

FRMA Amphidrome® and EnBac™ Process Provides Solution for Technically Challenging Total Organic Carbon (TOC) Limit Imposed on MA Wastewater System

The Challenge:

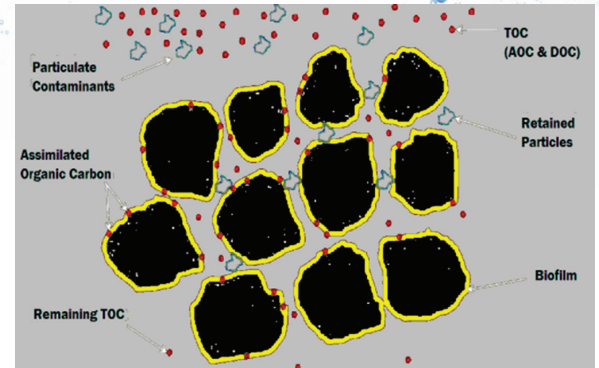
Sharon, Massachusetts: **CHA Engineers** was required by the Massachusetts DEP to design a 39,000 gpd treatment system with stringent TOC limits because it discharges treated wastewater into a drinking water Wellhead Protection Area (Zone II) with a less than 2-year travel time. The project is designed to treat flow from an apartment complex and an assisted care living facility.

Total Organic Carbon (TOC) is partially comprised of organic compounds that are not traditionally deemed biodegradable and pass through a traditional biological treatment process.

After discussion with the DEP, an effluent limit of ≤ 3 mg/L TOC was determined to be required.

The Solution:

The best technical solution was a combination of **FRMA's Amphidrome® Biologically Active Filter (BAF)** process and the **FRMA Enhanced Biological Active Carbon (EnBac™)** process to reduce TOC to very low levels.



EnBac™ is a 3-step process:

- 1. Coagulation:** Reduces TOC by approximately 50%; increases UV Transmittance (UVT) by 10%.
- 2. UV Degradation:** ENhances biodegradability, creating low molecular weight biodegradable **BioBites™**.
- 3. Biological Degradation in Biologically Active Carbon (BAC) Filter:** Adsorption of **BioBites™** on the carbon provides extended treatment period (days vs hours) allowing bacteria to biodegrade the TOC, free up adsorption sites, and extend the carbon life.

The system has consistently outperformed the required <3 mg/L TOC limit and is producing near "drinking water quality". The facility has not replaced carbon since its startup in May of 2019.

2020 Operational Data (Monthly Average based on Bi-Weekly Testing)

| Month | Influent * TOC/mg/L | Effluent TOC mg/L | Effluent TN mg/L | Effluent TKN mg/L | Effluent BOD mg/L | Effluent TSS mg/L | Effluent UVT |
|-----------|------------------------|----------------------|---------------------|----------------------|----------------------|----------------------|-----------------|
| July | 17 | 2.64 | 4.24 | 1.90 | 6.5 | 6.4 | $\geq 95\%$ |
| August | 17 | 2.51 | 4.7 | 2.34 | ND ₁ ** | ND ₂ *** | $\geq 95\%$ |
| September | 17 | 2.06 | 4.13 | 1.43 | ND ₁ | ND ₂ | $\geq 95\%$ |
| October | 17 | 1.91 | 3.09 | 1.13 | ND ₁ | ND ₂ | $\geq 95\%$ |
| November | 17 | 1.42 | 2.96 | 1.10 | ND ₁ | ND ₂ | $\geq 95\%$ |
| December | 17 | 0.97 | 2.78 | 1.15 | ND ₁ | ND ₂ | $\geq 95\%$ |

*based on initial testing

**ND1 detection limit 4 mg/L

***ND2 detection limit 2 mg/L