

# Town of Ticonderoga

2012 DWSRF IUP Update: Pre-Application for Financing of Public Water Supply Improvements  
New York State Drinking Water Revolving Fund: Project # 17163

## Introduction and Description of Water System



The Town of Ticonderoga is located in the southeast region of Essex County, within the bounds of the Adirondack Park. The water system operated by the Town supplies water to approximately 1,700 users in the central former Village boundaries, as well as extensions to NYS Route 9, Ticonderoga Mill, Baldwin Road, and other outlying areas as far as Chilson and Eagle Lake. The Ticonderoga Water System maintains two sources of water supply; Gooseneck Pond and Lake George, both surface water sources.

Gooseneck Pond is an unfiltered gravity fed water source located approximately nine miles west of the former Village. It operates under the filtration avoidance criteria of the Surface Water Treatment Rule and supplies roughly fifty percent of the water demand of the Town of Ticonderoga's potable water system. The maximum yield of Gooseneck Pond is approximately 0.8 MGD. The Gooseneck system serves primarily the northern portion of the water service and remote areas off the old transmission main along Eagle Lake and Chilson. Before the Lake George filter plant was commissioned it was the sole water source for the system.



The water from Gooseneck Pond travels approximately 4,500 feet across private property and NYS-designated "Forever Wild" land before reaching the Eagle Lake chlorination station where it is dosed with hypochlorite. The transmission main between Gooseneck Pond and the chlorination station is 14" pit cast iron pipe, and almost 100 years old in some sections.



After chlorination, the water travels through more than 6.5 miles of 14" and 10" cast iron pipe main before it reaches the Chilson Reservoir, where it is re-chlorinated. After re-chlorination it runs through a 100+ year old transmission main to the distribution system. The Chilson Reservoir is a 1 million gallon, open reservoir that is under a NYS DOH Tribunal Order to be covered or replaced.



The Lake George water source, located along Baldwin Road, south of the former Village, is filtered at the Town's Baldwin Landing diatomaceous earth (DE) filtration plant and pumped into the system. Filtration was installed in 1995 to meet the requirements of the Surface Water Treatment Rule since control of the watershed of Lake George could not meet the requirements of the filtration avoidance. It was not until under mandate that the Town commissioned the filters in 2000, due to the operational costs of running the filters. The Lake George source is reported to be the primary supply for the southern portion of the water system, with a corresponding one million gallon water storage tank located at Mt. Defiance.

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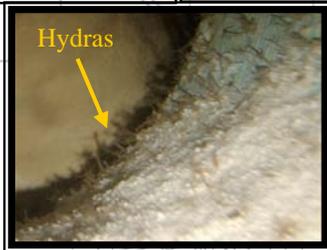
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### Violations & NYS DOH Enforcement Actions - Lake George DE Plant

Lake George DE Plant: Ticonderoga's DE filter plant is antiquated technology that cannot effectively meet current water quality standards and does not comply with the NYS adopted Recommended Standards for Water Works (10 State Standards). DE filtration is a process that uses diatomaceous earth—the skeletal remains of small, single-celled organisms—as the filter media. It relies upon a layer of diatomaceous earth placed on a filter element or septum which strains particulate matter from the water. Re-circulating DE slurry through the filter establishes the filter layer but is often an energy intensive pumping process.



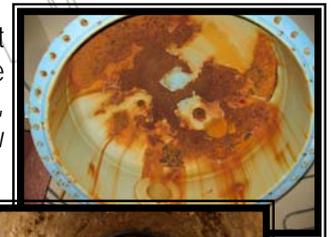
The Ticonderoga filter plant has suffered from multiple septum breaks. Each time a septum breaks, unfiltered water and DE flow through the break and into the clearwell, bypassing filtration. A thick layer of DE is visible at the bottom of the clearwell, indicating that a significant amount of water has avoided filtration in the past. Bypassing filtration constitutes a Surface Water Treatment Rule violation.



The filters have become impacted with spent DE that is no longer washing off the septums at the end of each filter cycle. This dirty material can foul the septa and, by creating uneven pressure and flow through the septums, it is one of the possible reasons that plant has endured so many septum failures. Impacted DE also provides a place for microorganisms and bacteria to flourish. A foul smell when the Ticonderoga filters were opened indicates that biological growth had definitely occurred. Hydras were also noted to be living in the filter system. Hydras are a higher life form that feeds on microorganisms. Their presence on the outside of the septums does not necessarily result in diminished filter water quality, but they are an undesirable organism in a drinking water filter system contributing to biological surfactants and slimes.

Excessive corrosion was noted inside the piping and filter bonnets of the DE plant. All of the piping in the plant is plain steel, which is highly susceptible to corrosion and oxidation compared to stainless steel. The extent of corrosion indicates the presence of air, which promotes oxidation and indicates valve leaks. The corrosion exacerbates valve leaks by making valves seats rough, which then allows more air to be introduced into the system and leading to more corrosion. The corroded piping in the DE system is a source of iron that feeds large colonies of iron bacteria that have proved problematic for the filter plant.

The Lake George DE filter plant violates the NYS adopted 10 State Standards. Filtration is not controlled by positive means. The plant has no laboratory facilities, no flow pacing of hypochlorite injection, no automatic switch-over of chemical feed systems or plant shutdown in the event of a failure, and no flow meter on the filters. Without a flow meter on the filters (not to mention the separate flow meters that are required to be on each filter train) there is no way to determine the filtration rate.



The facility also has antiquated control systems, everything is manually adjusted. In fact, the manual operation of the facility extends to requiring the Water Operator to refill the filters with DE by hand, carrying the bags from the storage room to the filter and pouring them in one-by-one after each backwash cycle.



The ventilation system in the plant does not provide respiratory protection from DE dust. Diatomaceous earth is a fine silica-based powder. Exposure to silica dust is an inhalation hazard that can result in lung damage with excessive or repeated exposure. This constitutes an OSHA violation.

The multiple Surface Water Treatment Rule and 10 State Standard violations have resulted in the Town of Ticonderoga receiving a NYS DOH Administrative Tribunal Stipulation (AT10). The Stipulation, among other things, requires the Lake George Filter Plant to be upgraded or replaced on or before July 1, 2015.

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### Violations & NYS DOH Enforcement Actions - Chilson Reservoir

Chilson Reservoir and Distribution System: The Chilson Reservoir is a 1 million gallon open reservoir that provides a storage and a re-chlorination point for the water from Gooseneck Pond. After the reservoir, the water continues by gravity down a transmission main to the north end of the Hamlet area of Ticonderoga, where it joins the main distribution system that is also fed by the Lake George Filter Plant.



After initial chlorination at the Eagle Lake Chlorination Station the water from Gooseneck Pond travels through more than 6.5 miles of 14" and 10" cast iron pipe to the Chilson Reservoir. The reservoir is a inclined concrete slab reservoir with an asphaltic membrane. The concrete slab is in very poor condition, with cracking and crumbling of the concrete and invasive plant growth both above and below the water line.

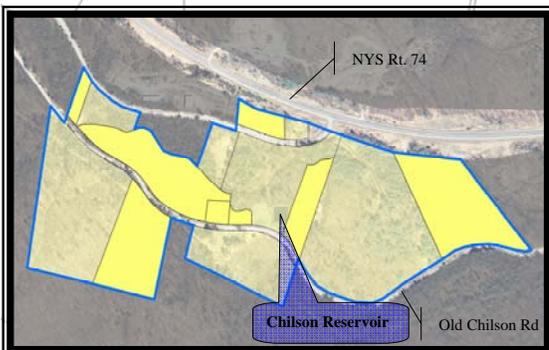
The reservoir is leaking. The coal tar pitch used to seal the reservoir has through time slumped from between the sections of slab it was intended to fill. While the exact locations of leakage are unknown, the places where the sealant is missing are likely culprits. Additionally, coal tar is a known human carcinogen and should be avoided in drinking water applications.



Without a cover, the Chilson Reservoir allows organics and contaminants to be introduced into the drinking water system. Leaves, mud, and other decomposed organic material are visible in the reservoir, and water beetles and insect larvae have been observed in the shallow perimeter areas. The water is re-chlorinated at the reservoir but the injection and residual sampling points are near the reservoir outlet. It is likely that only the water in the immediate vicinity of the outlet gets dosed. This conclusion is supported by the healthy plant and animal population observed to be living in the reservoir. In the event of a high flow situation such as a fire it is possible that the demand will exceed the volume of chlorinated water in the vicinity of the outlet, and water without a residual will be distributed to users. The combination of additional organics and chlorine can also result in elevated levels of disinfection byproducts.

According to the 10 State Standards, "water mains should be covered with sufficient earth or other insulation to prevent freezing," and for underwater crossings "a minimum cover of five feet should be provided over the pipe." Ticonderoga's water and sewer committee has established a 6' standard bury depth for all water mains and force mains. Contrary to existing standards, large sections of the pipeline downstream from the Chilson Reservoir are exposed. Many of the exposed sections lay in open water. These exposed sections of pipe are susceptible to freezing, being struck by falling trees and rolling rocks, and frost heave, increasing the potential for breaks. This increased risk of waterline breaks creates an increased risk of contamination, especially for those pipes that are resting in creek beds and swamps. The location of the transmission line in the Chilson Brook makes repair difficult and/or impossible in some areas because the brook runs through a forest and steep ravine.

**Ticonderoga is under an NYS DOH Administrative Tribunal Stipulation to replace the Chilson Reservoir with a storage tank on or before July 1, 2015.**



Between the Eagle Lake Chlorination Station and the Chilson Reservoir many out-of-district users are connected to the system. When users are not in a district they are not legally required to help shoulder the burden of any maintenance costs or improvements made to the system because they can choose to leave the system at any time. Undocumented out-of-district users may not be made aware of potential water quality concerns because their existence as a user and their point of use along the water line is unknown to the Town. Forming a district for current out-of-district users in the vicinity of the existing Chilson Reservoir will be included in the project.

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## Project Description



The Town of Ticonderoga has begun a comprehensive project to address many of the deficiencies in its water system and to correct outstanding State Sanitary Code violations. The primary objectives of the project include replacing the Lake George DE filter plant with a new groundwater supply or treatment plant and replacing the Chilson Reservoir with a storage tank(s).

The Lake George DE Filter Plant will be replaced with a new groundwater supply to remediate the numerous 10 State Standards violations and the Surface Water Treatment Rule filtration violation that is included in the outstanding NYS DOH Administrative Tribunal Stipulation (AT10). Two sites have been identified as having the potential to supply the Town, one located adjacent to the Chilson Reservoir, and the other along Street Road. Both sites will be investigated in order to determine if they are able to provide the quantity of water needed to serve the entire Town. The development of a source on Street Road will require construction of one 0.65 million gallon tank, treatment facilities and an updated transmission main into the community replacing the failing transmission main currently serving the area. The replacement system will be contingent on completion of test wells, confirming the hydrogeologic investigations.

The existing uncovered Chilson Reservoir will be demolished and replaced with one 0.65 million gallon wire wrapped, pre-stressed concrete tank. In conjunction with plans to construct a 0.65 million gallon tank on Street Road the two tanks will increase available the storage volume to meet Insurance Services Office (ISO) Needed Fire Flows (NFF) for the areas currently served by the Chilson Reservoir. New process and laboratory equipment will be installed to improve control over the tank levels and chlorine dose, thereby improving operational efficiency. New pumps, valves, and chemical feed systems will have automatic switchover to redundant backup systems. The new tanks and associated control systems and laboratory equipment will resolve the deficiencies that caused the reservoir to be included in the outstanding NYS DOH Administrative Tribunal Stipulation (AT10).

A 16" transmission main will be installed from the Chilson tank down along NYS Route 74 to a tie in near the intersection of NYS Route 74 and Racetrack Road. The new main will replace the existing cast iron main that travels along the Chilson Brook. The existing main is inaccessible in many areas for repair or maintenance, has pipes that date back to the 1890's, is laying exposed in many area, and contributes to high head loss due to tuberculation. This replacement of an aged main will result in improved water quality and pressure and will make maintenance of the main more efficient and effective.

Contingent on community and legal approval, water districts will be formed in the Chilson area and along Street Road to provide municipal potable water to residents. Many of these residents currently have insufficient yielding private wells or are out-of-district users without sufficient property to drill a well and maintain proper separation distances between their septic system and well.

Improvements are represented schematically in Figure 1. A cost summary of the proposed improvements described is shown in Table 7.7 with resulting user costs indicated in Table 10.8.

# Town of Ticonderoga

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### DWSRF Intended Use Plan - Project Priority Ranking and Cost

The Town of Ticonderoga is submitting a Drinking Water State Revolving Fund Pre-Application to the NYS DOH for potential funding of the proposed project. The Town is under enforcement by the NYS DOH (docket number 20110406). This project should be included in the new DWSRF Intended Use Plan Project Readiness List. The Town must submit engineering plans and specifications for the project that includes: (1) replacement of the Chilson Reservoir with a new storage tank(s); (2) upgrade or replacement of the Lake George filtration plant, and; (3) upgrade or replacement of the Gooseneck Pond water supply by October 1, 2012 under the terms of enforcement. Construction to remediate the enforcement items is required to be completed on or before July 1, 2015.

#### Project Priority Ranking:

The project qualifies for the following DWSRF Priority Ranking System points based on the objectives and public health benefits of the proposed improvements:

#### Technical Factors:

##### A.1.a.i. Filtration

This project will eliminate an antiquated diatomaceous earth filter plant that has violated the filtration requirements of the Surface Water Treatment Rule.

**100 Points**

##### B.1 Inadequate Source Capacity

The Ticonderoga water system was designed to be fed solely by Gooseneck Pond. The Lake George DE Plant was intended to be a supplemental source for high demand periods. Since the DE plant was commissioned in 2000 it has gone from a supplemental source to a key water supply. When the DE plant is decommissioned due to its numerous violations the Ticonderoga system will be unable to meet current water demands because the maximum yield of Gooseneck Pond is only 0.8 MGD, with current yields significantly less due to the failures of the ponds dike system. This project will provide a new groundwater source or treatment facility to ensure adequate water is available for the increasing demands on Ticonderoga's water system.

**50 Points**

##### B.3. Uncovered Finished Water Storage

This project will eliminate an uncovered finished water storage structure and replace it with two covered tanks. The covered tanks will increase the system's fire flow to meet ISO Needed Fire Flow, reduce organics in the water which will decrease the amount of chlorine needed at the second chlorine injection point and reduce disinfection byproduct formation, and increase operational flexibility.

**25 Points**

##### C.1. System Reliability/Dependability Issues (Replacement/major Rehabilitation)

This project will completely replace the antiquated Lake George filter plant, which has violated filtration standards, with a new ground water source or a new treatment facility.

**20 Points**

##### C.2 System Reliability/Dependability Issues (Vulnerable System Components)

C.2.d (Existing Disinfection System) The disinfection system at the second chlorine injection point (currently the Chilson Reservoir) will be completely replaced in conjunction with construction of the new storage tanks. The replacement will meet the design standards in the current edition of the Recommended Standards for Water Works.

C.2.e (Transmission Main) Sections of the transmission main downstream from the Chilson Reservoir and along Street Road that have exceeded their design life and/or do not meet the Recommended Standards for Water Works will be replaced.

C.2.f (Finished water or distribution storage) The tank(s) that will be constructed to replace the existing uncovered Chilson Reservoir will reduce chlorine demand, reduce disinfection byproduct formation, and provide additional storage.

**10 Points**

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### DWSRF Intended Use Plan - Project Priority Ranking and Cost

#### C.3 System Reliability/Dependability Issues (Aged Mains and Appurtenances)

Aged mains, some over 100 years old, downstream from the Chilson Reservoir will be replaced as necessary based on their location and condition.

**5 Points**

#### C.4 System Reliability/Dependability Issues (Redundancy of Critical Components)

New pumps, valves, and chemical feed systems will be installed at the new storage tanks. All new critical components will have redundant backup systems. Automatic switchover to the backup chemical feed systems will be provided.

**5 Points**

#### C.6 System Reliability/Dependability Issues (Control/automation for operational efficiency)

The Lake George DE plant has no automated systems, no laboratory facilities, and insufficient metering. The project will drastically improve operational efficiency by providing the water system with automated systems at the new treatment locations, laboratory facilities, and sufficient metering.

**5 Points**

#### Non-Technical Factors:

#### D.1. Development of a Water System or Extending Existing System

The project will seek to form new Water Districts in the Chilson area and along Street Road to provide municipal potable water to residents. Many of these residents currently have insufficient yielding private wells or are out-of-district users without sufficient property to drill a well and maintain proper separation distances between their septic system and well.

**40 Points**

#### D.5 Consistent with Water Resources Management Strategy (WRMS)

The project is consistent with the WRMS. Among other things, periodic inadvertent discharge of DE into Lake George, a protected "no-discharge" lake, will be stopped.

**5 Points**

#### D.6 Proposed Operational Changes that Improve and Ensure Adequate Technical, Managerial and Financial Capacity

The project will give the water operators more control over water quality by allowing fewer organics to be introduced into the system. The new tanks will reduce chemical disinfection costs because the covered water storage will reduce chlorine demand. Replacing the Lake George DE filter plant with a new groundwater supply or a gravity-based treatment facility will result in a system that provides safe drinking water and is more economical to operate. The improved controls and automation, and new laboratory facilities that are included in the project will increase the technical capabilities of the system and require significantly less operator time than the current system.

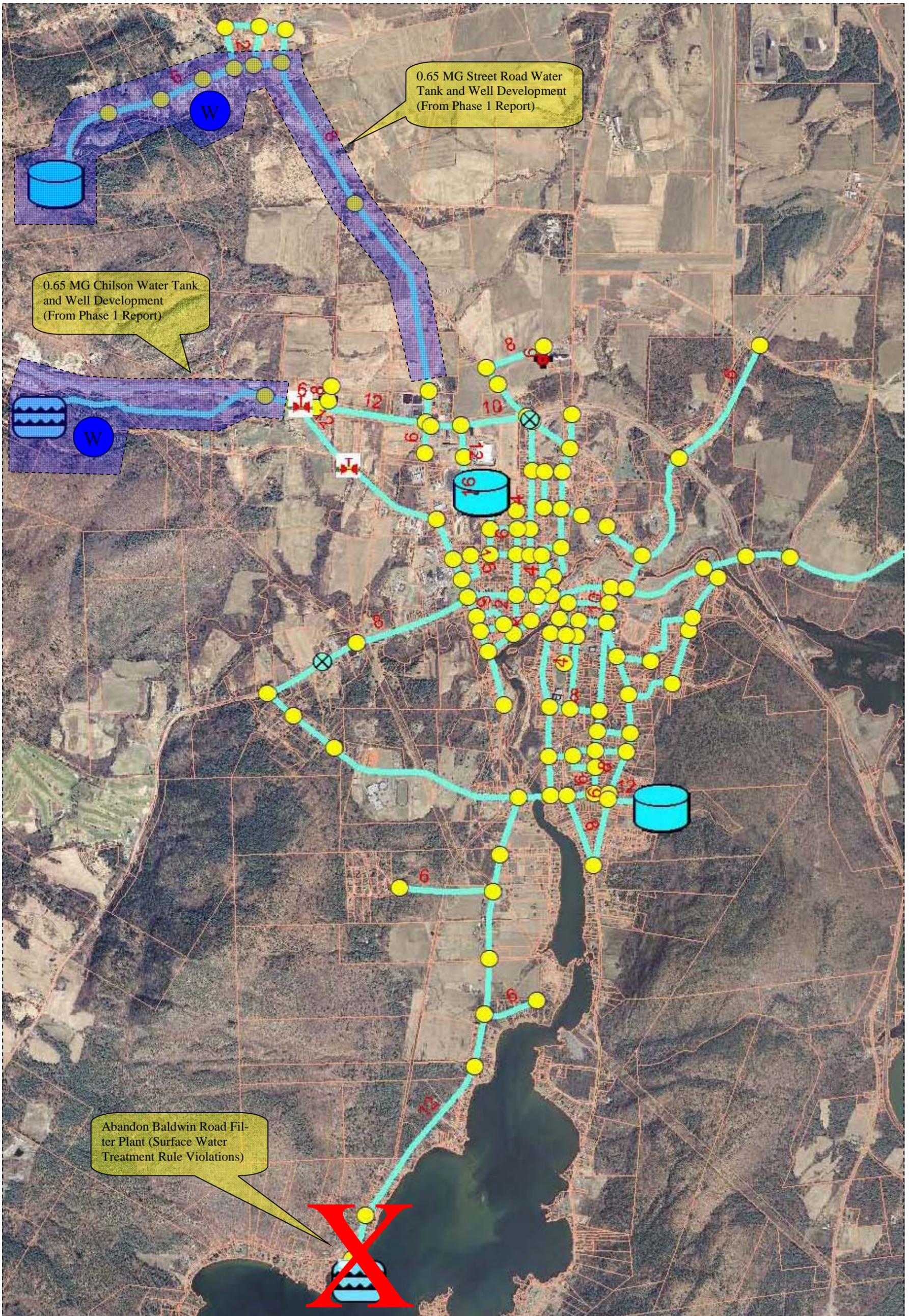
**5 Points**

#### E. Financial Need

The 2000 U.S. Census MHI for the Town of Ticonderoga is \$34,160

**15 Points**

**ANTICIPATED TOTAL SCORE: 285**



**Figure 1**  
**Schematic of Improvements**

**Town of Ticonderoga**  
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Table 7.7  
Town of Ticonderoga, Gooseneck Pond Water System Evaluation  
Phase 1 - Chilson Reservoir  
Cost Estimate: GW at Street Road and Chilson

<b>Alternative #4 - Ground Water Development, Lower Chilson</b>		
Lower Chilson Water Transmission Main (Contract WMR)	\$	1,227,531
Lower Chilson Water Storage Tank and Site improvements (Contract GC)- one tank	\$	1,775,335
Pressure Reducing station (Village District)	\$	140,156
Chilson Water Treatment Plant	\$	1,703,972
8" Water Main for Chilson Water Plant Connection With Tank	\$	207,317
Demolition: Misc	\$	120,000
	<b>\$</b>	<b>5,174,312</b>
<b>Alternative #3 - Ground Water Development, Street Road</b>		
Street Road Water Storage tank	\$	1,520,331
Street Road Tank, Water Transmission	\$	1,387,261
Street Road Water Treatment Plant	\$	3,345,943
Pressure Reducing Station	\$	140,156
	<b>\$</b>	<b>6,393,690</b>
<b>Construction Costs Sub-Total</b>	<b>\$</b>	<b>11,568,003</b>



**Table 10.8**  
Town of Ticonderoga, Gooseneck Pond Water System Evaluation  
Phase 2 - Alternative 7  
Project Financing and User Rates: Water Storage and GW treatment at Chilson and Street Road  
Hardship application

**Total Project Costs**

		<b>Combined project</b>
Construction Costs	\$	11,568,002.61
Engineering Fees	\$	811,857.00
Other Expenses	\$	175,000.00
Equipment Costs	\$	150,000.00
Land Accuision	\$	125,000.00
Contigencies (estimated at 8%)	\$	1,026,388.77
<b>Subtotal Project Costs</b>	<b>\$</b>	<b>13,856,248.38</b>
Deduct Other Funding	\$	2,000,000.00
Grant Program: DWSRF	\$	2,000,000.00
Grant Program: Economic Development	\$	-
Grant Program:	\$	-
Issuance Costs (3%)	\$	415,687.45
<b>Total Estimate of Probable Costs</b>	<b>\$</b>	<b>12,271,936</b>

**Loan Program**

Loan Program: DWSRF	\$	12,271,936
Anticipated Loan Period		30 yrs
Anticipated interest rate		0.00%
Cost of Loan (Interest and Debt annually)	\$	<b>409,064.53</b>

**Estimated Cost Per User**

<b>Existing Cost Per User</b>		
# of User Units (Total)		1735
Existing Annual Rates	\$	320.00
<b>Operations and Maintenance</b>		
Anticipated Operations and maintenance, per year	\$	17,115.40
<b>Proposed Cost Per User</b>		
Proposed Annual O&M Per User	\$	9.86
Proposed Annual Debt Service, Payment term:	\$	409,064.53
Proposed Annual Debt Service Per year per user		\$235.77
Total user rate for proposed improvements		<b>\$565.64</b>