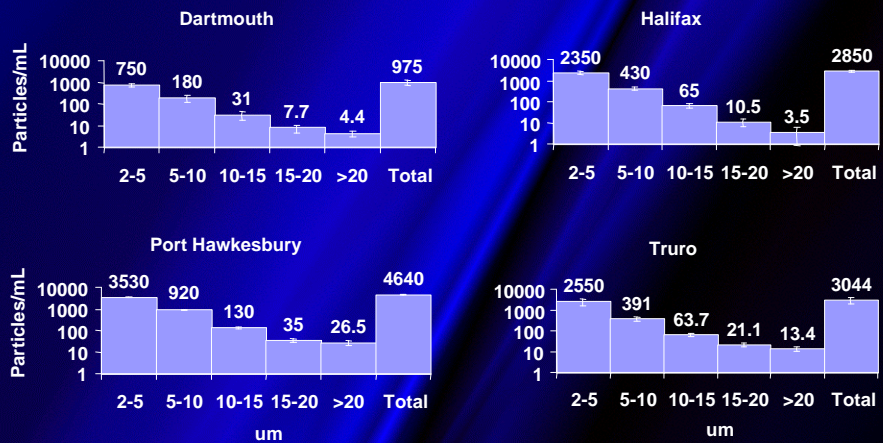


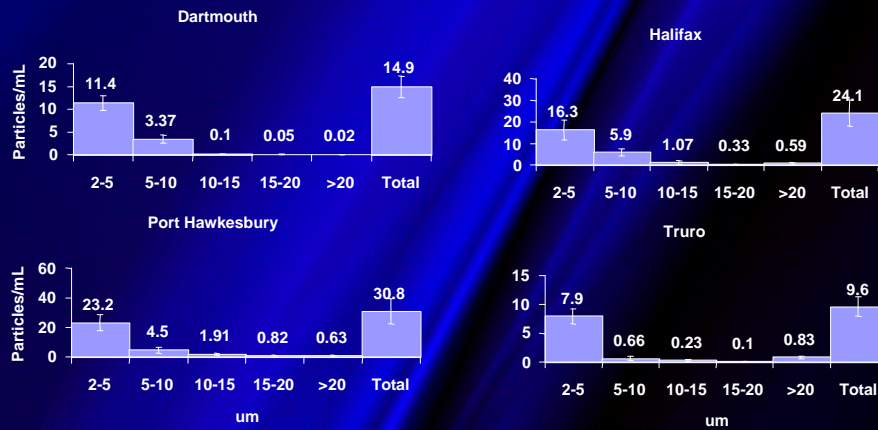
Comparison of NS Plants

Parameter	Halifax		Dartmouth		Truro		Port Hawkesbury	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated
Alkalinity, mg/L	< 1.0	35	<1.0	15	5.8	42	4	15
Color, TCU	5.4	<3.0	11	7.3	51	7	35	<5
Hardness, mg/L	4.6	47	6	16	13.4	68	15	-
Iron (total), mg/L	0.04	<0.03	0.05	<0.03	0.26	0.012	0.1	-
pH	5.4	8.8	6	8.8	6.5	8.38	6.5	7.5
Turbidity, NTU	0.4	0.35	0.35	0.03	2.10	1.01	1.1	0.11
Total organic carbon, mg/L	2.6	1.4	3.4	1.5	5.2	2.8	16.5	4.5

Comparison of Particle Removal: Raw Water



Comparison of Particle Removal: Filtered Water



Comparison of NS Plants: Overview

- Each plant has different treatment train
 - Able to obtain very comparable treated water values for dissolved species
 - Iron/Manganese below detection
 - TOC is low for all
 - Turbidity is below detection
 - Minor particle differences were detected among plants
 - Filter porosity

Membrane Processes

- Membrane technology has been used for water purification for many years
 - Power generation (reverse osmosis)
 - Food & Beverage
 - Aerospace
- Over the past 5+ years has gained wide interest and acceptance as a viable method drinking water treatment
 - Particularly for improved pathogen control

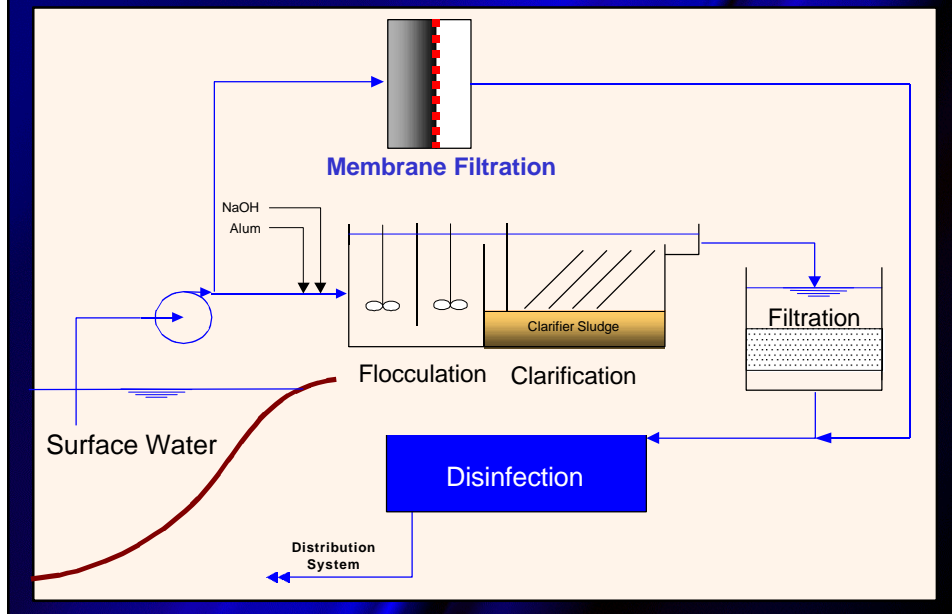
Membrane Processes: Objective of Section

- Present theory and operation of membrane processes in water treatment
 - Immersed membrane systems
 - Enhanced coagulation
- Provide treatment performance and operational characteristics of membrane plants in Canada

Advantages of Membrane Processes

- Less (if any) reliance on coagulation, flocculation, clarification
- Provide a physical barrier for removing submicron particles
 - *Cryptosporidium* and *Giardia*
- Reduction in chemical demands
 - The need for coagulants is reduced, which also reduces sludge disposal costs
- Smaller plant footprint

Conventional vs. Membrane Processes



Membrane Operation

- **Pressure gradient** forces water across semi-impermeable membrane
 - Either a suction pump on the permeate side
 - OR
 - Pump pushing water through on the feed side
- **Flux** is used to describe the flow rate across a unit area of membrane
- **Recovery** describes the % of feed water that is processed by the membrane

