Wastewater Innovation Task Force
White Paper w/ References

Prepared for Alberta Municipalities by:

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Alberta Municipalities
Strength In Members

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EXECUTIVE SUMMARY

Alberta Municipalities is an advocacy group that represents municipal members across the province of Alberta. Their focus is on finding solutions to various municipal issues raised by their members.

At the Alberta Municipalities Annual Convention in 2019, the Town of Nanton tabled a resolution calling for an "*Outcomes-based Focus for Provincial Regulation of Municipal Infrastructure*." This resolution was prompted by an upgrade to their wastewater treatment facility that left the Town with crippling operations and maintenance fees. The following year, the City of Cold Lake and the Water North Coalition tabled a similar resolution calling for "*Sustainable Funding for Water and Wastewater Infrastructure*" to advocate for context specific solutions for small communities in Northern Alberta while keeping economic sustainability in mind.

Prompted by these resolutions, Alberta Municipalities conducted a survey of its members and identified the following key challenges for municipal wastewater infrastructure management:

- Increasingly stringent environmental regulations;
- Increasing capital costs for wastewater infrastructure; and
- Financial burden of operating these facilities.

The Alberta Municipalities Wastewater Innovation Task Force (Task Force) was created in 2021 to address these key challenges and to advocate for changes to the provincial regulatory and funding pathways that would allow for innovative wastewater solutions for communities. Task Force members included municipalities and governmental agencies responsible for wastewater approvals and funding. This White Paper provides a summary of the Task Force activities, recommendations, overview of innovation opportunities for the province, and a list of shovel ready projects that could be used to test out the recommendations.

The Task Force has made eight key recommendations, which are spilt into two categories and summarized below. The order of the recommendations does not indicate prioritization of the recommendations:

Red Tape Reduction

1. DIFFERENTIATE between communities over and under 20,000 people to create a set of standard effluent targets that are applied for smaller communities. This will allow smaller communities to select appropriate wastewater treatment with confidence, knowing that they will be required to meet realistic effluent targets. The standard effluent targets will account for the impact a smaller community with a 3-week annual discharge window can have on the watershed, instead of holding small communities to the high standards set by a receiving stream study. This distinction of more or less than 20,000 is from a table in the existing Wastewater Standards and Guidelines (Table 3.1: Best Practicable Technology Standards for Municipalities with Current Population <20,000).

2. DEVELOP a process by which communities that generate under 25 m^3 of daily wastewater flow, can receive approvals from Alberta Environment and Parks (AEP) that are modelled after the *Private Sewer Systems Standards of Practice*. For reference, a community of about 75 people would produce about 25 m^3 of wastewater per day. This could include hamlets, individual neighbourhoods within small communities, or small country residential communities. Currently, the *Private Sewer Systems Standards of Practice* are only applicable for private developments (i.e. land with a single owner instead of any municipal systems that are shared by multiple landowners), but having a similar process administered by AEP would give small communities an alternate pathway for simplified prescriptive wastewater treatment systems.

3. ADVOCATE for the needs of smaller municipalities by establishing an advocate program that can help navigate the interests of all stakeholders at the table while protecting the municipality's main concerns. This program could be established within one of the key Provincial departments, or within Alberta Municipalities, so that communities can access a champion to aid them in understanding the varied pathways and options that are available to them.
4. INFORM communities explicitly that they will be held to effluent targets set by the provincial regulators as well as the Environment Canada standards under the *Wastewater Systems Effluent Regulations*. This information should be delivered by AEP when providing discharge effluent targets in consultation before a project and when an approval is given. This is needed because small communities may want to pursue lagoon treatment systems but the ammonia treatment requirements from Environment Canada may require the addition of enhanced treatment technologies.
5. INTRODUCE a Project Pre-Application Process. Before the discharge approvals are set there should be a Pre-Application Process that brings together AEP and Alberta Transportation (AT) to review a community's internal capacity so that an appropriate technology can be chosen. This would align both technology and funding options to provide a clear path for communities.
6. UTILIZE the existing Municipal Policy and Procedures Manual to approve innovative technologies. This existing policy document has a process laid out for how untested technologies can be piloted in Alberta and approved after a testing period. The Task Force recommends that this policy be made readily available for any community that has assessed how an innovative technology could help them achieve the prescribed effluent quality targets at a more sustainable upfront or long-term cost.
7. DEVELOP a process for piloting innovative technologies that utilizes existing policy documents to approve innovative technologies. This process must show that the technology consistently meets the requirements of the ultimate discharge approval. The Task Force recommends that a 12-month (4 season) pilot period be used to achieve a data set from the technology that sufficiently shows 4 season operation. This is based on the best judgment of the taskforce at the time of white paper submission. As per the outcomes of this White Paper, there would be three potential existing policy documents that can be used to set the approval metrics:

    - Less than 25 m^3 of wastewater flow per day – utilize the Private Sewer Systems Standards of Practice (refer to Recommendation #2);
    - Small Communities set the approval based on an annual discharge window of three weeks (refer to Recommendation #1); and
    - Large Communities follow the standard process for advanced mechanical system for continuous discharge.

Financial

8. FOLLOW a format similar to the one used by the Federation of Canadian Municipalities (FCM) for funding feasibility studies. Funding needs to be provided for feasibility studies so that there is an understanding of how the technology works before an innovative pilot project is submitted for funding under the Alberta Municipal Water Wastewater Partnership (AMWWP) grants.
9. PROVIDE wastewater grant dollars that can facilitate a shared risk model for funding innovation projects. It is recommended that the province provide two types of capital funding:

    - Seed funding for pilot projects. The Task Force recommends modelling this seed funding program after the format of FCM funding under the Green Municipal Fund, providing 50% pilot costs up to a set value; and

- Capital funding that would align with the standard AMWWP eligibility to support technologies that have successfully completed the 12-month pilot period (as per recommendation #7).

10. UPDATE the wastewater funding model so that smaller communities can receive funding to account for the alternative methods of wastewater servicing that low density rural municipalities need to provide. This would include provisions for funding of septage receiving infrastructure and wastewater treatment upgrades to support the input of these lower dilution flows. Additionally, population assessments could be conducted differently so that eligibility criteria could consider populations that are serviced by wastewater septic and holding tanks but are still within the vicinity of a proposed facility.

A list of shovel ready projects that could be used to test out and further refine proposed recommendations is included at the end of this White Paper. Additionally, a few current innovative wastewater treatment technologies that are part of ongoing pilot projects or are just interested in piloting in Alberta communities. These include the Soneera Electro-Flocculation System, naturalized passive treatment wetlands, and Clear Water Clarification Technologies wastewater system. Action on the proposed Task Force recommendations would help pave the way for these technologies, and others, to gain traction in the province and provide a wider range of options for Alberta communities.

This White Paper is the final report from the Task Force project, and it documents the complete findings and final recommendations of the Task Force, providing actionable steps and identifying the key stakeholders from the province who can act on them. Additionally, the appendices of this White Paper include several case studies from communities that were members of the Task Force, documenting their stories to further develop the context in which these solutions have been created. Finally, there are accompanying documents to compliment this white paper including the *Wastewater Innovation Task Force Proceedings Report*, which explains the methodology of the Task Force, and the *Wastewater Innovation Task Force Background Report*, which outlined the current policy and procedures for approval of wastewater treatment systems in the province.

ACKNOWLEDGEMENTS

Funding from Alberta Innovates

The work of the Alberta Municipalities Wastewater Innovation Task Force was made possible through funding from Alberta Innovates through a fee-for-service contract under the *Clean Resources Water Innovation Program*. Alberta Municipalities and the members of the Task Force would like to express their highest appreciation to Alberta Innovates as the funding partner in this work to support communities across Alberta. Their leadership in this project has been critical to the successful delivery of this White Paper.

Support from Elected Officials

The organizing team would also like to thank several Cabinet Ministers who provided their support of the Task Force during the early stages and helped to support the organizing team in carrying out this important analysis of wastewater challenges in the province. The Task Force extends its most sincere thanks to:

- The Honorable Rick McIver, Minister of Municipal Affairs;
- The Honorable Rajan Sawhney, Minister of Transportation; and
- The Honorable Jason Nixon, Minister of Environment and Parks.

Additionally, the Task Force team would like to extend its thanks to Mr. Nathan Neudorf, MLA for Lethbridge East and Parliamentary Secretary for Water Stewardship, for his support of the Task Force's work and his input.

Participants

Lastly, the organizing team would like to thank the following organizations and individuals for their involvement in the meetings of the Task Force.

Organization	Participants
Alberta Innovates	Brett Purdy, Ph.D., Executive Director, Environmental Innovation Mark Donner, Ph.D., Manager, Environmental Remediation and Restoration
Alberta Environment and Parks	Jeffery Wu, M.Eng. P.Eng., Wastewater Specialist Sharon Willianen, Director, Drinking Water and Wastewater Keith Pridgen, Senior Policy Advisor
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MAGNA Engineering Services Inc.	Jennifer Massig, P.Eng., CEO, and Senior Municipal Engineer Gideon Mentie, Facilitator and Civil Designer Jennifer Trzok, Facilitator and Civil Designer

BACKGROUND

The Town of Nanton is a dynamic community nestled in the rolling prairies of southwest Alberta. In this town of just over two thousand people, agriculture and tourism drive the local economy. As in many communities, wastewater infrastructure was not a topic of concern for most residents; however, that changed in 2014 after the sudden failure of the local wastewater treatment plant. The community needed a solution fast and brought in an engineering firm to begin designs for a new facility to be approved, designed, and constructed immediately.

Figure 1: Iconic Grain Elevators in Nanton, AB – Photo by Bernard Spragg

Working with the consulting team and the provincial government, the Town selected the recommended option for a membrane bioreactor (MBR) wastewater treatment facility (WWTF), and it began operation in 2017. A generous $11 Million dollar federal and provincial infrastructure capital grant package was made available for the new plant which helped to cover the upfront costs of the facility. After operating the facility for one year; however, the Town saw significant increases in the operation and maintenance (O&M) expenditure for the wastewater facility. Additionally, it was determined that the MBR plant would require additional capital upgrades to further reduce operating costs. With no funding to help shoulder the cost of ongoing O&M, the cost of levies paid by citizens of Nanton increased by 70%. Ultimately, the process of upgrading the wastewater facility in Nanton has left citizens, community leaders, and town staff frustrated and confused. Looking back on the process, city administration was left feeling disillusioned by the approvals process which prescribed them with a complex mechanical technology instead of giving them an outcomes-based approach that addressed their needs. In 2019, the Town of Nanton raised their concerns at the Alberta Municipalities Annual Convention as a resolution, calling for a move towards “Outcomes-based Focus for Provincial Regulation of Municipal Infrastructure.”

The process of upgrading the wastewater facility in Nanton has left citizens, community leaders, and town staff frustrated and confused.

Nanton is not the only community in Alberta disappointed by the current approval process for wastewater infrastructure. In 2020, the City of Cold Lake, along with the Water North Coalition, raised a similar resolution at the Alberta Municipalities annual convention titled "Sustainable Funding for Water and Wastewater Infrastructure," highlighting the unique challenges that remote northern communities have in maintaining their water and wastewater infrastructure. This resolution advocated for context-specific solutions for small communities in Northern Alberta and questioned how the current regulations made space for them to make sound infrastructure planning decisions with economic sustainability in mind. Through these resolutions and the previous work that Alberta Municipalities had been doing with its members, they had been prioritizing this issue as one of the highest pain points for Alberta communities. To help address this concern, Alberta Municipalities partnered with MAGNA Engineering Services Inc. (MAGNA) to conduct a province-wide survey in September 2020 asking municipalities about the state of their wastewater infrastructure and key concerns moving forward. The survey responses commonly highlighted concerns related to:

- Increasingly stringent environmental regulations;
- Increasing capital costs for wastewater infrastructure; and
- The financial burden of operating these facilities.

"The major concerns for our communities are meeting federal discharge limits and planning for capital replacement." (Central Alberta Community Public Works Staff Member, 2020 Alberta Municipality Wastewater Survey Respondent)

Many municipalities indicated an interest in using innovative technologies to address these concerns; however, the current regulatory framework favours conventional mechanical treatment facilities like the MBR that was installed in Nanton. That said, an alternative regulatory pathway does already exist for innovative wastewater treatment designs; however, without considerable support from AEP, this pathway is difficult to access and navigate. It is also worth noting that in this pathway, the municipality is required to bear all innovation risk related to piloting new technology and mitigating potential failure, so it makes it hard for most communities to approach the idea of selecting an innovative technology. This is especially true for small municipalities that may stand to benefit the most from new or alternative wastewater treatment technologies.

Building on the resolutions raised by Nanton and Cold Lake, Alberta Municipalities formed the Wastewater Innovation Task Force in 2021 to address the concerns that were being raised by its members. The mandate of the Task Force has been to analyze Alberta's current wastewater infrastructure policy and develop recommendations that can be utilized by the provincial government to better serve the needs of small- and medium-sized communities that want to improve both the environmental and economic sustainability of their wastewater treatment systems. The primary focus of these recommendations has been on low-risk process improvements and modifying funding instruments that promote the adoption of innovative wastewater treatment systems that can support the sustainable growth of Alberta communities.

This White Paper is the final report from the Task Force project, and it documents the complete findings and final recommendations of the Task Force, providing actionable steps and identifying the key stakeholders from the province who can act on them. The sections to follow detail the Task Force recommendations and next steps for stakeholders that can continue the momentum of the Task Force. Additionally, the appendices of this White Paper include several case studies from communities that were members of the Task Force, documenting their stories to further develop the context in which these

solutions have been created. Finally, there are accompanying documents to compliment this white paper including the *Wastewater Innovation Task Force Proceedings Report*, which explains the methodology of the Task Force, and the *Wastewater Innovation Task Force Background Report*, which outlined the current policy and procedures for approval of wastewater treatment systems in the province.

TASK FORCE RECOMMENDATIONS

The Task Force process brought together stakeholders from various public institutions in Alberta and beyond, resulting in robust debate and discussion on the topic of improving how municipalities pursue wastewater infrastructure projects. The accompanying Task Force Proceedings report provides an account of the three Task Force meetings and various additional discussions that led to the recommendations presented in this section. The intent of these discussions was to generate methods to improve the delivery of wastewater infrastructure in the province, while also ensuring that innovative solutions are available to small and rural municipalities that need more flexible and sustainable solutions to support growth and long-term economic stability.

Now that the exploratory phase of the Task Force's work has been completed, the goal of this White Paper is to provide actionable recommendations for key stakeholders who have the authority and influence to carry out the findings advanced by our members. In this section, the most actionable steps for each of the recommendations have been listed and the key stakeholders who have the authority to carry out these recommendations have also been identified. Note that the ordering of recommendations does not indicate prioritization.

Recommendation 1

DIFFERENTIATE between communities over and under 20,000 people to create a set of standard effluent targets that are applied for smaller communities. This will allow smaller communities (less than 20,000 people) to select appropriate wastewater treatment with confidence, knowing that they will be required to meet realistic effluent targets. The standard effluent targets will consider the impact a smaller community with a 3-week annual discharge window can have on the watershed, instead of holding small communities to the high standards set by a receiving stream study. This distinction of more or less than 20,000 is taken from a table in the existing *Standards and Guidelines for Municipal Waterworks, Wastewater, And Storm Drainage Systems Part 3* (Table 3.1: Best Practicable Technology Standards for Municipalities with Current Population <20,000).

Table 3.1 from the *Standards and Guidelines* provides a reduced set of water quality targets for new mechanical wastewater treatment systems serving communities with a population of 20,000 or less and release effluent within a once annual discharge window, similar to the discharge requirement for systems using wastewater lagoons. Less contaminants are listed for the smaller community category and the limits set are more in line with equivalent minimum federal limits on those targets. This suggests that there was likely an intent in the original guidelines to factor in the comparatively lower risk a small community has on a receiving environment when limited to a once annual discharge window. Task Force members raised concerns about the challenges presented when small communities are required to adhere to the more stringent regulations set when regulators ask for receiving stream studies that result in targets better suited for advanced treatment technologies and continuous discharge.

It is recommended that AEP develop a consistent and transparent way of establishing wastewater effluent targets that are appropriate for smaller communities by utilizing the distinction between communities smaller than 20,000 persons as presented in the existing guidelines.

Of note, it is understood that this may require small communities that fall under this recommendation to continue using a discharge approval set using the *Code of Practice for Wastewater Systems Using a Wastewater Lagoon* to support the lower impact to human health and the environment. For example, a

small community that meets the requirements of Table 3.1 from the *Standards and Guidelines* but needs to update their lagoon to support growth and unionized ammonia targets, should still be able to keep their discharge within the once a year 3-week discharge window. They would still be considered to fall under the *Code of Practice for Wastewater Systems Using a Wastewater Lagoon* and not be required to carry out a receiving stream study or be pushed into an Advanced Mechanical Facility. This will allow them to reduce lengthy, technical approval processes. Smaller municipalities commonly have a small, less technical staff and reducing red tape in this process will ensure they are not caught up in highly technical decisions that will affect their long-term growth and sustainability.

Key Stakeholder:

- Alberta Environment and Parks (AEP): AEP administers all approvals and authorizations and is the key stakeholder in ensuring this recommendation is implemented. The Task Force requests that AEP evaluate the importance of a size or capability in a community when setting approval requirements targets. By utilizing the information is already available within the current Standards and Guidelines, this recommendation is expected to only require an update to the approval process instead of a policy change.

Recommendation 2

DEVELOP a process by which communities that generate under 25 m^3 of daily wastewater flow can receive approvals from AEP that are modelled after the *Private Sewer Systems Standards of Practice*. For reference, a community of about 75 people would produce 25 m^3 of wastewater per day. This could include hamlets or individual neighbourhoods within small communities. Currently the Private Sewer Systems Standards of Practice are only applicable for private developments (i.e. land with a single owner instead of any municipal systems that are shared by multiple landowners), but having a similar process administered by AEP would give small communities an alternate pathway for simplified prescriptive wastewater treatment systems, without having to reinvent the wheel on this type of process.

The Task Force recommends that a new process under the AEP approvals be included for municipalities that is modelled after the *Private Sewage Systems Standards of Practice.* This would also be a great way to test out pilot scale wastewater treatment technologies. The value of this approach would be to test out innovative technologies in situations where all, or a portion of, municipal wastewater is 25 m^3 of sewage per day or less. The key benefit of this approach is that it simplifies the process for discharge approvals because if modelled after the *Private Sewage Systems Standards of Practice* systems would primarily discharge to groundwater, not surface water. 25 m^3 of sewage per day can be an optional scale for a technology to become verified.

The new process would for all purposes be similar to the current *Private Sewage Systems Standards of Practice* with one main adjustment to open up the approval from a single property, to multiple owners in a single community. Then municipalities would have a pathway to launch low risk pilot projects of new technologies, study the outcomes, and scale up once the necessary data can be shown to regulators proving that the technology achieves the targets needed for scaled up daily volume and discharge to surface water.

Key Stakeholders:

- Municipal Affairs (MA): The *Private Sewage Systems Standards of Practice* policy is under the jurisdiction of Municipal Affairs. It would be beneficial for the Safety Codes Officer to be engaged during the process update in order to provide input to the new section for discharge that is 25 m^3 of sewage per day or less. There also is an opportunity for AEP to engage MA to support this process on AEP's behalf for situations where municipalities are discharging 25 m^3 of sewage per day or less.

- Alberta Environment and Parks: AEP would be the deciding stakeholder if there is an option to create a parallel process that makes use of the current *Private Sewage Systems Standards of Practice* process. This process would require a permit for these types of systems as long as they meet the explicit requirement of the *Standards of Practice*. In this option AEP may be able to engage the MA Safety Codes Officer to aid in managing the permitting process. It may also be possible that this section may require an addition of a section within the current AEP Standards and Guidelines.

Recommendation 3

ADVOCATE for the needs of smaller municipalities by establishing an advocate program that can help navigate the interests of all stakeholders at the table while protecting the municipality's main concerns. This program could be established within one of the key Provincial departments, or within Alberta Municipalities, so that communities can access a champion to aid them in understanding the varied pathways and options available to them. Often communities only go through these types of processes every decade, especially small communities. This makes it difficult for staff in these communities to advocate for themselves in the complex, technical approvals space of wastewater treatment technology selection because they have limited, if any, experience in the process. This proposed advocate would be able to guide municipalities through the process based on lessons learned from other Alberta municipalities; they would be versed in data on available technologies and best practices in Alberta to support communities in making outcome-based decisions. This advocate would administrative staff consider the long-term impacts on their community, and potential alternative options for approvals and technologies. Although each Provincial department is working to provide the best options for a community, they will be inherently limited to their specific scope within the projects process (i.e. funding vs approvals). The advocate would be able to bridge the domains of various Provincial departments and help communities build a comprehensive plan for upgrading their wastewater treatment facilities.

Key Stakeholders:

- Municipal Affairs (MA): MA could be the right choice for a process like this because they are at an arm's length from both the regulatory and funding processes. Having a representative from MA join the process, acting as an "ombudsperson-like" role for the community, could help to ensure that the needs of long-term sustainability and community capacity are taken seriously throughout the entire wastewater approvals process. The group would also be responsible for keeping open communication channels to both AEP and AT to keep those departments apprised of common issues and obstacles impacting Alberta communities in the wastewater treatment approval process.
- Alberta Municipalities: Alberta Municipalities could also be the provider of this service. However, as they do not have government leverage, they would be better suited to be the communication and voice of Alberta communities that are looking to use this type of service.
- Alberta Environment and Parks (AEP): A commitment from AEP is needed to support the advocate program and provide updated and timely information to keep this group apprised of data that would impact their client communities. Further, AEP would also take info from the advocate program to inform regulatory updates, ensuring that updates are in alignment with the needs of Alberta communities.
- Alberta Transportation (AT): A commitment from AT is needed to support the advocate program and provide updated and timely information to keep this group apprised of data that would impact their client communities. Further, AT would also take info from the advocate program to inform regulatory updates, ensuring that updates are in alignment with the needs of Alberta communities.

Recommendation 4

INFORM communities explicitly that they will be held to effluent targets set by the provincial regulators as well as the Environment Canada standards under the *Wastewater Systems Effluent Regulations*. This information should be delivered by AEP when providing discharge effluent targets in consultation before a project and when an approval is given. This becomes important when small communities want to pursue lagoon treatment systems but the ammonia treatment requirements from Environment Canada may require the addition of enhanced treatment technologies.

Make sure that the minimum requirements given under discharge approvals align with the Federal Wastewater Systems Effluent Regulations to ensure communities are selecting wastewater treatment facilities that are in line with both Federal and Provincial requirements.

The organizing team reached out to Environment Canada and invited them to participate in Task Force discussions, however, Environment Canada declined the invitation as their mandate keeps them from interfering in policy discussions that are primarily within the provincial jurisdiction. That said, they did offer to respond to any queries or provide supporting documentation that would aid the Task Force in framing their outcomes. They reiterated that the targets set at the federal level are designed to be minimal so that Provinces can then set additional quality targets on top of those standards as they see fit. This primarily impacts small communities looking to gain approval under the *Code of Practice for Wastewater Systems Using a Wastewater Lagoon*.

Key Stakeholder

- Alberta Environment and Parks (AEP): The regulating team at AEP would be the key stakeholders involved in this recommendation. The main action under this recommendation would be to include explicit communication to communities so they are aware that any chosen wastewater system approved under the Provincial regulatory process would also be required to meet federal requirements as well. This could be a checklist item as part of the approvals process or an update to the Provincial regulations that refer to targets that “reflect the federal targets at a minimum”. This would provide a pathway where all minimum requirements were in alignment with the federal requirements.

Recommendation 5

INTRODUCE a Project Pre-Application Process. Before the discharge approvals are set there would be a Pre-Application Process that brings together AEP and AT to review a community’s internal capacity so that an appropriate technology can be chosen. If Recommendation #3 is adopted, creating an advocate program, this may be a great stage for that process to commence. Otherwise, AEP would most likely need to engage the necessary parties for the Pre-Application Process once the community has started their regulatory process.

The Task Force recommends that this Pre-Application Process be used to help a community engage with necessary government stakeholders and set in motion a standardized technical, managerial, and financial review that would be used to support a new wastewater project. The benefit is to understand the internal capacity of a community to manage new wastewater infrastructure. This recommendation stems directly from Nanton’s experience. If they had been able to show quantitively that they did not have the internal operating bandwidth to take on an advanced mechanical system like the MBR plant, they would

have been able to advocate for a simplified wastewater option that better suited their operating capacity and would not result in a substantial increase of their operating costs.

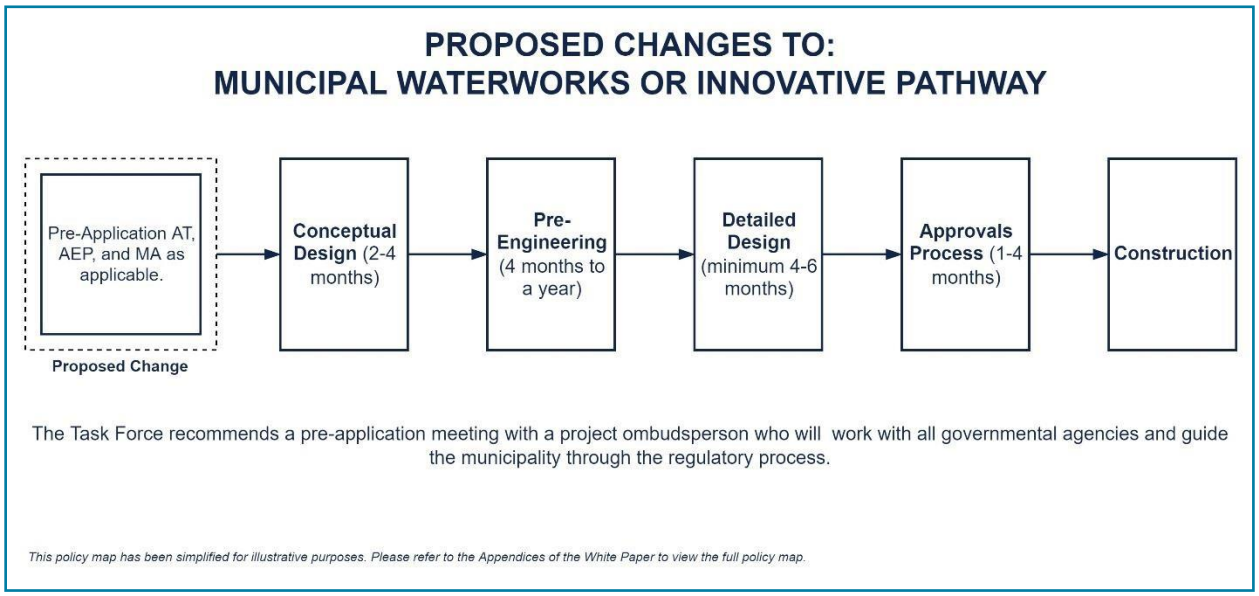

Figure 3: Proposed Changes to Municipal Waterworks or Innovative Pathway

The Task Force would recommend that this analysis take the form of a standardized initial contact meeting and follow-up document that AEP takes into consideration during the early stages of a project development process with the community. It's critical that this process be created in a way that empowers the regulating team at AEP to factor in the outcomes of the review into the decisions around setting effluent quality targets, discharge windows, and wastewater treatment system approvals. The outcomes of this process would also support AT in their funding decision-making process.

Key Stakeholders:

- Alberta Environment and Parks (AEP): As the main stakeholder in the approvals process this process would need to be fully supported by AEP, as either the holder of the process or as a key supporter.
- Alberta Transportation (AT): The main role AT would have in the process is in supporting communities with information about their options for funding and the required information needed to fund a proposed project. Having access to AT throughout the pre-application review of a communities would help to build trust among stakeholders so that when funding decisions are finally made there is confidence that a robust understanding of the community's capacity is taken into account.
- Municipal Affairs (MA): This program could also be championed through MA as a municipal requirement once a necessary wastewater update is identified based on either a system breakdown or emergency, or as part of growth planning. Although both AEP and AT would be involved – AEP from a regulatory perspective, and AT from a funding perspective – it might fit better within the strategic directives of MA to coordinate this pre-application process as part of an advocate program. This would also allow the MA department to stay in the loop as part of being a champion for small communities in this process.

Recommendation 6

UTILIZE the existing *Municipal Policy and Procedures Manual* to approve innovative technologies. This policy document has a process laid out for piloting untested and alternative technologies in Alberta and gaining approval after a testing period. The Task Force recommends that this policy be made readily

available for any community that has assessed how an innovative technology could help them achieve the prescribed effluent quality targets at a more sustainable upfront or long-term cost.

Currently, ministerial support is highly recommended for this pathway to be supported. This is the process that The Town of Sundre is currently using to implement their proposed new wastewater treatment facility; however, the intention of this recommendation is to ensure that communities do not need to engage the ministerial level to have a technology approved under this process. There needs to be a consistent way for all communities to access this pathway, and utilizing this existing manual is the fastest way to implement consistency for all communities. Since beginning the Task Force meetings, this has already begun to change, with this policy option being made more available to communities across the province through circulation of the *Manual* amongst AEP wastewater staff. The next step in implementing this as a feasible option for communities is for AEP regulatory staff to streamline this process for communities pursuing innovative technologies so that the length of the process matches a conventional approval. If Recommendation #5, the Pre-Application Process, is implemented, this would provide the data for AEP wastewater staff to more easily measure the impacts of treatment technology risks compared to financial and long-term sustainability risk for Alberta communities, justifying the adoption of this alternative pathway.

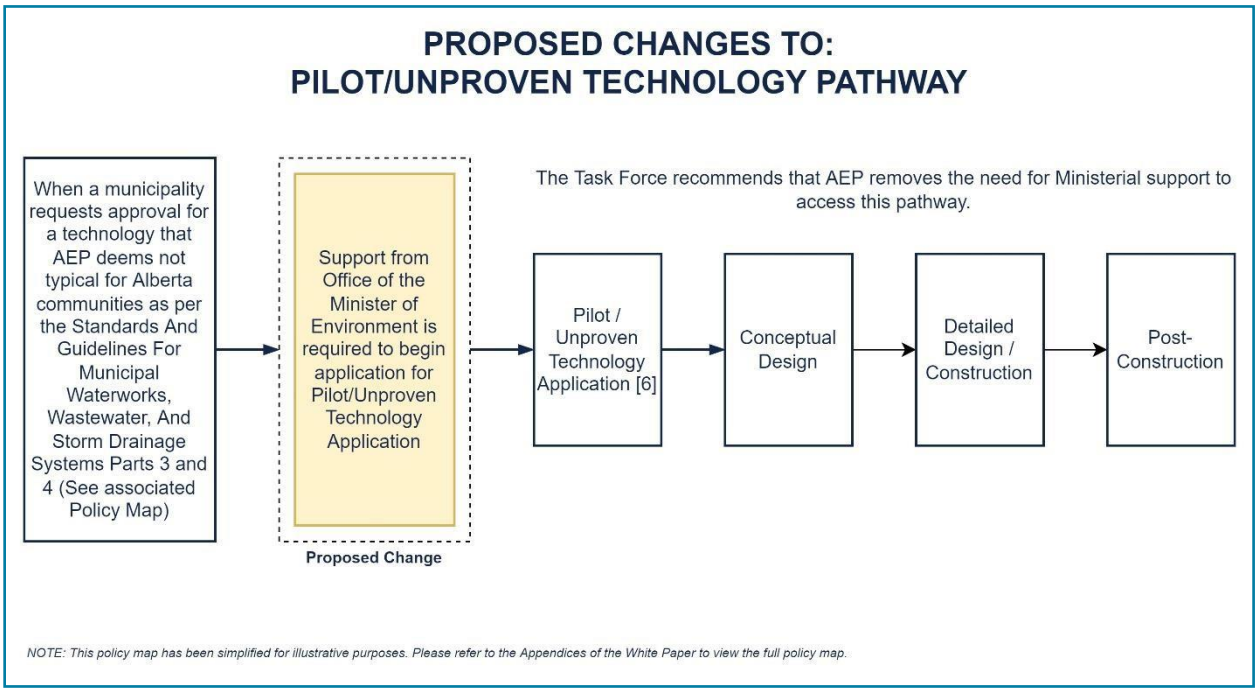

Figure 2: Proposed Changes to Pilot/Unproven Technology Pathway

To further provide clarity for both the community and the AEP wastewater staff, the Task Force recommends that the pilot include a 12-month monitoring and evaluation period after facility commissioning to assess performance across all seasons. This requirement could be removed if technologies are able to provide adequate data of the technology operating in similar environmental conditions as Alberta for 12 consecutive months while meeting similar effluent requirements. While monitoring and operation will always extend for longer than a year, it is important to ensure that an approval for the technology can be delivered shortly after 12 months of data is collected. This can help to ensure that companies and communities who partner on pilot projects are confident they can see a return on their investment. Otherwise, the risk of pursuing an innovative technology becomes too high with the increased uncertainty related to deferred approvals. The requirements of this policy pathway have been outlined in the Background Report included in Appendix A of this report.

Key Stakeholders:

- Alberta Environment and Parks (AEP): As the current holders of the *Municipal Policy and Procedures Manual*, the Task Force would like to see AEP utilize this policy document when it comes to innovative technologies. There are two recommendations for AEP to reduce uncertainties in this process for communities:
    - Ensure effluent target metrics and required monitoring are clear; and
    - Ensure approval is provided once the 12-months of consistent successful treatment is complete in order to reduce project uncertainty.

Recommendation 7

DEVELOP a process for piloting innovative technologies that utilizes existing approval policy set the clear effluent quality targets required to approve these technologies. As per Recommendation #6, this process must show that the technology consistently meets the requirements of the ultimate discharge approval over a 12-month (4 season) pilot period. As per the outcomes of this White Paper, there would be three potential existing policy documents that can be used to set the approval metrics:

- Less than 25 m^3 of wastewater flow per day – utilize the *Private Sewer Systems Standards of Practice* (refer to Recommendation #2);
- Small Communities (pop.<20,000) set the approval based on an annual discharge window of three weeks (refer to Recommendation #1), using the *Standards and Guidelines for Municipal Waterworks, Wastewater, And Storm Drainage Systems Part 3* and the *Code of Practice for Wastewater Systems Using a Wastewater Lagoon*; and
- Large Communities (pop.>20,000) follow the standard process for advanced mechanical system for continuous discharge using the *Standards and Guidelines for Municipal Waterworks, Wastewater, And Storm Drainage Systems Part 3*.

Recommendation 8

FOLLOW a format used by Federation of Canadian Municipalities (FCM) for funding innovative technologies for feasibility studies. Funding needs to be provided for feasibility studies so that there is an understanding of how the technology works before an innovative pilot project is drafted and submitted for funding under the AMWWP grants.

With limited funds on offer each AMWWP funding cycle, it is understandable that AT would like to minimize lending risk and favours funding projects that have a high likelihood of successful implementation. This tends to favour conventional projects over innovative technologies, especially if there is apprehension about innovative projects from the regulating team at AEP. The Task Force recommends that AT, in conjunction with AEP, expand the existing funding framework to include feasibility studies as a risk reducing first step in the innovative technology process.

The FCM Green Municipal Fund (GMF) program offers funding pathways that favour innovation, with the goal of helping communities evaluate proposed capital projects for both technological and fiscal feasibility. Competition for FCM funding is fierce, and a specific solution for Alberta that would incorporate regulatory oversight into the proposed project would ensure that Alberta communities have the financial backing to investigate innovative technologies they might be interested in. Involving AEP in the funding application process would remove some risk from AT, by ensuring that the proposed innovation would be assessed at the feasibility study stage. This will provide the applicant with a clear regulatory pathway for the innovation.

Key Stakeholders:

- Alberta Environment and Parks (AEP): By involving the regulatory body in the funding process, AT can reduce lending risk by ensuring that the proposed innovation conforms with AEP requirements and is likely to gain approval if successfully piloted after the completion of the feasibility study stage.
- Alberta Transportation (AT): As the primary funding body for wastewater projects in Alberta, it would be the responsibility of this agency to make changes to their funding approvals pathways that would promote innovation while minimizing fiscal risk. This is the intention of the feasibility study process and would support furthering responsible innovation in Alberta.

Recommendation 9

PROVIDE wastewater grant dollars that can facilitate a shared risk model for funding for capital expenses on pilot scale innovation projects. Providing capital funding that builds on the results of the funded feasibility studies, as per Recommendation 9, will allow for communities to pursue pilot technologies with clarity and confidence. This recommendation could also be modelled on the FCM GMF, which offers a similar funding pathway for capital funding after the successful completion of a feasibility study. The funding of small-scale pilots provides the municipality and regulatory bodies with valuable performance data while eliminating a large portion of the risk associated with innovation.

A promising risk reduction strategy for AT would be to consider alternative procurement models such as Public-Private-Partnerships (P3s) at the pilot stage. This would see the fiscal risk divided between AT, the municipality, and the technology provider. These and other alternative funding models would ensure that AT is not funding the entirety of a pilot project and holding all the risk should the innovation not prove successful.

At the conclusion of the Task Force, AT reached out to announce administrative changes that would request optional information from applicants to support some of the outcomes in this White Paper. Specifically, changes will allow AT to evaluate projects for innovation and fiscal responsibility using the following supplemental information:

- Method of procurement, to evaluate alternative funding arrangements;
- Project lifecycle costs, to evaluate the long-term financial sustainability of a project;
- If the project is part of a Municipal Asset Management Plan, to evaluate the long-term viability of the project; and
- If the project proposes innovation approved by AEP.

These changes are an important first step in encouraging innovation in wastewater projects. By supporting these municipalities with much needed capital funding to achieve project objectives such as regulatory compliance, or growth capacity for the community.

In reference to innovation funding, it is recommended that the province provide two potential types of capital funding:

- Seed funding for pilot projects. The Task Force recommends modelling this seed funding program after successful format of FCM funding under the Green Municipal Fund, providing 50% of pilot costs up to a set value; and
- Capital funding that would align with the standard AMWWP eligibility to support technologies that have successfully completed the 12-month pilot period (as per recommendation #7).

Key Stakeholders:

- Alberta Environment and Parks (AEP): The pilot project process is governed by AEP and will be a key partner in working with AT to identify pilots for funding support.

- Alberta Transportation (AT): As the primary funding body for wastewater projects in Alberta, it would be the responsibility of this agency to make changes to their funding approvals pathways that would promote innovation by supporting communities by reducing fiscal risk.

Recommendation 10

UPDATE the wastewater funding model so that smaller communities can receive funding to account for the alternative methods of wastewater servicing that low density communities need to provide (i.e. septage receiving at wastewater facilities to support residents in small communities). This would include provisions for funding of septage receiving infrastructure and wastewater treatment upgrades to support the input of these lower dilution flows. Additionally, population assessments could be adjusted to include populations that are serviced by wastewater septic and holding tanks but are still within the vicinity of a community's proposed facility.

Members of the Rural Municipalities Association raised concerns during the meetings around the increasing costs that rural municipalities need to carry for trucking and septic discharge. It is understood that these systems are not currently eligible for funding through the standard AMWWP funding mechanism because the grant program does not include dwellings using septic and holding tanks as part of the service population.

At the conclusion of the Task Force, the AT grant funding team announced administrative changes that could help to achieve this recommendation. Applicants can now optionally support some of the outcomes in this White Paper. It would be possible for smaller municipalities to show the financial justification for a septage receiving station as part of the long-term financial sustainability of a new facility. If the financial justification for a septage receiving stations can be shown then AT could make the case for an updated service population eligibility metric, accounting for users on septic systems that are currently left out of the population count. These changes are an important first step in encouraging innovation in wastewater projects by supporting municipalities with much needed funding to achieve project objectives such as regulatory compliance, or growth capacity for the community.

The *Septage Management Advisory Committee* provides methods for calculating population sizes for septage receiving that could provide some support on how to include this in the eligibility requirements.

Key Stakeholders:

- Alberta Environment and Parks (AEP): Provide support to AT by outlining the most appropriate way to assess populations based on how treatment requirements are approved. AEP can also help support municipalities in determining if a septage receiving station is an appropriate infrastructure option for them.
- Alberta Transportation (AT): As the primary funding body for wastewater projects in Alberta, it would be the responsibility of this agency to make changes to their funding approvals pathways that would promote support for wastewater serving for lower density rural communities.

SHOVEL READY PROJECTS

The recommendations in the preceding section will require the coordination of many stakeholders and further input and refinement to deliver better outcomes across the province for communities like Nanton. To continue the momentum generated in the Task Force meetings it was identified that trialing updated processes, funding models, and strategies for innovation could be best applied to imminent projects. A call was sent out to all member communities with Alberta Municipalities and Rural Municipalities of Alberta asking if they had upcoming projects that might fit with the goals of the Task Force. Several communities reached out and were selected to be included in this list of shovel ready projects below.

Additionally, all these projects have applied for AT funding under the grant funding programs available for wastewater infrastructure. Funding is an important part of the puzzle when a community is looking at an innovative technology. Funding for preliminary studies and pilot projects help communities and AEP to de-risk opportunities to study new technologies.

The following list of innovative wastewater treatment projects in Alberta are currently in the planning and development stages, that could be used to test out proposed alternate pathways for funding and regulatory approvals. These were summarized and presented at Task Force Meeting #2, on January 20, 2022.

Town of Sundre

Background

The Town of Sundre currently operates a lagoon system that requires upgrades to meet provincial effluent limits in order to pursue a renewal of the facility permit in 2025. The Town is also looking at increasing treatment capacity to accommodate both population growth and provide opportunities for industrial development.

An estimate was provided for a new mechanical wastewater treatment facility. The project would cost $15 million up front with an additional $28 million upgrade triggered by population growth. The annual operating costs would increase significantly over the lagoon system currently in operation. The Town was put in the difficult position of continuing to operate a lagoon incapable of meeting modern environmental standards or paying for an expensive facility that includes over twenty years of elevated operations and maintenance costs. The Town decided to pursue alternatives to upgrade their wastewater treatment at a more manageable cost.

The Town aims to upgrade the lagoon system with electro-flocculation, filtration, and UV treatment provided by Soneera Water Canada, similar to a system operating in Unity, Saskatchewan. AEP approval for the facility in Sundre was granted with the provision that the influent flow comes from the existing wastewater lagoon system and the pilot facility discharges back to the existing lagoon. After a monitoring period to prove that the system can achieve the effluent targets, an alternative discharge scenario may be pursued.

The facility is planned for construction in 2022.

The Technology: Soneera Electro-flocculation System

Soneera Water LLC is a wastewater treatment technology company based out of Scottsdale, Arizona. Their technology uses electrical current through sacrificial anodes to remove solids from wastewater while additional filtration steps and ultraviolet treatment propose to deliver tertiary level treated effluent with low operating costs. The Soneera technology will be used in the shovel ready project in the Town of Sundre. A simple lagoon upgrade would not deliver on effluent targets to achieve regulatory compliance.

This innovative technology promises environmental compliance with economic sustainability, a goal that many municipalities are striving to achieve.

The Soneera system consists of three phases of treatment. The first is electro-flocculation where an electrical current is passed through sacrificial anodes in an open topped tank. This stage removes phosphate, metals, reduces the biological and chemical oxygen demand, and reduces total organic carbon. The flocculant and settled waste is dehydrated and landfilled.

The filtration stage consists of sand filter for suspended solids removal, Granular Activated Carbon filters for free chlorine and organics removal, and zeolite filters for ammonia removal. The final stage is ultraviolet treatment to remove pathogens.

Achieving Task Force Objectives

This project aligns with recommendations 6 & 9, approvals using the innovative technology pathway and alternative funding processes to pilot innovative technologies in the province.

#6. Utilize the existing Municipal Policy and Procedures Manual to approve innovative technologies.

As mentioned previously, an approval was granted by AEP that allows for the innovative technology to operate as long as the influent is drawn from the lagoon and the effluent is returned to the lagoon. This removes environmental risk to the receiving waters but still allows for testing of an innovative technology.

#7. Develop a process for piloting innovative technologies that utilizes existing policy documents to approve innovative technologies.

The effluent targets for this project have been identified as per a continuous discharge to the Red Deer River. However, there are no further metrics currently for testing, reporting, and pilot process period required to reach a successful project outcome and gain regulatory approval. The lack of clear metrics for weighing an innovative technology creates uncertainty for both the community and the regulators reviewing the project.

In additional to the effluent targets provided, the approval process for this system could include the following clear metrics to balance the risk to the approving authority and provide clarity to the community applicant by providing a clear path for project success:

1) Clear non-onerous testing requirements over the 12-month (4 season) consecutive pilot phase and the associated required outcomes of testing.
2) Reporting requirements at end of 12-month (4 season) pilot period to support final regulatory approval for the WWTF.

#9. Provide wastewater grant dollars that facilitates a shared risk model for funding innovation projects.

The Town successfully pursued funding for construction from the provincial government and contributed funds from its own budget for the remainder. In an effort to promote innovation, the Town and Soneera have entered into a unique operations agreement for the first five years of the facility, that reduces much of the risk to the Province and the Town should the technology not perform as promised. If the technology is successful and gains both regulatory and public approval, this innovation could become a mainstream treatment option for other municipalities in the province.

Brazeau County: Violet Grove Hamlet Lagoon Improvements

Background

Brazeau County is constructing an innovative wastewater treatment facility called a Solar Aquatic System (SAS) plant in the Hamlet of Violet Grove, Alberta. A description of the technology from their application to the AMWWP Grant says, *"this facility treats wastewater using natural plants in concert with heat and aeration."* The County has been operating another SAS system for the hamlet of Cynthia for over a decade. Just as in Cynthia, the proposed project for Violet Grove would have sewage from the hamlet treated by the SAS system and then stored in an expanded lagoon. This system will also include engineered wetlands as part of the proposed treatment processes.

This project is driven by the need to increase the treatment capacity of the lagoon and to ensure that both Provincial and Federal effluent targets can be met. This treatment solution is attractive to the County as it has a low maintenance requirement once installed. The aeration will be solar powered to save on energy costs.

The SAS systems are not a common form of wastewater treatment in the province. Approvals from AEP are the next major milestone for this project. To support the approval the County conducted pilot projects to collect data and develop practical experience related to the installation and operation of the floating wetlands. Further, engineered wetlands have been studied by graduate students at the University of Calgary providing additional public data. Construction is expected in 2023 pending AEP approval.

The County is pursuing funding to carry out the detailed design and construction of the innovative system.

The Technology: Solar Aquatic Systems and Engineered Wetlands

Brazeau County has been operating an SAS to treat domestic wastewater in the hamlet of Cynthia for over a decade. The system brings domestic wastewater into several aerated tanks where suspended plants are growing with their roots reaching down into the tanks. Incoming wastewater is passed through a micro-screen prior to entering the aerated tanks where micro-bacterial activity among the root structure provides wastewater treatment. The tanks are housed within a green-house structure to maintain the heat necessary to keep the facility operational all year round. In Cynthia, the effluent from these tanks is sent to the existing lagoon for storage until the annual discharge window. The proposed system for Violet Grove, however, will send the effluent from the SAS system to an additional micro-screen prior to entering the constructed wetlands system. That would allow for treatment of nitrogen and other nutrients prior to entering a lagoon for storage until the annual discharge window.

Achieving Task Force Objectives

This project aligns with 1, 3, 4, 5, 6, 7, & 9 of the Task Force Recommendations outlined below.

#1. Differentiate between communities over and under 20,000 people to create a set of standard effluent targets that are applied for smaller communities.

Given the small population that will ultimately support the utility, building a costly mechanical treatment facility with high operating costs will not be financially sustainable for the County. Conversely, a cost-effective lagoon upgrade will not provide treatment capacity to meet effluent targets. Considerations for these financial constraints could be applied to this project during the approvals process to achieve a balance between the best possible treatment outcomes within the financial constraints of the County.

#3. Advocate for the needs of smaller municipalities by establishing an advocate program that can help navigate the interests of all stakeholders at the table while protecting the municipality's main concerns.

This project would be a prime opportunity to develop a first trial of an advocate program to facilitate the County's journey from approval to funding of this project. The innovative nature of the project would need

to be explained and understood in light of existing regulations so that the appropriate approval pathway can be chosen. This will then allow the County to develop a feasibility study and design drawings that meet the requirements for both Alberta Environment and Parks and Alberta Transportation, helping to avoid miscommunication leading to project delays.

#4. Inform communities explicitly that they will be held to effluent targets set by the provincial regulators as well as the Environment Canada standards under the Wastewater Systems Effluent Regulations.

By combining the benefits of an existing lagoon with passive treatment elements like the SAS and engineered wetlands, this proposed project will ensure the County is able to meet both provincial and federal effluent regulations. The approval process used to evaluate the project should take both levels of government into account when setting effluent quality targets. The added passive treatment elements ensure nitrogen and phosphorus removal in an economically feasible way, instead of pursuing a large mechanical treatment system.

#5. Introduce a Project Pre-Application Process. Before the discharge approvals are set there should be a Pre-Application Process that brings together AEP and Alberta Transportation (AT) to review a community's internal capacity so that an appropriate technology can be chosen.

In tandem with Recommendation #3, this project would also be a good opportunity to trial the Pre-Application Process. The County will be developing a detailed design package for this project, so bringing in AEP and AT now to set a clear direction for the project's approval would help to avoid miscommunication and approval delay later on.

#6. Utilize the existing Municipal Policy and Procedures Manual to approve innovative technologies.

This project will be an additional opportunity for AEP to implement the existing policies for innovative wastewater treatment technologies that already exist underneath the *Municipal Policy and Procedures Manual*. Although there is over a decade's worth of data about the operation of an SAS system in Alberta in all seasonal variations over a decade, the County is still looking at this as a pilot project. The goal of this project, however, is to verify that the technology is suited for similar communities around the County and the rest of the province so that other communities can benefit from these types of naturalized approaches.

The AEP does have documentation on treatment wetlands (*Guidelines for the Approval and Design of Natural and Constructed Treatment Wetlands for Water Quality Improvement*, 2000); however, these are not widely applied and need updates and expansion to include new knowledge and applications to guide the regulatory process.

#9. Provide wastewater grant dollars that facilitates a shared risk model for funding innovation projects.

This project is the ideal opportunity to develop alternative approvals processes for innovative technologies as existing guiding documentation could be updated to use as a framework. Further, pilot information and published data are available to support the development of an approvals process that would allow for innovation while decreasing environmental risk.

Clearwater County: Lagoon with Added Naturalized Treatment

Clearwater County is home to several municipalities and a large rural population. The County currently has a septage hauling contract with Rocky Mountain House that expires in 2023. To support growth, to ensure compliance with effluent targets, and to bring the lagoon in compliance with current design standards, the County is looking to create an upgraded regional wastewater treatment solution for sewage and hauled septage at the existing Leslieville Lagoon site.

A previous engineering report recommended an expensive mechanical solution that could not be supported by the County. A more economical option was needed to ensure long term financial sustainability for the utility.

The County is moving forward with a design that will upgrade the existing lagoon to bring it into compliance with the *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems* and then achieve additional naturalized treatment using biofilters: a wastewater treatment technology that is similar to a subsurface engineered wetland. The biofilters will help to achieve high levels of nutrient removal by constantly cycling water from the lagoon. Pending AEP approvals, construction will begin in 2022.

The County has applied for funding to support this innovative approach through Alberta Innovates and has applied for construction funding through AT's AMWWP Grants.

The Technology: Engineered Wetlands

There is an existing AEP policy document called *Guidelines for the Approval and Design of Natural and Constructed Treatment Wetlands for Water Quality Improvement* and in this manual, there are explicit design recommendation and guidelines that can be used to size treatment wetlands for wastewater treatment. This document, however, is not currently utilized by AEP and projects that have tried to use engineered wetlands for wastewater treatment have faced significant hurdles in the approval process. Engineered wetland systems have been designed, constructed, and studied in Europe and North America, including Montana which has a similar climate to Alberta. These systems can provide naturalized passive treatment at lower long-term O&M costs. Inputs like chemical additives and electricity to run membranes are not required by systems such as these. There are a handful of communities in the province that have tried to explore naturalized facilities utilizing engineered wetland because they provide benefits like lower operating costs and reduced operational complexity.

Achieving Task Force Objectives

This project aligns with 1, 4, 6, 7, 9, & 10 of the Task Force Recommendations outlined below:

#1. Differentiate between communities over and under 20,000 people to create a set of standard effluent targets that are applied for smaller communities.

Given the small population that will ultimately support the utility and the use of the once annual discharge window, building a costly mechanical treatment facility with high operating costs would not be financially sustainable for the County. Conversely, a cost-effective lagoon upgrade will not provide treatment capacity to meet effluent targets, both provincially and federally, and handle regional septage. Considerations for these financial constraints could be applied to this project during the approvals process to achieve a balance between the best possible treatment outcomes using the once annual discharge window for lower environmental risk and weighing the operational financial constraints of the County.

#4. Inform communities explicitly that they will be held to effluent targets set by the provincial regulators as well as the Environment Canada standards under the Wastewater Systems Effluent Regulations.

The most sustainable option for Clearwater is a treatment option that requires an approval that includes wastewater effluent targets appropriate for a community under 20,000 people and remains as a once-a-year discharge to minimize environmental risk. However, a standard lagoon may not be able to consistently meet Environment Canada Standards under the Wastewater Systems Effluent Regulations. Additionally, relying on just a lagoon could be a concern if any future provincial regulations around nitrogen or phosphorus removal are introduced. Therefore, this project addresses bothe federal and provincial requirements by including an enhanced treatment component upstream of the lagoon to address these additional targets.

#6. Utilize the existing Municipal Policy and Procedures Manual to approve innovative technologies.

The regulatory process for the County has seen many extensions and delays, due in large part to the challenge in defining and understanding the biofilters. Including this naturalized wastewater treatment system in addition to the lagoon approval is an innovative approach that will benefit from the application of the innovative technologies policy pathway in the *Municipal Procedures and Policies Manual.* Additionally, the biofilters in this project are similar to engineered wetlands. This once again highlights the fact that there is an existing, although outdated, specification for engineered wetlands treating wastewater in *Guidelines for the Approval and Design of Natural and Constructed Treatment Wetlands for Water Quality Improvement*, 2000). Updated guidelines on these naturalized systems are needed to ensure that the practices align with the documentation, making it easier for communities to navigate the regulatory process.

#7. Develop a process for piloting innovative technologies that utilizes existing policy documents to approve innovative technologies.

As above for Recommendation #6, the regulatory process for the County has seen many extensions and delays. This has been due in large part to the challenge in defining and understanding the enhanced treatment technology. Because the technology is outside of the list of traditional technologies directly mentioned in the *Standards and Guidelines for Municipal Waterworks, Wastewater, And Storm Drainage Systems,* the current approvals process has struggled to facilitate the County's proposed system. The lack of clear metrics for weighing an innovative technology creates uncertainty for both the community and the regulators reviewing the project. As per the details from Recommendation #7, the updated approval process for a pilot system would be based on meeting the requirements of the following terms that align with existing regulation:

"Small Communities (pop.<20,000) set the approval based on an annual discharge window of three weeks (refer to Recommendation #1), using the *Standards and Guidelines for Municipal Waterworks, Wastewater, And Storm Drainage Systems Part 3* and the *Code of Practice for Wastewater Systems Using a Wastewater Lagoon"*

The approval process for this system could include the following clear metrics to balance the risk to the approving authority and provide clarity to the community applicant by providing a clear path for project success:

1) Clear effluent targets that are in alignment with the goals of the ultimate regulatory approvals as mentioned above. In this case that would be TSS, BOD, and any additional targets to align with the Environment Canada Standards under the Wastewater Systems Effluent Regulations.
2) Clear non-onerous testing requirements over the 12-month (4 season) consecutive pilot phase and the associated required outcomes of testing.

3) Reporting requirements at end of 12-month (4 season) pilot period to support final regulatory approval for the WWTF.

#9. Provide wastewater grant dollars that facilitates a shared risk model for funding innovation projects.

The innovative naturalized treatment components of this project could be an opportunity to further develop the framework used by AT for alternative funding and approvals processes that include innovative wastewater treatment approaches. Learnings from this pilot system should be recorded and used by the AEP regulating team to ensure that an innovative approvals process covers all aspects of environmental risk.

#10. Update the wastewater funding model so that smaller communities can receive funding to account for the alternative methods of wastewater servicing that low density rural municipalities need to provide.

The County is building this facility to support long-term growth in the surrounding hamlets and also to support their citizens on acreages serviced by septage tanks in the region by providing septage receiving. The County has shown the financial justification for a septage receiving station as part of their long-term financial sustainability planning. Therefore, Alberta Transportation (AT) could make the case for an updated service population eligibility metric, accounting for users on septic systems that are currently left out of the population count. Therefore, this project is an opportunity for Alberta Environment to develop a way to fund treatment systems that will help the community successfully service citizens connected to the sanitary sewer in Leslieville and acreage residents as well. The process changes required to appropriately fund this project will revolve around how to calculate the total service population. The *Septage Management Advisory Committee* provides methods for calculating population sizes for septage receiving that could provide some support on how to include this in the eligibility requirements. These metrics were used for this project to support the facility planning.

INNOVATIVE TECHNOLOGY OVERVIEW

Another important reason for the momentum of the Task Force to continue is to support a climate of innovation in Alberta. There are several companies marketing innovative wastewater treatment systems that are eager to pilot their technologies in Alberta communities. Implementing the recommendations in this White Paper will help further innovation in Alberta and provide inroads for additional technologies to thrive. This will provide direct benefit to Alberta communities looking for alternative wastewater solutions that are economically and environmentally sustainable.

Below are some current technologies that were brought forward during the Task Force process that are involved in or have expressed interest in being involved in other innovative projects for communities in Alberta.

The Soneera Electro-Flocculation System

Soneera Water LLC is a wastewater treatment technology company based out of Scottsdale, Arizona. The technology is explained in the description of Sundre's upcoming pilot project.

Engineered Wetlands

Engineered wetlands and naturalized biofilters for passive water treatment are being pursued by multiple communities throughout the province. The technology is explained in the description of both Brazeau County and Clearwater County's upcoming pilot projects.

Clear Water Clarification Technologies

Clear Water Clarification Technologies Inc. (CWT) is wastewater technology company based out of Regina, Saskatchewan. The CWT is a completely enclosed system that cleans contaminated water and eliminates sewage odors. By using submersible pumps and grinders, the C50 Clarifier also eliminates most operation noise. Elimination of odor and reduction of noise allows the CWT Technology to be located anywhere including urban, populated areas. The clarification system takes in raw effluent, grinds it down, and then separates the solids from the liquid using a combination of flocculation, chemical treatment, and centripetal force. In addition to the C50, CWT offers a variety of sizes for their clarifier to serve community needs both large and small.

CONCLUSION

61 communities responded to the survey put out by Alberta Municipalities in 2020 to express their fears, concerns, frustrations and vision about the future of wastewater in the province. The recommendations of this White Paper are written for them and every other community that is trying to ensure that one of the most critical public health services they provide will be effective into the future.

In the Task Force Recommendations section the recommendations are intended to give the provincial government a place to start when trying to address the challenges raised by the members of the Task Force and Alberta communities as a whole. Each of the recommendations help to address the highest priority goals highlighted by members of the Task Force:

- Working with the provincial regulatory bodies to develop approvals processes that are applied consistently and transparently;
- Promote a standardized technical, managerial, and financial review of the community's resources to ensure sufficient internal capacity for any proposed treatment technology; and
- Develop and/or revamp a pilot funding model and pilot approvals process to share financial risk between the municipality and the province to incentivize the assessment of alternative wastewater treatment technologies.

The stories of communities involved in the Task Force, like Nanton, have been included in APPENDIX A: Municipal Case Studies, to keep the real-world impacts of the wastewater policy front and centre throughout all future discussions where the recommendations of this White Paper are discussed. For the recommendations in this paper to be fully realized, there is still additional work between the key provincial ministries that hold the power to modify process and improve delivery of wastewater flows. That said, this work is already in the process of occurring – in February 2022, AT added new optional criteria to its grant programing, giving communities an opportunity to share additional information about their proposed wastewater treatment projects so that innovative technologies and delivery methods like public private partnerships can be considered in the merit of the project. Additionally, the pilot projects listed in the report are another example of how the goals and vision of the Task Force are already in motion.

There is a clear opportunity in these projects for the regulating and funding teams within the provincial government to set new direction and intent for pilots and innovative project delivery in Alberta, guided by the recommendations from the Task Force. In the months to come, as these projects progress and other communities reach out looking for unique technologies and project delivery methods to meet their contextually specific needs, there will be further opportunities for the ministries to turn these recommendations into repeatable processes.

The Task Force recognizes that the recommendations given have multiple levels of complexity to them and that there will need to be further discussions between key stakeholders to deliver the intended outcomes. It is the hope of the organizing team that this White Paper will serve as a road map, showing where communities across the province have been with regards to wastewater, identifying where they want to go, and providing actionable recommendations for the decision makers who can get us there.

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APPENDIX A: Municipal Case Studies

City of Cold Lake

Background

The City of Cold Lake (the City) is in northeastern Alberta situated adjacent to Cold Lake. Beaver River is the receiving waterbody for the City's treated wastewater effluent. Beaver River flows downstream across the border between Alberta and Saskatchewan, where other users either directly or indirectly draw water. The Prairie Provinces Water Board (PPWB) set water quality objectives at Beaver River Crossing which is based on the interprovincial boundary between Alberta and Saskatchewan. The Cold Lake Regional Wastewater Treatment Facility (WWTF) is the last nutrient point load for Beaver River.

The City currently operates a WWTF, that includes a septage receiving station, two aerated cells, two anaerobic cells, one facultative lagoon, and two storage ponds operated in series. The City has an existing permit to operate the WWTF, which expires January 1, 2022.

Proposed Wastewater Upgrades

Alberta Environment and Parks (AEP) recommended the City upgrade the existing WWTF to address concerns regarding multiple failed Lethality Tests and integrate the facility into a Regional Wastewater Treatment System. In 2016, the City initiated a Feasibility Study to evaluate several proposed solutions to meet the stringent effluent limits imposed by regulatory agencies. Additionally, the Toxicity Identification & Evaluation Study (2017) was completed and identified un-ionized ammonia in the effluent being the cause of the Lethality Test failures.

An update to the Feasibility Study recommended the Moving Bed Biofilm Reactor (MBBR) treatment option as it offered the greatest benefits in terms of overall life cycle cost, expandability, ease of maintenance, and minimal social and environmental impacts. It was recommended that a MBBR pilot study was performed to confirm the suitability of the technology for Cold Lake, as there are limited full-scale MBBR operations in cold climates. The pilot study took place from 2019 to 2020 and determined the MBBR to be a suitable technology for ammonia removal in cold climates. Full-scale implementation of the MBBR is recommended for the City as it is a natural fit to meet the regulatory requirements and growth needs of the community.

Achieving Task Force Objectives

Although the future upgrades to the wastewater infrastructure does not appear to have any direct bearing on attracting advanced industry establishment or tourism in the community, the MBBR upgrades meet the regulatory requirements and are cost effective, which lets the community remain competitive in the marketplace for growth opportunities.

Project Successes

The pilot study has proven to be successful as it affirmed the suitability of the MBBR technology for ammonia removal in cold climates. As full-scale implementation of the MBBR is not completed, the full benefits to the community are yet to be realized.

Project Challenges

The City has not experienced significant challenges relating to the WWTF upgrade process; however, they have faced challenges regarding the regulatory requirements that triggered the upgrades. The most challenging aspects of the project have been a lack of regional considerations for water quality, lack of clear regulatory requirements, and inconsistency between the provincial and federal jurisdictions regarding regulations. It was a surprise to the City that the Lethality Tests were required under federal

regulation. Additionally, the City of Cold Lake is the last municipality on the Beaver River before the border between Alberta and Saskatchewan and they bear the brunt of strict effluent targets to compensate for the upstream pollution.

Conclusion

The City of Cold Lake has initiated the process to upgrade their older WWTF with an MBBR for their wastewater treatment; the proposed upgrades are anticipated to resolve new regulatory limits and requirements. This case study was compiled for the Alberta Municipalities Wastewater Innovation Taskforce and is intended to share the experience of the City to help other communities better navigate the design and approvals process for their own wastewater infrastructure. Any regulatory process changes or recommendations identified by this case study may be included in the Task Force White Paper to promote improved collaboration between municipalities and regulatory bodies.

Contact Information

For further information about the project, please contact the City of Cold Lake.

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County of Leduc

Background

The County of Leduc (the County) has a population of 13,172 and is located immediately south of the City of Edmonton. The County includes hamlets, localities, summer villages, and municipalities. In addition to the County operated lagoon system, there are currently multiple small communal wastewater systems approved under the Safety Codes Officer that are operating within the County. The wastewater is discharged to multiple small drainage waterways throughout the County, which are generally intermittent streams, or it is discharged to groundwater in the case of some of the communal systems. As such, there are no downstream municipalities that are impacted by the discharge.

The lagoons are operated under a code of practice, and there are currently no plans to expand them. Some studies were completed to look at expansion due to community growth; however, there are no current pressures for expansion. The county acts as the approving body for development approval of small communal wastewater systems. These systems process less than 25 m^3 of wastewater per day, and discharge to groundwater within the property boundary.

Community Impact

The Leduc County Municipal Development Plan (MDP) supports higher density residential land use in rural settings where there is currently no municipal utility infrastructure. The MDP supports the implementation of communal systems in these applications. The County has previously been a very strong advocate for communal wastewater systems for rural applications. Both conventional technology (mounds, septic fields) and advanced treatment systems (activated sludge micro-systems) have been supported by the County to meet the wastewater needs of small developments within the County.

Wastewater Treatment Successes

The County has experienced good success constructing and operating wastewater lagoons because there is a well-defined AEP framework (code of practice) for them. The framework for approvals under the Municipal Affairs and Safety Codes Act for small communal systems that meet the volume and discharge criteria has been very successful. The framework is straightforward and easily implemented by the County Safety Codes Officer.

Wastewater Treatment Challenges

Much of the development within the County consists of communities with thirty or more lots, that do not meet the small systems criteria of 25 m^3 wastewater flow or less, and discharge on the same property. Developments of this type would require the County or municipality to construct a trunk line and lagoon to accommodate the development. This is a costly undertaking. The other option is to have all the lots on individual private systems or a communal system that would require AEP approval.

At this time there are two communal systems as described above in the AEP application process, one of which has been in the application phase since 2014. This long delay can be a deterrent to development in the county.

The reason for the delay is changing criteria for approval, particularly around treated effluent discharge. Without a discharge approval the community is forced by the regulator to build lagoons or a large mechanical plant that the County cannot financially support. The only other option would be holding tanks on site with hauling services provided by a vacuum truck company to the existing lagoon. This is not financially or environmentally sustainable.

Another example of changing discharge approval criteria is a communal system located within the County that was approved by AEP to discharge to a wetland. This system operated for almost two years before the AEP asked for increased nutrient removal (tertiary treatment) and closed operation. Without a

discharge approval, this communal system is forced hire a vacuum truck and haul wastewater to the County lagoon at great expense.

Given the challenges on gaining discharge approval from AEP, the County would like to see a consistent framework around communal system approvals that takes into consideration the capacity of the municipality. Specifically; can they afford to pay the operator and run a large municipal system? If not:

- Is the proposed communal system feasible and will the technology work?
- Is it a long-term sustainable solution in terms of both cost and environmental impact?
- Is the communal system owner(s) capable of operating and maintaining the system?
- Can the financial burden for the testing requirements imposed in the approval be supported by the system users?

If the owners are not capable of operating and maintaining the system, non-compliances may cause the system owners additional fines and lead to termination of the approval. This would be an unfavourable outcome for both the County and Province after significant investments have already been made.

Conclusion

This case study was compiled for the Alberta Municipalities Wastewater Innovation Task Force and is intended to share the experience of the County to help other communities better navigate the design and approvals process for their own wastewater infrastructure. The County would recommend the following strategies to promote innovation while at the same time meeting the wastewater treatment needs of small communities:

1. Creating a Code of Practice or Guidelines for new technologies to bridge the gap as there is no defined approvals process within AEP for innovative systems.
2. Amending the Private Sewage Disposal Systems Regulation, to increase the sewage treatment limit from 25 m^3 to allow for small innovative systems to gain approval through the Safety Codes Officer in the jurisdiction. Oversight from the Private Sewage Sub-Council within the Safety Codes Council could support these approvals. This would streamline the approvals process and allow the system operator to collect data validating the treatment. Combined, this would support innovation in wastewater treatment systems for small communities and possible lead to the innovative treatment systems becoming accepted within the Province.
3. Rather than declaring that the technology is not working, holding the small system operator/owner accountable for non-compliance as these are usually the result of the operators' technical capacity, or undue care and attention.
4. A regional approach to surface water health, specifically regarding nutrients, as municipalities are unfairly burdened with reducing nutrient concentrations in surface waters.
5. Appropriate training for the approvals engineers so that they can evaluate innovative technology within the framework for new system approvals.

Contact Information

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Town of Nanton

Background

The Town of Nanton (the Town) has a population of 2,100 and is located south of the City of Calgary along Mosquito Creek, which is the receiving waterbody for the Town's treated wastewater effluent. Mosquito Creek flows downstream to Twin Valley Reservoir, which other users either directly or indirectly draw from.

The Town currently operates a Membrane Bioreactor (MBR) wastewater treatment facility (WWTF), which replaced the Rotating Biological Contactor (RBC) WWTF in 2017. The Town has requested an extension to their permit for operating the existing WWTF and have been granted an extension until March 1, 2022.

Proposed Wastewater Upgrades

In late 2014, the Town's aging RBC WWTF was facing an unexpected critical failure. An $11 million federal and provincial infrastructure capital grant package was ultimately made available for a new MBR mechanical WWTF. With few alternatives provided to the Town in stakeholder meetings with government and engineers, this recommended option was selected and the MBR facility began operation in 2017.

After operating the new facility for a year, it was determined that the MBR plant would require additional upgrades. System deficiencies had resulted in crippling operational costs, so MPE Engineering Ltd. was hired to identify the capital upgrades that would be required. They found system deficiencies requiring $5 million in additional capital upgrades including a new de-watering system which was not included in the original project. Additionally, primary filtration is an issue for the MBR facility and also needs to be upgraded.

If the Town had the opportunity to re-do the project, lagoons or a new RBC system would be pursued instead of the MBR facility. Due to the large operation and maintenance (O&M) costs, the Town is of the view that a facility like an MBR should be ruled out for smaller municipalities, unless the project is part of a larger regional system with a broader user and tax base.

Community Impact

According to Neil Smith, the Town's CAO, "the MBR facility is a financial disaster of multigenerational proportions". He specifically highlights the following ways that the Town has been impacted.

- Elevated Utility Costs Impeding Other Infrastructure Spending: The O&M costs for the MBR facility are significantly impacting the Town's capacity to deal with other required infrastructure upgrades. With O&M costs taking a large portion of annual operations budgets, the replacement of other depreciated assets in the community are postponed, such as water, roads, sidewalks, recreation, parks, and more. These higher O&M costs have also turned the Town into one of the higher taxation communities in the region to reach a comparable level of service with other towns their size.
- Water Restrictions Limiting Economic Diversification: To balance these costs other communities would often take advantage of an expensive and MBR facility to attract industries that need advanced wastewater treatment (e.g., breweries), dividing costs between expanded commercial users and the current residential tax base. However, the Town has been unable to do this because the raw water resources in the community are restricted and cannot support expansion of water intensive industry.
- Asset Management Challenges: There are also sewer line upgrading projects required to facilitate new housing subdivisions within the Town, but these projects have taken a back seat to upgrading the MBR facility. Additionally, the Town does not have spare cash to put in reserve for buying and servicing new industrial lands to broaden the tax base. As described by Smith, *"the MBR plant has made the usual small-town situation with asset management far worse than normal."*

Project Successes

The Town transitioned from failing, yet inexpensive to operate, RBC plant to a more expensive MBR plant that is struggling to fulfill its operational potential unless millions more are invested for further upgrades – the Town does not view this transition as a success. The biggest success for the Town, according to Smith, has been switching to a different engineering firm to help guide and manage their list of future action items.

Project Challenges

The Town has faced significant challenges with the new MBR facility. A lack of understanding of why things were done the way they were done and lack of accountability amongst involved stakeholders has been extremely frustrating to the Town. The sentiment within the Town is they had no choice but to proceed with the expensive MBR facility and they are struggling with the operational aspect of the plant. The Town is not confident that this plant can serve a growth population of 6,000, when it struggles with their existing population of 2,100 and only stays regulation compliant by shipping large volumes of sludge to Calgary weekly. The Town believes that a more robust third-party inspection or quality assurance throughout the project might have rescued them from this costly design.

Conclusion

The Town of Nanton has transitioned from an RBC facility to an MBR for their wastewater treatment; this new facility has presented many challenges for the Town, including costly O&M and necessary upgrades to achieve water quality targets. This case study was compiled for the Alberta Municipalities Wastewater Innovation Taskforce and is intended to share the experience of the Town to help other communities better navigate the design and approvals process for their own wastewater infrastructure. The Town of Nanton would recommend that other small municipalities avoid installing new MBR wastewater treatment systems and that the Province provide support to evaluate the long-term impacts of operating complex mechanical wastewater treatment systems.

Contact Information

For further information about the project, please contact the Town of Nanton.

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City of Wetaskiwin

Background

The City of Wetaskiwin (the City) has a population of 12,700 and is located 70 km south of the City of Edmonton. The City currently operates a lagoon system for wastewater treatment that discharges to an unnamed dry creek, and ultimately to the Battle River. The City of Camrose draws drinking water from Driedmeat Lake, which is fed by the Battle River downstream of Wetaskiwin.

The operating permit for the existing WWTF expires in 2023, after which new regulations on wastewater effluent quality will come into effect. Alberta Environment and Parks (AEP) has indicated that wastewater treatment facility upgrades must be completed to ensure regulatory compliance, prior to the end of 2023.

Proposed Wastewater Upgrades

The City has considered multiple technologies to address the regulatory deficiencies by the 2023 deadline, including, but not limited to:

- Biological Nutrient Removal (BNR) Reactors.
- Submerged Attached Growth Reactor (SAGR).
- Moving Bed Biofilm Reactor (MBBR).
- Sequencing Batch Reactor (SBR).
- Membrane Bioreactor (MBR).
- Pre and Post Lagoon treatments.
- Natural Filtration.

The Natural Filtration option was eliminated because the City does not have enough land available for the drain fields.

A study completed by M2 Engineering in 2019 recommended either an MBR or SBR treatment system for the City's planned upgrades to achieve regulatory compliance. The estimated cost for either option was the same, at 33.6 million dollars.

Community Impact

In anticipation of the change in the new regulations on effluent quality targets, the City has spent the last few years evaluating the impact an upgraded wastewater treatment facility will have on the community. The City has identified the following outcomes as a direct or indirect result of the wastewater upgrades required to stay in compliance with updated regulation:

- Without upgrades, the City faces stiff fines for non-compliance with wastewater regulations under the Environmental Protection and Enhancement Act (EPEA) and the Wastewater Systems Effluent Regulations (WSER) under the federal Fisheries Act;
- Utility fees in the City are already high, and costs for the new facility will increase them further;
- The current WWTF restricts new industry from becoming established in the City, because many small industries (such as micro-breweries) require increased effluent treatment; and
- WWTF upgrades may attract new industry to the City; however, higher utility rates and taxes to fund the upgrades will be a deterrent to growth.

Project Successes

The City was successful in obtaining a stimulus grant from Municipal Affairs to fund some of the WWTF Upgrade project. These funds helped to ease some of the high costs related to engineering and design of the new WWTF. Engineering guidance from consultants has thus far been beneficial in navigating the regulatory and technical aspects of the WWTF Upgrade project, enabling the City to make well informed decisions.

Project Challenges

The City of Wetaskiwin has faced challenges with the new WWTF facility related to the relationship between regulatory requirements and funding opportunities. Specifically, funding from the provincial government for this project was not able to match the true costs the City will need to incur if it wishes to stay in compliance with regulatory targets. The City believes that if the more stringent effluent targets were implemented by AEP then there should be consideration made for the availability of adequate funding pathways to assist those municipalities who will be required to acquire and manage upgraded wastewater treatment systems. One of the reasons for this incongruency is that funding pathways for wastewater infrastructure are administered through Alberta Transportation and are independent of AEP, so funding is not prioritized based on the need to meet regulatory targets.

Additionally, previous lagoon expansion projects in the City were not well thought out and proved not to be useful in terms of regulatory compliance. While the projects were small, the City did not have access to qualified staff to protect them from spending money on treatment solutions that fell short of the City's needs to keep up with changing regulations. If additional guidance from AEP had been provided to the City regarding the system effluent regulations, then those upgrades could have been consolidated into a single wastewater treatment and financial resources would have been utilized more efficiently, setting up the City to better manage the large investment it is now making.

The consideration of pilot project funding and a regulatory pathway to test out alternative solutions or technologies would have benefitted the City by allowing them to explore more treatment options. As it is, the proposed solutions from the M2 study are all traditional and have a high price tag with significant operational complexity. The long-term impacts of these factors on attracting new business, user fees, and tax burden, remains to be seen.

Conclusion

The City of Wetaskiwin is currently transitioning from a lagoon facility to a new mechanical system for their wastewater treatment; this new facility has presented many challenges for the City, including costly capital expenditures for necessary upgrades to achieve water quality targets and an expected increase in operating costs.

This case study was compiled for the Alberta Municipalities Wastewater Innovation Taskforce and is intended to share the experience of the City to help other communities better navigate the design and approvals process for their own wastewater infrastructure. The City of Wetaskiwin would recommend that improved communication between municipalities, Alberta Transportation, and Alberta Environment and Parks become standardized to help streamline the application, funding, and approvals processes. Most importantly, the City recommends that funding pathways be updated in tandem with regulatory changes, so that municipalities are not left to navigate two incompatible processes to achieve system compliance through facility upgrades.

Contact Information

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