

City of Hastings

Water System Disinfection Alternatives Analysis

Alternative	Provide Residual Protection in Distribution System by itself?	Additional Disinfection Implements Needed for Distribution Protection?	Risks of Microbiological Contamination Reduced?	Physical Space/Facility Modification Needs	Can Additional Treatment Types (i.e. Nitrates, PFCs) be integrated afterward?	Operational Management Effort	Initial Capital Costs*	Annual Operational Costs	Capital Cost when paired with method for residual protection	Annual Operational Cost when paired with method for residual protection	Costs per singular action
Chlorine Gas	Yes	No	Yes - continual protection.	Small to Modest, depending on facility	Yes - easily configured. System can be designed in anticipation of future treatment methods.	Low - dosing levels can be set and do not require frequent checking.	\$351,000	\$44,000	N/A	N/A	N/A
Sodium Hypochlorite (Liquid)	Yes	No	Yes - continual protection.	Small to Modest, depending on facility	Yes - easily configured. System can be designed in anticipation of future treatment methods.	Low to moderate - management of dosing levels requires more attention than Gas option.	\$155,000	\$99,000	N/A	N/A	N/A
Ozone	No - eliminates pathogens and microbiological contaminants only from source water.	Yes - required by standards.	Only when paired with method for protection in distribution system.	Small to Modest, depending on facility	Yes. Moderate to significant impact depending on size, scale, and type of additional treatment.	Significant	\$3,000,000	\$104,000	\$3,155,000 to \$3,351,000	\$148,000 to \$203,000	N/A
Ultraviolet Light	No - eliminates pathogens and microbiological contaminants only from source water.	Yes	Only when paired with method for protection in distribution system.	Significant	Yes. Moderate to significant impact depending on size, scale, and type of additional treatment.	Moderate	\$750,000	\$22,000	\$905,000 to \$1,101,000	\$66,000 to \$121,000	N/A
Shock Chlorination	No - temporal and performed only once or twice annually.	No	No. This method does not offer continual protection.	None	N/A	Moderate and intermittent - intense staffing needs during operation, with significant communications efforts.	N/A	N/A	N/A	N/A	Estimated \$10,000 of staffing costs and chemicals
Filtration	No - removes contaminants only from source water.	Yes - required by standards.	Only when paired with method for protection in distribution system.	Small to Modest, depending on facility	Yes. Moderate to significant impact depending on size, scale, and type of additional treatment.	Low to moderate depending on type of filtration.	\$15 to \$20+ Million, depending on type**	\$50,000-\$120,000 (sand filtration) Minimal for membrane filtration, but periodic replacement of membrane is required (\$600,000)	\$15.2-\$20.5+ Million	\$100,000-\$220,000 (sand filtration) \$50,000-\$100,000 (membrane filtration) Periodic membrane replacement (\$600,000)	N/A
Ongoing Comprehensive Inspection & Enforcement	No	N/A	No, but likelihood of discovering potential risks is increased.	N/A	Yes. Moderate to significant impact depending on size, scale, and type of additional treatment.	Significant - requires examination of all private plumbing work on 7,800+ served properties in the City. Requires intense efforts in scheduling visits to properties, and consent of owners.	None	Significant - would require several full-time staff dedicated to task.	N/A	N/A	N/A
Do Nothing	No	N/A	No	None	N/A	None	None	None	None	None	N/A

*Does not include design and project management overhead costs, which range from 15%-30% and depend on the variable characteristics of each site where implementation is being made.

**Membrane filtration requires extensive operational efforts and costs, and process results in up to 30% of source water being sent to waste. Sand filtration system requires large amount of space, but minimal operation and maintenance efforts.