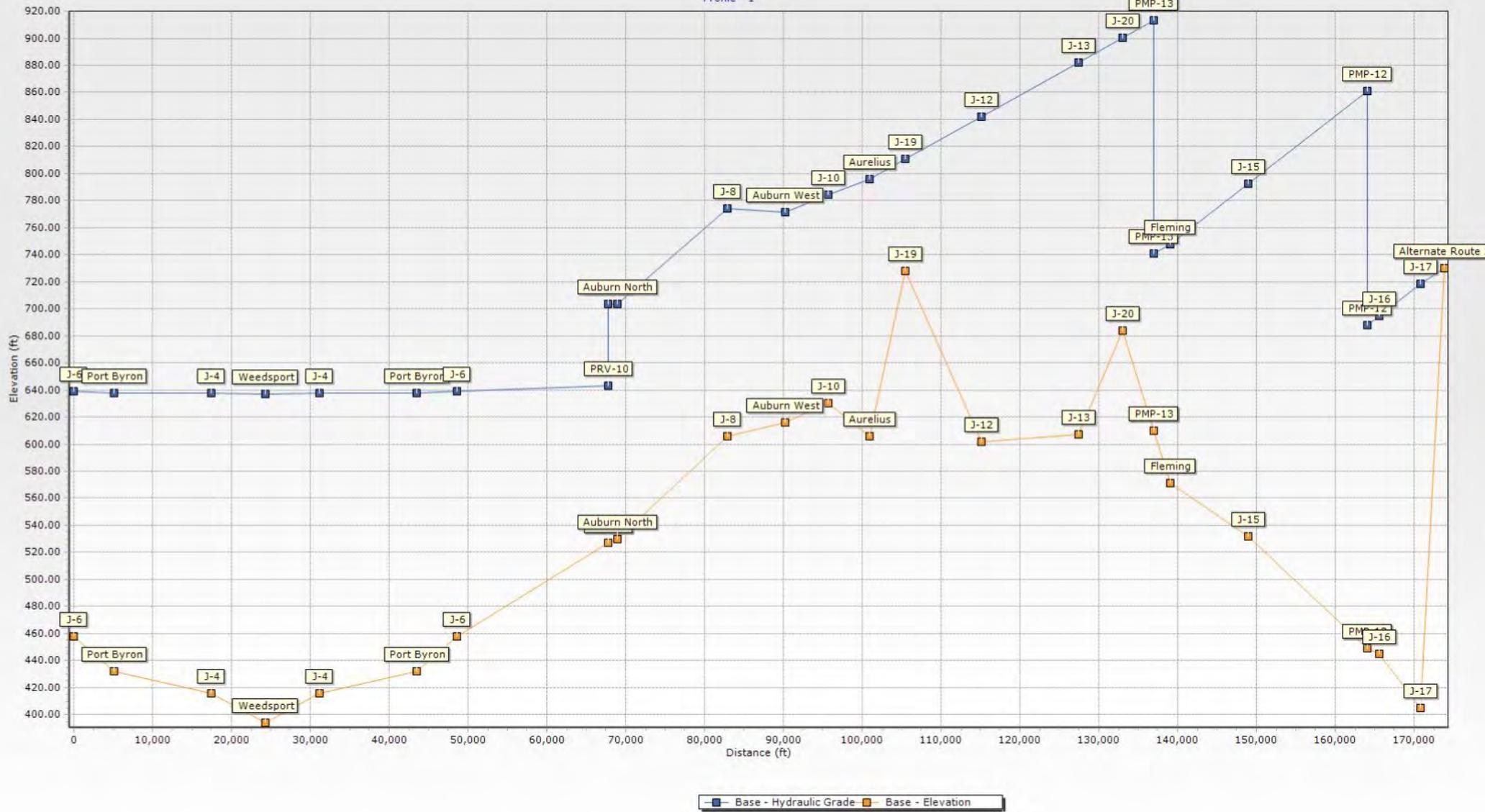
ID	Label	Zone	Elevation (Base) (ft)	Elevation (Minimum) (ft)	Elevation (Initial) (ft)	Elevation (Maximum) (ft)	Volume (Inactive) (MG)	Diameter (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
87	T-2	<None>	733.00	793.00	823.00	828.00	0.00	10.00	2,127	823.00

\\blfilsvr1\GIS\Projects\1900\1980001\Projects\Cayuga County Water Model\Cayuga\_County\_Model.wtg

**Alternative No. 2**  
**System Fed from South**



Profile - 1



**Scenario: Base**  
**Current Time Step: 0.000 h**  
**FlexTable: Junction Table**

ID	Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
31	J-1	402.00	<None>	<Collection: 1 item>	0	637.30	102
33	J-2	388.00	<None>	<Collection: 1 item>	0	637.30	108
35	Weedsport	394.00	<None>	<Collection: 1 item>	97	637.30	105
37	J-4	416.00	<None>	<Collection: 1 item>	0	637.56	96
39	Port Byron	432.00	<None>	<Collection: 1 item>	139	637.98	89
41	J-6	458.00	<None>	<Collection: 1 item>	0	639.01	78
43	Auburn North	530.00	<None>	<Collection: 1 item>	1,215	703.60	75
45	J-8	606.00	<None>	<Collection: 1 item>	0	774.41	73
47	Auburn West	616.00	<None>	<Collection: 1 item>	1,215	771.51	67
49	J-10	630.00	<None>	<Collection: 1 item>	0	784.13	67
51	Aurelius	606.00	<None>	<Collection: 1 item>	181	796.03	82
53	J-12	602.00	<None>	<Collection: 1 item>	0	842.25	104
55	J-13	607.00	<None>	<Collection: 1 item>	0	882.04	119
57	Fleming	571.00	<None>	<Collection: 1 item>	208	747.96	77
59	J-15	532.00	<None>	<Collection: 1 item>	0	792.67	113
61	J-16	445.00	<None>	<Collection: 1 item>	0	694.47	108
63	J-17	405.00	<None>	<Collection: 1 item>	0	718.14	135
67	J-19	728.00	<None>	<Collection: 1 item>	0	810.77	36
70	J-20	684.00	<None>	<Collection: 1 item>	0	900.23	94
131	J-25	402.00	<None>	<Collection: 0 items>	0	637.30	102

\\bfilsvr1\GIS\Projects\1900\1980001\Projects\Cayuga County Water Model\Cayuga\_County\_Model\_South\_Fed.wtg

Scenario: Base  
 Current Time Step: 0.000 h  
 FlexTable: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
34	P-2	13,260	J-1	J-2	12.0	Ductile Iron	120.0	0	0.00	0.000
36	P-3	4,089	J-2	Weedsport	12.0	Ductile Iron	120.0	0	0.00	0.000
38	P-4	6,821	Weedsport	J-4	12.0	Ductile Iron	120.0	-97	0.28	0.000
42	P-6	5,083	Port Byron	J-6	12.0	Ductile Iron	120.0	-236	0.67	0.000
48	P-9	7,243	J-8	Auburn West	12.0	Ductile Iron	120.0	341	0.97	0.000
50	P-10	5,505	Auburn West	J-10	12.0	Ductile Iron	120.0	-875	2.48	0.002
52	P-11	5,186	J-10	Aurelius	12.0	Ductile Iron	120.0	-875	2.48	0.002
56	P-13	12,255	J-12	J-13	12.0	Ductile Iron	120.0	-1,055	2.99	0.003
60	P-15	9,862	Fleming	J-15	12.0	Ductile Iron	120.0	-1,263	3.58	0.005
64	P-17	5,222	J-16	J-17	12.0	Ductile Iron	120.0	-1,263	3.58	0.005
68	P-19	4,541	Aurelius	J-19	12.0	Ductile Iron	120.0	-1,055	2.99	0.003
71	P-21	5,602	J-13	J-20	12.0	Ductile Iron	120.0	-1,055	2.99	0.003
95	P-33	12,382	Port Byron	J-4	12.0	Ductile Iron	130.0	97	0.28	0.000
102	P-38	14,014	J-8	Auburn North	12.0	Ductile Iron	130.0	1,451	4.12	0.005
132	P-58	1,548	J-1	J-25	12.0	Ductile Iron	120.0	0	0.00	0.000
135	P-60	3,035	J-17	Alternate Route 2	12.0	Ductile Iron	130.0	-1,263	3.58	0.004
139	P-63	1,986	T-2	PMP-8	12.0	Ductile Iron	120.0	1,792	5.08	0.009
140	P-64	1,798	PMP-8	J-8	12.0	Ductile Iron	120.0	1,792	5.08	0.009
145	P-67	9,694	J-12	J-19	12.0	Ductile Iron	120.0	1,055	2.99	0.003
162	P-78	19,197	J-6	PRV-10	12.0	Ductile Iron	120.0	-236	0.67	0.000
163	P-79	1,141	PRV-10	Auburn North	12.0	Ductile Iron	120.0	-236	0.67	0.000
173	P-84	15,148	J-15	PMP-12	12.0	Ductile Iron	120.0	-1,263	3.58	0.005
174	P-85	1,460	PMP-12	J-16	12.0	Ductile Iron	120.0	-1,263	3.58	0.005
178	P-88	2,086	Fleming	PMP-13	12.0	Ductile Iron	120.0	1,055	2.99	0.003
179	P-89	4,021	PMP-13	J-20	12.0	Ductile Iron	120.0	1,055	2.99	0.003

\\bifilsvr1\GIS\Projects\1900\1980001\Projects\Cayuga County Water Model\Cayuga\_County\_Model\_South\_Fed.wtg

**Scenario: Base**  
**Current Time Step: 0.000 h**  
**FlexTable: Tank Table**

ID	Label	Zone	Elevation (Base) (ft)	Elevation (Minimum) (ft)	Elevation (Initial) (ft)	Elevation (Maximum) (ft)	Volume (Inactive) (MG)	Diameter (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
87	T-2	<None>	611.00	671.00	701.00	711.00	0.00	50.00	1,792	701.00

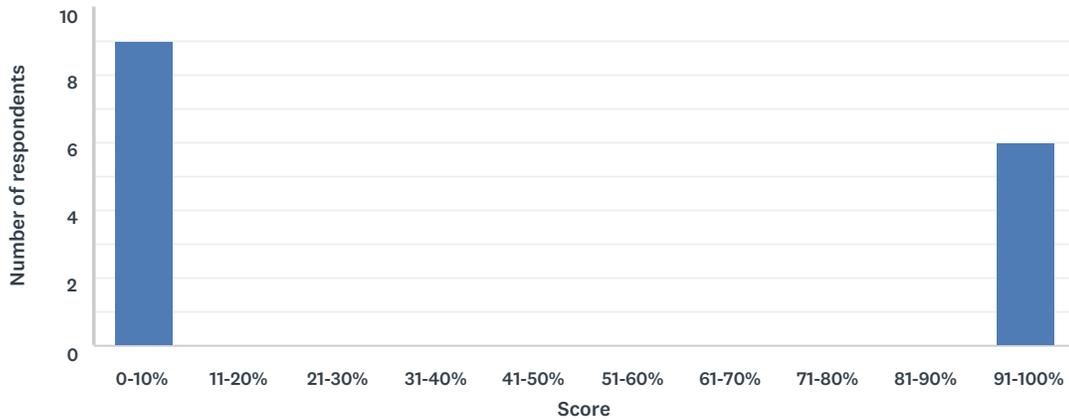
\\bfilsvr1\GIS\Projects\1900\1980001\Projects\Cayuga County Water Model\Cayuga\_County\_Model\_South\_Fed.wtg

**APPENDIX C**  
**FARM BUREAU INTEREST SURVEY RESULTS**



**Quiz Summary**

AVERAGE SCORE  
40% • 0.4/1 PTS



**STATISTICS**

Lowest Score	Median	Highest Score
0%	0%	100%

Mean: 40%

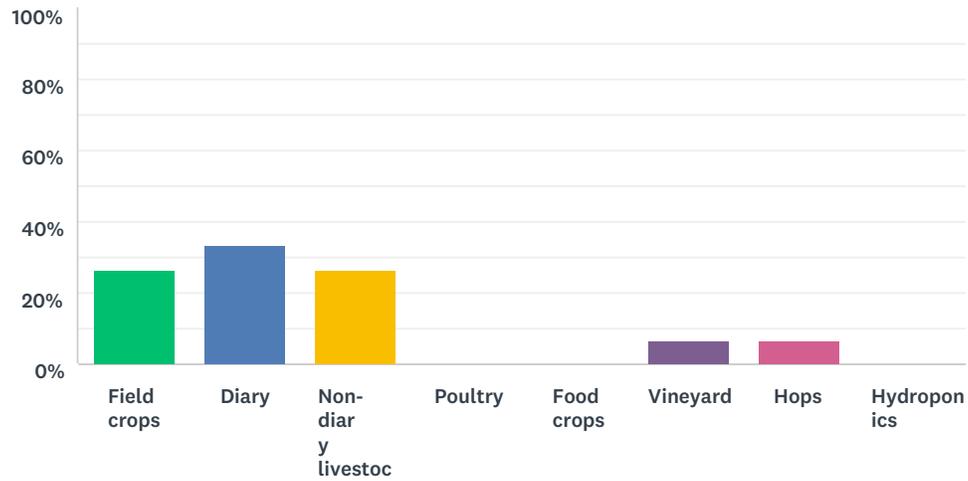
Standard Deviation: 51%

**Question Ranking**

QUESTIONS (1)	DIFFICULTY	AVERAGE SCORE
<b>Q3</b> Are you interested in obtaining a supplemental or replacement water supply subject to it being available at an acceptable cost? If YES continue with survey. If NO, you can stop at this point and submit the survey.	1	40%

## Q1 What type of agricultural operation do you have?

Answered: 15 Skipped: 0



ANSWER CHOICES	RESPONSES	
Field crops	26.67%	4
Dairy	33.33%	5
Non-diary livestock	26.67%	4
Poultry	0.00%	0
Food crops	0.00%	0
Vineyard	6.67%	1
Hops	6.67%	1
Hydroponics	0.00%	0
<b>TOTAL</b>		<b>15</b>

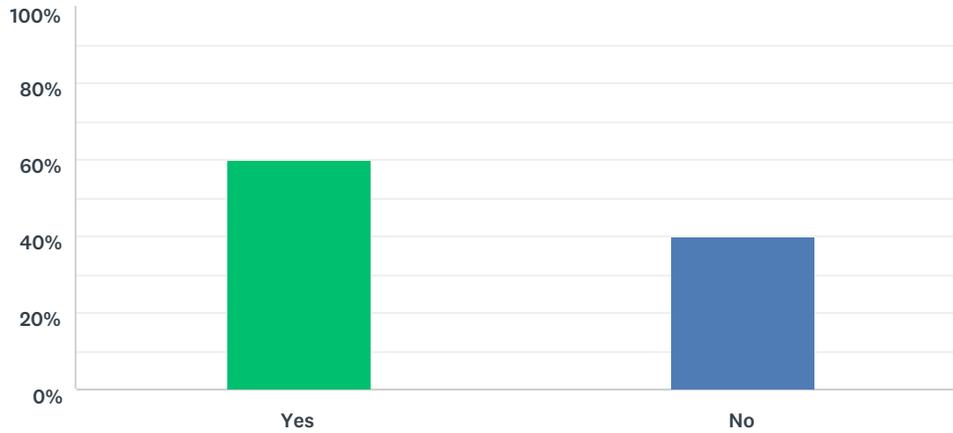
## Q2 Approximately how much water do you use on an annual basis?

Answered: 14 Skipped: 1

#	RESPONSES	DATE
1	750 gal per day 273,750 gal per year	9/6/2018 11:56 AM
2	640,000	9/5/2018 1:56 PM
3	5million	9/5/2018 6:48 AM
4	4,000,000 gallons	9/4/2018 5:39 PM
5	7 million gallons	9/4/2018 3:21 PM
6	10,000,000 gallons	8/23/2018 7:23 AM
7	10000 gl	8/22/2018 6:44 PM
8	49,500,000	8/22/2018 8:42 AM
9	70000 gal	8/20/2018 2:50 PM
10	none	8/20/2018 1:15 PM
11	On the crops, none	8/20/2018 12:20 PM
12	2 million gallons	8/20/2018 11:47 AM
13	1000000	8/20/2018 11:35 AM
14	Several thousand gallons	8/20/2018 11:32 AM

**Q3 Are you interested in obtaining a supplemental or replacement water supply subject to it being available at an acceptable cost? If YES continue with survey. If NO, you can stop at this point and submit the survey.**

Answered: 15 Skipped: 0



**QUIZ STATISTICS**

Percent Correct 40%	Average Score 0.4/1.0 (40%)	Standard Deviation 0.51	Difficulty 1/1
------------------------	--------------------------------	----------------------------	-------------------

ANSWER CHOICES	SCORE	RESPONSES	
Yes	0/1	60.00%	9
✓ No	1/1	40.00%	6
<b>TOTAL</b>			<b>15</b>

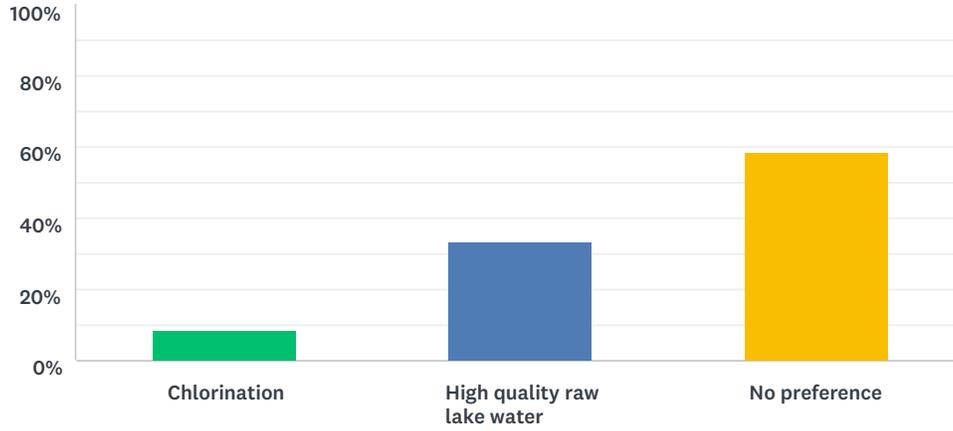
## Q4 What is your peak day water use? What month does it typically occur?

Answered: 11 Skipped: 4

#	RESPONSES	DATE
1	May-June	9/6/2018 11:56 AM
2	2000 gallons; August	9/5/2018 1:56 PM
3	30000 july and august	9/5/2018 6:48 AM
4	12,000 august	9/4/2018 5:39 PM
5	same usage 7 days a week, more in warmer weather months	8/23/2018 7:23 AM
6	August	8/22/2018 6:44 PM
7	150,000 July/August	8/22/2018 8:42 AM
8	They are all about the same	8/20/2018 2:50 PM
9	July	8/20/2018 12:20 PM
10	5000 gallons July	8/20/2018 11:47 AM
11	june-augest	8/20/2018 11:35 AM

**Q5 Do you have a preference for water that is treated to drinking water standards including chlorination or high quality raw lake water or no preference.**

Answered: 12 Skipped: 3



ANSWER CHOICES	RESPONSES
Chlorination	8.33% 1
High quality raw lake water	33.33% 4
No preference	58.33% 7
<b>TOTAL</b>	<b>12</b>

## Q6 Are you interested in one of the following?

Answered: 12 Skipped: 3

ANSWER CHOICES	RESPONSES
A supplemental water supply to be used only in extreme conditions ie. no more than a few weeks every few years?	50.00% 6
A supplemental water supply that would be used on a continuing basis? If so, approximately how much water would you need on an annual basis and what would your peak day need be?	50.00% 6
A water supply to completely replace your existing source(s)? If so, how much water would you need on an annual basis and what would your peak day need be?	16.67% 2

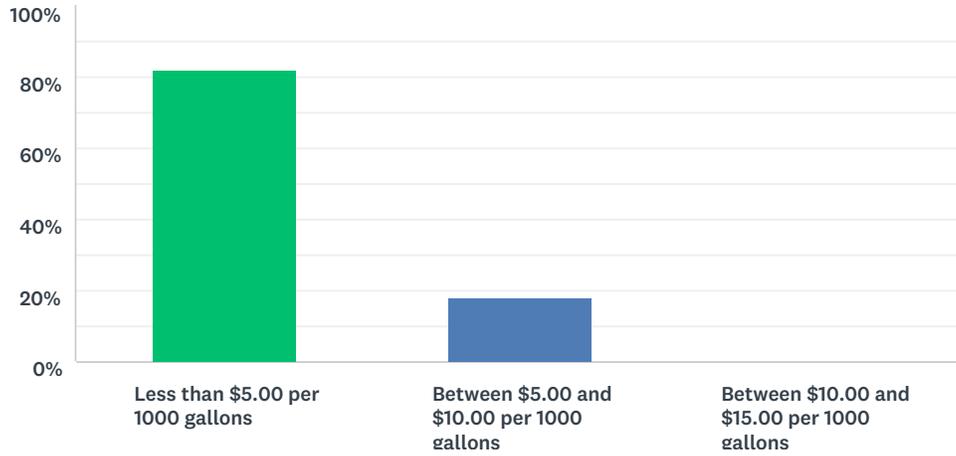
#	A SUPPLEMENTAL WATER SUPPLY TO BE USED ONLY IN EXTREME CONDITIONS IE. NO MORE THAN A FEW WEEKS EVERY FEW YEARS?	DATE
1	Yes	9/4/2018 5:39 PM
2	Yes	8/22/2018 6:44 PM
3	yes	8/22/2018 8:42 AM
4	no	8/20/2018 2:24 PM
5	No	8/20/2018 12:20 PM
6	extreme condntions for farm worker houses	8/20/2018 11:35 AM

#	A SUPPLEMENTAL WATER SUPPLY THAT WOULD BE USED ON A CONTINUING BASIS? IF SO, APPROXIMATELY HOW MUCH WATER WOULD YOU NEED ON AN ANNUAL BASIS AND WHAT WOULD YOUR PEAK DAY NEED BE?	DATE
1	750	9/6/2018 11:56 AM
2	650,000 gallons anually; peak of 2500	9/5/2018 1:56 PM
3	8 million gallons per year	8/23/2018 7:23 AM
4	40000, no specific peak day. Supplement would be for human consumption	8/20/2018 2:50 PM
5	no	8/20/2018 2:24 PM
6	2m 5000 gal	8/20/2018 11:47 AM

#	A WATER SUPPLY TO COMPLETELY REPLACE YOUR EXISTING SOURCE(S)? IF SO, HOW MUCH WATER WOULD YOU NEED ON AN ANNUAL BASIS AND WHAT WOULD YOUR PEAK DAY NEED BE?	DATE
1	5million gallons	9/5/2018 6:48 AM
2	no	8/20/2018 2:24 PM

### Q7 Considering what you spend now for water what would you consider a reasonable cost for water from another source?

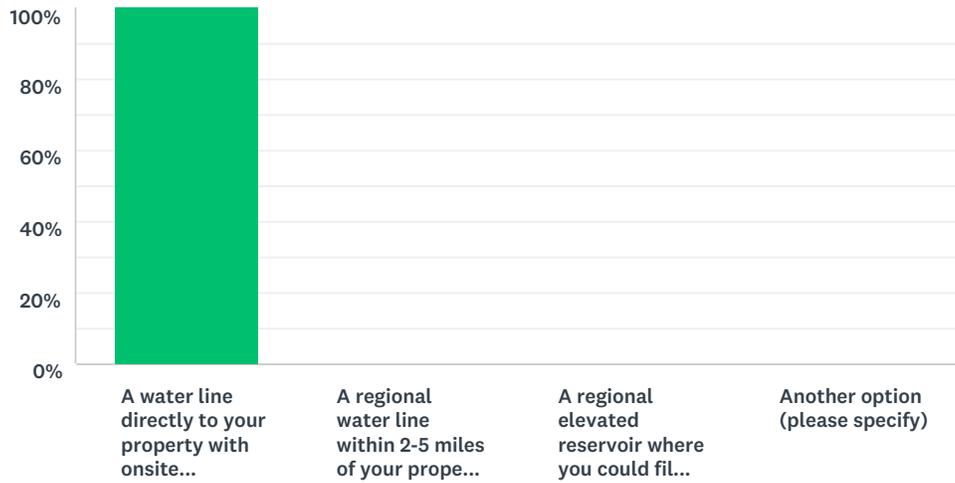
Answered: 11 Skipped: 4



ANSWER CHOICES	RESPONSES	
Less than \$5.00 per 1000 gallons	81.82%	9
Between \$5.00 and \$10.00 per 1000 gallons	18.18%	2
Between \$10.00 and \$15.00 per 1000 gallons	0.00%	0
<b>TOTAL</b>		<b>11</b>

## Q8 Considering your particular operation would you prefer?

Answered: 10 Skipped: 5

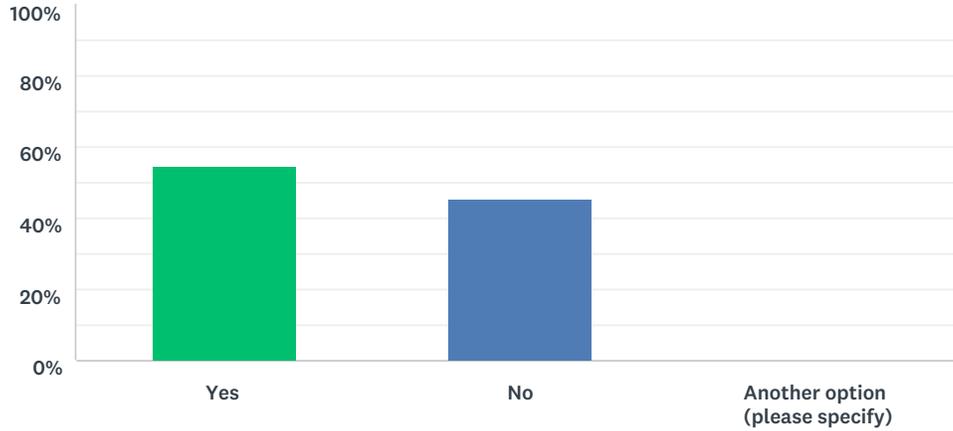


ANSWER CHOICES	RESPONSES
A water line directly to your property with onsite distribution being your responsibility.	100.00% 10
A regional water line within 2-5 miles of your property with you being responsible for extending pipelines to your property.	0.00% 0
A regional elevated reservoir where you could fill tankers to truck water to your property.	0.00% 0
Another option (please specify)	0.00% 0
<b>TOTAL</b>	<b>10</b>

#	ANOTHER OPTION (PLEASE SPECIFY)	DATE
	There are no responses.	

### Q9 Would you be willing to participate in an assessment district in order to have your share of capital costs associated with a project levied against your property taxes for 30 years?

Answered: 11 Skipped: 4



ANSWER CHOICES	RESPONSES	
Yes	54.55%	6
No	45.45%	5
Another option (please specify)	0.00%	0
<b>TOTAL</b>		<b>11</b>

#	ANOTHER OPTION (PLEASE SPECIFY)	DATE
	There are no responses.	

The experience to  
**listen**  
The power to  
**solve**<sup>SM</sup>

**Barton**  
**&Loguidice**

[www.bartonandloguidice.com](http://www.bartonandloguidice.com)