Transportation and Infrastructure
Municipal Infrastructure Division

# Water Treatment Project Policy Guide

Revision 0
July 2024

| Revision | Changes | Effective Date |
|---|---|---|
| 0 | New Policy Guide | July 2024 |
| | | |
| | | |

[This Page Intentionally Left Blank]

# CONTENTS

[This Page Intentionally Left Blank]

# 1 INTRODUCTION AND PURPOSE

## 1.1 Introduction

1. The Municipal Infrastructure Division (MI) provides cost-shared funding to local governments ("Owners") throughout the province, to address their identified infrastructure needs. MI accepts applications for prospective projects, wherein the Owner indicates where an infrastructure deficiency exists, outlines their proposed identified infrastructure needs, and presents a cost estimate for the work.
2. MI works closely with other government departments throughout the full project lifecycle, from application submission to project execution and closeout.
3. Specifically, the Water Resource Management Division (WRMD) of the Department of Environment and Climate Change provides MI with subject matter expertise on water treatment applications and projects.
4. Coordination between MI and WRMD remains a crucial part of the GNL involvement in cost-shared projects.

## 1.2 Definitions

1. **Water Treatment Facility:** A public drinking water system that has a drinking water treatment process other than chlorine disinfection. A water treatment facility can include a single treatment process or multiple treatment processes that target specific water quality parameters and that may involve chemical treatment, process adjustment, backwashing, or media regeneration (e.g., pH adjustment, iron, and manganese removal). A water treatment plant is considered a type of water treatment facility.
2. **Water Treatment Plant:** A water treatment facility that is designed to produce drinking water that meets all required drinking water quality standards and guidelines. The plant must use multiple treatment processes for the targeted reduction, increase, removal, or inactivation of multiple water quality parameters. To be classified as a water treatment plant, the facility must be listed on the Department of Environment & Climate Change Water Treatment Plant Inventory List.

## 1.3 Purpose

1. The purpose of this document is to outline the joint expectations from MI and WRMD pertaining to water treatment projects. Specifically matters that involve

selection/determination of technologies or processes for treatment, quality parameters, suitability for future operation, and specific requirements that an Owner (i.e., municipality or Local Service District) must comply with when undertaking the design and construction of a water treatment facility.

2. The selection process for a water treatment facility must ensure that the recommended system is appropriate and affordable for the recipient's specific needs, in terms of both initial capital costs and ongoing operations and maintenance costs.
3. It must ensure that the treatment system produces drinking water that meets the current version of the Guidelines for Canadian Drinking Water Quality (GCDWQ) and adheres to the Drinking Water Treatment Standards for Newfoundland and Labrador.
4. It must also ensure that the treatment facility produces drinking water that meets the specified objective for the system. This objective must be identified by the Owner as part of the original project concept for both new and upgrades to existing treatment facilities. This objective could be:

    1. Producing drinking water quality that meets the Guidelines for Canadian Drinking Water Quality (GCDWQ), current version; or
    2. Producing drinking water that meets specific parameter guidelines from the Guidelines for Canadian Drinking Water Quality (GCDWQ), current version. The specific parameters are to be identified clearly.

# 2 APPLICABILITY

## 2.1 Guide Applies

1. This policy guide will apply when an Owner is proposing a treatment system with the objective of complying with the Guidelines for Canadian Drinking Water Quality, or specifically addressing a particular parameter of interest within the Guidelines for Canadian Drinking Water Quality. Parameters of interest may include, but are not limited to, the following:
2. Microbiological Parameters such as Giardia, Cryptosporidium, Escherichia coli, etc.
3. Chemical Parameters such as Arsenic, Manganese, Iron, etc.
4. Dissolved Organic Carbon
5. Disinfection By-Products; Trihalomethanes (THMs); Haloacetic Acids – Total (HAAs)
6. Radiological Parameters

7. In the case where a parameter is not explicitly listed above, the policy guide will still apply; the policy guide applies to all water quality improvement projects. The Owner must also adhere to the Drinking Water Treatment Standards for Newfoundland and Labrador.

## 2.2 Guide Does Not Apply

1. This policy guide will not apply if the Owner is proposing the following:
    1. Installation or replacement of a Chlorine Disinfection
    2. Installation or replacement of a pH adjustment system

## 2.3 Funding from Other Sources

1. It is advisable that Owners consider using the procedural steps outlined in this Guide even when project funding does not come from MI. Owners undertaking water treatment projects on their own still would benefit from planning and engagement with WRMD.

# 3 PROJECT OUTCOMES

## 3.1 Water Quality

1. A drinking water treatment project must produce drinking water that meets the Guidelines for Canadian Drinking Water Quality (latest version).
2. A drinking water treatment project must also adhere to the Drinking Water Treatment Standards for NL
3. Any variance from these treatment requirements will require approval from MI and WRMD.

## 3.2 System Operation

1. Systems must function to meet the water quality objectives, for an operational cost that the Owner can afford, and at a complexity that the Owner can manage. Consultants, Owners, and GNL stakeholders must work together to ensure that the right system is installed so it can meet the needs of the community for the full-service life.

### 3.3 Impact on Municipal Budgets

1. Construction and operation of a water treatment system will represent a significant financial commitment by the Owner for many years. Thus, a comprehensive review of the financial impact on the municipal budget is required. The Owner may need retain the services of a financial specialist to assist with the budgetary analysis.

# 4 PROJECT EXECUTION

## 4.1 General

1. Water Treatment projects benefit from following a predictable project execution path. Water treatment is often a very expensive endeavor for many communities throughout the province, and therefore, it should be undertaken in a deliberate manner.

## 4.2 Water Treatment Project Phases

1. To adequately meet the Project Outcomes, it is important that water treatment projects are planned and executed with certain key phases.

| Phase | Description | Suggested Action(s) or Next Steps |
|---|---|---|
| **Identification of Deficiency** | Prior to proceeding with infrastructure design or construction, the Owner must identify the deficiency in their water quality and current infrastructure, or their desired end state. | Reach out to the WRMD or the MI Regional Office to review options for addressing the deficiency or infrastructure need. |

| Phase | Description | Suggested Action(s) or Next Steps |
|---|---|---|
| **Investigation Phase** | Once the deficiency or infrastructure need is identified, it should be investigated by a suitably qualified party (e.g., engineering consultant with experience in water treatment) to establish the specific process or infrastructure to address the identified need. | Complete a Feasibility Study, through a suitably qualified party, as outlined in Part 5, below.<br><br>The Feasibility Study should inform a future funding application through MI (or others) if it is needed. |
| **Secure Funding** | Owners need to ensure they have the funds to address any infrastructure needs identified in the Feasibility Study. | Owners applying for Capital Works through MI should follow the identified application submission requirements during an Open Call for Applications. |
| **Consultant Engagement** | Owners will need to engage a consulting firm to design and oversee the construction of infrastructure needed. | MI and WRMD can assist Owners with creating a scope of work for consultants. |
| **Design Phase** | Owners will need to engage with the consulting firm designing the infrastructure to ensure their needs are being met by the project.<br><br>Piloting of proposed water treatment technologies may be required. | MI will work closely with the Owner to ensure the project progresses.<br><br>WRMD will work closely with the Owner and MI, as a subject matter resource, and as the regulator. |
| **Construction Phase** | Owners will need to engage with other project stakeholders while their infrastructure project is under construction and will, ultimately, operate the completed system. | MI will work closely with the Owner to ensure the project progresses.<br><br>WRMD will work closely with the Owner and MI, as a subject matter resource, and as the regulator. |

| Phase | Description | Suggested Action(s) or Next Steps |
|---|---|---|
| **Project Closeout Phase** | Owners will need to engage with the consulting firm and other stakeholders to complete a comprehensive final review and/or deficiency list to ensure the project is completed per the project specifications.<br><br>Owners will undergo extensive training from the involved stakeholders on how to operate the completed system. | MI will work closely with the Owner to ensure that all deficiency items have been identified and appropriately addressed.<br><br>WRMD will work closely with the Owner and MI, as a subject matter resource, and as the regulator. |

## 4.3 Water Treatment Project Delivery

1. Projects funded through MI must conform to MI's Procurement Policies and Project Guidelines. An assessment will be made on a project-by-project basis, to establish the most suitable procurement approach for Water Treatment Infrastructure. This includes consideration of Design-Bid-Build and Design-Build delivery approaches.

### 4.3.1. Design-Bid-Build

1. The Design-Bid-Build (DBB) delivery method involves the engagement of professional services (engineering consultant) by an Owner for planning, conceptual, and detailed design, and preparation of bidding packages for open public bidding.
2. The DBB delivery method allows for strict control by an Owner and their consultant, over the form and function of a particular design solution to an infrastructure project. This design control is a trade-off, increasing the cost risks to the Owner, as the Owner and their design team is fully responsible if there are errors, omissions, or unknown conditions found during the construction phase. This includes operation and efficacy of the treatment equipment.
3. Additional details on this delivery method can be found in the latest edition of MI's Project Guidelines.

### 4.3.2. Design-Build

1. The Design-Build (DB) delivery method allows an Owner to engage with a Design-Build Team, comprised of Contractors and Design Professionals, to provide the detailed design and construction services for the water treatment project.
2. The DB method allows an Owner to establish an overall infrastructure need and project budget but shift the detailed design work and associated cost and performance risk to the Design-Builder. The Design-Builder, on the other hand, has the advantage of being able to execute a project in a more expedited timeframe, since construction can generally start before all the design work has been finalized. As well, having the Design Professionals on the same team allows for quicker resolution of issues during construction.
3. DB projects include an Owner's Advisor (OA), often an engineering consulting team with specific expertise on water treatment and DB project delivery. The OA provides technical expertise on conceptualizing infrastructure needs and formalizing them in a set of bidding documents for engagement with industry. The OA provides project management oversight throughout the project and ensures that the Owner receives the infrastructure they need to achieve their specific performance goals. **Selection of a suitable OA is critical, as the success or failure of a DB project often hinges on the quality of the OA.**
4. Additional details on this delivery method can be found in the latest edition of MI's Project Guidelines.

# 5 FEASIBILITY STUDY

## 5.1 General

1. An Owner proposing to implement any of the treatment types outlined in Section 3.1, above, or proposing to construct a water treatment system must undertake a Feasibility Study of their drinking water system. The study must be conducted by an engineering consultant with suitable experience in the design of drinking water treatment infrastructure.
2. Prior to initiating the Feasibility Study, the Owner will work with the MI Regional Office representative and representatives from WRMD to review:

    1. Project Scope of Work and Timelines
    2. Feasibility Study Scope of Work
    3. Study Deliverables
    4. Procurement Method(s)

## 5.2 Feasibility Study Scope of Work

1. The scope of work for the study must include, at a minimum, the following content:
    1. Assessment of current system infrastructure (distribution, disinfection, treatment)
        1. Age
        2. Condition
        3. Availability of Parts
        4. Treatment Efficacy
    2. Review of historical water quality data
        1. Conduct additional water quality sampling if required.
        2. Testing should include metals speciation (if applicable).
        3. Assessment of seasonal variation and worst-case water quality.
    3. Review of water system demand (flow monitoring data)
        1. The water usage should identify appropriate categories such as domestic, commercial, and unaccounted flows.
            1. If no reliable records are available, then a flow measurement program must be undertaken before the project can proceed any further. A minimum of one-year of good quality data must be collected.
            2. Conduct additional flow monitoring, if required, to plug gaps in data.
    4. Analysis of continuous flow measurements to determine actual peak flows for other supporting water supply system components (storage tanks, pumping systems, etc.) during high flows for various conditions.
        1. May include a water main break, fish plant operating at full capacity, a major fire occurring at the same time as a water line break, etc.
            1. Assessment of future flows out to 25 years.
            2. Assessment of maximum flows.
            3. Hydraulic analysis based on flow demands and pressure requirements.

5. Review of water conservation methods to decrease system demand. This should include:

    1. Leak detection and repair.
    2. Waterline replacement.
    3. Supply heavy commercial users with untreated or partially treated water.
    4. Separate treatment system for drinking water distribution.
    5. Installation of water conservation equipment in individual homes.
    6. Water storage tanks to address high flow, short-term peaks related to fire flows, watermain breaks, etc.
    7. Freeze protection of service lines.
    8. Other feasible strategies.

6. Analysis of source water quantity (safe yield)
7. Analysis of alternative source(s) of water
8. Feasibility of regional water system

    1. Water supplies in adjacent municipalities should be evaluated, at high level, to determine the cost effectiveness of joining water supply systems and sharing water treatment facilities.

9. Water treatment options analysis

    1. Design system in accordance with WRMD's Guidelines for the Design of Drinking Water Systems, latest version.
    2. Design flow rates must be determined using metered flow data, theoretical values will not be accepted.
    3. Plant output must be based on Maximum Day Demand.
    4. Determine the rated capacity of all components of the water treatment plant.
    5. A maximum of 25 years to be used for future projected flow calculations.

10. Proposed treatment processes

    1. Assess fluctuations in raw water quality, water quality parameters that exceed guidelines values, and DBP formation potential.
    2. Summarize the adequacy of proposed processes.
    3. Summarize the basic process design parameters providing flow diagrams showing all process components.

4. Bench scale testing, pilot studies, or demonstrations may be required to establish adequacy.

11. Future Project rationale and approach, including recommended delivery method.
12. Budget for recommended option(s) including capital cost, and annual operation and maintenance costs.

2. The Feasibility study must incorporate tools and information available from the Owner, MI, and WRMD, including but not limited to:

    1. WRMD's Full Cost Assessment Tool
    2. Historical Operational Data
    3. Input from Owner's Water Operator(s) and Public Works Staff

3. Climate change considerations
4. The feasibility study scope of work may not be limited to the above-mentioned deliverables. The owner must adhere to Section 2.1 Feasibility Study of WRMD's Guidelines for the Design of Drinking Water Systems regarding additional items that may be required in the feasibility study. Additional deliverables may be included in the study at the request of MI or WRMD.