

Proposed Treatment Alternatives & Facility Upgrades for Okanese Cree Nation Drinking Water Treatment Plant

Alora Eberle, Areeg Ahmed, Caitlin Gillis, Nada Hosni
 Internal Supervisor: Stephanie Young
 External Supervisor: Deon Hassler

Treatment Objectives:

- Meet SK Drinking Water Quality Guidelines
- Fit Upgrades into the Existing Building
- Minimal Operation & Maintenance
- Cost Effective
- Sustainable
- Community Acceptance

Constituents:

- Ammonia
- Iron
- Manganese
- Sulphate
- Sodium
- TDS

Location in SK:

Okanese Cree Nation
 2050 Population: 545
 2050 Water Demand: 1.00 L/S
 Regina

Existing Process



= Not Functional
 Nanofiltration Rapidly Fouling

Alternative 1: Retrofit



Alternative 2: Direct Reverse Osmosis



Alternative 3: Biofiltration & Reverse Osmosis



- Optional Polishing BAF Following Ammonia BAF
- Oxygen Generation Before Each BAF
- Existing Greensand Vessels can be Converted into BAFs

All Alternatives:

- Raw Water Source: Groundwater Wells
- RO Pretreatment: Anti-Scalant & Pre Filtration
- RO Posttreatment: Calcite Contactors
- RO Rejected Water (~25%) Applications: Lagoon Holding for Later Reclamation Toilet Flushing Irrigation

Biological Aerated Filters (BAF):

- Use High Surface Area Media Called Filtralite
- Microorganisms Live on the Media in a Biofilm and Chemically Oxidize the Constituents
- Microorganisms that Remove Iron and Ammonia are Different, so 2 Filters are Needed
- High Dissolved Oxygen is Required

Cost Estimation (± 15%):

Alt.	Category	Cost
Alt. 1	Capital Cost	\$821 850
	Annual Maintenance and Operation	\$65 000
Alt. 2	Capital Cost	\$752 100
	Annual Maintenance and Operation	\$60 950
Alt. 3	Capital Cost	\$1 269 550
	Annual Maintenance and Operation	\$78 200

Facility Upgrades Addressed:

- Ventilation & Heating
- Backup Power Source
- Automation
- Building Height Extension

Recommended Design: Biofiltration & Reverse Osmosis

- Will Produce High Quality Drinking Water
- Fits in Existing Building
- Operation & Maintenance is Manageable
- Existing Greensand Vessels can be Converted into BAF
- Will Treat Ammonia Without Breakpoint Chlorination
- Biological Process is Preferred by Community
- Unconventional but Sustainable for the Community
- Support from Similar Neighboring WTP

Weighted Matrix:

Objective	Weight	Alternative 1: Retrofit		Alternative 2: Direct RO		Alternative 3: Biofiltration & RO	
		Evaluation	Score	Evaluation	Score	Evaluation	Score
	5	3.5	17.5	3.5	17.5	5	25
	2.5	4	10	5	12.5	4	10
	4	2	8	4.5	18	4	16
	3	4	12	3	9	2	6
	5	1	5	4	20	4.5	22.5
	3.5	2	7	4	14	5	17.5
Overall Score		59.5		91		97	

Flow Schematic:

Biofiltration & Reverse Osmosis

