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Aroostook Utility Assets Assessment

Village of Southern Victoria, NB

GEMTEC Project: 103013.002

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Submitted to:

Village of Southern Victoria
1131 West Riverside Drive
Perth-Andover, NB
E7H 5G5

Aroostook Utility Assets Assessment

Village of Southern Victoria, NB

February 26, 2024
GEMTEC Project: 103013.002

experience • knowledge • integrity

GEMTEC Consulting Engineers and Scientists Limited
124 Greenview Drive
Hanwell, NB, Canada
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February 26, 2024

File: 103013.002

Village of Southern Victoria
1131 West Riverside Drive
Perth-Andover, NB
E7H 5G5

Attention: Dan Dionne – Chief Administrative Officer

Re: Aroostook Utility Assets Assessment

In October 2023, the Village of Southern Victoria retained GEMTEC Consulting Engineers and Scientists Limited (GEMTEC), to assess the former Village of Aroostook Water Utility (Utility) assets. This report presents the summary of our work and findings regarding the Utility's water assets.

We thank you for the trust and opportunity to work with the Village of this assignment. Do not hesitate to contact the undersigned should you have any questions.

Jihad El Zamer, P.Eng., CAM
Manager- Municipal and Asset Management

JZ/cd

Enclosures
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1.0 INTRODUCTION

As a result of the 2021 Local Governance Reform in New Brunswick, the Village of Perth-Andover, the Village of Aroostook, portions of the Local Service District of Perth, and Portions of the Local Service District of Andover were joined to form the Village of Southern Victoria (hereafter, 'the Village'). The Village retained GEMTEC to assess the former Village of Aroostook's utility assets. The objective of this study is to establish a compete list of all Aroostook's utility assets, along with their condition assessment and replacement costs, to assist the newly formed Village in developing a plan to sustain these assets.

2.0 METHODOLOGY

GEMTEC employed a collaborative methodology for conducting the assessment, involving the following steps:

1. Gathered and reviewed previous plans and relevant information concerning Aroostook utility assets.
2. Examined available plans and related data for a more thorough understanding.
3. Conducted a site tour of visible assets in conjunction with the Utility's operator to become more familiar with the assets list.
4. Compiled a comprehensive inventory of utility assets, encompassing both linear assets (such as pipes and hydrants) and vertical assets (including well houses and storage tanks).
5. Developed criteria for rating the condition of utility assets.
6. Performed non-destructive visual assessments on vertical assets and age-based assessments on linear assets.
7. Estimated replacement costs for the utility assets.
8. Reviewed the utility's budget to evaluate its financial adequacy.
9. Prepared a detailed report containing the findings from the aforementioned steps and presented it to the Village's Chief Administrative Officer (CAO) and Council for their consideration.

3.0 WATER SYSTEM OVERVIEW

The Aroostook system, established in 1963 by the Province of New Brunswick to serve approximately 120 residential accounts, has undergone significant developments over the years. Initially, homeowners relied on a makeshift water supply from a spring, which was disrupted during the construction of the Trans-Canada Highway. To address this, the Province constructed the first Aroostook supply (Well #1), with a 1000 gallon pressurized tank, replacing the interrupted system.

Well #2 Pumphouse

The system saw expansion in 1972 with the development of Well #2, which in turn feeds a 115,000 imperial gallon steel water tank (standpipe). At present, Well #2 stands as the primary water source for the community, with Well #1 serving solely as an emergency backup. Well #1, classified as a gravel well, has a production capacity of 40 gallons per minute, while Well #2, categorized as a rock well, boasts a higher output of 100 gallons per minute. The monitoring of turbidity levels at Well #2 is of particular importance, especially during periods of elevated runoff, ensuring the ongoing maintenance of water quality standards. Well #2 is "believed" to be GUDI (groundwater under the direct influence of surface water) but there is no special treatment for GUDI (ex. UV disinfection). UV was contemplated but not implemented because the water is quite hard, and UV would not be effective. The current water treatment is chlorination with sodium hypochlorite. Well #2 is equipped with a transfer switch for generator connection during power failures, ensuring uninterrupted service provision.

115,000 IG Steel Water Tank

The main water tank is a steel standpipe installed in 1972, with a capacity of approximately 115,000 imperial gallons and dimensions of 24 feet in diameter and 42 feet in height. The high-water level is at 40 feet and the filling process is regulated by a mechanical pressure switch maintaining pressure between 25 and 31 psi. The tank's last relining was in 1994. In July 2022, Landmark conducted a study encompassing the evaluation of interior and exterior coatings, identification of any corrosion on the interior surface, assessment of exposed foundation conditions, and recommendations for safety equipment upgrades, with the detailed report attached as Appendix A. Landmark's report includes a breakdown of the repairs required and of additional inspection requirements, with an estimated cost of approximately $700,000.

The distribution system is primarily composed of 6" un-lined cast iron pipes. Pipe material was confirmed through examination of a section from the last water break in 2023. The piping system exhibits signs of external corrosion and minimal internal tuberculation. Regular flushing on a yearly basis is being conducted by the operator to help maintain water quality and remove corrosive substances and scale deposits from the inside of pipes. The water level in the standpipe regulates the system pressure, maintaining it within an adequate range of 40 to 50 psi in lower areas. The operator reports all system valves are operable. There are 15 fire hydrants in the system for fire protection. The consistent flows observed within the Aroostook system would suggest minimal leakage.

Water Pipe Section

According to the operator, the frequency of water breaks increased from an average of one break every three years (1 in 3) to an average of one break every year (1 in 1), typically a shear break that can be repaired with a clamp. It was also noted by the operator that there are sections of the system where the pipes are installed on a rock bed without proper backfill material below and above the pipes. Poor workmanship in pipe installation can typically reduce the expected useful life of the pipes.

Well #1 Pumphouse

The system is compliant with the Certificate of Approval issued by the Province of New Brunswick. Discussions between the Province and the operator have revolved around turbidity levels and chlorine contact time to the first customer, with the regulator displaying minimal concern. The operator believes the reason contact time is not more of a concern for the Province is because of the system's slow flow rate. Regular system maintenance includes maintaining a chlorine residual between 0.2 and 0.4 mg/l, with daily testing to ensure compliance. Even in "dead ends" at the system's extremity, the current chlorination practice is able to maintain an adequate chlorine residual.

Boil orders are mandated during reduced pressure situations, and alarms for turbidity, chlorine level, and equipment malfunctions are effectively monitored through PLCs and SCADA systems. The system's maintenance is overseen by the operator, who is responsible for operational efficiency and compliance with regulatory standards through regular inspections and necessary repairs. The system is maintained by the operator, who hires equipment and other help as required, typically for major repairs or water breaks.

4.0 UTILITY ASSETS INVENTORY AND CONSTRUCTION VALUE

The following table summarizes the inventory of key Utility assets and their estimated current construction costs. These costs are based on GEMTEC's research and price benchmarking from similar jobs constructed in New Brunswick over the past few years.

Table 1 – Inventory of Utility assets and their current construction costs

Asset Description	Current Construction Cost	
PVC installed between 1970-1980	$	226,778
150 mm CI 1963 from GIS; to be replaced with PVC;	$	1,466,500
200 mm CI 1963 from GIS; to be replaced with PVC;	$	315,012
115,000 IG Steel Tank	$	995,000
Surge tank	$	50,000
Well #1 and well house	$	150,000
Well #2 and well house	$	250,000
Chlorination and Control system	$	54,664
Well #1 pump	$	20,000
Well #2 pump	$	35,000
	$	**3,562,954**

5.0 UTILITY ASSETS INVENTORY AND CONDITION RATING

5.1 Condition Rating Framework

The condition of each asset represents the current state of physical repair and is often used as an indicator for the relative time until rehabilitation or replacement is required. A five-point rating scale is used. This simplified condition rating scale allows for comparative benchmarking between asset groups and is sufficiently detailed for high-level decision making. Descriptions of each condition rating (from 1 to 5) are shown in Table 2 below.

Table 2 - Condition Rating Descriptions

Condition Rating	Physical Condition	Expected Service Life
Very Good	Excellent working conditions. No signs of deterioration.	Between 70% and 100% remaining useful life.
Good	Minor signs of deterioration.	Between 50% and 70% remaining useful life.
Fair	Some elements exhibiting major deficiencies.	Between 20% and 50% remaining useful life.
Poor	Significant deterioration with localized areas of failure.	Between 0% and 20% remaining useful life.

Very Poor	Asset requires immediate repair.	No remaining useful life.

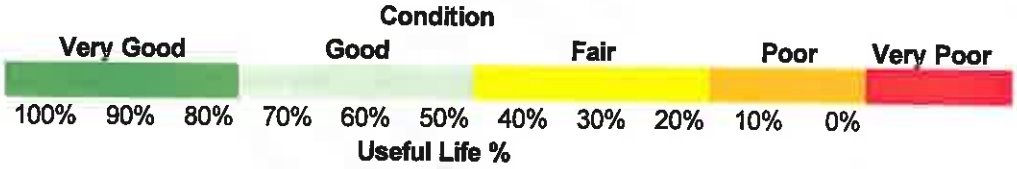
Condition ratings of assets in the Village of Southern Victoria are estimated using one of two methods:

- Theoretical Condition – using asset age and estimated useful life as a proxy for condition.
- Documented Observations – systematic and documented observations of the asset.

Buried and hidden Utility assets rely on a theoretical condition assessment using age as a proxy. Theoretical condition based on age is calculated as demonstrated in Figure 1. This proxy is intended to mimic the rate of deterioration an asset experiences during its life cycle.

GEMTEC conducted a visual assessment of the key Utility vertical assets and followed the theoretical condition assessment for buried and invisible assets.

Figure 1: Age proxy for condition assessment

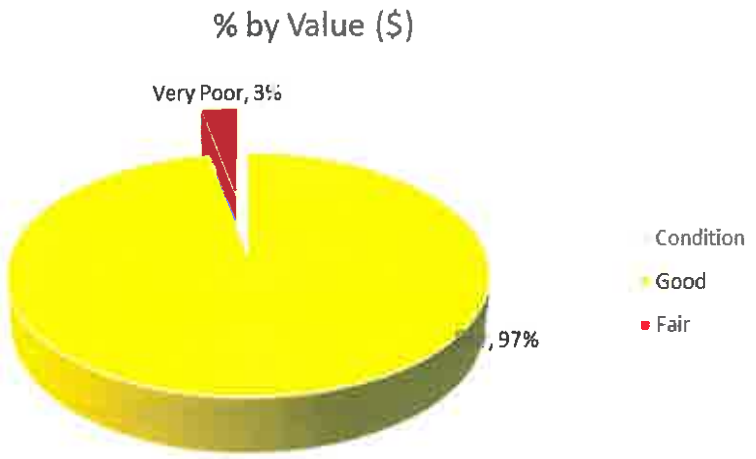


5.2 Utility Assets Condition Summary

The following table and graph present a visual summary of the Utility's assets condition as percentage of asset type relative to the Utility assets cost:

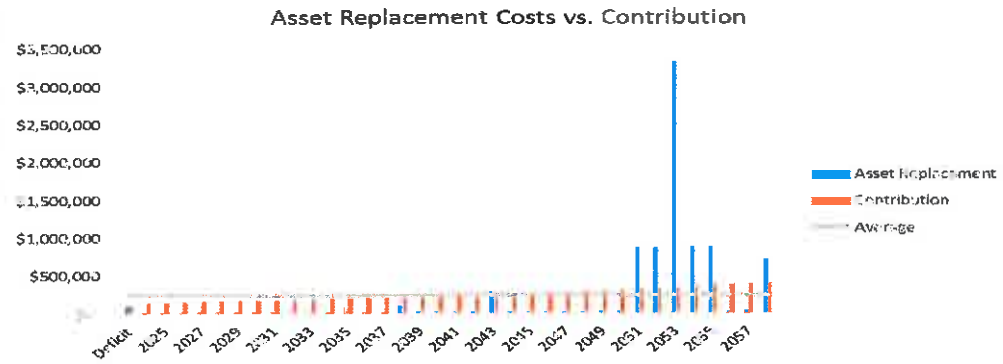
Asset Description	Age (years)	% of Life Remaining	Condition
PVC installed between 1970-1980	54	46%	Fair
150 mm CI 1963 from GIS; to be replaced with PVC;	61	32%	Fair
200 mm CI 1963 from GIS; to be replaced with PVC;	61	32%	Fair
115,000 IG Steel Tank	46	39%	Fair
Surge tank	61	0%	Very Poor
Well #1 and pumphouse	61	24%	Fair
Well #2 and pumphouse	46	43%	Fair
Chlorination and Control system	14	44%	Fair
Well #1 pump	61	0%	Very Poor
Well #2 pump	46	0%	Very Poor

Note: based on age proxy, the steel tank's condition would be considered, however, the tank requires repairs and upgrades, estimated at approximately $700,000 based on Landmark's report.



6.0 FINANCIAL OVERVEIW

The Aroostook Utility operates with an annual budget of roughly $70,000, primarily allocated towards covering operational expenses with no provisions for capital upgrades or asset replacement. There is no wastewater system in Aroostook, and residents pay $225 annually for water services, with 120 connections yielding an estimated yearly revenue of $27,000 from water sales. Non-payment of water bills is not a major issue in Aroostook. The General Fund transfer allowed for fire protection constitutes a substantial portion of the revenue (approximately 27%), a notably higher percentage compared to the Perth-Andover system, where the transfer accounts for only 8% of overall revenue. The current revenue for the Aroostook system is not sufficient to cover the necessary and ongoing capital replacement required in the system. To address this discrepancy, GEMTEC recommends that the Village of Southern Victoria reassess water fees and explore alternative funding sources, such as grants or low-interest, long-term loans, to facilitate necessary capital upgrades for the water system. The graph below shows the required infrastructure replacement costs and the annual capital contribution required to cover these costs:



7.0 CONSULTING TEAM RECOMMENDATIONS

7.1 System Improvements:

1. Consider acquiring a replacement pump for Well #2 as the main well pump has been in operation for 15 years, and hence nearing its end of useful life. In the event of Well#2 pump failure, Well #1 is unable to meet the system's demands for an extended period. Upon the arrival of the replacement pump, installation can proceed, followed by evaluation and potential refurbishment or replacement of the current pump as necessary.

2. Enhance pump control by installing a more accurate electronic pressure switch for Well #2.

3. Address turbidity concerns by investigating the installation of a filtration system for Well #2. The new filtration system could be accommodated within the current well house.

4. Replace plastic piping with steel piping in the well house for Well #2, as proposed by the operator, for enhanced reliability.

5. Verify and develop a plan to act upon repairs recommended by Landmark concerning the water tank, as per the report received by the Village in 2022. This plan could have a risk matrix developed for the repairs required so they can be ranked in an order of priority.

6. Verify and discuss Groundwater Under the Direct Influence (GUDI) status and contact time requirements with the regulator to ensure compliance and address any potential concerns.

7.2 Other Recommendations:

1. GEMTEC recommends that the Village of Southern Victoria reassess water fees and explore alternative funding sources, such as grants or low-interest, long-term loans, to facilitate necessary capital upgrades for the water system.

2. Develop a long-term plan to replace Utility assets as they approach the end of their useful life. While maximizing the use of linear infrastructure until its full potential is crucial, it's impractical to undertake a simultaneous replacement of all water mains. This process would unfold over multiple years, necessitating the replacement of sections slightly prior or slightly beyond their expected useful life. Common indicators of water mains nearing the end of their life include elevated occurrences of water breaks, pipe corrosion, and tuberculation.

3. If the Village opts to have a municipal wastewater system in the future, there will be financial advantages in concurrently installing the linear infrastructure for the wastewater system alongside the replacement of existing water mains.

4. Periodically update the SCADA system to ensure it remains current and capable of efficiently monitoring and controlling the Utility's infrastructure. This is crucial for maintaining operational efficiency and responding to changing demands.

5. Have a training program for staff and ensure it covers relevant aspects of Utility operations, maintenance, and technological systems. Additionally, emphasize the importance of

representation in external events or initiatives held by CPWA, APWA, MPWWA, ACWWA, etc. to keep staff updated on industry best practices and innovations.

8.0 CLOSING

We appreciate the chance to work with the Village of Southern Victoria in evaluating the Utility assets for the former Village of Aroostook. Our assessment indicates that the Village manages the Aroostook water system efficiently. It would be advantageous to build upon this solid groundwork and ensure the long-term financial sustainability of the Utility, particularly as it relates to ensuring the financial capacity for asset upgrades and replacements. If you have any questions about this report, please don't hesitate to contact the undersigned.

Jihad El Zamer, P.Eng., CAM
Municipal and Asset Management Lead

experience • knowledge • integrity

civil	civil
geotechnical	géotechnique
environmental	environnement
structural	structures
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

expérience • connaissance • intégrité