WASTEWATER FIRST NATIONS

- Currently the most common type of sewage treatment facility used on First Nation communities in the province is that of a facultative lagoon where effluent is treated by both aerobic and anaerobic bacterial processes and discharged once or twice a year into a receiving water body.
- Other common wastewater systems include both mechanical treatment and communal septic systems.
- According to Indian and Northern Affairs Canada, just over a quarter of these facilities are at capacity (where the existing system is able to meet current needs) or over capacity (where the existing system is unable to meet current needs)
- There are 28 wastewater system in Ontario First Nation lands that are identified as high-risk systems.
- While there are multiple factors contributing to risk, design and operational concerns are given the most weight, particularly when the concern is related to the protection of public health or the environment.
- High risk systems typically require system upgrades or improved operational procedures to meet the guidelines of sewage effluent quality

IMPORTANT RISKS STATISTICS

- 82% of the wastewater systems in First Nations communities in Ontario have poor system reliability
- 55% of the wastewater systems in First Nations communities in Ontario exceed 75% capacity
- 23% of the wastewater systems in First Nations communities in Ontario have failed to meet effluent quality guidelines due to the operations
- Maintenance is not adequately performed for 49% of the wastewater systems in First Nations communities in Ontario
- 38% of the wastewater systems in First Nations communities in Ontario have no access to a fully trained operator

CONSTRUCTED WETLANDS

- Constructed wetlands are an artificially engineered sequence of water bodies designed to filter and treat waterborne pollutants found in sewage, industrial effluent or stormwater runoff
- These systems have also been used for land reclamation after industrial operations such as mining or refineries
- Effluent filtration occurs as a result of various processes that are similar to those that mimic a natural wetland
- The vegetation in a wetland provides a substrate upon which microorganisms can grow as they break down organic materials
- Many regulatory agencies often refer to constructed wetlands as a “best management practice”

WHY USE CONSTRUCTED WETLANDS

- Constructed wetlands may be a viable alternative to treat wastewater on many First Nation lands as they are particularly suited for small-scale applications due to their low cost of construction, operation and maintenance when compared to other wastewater treatment techniques
- These systems promote sustainable use of local resources, which is a more environment friendly biological wastewater treatment system
- Lower costs, with low technology methods
    - No new or complex technological skills are needed
    - System relies on renewable energy sources such as solar and kinetic energy, wetland plants and microorganisms (active agents in the treatment process)

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- Wetlands are highly productive and provide habitat for many different species, so there is the added benefit to go along with reducing risks to human health

COBALT CONSTRUCTED WETLAND

- Is a town in northeastern Ontario with a population of close to 1200
- Recognition as the first year-round constructed wetland facility to treat raw municipal sewage in Canada
- Total cost of the project was approximately $3.9 million
    - Reduces the construction, operation and maintenance costs by $300 000 anually

BASIC COMPONENTS

- The constructed wetland consists of three basic treatment components
    - Grit channel/Grinder
        - The first stage of treatment
        - Raw sewage passes thru a grit channel which removes sand and other non-biodegradable solids
        - The sewage influent is then pulverized using a grinder to break any remaining solids into smaller particles
    - Maintenance Forebay
        - After preliminary treatment, the sewage is discharged into a maintenance forebay designed to collect all non-biodegradable and other solids thru sedimentation.
        - Each spring the forebay is cleaned out and is the only operation that must be performed to keep the system operating smoothly
        - Cleaning the forebay consists of pumping out the settled sludge into dewatering container which retains the solid sludge material. The filtrate effluent material is then directed back into the forebay. The retained solids are then disposed of at the local landfill.
    - Wetland cells

        - Once all the solids are removed from the sewage influent, the wastewater flows at low velocity into the constructed wetlands area that resembles a natural open-water marsh, for treatment.
        - The wetland system consists of three cells where wastewater flows from one cell into the next
        - Each cell is separated by vegetated berms and are connected by inlet and outlet pipes
        - Within each cell are a series of channels that force the wastewater to follow a serpentine pattern allowing for maximum contact with microfilm bacteria colonies on the vegetation and sediments.
        - Once treatment is complete, the clean effluent is then discharged into a nearby creek.
- Thru this process, raw sewage is transformed into relatively clean water where both BOD_5 and TSS have been found to be less than that of the provincial objective targets.
- The municipal sewage is treated at a rate of approximately 900 m^3/day and treated effluent is released at an average of 630 m^3/day.

ENVIRONMENTAL FEATURES OF COBALT CONSTRUCTED WETLAND

- Current plant and animal communities are quite stable within the wetland. Extensive colonization of:
    - 71 plant species including cattail, duckweed and various grasses
    - 41 bird species including spotted sandpipers and mallard ducks
    - 7 amphibian species and several mammal species including raccoons and muskrats

- Additionally this wetland system has been the subject of various scientific research projects with strongest attention towards constructed wetland functioning in northern and extreme cold climates