



report

Forest River Park Pool Evaluation-DRAFT

City of Salem, Massachusetts
93 Washington Street
Salem, MA 01970

JUNE 2017



ENGINEER'S REPORT

The City of Salem is located in Essex County, Massachusetts. It is a community roughly 18.1 square miles in size, with a population of 41,340 based on the 2010 census¹. The city operates a variety of active parks. Each park offers many amenities for the community including athletic fields, playgrounds, picnicking, nature trails, swimming, marinas, camp grounds, beaches, and a golf course. This report is limited to the swimming facility at Forest River Park.

The pool was not in operation during this facility review. Initial review occurred in March 2017.

Weston & Sampson has been retained to perform professional engineering, compliance evaluations, and planning services in connection with the planning for the future of the Forest River Park Pool.

Scope of this report includes:

- Site inspection of the existing pool, filter, and bath house.
- A code analysis for conformance with National Standards, as well as the new Federal standards for ADA and Virginia Graeme Baker (VGB)
- Evaluate the current bath house building and filter building
- Examine existing piping, circulation, chemical treatment and filtration systems
- Review the required upgrades to be able to operate in the summer of 2018.

Code Review

The Forest River Park Pool Facility will be evaluated by the code standards below:

- Massachusetts – Department of Public Health 105 CMR 435.00 – MINIMUM STANDARDS FOR SWIMMING POOLS (STATE SANITARY CODE: CHAPTER V)
- American National Standard for Public Swimming Pools (ANSI / NSPI – 2014)
- International Swimming Pool and Spa Code (2012) (ISPSC)
- International Building Code (2009) (IBC)
- International Plumbing Code (2009) (IPC)
- United States Access Board - Accessible Swimming Pools & Spas (June 2003) (ADA code)
- Virginia Graham Baker Pool and Spa Safety Act – January 2012 (VGB code)

1. US Census Bureau website: <https://factfinder.census.gov>

Executive Summary

Weston & Sampson's evaluation of the current swimming pool facility at the Forest River Park Pool, in the City of Salem, MA. This pool has a long history, having originated as a tidal water pool approximately 116 years ago. Over the years, many changes occurred, primarily the modification from an open pond to a formalized concrete vessel in 1969.

Our basic findings:

- Pool shell structure compromised and severely leaking
- Seawall supporting deck at bay is compromised
- Pool filtration equipment has reached end of normal lifespan
- Pool house not ADA compliant
- Pool house electrical and ventilation systems inadequate
- Multiple ADA compliance issues; proximity of parking, pool house accessibility issues, lack of handicap lifts, ramp into kiddie pool non-compliant.
- Severe grade change between pool and pool house inconvenient for guests.
- Pool size and shape are not ideal for current users: Large square kids pool is difficult to patrol from a lifeguarding point of view.
- Lap pool length and depth too extreme for majority of users. 187' length is longer than a regulation 50 meter pool, which measures 164' in length.

Our recommendations:

Weston & Sampson generally finds that this facility has exceeded its useful life, and much of the facility needs to be replaced. Our overall recommendation is to no longer put 'band-aids' on the current structures, but to develop a plan for a new updated facility which incorporates the ultimate goals of the community for this facility.

Outline of Report

The evaluation of the Forest River Park Pool is outlined below:

- 1.0 – Background, General information, and Current Use of the Facility
 - 1.10 – Description of Current Facilities
 - 1.11 – Bathhouse and Facility
 - 1.12 – Pool
 - 1.13 – Filtration Building & Recirculation System
 - 1.20 – Patron Usage
 - 1.30 – Current Challenges
- 2.0 – Evaluation of the Current Main Swimming Pool
 - 2.10 – Existing Design
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 - 2.12 – Finishes
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 - 2.20 – Compliance Issues
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- 3.0 – Evaluation of the Current Bath House and Main Building
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 - 3.14 – ADA Accessibility
 - 3.20 – Compliance Issues
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- 4.0 – Evaluation of the Current Main Pool Filter Building and Filter
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 - 4.11 – Recirculation System
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 - 4.13 – Mechanical & Pool Filtration
 - 4.14 – Electrical
 - 4.20 – Compliance Issues
 - 4.21 – Required by Code
 - 4.22 – Recommended Repairs
 - 4.30 – Recommended Remediation / Replacement
- 5.0 – Repair and Replacement Costs
- 6.0 – Conclusion

1.0 – BACKGROUND, GENERAL INFORMATION, AND CURRENT USE OF THE FACILITY

The Forest River Park Pool is located in the Forest River Park. The facility includes one swimming pool for water recreation.

There is substantial community involvement in the pool's programs, including seasonal memberships, swimming lessons, summer camps, adult swimming, and competitive team usage. In all, the pool enjoys broad appeal across all population groups in the city.



The pool was first put into use in 1901, as a tidal pool in which seawater was allowed to flow in through flood gates and then released. The pool was transitioned from the tidal pool to a concrete pool after 1969.

The facility's last major upgrade occurred in 1999 when the City converted the salt water pool to a recirculating, fresh water pool. Yearly maintenance is performed on the facility in order to keep it operational before each summer season.

The bathhouse building and filter building were built the same time as the pool in 1901. Maintenance renovations have been regularly performed by the city throughout its lifetime. This includes painting, fixture upgrades, ADA compliance upgrades, and new roofing. Figure A below shows a view of the existing building.



Figure A: Front of Bath House Building

1.10 Description of Current Facilities

1.11 Bathhouse and Facility

The entrance to the facility is through chain link fence that directs you into the pool area and bathhouse building. The building is a single wythe concrete masonry building. The building façade is painted concrete masonry blocks and stucco veneer. The facility includes men and women's bathrooms, outdoor showers, various rooms for storage, staff staging areas, and changing areas. There is a life guard/first-aid station, with a center administration room where patrons pay an entry fee. The facility is a one-season building which is winterized after seasonal use.

The entire pool facility is enclosed by 6-foot high galvanized chain link fence with a service gate near the filter building and a pedestrian gate on the north side of the property. Patrons make their way to the entrance via a cast in place concrete sidewalk which connects the bathhouse to the street. The bathhouse exits onto a landing where patrons can either take steps or a handicap ramp down to the pool deck. There is an approximately 15 foot grade change between the pool house and the pool deck. The aerial photograph in Figure B shows the layout of the existing pool facility.



Figure B: Aerial Photo of the Forest River Park Pool

1.12 Main Pool



Figure C: Photo of Current Lap Pool

The main pool layout configuration is split into two separate portions. The long lap lane portion of the pool is approximately 65-feet wide by 187-feet long with depths from 3.0-feet on the north side of the lap lanes, sloping to depth of 9-feet in the south end of the pool. The pool

is used for general swim recreation, swim lessons, lap swim and is not used for competition swimming. A photo of the lap pool area can be seen in Figure C above.



Figure D: Photo of Wading Pool

The pool also contains a shallow children area (Figure D). This section of the pool is approximately 50-feet wide by 60-feet long, with depths of 1'-9" deep to depths of 3 FT. This section of the pool has a ramp system that allows patrons to enter the pool. The entire pool approximately has a surface area of approximately 15,150 square feet, contains 610,000 gallons of water, with 724 linear feet of perimeter. Water flows from the children's pool into the lap pool through the gate area and a series of weirs at the base of the dividing wall between the two pool areas.



Figure D: Weirs in dividing wall

1.13 Filter Building & Recirculation System

The filter building is a precast concrete building. Constructed in 1999, the building contains a flat roof and houses the pool circulation pump, electrical panels, chemical analyzers, and chemical feeders for the swimming pool's recirculation system.

The recirculation system consists of four (4) rapid-rate sand filters, one flooded suction centrifugal pump with strainer, chemical feed injectors, storage, and various electrical motor starters.

Recirculated water is delivered to the pool through a network of return wall inlets in the pool, which creates movement in the water. The water then recirculates back to the filter system through the two stainless steel gutters found at the surface of the water and through the two main drains found in the deep end of the lap pool. Water is drained to a collector tank where it is suctioned through the recirculation system. The centrifugal pump moves water through the system, pushing it through the sand filter, through the network of piping to provide proper disinfection chemicals, and discharge filtered and disinfected effluent back into the pool through the same network of return inlets.

1.20 Patron Usage

Using the bather load calculation in 310 CMR 435.00, the permissible bather load of the current pool is approximately 740 bathers. However, a typical recommended ratio of lifeguard to swimmers is 1:25. If the pool were ever to be at 'full' permissible bather, a total of 30 lifeguards would be required. Therefore bather load is more often regulated by the number of guards, than by the permissible bather load.

In addition to daily pass users, the facility also utilizes seasonal individual pass holders, family pass holders and YMCA Summer Camps throughout the summer. **NEED #s**

1.30 Current Challenges

The facility is currently facing many challenges in order to continue to safely operate. The one hundred and sixteen year old pool structure and bath house along with the nineteen year old filtration equipment are all deteriorating and no longer comply with today's standards. This report details the facility deficiencies.

The current facility has exceeded its useful life and over time building and health codes have been updated, rendering this facility non-compliant. The city is now faced with the decision to either make

repairs, including code upgrades to this aging facility or construct a new facility. Both options will have similar costs.

2.0 Evaluation of the Current Main Swimming Pool

2.10 – Existing Design

The current main swimming pool is a cast in place concrete structure with painted finish. The pool contains small sections of a stainless steel gutter and large main drains in the floor of the deep end. The pool currently has an entry ramp, stainless steel drop-in stairs, and portable life guard towers.

The pool traverses north and south. The pool does not contain swimming lanes nor is it used for competition swimming.

The pool was originally designed as a flow through pool, where the pool would be filled with salt water from the ocean and then drained daily as the tide left the pool. Various maintenance items such as yearly pool painting, patching, and deck renovations occurred between 1901 and 1999. Because of the original tidal design of the pool, it is located within the flood zone. This situation has affected the condition of the facility and could complicate any proposed reconfiguration because of current regulatory requirements.

The main swimming pool has a total surface area of approximately 15,150 square feet, retains approximately 610,000 gallons of water, and was designed to have a turn-over rate of 8 hours at a pumped recirculation rate of 1,270 gallons per minute (GPM).

The facility has not seen any major renovations since 1999. Since then, the pool facility has made upgrades that include installation of an automatic liquid sodium hypochlorite disinfectant feeder, new chemical analyzers to automate the chemical feed process, painting of the pool, installation of a high rate sand filter system, strainers, valves, and pipes.

The pool is surrounded by an impervious concrete deck that extends 10-feet to 20-feet from the edge of the pool. The deck drains away from the pool to a various area drains.



Figure D: Current Wall Conditions
loss, structural failure has occurred.

2.11 – Structural

The pool shell consists of a reinforced cast in place concrete walls and floor. The size of the structure is unknown, and size of bar is unknown.

Originally constructed to be a flow through pool using salt water. Adverse effects of sodium chloride have been seen on the walls of the pool.

There were no expansion joints or construction joints found in the concrete structure. There was no available information on the structure of the pool to determine wall and floor thicknesses and reinforcing. However, given several visible and leaking cracks in the pool wall along the reported water

2.12 – Finishes

The main swimming pool is finished with epoxy paint. The City drains and power washes the surface on an annual basis. Because of leaking in the structure, and the high water table (or more accurately the low pool elevation) water continually floods the lowest section of the pool. The City attempts to paint the pool in areas where high ground water doesn't affect the installation of paint. It is evident from visual inspection and conversations with staff that paint peels from surface and is a continual maintenance issue.

2.13 – Deck



Figure E: Existing Pool Deck

The main swimming pool has an impervious concrete deck around the perimeter of the pool extending approximately 10 to 20 feet from the pool edge in some locations. There is an expansion joint between the edge of the pool wall and the edge of the concrete deck, as well as other various locations around the deck.

It appears that during the life span of the pool the deck has been repaired and patched in various locations. Painted depth markers are located around the edge of the perimeter of the pool.

2.20 – Compliance Issues

2.21 – Required by Code

The facility is considered a public pool under 310 CMR 435.00.

This facility is considered a “Class B” facility in accordance with American National Standard for Public Swimming Pools (ANSI / NSPI – 2014). The following is a review of current requirements as they pertain to this facility:

System Turnover

- In accordance with 105 CMR 435.06 (1) All swimming, wading and special purpose pools shall be equipped and operated with a system for recirculation and purification of the pool water. This system shall be capable of maintaining the water quality standards of 105 CMR 435.28 through 435.31. The over-all recirculation and purification system shall be so designed and constructed that the entire volume of the pool can be recirculated and filtered as follows:
 - (a) swimming pools - once every eight hours
 - (b) wading pools (maximum depth less than 2') - once every four hours
 - (c) special purpose pools (hot tubs, therapy pools) - once every ½ hour
 - (d) water slide flumes - once every hour

Issue

Currently the system struggles to meet the required 8-hour minimum turnover rate. The filters have been losing sand, and it is unknown how much sand is left in the filters. A flow meter was not found on the pool recirculation system. A flow meter should be installed to determine whether the minimum flow required is being achieved to allow proper filtration of the pool. **Has this been done?**

ADA Compliance

- In accordance with “Types of Facilities and Required Means of Entry into the Water”, from the United States Access Board states, “Large pools must have a minimum of two accessible means of entry. A large pool is defined as any pool with over 300 linear feet of pool wall. Pool walls at diving areas and in areas where swimmers cannot enter because of landscaping or adjacent structures are still counted as part of the pool's total linear feet.”

Issue

The current main swimming pool perimeter exceeds 300 linear feet. This requires two forms of ADA access. There is a ramp into the square pool, but the handrail is not adequate, and additionally the ramp does not meet slope requirements. The current handicap ramp may potentially qualify for one of the required entries, but the city would need to purchase and install another lift, transfer station, or ADA accessible stairs. Any lift installation would need to be incorporated into the electrical equipotential bond.

Wall Inlets

- In accordance with 105 CMR 435.08 (e) the spacing of the return inlets shall be not greater than 20 feet on center. In no case shall there be less than two such inlets per 600 square feet, or fraction thereof. The total velocity through the inlets shall not exceed 15 feet per second.

Issue

The current installed inlets do not provide proper circulation of filtered effluent. Inlets cannot exceed 20 FT on center. During the site inspection and based on correspondence with the operator, there are only a handful of inlets. If the system is pushing 1,200+ GPM as currently designed, the water is flowing at more than 15 FPS out of an inlet, exceeding the allowed velocity.

Signage

- In accordance with 105 CMR 435.22 (1) No person having a communicable disease shall be employed or work at a swimming, wading or special purpose pool.

In accordance with 105 CMR 435.22 (2) The following regulations shall be enforced by the operator:

- (a) No bather shall enter the pool unless he first takes a cleansing shower.
- (b) No bather shall wear a bathing suit that is unclean.
- (c) No person suffering from a fever, cough, cold, inflammation of the eyes, nasal or ear discharges, or any communicable disease shall be allowed the use of the pool.
- (d) No person with sores or other evidence of skin disease, or who is wearing a bandage or medical covering of any kind, shall be allowed the use of the pool.
- (e) No person shall spit in or in any other way contaminate the pool, or its floors, walkways, aisles, or dressing rooms.

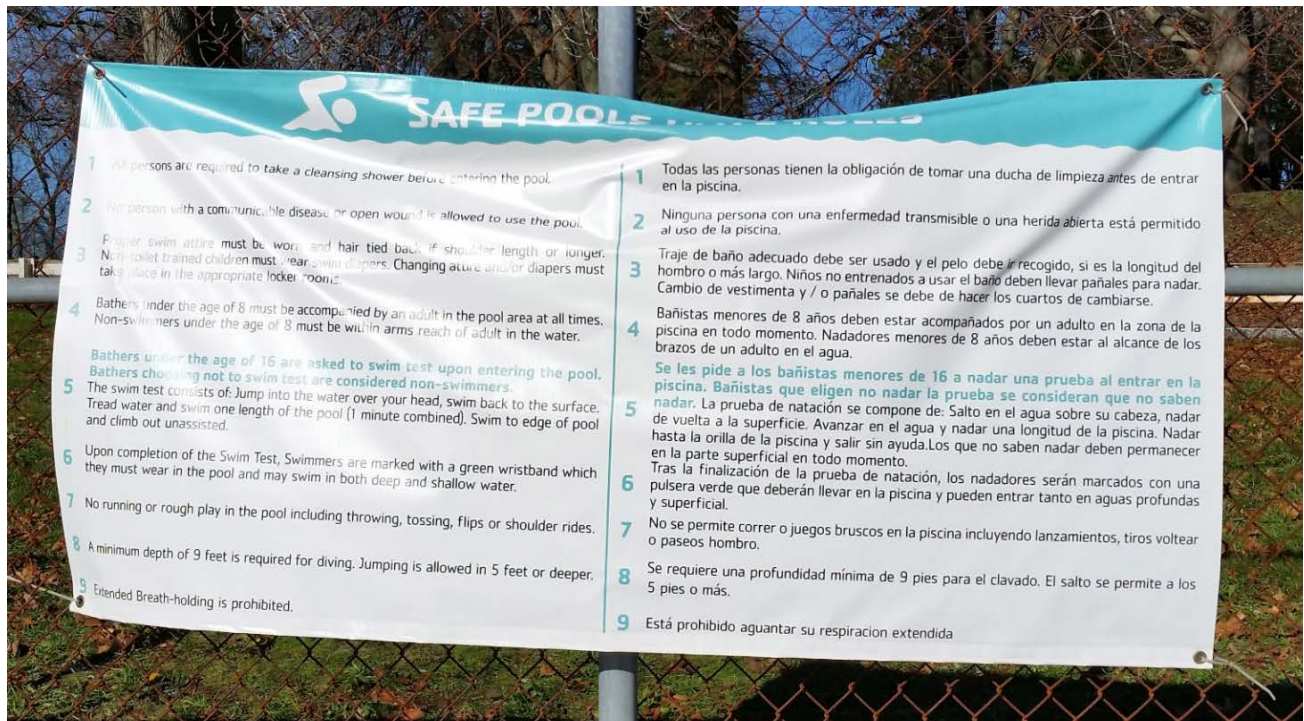
(f) No glass, with the exception of shatterproof light shields, shall be permitted in the pool or on walkways within eight feet of the pool.

(g) No person shall bring or throw into the pool any object that may in any way carry contamination or endanger the safety of bathers.

In accordance with 105 CMR 435.22 (3) The operator shall cause a sign to be placed at the entrance of the pool enclosure, or on a wall of the dressing room where one is provided, which reads substantially as follows: "All persons are required to take a cleansing shower bath before entering the pool." "No person with a communicable disease is allowed to use the pool."

Issue

Health and safety signs that are required by code, with specific language are not found in the bath house or at the facility. The existing banner signage contains some, but not all of the required language.



Existing Pool Rules Signage

Skimming - Gutter

- In accordance with Code, “4.8.1 Skimmer equalizer lines”, from the American National Standard for Public Swimming Pools states, “Skimmer equalizer lines, when used, shall be located on the wall with the center no more than 18 inches (457mm) below the maximum operating level. It shall be protected by a listed suction outlet cover/grate with a flow rating equal to the maximum system flow divided by the number of skimmers when piped through a common suction line, or the maximum flow rating of the skimmer, whichever is greater.”
- In accordance with Code 105 CMR 435.10 (2), “When skimming devices, or deck drains for water-level deck-type swimming and wading pools are not used, an overflow channel shall extend completely around every swimming and wading pool.”

Issue

When using an overflow gutter as a skimming device, it shall be found around 100% of the pool perimeter. Currently a gutter is found around approximately 20% of the pool perimeter. Improper skimming will impact the health and clarity of the pool because the dirtiest portion of water is not being adequately removed.

Depth Markers

- In accordance with 105 CMR 435.12 (1) The water depth of every swimming pool shall be plainly marked on the pool deck at the edge of the pool and on the vertical pool walls, at or above the water surface. Where depth markings cannot be placed on the vertical walls above the water level, other means shall be used so that the markings are clearly visible to persons in the pool. Markings shall be in dark colors, a minimum of four inches high, spaced at one-foot depth intervals in the shallow portion of the pool to a depth of five feet, and then at appropriate places of not more than 25 foot intervals around the deep portion of the pool. When non-swimmers use a pool, a polyethylene line with floats shall separate the non-swimmer area from deeper water.
- In accordance with 105 CMR 435.12 (2) All painted swimming, wading and special purpose pools constructed, or drained after the effective date of these regulations shall have the boundary line between the shallow and deep areas marked with a four-inch stripe of contrasting color on the floor and walls of the pool. Ledges and step edges shall also be marked with a four-inch stripe of contrasting color.

Also,

- In accordance with Code 409.4, “No Diving” Symbol, from the International Swimming Pool and Spa Code states, “Where the pool depth is 5-feet or less, the “No Diving” symbol shall be displayed. The symbol shall be placed on the deck at intervals of not more than 25 feet.”

Issue

Depth markers shall be replaced on the wall faces and on the pool deck. The spacing between depth markers shall not exceed 25 linear feet or a change in direction.

In all depths less than 5-feet, “NO DIVING” international symbol needs to be present at every point where there is a water depth marker. Currently, painted ‘No jumping’ or ‘No diving’ markings are painted on the deck in shallow locations. These do not conform to the code requirements.

Also, there is no 4” contrasting color band and rope line found at the 4 FT mark in the pool. This would need to be installed.

Pool Floor

- In accordance with Code 435.05, “Location, Structural Stability, Finish (4)”, states, “the finish of the walls and floors of every swimming, special purpose and wading pool shall be of concrete, cement, mortar, tile, paint, vinyl liner, fiberglass or other inert and impervious material, shall be reasonably enduring, shall be moderately smooth and free from cracks, and shall be of light color.”

Issue



In the center of the wading pool section of the pool is a picture of a witch. The witch contains colors that are not light or white in color. The witch shall be removed from the bottom of the pool, or a graphic that has been reviewed and approved by the Board of Health should be installed. As of the writing of this report the witch was being painted over with the blue paint to match the rest of the pool color.

Signage and Emergency Phone

- In accordance with Code 18.5.2, “Emergency Telephone Signs”, from the American National Standard for Public Swimming Pools states, “A sign shall be posed in the immediate vicinity of the pool, stating the pool’s address, the location of the nearest telephone with references that emergency telephone numbers are posted in this location.

Issue

Currently there is no sign indicating the location(s) of 911 emergency phones. Additionally, when there is a rain event the emergency phone loses connection. This critical emergency phone service is not reliable and we recommend replacement of the phone lines or entire system.

Settling Deck:

- In accordance with the Code 306.5, “Slope”, from the International Swimming Pool and Spa Code, “a minimum slope of the deck shall be provided except where an alternate drainage method is provided that prevents the accumulation or pooling of water. The sloped deck shall be not greater than ½-inches per foot and not less than 1/8-inches per foot.”

Issue:

The concrete deck has settled in various locations. The concrete deck settled between ½ to 2 inches in locations, resulting in standing water on the deck. Standing water on the deck is a health and a safety hazard. In accordance with Code 306.5.1, “Maximum Gaps”, from the International Swimming Pool and Spa Code states, “The difference in vertical elevation between the pool deck and adjoining sidewalk shall be not greater than ¼-inch.”



The deck has settled or shifted around the perimeter of the pool. In some locations, there is a vertical elevation change of ½ to 6 inch. The settled deck has created a trip hazard around the perimeter of the pool.

Pool Interior Abrasion Hazards

- In accordance with Code 307.6, "Surface Conditions", from the International Swimming Pool and Spa Code states, "The surface within the public aquatic vessels intended to provide footing for users shall be slip-resistant and shall not cause injury during normal use."

Issue

The interior surface of pool is delaminating and the paint is flaking off in the pool. The sharp edge from the layers of paint flaking off is abrasive.

2.22 – Recommend Repairs

Water Loss

The main pool experiences significant water loss throughout the season. In discussions with the operator, water loss is estimated to be between 1-inch to 6-inches daily depending on the usage and type of weather. It has been observed the pool loses water even when there is zero use and there is a rain event. This adds a significant cost to the city for water usage, chemical usage, and time required to maintain the system. Based on the total square footage of the pool, if it is losing 6" of water a day, then the annual water loss over just the summer season could be in excess of 5 million gallons of water.



The source of water loss is found in the structural cracks and failures, which were visible during inspection. High water table during inspection resulted in ground water leaking back into the pool, since the pool was empty.

It has been noted that the City needs to use a fire hydrant to fill the pool after each night. The city is having a difficult time in repairing the structural cracks because of the excessive amount of ground water that is infiltrating into the structural failures.

Structural Issues

A majority of the loss of water can be contributed to the structural failures in pool shell. The failures stem from the deterioration of the structural shell. In discussions with the staff, when they have

attempted to make repairs, they have been unsuccessful because the block wall has deteriorated beyond the point where it will hold an anchor or be structurally strong.

The shell is approximately 116 years old. Years of salt water operation and chlorine have allowed sodium chlorides to penetrate the concrete and breakdown the structure. Additionally flood and storm events have surely contributed to structural deterioration.

The cracks and gaping holes are a result of hydrostatic pressure and the absence of control joints and expansion joints. The pool shell has exceeded its service life.

Safety

Currently there are areas of the pool that are entrapment hazards:

1. Stainless Steel Gate between lap pool and wading pool: The openings in the gate are large enough that a child's head could get lodged under the gate and in the gate slats. The stainless steel gate found between the main pool and wading pool sections shall be removed.
2. Flow Pockets: There are openings found in the common wall between wading pool section to allow water to flow into the wading pool from the main pool. However these openings are larger than 4" and could pose an entrapment hazard.
3. Common Wall: The common wall has a chain link fence mounted on the wall. This poses an issue where kids can climb up the fence and launch off the wall. The fence is poor condition and could cause cuts or abrasions.

2.30 – Recommended Remediation / Replacement

Repairs / Renovations

The code compliance issues stated in the above section need to be corrected in order to legally operate the pool. The structural repairs should be a high priority as they are creating unsafe and unacceptable conditions for the patrons and the environment. Given the age and condition of the existing structure, Weston & Sampson recommends the replacement of this pool.

Replacement

Based on historical data from other public swimming facilities throughout the northeast, a well-constructed pool should have a normal life expectancy of 40+ years. This pool has outlived its life expectancy. Additionally the size and configuration of the pools is inefficient and does not reflect current needs and requirements for typical municipal pool facilities. The lap pool is extremely large

for lap swimming, especially if not being used for competition swimming and the wading pool, although large, does not provide much diversity in activity for different age groups and swimming levels. A new pool facility would combine the current municipal aquatic trends as well as swimming lanes for competition swimming.

Strategic planning shall be performed to understand the needs and requirements for the City and relationships with community non-profits such as the YMCA for optimal program and pool requirements.

3.0 – Evaluation of the Current Bath House and Main Building

3.10 – Existing Design

The bathhouse is a single story building constructed with single wythe concrete masonry block, pre-a flat rubber roof and stucco finishing. The façade of the building is the structural concrete masonry block wall with white epoxy paint. The building is a slab on grade with frost walls extended below the frost line. The building has seen various upgrades but the original structure was constructed as part of the original facility from 1901.

The building provides men's and women changing areas, showering and bathroom areas, life guard area, first aid area, concessions, and an operations management area.

The building is a one season building that is winterized during the fall, spring and winter months.

3.11 – Structural

The structure of the building is mentioned above. During the buildings lifespan, it has been maintained by installing a new roof and a repainting the exterior / interior walls.

The roof structure utilizes large timber beams and custom made gusset plates with anchors.

The structure has exceeded its service life. There are signs of fatigue and cracking in the surface of the walls. The exterior façade is delaminating in many places. This has left the block / brick structure exposed to the elements.

3.12 – Electrical

The bath house electrical system was most likely updated during construction in 1972, according to the wall placard. The building currently is serviced from a single phase service. The building is illuminated by standard fluorescent and incandescent lights fixtures which appear to have been

updated throughout the years of service. The electrical outlets are installed in the CMU walls, and some are attached to the face of the CMU walls. Wall embedded outlets appear to be original to the building.

3.13 – Mechanical

The bath house plumbing appears to be from the 1972 construction. The men's locker room contains three urinals, two lavatory sinks, and two water closets, one that is handicap accessible.

The women's locker room contains two lavatories and four water closets. One of the water closets is an ADA accessible water closet.

Showers for men's and women's are not provided on the interior of the building. The showers are rinse stations located outside.

Fixtures are believed to be from the 1972 construction.

Floor drains, toilets, and sinks are connected to the sanitary sewer system.

Currently, the building has no mechanical ventilation. The building is naturally ventilated from open windows, doors, overhead gravity louvers, and screened openings.

3.14 – ADA Accessibility

The current building provides one water closet fixture, sink, and shower unit intended to be ADA compliant for both the men's and woman's changing rooms, however the fixture selections and other components are not fully compliant with current ADA requirements.

3.20 Compliance Issues

3.21 – Required by Code

Bathroom Fixtures

- In accordance with 105 CMR 435.03 (2) The operator of a public swimming pool shall provide showers and shall furnish hot and cold water. The minimum number of showers shall be one for each 40 bathers based on the maximum bather load, (see 105 CMR 435.27).
- In accordance with 105 CMR 435.03 (3) The operator of a public swimming pool shall provide and shall maintain in a sanitary condition, for each sex, at least one water closet at convenient locations for each 40 bathers. One additional water closet shall be provided for each

additional 40 bathers. For males, urinals may be substituted for up to one third of the number of water closets required. Toilets for the use of spectators shall be separated from those provided for bathers and shall be located outside the area used by bathers.

Bather load based on current size of the pool equals 740 Bathers:

Required Facilities for this number of bathers would include:

Men's Locker Room

- Water Closets: 5 with ADA stalls
- Urinals: 5
- Lavatories: 5
- Showers: 10

Women's Locker Room

- Water Closets: 10 with ADA stalls
- Lavatories: 5
- Showers: 10

Issue

The current bather load is 740 bathers. The bath house must accommodate 50% of the total bather load per gender = 370 bathers per gender.

The facility has does not contain the correct amount of fixtures.

HVAC

- Table 403.1 Minimum ventilation rates, from the International Mechanical Code states the minimum ventilation requirements for this facility. Ventilation required for facility classifications are listed below, found under "Education".

Education - Locker / dressing rooms = 0.25 CFM / FT²

Issue

The current building does not provide any mechanical ventilation. The ventilation is provided by natural ventilation through window, inlets, open doors, and screen louvers. It was observed the building is damp, and typically has a musty smell when in operation.

3.22 – Recommended Repairs

Structural

The building walls are showing signs of heavy decay and failure. Stucco is falling off the building. Some doors are difficult to open and are permanently shut. The building shall be raised rather than repaired.

Electrical

The building electrical system is original from the 1972 construction. The current system does not utilize any energy saving equipment typically found in current buildings. The building has a pair of outdoor safety spot lights.

The building houses the electrical panels and meters for the facility. Panels are showing signs of corrosion.

Mechanical

There is currently no HVAC exhaust system, resulting in musty smells, and promoting bacteria growth on the changing room surfaces. Proper ventilation cannot be provided with the current design of the building in order to achieve the ASHRAE* requirement of 6 air exchanges per hour.

3.30 Recommended Remediation / Replacement

Repairs and Recommended Repairs

Given the age, condition, and amount of work required in order to bring the pool house structure into compliance with current pool health and building code requirements, the building doesn't provide any salvage or repair value. The building is not registered as a historical building with the Salem Historical Society. The building should be razed, and replaced with a new compliant building.

4.0 Evaluation of the Current Pool Filter Building & Filter

4.10 – Existing Design

4.11 – Recirculation System

The high rate sand filter is pressurized by a centrifugal recirculation pump. Water from the pool is pumped to the filter vessel, and forced through the sand media under pressure to remove suspended solids and other contaminants. Sand filter back pressure is monitored using an effluent gauge located on the front of the vessel with the influent pressure gauge. When the pressure difference is greater than 10 psi between the influent gauge and effluent gauge, the filter is manually backwashed to remove the contaminants which are binding the sand media.

The current filter building is a one room, precast concrete structure that houses the recirculation pump and the pool chemical analyzers and feeders.

4.12 – Structural

The filter building is a precast concrete building. The building contains some louvers and a 6'-0" door. Condition of the building is fair, but is showing some aging due to a chlorine environment and moist environment.

4.13 – Mechanical & Pool Filtration

The filtration system components can be found listed below:

Pool Sand Filter: Quantity 4

- Manufacturer: Astral
 - o Filtration Rate: 15 GPM per SQ. FT.
 - o Capacity: 932 GPM (per filter)
 - o Constructed in 1999
 - o Working Pressure: 50 PSI
 - o Filter Area: 46.6 SQ. FT. (per filter)
 - o Last time sand was changed: unknown

Pool Filter Pumps: Quantity 1

- Manufacturer: Marlow – ITT Industries
 - o Model # : Unknown (tag has decayed)
 - o Serial No: 7D89
 - o Motor: Marathon Electric
 - o Power: 3 Phase / 460V

Chemical Feeder: 2 Metering Pumps

- Manufacturer: Stenner
 - o 45MP5 chemical metering pump.
 - o Max Working Pressure: 45 psi
 - o Capacity: 50 GPD

Chemical Controller:

- Hayward
 - o CAT 2000 with ORP and pH control.

The system does not contain an auto fill system or an automatic backwash system.

4.14 Electrical

Power for the pump is supplied by the filter building main service panel. All breakers for the pump and electrical components can be found in this location.

There is a main disconnect found on the outside the building to de-energize the building, and switches in the subterranean room control the pump motors.

The building has one fluorescent light. The panels are showing evidence of corrosion due to the high moisture content and chloramines.

4.20 – Compliance Issues

4.21 Required by Code

Pool Filling

- In accordance with 105 CMR 435.09 Potable water supplying any public, semi-public, wading or special purpose pool, either directly or to the recirculation system, shall be supplied through an air gap. In addition, no piping arrangement shall exist that will permit sewage, wastewater or any water of unknown or questionable quality to enter the pool or pool piping system.

Also,

- In accordance with Code 7.1.17, “Decks and Deck Equipment”, from the American National Standard for Public Swimming Pools states, “Water-powered devices (such as water-powered lifts) shall have a dedicated hose bib (water source) with approved back flow protection in accordance with authority having jurisdiction.”

Issue

There was no backflow prevention device found in the building, and when pool is filled from the hydrant, there is not backflow prevention. If a pressure drop were to occur, the pool could back syphon into the system.

Flow Meter

- In accordance with 105 CMR 435.06 (2) The equipment of the recirculation and purification system shall include:
 - (a) a filtration system;
 - (b) recirculation pumps;
 - (c) hair and lint strainers;
 - (d) provision for chemical feed;
 - (e) provision for bactericidal treatment;
 - (f) filter effluent flowmeter or meters;
 - (g) balancing or float-control tank or above-rim fill-spout;

(h) test kit(s) will be available to meet the requirements of 105 CMR 435.29 and must be capable of distinguishing free residual chlorine and combined chlorine;

(i) All other equipment necessary to make the particular treatment process complete and efficiently operable.

- In accordance with Code 8.4, "Class A, Class B, Class C, and Class F Pools", from the American National Standard for Public Swimming Pools states, "Class A, Class B, Class, C, Class F pools shall be equipped with a pump suction (vacuum) gauge, filter inlet pressure gauge, filter outlet gauge and flow meter".

Issue

Currently, a flow meter was not found on the effluent line. A flow meter is required by code to ensure the pool is operating at the designed turnover rate.

Backwash

- In accordance with 105 CMR 435.09 Potable water supplying any public, semi-public, wading or special purpose pool, either directly or to the recirculation system, shall be supplied through an air gap. In addition, no piping arrangement shall exist that will permit sewage, wastewater or any water of unknown or questionable quality to enter the pool or pool piping system.

Issue

The original system utilized a filter tank that would filter the backwash water before being reused back into the pool. However, currently that system is no longer operable. During current operation, the filter is backwashed to a holding tank, and is allowed to overflow onto the ground, which could be an issue given the proximity to the tidal water in the bay.

The only alternative to the current issue is to backwash to the sewer system. An injector pump system would be needed to be installed to pump the water to the pump station at the bath house. However, it is questionable if the current pump station at the bath house will handle the flow.

Pool Filtration System

The current filter system has reached the end of the service life. The filters have been left to the elements since 1999 and years of harsh New England winters have deteriorated the fiberglass surface.

Filter sand is found on the ground around the filters and filter area. This show evidence that sand has been flushed from the filters during backwash, and there could be limited sand in the filter. It

would be good to inspect the filter sand, but it would be cautioned the manway could break during opening.

The pool uses liquid sodium hypochlorite for disinfection. Chemicals are injected into the filtered effluent line with Stenner metering pump. The Stenner pump suctions liquid sodium hypochlorite from a large 1500 gallon chlorine tank. The tank has been left outside and exposed to the elements. There is a stress crack developing in the top of the tank. The staff is constantly feeding liquid chlorine into the pool to keep up with the demand. A new properly sized Stenner pump would reduce the need for the frequent addition of liquid chlorine by the staff.

Electrical

The electrical systems in this building are 19 years old. The panels and conduit show signs of decay due to chloramines present in the atmosphere and the amount of moisture found in the space.

Mechanical

The building does not contain a domestic water feed or a sewer connection outside the building. The building would be razed if the facility were to be replaced.

4.30 - Recommended Remediation / Replacement

In combination with the pool, the filter system has reached the end of efficient service life. There are some compliance items that will require upgrades in order to operate the pool in 2017.

A new filtration system should be would be incorporated into the designs for any replacement of the pool facility.

5.0 – 2017 Repair Items & Costs

It is not feasible to make repairs or improvements in order to bring the pool facility into full compliance with current board of health codes and building code requirements. However, the Board of Health if grants the City permission to operate the pool during the 2017 or 2018 seasons, Weston & Sampson recommends that the following repairs be completed:

- **Main Pool:**

1. Remove the “Witch” from the floor of the pool, grind rough surfaces of the pool, and repaint portions of the pool that were refinished.

Estimated cost: should be completed by issuance of this report

2. Remove the Fence and Fence gate on the common wall.

Estimated cost: \$2,500.00

3. Replace depth markers.

Estimated cost: \$2,500.00.

4. Patch voids and holes in the pool shell with epoxy grout.

Estimated cost: \$4,000.00

5. Signage.

Estimated cost: \$2,500.00

6. Gutter and inlets could not be quantified as major construction would be required to install / replace these items.

- **Filter System:**

7. Sand inspection and possible replacement:

Estimated cost: \$6,500.

8. Flow Meter:

Estimated cost: \$5,000.

9. Water Backflow preventer:

Can be installed by Water Department

10. Backwash Pump System:

\$30,000.00 (questionable if the new pump station will be able to handle the increased flow.

11. Replace the Stenner Pump:

Estimated cost: \$3,000.00

7.0 – Conclusion

The above report outlines the findings from the Weston & Sampson's evaluation of the current swimming pool facility at the Forest River Park Pool, in the City of Salem, MA. We would like to note that the staff and the city have done an excellent job maintaining this facility throughout its life of operation. However, the 116 year old pool has reached the end of its service life.

The evaluation did not test for any contaminations such as lead, polychlorinated biphenyls (PCB's), asbestos, and other contaminants. The facility was constructed during a time period where these contaminants were commonly used in the construction industry. It can only be assumed that the facility may contain these contaminants. In addition, our structural evaluation was limited to a visual inspection of the pool and facilities, and review of the facility record drawings. Concrete testing was not required for this evaluation, and was therefore not undertaken.

Weston & Sampson generally finds that this facility has exceeded its useful life, and much of the facility needs to be replaced. Our overall recommendation is to no longer put 'band-aids' on the current structures, but to develop a plan for a new updated facility which incorporates the ultimate goals of the community for this facility.

It should be noted that in order to meet current minimum requirements, large-scale construction would be required in order to become fully compliant. Considering the substantial water loss, and excessive annual budget required in order to operate the facility, the City should conduct an evaluation of the viability of operating in 2017 or 2018. Concerns should be providing safe and clean water quality. Based on the current condition and operation of the system, it is difficult to provide consistently balanced and clean water to prevent the risk of patron illness. However, the improvements listed on the previous page (27) will

This concludes our analysis of the Forest River Park Pool.