McCafferty Brinson consulting

Client
City of Pompano Beach

Scope of Services
Design of the buildout of the City's existing NF facility, a second concentrate deep injection well, new reverse osmosis treatment facility, and decommissioning of the existing lime softening process to comply with the USEPA NPDWR for PFAS.

Contact
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Start Date
November 2024

Completion Date
Ongoing

Key MBC Staff
Frank A. Brinson, P.E.
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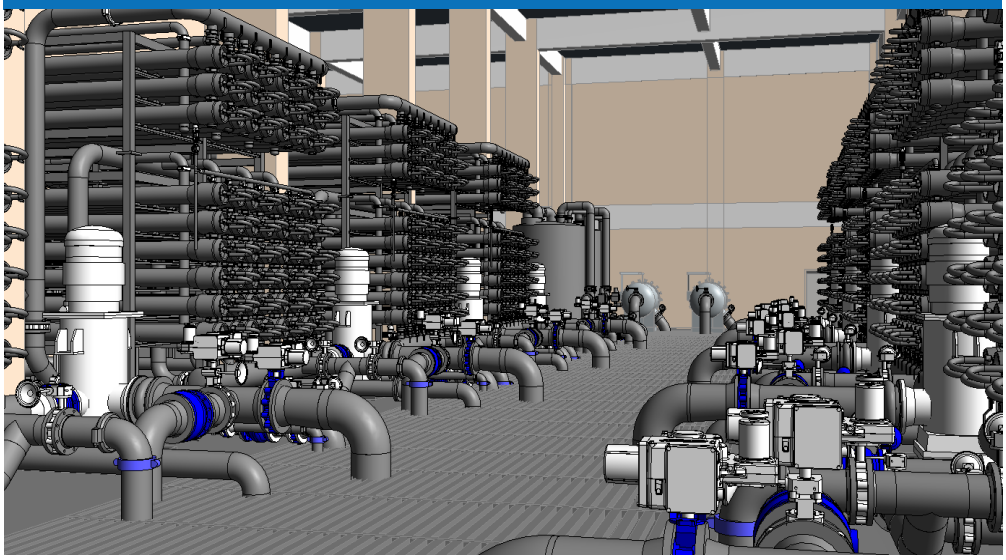
Audra McCafferty, P.E.

Key Features
- Evaluation of raw water supply and wellfield.
- Pilot testing of NF membrane elements and pretreatment technologies.
- Development of preliminary design report, corrosion control study, and construction documents.
- Funding administration and assistance.

Benefit to the City
Expedited design enabled the City to secure $46.2 million (with 26% principal forgiveness) in SRF loan funding for construction for timely compliance with PFAS regulations.

Water Treatment Plant Improvements Program: Emerging Contaminants (PFAS)

Pompano Beach, Florida



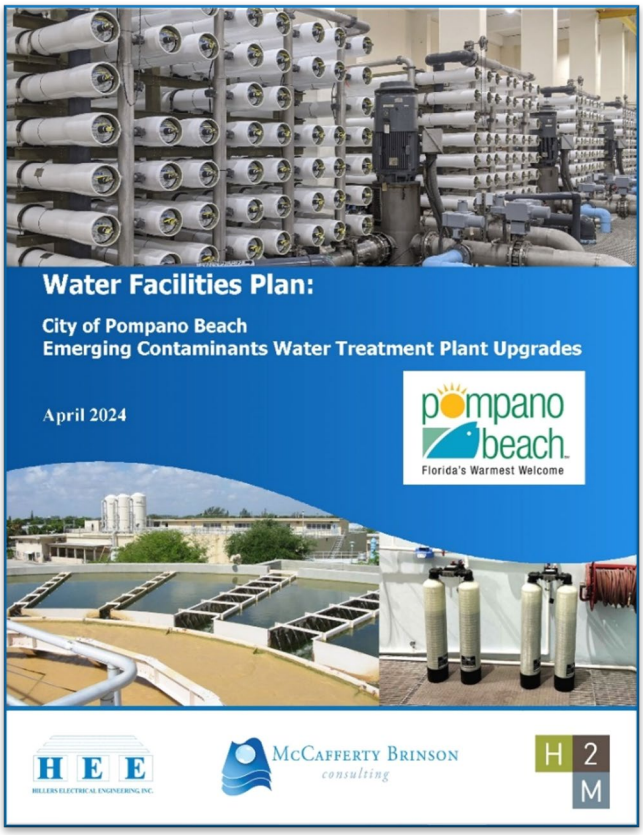
3D Revit Model of the Phase 1: Buildout of the Existing NF Facility

Background

The Pompano Beach Water Treatment Plant (WTP) utilizes a combination of conventional lime softening (40 mgd) and nanofiltration (NF) membrane treatment (10 mgd) to produce the City's blended finished water supply. In April 2025, the United States Environmental Protection Agency (USEPA) released the final National Primary Drinking Water Regulation (NPDWR) for per- and polyfluoroalkyl substances (PFAS) with an estimated compliance date of April 2029. The 2021 Bipartisan Infrastructure Law (BIL) established an Emerging Contaminants funding source, from which Federal grant funds were made available to drinking water utilities for implementation of water treatment plant upgrades that are necessary to provide compliance with the proposed PFAS regulations. As with nearly all utilities in South Florida who utilize conventional lime softening treatment of the surficial Biscayne Aquifer raw water supply, the Pompano Beach WTP requires substantial upgrades to comply with the new PFAS regulations.

After assisting the City with securing a planning/design grant (loan with 100% principal forgiveness) in the amount of $9,595,000 and preparing the *Water Facilities Plan: Emerging Contaminants Water Treatment Plant Upgrades*, McCafferty Brinson Consulting, LLC (MBC) was selected by the City for design of the recommended, most cost-effective alternative from the *Facilities Plan*, under the Water Treatment Plant Improvements Program.

The Program



The City's program for compliance with the PFAS NPDWR was developed by MBC and the City during preparation of the *Water Facilities Plan: Emerging Contaminants Water Treatment Plant Upgrades* (April 2024), which evaluated various treatment technologies for upgrading the plant for PFAS removal, including NF, reverse osmosis (RO), anion exchange (AIX), and granular activated carbon (GAC) on both capital and operation and maintenance (O&M) cost bases. The *Facilities Plan* established the total design treatment capacity for the PFAS-compliant treatment facilities at 30 mgd (on a maximum day demand, MDD, basis) to meet future drinking water demands. The evaluation in the *Facilities Plan* also considered current and potential future limitations on the fresh raw water supply from the Biscayne Aquifer in the City's South Florida Water Management District (SFWMD) Water Use Permit (WUP). The *Facilities Plan* recognized and considered that the City's future drinking water demands in excess of the fresh Biscayne Aquifer supply allocations under the SFWMD WUP would need to be met with an alternative water supply such as the brackish Floridan Aquifer, thus requiring RO treatment for that component. Accordingly, the developed program included a combination of PFAS-treatment upgrades for the Biscayne Aquifer supply, coupled with an RO component to meet demands in excess of the Biscayne Aquifer WUP allocations. The individual projects included under the PFAS Water Treatment Plant Improvements Program include the following phases:

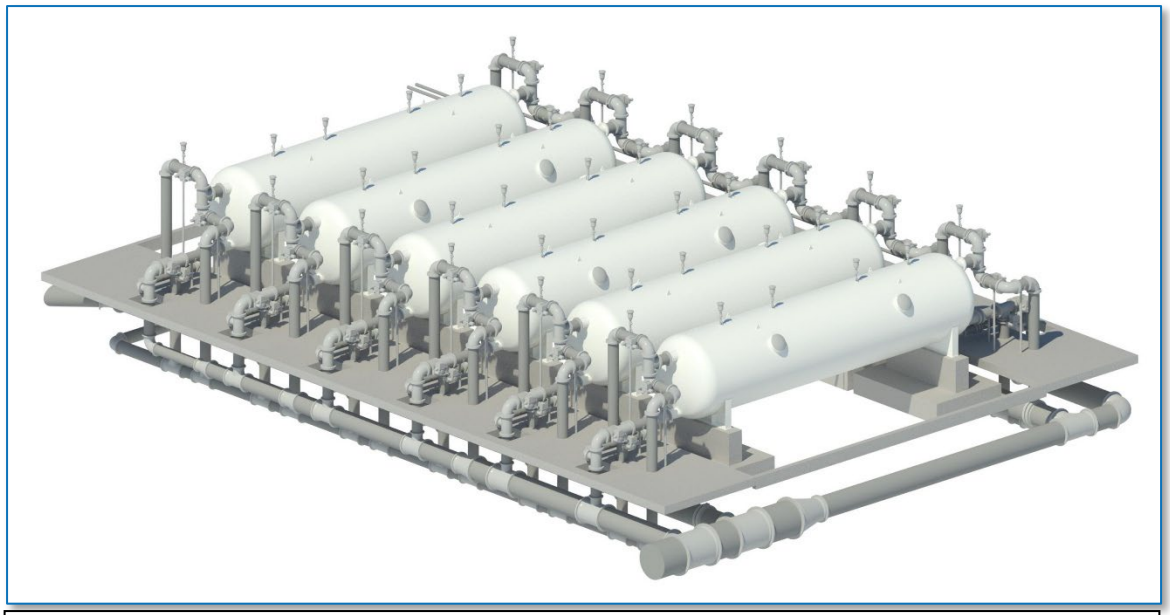
- **Phase 1: Buildout of the Existing Nanofiltration Facility.** The largest component of the program consists of design and construction of the buildout of the City's existing NF facility. The existing NF facility has a rated capacity of 10 mgd (five 2-mgd NF units) and was originally designed to be expandable to 20 mgd through the installation of five additional 2-mgd NF units within the building.

  Phase 1 of the program also included a modification/renewal of the City's SFWMD WUP to request an increase in the raw water allocations from the surficial Biscayne Aquifer. The renewal application was submitted on January 30, 2026. It is anticipated that the Biscayne Aquifer allocations under the new permit will support a total design NF process capacity of approximately 24.3 mgd on a finished water maximum day demand (MDD) basis.

During the preliminary design phase, MBC analyzed the existing NF treatment process and found that the existing NF facility (building) could accommodate an expansion to a total capacity of up to approximately 30 mgd (recognizing that the production capacity is limited by the raw water supply availability) by upsizing certain sections of process piping, replacing the five existing 20-year-old 2-mgd NF units with new higher-capacity NF units, and installing five additional higher-capacity NF units. The design of the new NF treatment process under the Phase 1 project included the following components:

- A raw water booster pump station consisting of six 250-horsepower (HP) stainless steel vertical turbine pumps in suction barrels and equipped with variable frequency drives (VFDs).

- A raw water pretreatment pressure filter system consisting of six 10-ft diameter x 40-ft long dual granular-media (sand and anthracite) pressure filters with face piping, control valves, and air-water backwash. The pressure system will be pilot tested to demonstrate effective removal of suspended particulate contaminants upstream of the 5-micron cartridge filter system, reducing the loading on the cartridge filters and extending the service lives of the cartridge filter elements.

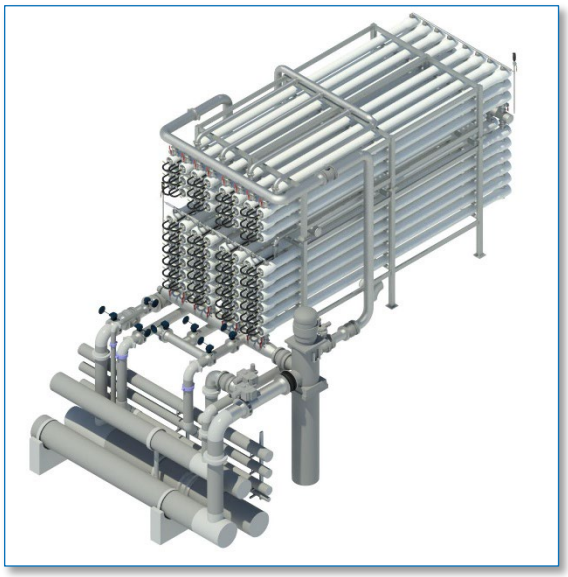


Dual-media (sand and anthracite) pretreatment pressure filter system for the removal of particulate contaminants (primarily oxidized iron) in the east wellfield raw water supply, upstream of the 5-micron cartridge filter system.

- The addition of two 5-micron cartridge filters (Filters 5 and 6) to the existing pretreatment cartridge filter system. The upgraded cartridge filter system will consist of six vessels, each vessel housing 231 40-inch-long melt-blown polypropylene filter elements rated at 5-micron, and handling a total flow of 4,234 gpm.

- Replacement of the main raw water feed, permeate, and concentrate stainless steel piping in the building (rated to handle a treatment process capacity of 30 mgd). Installation of ten new 150-Hp stainless steel vertical turbine membrane feed pumps in the existing suction barrels. Each pump will be equipped with a VFD and be controlled to feed an individual NF unit.

- Replacement of the existing five 2.0-mgd NF units and the addition of five new larger-capacity NF units. The new NF units will utilize a 48:24 array and operate at a recovery rate of 82%, similar to the existing NF process. The upgraded NF process will continue to operate without pretreatment chemicals (demonstrated during design-phase pilot testing), resulting in ongoing operating cost savings in excess of $1 million annually and a safer work environment for plant operating staff.



48:24 array NF unit with new membrane feed pump (ten total) and upsized feed, permeate, and concentrate trench pipe headers.

- Replacement of the existing clean-in-place and permeate flush systems with new systems designed based on the new NF unit design.

- The addition of three 12-ft diameter forced-draft packed tower degasifiers with blowers to remove dissolved hydrogen sulfide and carbon dioxide gas from the membrane permeate prior to chemical post-treatment (disinfection and stabilization). The degasifers will be installed over the City's existing finished water clearwell adjacent to the existing three degasifiers.

3D Revit rendering of the proposed degasifiers (left three) adjacent to the existing (right three).

- Installation of a second concentrate disposal deep injection well (DIW) and additional concentrate injection pump. The second well will provide the required redundancy for the City's single existing well, allowing the membrane plant(s) to remain on line during planned outages of each well for periodic mechanical integrity testing. The second DIW will be constructed under a separate construction contract from the membrane plant upgrades.

- Miscellaneous site work and yard piping improvements to support the treatment process upgrades.

Engineering services provided by MBC during the design phase of the Phase 1 project included the following tasks:

- **Preliminary Design Reports (PDR) and Permitting:** In accordance with Florida Administrative Code, MBC prepared a PDRs for the treatment plant upgrades and the second DIW for submittal to the Florida Department of Environmental Protection (FDEP) in support of the Application for a Specific Permit to Construct Public Water System (PWS) components. The PDR and application for the treatment plant improvements were submitted to the FDEP on June 10, 2025, and the City received the Notice of Permit Issuance on July 24, 2025, with no requests for additional information from the FDEP. The City received the Notice of Permit Issuance for the DIW on November 7, 2025.

- **Raw Water Characterization, Raw Water System Evaluation, and Improvements:** The City's existing NF facility is fed from the City's western wellfield. Increasing the capacity of the NF facility to 25 to 30 mgd requires the use of the City's existing eastern wellfield which currently feeds the lime softening process. Because this is a new raw water supply for the NF facility, it is necessary to evaluate the raw water quality and treatability requirements of the eastern wellfield supply for the buildout of NF facility. Additionally, the mechanical design, materials of construction, and condition of the raw water pumping and transmission system of the eastern wellfield were evaluated because of their substantial impacts on the viability, operating stability, reliability, and treatment efficiency of the NF facility. MBC and the City are currently working to condition the eastern wellfield supply by flushing the system and by implementing recommended improvements associated with the evaluation.

Particulate oxidized iron sediment flushed from the eastern wellfield transmission system.

- **Pilot Testing:** Due to the changes to the raw water supply needed for increasing the capacity of the NF facility (described above), the City is testing a composite blend of water from the eastern and western wellfields at similar ratios to that of the full-scale process. This testing is necessary to confirm that the new composite blend can be treated similarly to the City's existing NF process (i.e. without chemical pretreatment) and to select suitable physical pretreatment (sand strainers or pressure filters). MBC and the City are currently evaluating physical pretreatment technologies utilizing the City's existing membrane pilot unit.

- **Corrosion Control Study:** The buildout of the NF facility, and ultimately the decommissioning of the lime softening process (Phase 2A, described herein), will impact the corrosion control requirements of the City's finished water. MBC and their subconsultants prepared a desk-top corrosion control study to determine the optimal corrosion control treatment for the treated finished water. MBC and the City are collecting pipe materials and appurtenances from the City's distribution system to prepare for pipe loop and coupon testing to confirm the findings of the desk-top analysis.

- **Construction Document Preparation:** MBC and subconsultants have prepared and delivered construction drawings, specifications, and opinions of probable construction costs at the 30%, 60%, 90%, and permit set stages of design development. These documents are considered biddable and were utilized to secure $46.2 million in funding (with 26% principal forgiveness) for construction of the proposed improvements from the FDEP State Revolving Fund (SRF) at the August 2025 priority list meeting.

- **Funding Assistance:** In addition to provide planning- and design-phase SRF administration services (coordination with SRF, preparation and transmittal of disbursement requests), MBC assisted the City with securing two SRF loans for construction of the Phase 1 project at the August 2025 priority listing meeting: $30 million (with 20% principal forgiveness) for the WTP upgrades and $16.2 million (with 37% of principal forgiveness) for the DIW. At the August 2025 priority listing meeting, the City was also waitlisted for an additional $114 million in construction funding in future funding years.

The design of the Phase 1 project is expected to be completed in the first quarter of 2026, and construction is anticipated to commence in the third quarter of 2026.

- **Phase 2: RO Facility.** Phase 2 of the program includes design of a brackish Floridan Aquifer-supplied RO facility to meet any demand deficit between the City's projected buildout finished water demands relative to the fresh Biscayne Aquifer allocations allowed by the SFWMD under the City's pending WUP. Based on the currently estimated NF plant capacity supported by the anticipated allocations in the new SFWMD WUP of 24.3 mgd, this deficit is estimated to be approximately 5.7 mgd.

- **Phase 2A** – Upon construction completion of Phase 1 (and Phase 2, if required), MBC and will prepare construction documents for the decommissioning, demolition, and removal of the City's existing lime softening process.

By implementing the projects described herein under the Water Treatment Plant Improvements Program, the City is on target to comply with the USEPA NPDWR for PFAS by the current compliance date, April 2029.