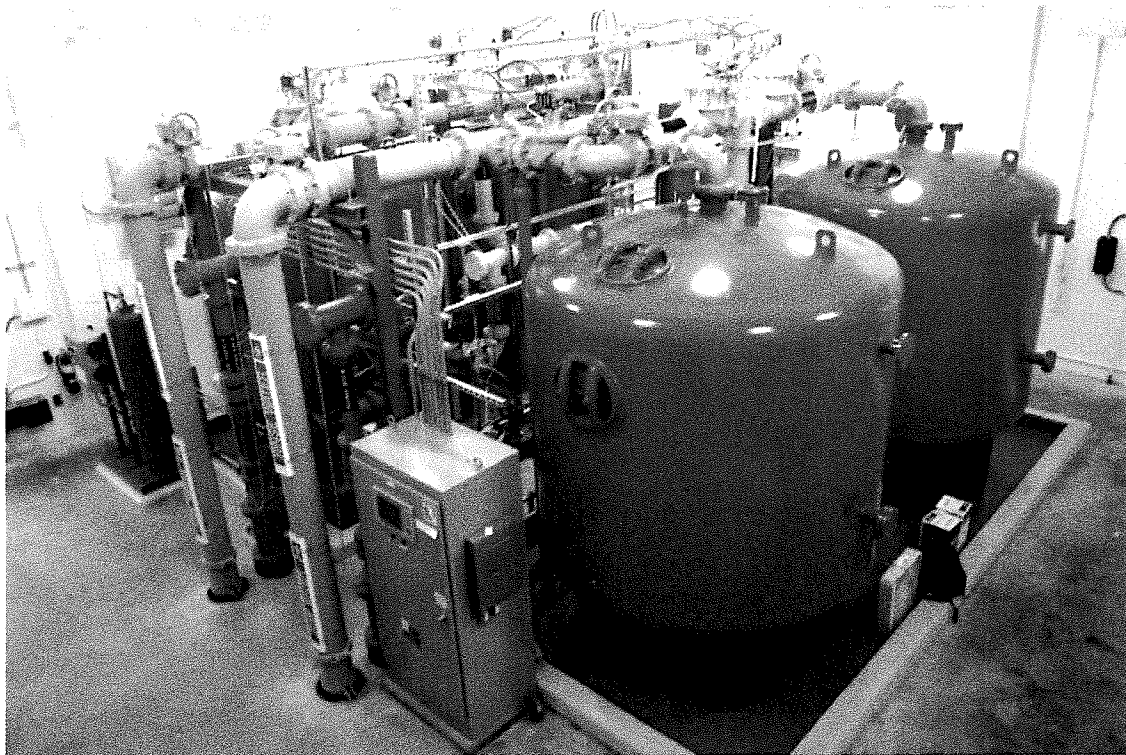


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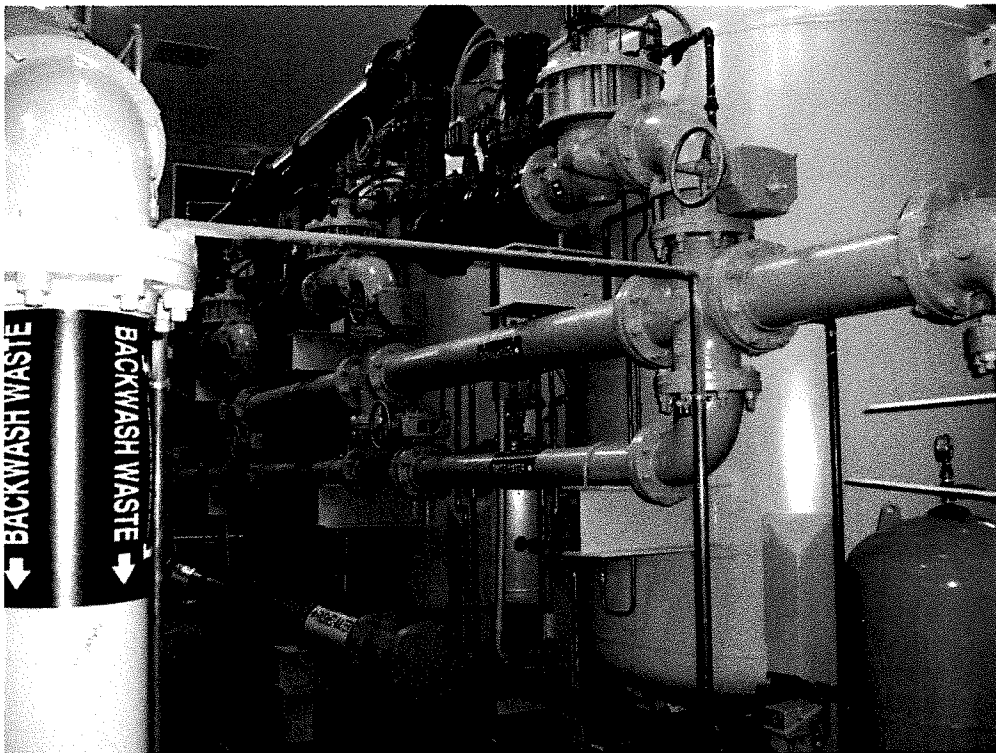
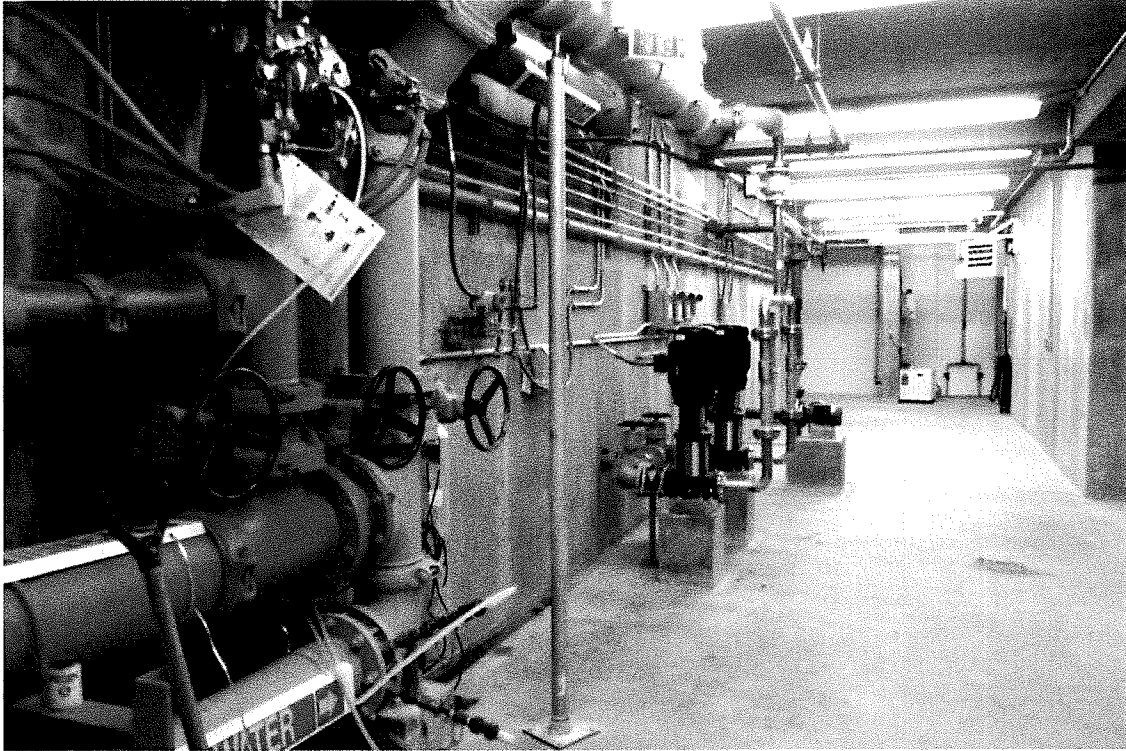
**Summary of Results and Recommendations
Pilot Test Report
Maher Filtration Plant**

- We recommend implementation of all proposed treatment processes, including greensand filtration, advanced oxidation, and GAC filtration. Implementation of greensand filtration at present will improve the performance, functionality, and longevity of the advanced oxidation and GAC equipment and treatment processes and provide the optimum benefit and water quality to Hyannis Water System customers.
- Based the results of the advanced oxidation pilot testing, which demonstrated high UVT, low hydroxyl radical scavenging, and removal of 1,4-dioxane levels to below laboratory detection limits, we recommend that the Town proceed with advanced oxidation with hydrogen peroxide for the removal of 1,4 dioxane from the source waters at the Maher Wells.
- Based the results of the GAC filtration pilot testing, which reduced PFOS and PFOA levels to below laboratory detection limits in all samples collected during the pilot test, we recommend that the Town proceed with GAC filtration for the removal of PFOS and PFOA from the source waters at the Maher Wells.
- Implementation of all proposed treatment processes at the Maher WFP at present, including greensand filtration for iron and manganese removal, will provide the optimum benefit and provide water customers with the best water quality based on the treatment options presented in the Pilot Study. Water customers would have the security of knowing that the drinking water they are being provided exceeds all State and Federal drinking water standards associated with iron, manganese, 1,4-dioxane, and PFOS/PFOA.
- Water supplied by the Maher Facility serves areas in Hyannis including Cape Cod Hospital, commercial businesses, hotels, the Youth & Community Center (Ice Rink), and other critical water customers in the downtown area. These are sensitive areas of town making it imperative that the best water quality possible be provided to these locations.
- Removal of iron and manganese from the water supply would improve water quality within the water distribution system and, subsequently, reduce the amount of dirty water complaints from commercial and residential water customers and reduce the amount of system flushing thereby saving labor and production costs.
- Removal of iron and manganese ahead of advanced oxidation and GAC filtration would benefit the functionality, efficiency, and life span of the equipment and media.
- Intervals between backwashing of the GAC contactors would increase resulting in an increase in the life span of the carbon media and a decrease in disruption of water production.
- Construction of all proposed treatment processes under one construction contract (Option No. 2) in lieu of Option No. 1 (implementing greensand in the future) would simplify design and optimize construction of the filtration plant and result in a substantially lower total project cost. Capital costs to implement greensand filtration at the new facility at a future date (assumed Year 2024) will increase by approximately \$850,000 when compared to the cost to implement greensand filtration under Option No. 2 at present. This includes construction, additional design, permitting, MassDEP approval, and bidding requirements.

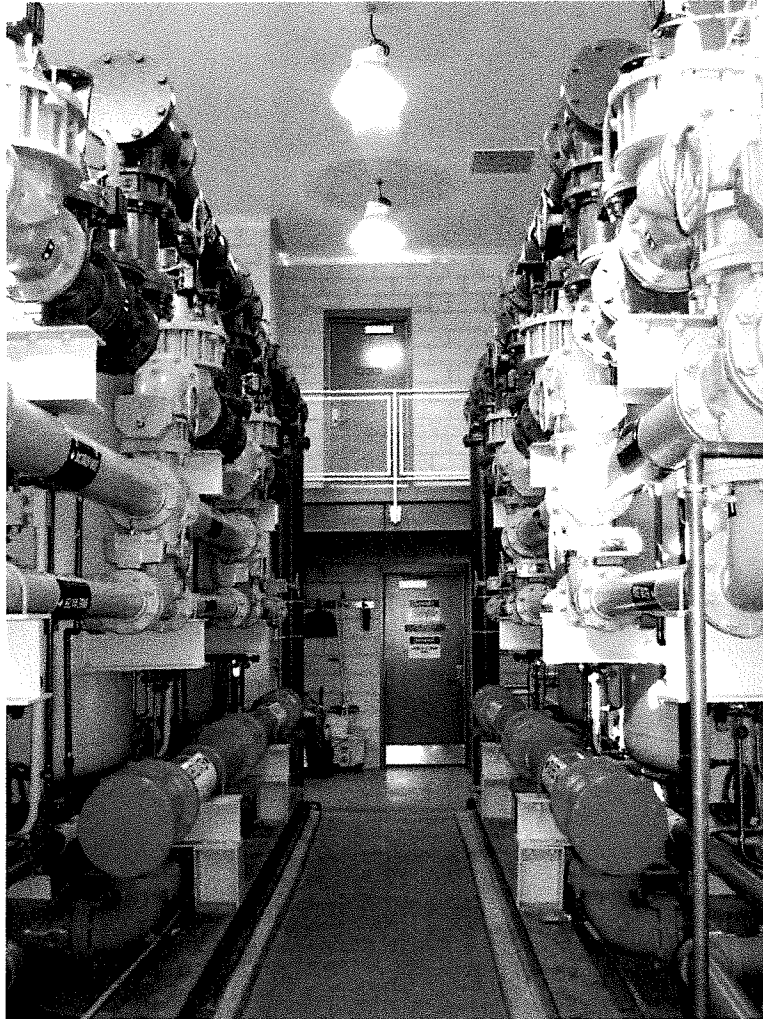
Greensand Filtration for Iron and Manganese Removal



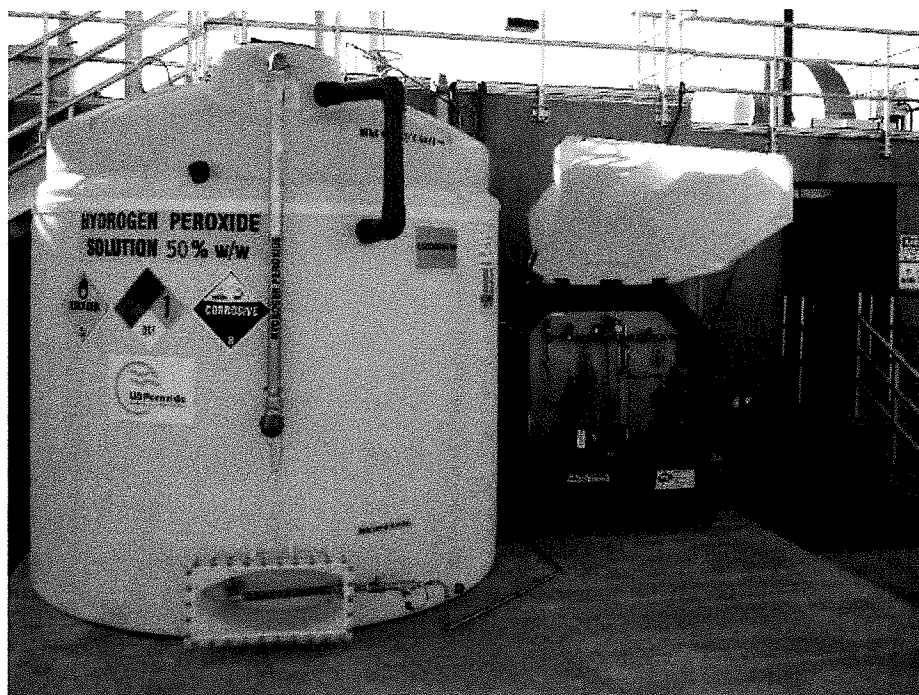
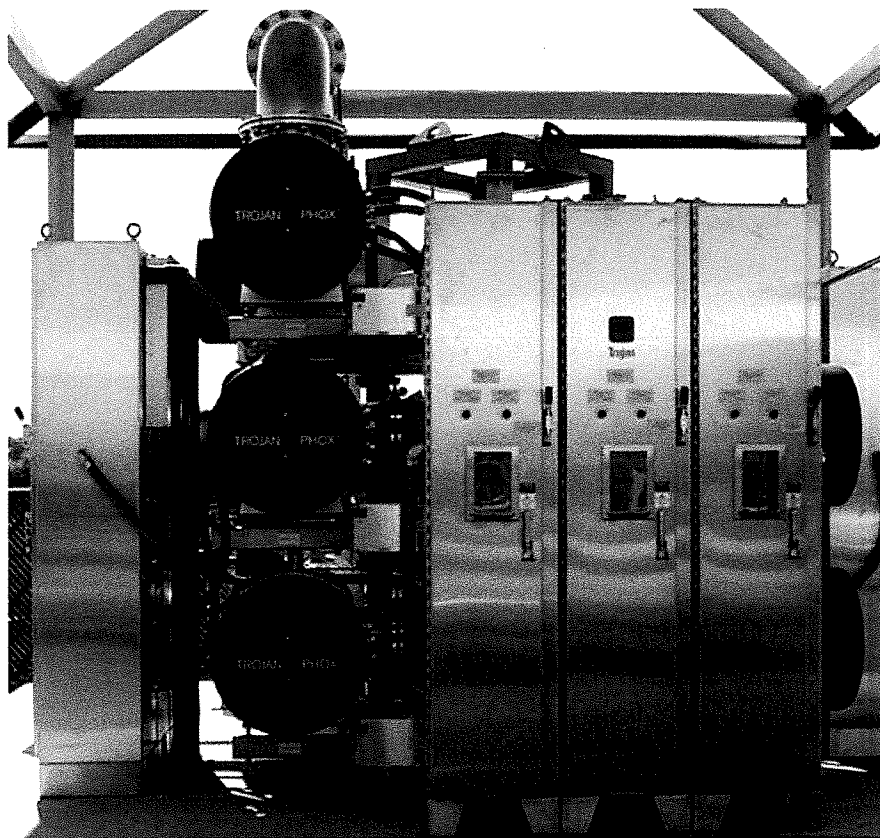
Greensand Filtration for Iron and Manganese Removal



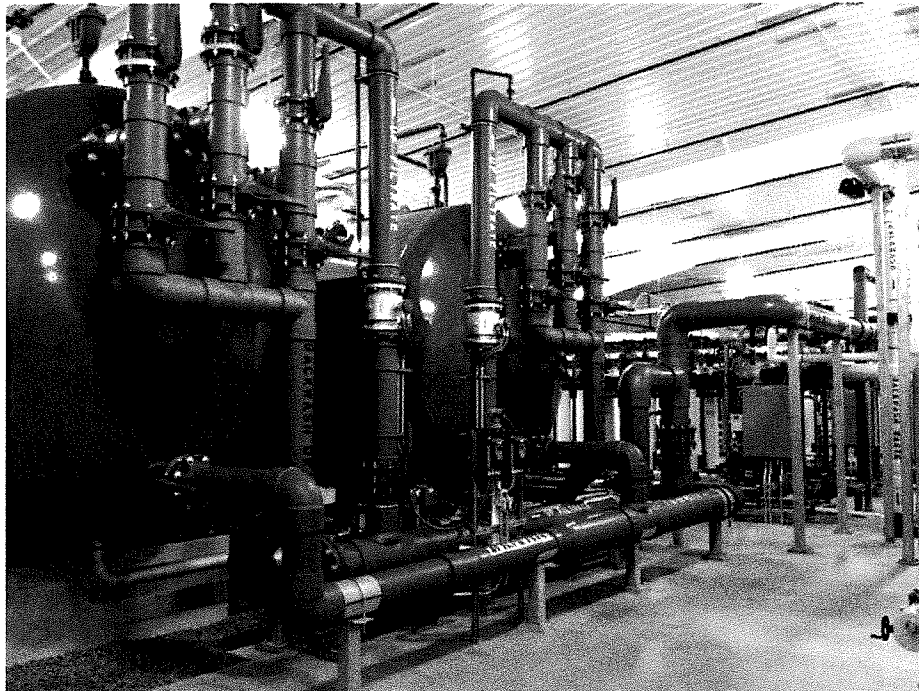
Greensand Filtration for Iron and Manganese Removal



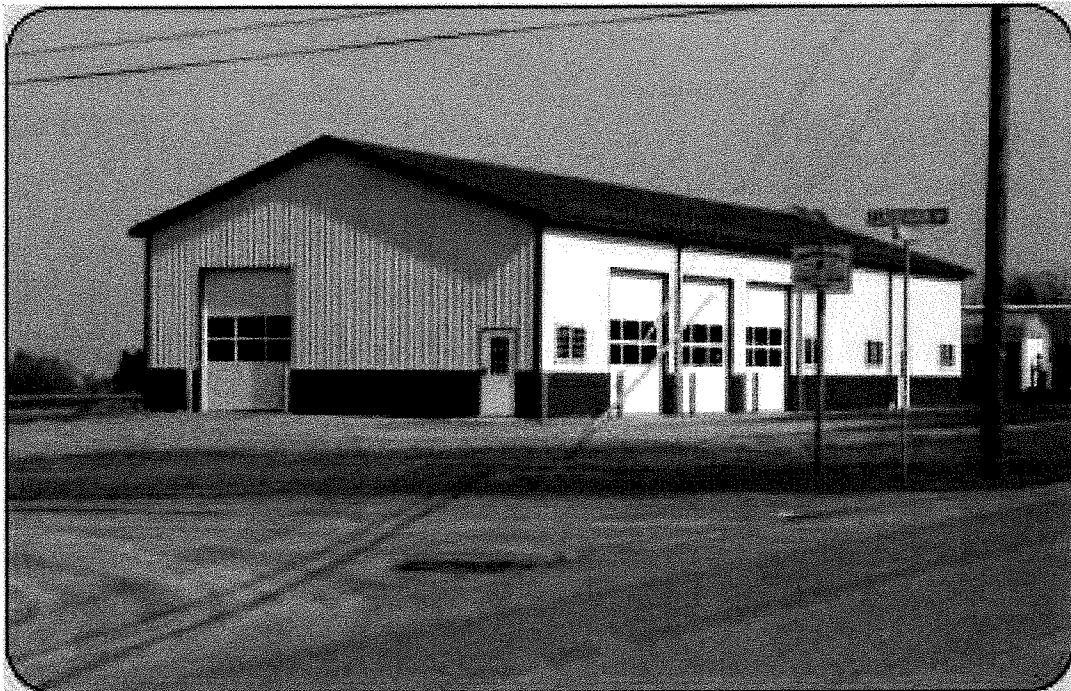
Advanced Oxidation Equipment for 1,4 Dioxane Removal

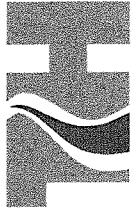
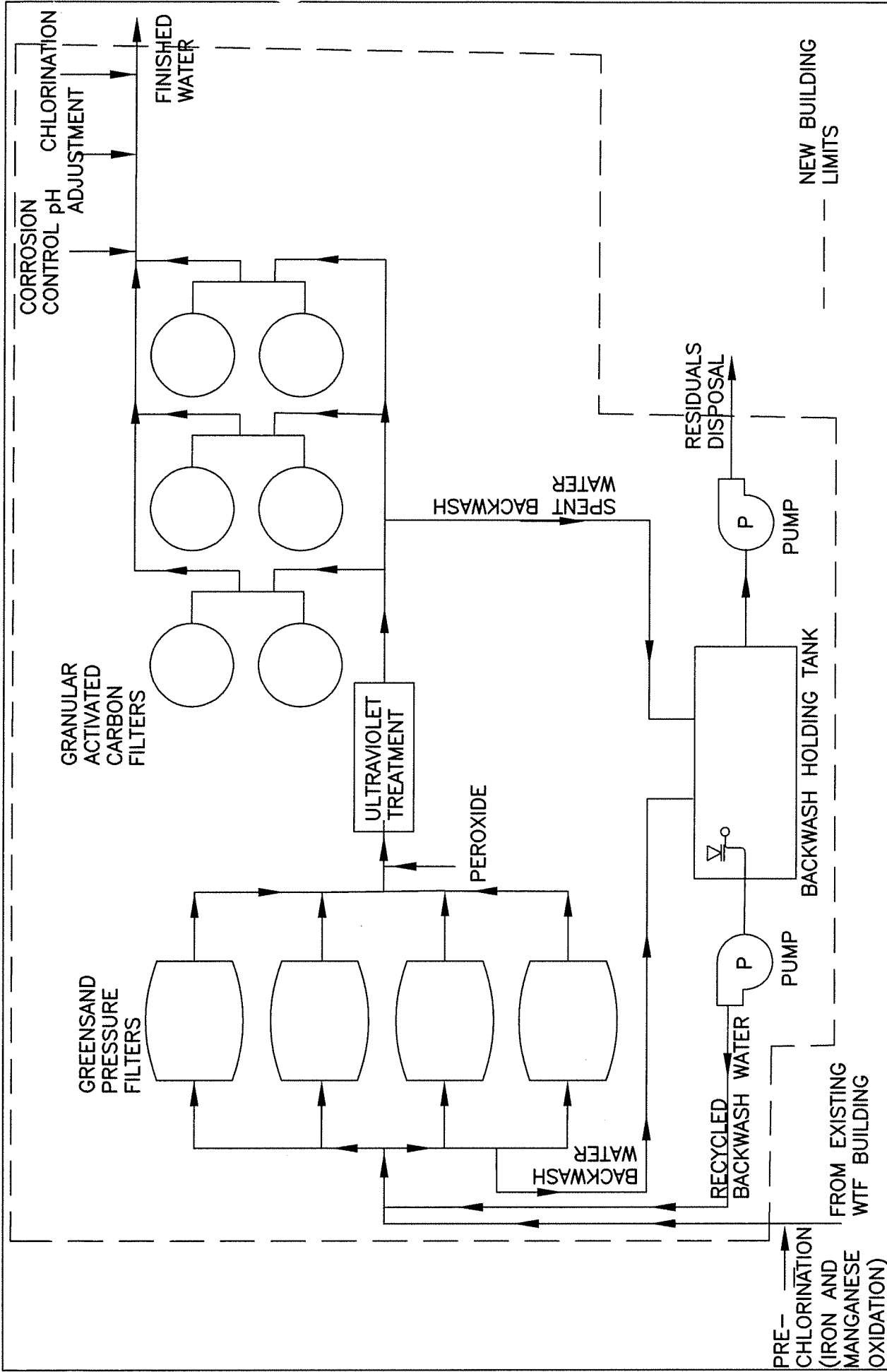


Granular Activated Carbon Filtration for PFOS and PFOA Removal



Pre-engineered Metal Building





TATA & HOWARD

DATE: JANUARY 2018

SCALE: NONE

PROPOSED TREATMENT SYSTEM SCHEMATIC
 OPTION No. 2 - GREENSAND FILTRATION, ADVANCED OXIDATION,
 AND CARBON FILTRATION
 MAHER FILTRATION PLANT - PILOT TEST REPORT

TOWN OF BARNSTABLE DPW - WATER DIVISION

Figure No.

10-1

WALL KNOCKOUT

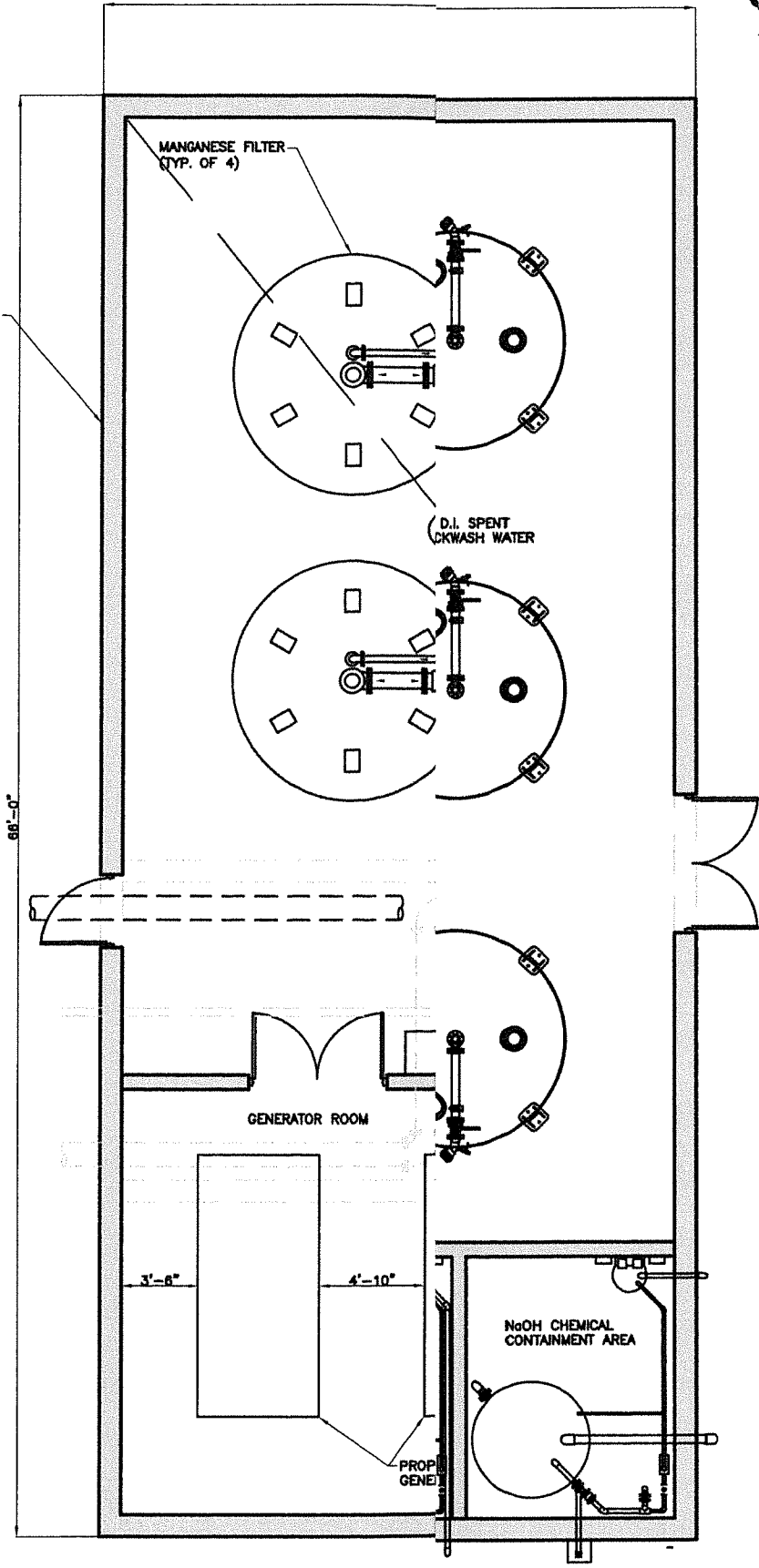


Figure No.

10-2

PRELIMINARY WATER FILTRATION PLANT FIRST FLOOR PLAN
 OPTION NO. 2 - GREENSAND FILTRATION, ADVANCED OXIDATION, AND
 CARBON FILTRATION

MAHER FILTRATION PLANT - PILOT TEST REPORT
 TOWN OF BARNSTABLE DPW - WATER DIVISION



TATA & HOWARD

SCALE: NONE

DATE: JANUARY 2018

**Option No. 1 - Total Estimated Capital Costs
Metal Building, Advanced Oxidation, and GAC Filtration
Maher Filtration Plant**

Description	Estimated Cost
66' x 95' Metal Building, Mechanical, Doors and Windows, Roofing, Waterproofing, Finishes, Specialties	\$870,000
Foundation and Backwash Tank	\$495,000
Site Work	\$210,000
Advanced Oxidation Equipment and Appurtenances	\$700,000
Granular Activated Carbon Filtration Equipment and Appurtenances	\$1,200,000
Floating Supernatant Water and Sludge Pumps	\$65,000
Chemical Feed Equipment	\$100,000
Electrical with Service Upgrade	\$560,000
Emergency Generators	\$355,000
Instrumentation, SCADA, Integration	\$160,000
Subtotal	\$4,715,000
Escalation to Midpoint of Construction (2.5%)	\$120,000
Contractor Overhead & Profit (15%)	\$715,000
General Conditions, Bonds, Insurance	\$550,000
Engineering (Design, Permitting, Bidding, Construction Services)	\$915,000
Contingency	\$1,220,000
TOTAL ESTIMATED PROJECT COST	\$8,235,000

Option No. 2 - Total Estimated Capital Costs
Metal Building, Greensand Filtration, Advanced Oxidation, and GAC Filtration
Maher Filtration Plant

Description	Estimated Cost
66' x 95' Metal Building, Mechanical, Doors and Windows, Roofing, Waterproofing, Finishes, Specialties	\$870,000
Foundation and Backwash Tank	\$495,000
Site Work	\$210,000
Greensand Filtration Equipment and Appurtenances	\$1,200,000
Advanced Oxidation Equipment and Appurtenances	\$700,000
Granular Activated Carbon Filtration Equipment and Appurtenances	\$1,200,000
Floating Supernatant Water and Sludge Pumps	\$65,000
Chemical Feed Equipment	\$100,000
Electrical with Service Upgrade	\$740,000
Emergency Generators	\$355,000
Instrumentation, SCADA, Integration	\$215,000
Subtotal	\$6,150,000
Escalation to Midpoint of Construction (2.5%)	\$155,000
Contractor Overhead & Profit (15%)	\$945,000
General Conditions, Bonds, Insurance	\$725,000
Engineering (Design, Permitting, Bidding, Construction Services)	\$1,200,000
Contingency	\$1,595,000
TOTAL ESTIMATED PROJECT COST	\$10,770,000

**Proposed Project Schedule - Engineering and Construction
Maher Filtration Plant
Option No. 2 – Greensand Filtration, Advanced Oxidation, and GAC Filtration
Barnstable, Massachusetts**

Date	Milestone
January 19, 2018	Submit pilot test report to Town and MassDEP
February 28, 2018	Receive MassDEP response/approval of pilot test report and New Technology Approval
May 4, 2018	Submit 50% draft design plans to Town
July 20, 2018	Submit 90% draft design plans and specifications to Town and MassDEP for BRP WS 24 Approval and DWSRF approval ¹
August 17, 2018	Receive MassDEP approval of design documents and DWSRF approval ²
August 20, 2018	Submit 99% draft plans and specifications to Town for DPW Administration approval
September 19, 2018	Bid advertisement/bid documents available
September 26, 2018	Pre-bid conference
October 10, 2018	Sub-bid opening
October 31, 2018	General bid opening
November 16, 2018	Receive DWSRF Authorization to Award
December 7, 2018	Execute construction contract
December 19, 2018	Preconstruction conference
January 10, 2019	Shop drawing reviews ³
January 21, 2019	Start construction
April 20, 2020	Begin full facility startup
May 29, 2020	Complete construction and facility fully on-line ⁴

¹ Assumes one 90% draft review of the plans and specifications by the Town and return of 90% draft edits and comments to Tata & Howard by August 3, 2018.

² A 30-day expedited review period by the MassDEP is assumed.

³ This marks the date of initial shop drawing reviews required for the start of construction. Additional shop drawing reviews will occur during construction.

⁴ Assumes an 18-month construction period.