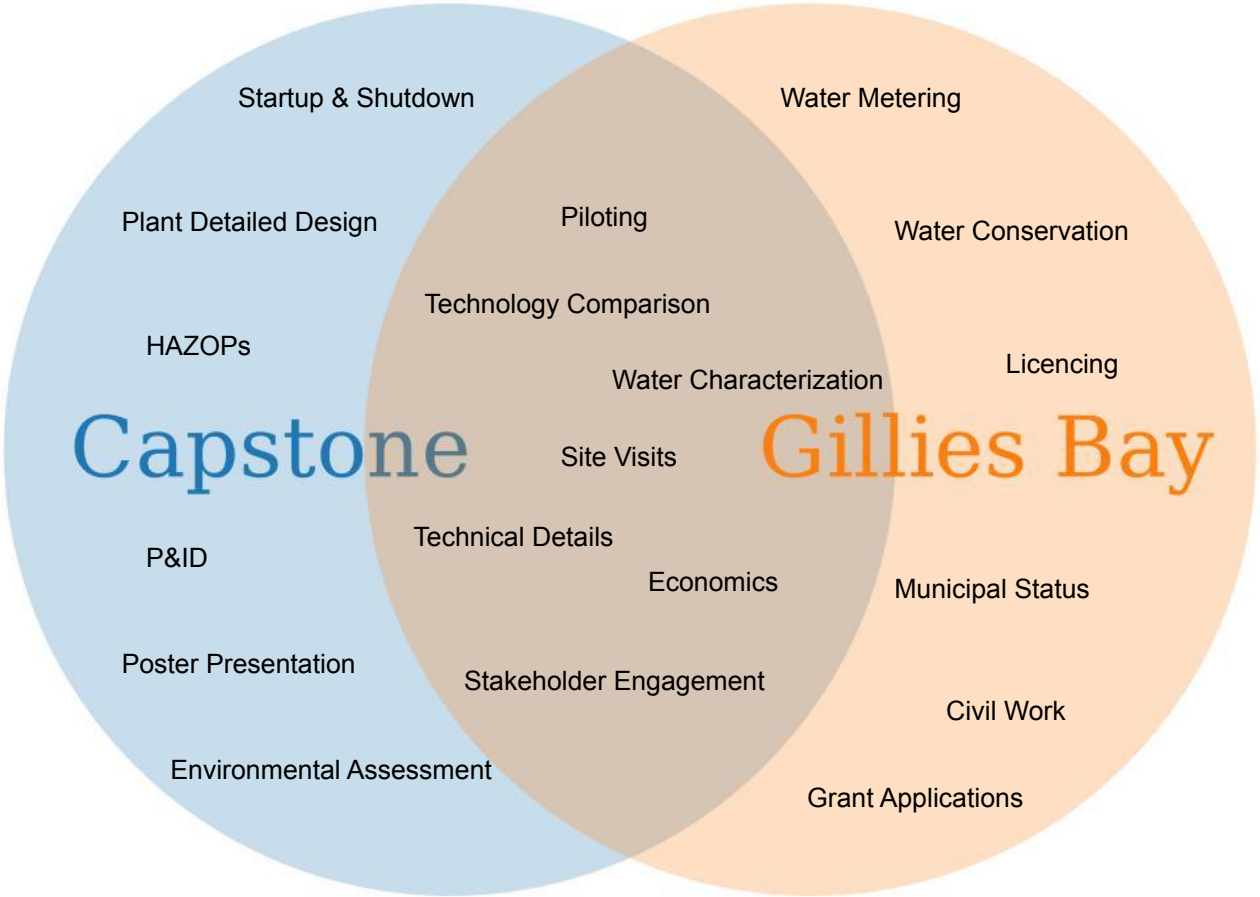
GBID Water Treatment Project

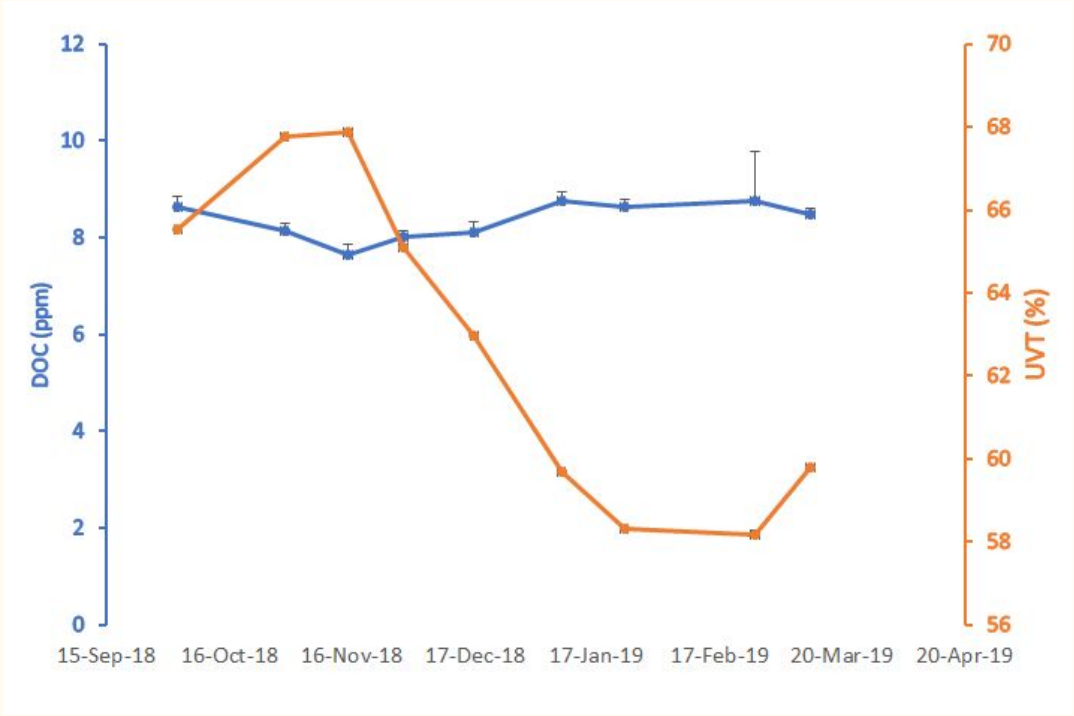

Startup & Shutdown
Plant Detailed Design
HAZOPs
P&ID
Poster Presentation
Environmental Assessment
Capstone
Piloting
Technology Comparison
Water Characterization
Site Visits
Technical Details
Economics
Stakeholder Engagement
Water Metering
Water Conservation
Licencing
Gillies Bay
Municipal Status
Civil Work
Grant Applications

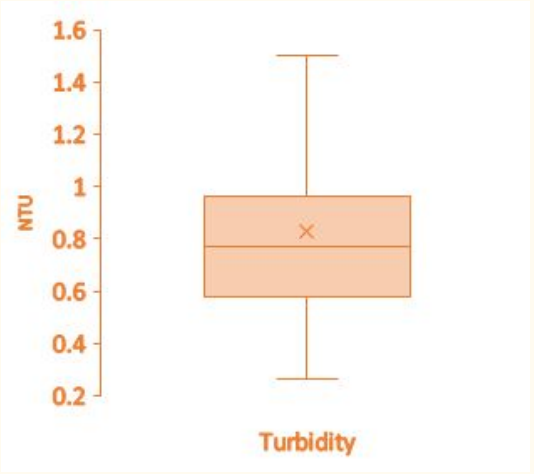
Overview of Presentation

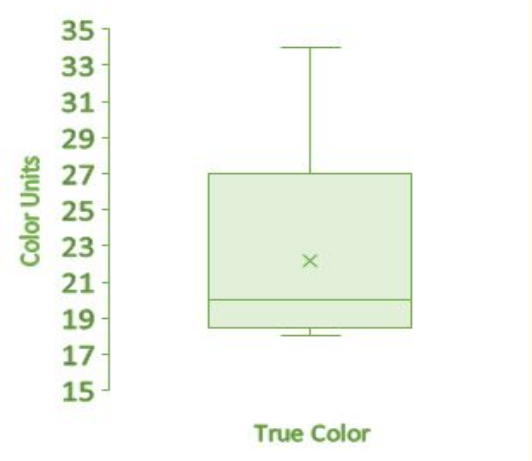
- Water Quality
- Capstone Project
  - Synthesis tree
  - Plant design
  - Economic analysis
- Project Moving Forward
  - Treatment technology options
  - Piloting logistics
  - Open floor for group discussion
- Ask Questions!

Water Quality

Water Quality

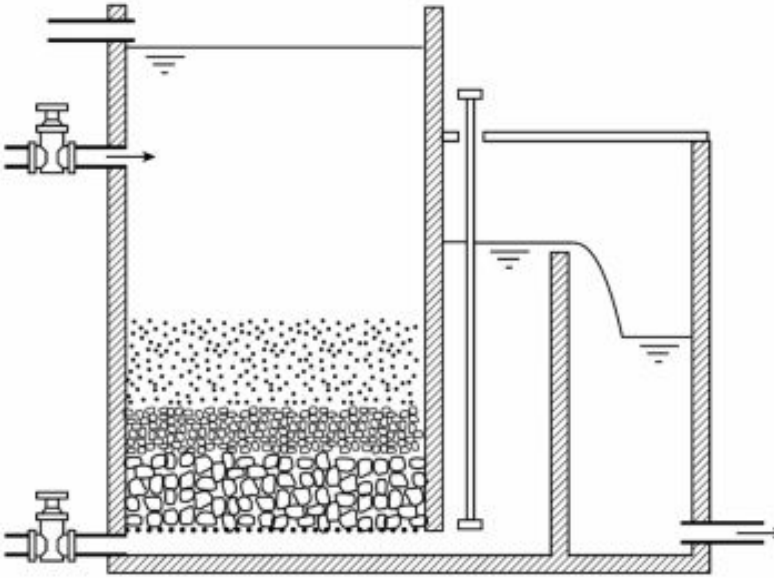


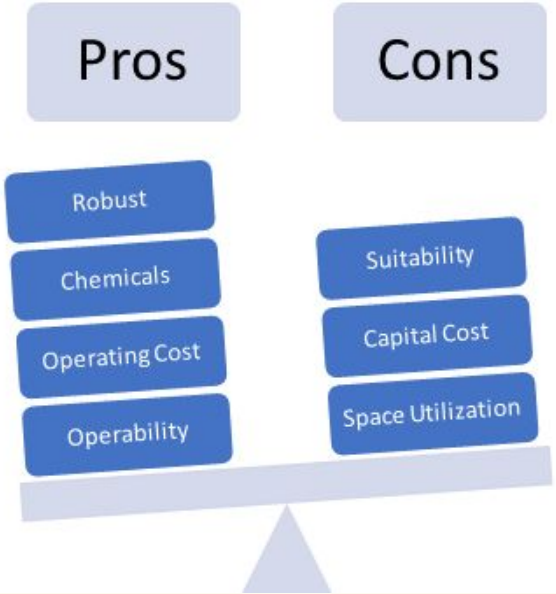




Capstone

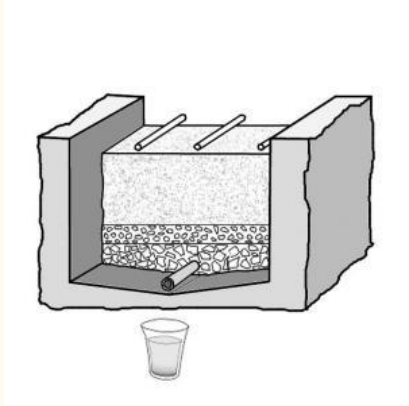
Slow Sand Filtration





- Various sand/gravel layers filter water
- Top layer provides biological filtration/pathogen removal

Other Filtration Methods



Rapid Sand Filtration:

- Pros: Effective turbidity removal, small footprint, quick cleaning time
- Cons: Ineffective for removal of bacteria, viruses, and organic matter, cleaning every 24-72 hrs

Membrane Filtration:

- Pros: Removal of viruses, bacteria, suspended solids, softens water, reduces colour
- Cons: Increased energy consumption, pretreatment may be required

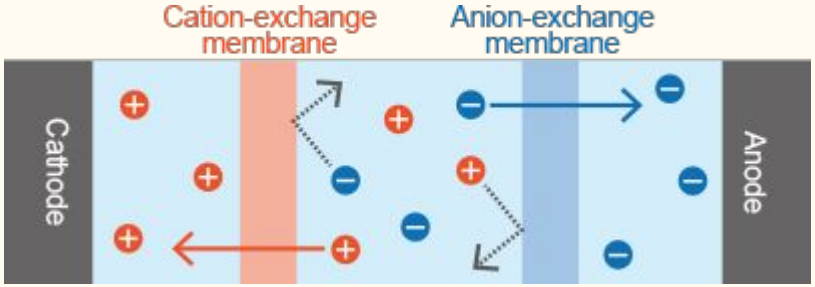
Biological Filtration:

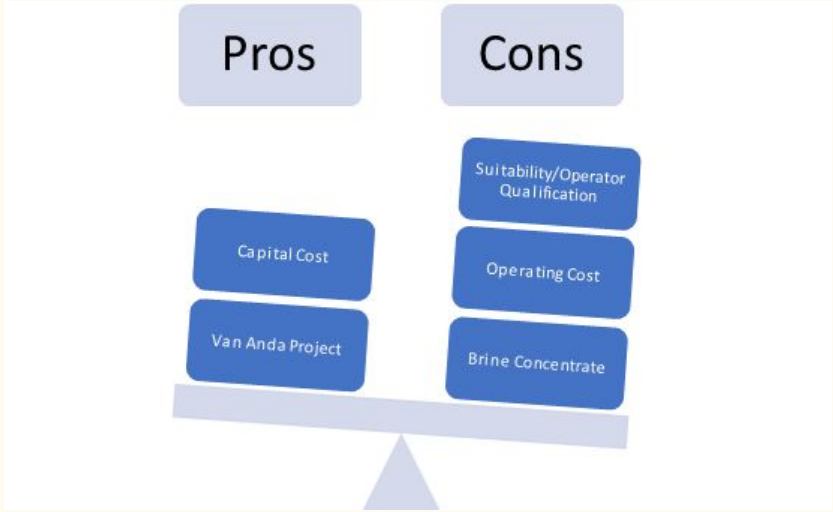
- Pros: Removes organic matter, reduces turbidity, different media choices for bacteria attachment
- Cons: Ozone and coagulant required prior, large footprint

IOX/MIOX

Process

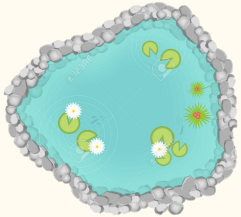
- Resin treated membranes pull ions from one solution and release same polarity ions into a concentrate solution
- One clean stream and one brine concentrate stream produced





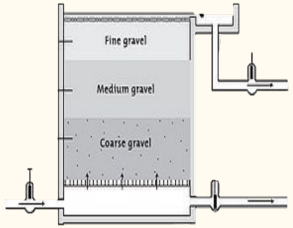
Capstone Slow Sand Filtration

Treatment Process

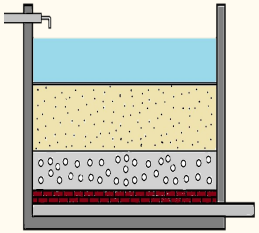


Cranby Lake

Ozone Generation



Roughing Filter



Slow Sand Filter

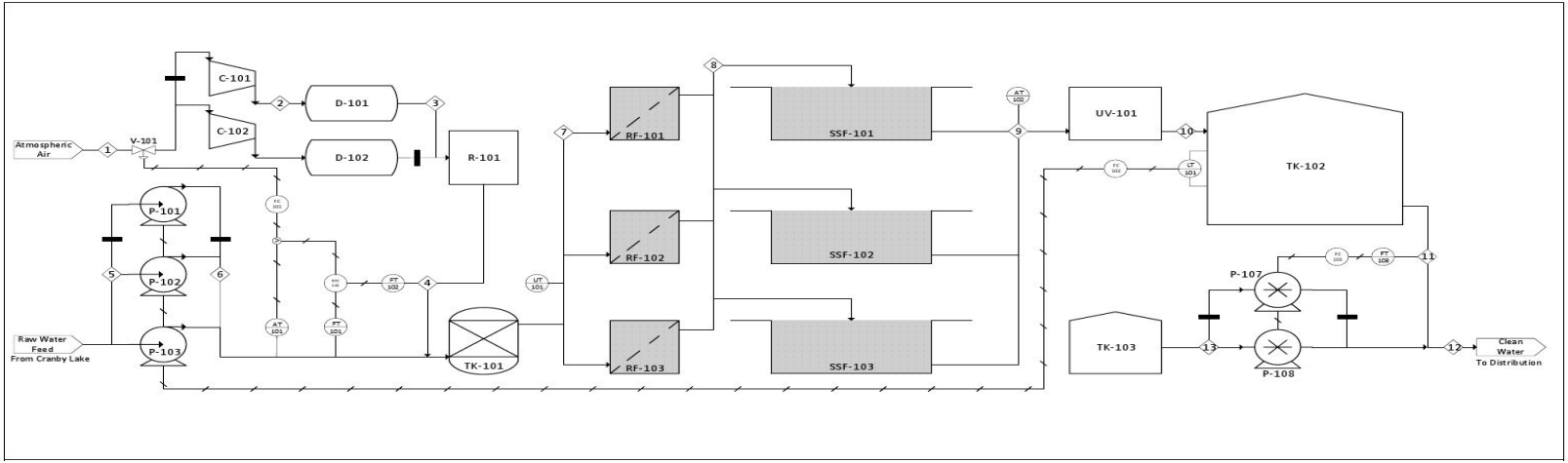
UV Disinfection

Reservoir

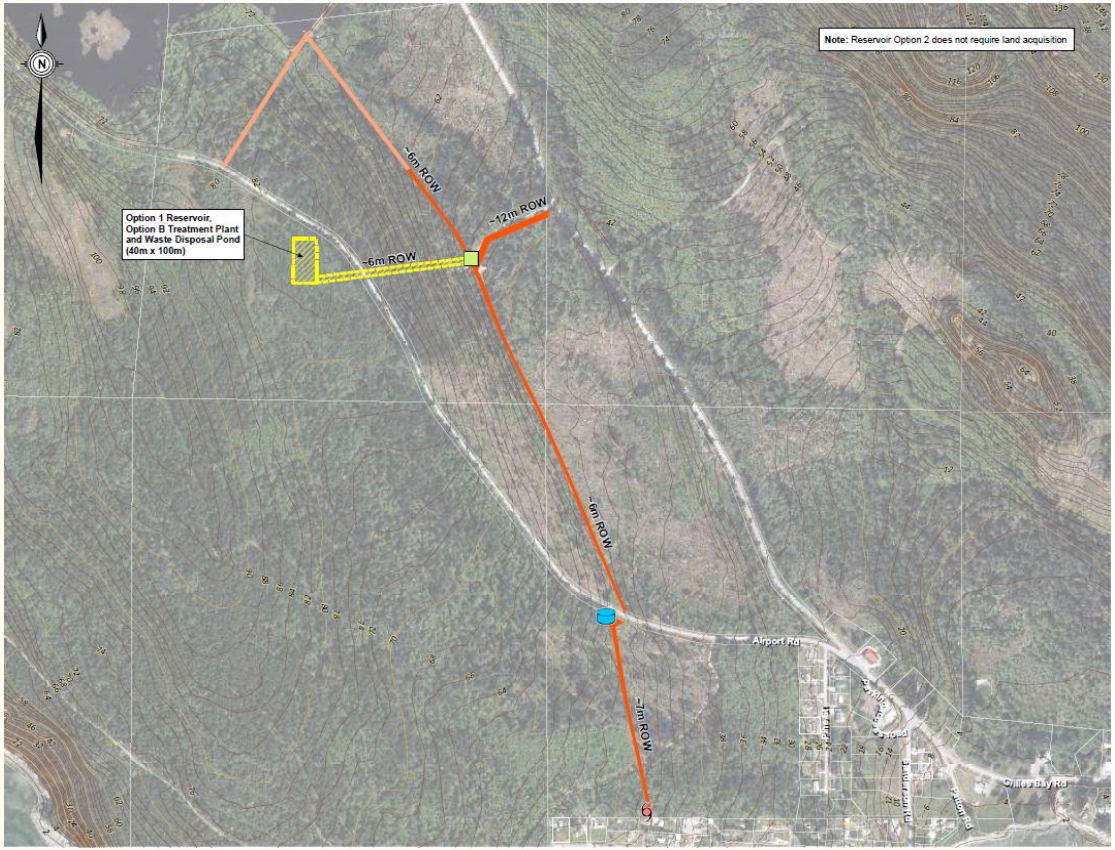
Chlorination

Distribution

Preliminary PFD

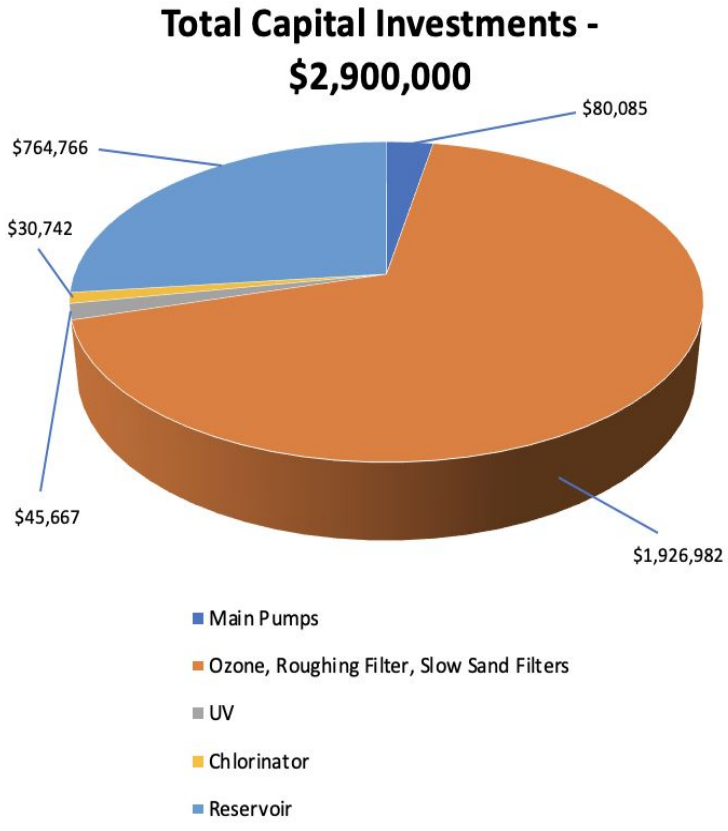


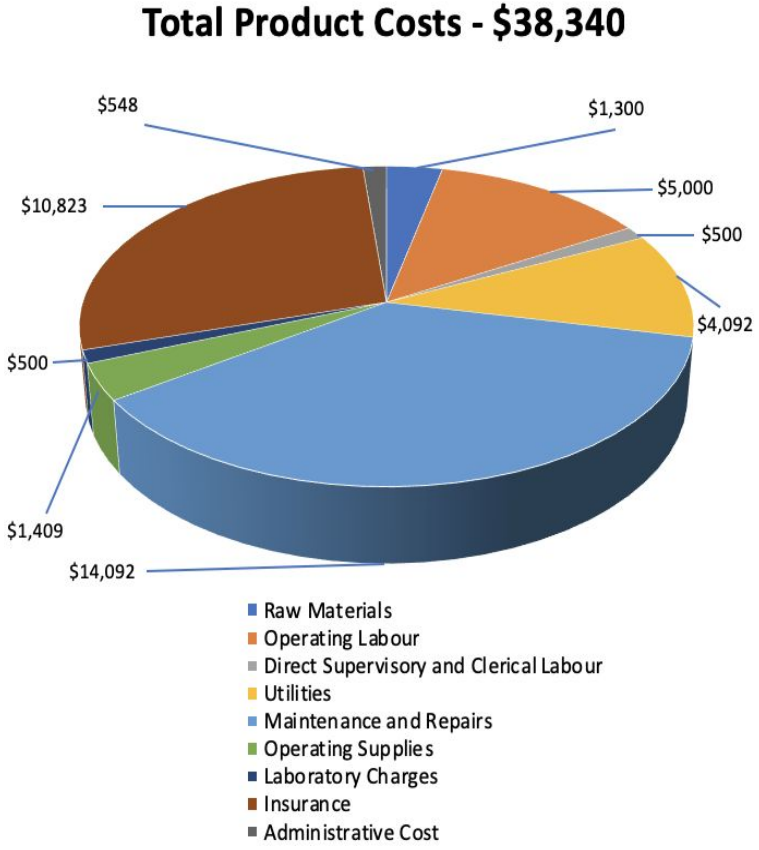
Plant Location



Courtesy of KWL, *Master Water Plan Report*

Economics


Total Capital Investments - $2,900,000
$80,085
$764,766
$30,742
$45,667
$1,926,982
Main Pumps
Ozone, Roughing Filter, Slow Sand Filters
UV
Chlorinator
Reservoir


Total Product Costs - $38,340
$548
$1,300
$10,823
$5,000
$500
$4,092
$500
$1,409
$14,092
Raw Materials
Operating Labour
Direct Supervisory and Clerical Labour
Utilities
Maintenance and Repairs
Operating Supplies
Laboratory Charges
Insurance
Administrative Cost

Treatment Technology

MS Filter Package

Pre-ozonation → Roughing Filter → Slow Sand Filtration

- Simple
- Effective treatment*
  - Organics removal
  - Colour removal
- No chemicals
- High upfront costs

Quote:

Capital Expenditure: $900,000

Operating Expenditure: $20,000/year**

*as per data available today which excludes summer water quality

**includes labour, Cl2, replacements parts, electricity

BI Pure - Ion Exchange

Pre-treatment → Ion Exchange

- Middle River, Van Anda
- Resin regeneration
- Brine
- Suitability (hard water, conductive water
- Potential pretreatment

Quote: (Awaiting)

Canadian Water Technologies - Ultrafiltration

Strainer → Ultrafiltration

- Lower upfront cost
- More labour intensive
- Additional nanofiltration for colour
- Chemicals to be shipped for cleaning
- Pre-treatment may be necessary

<u>Quote:</u>

Capital Expenditure: $250,000

Electricity: $2000/year

Chemical: $500/year

Posed Suggestions

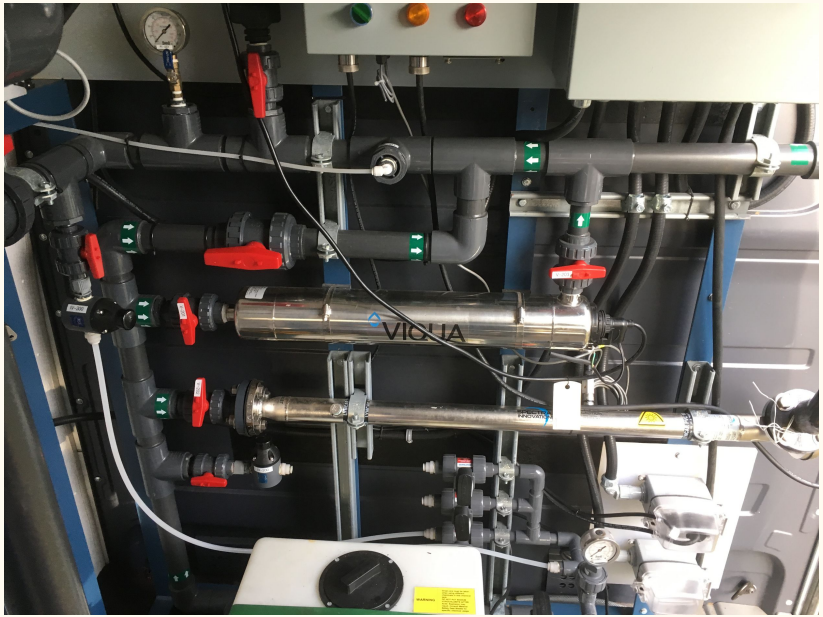
- Modular Implementation Concept
  - As suggested in October, not industrially done
  - Not feasible if suggestion is to implement MS Filter Package
- Basic Option
  - Add roughing filter/increased filter at intake
    - Cheap alternative
    - Will improve slightly water quality
    - Will greatly reduce system flushing
  - Not much technical work done yet

Courtesy of *Federal Screen Products Inc.*

Piloting

Logistics

- Needs to be minimum 1-2 months in spring/summer
- RES'EAU Resources
- Choose a variety of technologies



Piloting Logistics and Options

- MS Filter
  - Suggested if > ~10ppm DOC
  - Previous MS Filter Packages have not required piloting if data below this threshold
  - MS Filter seems willing to allow us to run pilot
- Selection of alternate technologies

- When?
  - Ideally, 1 year of data gathered
  - Pilot early as this summer
    - Capstone project still relevant

Thank you

GBID
Audrey Atkins
Theresa Beech
Danusia Kusmierek
Jim Mason
Tara Schumacher
Anton Stetner
Ken Taylor
And all trustees/board members

RES'EAU
Siddharth Bhartia
Maryam Dezfoolian
Keyvan Maleki
Madjid Mohseni

KWL
Irfan Gehlen
Siobhan Robinson

UBC
Sergio Berretta
Pierre Berube
Lee Rippon
Kevin Smith
Jonathan Verrett

Speaking Points

1. Technology Options
2. Budgeting/Grants
3. Piloting
4. Plant Location

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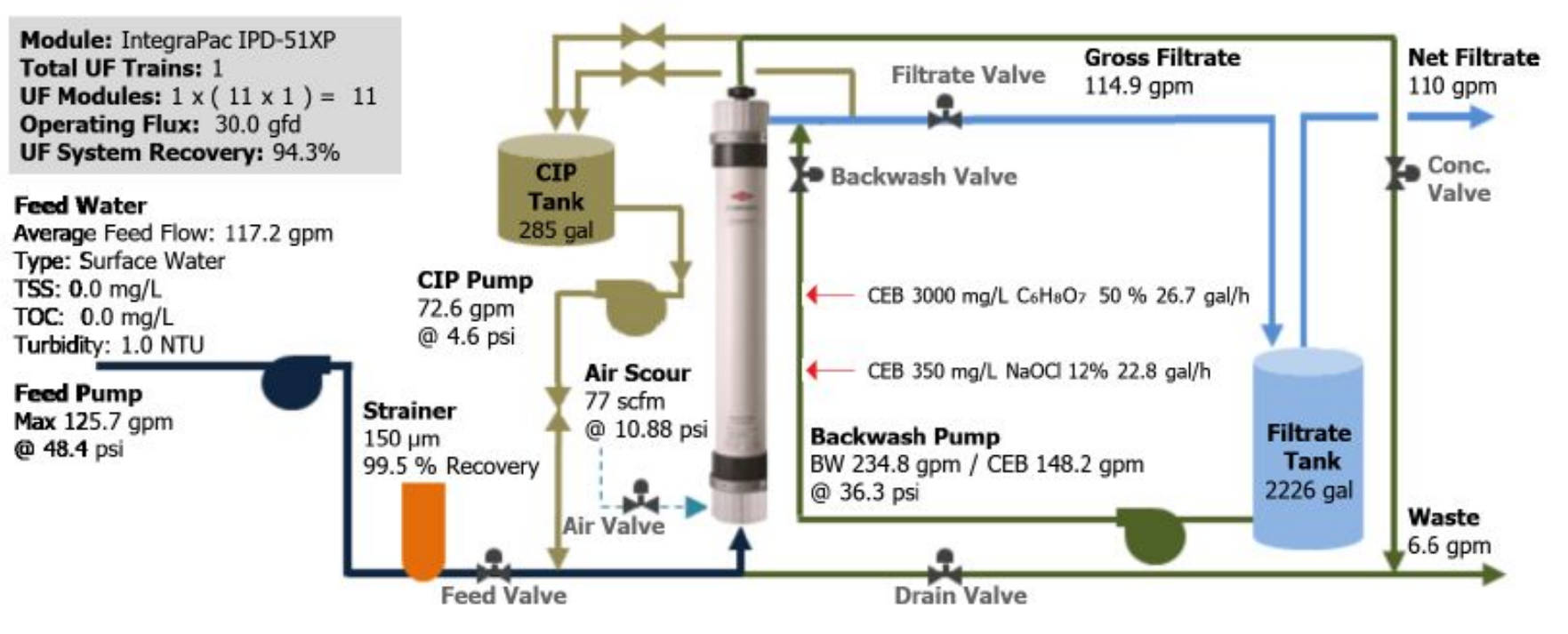
Appendix

Canadian Water Technologies - Ultrafiltration



Canadian Water Technologies - Ultrafiltration

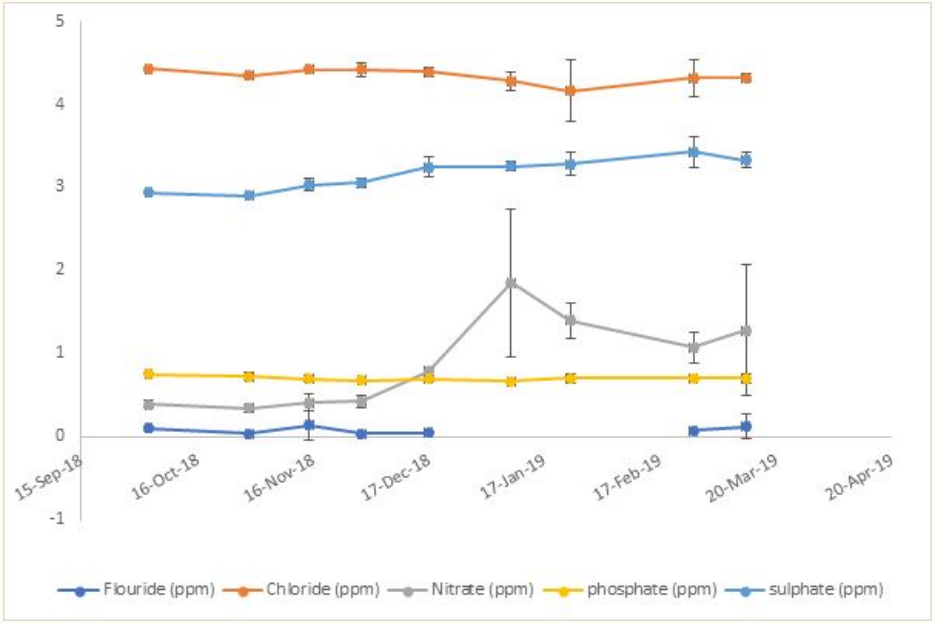
Canadian Water Technologies - Ultrafiltration

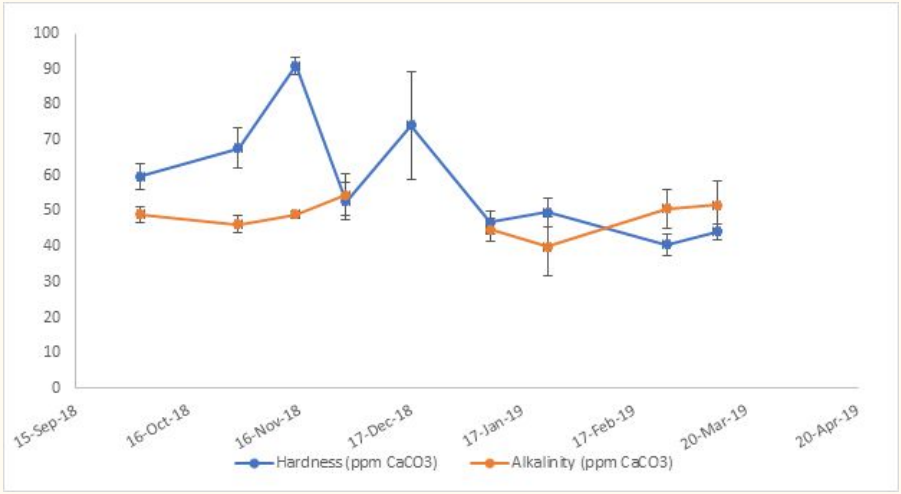
- notes:
- 1 train, 11 modules
- Flow rate 117.2 GPM (639m^3/day)
- $250,000 CapEx
  - Complete UF, 100 micron disc filter, clean system, CEB system (+ pumps), feed pumps, backwah pumps, I&C + PLC, chemical day tanks,
  - NO filtrate clearwater tank (reservoir)
- Typically does not remove colour (Nanofilter as secondary treatment could do this)
- Wastewater disposal - 36m^3/day

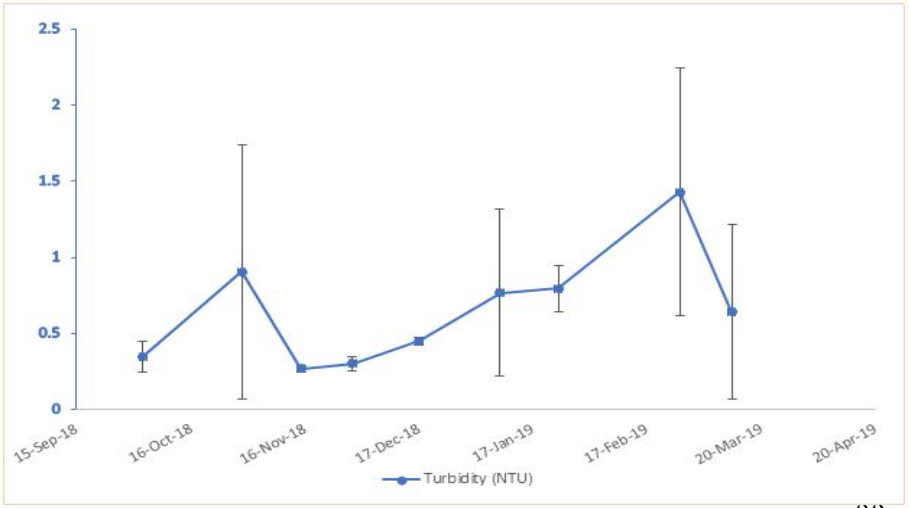
Canadian Water Technologies - Ultrafiltration

- Notes:
- OpEx: CAD
- $2000/year electricity
- $500/year additional chemical (does not include shipping to GB)
- $1100/year chlorine (same as MS Filter assumption)
- Replacement Costs:
- Additional Labour costs (eg service call, general labour, operator upgrade):

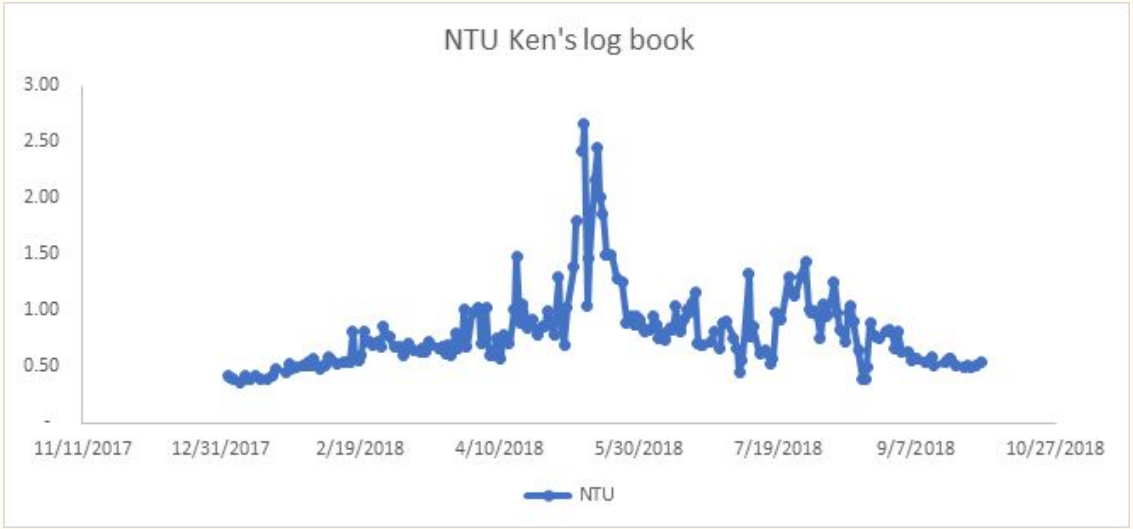
Water Quality Cont'd

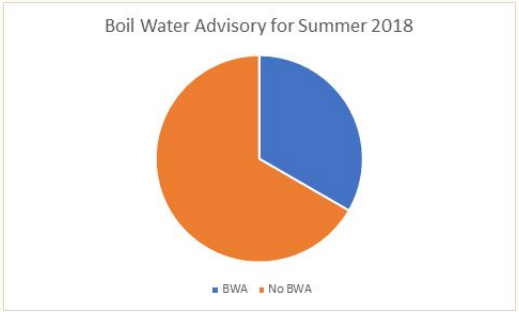


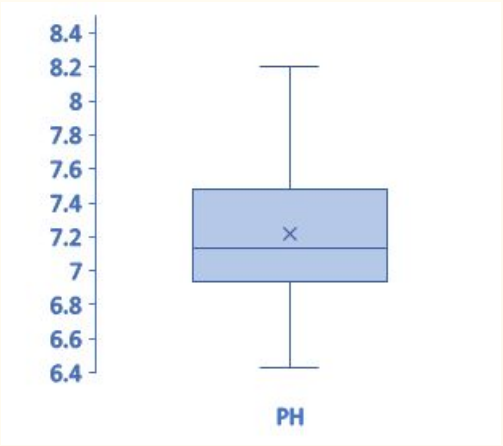




Water Quality Cont'd (Ken's log book)







Water Quality Cont'd (Exova)