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Lewis County, New York
Central Lewis County
Regional Water Supply Study

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Abbreviations

AO – Administrative Order

AWQR – Annual Water Quality Report

bgs – below ground surface

CFA – Consolidated Funding Applications

CSLAP – Citizens Statewide Lake Assessment Program

DBP – Disinfection by Product

DIP – Ductile Iron Pipe

DWSRF – United States Environmental Protection Agency Drinking Water State Revolving Fund

EFC – New York State Environmental Facilities Corporation

GAC – Granular Activated Carbon

gpd – Gallons Per Day

HAA – Haloacetic Acids

NYS – New York State

NYSDOH – New York State Department of Health

PCS – Potential Contaminant Source

PWS – Public Water System

REDC – Regional Economic Development Council

SDWA – Safe Drinking Water Act

THA – Total Haloacetic Acids

THM – Trihalomethanes

TOC – Total Organic Carbon

TTHM – Total Trihalomethanes

USDA – United State Department of Agriculture

USEPA – United State Environmental Protection Agency

WEP – Rural Utilities Service Water and Environmental Programs

WIIA – New York Water Infrastructure Improvement Act

WIFIA – United States Environmental Protection Agency Water Infrastructure Finance and Innovation Act

Executive Summary

For this Study, Miller Engineers (Miller) evaluated all aspects of each participating municipal public water system (PWS) in the Towns of Lowville, Watson, Denmark, and Martinsburg. It is important to note that the largest single system, the Village of Lowville, chose not to participate. The Study includes an evaluation of existing conditions of the PWS's including the age of infrastructure, capacity, demand, and historical and current improvements, current water rates, debt service, yearly budget, and potential community interconnections to promote and sustain beneficial economic development as well as promote sustainable population growth in areas that are currently not served.

The most significant potable water issue in the Central Lewis County Study Area is the presence of byproducts of chlorine disinfection. The byproducts typically involve Trihalomethanes (THMs) and Haloacetic Acids (HAAs). The expanded use of groundwater sources would likely eliminate the need for THM and HAA removal such that raw surface water requires as long as well fields are not located within zones where surface waters are impactful.

The second most significant issue is available water quantity. The Towns of Lowville and Denmark have identified a need for additional water. The Towns of Watson and Martinsburg have excess capacity, however, there is no physical means of conveyance to other prospective purchasers.

Currently each system is operated by its own Town forces. The operational staff carry the required operator certifications but are integral to overall community function and are assigned other duties not related to water supply and distribution as well. The Town of Watson is currently evaluating how best to structure operation of their new expanded PWS. Current staffing, who are also tasked with many other Town duties, will not be sufficient to meet operational needs. The Town has indicated a desire to work with other communities to develop a structured shared resources approach if it were to reduce overall operational expenses.

Current coordination of activities related to individual water systems is informal. Water system administrators and operators do work with counterparts in other systems to access needed resources (personnel, parts, equipment), however, interaction is limited, and no formal agreements are in place. County/Town coordination is limited to broad planning efforts and assistance with grant applications/administration. A formal "shared services" arrangement between the PWS's may offer a cost-effective way of addressing staffing gaps or specific facility needs.

What could be considered is developing a formal system that could be put in place for times when the designated system operator was not available (vacations, sickness, training). This system could be put in place now with the establishment of mutual aid agreements between the existing municipalities. Coupled with a more regionalized SCADA system, available shared resources could reduce operational costs.

Relatively inexpensive regional interconnection projects could resolve some current supply limitations while increasing revenue to the selling communities. The regional concept projects would best be implemented at the County level as they serve multiple Towns and would provide access to greater resources to minimize the short-term financial impact of capital project implementation. These projects could be facilitated with the formation of a County led Cooperative .

In the long-term, municipal water systems should consider relying on new groundwater resources for future increased supply needs. Previous studies indicate that ground water resources of Lewis County

have sufficient capacity to provide a high-quality water to meet the demands for the foreseeable future. A common shared water supply between the municipalities within the Study Area could potentially offer reduced supply costs to each municipal user.

Our recommended approach would be to investigate the quantity and quality of groundwater in Zone A and Zone B as identified in a previously prepared study. Anticipating a new source from Zone A or Zone B, a new well field would need be developed. These two zones are the most centrally located to the Study Area and offer the potential for the largest sustainable yield. An interconnection to the Town of Watson distribution system and then to the proposed interconnections with the Towns of Lowville and Martinsburg would facilitate delivery of what could be considered an unlimited quantity of water for consumption in any or all of the Towns.

The County should, therefore, consider the formation of a County led Cooperative to facilitate the development and implementation of a "shared services" agreement and the intermunicipal connections. A district could more easily accommodate financial burden of project implementation and could open more opportunities for funding. The County, through the formation of a District, should consider, as a benefit to all municipal PWS, taking on the task of identifying potential groundwater sources as a future supply through implementation of a Phase II Study.

Section 1 – Introduction

1.1 General

United States Environmental Protection Agency (USEPA) in 2013 released a report on the "Importance of Water to the US Economy". The purpose of the report was to help raise the awareness of water's importance to the national economy and to provide decision makers with the information to sustainably manage the nation's water resources. It was important to note that energy production, agriculture, and water supply account for 94% of the withdrawal from the nation's groundwater, streams, rivers and lakes. All parts of the economy are directly dependent upon an adequate supply of high-quality water.

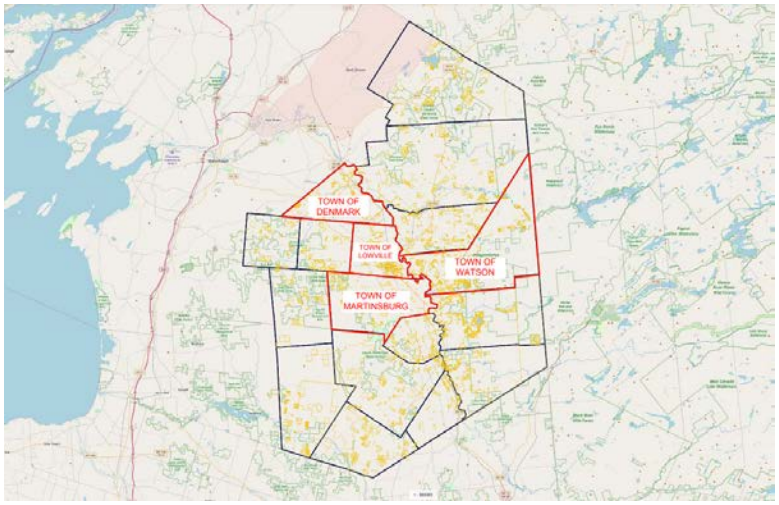
The value and cost of water is expected to rise because the current cost of water does not reflect its true value. Because water is undervalued, current use is inefficient and likely unsustainable. As competition for water increases the cost will rise. USEPA clearly sees a future where competition for water will increase as consumption increases, water quality decreases and the impacts of climate change are felt.

It is clear that those counties, towns and villages who invest in their water infrastructure today will have a clear edge in the future. Investments will be required in the areas of source controls, treatment system enhancements, and distribution system upgrades to secure their future.

The North Country Regional Economic Development Council (REDC) 2011 Strategic Plan (Attachment 1) indicated several limiting factors with respect to economic development (new and expanded business) including the "… capacity and condition of public sewer and water systems. There is an enormous need for improvement of water and wastewater systems throughout the region, both to protect the region's clean water resources and to support community development." This is evident with the United States Environmental Protection Agency Administrative Order (AO), (Docket No. SDWA-02-2018-8049) dated April 18, 2018, issued to the Town of Lowville Consolidated Water District #1 for violations of the Stage 2 Disinfection Byproduct Rule.

This Study provides a review and evaluation of municipal water systems for the Central Lewis County communities of the following:

- Town of Lowville,
- Town of Watson,
- Town of Denmark,
- Town of Martinsburg, and
- Village of Copenhagen.



It is the County's belief that by ensuring that reliable public water systems are available, the Central Lewis County region will be in a better position to tap into regional economic development opportunities that are at their doorstep, including regional tourism and recreation, business parks, and agribusiness/technology.

This Study is an outgrowth of work efforts previously funded by the New York State (NYS) Department of State in 2009 as presented in the report entitled "The Lewis County Comprehensive Public Water Supply and Sanitary Wastewater Study" dated February 2009 (Attachment 2). That study concluded that the municipalities studied had minimal problems with serving the present population with planned improvements to groundwater supplies and the addition of up-to-date disinfection/filtration systems; however, expansions would be limited, especially in the greater Lowville area due to the overall age of the systems and surface water supply limitations created by the introduction of pathogens and disinfection byproducts (DBP).

The communities involved in this Study are proactive and realize that shared collective resources could lead to more efficient operations and the economic development potential that could result will benefit all involved. The potential for pooling together the resources of the local communities and the County could result in improved delivery of services, coordination, more efficient systems, and more capacity for development and community revitalization. The objective of the Study is to evaluate the individual system needs going forward and to evaluate joint "regional" concepts as proactive infrastructure investment projects that could set the stage for economic development opportunities in the Central Lewis County region.

This Study examines the current conditions of the PWS in five participating municipalities, including supply, transmission and distribution, and their ability to treat and transmit additional supply in a collective manner. This Study also:

- Develops the engineering concepts needed to define capital improvements for individual systems and interconnections that would accomplish the study objectives,
- establishes operations, management, and maintenance; costs; and
- identifies the legal tasks necessary for the implementation of recommendations.

This Study focuses on the four towns and one village stated above. The Study Area is primarily a rural region that includes the Village of Lowville, which is the County seat and the most populated area within the Study Area. Outside of the Village of Lowville, much of the Study Area is rural and agricultural in nature. The eastern part of the Town of Watson is located inside the Adirondack Park.

The Central Lewis County region is a popular destination for tourists seeking opportunities for hiking, camping, snowmobiling, boating, fishing, and hunting. With the region being a popular tourist destination and local small businesses depending on the tourism, especially during winter months, efficient and well operated public water supply systems in this region are important for promoting economic growth and stability in the Central Lewis County region.

Over the past several years, each of the municipalities in the Study Area have been the subject of groundwater supply and distribution system assessments. Within the four Study Area, there are seven different PWS (community water systems only) according to the New York State Department of Health (NYSDOH) Contact Report dated 2019. The community water systems, as identified by the NYSDOH PWS Identification Number, are outlined in the Table 1.

Table 1 – Central Lewis County Public Water Systems

PWS Name	NYSDOH PWS ID	Total Population Served
Lowville (T) WD #1	NY2430039	350
Town of Watson Water District #4 Extension #1	TBD	TBD
Copenhagen Village	NY2402361	850
Martinsburg Water District	NY2402367	310
Glenfield Water District	NY2402363	200
Lowville Village	NY2402365	4,000
Vanucchi Apartments	NY2430001	14

Although there are seven PWSs within the municipalities included in this Study, the Village of Lowville and Vanucchi Apartments (5469 River Street, Lowville, New York 13367) PWSs have chosen not to participate in this Study.

1.2 Project Objectives

The communities involved in this study are proactive and realize that collective resources could lead to more efficient operations and the economic development potential as a result will benefit all involved. The study is designed to result in the development of a Regional Water Program, including capital improvements, operations, and the legal framework that will set the stage for economic development opportunities central Lewis County.

Pooling together the resources of the local communities and the County may result in improved delivery of services, coordination, more efficient systems, and more capacity for development and community revitalization.

This study is being developed in the light of several other successful regional water systems, including Genesee County, Niagara County, North Chautauqua County (in progress), and Southern Lewis County (in progress). In these instances, budget impacts and cost savings were realized in two categories: operations and debt service. In many rural communities, employees' duties are split between various departments, resulting in less than efficient workflows, communication issues, and longer timeframes for work completion with multiple projects going on. With consolidated, cooperative operations the number of employees can be optimized, resulting in cost savings for employee salaries, benefits, insurance, and retirement savings, the latter two having seen substantial increases over the past few years due to changes/updates in Federal and State regulations.

In addition to workforce, an operations benefit can be realized from purchasing supplies, materials, and chemicals in bulk, cooperative purchase of electric/gas/oil for equipment and machinery, lab services, and meter reading services. All of this has the potential to reduce operational expenses through economies of scale and by spreading the costs over a larger number of users and potentially more commercial users.

For this Study, Miller Engineers evaluated all aspects of each participating PWS in the Town of Lowville, Town of Watson, Town of Denmark, Town Martinsburg, and the Village of Copenhagen and identifies the areas within each municipality's PWS that could be enhanced to better serve public health and increase the economic growth potential of the Lewis County region. Existing conditions of the PWS including the age of infrastructure, capacity, demand, and historical and current improvements were established and current water rates, debt service, and yearly budget were assessed. Potential community operational

improvements and potential physical interconnections to promote and sustain beneficial economic development as well as promote sustainable population growth in areas that are currently not served.

1.3 Previous Reports / Studies

The PWSs in the Towns of Lowville, Watson, Denmark, Martinsburg and Village of Copenhagen have all been subject to public water supply system studies. These studies have outlined what would be required for each PWS to ensure a dependable complete system for the residences and businesses located within each municipality. Additionally, these studies have provided recommendations for how each municipality can come into compliance with NYS Environmental Conservation and Health Department regulations, if needed, and how each community can develop their PWS to help sustain local economic development.

The following studies have been completed for the Towns and serve as background for this Study.

Lewis County Comprehensive Public Water Supply and Sanitary Sewerage Study – February 2009 by Burley-Guminiak & Associates (Attachment 2)

This Study was completed to help consolidate all known information regarding the public water and public sewer systems in Lewis County in an overall effort to support economic development activities within the County. The study was to be used in conjunction with the County's Comprehensive Economic Development Strategy and also serve as support for the County's Comprehensive Plan. As part of this Study, Preliminary Hydrogeological Assessments were completed to help in the identification of future groundwater sources.

Groundwater Assessment and Recommendations Report for the Black River Watershed – December 2008 by Bergmann Associates (Attachment 3)

This report provides a summary of identified aquifers, utilization of groundwater resources, and an evaluation of future expansion and protection for groundwater resources within the Black River Watershed. At the conclusion of this report, a variety of criteria were established for consideration of future groundwater development in the Black River Watershed which included future yields, accessibility, wellhead protection, and groundwater quality.

Town of Lowville & Watson Preliminary Planning Effort to Evaluate Various Water System Options – June 2014 by Capital Consultants Architecture & Engineering, Inc. (Attachment 4)

This report was completed to evaluate the existing PWS systems for the Towns of Lowville and Watson and to consider alternatives for each. PWS alternatives for both Towns ranged from establishing their own respective PWS from establishing wellfields to combining efforts and establishing one wellfield that would serve both the Town of Lowville and the Town of Watson. The Village of Lowville decided not to participate in this study. This study was funded by a USDA Planning Grant to the Town of Lowville and the Town of Watson.

Town of Lowville Water Treatment Plant Improvements Project – September 2019 by BCA Architects & Engineers (Attachment 5)

This report was completed to provide a comprehensive water system evaluation for the Town of Lowville and to develop design and bidding documents for the improvement to the existing water treatment plant. This was done in response to non-compliance issues with the Stage 2 Disinfection Byproduct Rule. Overall,

this report reviews background information, data collected from the granular activated carbon (GAC) pilot study and considers alternatives for addressing the elevation of disinfection by-products in the current drinking water. The report establishes the basis of design, scope of work, and costs associated with the GAC project. The study was funded by a Senate Initiative Grant.

Village of Copenhagen Woodbattle Water Treatment Facility Renovation and Rehabilitation – October 2019 by Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, D.P.C. (Attachment 6)

This report was completed in response to the 2016 drought which caused the Village of Copenhagen to declare a State of Emergency for low water supply as their Stoddard Road wells dropped to an unsustainable level. In addition to unacceptable water levels at their Stoddard Road wellfield, the backup water source (Woodbattle Road Treatment Facility) was not in operable condition. This led to having to truck in water from a neighboring community. Two alternatives were established at the completion of this study. One alternative called for the rehabilitation and renovation of the Woodbattle Road Treatment Facility while the other called for a completion of an interconnection between the Village of West Carthage and the Stoddard Road Treatment Facility. This study ultimately recommended that the Village of Copenhagen take the necessary steps to proceed with an interconnection between the Village of West Carthage and the Stoddard Road Treatment Facility.

Village of Copenhagen Water Supply Evaluation – March 2020 by Barton & Loguidice, D.P.C. (Attachment 7)

This report was also completed in response to the 2016 drought which caused the Village of Copenhagen to declare a State of Emergency for low water supply. To address the needs of the Village of Copenhagen if they were to experience another drought, three alternatives were suggested. As with the EDR report, the alternatives of rehabilitating the Woodbattle Road Treatment Facility and an interconnection between the Village of West Carthage and the Stoddard Road Treatment Facility were proposed. In addition, it was also proposed that the Village of Copenhagen could potentially purchase raw water from the Village of West Carthage. Following the evaluation of all three alternatives, it was recommended to the Village of Copenhagen that they rehabilitate the Woodbattle Road Treatment Facility to serve as the backup water supply for the Village's PWS.

1.4 Regional Coordination

As mentioned in Lewis County Comprehensive Plan Policy Area 7: Regional Coordination "the county has a large geographic area with low population densities and some communities lack the critical mass to support all the desired services of its residents. Therefore, we must leverage our collective assets rather than compete or exist independent of one another. We recognize that constrained budgets at every level of government require us to make difficult choices. As such, we will engage in meaningful dialogue across municipal boundaries, and continue to engage entities with regional significance".

Currently, coordination of activities related to individual water systems is informal. Water system administrators and operators do work with counterparts in other systems to access needed resources (personnel, parts, equipment), however, interaction is limited and no formal agreements are in place. County/municipal coordination is limited to broad planning efforts and assistance with grant applications/administration.

1.5 Community Character

The Study Area consists of four Towns (Lowville, Watson, Denmark, and Martinsburg) with a total population of approximately 10,868 people and an approximate total area of 282 square miles (40 persons/square mile). The most populated region within the Study Area is the Town of Lowville while the Village of Lowville serves as the County seat. The Study Area is located in a rural region of New York State situated in the Black River Valley between the Tug Hill Plateau to the west and the Western Adirondack Foothills to the east.

Similar to Lewis County as a whole, the Study Area economy is heavily dependent on agriculture (dairy products), forestry, and tourism/recreation. A reliable and plentiful water supply for the Study Area Towns is an important aspect in supporting the agricultural, forestry, and tourism/recreation businesses.

1.6 Population Projections

1.6.1 Growth Projections – Local

Population data for the Central Lewis County Study Area towns was obtained from the 2010 United States Census Report data and the American Community Survey 5-Year Estimate data found on data.census.gov. Over the past two decades population has been trending downward in Lewis County. Table 2 outlines the estimated 2019 population, Total Housing Units (HU), Total Households, and Median Household Income (MHI) for the Towns within the Study Area.

Table 2 – Central Lewis County Census Data*

Town	Population	Total HU	MHI (dollars)
Town of Lowville	4,865	2,024	53,317
Town of Watson	1,769	1,448	63,333
Town of Denmark	2,814	1,312	59,492
Village of Copenhagen**	833	422	46,875
Town of Martinsburg	1,420	763	58,977
Lewis County	26,572	15,679	54,524

*Source: 2019 American Community Survey 5-Year Estimate

**Data for Village of Copenhagen also reflected in the Town of Denmark Data

Municipal specific data is documented below.

Town of Lowville

According to the 2010 Census report, the Town of Lowville had a total population of 4,982 people. The population of the Town of Lowville had increased from the 2000 census when it was reported to have a total population of 4,548. The American Community Survey 5-Year Estimate projected that the total population for the Town of Lowville in 2019 was approximately 4,865, a 2.3% decline from 2010.

Town of Watson

According to the 2010 Census report, the Town of Watson had a total population of 1,881 people while 1,987 people were reported to be living in the Town of Watson in the 2000 Census report. The American Community Survey 5-Year Estimate projected the total population of the Town of Watson to be approximately 1,769 in 2019, a decline of 5.9% since 2010 and a decline of 6.20% since 2000.

Town of Denmark

According to the 2010 Census report, the Town of Denmark had a total population of 2,860 people while the 2000 Census report reported a total population of 2,747 people. The American Community Survey 5-Year Estimate projected the total population of the Town of Denmark to be approximately 2,814 in 2019, a decline of 1.6% since 2010.

Town of Martinsburg

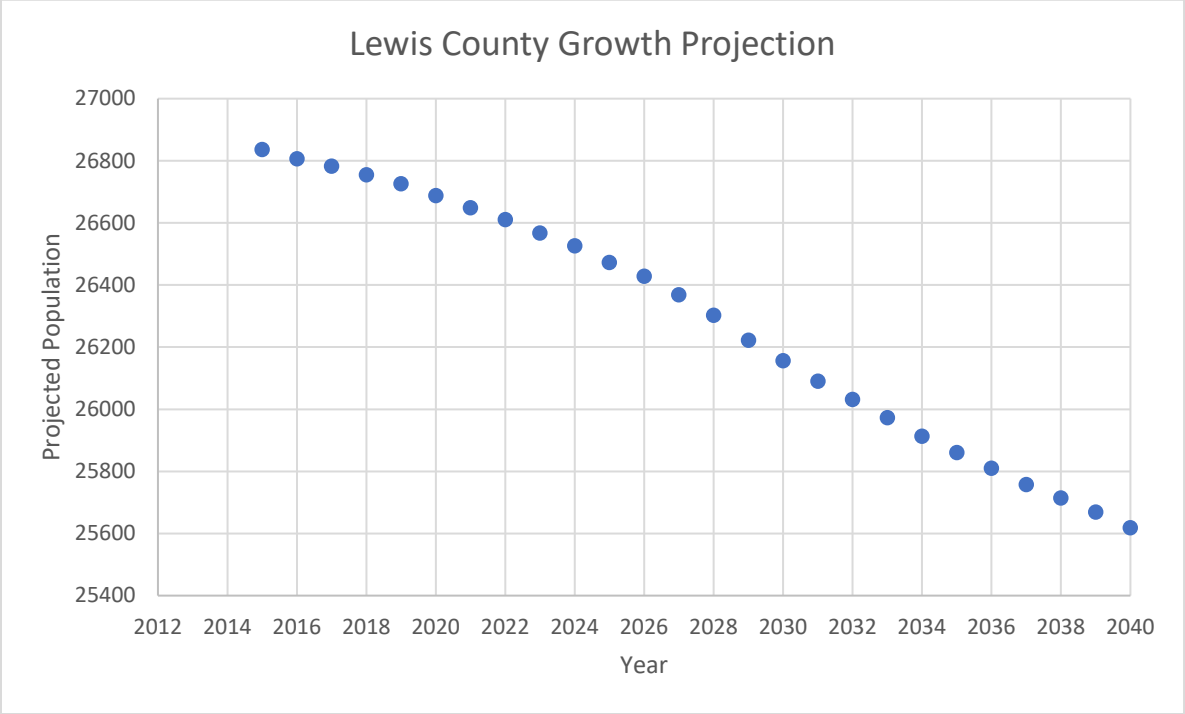
According to the 2010 Census report, the Town of Martinsburg had a total population of 1,433 people while the 2000 Census report reported a total population of 1,249 people. The American Community Survey 5-Year Estimate projected the total population of the Town of Martinsburg to be approximately 1,420 in 2019, a 0.90% decrease since 2010.

1.6.2 Growth Projections – Regional

Lewis County Total Population Projection

A Cornell University Program on Applied Demographics Study completed in 2018 for Lewis County as a whole, projects a steady decrease in the population of Lewis County, as seen in the Figure Number 1 below. In 2015, Lewis County had an approximate population of 26,825 people and in 2020 the population was determined to be 26,700 people. This general trend is continued throughout the projection ending in the year 2040.

Figure Number 1 – Lewis County Growth Projection



The projection (Figure Number 1) is consistent with the findings as reported by the United States Census and the American Community Survey 5-Year Estimate for the year 2019 as described in Section 1.5.1.

Two factors could slow the decline or contribute to a modest increase in population growth beyond the projections; climate change and migration from metropolitan areas. With many regions facing a scarcity

of water, due to climate change, Lewis County may become attractive for businesses requiring quality water that is in abundance. This could result in the relocation of their operations to Lewis County.

The nation's experience with handling the COVID-19 pandemic has also led to many families wishing to move out of metropolitan areas. Employers and employees have realized they can work remotely. The need to occupy expensive office space has been diminished. With exceptional education opportunities that exist in Lewis County, safe communities, and with millions of dollars of local dollars being invested in broadband infrastructure improvements, migration of families may play a role in the increase in population. Lewis County is currently one of counties in New York with under 80% broadband coverage BUT are pushing forward with millions of local dollars of broadband infrastructure investments.

1.6.3 Growth Projections – Industrial

Industrial water consumption outside of the Village of Lowville is minimal. We view increases in consumption to be focused on supporting existing dairy operations currently on individual well supplies as the primary growth potential in the absence of a new industrial user with a specific demand locating in an existing PWS service area.

1.7 Water Demands

With population growth trending steady or downward in each of the municipalities, we conclude that use of current values for residential consumption are adequate for future planning. Thus, for our planning purposes the residential component of our projected demands is 191,000 gallons per day, average. For planning purposes, we have projected a 20 percent growth in current average daily industrial consumption to allocate for new services. We project that industrial growth will increase overall demand by 39,000 gallons per day and for planning purposes we will evaluate a total average daily demand of 230,000 gallons per day.

Table 3 - Water System Demands by Town

Town	WSA Permit No.	Estimated Water Demand (gpd)
Town of Lowville		**42,350**
Consolidated Water District #1	10778	28,175
Water District #3	8661	4,900
Water District #4	8677	4,900
Water District #5	8678	2,100
Water District #6	8679	175
Water District #9	9741	2,100
Town of Watson		**16,100**
Water District #2	8547	6,125
Water District #3	8326	2,275
Water District #4	8379	4,725
Water District #4 Extension #1	TBD	TBD
Water District #5	8739	350
Water District #6	8740	700
Water District #7	8741	700
Water District #8	8742	1,225
Town of Denmark		**65,000**
Town of Denmark Water District #1	TBD	TBD

Village of Copenhagen Water District	8571	65,000
Town of Martinsburg	TBD	**67,575**
Martinsburg Water District #1	10437	46,000
Martinsburg Water District #2	8724	1,575
Glenfield Water District	9254	20,000

1.8 Project Funding and Financing Opportunities

Established State and Federal programs are currently in place to provide grants and low or no interest loans for water system improvement projects. These programs, summarized below, often are offered with a requirement for local participation at some percentage. Recent actions at the Federal level are directed at pumping more funds into local infrastructure projects. The full extent of the dollars to be made available and the vehicle for moving those dollars to local projects has not yet been determined.

1.8.1 Employee Analysis

Table 4 - Water System Operator Summary

PWS Name	PWS ID	Operator	NY Certification No.	Certification Level	Certification Expiration Date
Town of Lowville WD #1	NY2430039	Thomas Widrick	NY0041068	IIA, C, D	12/31/2023
		Donald Birchenough	NY0037934	C	4/30/2022
		Shawn Freeman	NY0038629	C	2/29/2024
		Brian Hanno	NY0042688	C	8/31/2024
		Troy Jones	NY0037973	C	5/31/2022
		Joseph Peters	NY0037935	C	4/30/2022
Town of Watson	TBD	TBD	TBD	TBD	TBD
Town of Denmark	TBD	TBD	TBD	TBD	TBD
Village of Copenhagen	NY2402361	Dave Potocki	NY0041694	C	8/31/2024
		Richard Ross	NY0030529	IIA, IIB	4/30/2022
Town of Martinsburg	NY2402367	TBD	TBD	TBD	TBD
Hamlet of Glenfield	NY2402363	TBD	TBD	TBD	TBD

1.8.2 New York State Grant Opportunities

Each of the five PWS would be eligible to apply for New York State Funding for their water quality needs assuming they meet the funding agencies criteria.

New York State Water Infrastructure Improvement Act of 2017

The New York Water Infrastructure Improvement Act (WIIA) provides for the investment of $2.5 billion in clean and drinking water infrastructure projects and water quality protection across New York State. New York State Environmental Facilities Corporation (EFC) authorizes and provides grants to assist

municipalities in funding water quality infrastructure. Funding can be issued in terms of grant money and low or no interest loans.

Projects eligible for grants/loans include water quality infrastructure projects at municipally-owned sewage treatment works OR municipally-owned public water systems for construction, replacement or repair of infrastructure; or compliance with environmental and public health laws and regulations related to water quality.

Each WIIA project must meet the following criteria:

- Result in construction of the project,
- Not have started construction before October 1, 2019, and
- Not have completed construction before November 1, 2021.

A drinking water project may be eligible for a WIIA grant of up to the lesser of $3 million or 60% of the total net project costs.

In 2019, an estimated $270 million in grants were awarded to communities in NYS which included projects that addressed cyanotoxins and contaminants of emerging concern. In 2018 and 2019 combined, an estimated $10.96 million was awarded to municipalities in Lewis County alone for drinking water projects.

New York State Regional Economic Development Councils

The Regional Economic Development Councils hold an annual solicitation of Consolidated Funding Applications (CFA) open for the months of June and July. Applications can be submitted for the design and or implementation of more modest improvements to water distribution systems. The CFA allows applicants to complete one application that can be considered for multiple sources of funding. In 2021, New York State advertises that there is over $750 million in funding available through more than 30 state programs. State agencies that are making funding available in 2021 include:

- Empire State Development
- Environmental Facilities Corporation, and
- New York State Department of Environmental Conservation

1.8.3 Federal Grant Opportunities

Each of the five PWS would be eligible to apply for Federal Funding for their water quality needs, assuming they meet the agencies funding criteria

United State Environmental Protection Agency Drinking Water State Revolving Fund (USEPA DWSRF):

The USEPA DWSRF was established by the 1996 amendments to the Safe Drinking Water Act (SDWA). Congress controls funding through the DWSRF, however, the USEPA awards capitalization grants to each States DWSRF based on the most recent Drinking Water Infrastructure Needs Survey and Assessment. An important requirement for public water systems is the capacity to ensure compliance with the SDWA. States receiving funds through the USEPA DWSRF are required to provide a match of 30% of total money awarded. States are allowed to take approximately 31% of their grant money in set-asides to fund state programs and third parties.

There are six categories of projects that are eligible for DWSRF support:

- Treatment
- Transmission and Distribution
- Source
- Consolidation
- Storage
- Creation of New Systems

In addition to the federal investments of over $21 billion, the state DWSRFs have provided more than $41 billion to water system through 2019. This assistance was provided through over 15,000 agreements. The Governor has recently announced $83 million is available for critical waster infrastructure through the DWSRF program.

Once States have been issued their grant money, the State has the authority to control the types of assistance it provides to the project owners. States may also set specific loan terms from zero percent to market rate or repayment periods of up to 30-years. “Project Priority Lists” are compiled by States and the projects with the highest priority according to the State are issued funding first.

Assistance can be provided in any of the following forms.

- Loans
- Refinancing
- Purchasing
- Guaranteeing local debt
- Purchasing bond insurance

United States Environmental Protection Agency Water Infrastructure Finance and Innovation Act (WIFIA)

The WIFIA is a federal credit program administered by the USEPA for eligible water and wastewater projects. The WIFIA program loans offer low, fixed interest rates and flexible financial terms to borrowers and can experience significant cost savings. Eligible borrows include local, state, tribal, and federal government entities, partnerships and joint ventures, corporations and trusts, and DWSRF programs. Funding can be issued for projects including:

- Project eligible for DWSRF,
- Enhanced energy efficiency projects at drinking water or wastewater facilities,
- Drought prevention, reduction, mitigation, and
- Acquisition of property if integral to project or will mitigate the environmental impact of a project

The WIFIA Program features include:

- $20 million minimum project size for large communities,
- $5 million minimum project size for small communities (25,000 people or less),
- 49%: Maximum portion of eligible project costs that WIFIA can fund,
- Total federal assistance may not exceed 80% of a project’s eligible costs,
- 35-years: Maximum final maturity date from substantial completion,

- 5 years: Maximum time that repayment may be deferred after substantial completion of the project,
- Interest rate will be equal to or greater than the U.S. Treasury rate of a similar maturity at the date of closing,
- Projects must be creditworthy and have a dedicated source of revenue, and
- NEPA, Davis-Bacon, American Iron and Steel, and all other federal cross-cutter provisions apply.

United States Department of Agriculture Rural Development

The United States Department of Agriculture (USDA), through the Rural Utilities Service Water and Environmental Programs (WEP), offer the ability for rural communities to obtain technical assistance and financing to develop drinking water systems. WEP is the only Federal program exclusively focused on rural water infrastructure in rural communities with populations less than 10,000 people. WEP provides funding for the construction of water facilities and also provides funding to organizations that provide technical assistance and training to rural communities. The WEP funding is administered through National office staff and a network of field staff in each State.

Some assistance programs offered under the USDA Rural Development Water and Environmental Programs and that could apply to the Town's in the Central Lewis County area include the following.

- The Circuit Rider Program.
- The Emergency Community Water Assistance Grants.
- The Water & Waste Disposal Loan & Grant Program.

New Sources of Federal Funds

The recent American Rescue Plan Act of 2021 provides $350 billion for states and local governments. These funds can be dispersed by the states and local governments to fill budget gaps, hire furloughed employees, or support important infrastructure for the states and local jurisdictions. Information should be available in the near future describing how these funds will be distributed to local jurisdictions.

It would be important to follow the development of guidance to determine the percentage of available funds which will be directed to urgent infrastructure needs. The upgrade of water infrastructure would likely be targeted as a high priority for funding.

The US Congress will likely pass a major infrastructure investment program in the range of $1 trillion. Planning and the development of an advocacy strategy should be developed to support critical improvements to the water treatment and distribution systems of Lewis County.

Section 2 – Inventory of Existing Conditions

2.1 Introduction

The Central Lewis County Study includes four Towns, the Town of Lowville (Population: 4,865, Area: 38.1 square miles (mi^2)), Town of Watson (Population: 1,769, Area: 115.7 mi^2) Town of Denmark/Village of Copenhagen (Population: 2,814, Area: 51.7 mi^2), and the Town of Martinsburg (Population: 1,420, Area: 76.1 mi^2), and one village, the Village of Copenhagen (Population: 833, Area: 1.2 mi^2. Each Town operates their own PWS. Water is sourced from either the Village of Lowville or from their own water source as identified in Table 5 below. A map of the Town PWS's are included as Figure Numbers 2 through 6.

Table 5 – Study Area Water District Summary

Town	District Number	Water Source
Town of Lowville	Consolidated District #1	Village of Lowville
	District #3	Village of Lowville
	District #4	Village of Lowville
	District #5	Village of Lowville
	District #6	Village of Lowville
	District #9	Village of Lowville
Town of Watson	District #1	Village of Lowville
	District #2	Village of Lowville
	District #3	Village of Lowville
	District #4	Village of Lowville
	District #4 Ext. #1	Groundwater Wells
	District #5	Village of Lowville
	District #6	Village of Lowville
	District #7	Village of Lowville
	District #8	Village of Lowville
Town of Denmark	Town of Denmark District #1	Groundwater Wells
	Village of Copenhagen	Groundwater Wells
Town of Martinsburg	District #1	Groundwater Wells
	District #2	Village of Lowville
	Glenfield District	Groundwater Wells

More detailed descriptions of the individual PWSs are included in the following sections.

2.2 Town of Lowville

2.2.1 Overview

The Town of Lowville owns and operates a total of six water districts. All water used in the six water districts is sourced directly through the Village of Lowville PWS, however, the Town of Lowville has its own drinking water storage tank that serves Consolidated Water District #1. All other water districts in the Town of Lowville are served directly from the Village of Lowville PWS pressure zone. It is estimated that the six water districts use approximately 42,350 gpd while serving an estimated 282 properties. The Town of Lowville has a total withdrawal limit of 37,250-gallons of water per day.

2.2.2 History

Prior to the creation of Consolidated Water District #1 in 2005, the Town of Lowville operated a total of nine water districts. Consolidated Water District #1 now consists of the former Water Districts No. 1, 2, 7, and 8. At the time of the consolidation, the existing galvanized steel piping was no longer suitable for use and did not comply with provisions of the Safe Water Drinking Act (SWDA) and New York State requirements. Complaints from users were received regarding poor water quality as the pipes had started to internally corrode. In addition to poor water quality, required fire flows were not able to be met or exceeded. Tests near the Lewis County jail indicated a fire flow of only 340 gpm was available while the jail required a fire flow of approximately 1,000 gpm.

As the new consolidated water district was established, it permitted new users in areas that were previously not served. In addition to the new users, part of Consolidated Water District #1 was located in an Economic Development Zone (EDZ) along NYS Route 12 and allowed for the EDZ to be an area of interest for future economic expansions.

An interest has been expressed to add additional water districts within the Town of Lowville to address water quality issues many residents are facing with their wells. Efforts by the Town to seek funding to meet these requests is ongoing. Town officials have also expressed interest in County support relative to water sourcing.

2.2.3 Source, Treatment, and Storage

Water Supply Source:

The Town of Lowville is wholly dependent upon water supplied directly from the Village of Lowville. Water is pumped directly from the Village of Lowville's 3,000,000-gallon water storage tank to the Town of Lowville's 200,000-gallon water storage tank. The Town of Lowville is supplied with water described as being the "oldest" water in the Village of Lowville's water supply system and has resulted in water quality issues for the Town of Lowville. The Town of Lowville was issued an AO from the USEPA for violations of the Stage 2 Disinfection Byproduct Rule in April of 2018.

The Village of Lowville sources their water from three different surface water sources located in the Town of Watson and the Town of New Bremen. These sources are located on 1,550-acres of Village of Lowville owned property located approximately nine miles east of the Village of Lowville. The water supply is managed under a Watershed Management Program. The three locations are known as Young's Pond (spring/stream reservoir) and the Upper and Lower Springs (spring/stream fed impoundments). In 2021, the Village of Lowville submitted plans for the construction of two groundwater wells, a chemical storage building, a well pump house, +/9,000 linear feet of water main and electrical line to service the well pumps and updates inside of the existing Water Treatment Plan to better modernize the facility. It is expected that the groundwater wells will draw approximately 500,000 gpd and will be used to service the Village of Lowville's municipal water users.

According to the 2018 Annual Water Quality Review Report (AWQR) for the Village of Lowville, the New York State Department of Health (NYSDOH) has evaluated the source's susceptibility to contamination under the Source Water Assessment Program. It was identified that the water source contains no discrete potential contaminant sources (PCS's) and none of the landcover contaminants prevalence ratings are greater than low. Susceptibility ratings for protozoa, enteric bacteria, and viruses were identified at

medium-high due to the use of a reservoir (Young's Pond) for a source of water. Reservoirs are described as having a high mobility potential for microbial contaminants by the NYSDOH.

Water Treatment:

Water delivered to the Town of Lowville is initially treated by the Village of Lowville. The Village utilizes a combination of slow sand filtration and micro-filtration system technology. Prior to 2017, the Village of Lowville used only the slow sand filtration technology. The micro-filtration system was added in 2017 in order to keep up with higher demands for water. Additionally, the Village of Lowville chemically treats the water for corrosion control and chlorinates for disinfection purposes.

Picture: Town of Lowville Treatment Building
Consolidated Water District #1

As the Town of Lowville receives the water from the Village of Lowville, but prior to entering the Town of Lowville water storage tank, chlorine is added again**.** Monitoring and control equipment have been installed by the Town of Lowville to closely regulate the amount of chlorine that is added to the system prior to distribution. The heavy use of chlorine coupled with the relatively high naturally occurring organic content of the water supply have resulted in elevated levels of Total Trihalomethanes (TTHMs) and Total Haloacetic Acids (THA). The elevated levels of disinfection byproducts (TTHMs and THAs) are the basis for the Town's April 2018 AO. The Town has recently completed a project to install activated carbon filtration to enhance DBP removal. This project will address the requirement of the AO to bring drinking water within SDWA standards.

Water Storage:

The Town of Lowville stores finished/treated drinking water supplied by the Village in a 200,000-gallon storage tank on Number Three Road just north of the Village of Lowville's water storage tank. The Town of Lowville water storage tank only serves the water district identified as Consolidated Water District #1 (formerly Water Districts #1, #2, #7, and #8). The remaining districts, #2 through #5, are served directly by extensions of the Village of Lowville distribution system into the Town. The storage capacity of the Town of Lowville storage tank is sufficient to supply the demands for one days' water consumption and fire flow.

Picture: Town of Lowville Drinking Water Storage Tank
Consolidated Water District #1

The Town of Lowville water system is included as Figure Number 2 of this Study.

2.2.4 Service Area

Consolidated Water District #1:

The Consolidated District #1 was established in 2005 and consists of the former Town of Lowville water districts #1, #2, #7, and #8. This water district mainly covers the area just outside the Village of Lowville along Route 26, Number Three Road, and Rice Road and serves approximately 350 people. The Consolidated Water District #1 is separated into three distinct areas based on elevation. The three areas are identified as follows:

- Low Service Area – Elevation below 910 feet asl – 1,800 linear feet of 10-inch pipe,
- Medium Service Area – Elevation between 910 feet asl and 1090 feet asl – 32,200 linear feet of 6 to 12-inch pipe, and
- High Service Area – Elevation above 1090 feet asl – 2,000 linear feet of 4-inch pipe

To manage water pressure in the Low Service area distribution system, a pressure reducing vault located on Ebbley Road is utilized to reduce the system pressure along East Road. To serve the areas of higher elevation, the High Service Area utilizes a booster pump station to draw water from the 12-inch main waterline that connects to the Town of Lowville water storage tank. The booster pump station raises the pressure in the system to supply the High Service Area.

Water District #3:

Water District #3 serves a total of 28 properties along E. State St and Indian River Road (State Route 812). This water district consists of 8-inch ductile iron pipe (DIP) and includes a reduced pressure zone valve along with a master meter pit.

Water District #4:

Water District #4 serves a portion of Waters Road that includes 28 properties. The distribution system consists of 8-inch ductile iron pipe (DIP) while the connections and is served from the Village of Lowville's main transmission line.

Water District #5:

Water District #5 serves 11 properties along Route 12 and E. Road. This water district also serves the Wal-Mart facility located on Route 12. This water districts consists of 12-inch DIP which includes capacity for fire flow.

Water District #6:

Water District #6 serves two properties along Route 26 which includes one residence and one vacant agricultural field. The residence is served off a 6-inch diameter main.

Water District #9:

Water District #9 serves 12 properties and is consisted of 8-inch DIP. Fire flows are available for this water district. Additionally, Water District #9 has experienced recent commercial growth. Location of this water district was not identified.

2.2.5 Current Demand

The Town of Lowville has been permitted by the Village of Lowville to withdraw a total of 37,250 gallons per day (gpd) from the Village of Lowville's PWS. Each Town of Lowville water district is permitted a maximum withdrawal limit on a per day or per year basis. Table 6 shows the withdrawal limits and an estimated daily usage rate based on population served (70 gallons/person/day) for the Town of Lowville water districts. As illustrated, current demand for water equals or exceeds that permitted for use. Expansion therefore is limited.

Table 6 – Town of Lowville Daily Withdrawal Limits and Daily Usage Rate

Water District	Permit ID	Permitted Withdrawal Limit (gpd)	Estimated Daily Usage Rate (gpd)
Consolidated Water District #1	WSA#10778	30,000	28,175
Water District #3	WSA#8661	1,885	4,900
Water District #4	WSA#8677	3,463	4,900
Water District #5	WSA#8678	299	2,100
Water District #6	WSA#8679	203	175
Water District #9	WSA#9741	1,400	2,100
Totals		**37,250**	**42,350**

2.2.6 Yearly Budget and Debt Service

The Town of Lowville budget in 2019 for water was reported to be $180,771 for all water districts. Of this amount, $37,549 represents debt service which is carried by Consolidated Water District #1 only and does not reflect the debt service for $1.3 million activated carbon treatment system that was recently completed. Of the $180,771 that was budgeted for 2019, Consolidated Water District #1 was allocated the largest budget when compared to the other Town of Lowville water districts. The budget for each water district is outlined in Table 7 below.

Table 7 – Town of Lowville Budget

Water District	2019 Budget (dollars)
Consolidated Water District #1	133,702
Water District #3	9,566
Water District #4	27,514
Water District #5	7,946
Water District #6	451
Water District #9	1,952
Total	**180,771**

2.2.7 Significant Issues

With the addition of the activated carbon adsorption system, water quality for Consolidated Water District #1 is addressed. Significant issues remaining are addressing water quality for the remaining water districts but more importantly addressing limitations on the quantity of available water.

2.3 Town of Watson

2.3.1 Overview

The Town of Watson owns and operates a total of eight water districts. At this time, the eighth water district (Water District #4 Extension #1) is being established and will be the only water district that is not served directly off the Village of Lowville PWS. For the seven existing water districts, there are a total of approximately 92 connections. It is estimated that the Town of Watson withdraws 16,100 gpd of water from the Village of Lowville PWS. The Town of Watson and the Village of Lowville have an agreement that permits the Town of Watson to withdraw a total of 39,050 gpd of water. As of the date of this report, it has not been determined how many connections Water District #4 Extension #1 will have.

2.3.2 History

Due to a petroleum spill at the Town of Watson Highway Department garage that contaminated the nearby resident's groundwater wells, the Town of Watson was required by the NYSDEC to address the spill and the contamination of the nearby groundwater wells. As a response, the Town of Watson decided to take a community approach instead of only addressing the affected area. The Town of Watson ultimately proposed a project that would expand the availability of water through a PWS that would be owned and operated by the Town of Watson. Since at least 2014, the Town of Watson has been expending money towards the new water district (Water District #4 Extension #1). As of the date of this Study, the Town of Watson Water District #4 Extension #1 has been completed.

2.3.3 Source, Treatment, and Storage

Water Supply Source:

Currently drinking water for all water districts, with the exception of Water District #4 Extension #1 (Attachment 8), is sourced directly from the Village of Lowville transmission main which travels through the Town of Watson from the supply and treatment facilities located east of the Village of Lowville. Connections to the Town of Watson PWS are limited to the Town of Watson residences. This supply source, the same as the Village and Town of Lowville, presents the same water quality issues (high TTHMs and THAs) to Watson residents as to those of the Town and Village of Lowville.

Picture: Town of Watson Well Field
Water District #4 Ext. #1

The majority of the of the Town of Watson residents however rely on individual water wells for water supply. Groundwater quality is highly variable for these residences. Most wells are shallow and are affected by the changing conditions of the nearby Black River. Turbid water generated in the personal wells is a common occurrence and is usually caused by the elevated water levels of the Black River.

The Town of Watson established Water District #4 Extension #1 to directly serve select Town of Watson residents and is near completion of a project to address the existing limitations. A groundwater well site was constructed on Number Four Road (County Road 26) near Kotel Road along with a new storage tank and distribution piping along Number Four Road which will tie all existing water districts together.

Water Treatment:

Treatment of water used by the Town of Watson for all other water districts, excluding Water District #4 Extension #1, is provided by the Village of Lowville and similar to the Town of Lowville, is currently reliant upon the Village for water quality and quantity.

The Town of Watson has completed construction on the new treatment building for Water District #4 Extension #1. This building contains the water pump controls and disinfection system.

Picture: Town of Watson Treatment Building
Water District #4 Ext. #1

Water Storage:

Water quantity and pressure for all water districts with the exception of Water District #4 Extension #1 are wholly dependent upon the operating conditions of Village of Lowville transmission main.

The Town of Watson Water District #4 Extension #1 water storage tank is currently being completed. Water District #4 Extension #1 utilizes a 166,000-gallon standpipe glass-fused to steel water storage tank located on Number Four Road (County Road 26).

The Town of Watson water system is included as Figure Number 3 of this Study.

Picture: Town of Watson Drinking Water Storage Tank
Water District #4 Ext. #1

2.3.4 Service Area

The Town of Watson system consists of seven water districts that are each directly served by the Village of Lowville's transmission main.

Water District #1:

The Town of Watson never received a permit to complete Water District #1 and therefore was never completed.

Water District #2:

Water District #2 consists of 35 connections on Crestview Drive.
This district specifically serves the Snow Belt Housing subdivision with an 8-inch ductile iron pipe (DIP). Historically, there has been problems with obtaining the required fire flows for this water district.

Water District #3:

Water District #3 consists of 13 connections for the River Road trailer park. This water district utilizes a 3-inch pvc looped distribution system. The distribution system uses pressure reducing valves as it is served directly off the Village of Lowville transmission main. Overall, this water district serves 21 manufactured homes. No fire hydrants were installed in this water district.

Water District #4:

Water District #4 consist of 27 connections on River Road. This water district was created as a result of a farmer installing a 3-inch HDPE line to his farm and picked up homes along the path. Three 1-inch lines serve some of the customers while another 1-inch line serves 17 additional customers. At the time of creation, Water District #4 served a possible 42 parcels with 20 receiving water. No fire hydrants were installed during the creation of this water district.

Water District #4 Extension #1:

This District has completed the installation of two (2) new 200 gpm municipal wells with a 528 sq ft well house building on Number Four Road, southwest of its intersection with Kotel Road; a 166,000-gal water storage tank on Number Four Road, southwest of its intersection with Erie Canal Road: approximately 52,000 ft of an 8" water distribution including fire hydrants, gate valves, water service taps; and 27,500 ft of service laterals. The project covers portions of Number Four Road, River Road, Snell Road, Stewart Lane and Pine Grove Road in the Town of Watson.

Water District #5:

Water District #5 consists of 2 connections on Snell Road served by 3-inch lines. No hydrants were installed during the creation of this water district.

Water District #6:

Water District #6 was created by a farmer who installed his own service line. This water districts serves 4 properties on Olmstead Road and Cemetery Road. No hydrants were installed during the creation of this water district.

Water District #7:

This district is served directly from the Village of Lowville 10-inch and 14-inch transmission line using taps and laterals. There are 4 connections on Hodge Road, Peckham Road, and Cemetery Road.

Water District #8:

This district consists of a 2-inch line with a master meter and no hydrants. There are 7 connections on Peckham Road, Kotel Road, and Ossant Road.

2.3.5 Current Demand

The Town of Watson is permitted by the Village of Lowville to withdraw a total of 39,050 gpd from the Village of Lowville's PWS. Each of the Town of Watson water districts are permitted on a per day basis. Table 8 shows the withdrawal limits and an estimated daily usage rate based on population served (70 gallons/person/day) for each respective Town of Watson water district.

Table 8 – Town of Watson Daily Withdrawal Limit and Daily Usage Rate

Water District	Permit ID	Permitted Withdrawal Limit (gpd)	Estimated Daily Usage Rate (gpd)
Water District #2	WSA#8547	12,600	6,125
Water District #3	WSA#8326	9,450	2,275
Water District #4	WSA#8738	8,500	4,725
Water District #4 Ext. #1	TBD	128,000	39,200
Water District #5	WSA#8739	400	350

Water District #6	WSA#8740	1,400	700
Water District #7	WSA#8741	6,000	700
Water District #8	WSA#8742	700	1,225
Totals		**167,050**	**55,300**

2.3.6 Yearly Budget and Debt Service

The Town of Watson has completed construction of a new project (Water District #4 Extension #1). At the time of our most recent interview with the Town of Watson officials, the impacts of their new project on the budget and debt service had not yet been determined. The Town officials are still working with interim financing as the construction project has not been closed out. Town officials were working through final project cost information to establish long-term debt service costs. In addition, they were getting additional requests from property owners along the new pipeline to connect and an overall operational strategy has not yet been put in place.

2.3.7 Significant Issues

Town officials believe that their new water supply will address water needs in the Town of Watson for the future. They have determined that their new system has excess capacity and they are willing to discuss potential sales to users outside of their service area but are uncertain of the methods and mechanisms for facilitation and arrangements and are open to input from other municipalities or Lewis County.

Further, they are currently working through operational costs, staffing, and employee contract conditions. Current operations are performed by existing staff who have other duties in addition to water system operations. They are open to the concept of shared resources as a way of optimizing operational costs. Town officials also noted that implementing a capital construction project of this magnitude has strained the Town cash flow on occasion. While they are managing the process currently, it points out the potential benefits of a larger partner in project implementation to better respond to project cash flow without stressing the local financial systems.

2.4 Town of Denmark/Village of Copenhagen

2.4.1 Overview

The Town of Denmark and the Village of Copenhagen each own and operate their own water districts. However, The Village of Copenhagen owns and operates the two water treatment facilities that serve users of the Town and Village water districts while the Town of Denmark owns and operates the water tower located on County Road 194. The treatment facilities are identified as the Stoddard Road Treatment Facility and the Woodbattle Road Treatment Facility. Currently, the Woodbattle Road Treatment Facility is not in operable condition but is still permitted by NYSDEC as the backup water source for the two water districts.

The Village of Copenhagen Water District serves the Village users only while the Town of Denmark Water District #1 serves users outside of the Village. The Village of Copenhagen Water District serves approximately 850 people with an estimated total water usage of 65,000 gpd while the Town of Denmark Water District serves approximately 50 people with an estimated daily usage rate of 3,500 gpd.

2.4.2 History

Prior to establishing a groundwater source on Stoddard Road in the Town of Denmark, the Woodbattle Road Treatment Facility was the only source of water for the Town of Denmark/Village of Copenhagen. The Town of Denmark/Village of Copenhagen originally obtained its drinking water from both groundwater and surface water sources. The surface water was sourced from the Deer River in the area of the treatment facility. In 1998, a shore well intake in the Deer River was established to transfer the water to the Woodbattle Road Treatment Facility. To aid in filtration during times of high river flows, 15-feet of cobblestone and perforated pipe was placed at the shore well intake. The raw water from the Deer River was treated using SternPAC as a way to coagulate and settle out any organic solids. After coagulation, the settled water was pumped through two filters and mixed with the finished well water. The surface water intake is no longer permitted for use at the Woodbattle Road Treatment Facility.

2.4.3 Source, Treatment, and Storage

Water Supply Source:

The Village of Copenhagen owns and operates two water treatment facilities and well fields located on Stoddard Road in the Town of Denmark and on Woodbattle Road within the Village of Copenhagen. Town residents are serviced by line extensions into the Town from the Village. The Stoddard Road Treatment Facility utilizes three groundwater wells (PW-3, PW-4, and PW-5) while the Woodbattle Road Treatment Facility has two groundwater wells (PW-1 and PW-2). Between 1989 and 2011, the well field located on Woodbattle Road was the sole source of water for the Village of Copenhagen.

In 2011, because of water quality issues at the Woodbattle Road well field, the Village of Copenhagen put into service the Stoddard Road Treatment Facility and well field to be used as the primary water source while the Woodbattle Road well field would be transitioned into serving as a backup water supply for the Village of Copenhagen. The Stoddard Road well field was established between 2007 and 2010 in anticipation of becoming the primary water supply source. The three groundwater wells located on Stoddard Road are between 195 feet below ground surface (bgs) and 275 feet bgs. Each of the three groundwater wells are located and sealed within a bedrock layer with discharge flow rates for the three wells of 300 gpm, 45 gpm, and 133 gpm, respectively.

After establishing the Stoddard Road well field, Microscopic Particulate Analysis (MPA) testing was conducted on each of the three wells and determined that the risk of surface water contamination in wells PW-3 and PW-5 were high and moderate, respectively. The risk for surface water contamination in well PW-4 was determine to be low. As a result of surface water contamination, coliform and E-coli both were present in groundwater samples collected from wells PW-3 and PW-5.

In 2010, the New York State Rural Water Association completed a Source Water Protection Plan for the Stoddard Road well field. Based on the recovery rate of well PW-5 during a pumping test after a rainfall event, it was confirmed that the well field is under direct influence of surface water. The Source Water Protection Plan states that the watershed for the Stoddard Road well field is estimated to be approximately 548-acres in size with a recharge rate of 178.6 million gallon of water per year.

Although the Woodbattle Road facility is listed on the Village of Copenhagen Water Withdrawal Permit as the backup source of water, the site has not been used or maintained and is currently not in serviceable condition, ultimately, leaving the Stoddard Road facility as the standalone water source for the Village of Copenhagen and Town of Denmark.

Following the drought in 2016, the New York State Department of Health issued an Administrative Order requiring the Village to provide an operable backup water supply. Most recently, the Village of Copenhagen once again experienced a water shortage in the summer of 2020.

Water Treatment:

Stoddard Road Treatment Facility:

Based on the MPA testing results described above for each of the three wells, it was concluded that groundwater from PW-3 and PW-5 were under direct influence of surface water and that the Stoddard Road Treatment Facility would need to include filtration as part of the treatment process.

Groundwater from the Stoddard Road well field is pumped directly to the treatment facility using 6-inch ductile iron pipe. Inside the treatment facility, the pumped groundwater is directed through an electronic flow meter and three stages of filtration. Once through the three-stage filtration process, the water is directed through a UV disinfection system. After the UV system, chlorine is injected into the water directly from a 50-gallon chlorine tank stored within the treatment facility providing additional disinfection for the water prior to leaving the treatment facility.

Woodbattle Road Treatment Facility:

At this time, the Woodbattle Road Treatment Facility is not in operable condition and remains idle. Historically, the Woodbattle Treatment Facility was used to treat surface water sourced from Deer River. The wellfield consists of two 8-inch diameter wells which have been shown to have elevated concentrations of iron, manganese and hydrogen sulfide. More recent testing conducted in November of 2018 have shown the ground water quality as gray or blackish in color, and turbid with a sulfur smell. There is also a strong likelihood of biofilm formation. Recent pump tests have shown very low yields in addition to the low quality of the source water.

This facility was the subject of an engineering evaluation conducted by EDR in October of 2019. EDR determined based on their evaluation did not recommend that the Woodbattle Road Treatment Facility be restored to operable condition even though based on the three alternatives EDR presented, the restoration of the Woodbattle Road Treatment Facility was determined to be less costly on a present worth basis and would result in a lower cost were dwelling served.

Water Storage:

The Town of Denmark Water District #1 utilizes an elevated storage tank located at 2339 County Road 194 in the Town of Denmark. The storage tank was constructed by and currently owned by the Town of Denmark. The storage tank has a capacity of 180,000-gallons and sits at an elevation of approximately 1,280 feet above sea level.

Picture: Town of Denmark Drinking Water Storage Tank

Although the storage tank is owned, operated, and maintained by the Town of Denmark, the storage tank is shared with the Village of Copenhagen and serves

both the Village of Copenhagen users and the users in the Town of Denmark Water District. Once the storage tank is fully paid for, the Town of Denmark plans to transfer ownership to the Village of Copenhagen who will then take over the operation and maintenance requirements. The Town of Denmark Water District #1 is included as Figure Number 4 of this Study.

2.4.4 Service Area

Town of Denmark Water District No.1:

Water District No.1 is the only water district located the Town of Denmark. The water district covers only the outside users of the Village of Copenhagen serving an approximately 20 properties (50 people).

Village of Copenhagen:

The water district utilizes approximately 235 connections serving approximately 850 people. The water district only includes users located within the Village of Copenhagen.

2.4.5 Current Demand

The Village of Copenhagen has been permitted to withdraw a total of 100,000 gpd from its water sources (WSA#8571), by the NYSDEC. With the Stoddard Road wells PW-3 and PW-5 under direct influence of surface water, the Village of Copenhagen is practically limited to well PW-4 during drought conditions. PW-4 has an estimated capacity of 64,800 gpd. On a daily average basis, the Village of Copenhagen uses approximately 68,500 gpd for use within the Village of Copenhagen and the Town of Denmark Water District No.1. The withdrawal limit and daily usage rate is summarized in Table 9.

Table 9 - Town of Denmark Daily Withdrawal Limit and Daily Usage Rate

Water District	Permit ID	Permitted Withdrawal Limit (gpd)	Estimated Daily Usage Rate (gpd)
Town of Denmark Water District No.1	TBD	TBD	3,500
Village of Copenhagen	WSA#8571	64,800[(1)]	65,000
Totals		**64,800**	**68,500**

[(1)] The Village of Copenhagen is permitted to withdrawal 100,000 gpd. During drought conditions, the Village of Copenhagen is limited to well PW-4. Wells PW-3 and PW-5 are under direct influence of surface water.

2.4.6 Yearly Budget and Debt Service

Current budget and debt service information is not available. This will be updated when published.

2.4.7 Significant Issues

In addition to the groundwater studies completed to establish the Stoddard Road well field, in the Spring of 2019, Hanson Van Vleet Hydrogeologic Consultants, PLLC evaluated the Stoddard Road well field yield under drought conditions. According to the evaluation report, the estimated yield during drought conditions for the Stoddard Road well field is approximately 45,000 gpd while the daily demand for the Village of Copenhagen distribution system at the time of the study was reported to be 56,000 gpd. Therefore, under drought conditions, Hanson Van Vleet Hydrogeologic Consultants, PLLC indicated a shortage of approximately 11,000 gpd. Similar conditions were experienced in 2016 when the Town of Denmark/Village of Copenhagen experienced drought conditions and were forced into purchasing water from the surrounding area which made apparent that a backup water supply is always needed.

Biofilms have been found in the well screens, piping systems, and treatment systems used in the treatment of potable water when the following factors are present:

- Presence of bacteria in the groundwater or in the system i.e., coliform. Sulfur or iron bacteria
- Carbon or energy source i.e., carbonates
- Nutrient source i.e., nitrates

Bacteria contamination can be initiated by a few "floating cells" in the source water or the distribution system. Inadequate chlorine residuals can allow these cells to attach to the wall of the pipe or well screen. Once the cells attach to the walls of the pipe, these bacteria begin to grow very rapidly and secreting a slime substance (polysaccharides) which serves as a barrier to effective disinfection. The biofilm usually doesn't create a health risk but when combined with inadequate disinfection they create system operation problems. Sulfate reducing bacteria form sulfurous slimes and are very much responsible for hydrogen sulfide odors and poor water quality. Biofouling is one of the five major causes for decreasing well yields and the development of poor well water quality.

During the Copenhagen well testing conducted in November of 2018 the pump test information for Well A at the 75gpm noted that the water quality was characterized as "Grey, Very Turbid, Sulfur Colloidal" and the Well B test at 130 gpm noted that the water quality was characterized "Grey, Sulfur, Turbid ". It was clear that both wells were contaminated by sulfate reducing bacteria.

Biofouling can also accelerate chemical and electrochemical corrosion by producing inorganic and organic metabolites that can lower the pH, increase the ability of the well water to increase the chemical corrosion of metal casings, well screens and piping ultimately leading to leaks and pipe failure. This process is called microbial induced corrosion.

There are three main components of well rehabilitation. The first involves disinfection which commonly utilizes chlorine or other chemical oxidizing agents targeted to reduce or eliminate the downhole active microbial population. Chemical cleaning using both chemical and mechanical efforts are used to reduce mineral scale or biomass. Chemical cleaning generally involves the use of mineral acids but may also include the use of dispersants, inhibitors, and surfactants.

It is also very important to protect the source water utilizing aquifer protection measures, wellhead protection controls and the management of development in the vicinity of the wells. There still may be merit in the use of GPR and grouting where there is an indication of surface water connection with an aquifer.

The Woodbattle Road Treatment Facility, as discussed in Section 2.4.1, is no longer in operable condition although it is still listed as the backup water supply system for the Village of Copenhagen. In 2019, the Village of Copenhagen contracted Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, D.P.C. (EDR) to evaluate the Woodbattle Road Treatment Facility and a possible interconnection with the Village of West Carthage water system (Attachment 6). After a complete evaluation of both alternatives, EDR recommended that the Village of Copenhagen investigate the possibility of an interconnection between the Village water system and the Village of West Carthage Water system. EDR recommended this alternative based on the following conclusions.

- Suspect safe yield of the Woodbattle Road Facility.

- Poor water quality of the Woodbattle Road wells.
- Suspect safe yield of the Stoddard Road well source based on the Hydrogeologic Report completed in 2019.
- Treated water is available from West Carthage in the quantities required to meet the Village of Copenhagen water needs.

Following the completion of the EDR report, the Village of Copenhagen contracted with Barton & Loguidice, D.P.C. (Barton & Loguidice) in 2020 to conduct a water supply evaluation (Attachment 7). Barton & Loguidice report evaluated three alternatives to address the issues of the Woodbattle Road Treatment Facility. The three alternatives are as follows.

- Alternative 1 – Rehabilitation of Woodbattle Road Treatment Facility
- Alternative 2 – Purchase of Raw Water from the Village of West Carthage
- Alternative 3 – Purchase of Treated Water from the Village of West Carthage

After each alternative was evaluated, Barton & Loguidice determined that Alternative 1, rehabilitation of the Woodbattle Road Treatments Facility, was the best option to explore. Barton & Loguidice stated that at the time of the evaluation, the Village of West Carthage stated in a letter to the Village of Copenhagen that they are unable to sell finished water and if they were to sell raw water, there would need to be an extensive engineering study of the impacts to the raw water supply near Pleasant Lake. Based on these statements made by the Village of West Carthage, Alternative 1 was determined to be the only feasible option left for the Village of Copenhagen.

2.4.8 Plans for Improvement

The Town of Denmark/Village of Copenhagen have been in discussion with the Village of West Carthage regarding using the Village of West Carthage's water supply as a supplemental supply to the Village of Copenhagen water system. The connection has been proposed to be constructed between the Village of West Carthage water storage tank located on Old State Road in the Town of Denmark and the Stoddard Road Treatment Facility (approximately 2.2 miles). This connection has an estimated total cost of $4.5 million. The items included in the estimated cost include piping, service connections, pump station, and a 150,000-gallon storage tank.

A new pump station, owned and operated by the Village of Copenhagen, would be constructed in the area of the West Carthage water storage tank. The connecting pipeline would be located in the public right-of-way of Old State Road, Fuller Road, and Stoddard Road. In addition to being a supplemental water supply to the Village of Copenhagen, the property owners along Fuller Road would have the ability to be connected to a public water service.

2.5 Town of Martinsburg

2.5.1 Overview

The Town of Martinsburg consists of three water districts, Martinsburg Water District #1, Martinsburg Water District #2, and the Glenfield Water District. The Martinsburg Water Districts #1 and #2 are owned and operated by the Town of Martinsburg while the Glenfield Water District is owned and operated by the Hamlet of Glenfield. Martinsburg Water District #1 serves approximately 310 people through 128 connections with an estimated demand of 46,000 gpd (permitted 86,400 gpd) while Martinsburg Water District #2 serves approximately 9 different properties with a demand of 1,575 gpd. Note, Martinsburg

Water District #2 is served directly from the Village of Lowville PWS. The Glenfield Water District serves approximately 200 people through 179 connections and has an estimated water demand of 20,000 gpd (permitted 30,000 gpd).

2.5.2 History

Martinsburg Water District #1:

The Martinsburg Water District #1 water system was approved by the former State Water Supply Commission in 1907 and built shortly after. The original system, built with wooden pipes, was replaced in the 1930's using six- and four-inch cast iron pipe.

Originally the water was sourced from a spring fed reservoir located on a tributary of Atwater Creek, 2 miles west of the Hamlet of Martinsburg. In 1912, a severe drought occurred and the Hamlet of Martinsburg constructed a second reservoir on Atwater Creek north of the original reservoir. Ultimately, due to low flow conditions, the initial reservoir was discontinued. Water from the new reservoir flowed by gravity to a hypo-chlorinator stations where the water was disinfected and metered to be distributed to the Hamlet of Martinsburg. In 1972, it was determined by President of the Water Commissioners that the nearby Whetstone Gulf Reservoir directly affects the flow in Atwater Creek.

In response, the Hamlet of Martinsburg purchased 60-acres of property that contained many natural springs adjacent to the Atwater Creek watershed. The water collected from the springs was transported to the Hamlet of Glenfield PWS by way of the same transmission pipes as the reservoir. No changes in water supply quantity were seen leading to the assumption that the transmission line was in very poor condition.

Glenfield Water District:

As early as 1972, the Glenfield Water District sourced it water from four unchlorinated springs. Two of these springs, identified as the House Springs, were located in the Town of Turin outside of the Water District east of Route 12 and Main Street. Water flowed by gravity from the House Springs through a 2-inch diameter pipe to supply the residents on the east side of Main Street. The other two springs, identified as the Fries Springs, were located in the Town of Martinsburg inside the Glenfield Water District east of Route 12 and west of Main Street. Water also flowed from these springs by gravity through a 1.5-inch diameter pipe to supply users on the west side of Main Street and the side streets west of Main Street.

In addition to the four springs, a well was established at a maple syrup plant on Mill Street and was available to the Glenfield Water District since as early as 1966. A 0.25 hp submersible pump pumped water from the well to a 4,000-gallon wet well. From the wet well, a 0.50 hp pumped transferred water to two 120-gallon pressure tanks and the water district distribution system. A hypo-chlorinator was installed at the well but was not used.

The water district distribution system consisted of small diameter galvanized and plastic pipe with distribution pressures ranging from 2 to 32 psi. The galvanized piping was reported as severely corroded.

In 1972, the Glenfield Water District made projections about the water demand in the years 1990 and 2020. Based on the 1990 and 2020 projections and to improve pressure throughout the system, recommendations were made that included new wells be installed, a new reservoir be constructed,

replace existing piping with 6- and 8-inch water mains, and serve the areas of Blue Street and to connect the new wells to the reservoir system.

In 1995, Resource Associates designed a potable water project for the Glenfield Water District. The design included a new 260,000-gallon water storage tank, an expanded service area, and other system improvements to meet the newly required demands of 20,000 gpd. Two wells were established near Main Street (Well #1 and Well #2) and water was pumped from these wells to the new storage tank West of Route 12.

2.5.3 Source, Treatment, and Storage

Water Supply Source:

Martinsburg Water District #1:

The Martinsburg Water District #1 consists of five drilled wells located in the town's approximately 7-acre well field on Cemetery Street. The wells are drilled to a depth of approximately 40 feet into a gravel aquifer.

Picture: Town of Martinsburg Treatment Building Water District #1

Martinsburg Water District #2:

The Martinsburg Water District #2 is supplied drinking water from the Village of Lowville through the Town of Lowville Water Districts #5 and #6.

Glenfield Water District:

The Glenfield Water District is served by two groundwater wells that are approximately 200 feet bgs into the Low Plains Aquifer. The wells are located in the Hamlet of Glenfield on Mill Street. The two wells are also capable of serving as a backup to the Martinsburg Water District #1.

Although there is currently no connection to the Glenfield Water District system, a well located at the local BOCES school is available for backup use in case of a shutdown to the primary Glenfield Water District system. The well located at the BOCES is capable of approximately 78 gallons per minute (gpm).

Water Treatment:

Martinsburg Water District #1

The water is chlorinated at the new pump station/control building and pumped directly into the distribution system for direct use by consumers or transferred by the same water mains to a storage tank. The pump station is also located on the same property as the groundwater wells on Cemetery Road in the Hamlet of Martinsburg.

Martinsburg Water District #2:

All drinking water treatment is completed by the Village of Lowville as the water is sourced through the Village of Lowville's system as previously discussed.

Glenfield Water District:

Groundwater sourced from the wells located on Mill Street is chlorinated at the pump station prior to entering the distribution system. The pump station is also located on Mill Street in the Hamlet of Glenfield on the same property as the wells.

Water Storage:

Martinsburg Water District #1:

The Martinsburg Water District #1 utilizes an Aquastore bolted steel water storage tank with a capacity of 189,000-gallons located at the east end of the distribution system in the Hamlet of Martinsburg on Whitaker Road.

Picture: Town of Martinsburg Drinking Water Storage Tank Water District #1

Martinsburg Water District #2:

There is no water storage for the Martinsburg Water District #2. Water is sourced directly from the Village of Lowville system through the Town of Lowville Water Districts #5 and #6.

Glenfield Water District:

The Glenfield Water District uses a 260,000-gallon elevated storage tank located on Glendale Road northwest of the Hamlet of Glenfield. The elevated tank has an approximate floor elevation of 920 feet asl. The storage tank is located at the most western end of the Glenfield Water District distribution area.

The Town of Martinsburg system is included as Figure Number 5 of this Study. The Hamlet of Glenfield system is shown on Figure Number 6.

2.5.4 Service Area

Martinsburg Water District #1:

The Martinsburg Water District #1 serves the Hamlet of Martinsburg and select areas surrounding the Hamlet of Martinsburg. This water district serves approximately 310 people including 109 single family homes, 2 multi-family homes, 9 commercial properties, and 8 farms.

Martinsburg Water District #2:

The Martinsburg Water District #2 serves 9 users along Route 12 and Route 26 near the town lines of Martinsburg and Lowville.

Glenfield Water District:

The Glenfield Water District serves the Hamlet of Glenfield and select surrounding areas. Overall, the water district serves approximately 200 people including 128 households/businesses through 179 connections.

2.5.5 Current Demand

The Town of Martinsburg contains three distinct water districts that each utilize a different source of water for their PWS. Table 10 summarizes the permitted withdrawal limits and water usage rates for the three Town of Martinsburg water districts. Water district #2 daily usage rate is estimated based on population served (70 gallons/day/person) while usage rates for Martinsburg Water District #1 and Glenfield Water District are reported values in the Lewis County Comprehensive Public Water Supply and Sanitary Sewerage Study dated February 2009.

Table 10 – Town of Martinsburg Daily Withdrawal Limit and Daily Usage Rate

Water District	Permit ID	Permitted Withdrawal Limit (gpd)	Estimated Daily Usage Rate (gpd)
Martinsburg Water District #1	WSA#10437	86,400	46,000
Martinsburg Water District #2	WSA#8724	825	1,575
Glenfield Water District	WSA#9254	30,000	20,000
Totals		**117,225**	**67,575**

2.5.6 Yearly Budget and Debt Service

The Town of Martinsburg for 2020 budgeted a total of $144,477 for Martinsburg Water District #1, Martinsburg Water District #2, and the Glenfield Water District. Debt service for 2020 amounted to $14,201 with debt service divided between Martinsburg Water District #1 and Glenfield Water District at $7,701 and $6,500, respectively. The Glenfield Water District was allocated the largest budget for 2020, as shown in Table 11 below.

Table 11 – Town of Martinsburg Budget

Water District	2020 Budget (dollars)
Martinsburg #1	43,200
Martinsburg #2	5,100
Glenfield	96,177
Total	**144,477**

No capital projects are anticipated for 2020 and beyond.

2.5.7 Significant Issues

The Town believes that current systems address their current needs. The Town has identified desires for additional growth in the service area. Water line extensions to Water District #2 have initially been identified. The Town of Martinsburg has proposed extending their water services along Route 26 north and south of the Hamlet of Martinsburg. The extension to the north of the Hamlet of Martinsburg was proposed with the idea of connecting Water Districts #1 and #2 to eliminate the need to purchase treated water from the Village of Lowville and eliminate the current DBP issues with the treated water from the

Town of Lowville system. The extension south of the Hamlet of Martinsburg along Route 26 would present the opportunity for additional Town of Martinsburg residents to be served by the PWS.

2.6 Central Lewis County Significant Issues

2.6.1 Summary of Town Water Demands

As shown below in Table 12, two towns within the Central Lewis County Study Area are operating very close to their permitted withdrawal limits. Two towns appear to have excess capacity. The Town of Lowville and the Town of Denmark/Copenhagen are at or above their respective withdrawal limits while the Town of Watson and the Town of Denmark show available capacity.

Table 12 – Central Lewis County Study Area Withdrawal and Usage Totals

Town	Permitted Withdrawal Limit (gpd)	Estimated Daily Usage Rate (gpd)
Town of Lowville	37,250	42,350
Town of Watson	167,050	55,300
Town of Denmark/Village of Copenhagen	64,800[(1)]	68,500
Town of Martinsburg	117,225	67,575
Totals	**258,325**	**191,025**

[(1)] The Village of Copenhagen is permitted 100,000 gpd. During times of drought conditions, the Town of Denmark/Village of Copenhagen water supply system is limited to an approximate water withdrawal rate of 64,800 gpd.

In summary, additional supply is available within several systems and would be adequate to address current needs and the modest growth projected in Section 1, however, conveyance to deliver the water to the users in need is not in place to take advantage of it.

2.6.2 Surface Water

The most significant potable water issue in the Central Lewis County Study Area is the significant presence of byproducts of chlorine disinfection. The byproducts typically involve Trihalomethanes and Haloacetic Acids.

THM and HAA formation is directly related to the dose of chlorine used for disinfection and the organic carbon concentration in the raw water supply. A high chlorine dose can create THMs in the presence of a high organic carbon concentration typically only found in surface water supply. Other factors including the system residence time, temperature, and the pH can also contribute to the presence of THMs.

To minimize or prevent THM and HAA formation, it may be necessary to select a disinfectant other than chlorine or practice better management of the free chlorine dose and/or reduce the organic carbon concentration.

The most often used techniques for organic content reduction involves optimized coagulation at the treatment facilities or pretreatment using granular activated carbon. After formation, THMs and HAAs can be removed by granular activated carbon (GAC) or aeration.

The SDWA Standards for THMs and HAAs are as follows:

- THMs – 80 µg/l
- HAAs – 60 µg/l

The water systems in the Village and Town of Lowville have historically been in violation of the Disinfection Byproducts Rule. Based on the 2018 Annual Drinking Water Quality Reports, the Town has completed a study of the application of GAC in the treatment train of the raw water to reduce the concentration of total organic carbon (TOC). The Town has also installed new monitoring and control equipment for the chlorine feed system to better control the system chlorine levels.

Surface water sources in Lewis County generally have higher raw water TOC than groundwater sources. As an example, the TOC concentration in the Black River has been measured at concentrations of 5.9 mg/l.

2.6.3 Groundwater

The use of groundwater sources would likely eliminate the need of TOC removal such that raw surface water requires as long as well fields are not located within zones where surface waters are impactful. Concerns for groundwater include high Fluoride concentrations found in previous studies and the presence of Radium, a general concern given the overall geology of the Central Lewis County region. However, all systems should consider installing updated technology to control the dosing of chlorine to the distribution system. Chlorine should be added to provide adequate disinfection and to maintain an acceptable chlorine residual in the system.

Section 3 – Local Recommendations

3.1 Introduction

This section focuses on identifying specific needs as expressed to the Study Team by local officials from each of the existing municipally operated community water systems within the Central Lewis County region. Most of the recommendations in this section could be incorporated into any regional effort outlined further in Section 4 of this Study, however they are identified in this Section because many of them could be addressed whether a regional initiative is implemented or not.

3.2 Water Rate Analysis

A factor that must be considered is the current water rates. Using an assumption of 2.5 people per service and a consumption rate of 70 gpd per person, a "typical" annual water bill is calculated for each PWS user account. The tables included in this section outline the costs associated with each municipal water districts. Table 17 summarizes the approximate yearly costs to a user of the PWS for each water district located in the Central Lewis County area.

The impacts on homeowner's individual budget cannot be neglected, especially when they are asked to connect when a new water district is formed. The advantages of water district supplied water include:

- Quantity and quality of water is the responsibility of the district,
- Ability to manage changing regulatory requirements (compliance with SDWA and NYSDOH),
- On occasion, mortgage lenders prefer and offer better rates if you are on municipal water,
- Homes generally have a higher value if they are on a municipal system,
- Average monthly cost of water for a Lewis County resident is…,
- Reduced concern about the quality and quantity of water particularly during droughts, and
- Reduced homeowner's insurance.

The disadvantages to homeowner's owning their own water system are:

- Well water is dependent upon reliable power,
    - When power is out there will be no water available
- Homeowner is responsible for both quantity and quality of the water,
    - Repairs can be expensive (pressure tank, pump, Piping, well screen, etc.)
    - Well water must be tested at a minimum of once per year
- Well water can become contaminated,
    - Runoff from farms and septic systems (fertilizer, animal manure, detergents, etc.)
    - It is estimated that there are 15,000 impaired water bodies in the United States
    - Approximately 20% of shallow wells in agricultural areas have nitrate levels above water quality standards
- The average cost to install a well is $5,000 ($15-$30 per foot),
- The average annual maintenance costs associated with a well is $400 to $500 per year
- Many homeowners may purchase a large amount of bottled water, which over a year's time, can be a considerable cost.

Overall, having an informed public will likely eliminate some of the problems faced when new water districts are formed.

3.2.1 Town of Lowville

The Town of Lowville charges the users of the PWS in all Water Districts on a semi-annual basis. The residential user charges are based on a fixed base cost depending on which Water District the user is located in. The following table outlines the Town of Lowville fixed base cost water rates.

Table 13 – Town of Lowville Water Rates

Water District	Base Usage Cost (dollars)
Consolidated Water District #1	350
Water District #3	280
Water District #4	250
Water District #5	250
Water District #6	250
Water District #9	250

3.2.2 Town of Watson

The Town of Watson calculates water billing using a fixed base cost plus water consumption. The Town of Watson also charges its customers an administration fee along with a maintenance fee. The following tables outline the Town of Watson water rates.

Table 14 – Town of Watson Water Rates

Diameter of Service Line (inches)	Base Usage Cost (dollars)
0.75	81.42
1.00	154.36
1.00 – 1.50	154.36
2.00	421.78
Administration Fee	25.00
Maintenance Fee	35.00

Table 15 – Town of Watson Additional Water Rates

Consumption Rate Over 1,000 cf	Cost per 100 cf (dollars)
1,001 – 8,000	4.30
8,001 – 100,000	4.14
100,001 +	3.98

Assuming 2.50 people per service with an average consumption of 70 gallons per person per day, a typical yearly water bill for a Town of Watson water system user account is calculated to be $564.00 per year The impacts of the new capital project are not accounted for in this estimate.

3.2.3 Town of Denmark/Village of Copenhagen

The Village of Copenhagen charges its users based on gallons of water used plus a fixed fee. The usage fee is set at $8.00/1,000 gallons and the fixed fee is set at $170 per service. A typical yearly water bill for a user account within the Village Copenhagen water district is approximately $680.

The Town of Denmark calculates water billing using a fixed base cost plus water consumption. The Town charges a semi-annual fee of $116.00 per dwelling. Additionally, a fee of $8.00/1,000 gallons used is charged to the users. A typical yearly water bill for a user account in the Town of Denmark water district is calculated to be $745 per year.

3.2.4 Town of Martinsburg

Martinsburg Water District #1

The Town of Martinsburg Water District #1 calculates water billing using a fixed base cost plus water consumption. There are no operation, maintenance, or administrative fees for the Town of Martinsburg Water District #1. Water rates for the Town of Martinsburg Water District #1 are listed below.

Table 16 – Town of Martinsburg Water District #1 Water Rates

Consumption Rate (gallons)	Cost (dollars)
Capital Cost	50
Up to 30,000	75.00
30,001 – 100,000	2.50/1,000 gallons
100,001 +	3.98

A typical yearly water bill for a user account in the Martinsburg Water District #1 is approximately $261.00.

Martinsburg Water District #2

This is included in the Town of Lowville 6-month Billing Summary.

Glenfield Water District

The Glenfield Water District charges a yearly connection fee to its users of the PWS system within the Hamlet of Glenfield. A $120.00 fixed rate is charged to the users for being connected to the system and the operation and maintenance fee of $2.46 fee per 1,000 gallons of water used is charged to each user account. A typical annual water bill is calculated at $277.

3.2.5 Year Cost Summary

Table 17 below summarizes the estimated yearly water cost for a residential user in each of the Town water districts.

Table 17 – Estimated Yearly Cost for Users of Public Water Supply Systems

Town and Water District	Yearly Cost per Service (Dollars)
Town of Lowville Consolidated Water District #1	700
Town of Lowville Water Districts #3	560
Town of Lowville Water Districts #4, #5, #6, and #9	500
Town of Watson Water Districts #2-#8	565
Town of Watson Water District #4 Ext. #1	TBD
Village of Copenhagen Water District	680
Town of Denmark Water District #1	745
Town of Martinsburg Water District #1	261
Town of Martinsburg Water District #2	TBD
Town of Martinsburg Glenfield Water District	277

Projects are not considered viable and/or fundable when user charges exceed $900 per year. As you can see, some PWS's have room for capital expenditure and some are more limited.

3.3 Town of Lowville

The Town of Lowville has been evaluating improvements options for many years. In or around 2008, the Town of Lowville proposed that a new groundwater source be installed for the sole use of the Town of Lowville water districts. With the new water source, the Town of Lowville believed production cost and water quality would be significantly better for the users and Town of Lowville compared to the continual use of water sourced through the Village of Lowville's water system.

The Town of Lowville contracted with HydroSource in 2008 to complete a Phase I investigation to identify favorable zones for the development of a water supply source with a sustained volume of 300,000 gpd or approximately 210 gpm. According to the 2008 HydroSource report, the Town of Lowville has many promising sites that could be developed into a high yield groundwater well that also appear to be located in an area protected from potential contaminant sources. It was ultimately recommended that the Town of Lowville proceed with completing geophysical well siting surveys for the identified favorable zones. The Town of Lowville did not proceed to a Phase II study with HydroSource.

In 2010, proposed a water infrastructure project that had the potential for improving the water supply needs to four of the existing water districts along with providing a water supply to areas that are currently unserved. The project would have provided improvements to Water District #4 and established a new Water District #10. The improvements were to include three specific areas within the Town of Lowville which include the following.

- northeast of the Village of Lowville including homes along Ridge Road and Waters Road,
- east of the Village of Lowville including homes in the existing Water District #4 along Waters Road, and
- southeast of the Village of Lowville including homes along Number Four Road.

This work was not done due to the lack of funding

Residents not served by the Town of Lowville system have experienced problems with their current individual shallow groundwater wells. Several private wells are located in close proximity to the Black River and are affected when the Black River floods, causing turbid groundwater. During the Town/Village of Lowville Comprehensive Planning Process, residents expressed interest in covering the entire Town of Lowville with Water Districts.

Residents within the Town of Lowville Water District #4 are served directly from the Village of Lowville transmission main using 1.5-inch galvanized steel pipes. It has been reported that the 1.5-inch galvanized steel pipes are severely corroded and complaints of rusty colored water and water leaks are frequent. The age of the water district pipes are believed to be around 50-60 years old and are thought to be no longer suitable for continued use. Additionally, users in Water District #4 are not provided fire flows.

In September of 2019, BCA Architects & Engineers (BCA) completed a study titled "Town of Lowville Water Treatment Plant Improvements Project" for the Town of Lowville. This study was completed for the purpose of providing a complete water system evaluation and to help develop ideas for improvement that would be identified during the water system evaluation.

BCA determined that the Town of Lowville would benefit the most from the use of a GAC filtration system which is just now being placed into service. With the development of a GAC filtration system, Town of Lowville will have the ability to lower DBP levels without the reliance on another Towns actions and having to develop their own groundwater source.

The Town of Lowville has also been discussing the potential option of purchasing groundwater from the Town of Watson once the Town of Watson finishes their proposed District #4 Ext. #1 project. Challenges will come with this potential connection (shallow depth to bedrock), as a water line from the Town of Watson to the Town of Lowville would have to be designed and installed.

3.4 Town of Watson

In June of 2014, Capital Consultants Architecture and Engineering, Inc completed a study titled "Town of Lowville & Watson Preliminary Planning Effort to Evaluate Various Water System Options" for the Town of Watson and the Town of Lowville. This study was funded by a USDA Planning Grant to the Town of Lowville and Town of Watson. This study was completed to evaluate both the Town of Lowville's and Town of Watson's water systems and identify potential alternatives to create a more effective PWS system for each Town. This study was conducted by the Town of Watson in response to spills that occurred at the Town of Watson town barn and the Town of Watson highway garage which had affected local resident's groundwater wells. As both the Town of Lowville and the Town of Watson at the time relied on the Village of Lowville for a source of water, the Village of Lowville was included in the proposed alternative scenarios even though they were not included in the pre-planning grant application to fund this Study.

The Town of Watson proceeded with establishing their own water system from a large groundwater source that has been identified along River Road leading to the Water District #4 Extension #1 project. The new Town of Watson well supply has excess capacity and the Town is willing to sell excess water from their new source to local adjacent populations.

The Town is currently evaluating how best to structure operation of their new expanded system. Current staffing, who are also tasked with many other Town duties, will not be sufficient to meet operational needs. The Town has indicated a desire to work with other communities to develop a structured shared resources approach if it were to reduce overall operational expenses.

3.5 Town of Denmark/Village of Copenhagen

The Town/Village currently struggles to provide water in the quantity and quality to meet their areas need. The Town's and Village's priority is to establish a reliable and good quality water supply.

Two Preliminary Engineering Reports have been completed for the Village of Copenhagen to evaluate the water supply of the Village of Copenhagen. The first evaluation of the system and subsequent recommendations was provided by EDR in December 2019 and the second was provided by Barton & Loguidice in March of 2020. The 2019 EDR report recommended the upgrade of the Woodbattle Road Treatment Facility and well field. The firm subsequently modified their recommendation to consider an interconnection with the West Carthage water supply system. The Barton & Loguidice report recommended the rehabilitation of the Woodbattle Road Treatment Facility.

In the course of this Study, we have discussed options for improvements to the Town of Denmark/Village of Copenhagen PWSs and have put together a Decision Matrix for the improvements to the Village of Copenhagen Water Supply to assist the Board in selecting the best pathway forward. The options were:

- Maintain Existing System and Truck in Water during Periods of Drought
- Woodbattle Road Water Treatment System Renovation and Rehabilitation
- Interconnection with West Carthage Water System
- Upgrade of Stoddard Road Well Field
- B&L Recommendation to Rehabilitate Woodbattle Road System

Based on the discussions and use of the Decision Matrix included as Attachment 9, it would appear as though the best decision would be an interconnection with the Village of West Carthage system. The Town/Village would have to negotiate with the Village of West Carthage to provide a connection to the West Carthage water system that could be utilized under drought conditions as a supplemental supply. This could also serve as the first step in developing a regional solution for water service in northern Lewis County. A regional solution would provide these Water Districts a solution for potential future interruptions in service due to drought or system operating problems. With a regional focus both technical and water quality issues would be more easily identified and addressed.

The Town/Village would like to proceed with the preparation of a formal Preliminary Engineering Report for the purpose of gaining regulatory acceptance, undertaking formal negotiations with the Village of West Carthage, and to obtain funding through:

- Submission of a Consolidated Funding Application to the Regional Economic Development Council
- Grant application to the NYS Environmental Facility Corporation for funding under the NYAS Water Infrastructure Program
- Application to the USDA Rural Development Program.

The proposed solution would involve the following basic components:

SCADA Control System and On-Line Chlorine Residual Sensors:

There is significant reason to believe that the chlorine feed system is at time over dosing the treated water generated by the Stoddard Road Water Treatment Facility. It is recommended that several in-line chlorine residual monitors be installed and integrated into a new SCADA system that will allow for better control of system operating pressure and chlorine residuals. The SCADA system chlorine sensors along with pressure sensors should allow the system to be operated at a lower cost while providing a higher quality service. This is a low-cost investment which will serve the community well. It is estimated that this control system could be installed for less than $100,000. The implementation of this system should be prioritized.

Interconnection Pipeline between the Village of West Carthage and the Village of Copenhagen Systems:

An interconnection pipeline, approximately 11,600 linear feet, would be used to connect the Village of West Carthage water distribution system to the Village of Copenhagen water distribution system. The connection would be constructed between the existing Village of West Carthage water storage tank located on Old State Road in the Town of Denmark and the Village of Copenhagen distribution system near the Stoddard Road Treatment Facility. The pipeline would be installed within the existing right-of-way along Old State Road, Fuller Road, and Stoddard Road.

Booster Pump Station:

A booster pump station would be constructed along the side of Fuller Road in the Town of Denmark. Two booster pumps and chlorination equipment would be utilized to maintain chlorine residuals in the Village of Copenhagen water distribution system.

It should also be noted that at a recent meeting in November of 2020, the Carthage/West Carthage Joint Utilities Management Board expressed an interest in selling water to the Village of Copenhagen.

The capital cost of the proposed solution, including piping, service connections, pump station, and a storage tank, is estimated to be $4.5 million. The financial impact of this investment on the Village of Copenhagen can be mitigated by pursuing available grants outlined in Section 1.7 of this Study.

3.6 Town of Martinsburg

The Town of Martinsburg is in the relatively comfortable position of having an adequate water supply of good quality for PWS users. In discussion with the Town, their long-term needs were modest. The Glenfield Water District has received bids to replace waterlines, but no additional needs were identified.

The Town of Martinsburg officials have proposed an extension of Water District #1 to include Water District #2 north of the Hamlet of Martinsburg. As stated above, Water District #2 is served directly from the Village of Lowville through the Town of Lowville Water Districts #5 and #6. The connecting pipeline would be constructed along Route 26 and East Road and connect to the existing Water District #1 distribution system.

The connection between the two existing Town of Martinsburg water districts would eliminate the need to purchase treated water from the Village of Lowville and effectively eliminate the need for additional treatment since the Town and Village of Lowville are under an AO issued in April 2018 to eliminate DBPs in their treated drinking water.

In addition to the proposed extension of Water District #1 on the north side of the Hamlet of Martinsburg, Town of Martinsburg officials have proposed an extension of Water District #1 south of the Hamlet of Martinsburg along State Route 26 and Alger Road. The southern extensions would add approximately 7-10 additional properties along State Route 26 located just outside the Hamlet of Martinsburg. Currently there are no developed properties along Alger Road in the area of the proposed expansion, however, it would allow for new developments to have the ability to connect to a public water service if needed.

Section 4 – Regional Considerations

4.1 Introduction

In this section, we explore opportunities for addressing individual system wants, needs, and desires by stepping beyond individual system boundaries and considering the wants, needs, and desires of the other systems in the Study. From the input received from each municipality, three subject areas were investigated. These are as follows.

- Sharing existing excess capacity through interconnections.
- Enhancing available quantity through development of a long-term sustainable high quality and economical supply.
- Reducing operation costs and providing increased depth to administrative/financial functions to facilitate further improvements.

The concepts discussed below are graphically shown on Figure 7 and Figure 8.

4.2 Sharing Existing Excess Capacity

4.2.1 Lowville/Watson/Martinsburg

What was evident from this Study is that the Town of Watson will have excess water after completing the Water District #4 Extension #1 project. The Town is interested in potential sales to other users to increase Town revenue and reduce the financial impact of the new improvements to its users. Further, the analysis shows that the Town of Martinsburg Water District #1 and the Glenfield Water District have excess capacity and could also share water, thereby generating revenue. The Town of Lowville on the other hand, from time to time, is limited. Interconnection between the Town of Lowville and the Town of Watson was considered in the past but not carried forward. This concept should be reconsidered with potential of an interconnection with the Town of Martinsburg Water District #1 as well. A brief discussion on the interconnection concepts is provided below.

Interconnection between Watson and Lowville (Project 1)

This project would involve the construction of a new 8-inch transmission main of approximately 13,910 linear feet between the Town of Watson and the Town of Lowville. This new transmission main would connect to the existing Town of Watson water distribution system at its western limit on Number Four Road, run south on Markowski Road, and connect to the Town of Lowville water line at the Village of Lowville border on State Route 12. Fire hydrants as well as gate valves would be installed at intervals along the length of the transmission line. The estimated project cost is $1,600,000.

The primary objective of this project is to allow excess water available from the Town of Watson to be sold to the Town of Lowville. The potential exists to add new customers along the route that are currently not served by a PWS. Public water availability along the route could also induce new developments with time. Assuming a limited number of existing units would opt to initially participate and addition of limited new development, we would estimate the addition of 20 new EDU's.

Interconnection between Lowville and Martinsburg (Project 2)

This project would involve the construction of a new 8-inch transmission main of approximately 22,035 linear feet between the Town of Lowville and the Town of Martinsburg. This new transmission main would

connect to the existing Town of Lowville water main on W. Martinsburg Road, run southeast on B Arthur Road and south on State Route 26 and connect to the Town of Martinsburg water distribution system at its northern limit on State Route 26. Segment 2 also includes connections to the existing water mains from the Town of Lowville that extend into the Town of Martinsburg on State Route 26 and Ross Road (Water District #2). Fire hydrants as well as gate valves would be installed at intervals along the length of the transmission line. The estimated cost project cost is $2,500,000.

The primary objective of this project is to allow excess water available from the Town of Martinsburg to be sold to the Town of Lowville. The potential exists to add new customers along the route that are currently not served by a PWS. Public water availability along the route could also induce new developments with time. Assuming a limited number of existing units would opt to initially participate and addition of limited new development, we would estimate the addition of 30 new EDU's.

Interconnection between Martinsburg and Glenfield (Project 3)

This project would involve the construction of a new 8-inch transmission main of approximately 18,860 linear feet between the Town of Martinsburg to the Hamlet of Glenfield. This new transmission main would connect to the Town of Martinsburg water distribution system at the eastern limit along Glendale Road and run southeast until it connects to the Hamlet of Glenfield's water distribution system on Glendale Road. Fire hydrants as well as gate valves would be installed at intervals along the length of the transmission line. The estimated project cost is $1,300,000.

The primary objective of this project is to allow excess water available from the Town of Martinsburg to be sold to the Hamlet of Glenfield. The potential exists to add new customers along the route that are currently not served by a PWS. Public water availability along the route could also induce new developments with time. Assuming a limited number of existing units would opt to initially participate and addition of limited new development, we would estimate the addition of 15 new EDU's.

4.2.2 Town of Denmark/Village of Copenhagen to Village of West Carthage

Also evident from the study was the benefit of an interconnection between the Town of Denmark/Village of Copenhagen and the Village of West Carthage as described below.

Discussed herein as Project 4, this alternative involves the purchase of treated water from the Village of West Carthage to meet a 56,000 GPD demand for the Village of Copenhagen and the Town of Denmark water district. A new water storage tank and pump station would be located by the existing West Carthage storage tank on Old State Road. A new transmission main would connect the new pump station in West Carthage to a new storage tank located at the Stoddard Road Treatment Facility. This transmission main would consist of approximately 12,700 linear feet of 8-inch ductile iron pipe. A second pump station would then feed the entire Village of Copenhagen system. A 6-inch ductile iron feed line could be added on Fuller Road to provide service to residents in that area. Fire hydrants as well as gate valves would be installed at intervals along the length of the transmission line. The estimated project cost is $4,500,000.

Public water availability along the route could also induce new developments with time. Assuming a limited number of existing units would opt to initially participate and addition of limited new development, we would estimate the addition of 70 new EDU's.

4.3 Increasing Supply

Above and beyond sharing of current excess capacity, this Study evaluated potential new groundwater and surface water sources within the Central Lewis County region that could provide for greater long-term sustainable growth for the municipalities and reduce the need for relying on the current water supplies which are currently limited in terms of quantity and/or quality.

Farms in some areas of northern Lewis County are experiencing difficulties with both the availability of ground water and the quality of that supply. In the case of at least one farm in the Village of Copenhagen, the quality of the ground water has degraded to the point where biofilms were forming on the well screens and on the interior of the distribution piping. As a result of this contamination the cows on this farm would not consume the water and as a result the milk production declined sharply. A treatment system involving chlorination of the raw water and post chlorination treatment with Granular Activated Carbon was installed to address the sulfate reducing biofilm and the resulting contamination.

The agricultural community could be well served by adopting a regional solution to these groundwater quality issues.

4.3.1 Surface Water Resources in Lewis County

There are 12 lakes listed by NYSDEC in Lewis County. These are as follows:

Table 18 – Surface Waterbodies in Lewis County

Name of Lake	Surface Area (acres)	Max Depth (feet)
Beaver Lake (Town of Watson)	238	20
Brantingham Lake*	341	50
Bullhead Pond	50	37
Effley Falls Pond*	294	20
Francis Lake	137	15
High Falls Pond (Town of Croghan)	118	40
Indian River Lake (Town of Diana)	176	35
Lake Bonaparte (Town of Diana) *	1,248	70
Long Pond (Town of Croghan)	146	70
Mud Pond (Town of Croghan)	69	30
Soft Maple Reservoir (Town of Watson)	271	60
Stony Lake (Town of Watson)	64	20

* CSLAP Reports or CSLAP Scorecards are available

There are four lakes in Lewis County that have Water Quality Reports prepared by the New York State Department of Environmental Conservation under the Citizens Statewide Lake Assessment Program (CSLAP) and the Lake Classification and Inventory Program. These lakes are as follows:

- Copper Lake (Town of Grieg)
- Lake Bonaparte (Town of Harrisville)
- Brantingham Lake (Town of Grieg)
- Effley Falls Lake (Town of Croghan)

Copper Lake is an approximately 60-acre lake with the land surrounding the lake being privately held.

The lake was included in the 2012 Lake Classification and Inventory screening program by the NYSDEC Division of Water. Copper Lake is not classified or used as a potable water supply. Based on limited sampling and analytical data, bottom water withdrawals may experience taste and odor problems due to low dissolved oxygen levels coupled with elevated iron and magnesium concentrations. The lake is classified for non-contact recreation. It was also reported to have a total organic carbon concentration of 5.4 mg/l, a characteristic of small lakes in the eastern Adirondacks.

Lake Bonaparte is located in the Town of Harrisville and is one of the larger lakes in Lewis County, having a surface area of 1286 acres and a mean depth of 31 feet. The lake is classified as a mesotrophic lake and with most of its water column phosphorus being soluble reactive phosphorus, the lake could be threatened by raw water cyanotoxins. The lake supports recreation and public bathing and is not designated as a potential public water supply.

Brantingham Lake is a moderately sized lake located in the Town of Greig having a surface area of 327 acres and an average depth of 28'. Like many lakes in the eastern Adirondacks, it is a mesotrophic lake having moderate levels of blue green algae with a chlorophyll concentration in August and September of approximately 4 micro grams/ l with values measured as high as 10 micrograms/ l in 2013. There is a high potential for greater algal growth due to warming water column temperatures.

Brantingham Lake supports recreation and public bathing. The CSLAP sampling conducted in 2018 suggests the following. The "public water supply is stressed by the high frequency of algal levels above criteria protecting water use and impacted by raw water cyanotoxins, deep water metals and other contaminants."

The Effley Falls Lake is designated as class C (T), which is suitable for general recreation use (non-contact recreation) and aquatic life support, but not as a water supply or public bathing beach. It is included in the NYS Section 303(d) List of impaired Waters. The lake is known to be impaired by mercury contamination as a result of atmospheric deposition. Fluoroprobe data acquired and analyzed by SUNY ESF found a low percentage of blue green algae, indicating a low susceptibility to harmful algal blooms. In general, the eutrophication indicators and the CSLAP summary suggest that the lake would not be suitable as a source of potable water.

4.3.2 Groundwater Resources in Lewis County

Gravel outwash deposits in eastern Lewis County present a significant potential for future groundwater resources. These deposits are variable in thickness and have been determined to be permeable with significant potential yield.

The May 2008 Phase 1 Report on Favorable Zone Delineation for Development of New Groundwater Sources in Lewis County, prepared by HydroSource Associates for Lewis County, identified six separate zones that may present favorable potential for further development.

These are as follows:

Table 19 – Favorable Zones in Lewis County

Favorable Zone ID	Location	Subsurface Characteristics	Geologic Unit
Zone A	Hamlet of Watson along River Road	Unconsolidated sediments; Sand and gravel deposits	Black River Valley; Recent Alluvium
Zone B	New Bremen; North of Crystal Creek; East of Black River	Unconsolidated sediments; Sand and gravel deposits	Black River Valley; Recent Alluvium
Zone C	New Bremen; South of Crystal Creek along Wagner Road	Unconsolidated sediments; Sand and gravel deposits	Lewis County; Gravel Outwash Deposits
Zone D	Current Village of Lowville; Current water supply	Combined springs and two wells	Combined unconsolidated bedrock and surface water
Zone E	West of Hamlet of Deer River	Bedrock aquifer with substantial fracturing indicated	River Group Limestone
Zone F	Village of Copenhagen	Bedrock aquifer with substantial fracturing indicated	Confined bedrock; Trenton Group Limestone

Five criteria have been developed for consideration of future groundwater development in the Black River Watershed. These criteria are as follows:

- Expanded use of known aquifers for consideration of future groundwater development in the Black River watershed.
- Establish ground water and aquifer protection measures.
- Establish municipal supply wellhead protection controls.
- Limiting development within the immediate area of municipal supply wells.
- Locate future sewage treatment plants or industrial discharge outfalls downgradient from unconsolidated aquifer recharge areas and municipal water supply wellheads.

The New York State Department of Environmental Conservation and the New York State Department of Health have expressed concern about ground water contamination in the carbonate bedrock (fractured limestone) aquifers in New York State. Both agencies have shown a strong interest in the unintended introduction of volatile organic compounds and liquid manure to these fractured limestone aquifers.

As a result, there has been a recent (11/10/20) announcement of a Statewide Assessment of New York's Karst limestone (fractured) Aquifers concerning ground water contamination via solution – enlarged

fractures, bedding planes and other solution cavities. Both agencies have recognized that coliform bacteria and nitrate concentrations have been increasing over the recent decades.

The Trenton Black River Group is one of six aquifers that will receive intensive investigation. The karst features of limestone formations such as sinkholes, swallets, solution channels and caverns are recognized as having the ability to transmit large amounts of potential contaminated surface water into these formations.

A statewide study has been proposed identifying the fractured limestone areas of concern and the mapping of reported concentration events. It is expected that the study will identify areas of concern, enhanced treatment of ground water extracted from areas identified as high risk, controls to minimize future risk, and possible exclusion areas.

The photo provided (Figure Number 9) shows the exposed face of Trenton Black River Group limestone formation underlying the Village of Copenhagen. The fractured and karst nature of the formation is very obvious in the photo. If you look closely, the fractures are in both the vertical and horizontal planes. The photo would suggest that the horizontal planes are easily weathered and are connected to the vertical seeps and suggest that the formation could be subject to continued fractionation by the blasting and excavation associated with construction of the wind turbine foundations. It is highly likely that the porosity and permeability of this carbonate sediment-based rock system was further compromised by the creation of additional solution cavities.

Figure Number 9 – Exposed Trenton Black River Group Limestone

From these and other observations it is highly likely that some of the Trenton Black River Group limestone formation will be characterized as carbonate-rock areas of concern. Blasting in these areas should be limited until further studies of the integrity of this carbonated-rock system are conducted. This would best assure that the integrity of the existing ground water recovery wells will not continue to be compromised.

The Black River Watershed is made up of geological deposits that include sedimentary deposits that are largely composed of fractured limestone. In Lewis County the formation is largely the Trenton Group Limestone formation that has the capacity to yield 10 to 50 gpm of groundwater. The Trenton Group Limestone is fractured and supplies local springs and seeps. The "Groundwater Assessment and Recommendations Report for the Black River Watershed" prepared by Bergmann Associates dated September 2008 identifies 19 subwatershed segments that make up the Black River watershed.

The overburden deposits within the watershed are comprised of glacial deposits, outwash and lacustrine deposits. Glacial Till dominates the area. The potential yield of groundwater from these deposits is in the range of 10 to 100 gpm. As a result of the highly permeable overburden the aquifer is susceptible to contamination through the recharge zone. This results in an aquifer that is susceptible to contamination from surface activity which is dominated by agriculture.

This porous overburden is further complicated by the fractured nature of the Trenton Group Limestone which is the primary aquifer. The presence of local springs and seeps in the region further supports the fractured and porous nature of the groundwater system. Where the fractures are prevalent there would be a strong possibility of contaminated surface water being introduced to the aquifer. There is evidence to suggest that these seeps have impaired groundwater quality with some wells seeing an increase in coliform bacteria, iron, manganese, sulfates, nutrients and the resulting biofilms, sulfur odors and increases in turbidity.

The Village of Copenhagen lies in Zone F which is described as a "Bedrock aquifer with substantial fracturing indicated". If the Trenton Group Limestone aquifer is to be relied on the future it is recommended that one or more of the following be implemented:

- Increase the level of potable water treatment
- Establish groundwater and aquifer protection measures
- Establish municipal supply wellhead protection controls
- Limiting development within the immediate vicinity of the municipal wells

4.4 Selected Approach

Treatment required is clearly dependent upon the water supply source. The existing systems evaluated are currently addressing treatment system improvement needs. Development and implementation of an alternate water supply source which would potentially reduce or eliminate the need for costly treatment system improvements is years away and thus current planned expenditures will be necessary to provide drinking water that is compliant with regulatory requirements. Over the long term, movement to a stable, higher quality, groundwater supply source could potentially reduce the need for the operating expenses associated with treatment technology needed to address DBP issues, however, debt service costs will remain a component of water rates for a long period of time.

Regarding distribution, system owners do not report significant structural deficiencies with distribution and storage. The Town of Lowville reports that restrictions are placed upon operation of its storage tank which appear to be related to providing adequate water to support consumption at the Kraft/Heinz facility in the Village. These issues relate to the quantity of supply and are not within the control of the Town.

Our recommended approach would be to investigate the quantity and quality of groundwater in Zone A and Zone B. Anticipating a new source from Zone B, a new well field would need be developed. These two zones are the most centrally located to the Study Area and offer the potential for the largest sustainable yield. The estimated project cost is $250,000. An interconnection to the Town of Watson distribution system and then to the proposed interconnections with the Towns of Lowville and Martinsburg would facilitate delivery of what could be considered an unlimited quantity of water for consumption in any or all of the Towns. A connection between Zone B and the Town of Watson is briefly discussed below.

Project 5 would involve the construction of a well field in Favorable Zone B. This well field will include three wells and three pumps, with a fourth pump for redundancy. Construction of a new 8-inch transmission main of approximately 19,705 linear feet would connect the new well field located in the Town of New Bremen to the Town of Watson at the town borders on River Road. Fire hydrants as well as gate valves would be installed at intervals along the length of the transmission line. The estimated project cost for Project 5 is $2,400,000.

4.5 Operational and Administrative Concepts

Currently each system is operated by its own municipal forces. The operational staff carry the required operator certifications but are integral to overall community function and are assigned other duties not related to water supply and distribution as well.

What could be considered is developing a formal system that could be put in place for times when the designated system operator was not available (vacations, sickness, training). This could be accomplished now with the establishment of a County led Cooperative and should be considered. Coupled with a more regionalized SCADA system, available shared resources could reduce operational costs.

All Water Districts in Lewis County should develop a "Water Use Efficiency Program". Water is very much a limited resource and potable water competes with other uses of water such as agriculture, industry, recreation watershed habitat requirements. Effective Water Use Efficiency Programs prepared by public water districts help ensure a safe and reliable supply of drinking water.

At the heart of a "Water Use Efficiency Program" is water conservation. Water conservation is defined to be any beneficial reduction in water losses, waste and use. These beneficial reductions will contribute to the long-term reliability of our water supply systems by providing protection against:

- Short Term water service interruptions during peak use.
- Long-term disruptions due to limitations in the water supply.
- Possible Contamination of the water supply due to leaky pipes.

"Water Use Efficiency Programs" improves overall system efficiency. By reducing the amount of treated water, water systems reduce energy use, amount of treatment chemicals and other associated operating costs. The important components of a "Water Use Efficiency Program" are as follows:

- Establishment of Goals
- Metering of all sources and service connections Data Collection
- Demand Forecasting
- Development of the Efficiency Program
    - Establishment of conservation goals Develop a User Education Program

- Evaluate Distribution System Leakage
- Forecast Future Demand with and without Conservation
- Establish Goals Report Progress on a Regular Basis
- Prepare and Issue Annual Reports

An objective should be to reduce the distribution system loses to 10% -20%. Given the current climate disruptions and the increased frequency of both low and higher precipitation, it is important that we do everything possible to reduce system loses and encourage user conservation.

Water Treatment and Distribution Systems can be vulnerable to a significant number of threats. Among those threats include climate change induced severe weather events causing flooding and drought. It is important to identify these extreme weather events and improve the resiliency of these facilities. Resiliency planning may involve the elevation of electrical switch gear, instrumentation, and transformers.

In extreme cases where the treatment facilities or pump stations may be within a flood plain, the facilities may have to be elevated or welled. These are costly preventative measures but may be very important as the frequency of severe storms increase. Backup power systems should be incorporated into the operating facilities based on the history of regional power system failures.

In many cases covering smaller Water Treatment and Distribution Systems security may be best assured by assuring that all critical systems are locked and access is restricted and closely monitored.

Water Treatment and Distribution Systems are increasingly under potential threat from the danger of cyber-attacks. Those water systems that have more automated control systems need to look at ways that their IT systems can be protected. For example, there was one case in New York State that reported a cyber-attack on a dam located in Rye, New York by individuals linked to the Iranian government. In response to that cyber-attack, New York State has required all water systems to include the possibility of cyber-attacks in their assessments of vulnerability.

Public water systems can use the results of source water assessment to help in the development of a Source Water Protection Plan. The plan should outline the measures that are necessary to protect or enhance source water quality. The action plan should identify activities of projects that are needed to mitigate existing and future threats to the quality of the source water and to improve the resilience of a community's water system.

The United States Environmental Protection Agency has suggested that a Source Water Protection Plan should include the Following:

- Characterize the source water protection area
- Delineate potential sources of contamination
- Prioritize protection and corrective actions
- Define implementation tasks and identify milestones
- Identify needed resources
- Present a schedule for implementation
- Identify the process for evaluating progress and effectiveness

Typical Source Water Protection Practices include the following:

- Conserving wetlands in the source water protection areas to help protect water quality and recharge areas
- Provide zoning ordinances to protect source water areas and reduce the probability of chemical spills
- Establish control over sensitive source areas
- Land conservation including conservation easements
- Adoption of “natural infrastructure” solutions
- Establish and implement best management practices
- Public education
- Examine the potential impact of animal agriculture and septic systems in the source protection areas

The EPA Clean Water Act provides a number of tools and controls that can be used to protect the sources of potable water. These include NPDES permits and subsequent effluent limitations and the establishment of Water Quality Standards for waters designated as source waters.

The Village of Copenhagen has a Source Water Protection Plan that was prepared in 2010 by the New York Rural Water Association in cooperation with the Village. The water supply protection strategies developed by the Village included the following:

- Landowner agreements to expand the control radius around their wells from 100’ to 200’
- Request of the Town of Denmark to pass an overlay protection zone for those wellhead protection areas that are outside the Villages jurisdiction
- A Water Supply Contingency Plan

Source Water Protection Plans represent a strong investment for the future. All thirteen water districts in Lewis County should be undertaking the identification of possible threats to the source waters and investing in mitigation strategies.

A Supervisory Control and Data Acquisition (SCADA) system is a computer- based application that is used to monitor real- time data and control a plant or water distribution system at the supervisory level. The main network components of a SCADA network are Remote Terminal Units (RTUs) or Programmable Logic Controllers (PLCs) and most important a Human-Machine Interface (HMI). Also critical to the SCADA operating system are the sensors that are installed in the water treatment system, pump stations, storage tanks and the distribution system that provide a real time update of the status of the operating system.

The potential advantages provided by a SCADA system when applied to a water treatment and distribution system are as follows.

- Potential reduction in energy and labor costs.
- Increased efficiency of the existing system assets.
- Provides instantaneous status of system assets.
- Minimizes the need for additional operating staff.
- Identification of the most pressing system maintenance.
- Allows the optimization of available system storage of water.

- Helps reduce system energy consumption.
- Creates potential synergy between Water Districts.
- SCADA Systems have the potential to reduce operating costs.
- Enhances communication.

Factors that influence the cost include,

- The amount of equipment (SCADA Console, number of PLC's, RTU's, system sensors, and the HMI (Human-Machine Interface).
- Required software development
- Installation
- Training
- Technical Support

System costs can generally be slotted into three Tiers.

- $10,000 Tier: Open-source software with only a few RTU's
- $50,000 - $60,000 Price Tier: Some specialized software and an increasing number of RTU's
- $100,000 Price Tier: Specialized software, many RTU's, large enterprise-grade SCADA System

From this general guidance an experience with other systems we would suggest that installing SCADA systems for the water districts in Lewis County would likely cost on the average of $75,000 for the smaller districts and on the average of $100,000 for the larger districts.

The following would be our preliminary estimate including technical support and a reasonable contingency.

- $1,100,000 – District Costs
- $ 200,000 – Technical Support
- $ 200,000 – Contingency
- $1,500,000 – Total

It is recommended that Lewis County prepare and submit a grant request to the EFC for a grant under the New York State Water Infrastructure Improvement Act and/or the Regional Economic Development Council.

The regional concept projects would best be implemented at the County level as they serve multiple Towns and would provide access to greater resources to minimize the short-term financial impact of capital project implementation. This could be facilitated with the formation of a County led Cooperative.

Guidance and coordination could be facilitated through an ad hoc committee similar to the Lewis County Water Quality Coordinating Committee (LCWQCC), a non-regulatory committee that has been assigned the task of developing a strategy for the management of nonpoint sources of pollution by the Lewis County Legislature. The LCWQCC has a larger effort to assess the potential impact of sources of contaminants. A similar structural organization could be put in place for drinking water.

The group could develop a Drinking Water Strategy which is updated on a regular basis. This strategy serves as a guidance tool for prioritizing and carrying out water quality programing in the county.

Section 5 – Lewis County Strategic Plan and Economic Opportunity

5.1 Strategic Plan

Naturally Lewis, the economic development arm of Lewis County, is championing the growth of a community where people want to live, work, build their business, and play. The strategic plan is focusing on creating a solid sustainable economic base by supporting practical, realistic programs and policies that advance the business diversity from value added agriculture and recreation to increasing the export of markets locally and beyond.

To grow the economic base, the community will build upon its economic assets, government will be business friendly and proper investments in infrastructure and education will be made. The Lewis County Central Lewis County Regional Water Supply Study will be aligned with the strategic plan and will outline the water infrastructure requirements identified in the strategic plan.

In the conduct of this Study, we have seen difficulties that have developed when there is not a focus of keeping water infrastructure in a state of good repair. Reliable water infrastructure is essential for a region's economic health and business productivity. By investing in in water infrastructure it has been demonstrated that jobs are created and the economy is strengthened.

Northern Lewis County has experienced drought induced disruption of both the quantity and quality of municipal water disrupting daily lives and has also seen at least seasonal impacts on the quality of private and municipal supplied water impacting agriculture, causing violations of the Safe Drinking Water Act maximum contaminant levels and the resulting Notice of Violations from the NYS Department of Health. In a number cases the quality of the raw water or the excessive use of chlorine has created substantial corrosion of well and pumping infrastructure as well as components of the potable water treatment systems. This serves as an indicator of problems with the raw water quality.

The Declaration of a Local State of Emergency due to a water shortage and an article in the New York Times highlighting contaminants above and below legal limits as part of their series titled Toxic Water certainly does not help economic development or confidence in the future.

Now is clearly the time to invest in the future. That investment needs to be prudent and well targeted. That future needs to be about both sufficient quality and dependable sources of water and an infrastructure that can be focused on delivering it when and where it is required. Communities in the future will be defined by the capacity and quality of their water resources and their ability to meet future challenges presented both by development and climate change. Those communities that understand these issues and make prudent investments in protecting their sources of water and the treatment and distribution infrastructure will be the model communities of the future.

5.2 Economic Development Opportunity

Lewis County has many economic benefits that can be highlighted to attract and retain its current businesses. It has a quality work force with a strong work ethic. While rural in nature, it has many quality-of-life benefits such as strong educational opportunities, access to unlimited outdoor recreation in all seasons as well as bordering on the six (6) million-acre Adirondack Park. Lewis County has an abundance of water resources that can attract and retain a diverse business and manufacturing economic base in the future.

There are currently many factors that will lead to Lewis County leveraging its water resource assets.

With climate change, the northeastern United States will become attractive to businesses that use large amounts of water. The US Geological Survey published a report entitled, “Summary of Estimated Water Use in the United States in 2010” (https://pubs.usgs.gov/fs/2014-3109.pdf) Three states, California, Texas and Arizona will have significant problems with their water resources. An article published in the Smithsonian in 2014 entitled, “Arizona Could be out of Water in Six Years”

Three industries, Semi-Conductor, Data Centers, and Controlled Environment Agriculture may look to relocate where water is plentiful.

With recent social changes caused by COVID-19, businesses and employees have realized that for many businesses they can work remotely. Given the quality of life that Lewis County offers, many very diverse businesses may look to relocate.

5.3 The Role of Water in Economic Development

In today’s environment, water is critical to our economy. Water is vital to almost all of economic sectors. You need water to extract energy and mineral resources, refine petroleum, make paper, and produce most goods in commerce from semiconductors to jeans. You find water hidden in the production of almost every purchased product.

In the view of site locators, adequate water resources and the availability of a solid work force are two of the most important factors in selecting a location for a new business. With factors like 20-year draughts and the impacts of climate change, manufacturers and food processors are doing their best to minimize these risks. Their focus is to find areas that have well managed water resources. This characterizes Upstate New York and Lewis County very well.

Many communities are investing in their water infrastructure to be prepared for the next wave of economic development. They realize that competition for water will increase as consumption rises, water quality decreases, and the impacts of climate change become more severe. The critical role of water in the U.S. economy is being better understood. All parts of the economy are directly or indirectly dependent on energy and water.

Modest investments in the water supply infrastructure of Central Lewis County will pay major dividends to those who can take advantage of the available grant programs provided at both the State and Federal levels.

USEPA in 2013 released a report on the "Importance of Water to the U S Economy". The purpose of the report was to help raise awareness of waters importance to the national economy and to provide decision makers with the information to sustainably manage the nation's water resources. It was important to note that energy production, agriculture, and water supply account for 94% of the withdrawal from the nation’s groundwater, streams, rivers and lakes. All parts of the economy are directly dependent upon an adequate supply of high-quality water.

The value and cost of water is expected to rise because the current cost of water does not reflect its true value. Because water is undervalued, current use is inefficient and likely unsustainable. As competition for water increases the cost will rise. EPA clearly sees a future where competition for water will increase as consumption increases, water quality decreases and the impacts of climate change are felt.

It is clear that those counties, towns and villages who invest in their water infrastructure today will have a clear edge in the future. Investments will be required in the areas of source controls, treatment system enhancements, and distribution system upgrades will be securing their future.

Section 6 – Conclusions and Recommendations

6.1 General Guidance to Lewis County Water Utilities

Since the initiation of this Study, several communities have completed or are near completion of important capital improvements to their PWS's. These improvements will have important positive impacts on either quantity or quality of their water systems. As these communities move forward, we offer the following general guidance for continued betterment of their current PWS's. So as communities move forward, regardless of the acceptance or implementation of regional concepts, additional enhancements in their systems can still be achieved.,

For communities with groundwater sources, we recommend:

- Implementation of well protection practices at the well field
- Annual inspections of the well field looking for adjacent land use changes
- Complete well and piping inspections annually looking for corrosion and biofilm development
- Application of GPR to look for solution cavities and increased fracturing that could indicate an increased hydraulic connection with surface water

For communities with surface water sources, we recommend:

- Analysis of surface water sources quarterly for changes in nutrient concentrations
- Inspections of surface water sources monthly for signs of increased algal activity
- The development of a Water Quality Management Plan to protect the water quality of the source water
- The development of a tributary or source water monitoring program to provide an early warning of the potential increase in sources of contamination and changes in flows

For treatment and distribution facilities for all PWS's, we recommend:

- The application of prechlorination of the source water upon detection of raw water total coliform bacterial contamination
- Installation of a SCADA system with sensors for system pressure and chlorine residual to detect potential system losses and inadequate chlorination
- Implementation of a quarterly inspection of process piping for corrosion and potential biofilm development
- Application of treated water aeration of the control of byproducts of disinfection and radium
- Addition of additional treated water storage to help address the increasing frequency of drought conditions during the summer months and the demand for fire protection

6.2 Specific Conclusions and Recommendations

Based upon our observations, we offer the following specific conclusions and recommendations.

6.2.1 Conclusions

- Formation of a County led Cooperative could provide added coordination between existing water districts that would allow for:
    - the sharing of technical expertise,
    - operational support during periods of stress,

    - the sourcing of water and ability to provide supplemental supply to existing and new districts through wholesaling,
    - supplemental treated water through system interconnections, and
    - support in conducting training as required.
-
- The Town of Lowville and the Town of Denmark/Village of Copenhagen system have no excess capacity.
- The individual water service districts should consider increased treated water storage to better address incidences of short-term excess demand, the potential for reduced source water quantity, and for improved fire flow.
- The Town of Martinsburg and the Town of Watson have excess capacity; however, they have no conveyance to connect to communities such as the Town of Lowville that could utilize the excess water.
- The Town of Denmark/Village of Copenhagen should pursue interconnection with the Village of West Carthage for the supply of supplemental water.
- As shared services become more common and interconnections are made, the application of a more robust/comprehensive SCADA system could assist in further reducing overall operational costs. Estimated system costs are $1.5 million.
- Relatively inexpensive interconnection projects could resolve some current supply limitations while increasing revenue to the selling communities as a driver for development along primary transportation corridors.
    - The cost of the three interconnection projects between the Town of Lowville, Town of Watson, and the Town of Martinsburg is $5.4 million.
    - The cost of interconnection between the Town of Denmark/Village of Copenhagen and West Carthage is $4.5 million.
- In the long term, municipal water systems should consider relying on groundwater resources for future supply needs.
- Previous studies indicate that the ground water resources of Lewis County have sufficient capacity to provide a high quality of water to meet the demands of the county for the foreseeable future.
- A common shared supply could potentially offer reduced supply costs to each municipal user.
- When considering site selection for future ground water supplies, the site should be analyzed for the presence of radium isotopes, identified as a potential concern as part of an overall evaluation but such concerns can be addressed with pre-aeration should be implemented to reduce their concentration to acceptable levels.
- Each PWS should develop an Efficiency Program and Source Water Protection Plan.

6.2.2 Recommendations

- The County should consider the formation of a Regional or County led Cooperative to facilitate the intermunicipal shared service agreements, physical interconnections, and source supply investigations. A District could more easily accommodate the financial burdens of project implementation and could open up more opportunities for funding.
- The County, through the formation of a new District, should consider, as a benefit to all Town systems, taking on the task of identifying potential groundwater sources as a future supply

through implementation of a Phase II study. Specific focus should be put on Zone A and Zone B. The ultimate cost of the investigation is $250,000.

- The available water resources in Lewis County should be used to stimulate economic development. They represent a strong asset to support future growth.
- The County on behalf of the towns and villages should pursue grants available through the Regional Economic Development Council URI and the consolidated funding application process, and the $2.5 billion EFC New York State Water Infrastructure program to fund the development of shared services agreements, physical interconnections, and a Phase II groundwater resource study to make an ample high-quality water source available to all public water system users.

6.2.3 Proposed Implementation Schedule

Year 1 Activities:

- Form a Regional or County led Cooperative
- Develop formal shared services agreements between the participating Towns
- Develop the Operating Agreement for the Carthage/West Carthage Commission to provide up to 40,000 gpd of water to the Village of Copenhagen
- Conduct a preliminary investigation of the 5 potential favorable zones recommended by Bergman Associates for development of ground water resources
- Identify areas of the County that could become wholesale water customers
- Develop an implementation Plan for the County to become a wholesale water provider.

Year 2-3 Activities:

- Secure the necessary funding/financing for the following:
    - Phase II groundwater study
    - Interconnection projects between the Town of Lowville, Town of Watson, and the Town of Martinsburg
    - Interconnection project between the Town of Denmark/Village of Copenhagen and West Carthage
    - SCADA system project

Year 4-5 Activities:

- Design and install interconnection projects and SCADA system