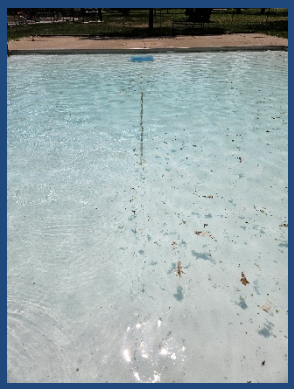

MILES CITY, MT
FROG POND

Preliminary Engineering Review

INTERSTATE ENGINEERING

6066 MT Highway
24 South
Glasgow, MT 59230

PRELIMINARY ENGINEERING REVIEW
OUTDOOR FROG POND
MILES CITY, MONTANA

July 2025

WR25-04-106

General

This Preliminary Engineering Review has been prepared on behalf of Milestown Community Improvement, Inc. (MCI2) and the City of Miles City to present the findings of a recent site evaluation and engineering assessment of the outdoor “Frog Pond” wading pool. The evaluation was initiated in response to ongoing concerns regarding water loss, and challenges in operating and maintaining the facility.

An on-site evaluation was conducted on June 11, 2025, by Kaden Bedwell, P.E., and Zach Mills, P.E, of Interstate Engineering and Brady Stone, Jase Kinsey, and Seth Lockie from the City of Miles City Parks & Recreation Department. Input from city staff provided valuable context regarding the facility’s operational history, and community usage.

The objective of this report is to document the results of the site investigation, identify the primary sources or contributing factors of the pool leakage, and then provide engineering solutions to address the identified issues. The nondestructive assessment focused on both structural and mechanical components of the pool system, including the pool shell, piping, and associated infrastructure.

Based on the findings, this report outlines a series of repair and replacement options for the facility recommending remedial actions ranging from targeted repairs to an entire facility replacement with the aim of restoring the pool to full operational condition, improving long-term performance, and supporting the municipality’s effort to preserve access to safe and sustainable public recreational opportunities for the community.

1. Tank Structure – Targeted Rehabilitation – A targeted, cost-conscious repair strategy focused on leakage of the pool structure.
2. Piping Infrastructure – Targeted Rehabilitation – The replacement of the underground piping from the tank to the mechanical building.
3. New Pool Facility – Construction of a similar sized new wading pool in the same general location, designed to meet current codes and standards with the ability to integrate the wading pool facility near the splash pad, while accommodating future community needs.

Each option will include estimated construction costs and various considerations related to maintenance, life expectancy, and operational efficiency. The goal of this report is to provide MCI2 and the city with the information necessary to make informed, fiscally responsible funding requests regarding the future of this valued community asset.

Background

The “Frog Pond” outdoor wading pool, is in Wibaux Park at 200 S. Strevell Ave, Miles City, MT 59301. It was constructed in 1992 and has served the community for over 30 years as a key recreational facility. The wading pool is a cast-in-place concrete structure and stainless-steel wall measuring approximately 40’ by 40’, with a sloping depth from 9

to 20 inches. The structure has had several updates and refinishes over the years, including features such as a frog slide.

The mechanical building houses the mechanical units for 2 operations separated by a wall, totaling approximately 2,100 square feet. It includes a mechanical room, restrooms, a covered picnic area, and storage. The facility was updated when the nearby splash pad was constructed in 2021.

The filtration system uses two vertical pressurized sand filters, along with a recirculation pump. In the summer of 2023 the Pulsar chlorine system was updated.

The existing complex approximate data is outlined below.

Wading Pool	
Surface Area	1,600 SQFT
Water Volume	14,000 Gal
Perimeter	160 LF
Turnover Rate (1 hr.)	233 GPM

Site Findings

An on-site evaluation of the Miles City Frog Pond was conducted on June 11, 2025. The assessment included a visual inspection of the pool structure, deck, mechanical systems, and surrounding infrastructure. Discussions were also held with past and present staff familiar with the facility. The following key findings were identified:

Pool Structure

- The pool is a cast-in-place concrete floor with an epoxy paint coating over the concrete and no major cracks or differential settlement is evident. There are multiple hairline cracks in the epoxy paint flooring. A construction joint runs north-south in the middle of the floor slab and appears to be uniform in width along most of its length. The joint sealant along the middle of the structure was partially missing, and staff noted patrons frequently play with the caulking once it starts to loosen from the . The stainless-steel walls show no signs of failing welds, and the sealant between the walls and floor is intact.
- The slab surrounding the pool is in good condition with a few minor cracks around the deck. The water level is consistent in relation to the gutter showing little to no signs of differential movement.
- During normal pool operation the water is filled to a level approximately 8” below the stainless-steel wall lip. One skimmer centered on each wall work together to remove floating debris, oils, and contaminants from the surface water layer. Four main drains were originally constructed in the deepest portion of the pool, however, were later removed. The drain covers were removed, holes patched and openings covered with epoxy paint to match the rest of the floor.
- A frog slide was installed along the south side of the pool after the pool was constructed. It attaches to the concrete deck and discharges into the pool. The slide was in storage at the time of our visit. In the pool bottom a foam pad is bolted to the floor slab to provide a landing for the slide patrons. The pad is missing one of its two bolts. It was unclear how deep the bolts penetrate into the pools floor.

Water Loss

- The city staff referenced the distance between screws in the flange of the West skimmer when referring to how much water is lost during a normal open swim day. The screws in reference are 2" apart which equates to approximately 2,000 gallons of water loss each day while in operation. The loss of water in a pool can come from a number of things but the main contributors are leaks in the structure or plumbing, splashing from play activity and evaporation. Based on historical local weather conditions in Miles City the estimated pond evaporation is approximately 0.2 in/day averaged over the months of operation. The result is a water loss of roughly 200 gallons per day from evaporation. A bather load estimate wasn't received, however a high bather load in a shallow facility typically leads to an elevated splash volume.

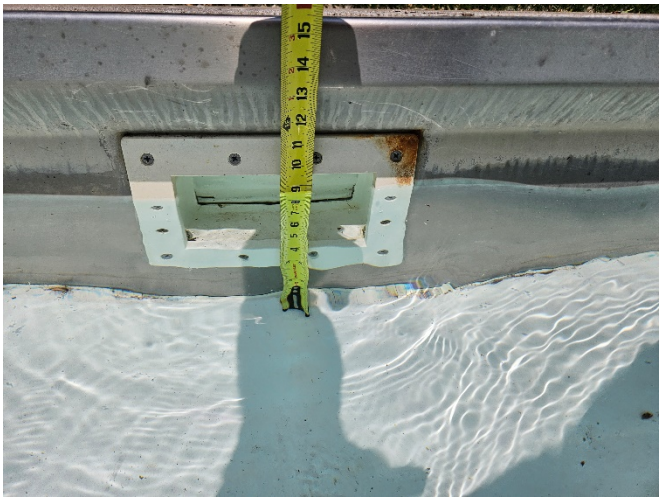

Figure 1: Surface water skimmer.

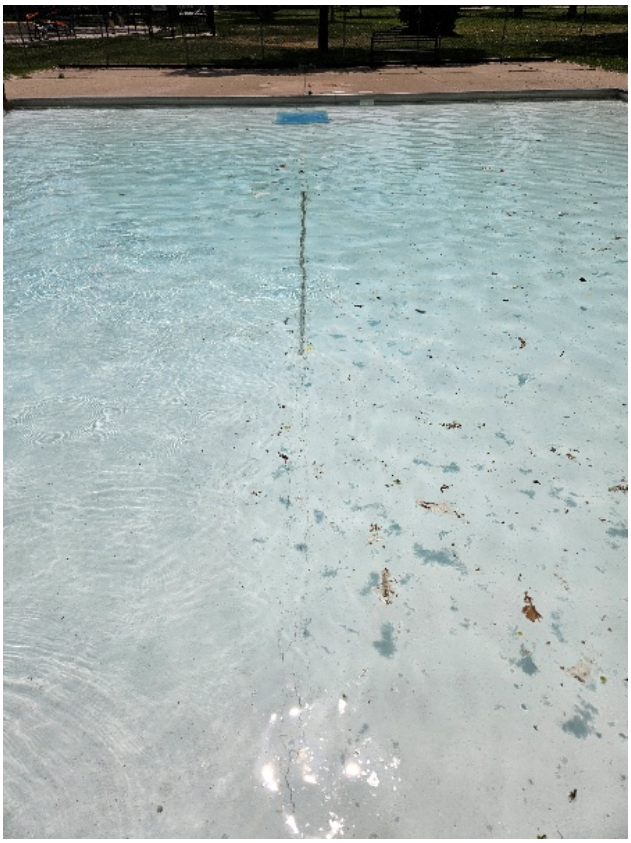

Figure 2: Joint sealant failure.

- Dye testing was conducted around all visible structural joints, cracks, seams, pipe penetrations, skimmers, and existing main drain locations to look for signs of leakage from the structure while the circulation system was off. No detectable dye migration was observed during the test.

- The pool was filled to its normal operational level and the skimmer baskets and pipe return inlets threaded ports were plugged to isolate the pool structure from the piping. City staff took measurements of the water level in the pool over the next approximate week before the pool was drained for safety reasons. Results of the city crew's data are summarized in the table below along with historical data recorded by the National Weather Service for the Miles City Airport.

Day	Water Drop (in)	High Temperature	Precipitation (in)	Notes
6/11/25	-	88	.15	Initial Fill
6/12/25	1/2	69	.19	
6/13/25	1/8	81	.15	
6/14/25	1/8	85	---	
6/15/25	1/8	89	1.32	
6/16/25	0	79	---	
6/17/25	0	81	---	
6/18/25	0	87	---	
6/19/25	0	92	---	
6/20/25	0	86	.15	Pool Drained

Subsurface and Groundwater Conditions

- Subsurface conditions were not directly observed as part of this report. However, the relatively good condition of the pool walls, and surrounding deck indicate that the subsurface is in decent condition. Ground water was not evident in the surrounding area, however city staff stated elevated groundwater levels in the park. Static ground water levels recorded at nearby wells indicate that the groundwater in the area may be as shallow as 10 feet below the surface.

Mechanical Systems

- The filtration system utilizes two vertical pressurized sand filters, which are original to the facility. The pool operator didn't state any loss of sand during backwash procedures or normal operation.

Figure 3: Mechanical Room

- The 5 HP Pentair Whisperflo XFE self-priming pump operates most efficiently between 200 and 280 GPM which aligns with the 233 GPM design turnover flow rate of the pool. A throttle control valve is located on the discharge side of the pump to artificially create head loss which reduces the GPM flow rate of the pump. The staff have expressed issues with getting the pump initially primed for operation.

- The recirculation piping in the mechanical room is Sch-40. Although it isn't a part of the wading pool recirculation system, the copper piping for the hot water heater has significant corrosion. It is unclear how the main drain piping was abandoned underground when the drains were plugged.

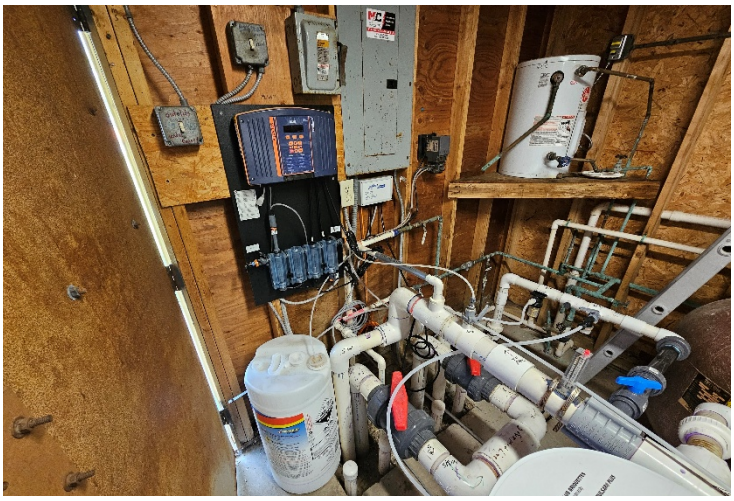

Figure 4: Tank Hot Water Heater and piping

Winterization Procedures

- The pool is drained in the fall and left empty the duration of the winter. The piping is drained via compressed air and the wall inlets and skimmer outlets are sealed with threaded plugs.

Analysis and Recommendations

Based on the results of the dye test, observations, and discussions with city maintenance staff, without further testing, Interstate Engineering cannot definitively state were the leak may be located or if the water loss exceeds normal expectation of this type of facility. It is our conclusion that the pool structure itself is not a major contributor of water loss based on the testing, water level reports received by city staff and anticipated daily evaporation rates. Periodic operational maintenance still needs to be performed on the structure such as reapplying the epoxy floor paint and caulking the joints and seams.

It was recommended to the city staff that they isolate the underground piping next by plugging the ports in the pool and hydrostatically test the underground piping in sections to evaluate if there is a broken pipe that needs replaced. The piping should be hydrostatically pressurized up to 25 pounds per square inch (psi) where the system then should hold the pressure for 15 minutes. Although no dye appeared to be drawn into the pipe penetrations when testing, the additional water pressure exerted on the pipe during system operation has the potential to open up a hairline crack in the pipes which otherwise may have closed itself while the system was off.

Further testing should be completed prior to advancing with a rehab project, however the following options analyze various costs associated with sealing the pool, replacing the underground piping and a third alternative considering reconstructing the entire facility.

Tank Structure – Targeted Rehabilitation

There are two viable alternatives to be explored, with each having pros and cons. The most economical being resealing all the joints and painting a new coat of epoxy paint on the flooring. The second option would be to install a PVC membrane liner over top of the concrete.

Epoxy Paint and Sealant

- ***Estimated Cost: $25,000***
- Remove and replace all joint sealant around the perimeter wall to floor transition and along the center pool construction joint. The existing sealant shall be completely removed and the joint cavity cleaned of debris and loose concrete, as epoxy paint prevents adhesion of caulking. A two part joint sealant applicable for use in pools and submerged locations shall be installed.
- Apply a new layer of epoxy paint to the existing concrete structure. Prepare the existing epoxy coat to remove any pooling or delaminated areas and etched for a good secondary layer adhesion.
- Waterproofing Reliability
    - Epoxy is a coating, not a waterproofing membrane and it relies on the integrity of the underlying concrete. When applied correctly over well prepared hairline cracks, the epoxy can bridge the small gaps and reduce seepage. However, it does not fill or seal moving joints, deep cracks or structural leaks.

PVC Membrane Liner

- ***Estimated Cost: $50,000***
- Lifecycle
    - These membranes typically have a 10-year warranty, although many installations last 20+ years with proper care.
- Low Maintenance and Easy Repairs
    - The smooth, nonporous PVC surface resists algae buildup and staining, reducing chemical use and maintenance demands. Should damage occur, the membrane can be heat-welded and patched with minimal disruption.
- Waterproofing Reliability
    - A PVC liner acts as a fully independent waterproofing layer, completely sealing the interior of the pool and isolating the water from the concrete structure beneath. Unlike epoxy coatings, a membrane liner does not rely on bonding to cracked or moving concrete, making it ideal for rehabilitation projects. This allows the liner to retain its watertightness even if control joints in the concrete structure below have shifted.
- Freeze-Thaw Resilience
    - PVC membranes remain flexible in cold temperatures and do not crack, shrink, or delaminate like epoxy finishes.

Piping Infrastructure – Targeted Rehabilitation

If a leak is detected in the recirculation piping, it may be acoustically located and spot repaired. However, it's generally advisable to replace all the underground piping for a long term solution if one has already failed.

Recirculation Piping

- ***Estimated Cost: $40,000***
- Existing underground pipes would be replaced from the pool tank to the mechanical building. The new piping would be installed in accordance with the latest regulatory codes and specifications.
- The concrete decking would need to be cut 2 ft wide around the perimeter of the pool for the pipe trench.

New Pool Facility

If the community is pursuing a long-term vision for community recreation or intends to integrate aquatic programming, a new aquatic structure and mechanical equipment should be considered. While the cost is significantly higher, a new facility would meet all current design, energy, and accessibility standards and could offer expanded features that better serve future generations.

A new build would provide flexibility to construct a modern aquatic facility with a 50+ year lifespan. This option is estimated based on a new facility approximately the same size of the current wading pool with all new recirculation piping, filtration equipment and controls.

- ***Estimated Cost: $500,000***

Next Steps

To support MCI2 and the city in making an informed decision, we recommend the following steps:

1. Perform additional facility testing by isolating the underground filtration piping and hydrostatically test individual piping for leaks.
2. Operate the system while closed to the public for a weeks time and document the daily water levels, temperatures and precipitation amounts.
3. Stakeholder Engagement – Review previous data and solicit additional feedback from residents, staff, and potential funding partners on the importance of the facility.
4. Capital Planning – Begin evaluating funding mechanisms.
5. Preliminary Engineering – Conduct site surveys and work on conceptual designs to refine cost estimates.
6. Design and Construction – Finalize project scope and design. Move into constructing the project.