VILLAGE OF NEW MARYLAND

SUNRISE WELLFIELD DEVELOPMENT

PROJECT OVERVIEW AND SUPPLEMENTARY INFORMATION

JUNE 15, 2020

TABLE OF CONTENTS

APPENDICES

1 PROJECT RATIONALE, SCOPE

1.1 RATIONALE

The Village of New Maryland (Village) wishes to undertake this project to provide for a secure water supply in the immediate future for its communal municipal water system users.

Currently, the Village's municipal drinking water needs are supplied from three (3) groundwater wells with generally acceptable water quality and quantity. However, the Village has the following ongoing concerns regarding the long-term security of its current water supply:

- 2 of 3 wells consistently exceed (up to 7 times) the Guidelines for Canadian Drinking Water aesthetic objective (AO) for manganese.
- Well drawdown levels suggest declining aquifer levels, which are resulting in reduced well production capacities.
- Efforts to restore well production with super-chlorination techniques have been only partially successful.
- Available well production capacities result in continuous well pump run times exceeding several days to meet diurnal water demands and maintain water storage reservoir levels.
- The loss of the Village's largest production well will put the ability to meet water demands, especially during peak demand periods, under significant stress.
- Water quality security of existing wellfield is compromised by the presence of a major highway crossing through the wellfield catchment area, the wellfield protection zones and within 120 m of one production well. The wellfield is also potentially impacted by an industrial park located up-gradient from and immediately adjacent to the wellfield protection area.

It has been the Village's goal to obtain a second, more secure and plentiful water supply source within its boundaries to augment (or replace) the existing wellfield. The Village has committed itself over the past 10+ years to search for a wellfield that can be proven not to be compromised by the above noted concerns. Except for the need for treatment (to remove manganese and hydrogen sulphide), the Village is very confident that the proposed project will provide the necessary water supply security for its long-term future needs.

The proposed new wellfield has a proven safe-yield capacity of 250 USgpm (15.8 L/s), with 100% stand-by capacity. With the largest well out of service, the wellfield is capable of a safe-yield capacity of 250 USgpm (15.8 L/s). In comparison, the Village's existing wellfield has a rated safe-yield capacity of 220 USgpm (13.9 L/s). However, it is only capable of 114 USgpm (7.2 L/s) with the largest well out of service, or 46% of the capacity available from the new wellfield. Well capacities are summarized in the following table. Therefore, the new proposed wellfield is a much more capable source for the Village's long-term future water supply needs.

WELLFIELD	NO. OF WELLS	TOTAL AVAILABLE SAFE-YIELD CAPACITY		AVAILABLE SAFE-YIELD CAPACITY WITH LARGEST WELL OUT OF SERVICE	
		USgpm	*L/s*	*USgpm*	*L/s*
Existing	3	220	13.9	114	7.2
Proposed New	2	500	31.6	250	15.8

1.2 SCOPE

The scope-of-work for this project is generally summarized as follows:

- Development and testing of one (TW05-02) of the two water supply wells to provide for a safe-yield capacity. Note: The other well (TW17-01) has been developed, tested and has obtained a safe-yield capacity rating.
- Property and property easement acquisition from private property owners for establishing access within the wellfield to the water supply well locations, and for obtaining lands for locating a water booster pump building.
- Preparation of an EIA submission document for review and approval by the NB Dept. of Environment and Local Government and subsequent Ministerial determination.
- On-site piloting of a selected manganese and hydrogen sulphide treatment technology.
- Detailed engineering design involving water supply, transmission, treatment and distribution, and incl. overall system control.
- Tendering of the overall project in specific phases that generally align with the primary project components - water supply/transmission, treatment, distribution and overall control.
- Construction of the project components in phases that align with the above noted project tendering phases. Project construction to include contract administration, on-site observation, equipment start-up and system commissioning, operator training and project close out.

2 PROJECT DESCRIPTION

2.1 OVERVIEW

This description covers the new municipal water supply, treatment and distribution project proposed for the Village.

This project represents an entirely new water supply system for the Village. As such, it involves the development of a new water supply field, construction of new water supply wells, construction of a new water treatment facility and the construction of a new water transmission mains. These components will enable conveyance of untreated water from a groundwater source to treatment and then onward to distribution within the Village's existing water distribution infrastructure. It is intended that this new infrastructure will eventually replace the Village's existing well field and water well infrastructure as its primary water supply system.

Conceptually, the proposed project is separated into the following three primary components:

- Raw Water Supply and Transmission.
- Water Treatment Process.
- Water Distribution.

Further primary component details are provided in the following sections. A project overview drawing is provided in Appendix A.

2.2 RAW WATER SUPPLY AND TRANSMISSION

The raw water supply and transmission component of this project involves the extraction of groundwater using well pumps and its conveyance (under pressure) from the wellhead through a water transmission line to a downstream water treatment system. Components of the water supply and transmission system include the following:

- Two (2) drilled water supply wells - TW05-02 and TW17-01, each with a safe-yield capacity of 250 USgpm (16 L/s).
- Two (2) well control buildings - one each at well location.
- Submersible well pumps, well drop piping and controls.
- Site access and service vehicle roadway.
- 3-phase power to the well control buildings.
- Water transmission pipeline (incl. valving, chambers, etc.) interconnecting the well control buildings to the downstream water treatment system.

The water supply well sites (TW05-02, TW17-01) are located along the Village's southern property boundary (see overview drawing - Appendix A). Each well will be sized to supply 250 USgpm (16 L/s) of raw groundwater from its respective control building, through the transmission pipeline and along the access roadway to the water treatment plant.

The access roadway will be constructed with a 6 m wide gravel surface. A three-phase power supply line will be installed on poles (i.e., overhead) along the access roadway, to service each well control building and the associated well pump equipment and controls. An additional access road will be provided to the existing Well TW05-1, which will be retained and re-purposed as a groundwater observation well.

The property on which all wells, well control buildings, access roadway and water transmission pipeline are to be located is to be acquired from private property owners.

2.3 WATER TREATMENT PROCESS

To meet drinking water quality under the Guidelines for Canadian Drinking Water Quality (GCDWQ), the proposed raw groundwater supply must undergo treatment to reduce manganese and hydrogen sulphide, as well as, provide residual chlorine within the distribution pipe network. This treatment will be undertaken using water treatment process equipment specifically designed for manganese and hydrogen sulphide removal.

Water treatment process equipment will be positioned within a Water Treatment Plant (WTP) building located in the Village's Sunrise Estates Subdivision on property owned by the Village. This location is shown on the project overview drawing provided in Appendix A. The WTP building (approx. outside dimensions – 21 m L x 16 m W) will house the following components:

- Manganese and hydrogen sulfide water treatment process.
- Temporary backwash storage tankage and associated pumps.
- Booster pumping station.
- Interconnecting process piping, isolation valves and specialized process valves (i.e., pressure reducing/sustaining valves).
- Workshop and general equipment storage area.
- Chlorine addition and storage room, incl. dosing pumps.
- Control room, incl. operator office area and Supervisory Control and Data Acquisition (SCADA) system.
- Water testing lab area.
- Electrical room.
- Washroom/shower/locker area.
- Emergency stand-by power system (exterior to building).

- Entrance vestibule.
- Various single/double entrance and overhead doorways.

The treatment process will include redundant process equipment and controls at strategic points in the process train and process control network. For example, chlorine dosing and treated water boosting will include stand-by pumping capacity that is automatically engaged should the duty pump fail.

2.4 WATER DISTRIBUTION

The water distribution piping and booster pumping system will interconnect the WTP with the Village's existing water distribution piping network, including the water storage reservoir. This distribution system will also permit reverse gravity flow from the water storage reservoir through to the WTP to provide necessary backwash water quantities during cleaning (backwashing) of the manganese treatment process filter. The piping system will be designed to provide an operating pressure range of 40 to 85 psi.

The water distribution piping will be positioned within an existing sanitary sewer system right-of-way (from the WTP to Highway 101) and along the west side of Highway 101 to interconnections with the Village's existing water distribution piping network. The water distribution piping route is identified in the overview drawing provided in Appendix A.

The primary components of the proposed water distribution piping system are:

- 1st water booster station, incl. a triplex booster pump package, located within the WTP building.
- Water distribution piping routed from the WTP westward to Highway 101, and then northward along Highway 101 to piping network interconnection points at Daniel Drive and at Sandcherry Lane.
- Pressure reducing valve (PRV) building located on Highway 101 at the Village's Victoria Hall property. This building will also incorporate a chlorine dosing station and an emergency stand-by power supply system.
- 2nd water booster station, incl. a quadplex booster pump package, located on Highway 101 near the existing Centennial Gardens storm water retention pond complex. An emergency stand-by power supply system will be provided at this booster station facility. Note: The Village will acquire this property from existing property owners.
- Strategically located hydrants along Highway 101, as well as, stubbed-off piping laterals positioned at subdivision entrances on Highway 101 (i.e., Sunrise Estates, Petersen Park, Phillips Drive North/South, Timothy and Cedar Acres) for potential future water service connections.
- Stubbed-off water service lateral connections to individual residences and commercial establishments along Highway 101.

2.5 SYSTEM OPERATION AND CONTROLS

The entire water supply, transmission, treatment and distribution system components will be designed to operate as a single and cohesive process train. All system components must operate in unison with one another each time the system is placed in full operating mode. Failure of any one system component will create an incomplete process train. Unless a full redundant stand-by component is immediately (and automatically) available, this condition will result in stoppage of all remaining system components and thus failure of the system to operate.

Operation of the water system is predicated on satisfying fluctuating diurnal water demands by maintaining adequate water levels within the Village's existing water storage reservoir. When the reservoir's water level is lowered to a pre-determined low-level condition, a *system cycle* commences with automatic start-up of the water supply system. System start-up will begin with initiating operation of a water supply well and the transmission line, followed by initiating operation of the water treatment process, and subsequently followed by initiating operation of the water distribution system.

Assuming all components are successfully started, treated water will eventually be conveyed to the water storage reservoir to raise the reservoir operating level to a pre-determined full level, thus ending the *system cycle* and initiating a coordinated system shutdown. The *system cycle* is repeated upon detection of a low water reservoir level condition. The system will be designed to accommodate process interruptions resulting from filter backwashing requirements, power loss and individual process component failures.

A specialized control system will be utilized to coordinate, control and frequently confirm operating status to ensure proper system cycling is achieved. This control system, known as Supervisory Control and Data Acquisition (SCADA), is comprised of a network of sensors, programmable logic controllers (PLC), servers, computers and control terminals. Uninterrupted communication is essential among the various system components. Secured communication will be achieved using a licensed radio frequency and specialized radio communication equipment, such as radio towers at the well control buildings, WTP building, water booster station buildings and water reservoir.

3 BENEFITS

3.1 ECONOMIC BENEFITS

The following economic benefits are identified for this project:

1. **Upfront investment is often less costly:**

   The Village is investing in the long-term future of their community, rather than waiting until the existing infrastructure is no longer functional. Should one current water supply well prove unusable and be removed from long-term service, the remaining available capacity could seriously threaten the Village's ability to meet its water demand. Mitigating possible issues before they arise is often the less costly and more economically sustainable option.

2. **Circular and local economic benefits:**

   Direct investment in new infrastructure in New Maryland will stimulate economic activity in the Village and in the Fredericton area at large, by employing local contractors and consultants. The proposed project is anticipated to occur over a 3 to 5-year period with a total budget over $10M. This project is being divided into several design and construction phases over the proposed project timeline. Portions of the project will be tendered at a size to enhance the opportunity for smaller local contractors to remain on a more equal and competitive footing compared to larger outside contractors.

   As such, tax dollars invested in local infrastructure improvements spur job opportunities and quality of life improvements. This can foster increasingly attractive conditions for business investment, which can create a more resilient local economy and meaningful livelihoods for Village and surrounding area residents.

3. **Investing in capacity to account for population growth:**

   Increases the Village's long-term viability, allowing it to grow as market-driven need dictates without being hindered by water capacity challenges. Currently, not all local ratepayers are connected to the Village's communal water supply system. This project will permit the Village the ability to extend its communal water supply to existing private well users and to future developments.

4. **Reduction of unnecessary investment for tax payers:**

   A portion of this project utilizes an existing sanitary sewer easement right-of-way on which to locate a portion of new water distribution piping. This will assist with reducing project costs compared to the extra cost of creating new easements and accessibility for new infrastructure components.

5. **Maintenance reduction:**

   By investing in new infrastructure, the required maintenance cost on the distribution system will be reduced over the long-term.

3.2 ENVIRONMENTAL BENEFITS

The following environmental benefits are identified for this project:

1. **Accounting for increased rainfall and flooding:**

   Project considers changing climate, in terms of current and expanding threats to the existing groundwater wells, i.e. major highway and industrial park within or up-gradient from the wellfield production area. Considering that rainfall and flooding are expected to worsen due to climate change effects, the Village is taking steps to 'future proof' its water supply by introducing a second, more secure wellfield that is located to mitigate the threat of rainfall and flooding contamination.

2. **Reducing energy consumption of the facility:**

   The new groundwater supply wells are positioned where storm water run-off from adjacent hard surfaces is likely less, thus potentially resulting in a lesser toll on water treatment facilities, thus reducing the overall need for electricity to manage water treatment.

3. '**Smart' technology system to regulate extraction of groundwater to sustain the groundwater source:**

   System operation will be dependent on supervisory control and data acquisition (SCADA). SCADA will link via radio-wave technology to all programmable logic control (PLC) units. SCADA will continuously collect operating data for subsequent operator analysis and monitoring, as well as, for trending and historical data base purposes.

   The use of 'smart' technology will ensure critical operations data (i.e., aquifer water levels, turbidity concentrations, etc.) is continuously monitored and recorded. This is increasingly important due to the heightened risk of flood or drought, and the unpredictability of extreme climate change weather events. This data will enable the operator to better determine if water extraction is exceeding water recovery.

   The 'smart' system will ensure adequate water levels (i.e., for drinking, emergency use, fire-fighting) are maintained within the existing storage reservoir. In periods of drought, pre-drought, or flooding conditions, the typical water reservoir fill and draw operating cycle will commence and complete automatically. The result is that levels are maintained for fire-fighting safety and security of drinking water, but that no excess water or other resources are used. Also, ensuring an adequate water supply for fire fighting purposes is a priority for the Provincial Government as the Village of New Maryland provides fire service coverage for Local Service Districts in the area.

4. **Sustainable water source = less chance of needing to truck in water.**

   Providing a sustainable source of drinking water for the residents of New Maryland reduces the possibility that, in the case of increased drought or heat, the Village may need to resort to trucking in water from elsewhere (reduction of GHGs). If one water supply well pump is taken out-of-service, there is redundant 100% stand-by pumping capacity.

3.3 SOCIAL BENEFITS

The potential social benefits resulting from infrastructure that provides for basic community services, but remains relatively hidden from public view (i.e., that which is buried underground) can often be more abstract than other more obvious infrastructure, such as roadway networks. Buried infrastructure, such as water supply and distribution network piping, can often result in equal or even far more profound social benefits, even though the public may be unaware of their contribution to the community social fabric.

1. **Social Stability:**

   Continued access to clean drinking water, particularly in Canada, is a basic human right. While clean and consistent drinking water will be increasingly threatened due to increased drought and heat because of climate change, consistent access to this resource can have an enormous impact on the social stability of a community. If residents of the community do not need to worry about whether they will have access to clean, adequate drinking water consistently, then they have the capacity to invest their time in the social and economic growth of their community.

2. **Increased Home Equity:**

   Adequate water supply infrastructure helps individuals to sustain the value of the personal investment they have made in their home, because being connected to central services which are reliable is an asset.

3. **Economic Benefits Result in Social Benefits:**

   The economic benefits reviewed in Section 3.1 result in a series of social benefits, such as job stability, the availability of meaningful work, and private and public-sector investment in a community. The result is that more workers can choose to work close to home, and civic pride increases.

4. **Perception-based Benefits:**

   A community is only as resilient as the perception that its residents (and visitors or possible residents) have of their government's ability to provide for their needs. The perception of investments made by the government in the community's needs helps to build resiliency and favour within a community, which can add to the overall satisfaction that residents feel.

3.4 BENEFITS TO ABORIGINAL COMMUNITIES

The Village has undertaken a Heritage Resource Impact Assessment for the proposed project. This work included documentary research and a preliminary field examination. The scope of this work was developed in consultation with NB Archaeological Services Branch.

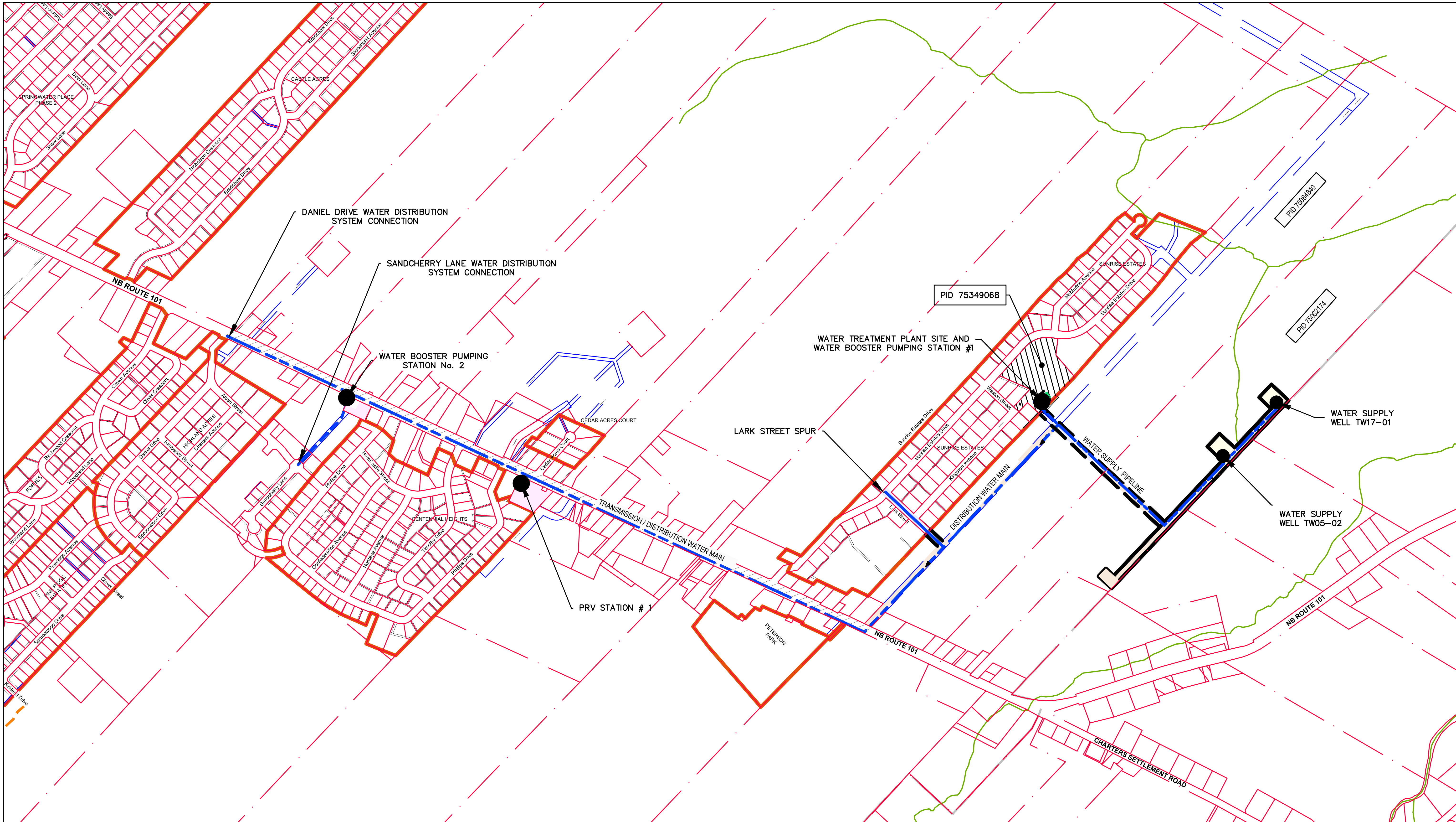
This assessment found that the project's assessment area does not have medium or high potential to contain unknown heritage resources. As a result, archaeological testing is not recommended. However, it is recognized that there is a possibility of uncovering artifacts during the project construction phase, and it is recommended that the appropriate protocol be followed in the unlikely event of accidental heritage resource discovery.

Therefore, there are no known benefits associated with this project to aboriginal communities or off-reserve groups.

APPENDIX

A

PROJECT OVERVIEW- CONCEPT DRAWING



1:5000 @ A1
1:10000 @ A3
0 50 100 150 200 250 300 350 400 450 500 m

LEGEND

PROPOSED WATER MAIN

wsp
Fredericton Office
+1 506 451 0055
80 Bishop Drive
Fredericton NB E3C 1B2
Canada

Project	VILLAGE OF NEW MARYLAND NEW WELLFIELD DEVELOPMENT		
Sheet	PROJECT OVERVIEW -CONCEPT DRAWING EIA - PUBLIC INVOLVEMENT COMPONENT		
Designed	Approved	Approved Date	
Drawn	Scales: 1:10000		
Project No.: C-84510.70	Sheet. No.: 007	Revision: 0	

Original Sheet Size ANSI B [11"x17"] Plot Date 2020-06-19 at 10:09:18 AM Path G:\JOBFILES\800\845_NewMaryland\C-84510.70 - Arsam Property - EIA For Wellfield Development (2018)\04_Project Working Files\CADD\C-84510.70 Figure 7.dwg FIGURE 7

APPENDIX

B

PROJECT PHASING and PROJECT FINANCES

Village of New Maryland
Sunrise Wellfield Development – (2020 to 2024)

1.0 Project Phasing

Phase No.	Years	Description of Tasks, Construction, Etc.
1	2020 and 2021	Preparation of EIA Registration Document and Initial Site Development (access road, water supply main and power)
2	2021, 2022 and 2023	Full Development and Commissioning of Production Wells and Detailed Design and Preparation of Tender Ready Documents for Water Treatment Plant, Booster Station and PRV Station
3 and 4	2022 and 2023	Construction and Commissioning of Water Treatment Plant, Booster Station, PRV Station and SCADA System and Installation of Water Distribution Piping and Connections to the Village's Existing Water Distribution System
5	2024	Wellfield Protection Plan for New Wellfield and Partial Decommissioning of Existing Water Supply Infrastructure

2.0 Project Finances

The overall project cost is currently estimated at $ 10 665 710. The Village submitted an Expression of Interest to the Integrated Bilateral Agreement for the Investing in Canada Infrastructure Program in June 2019 for funding assistance.

Based on the Village's application, funding contributions to the project would be as follows:

Federal ICIP Contribution -	$ 5 559 426.00
Province of New Brunswick Contribution -	$ 3 057 684.00
Village Contribution (Gas Tax Monies) -	$ 1 400 000.00
Village Contribution (Other Sources) -	$ 648 600.00