

***Town of Regina Beach
Municipal Waterworks***

***Water Treatment Facilities
Predesign Review***

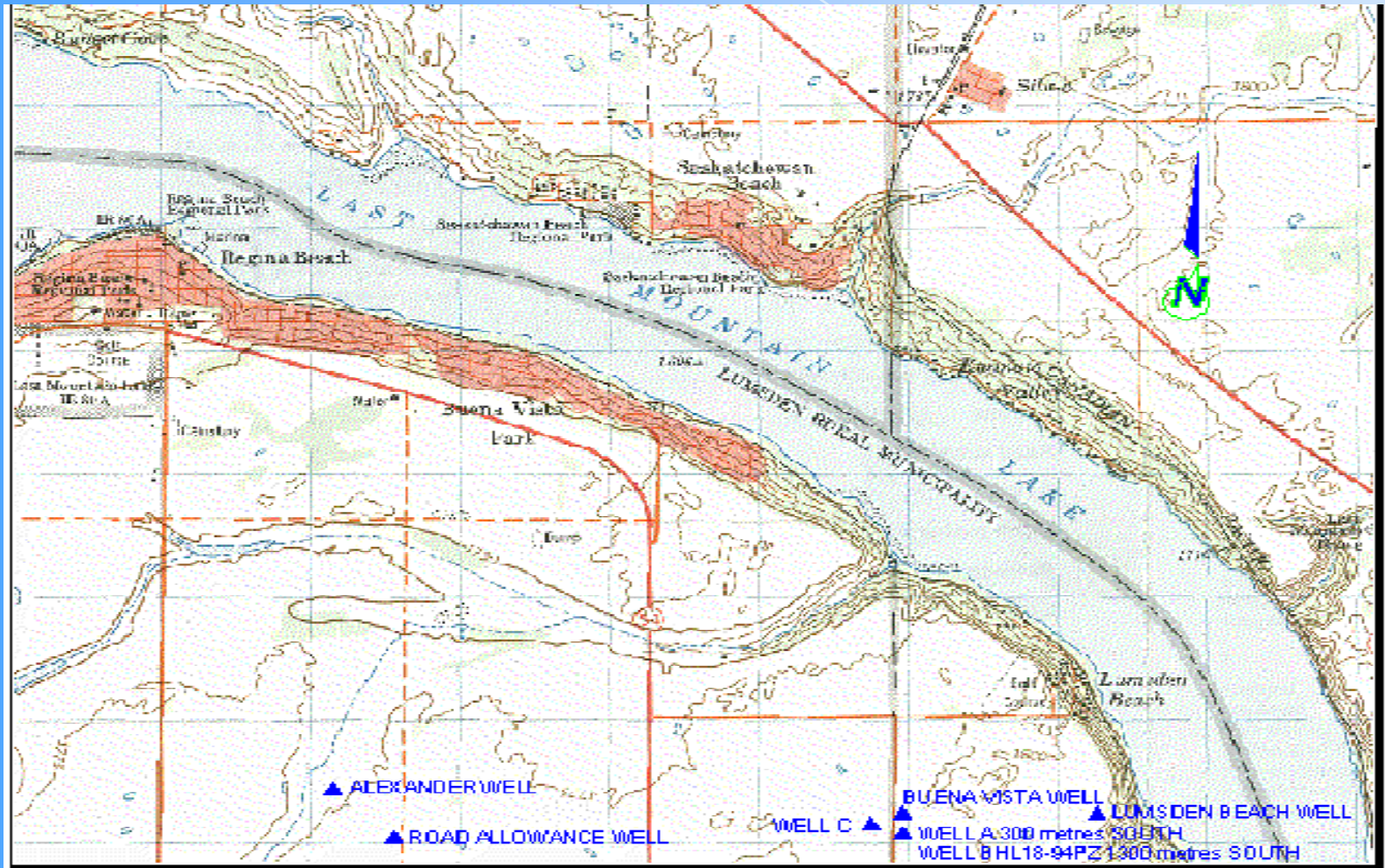
Rodger McDonald, M.Sc., P.Eng.
M•R•2 - McDONALD & Associates

Outline

- **Waterworks Overview**
- **Purpose**
- **Water Quality**
- **Water Use/Supply**
- **Wastewater**
- **Water Treatment Processes**
- **Treatment Plant Siting**
- **Storage/Distribution**
- **Implementation/Cost Estimates**
- **Discussion**

Waterworks Overview

- Current Plan



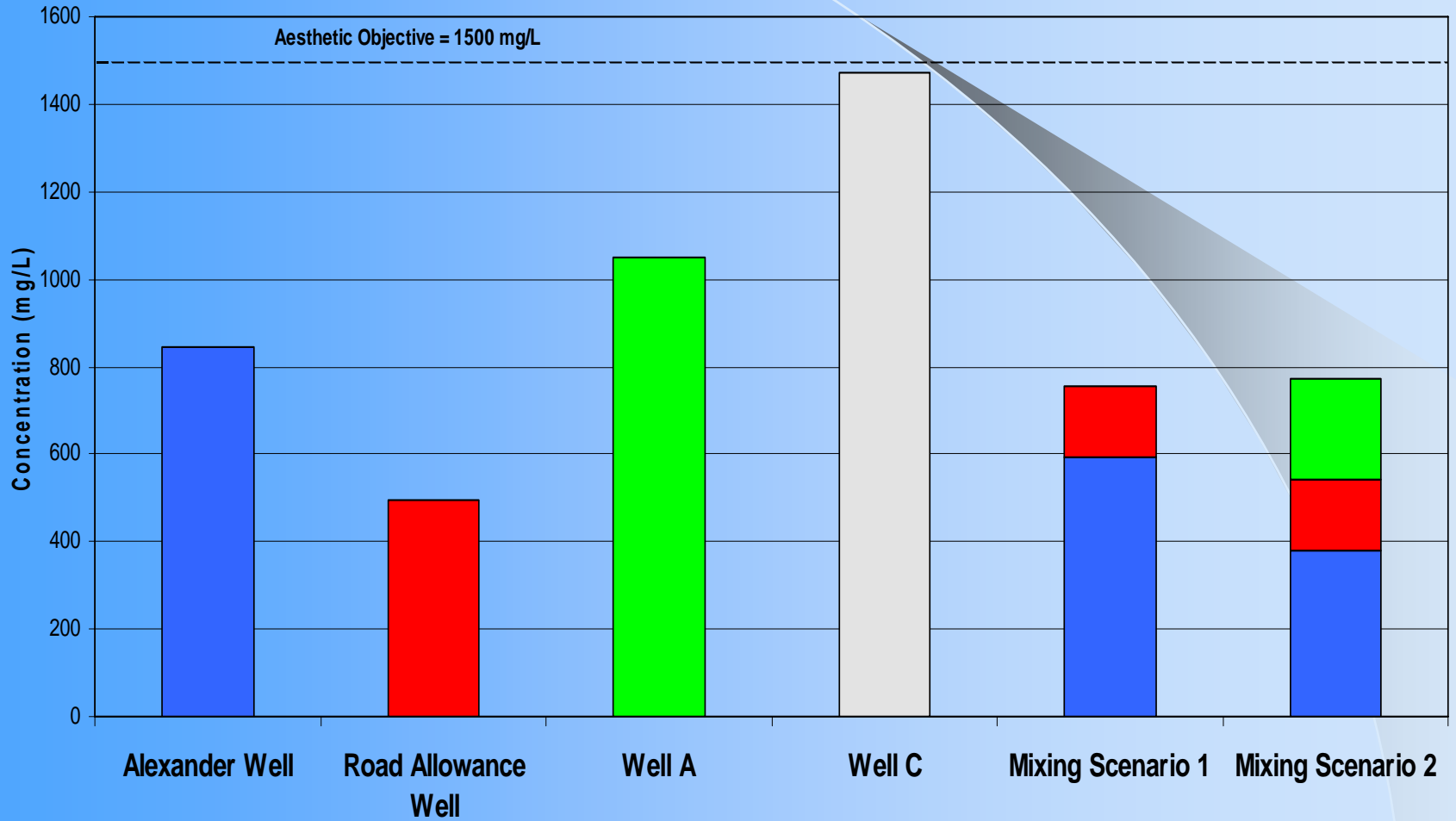
Predesign Purpose

- **Focus**
 - **Centralized treatment**
- **Study Components**
 - **Demands and use patterns**
 - **Water quality needs**
 - **Treatment process**
 - **Wastewater**
 - **Siting and Supply Delivery**
 - **Storage**
 - **Operations/Controls**
 - **Implementation Strategy/Costs**

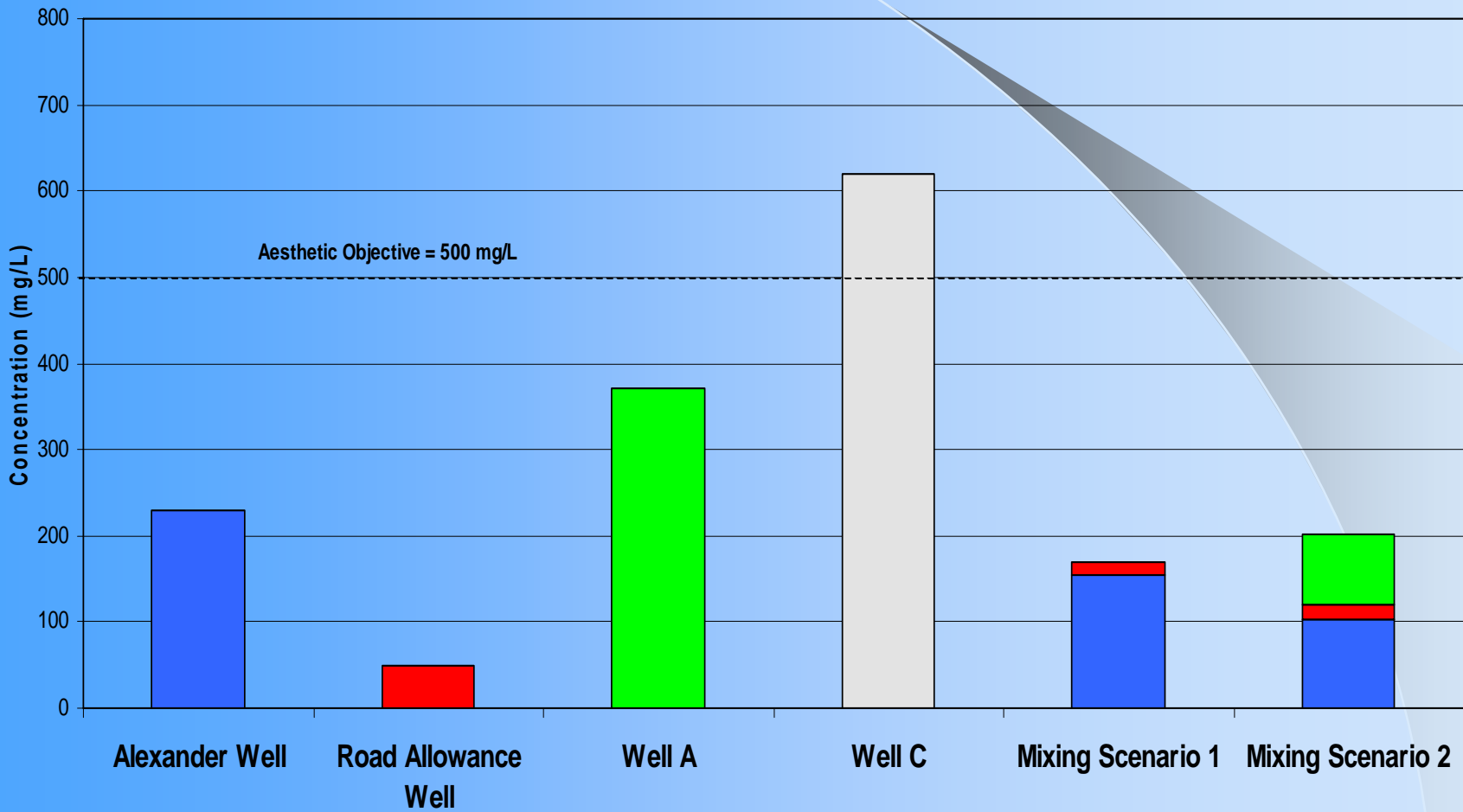
Issues – Water Quality

- **General Characteristics**
 - Total Dissolved Salts
 - Sulphate
 - Sodium
 - Hardness

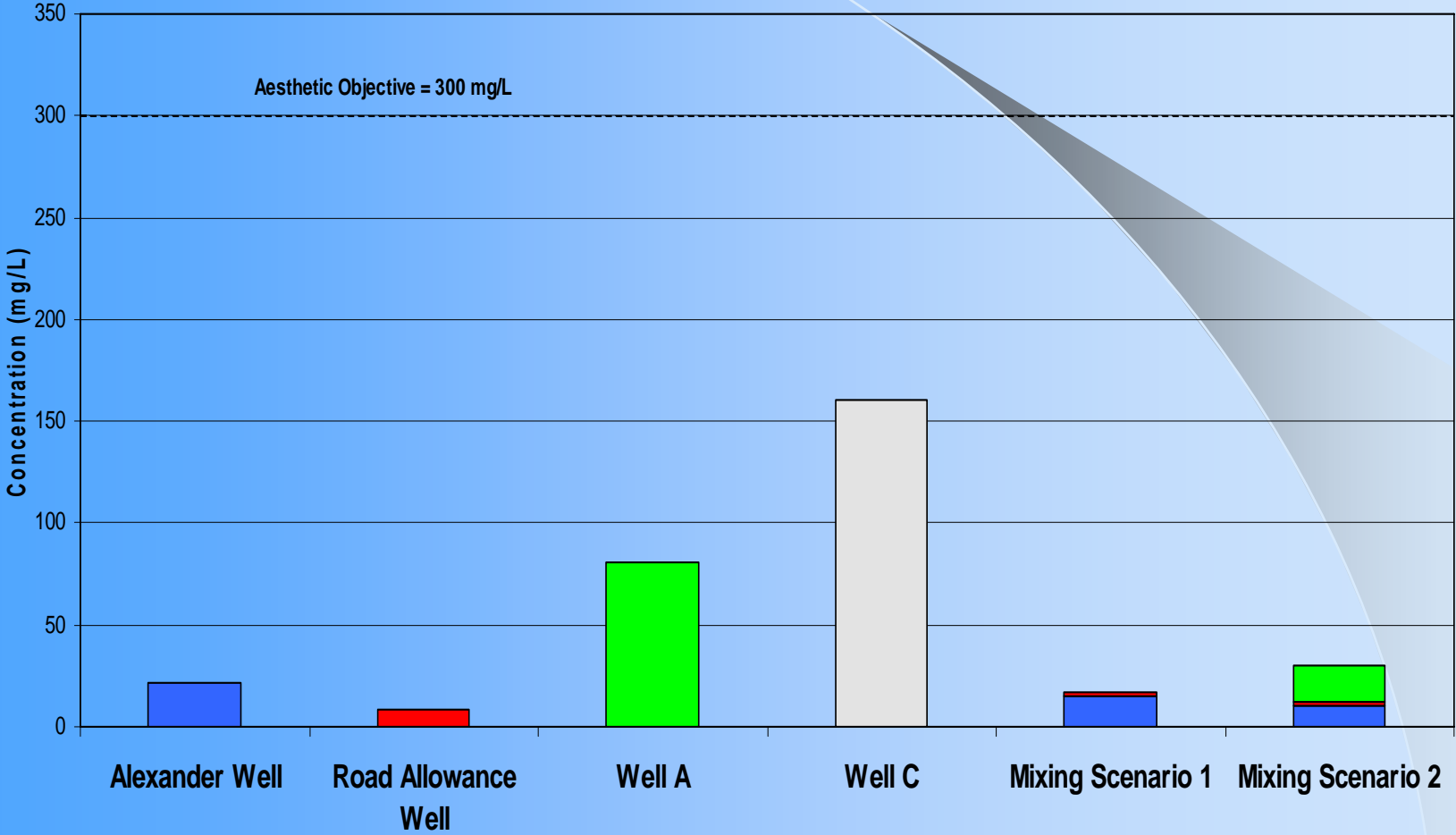
Town of Regina Beach Municipal Water Quality - Total Dissolved Salts



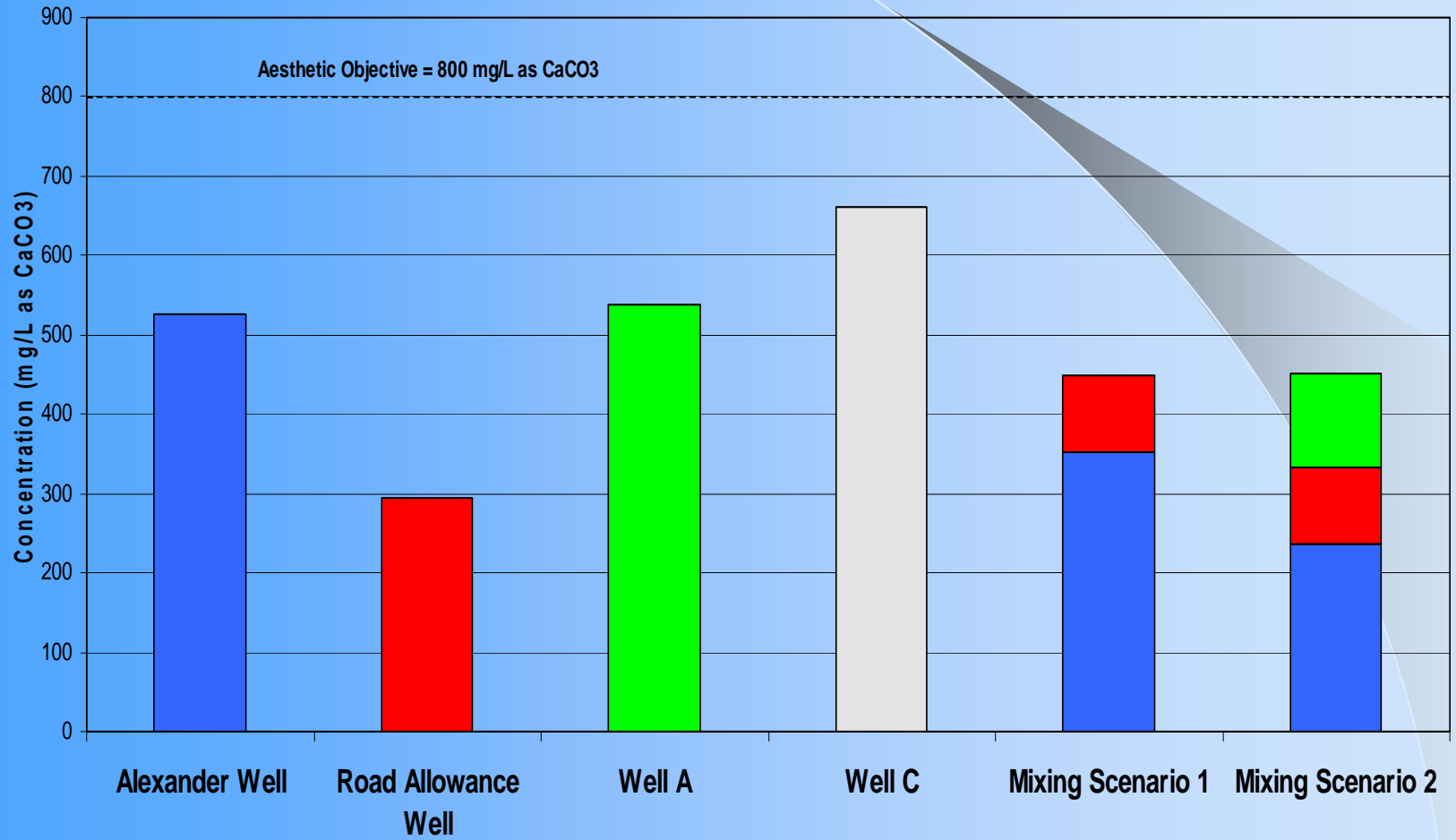
Town of Regina Beach Municipal Water Quality - Sulphate



Town of Regina Beach Municipal Water Quality - Sodium



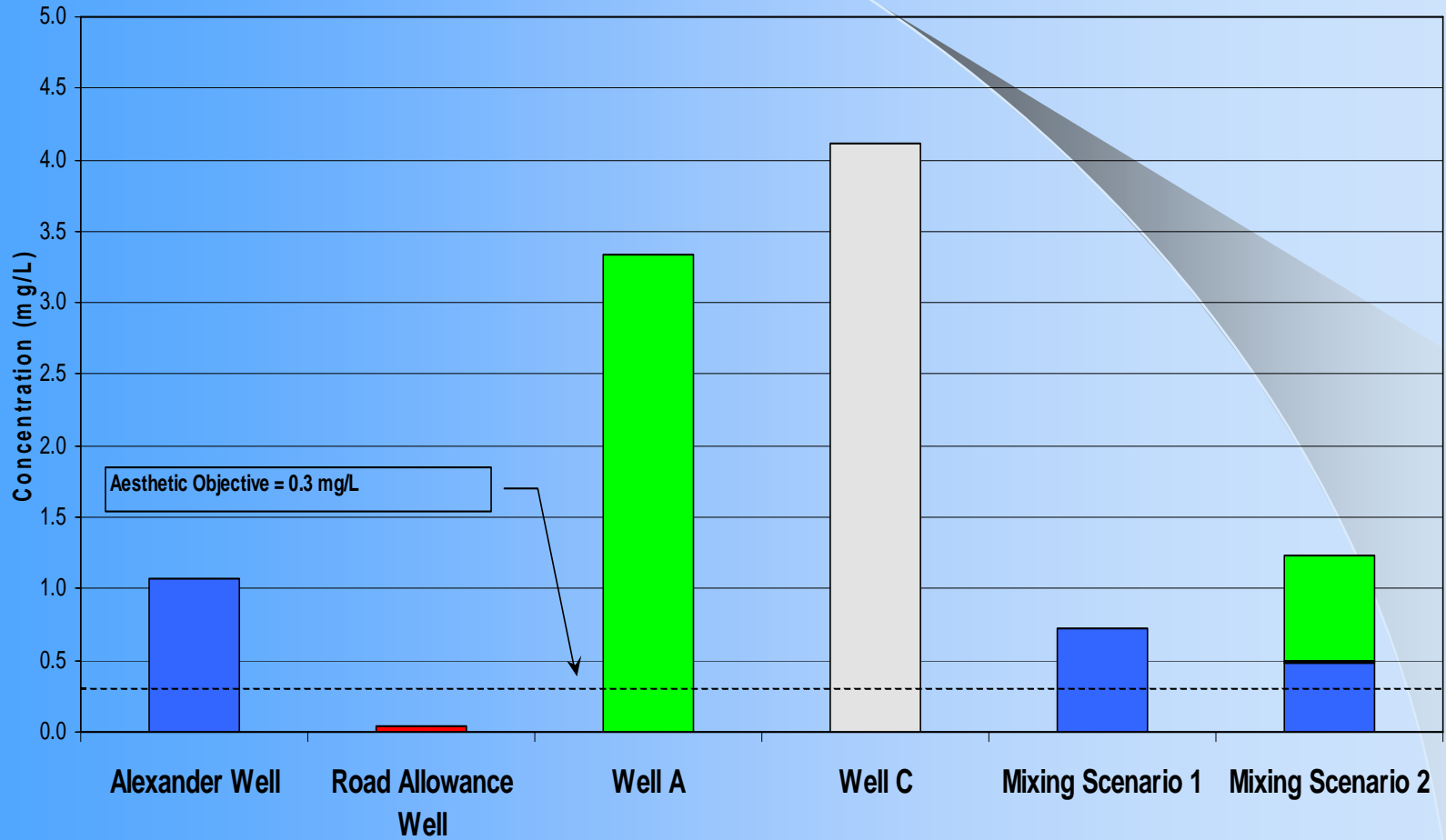
Town of Regina Beach Municipal Water Quality - Hardness



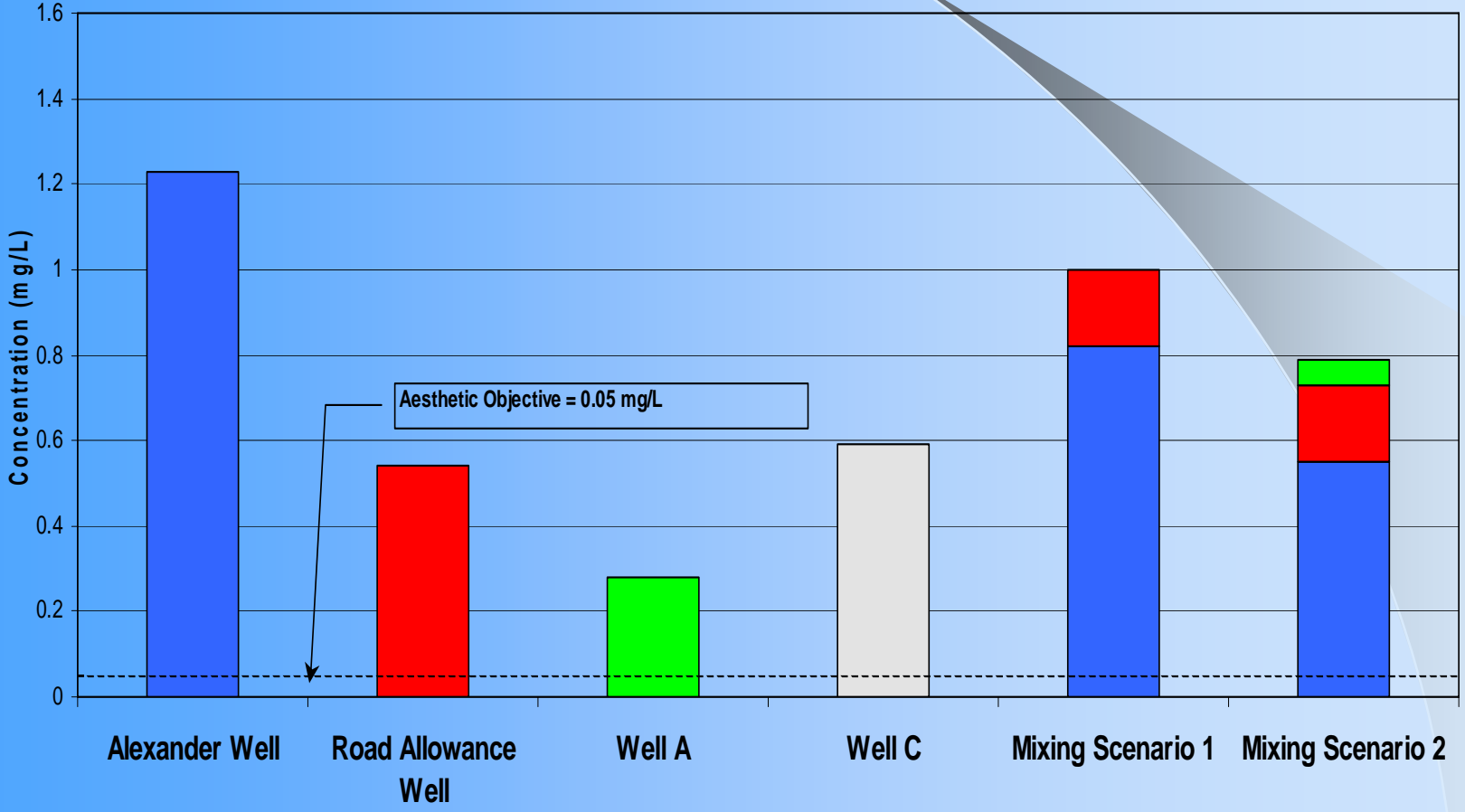
Issues – Water Quality

- **Issues**
 - *Iron*
 - *Manganese*
 - *Arsenic*
 - *Turbidity*
 - *Disinfectant Residual*

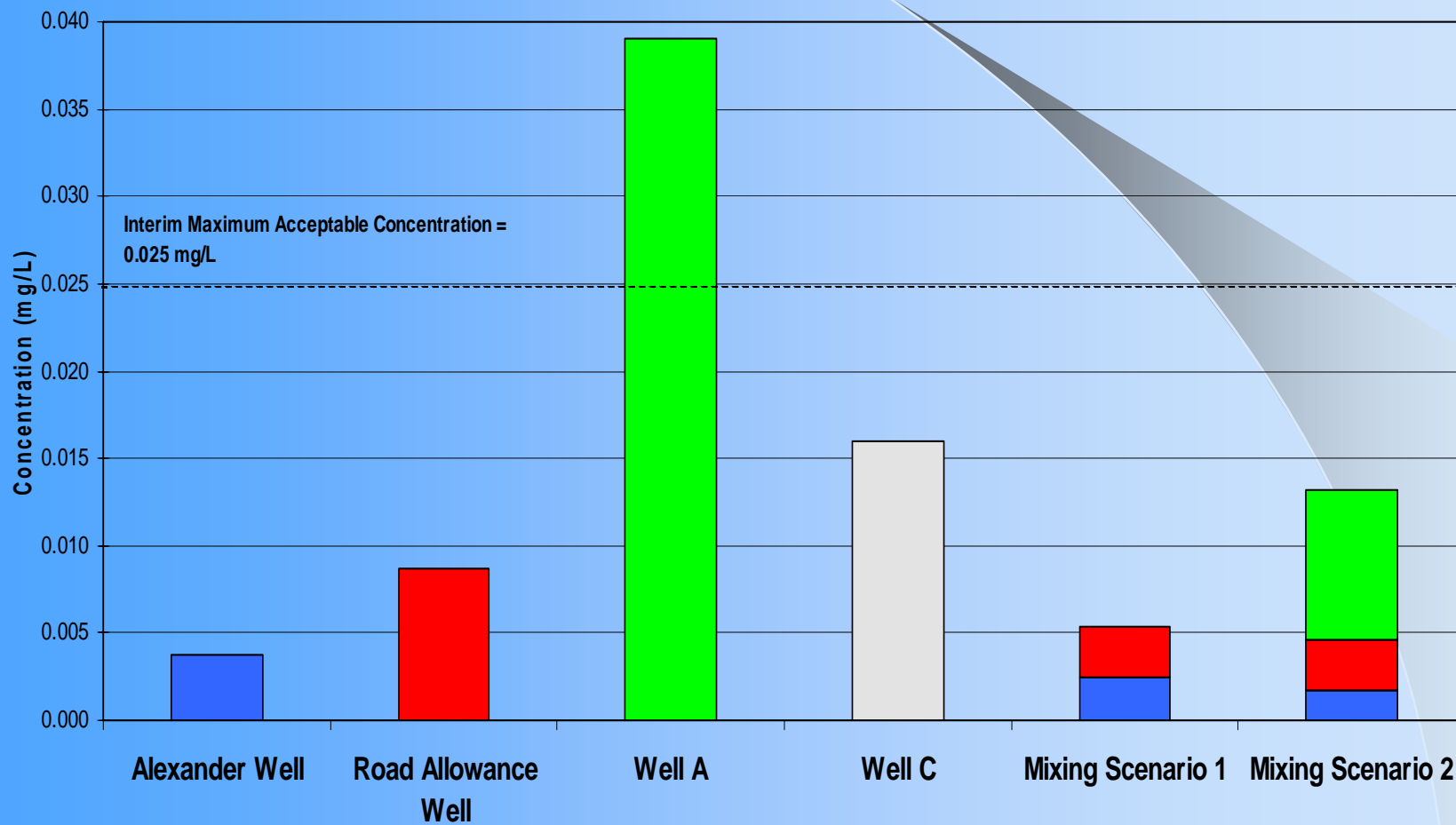
Town of Regina Beach Raw Water Quality - Iron



Town of Regina Beach Raw Water Quality - Manganese



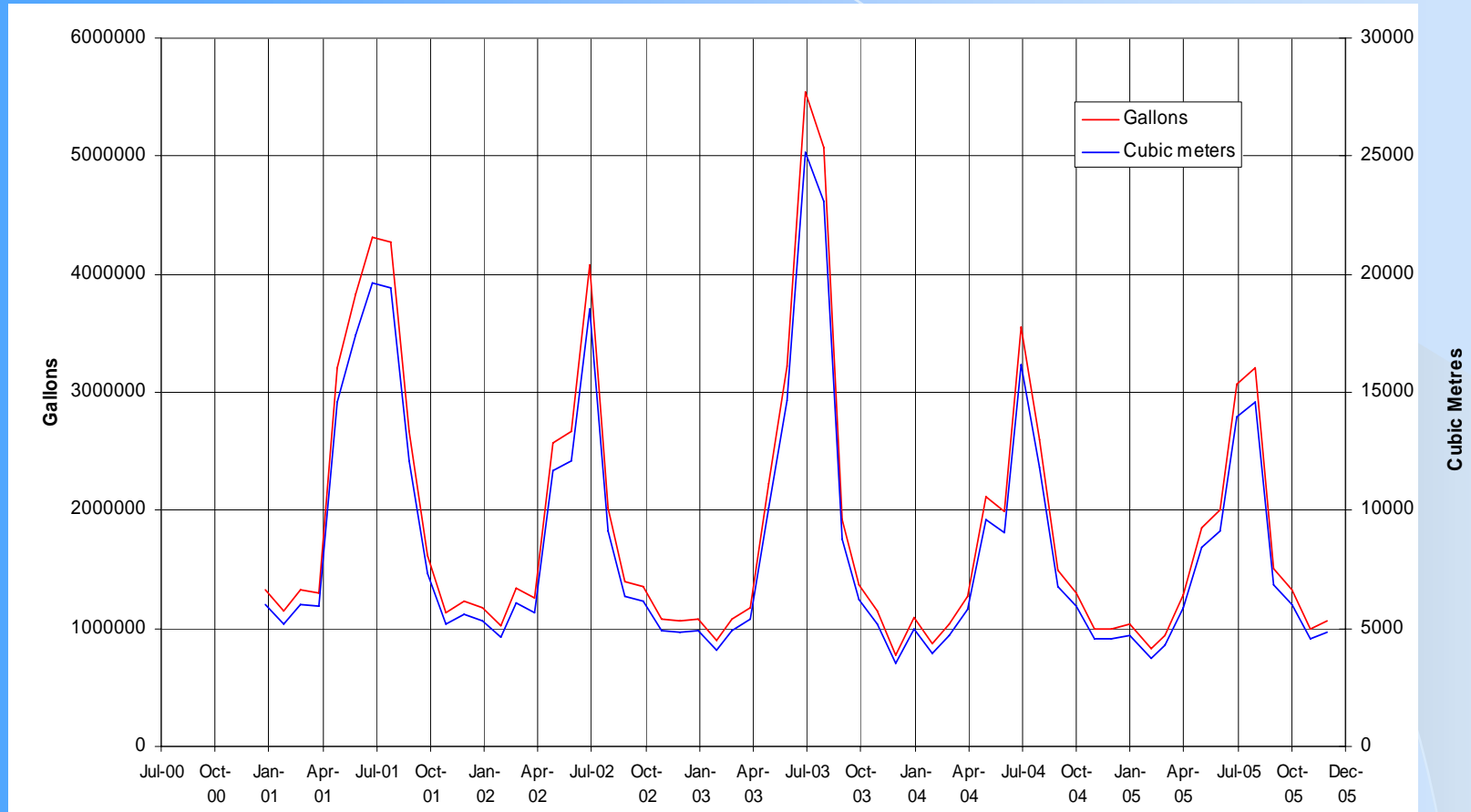
Town of Regina Beach Raw Water Quality - Arsenic



Water Use and Supply

- **Historic Use Patterns**
- **Seasonal Variations (2001-2005)**
 - **October to April – 184 m³/d (40,500 gal/d)**
 - **May to Sept. – 468 m³/d (103,000 gal/d)**
- **Per capita use**
 - **Winter – 173 L/cap•d (38 gal/ cap•d) - low**
- **Peak day use**
 - **250% summer average**

Monthly Groundwater Volumes

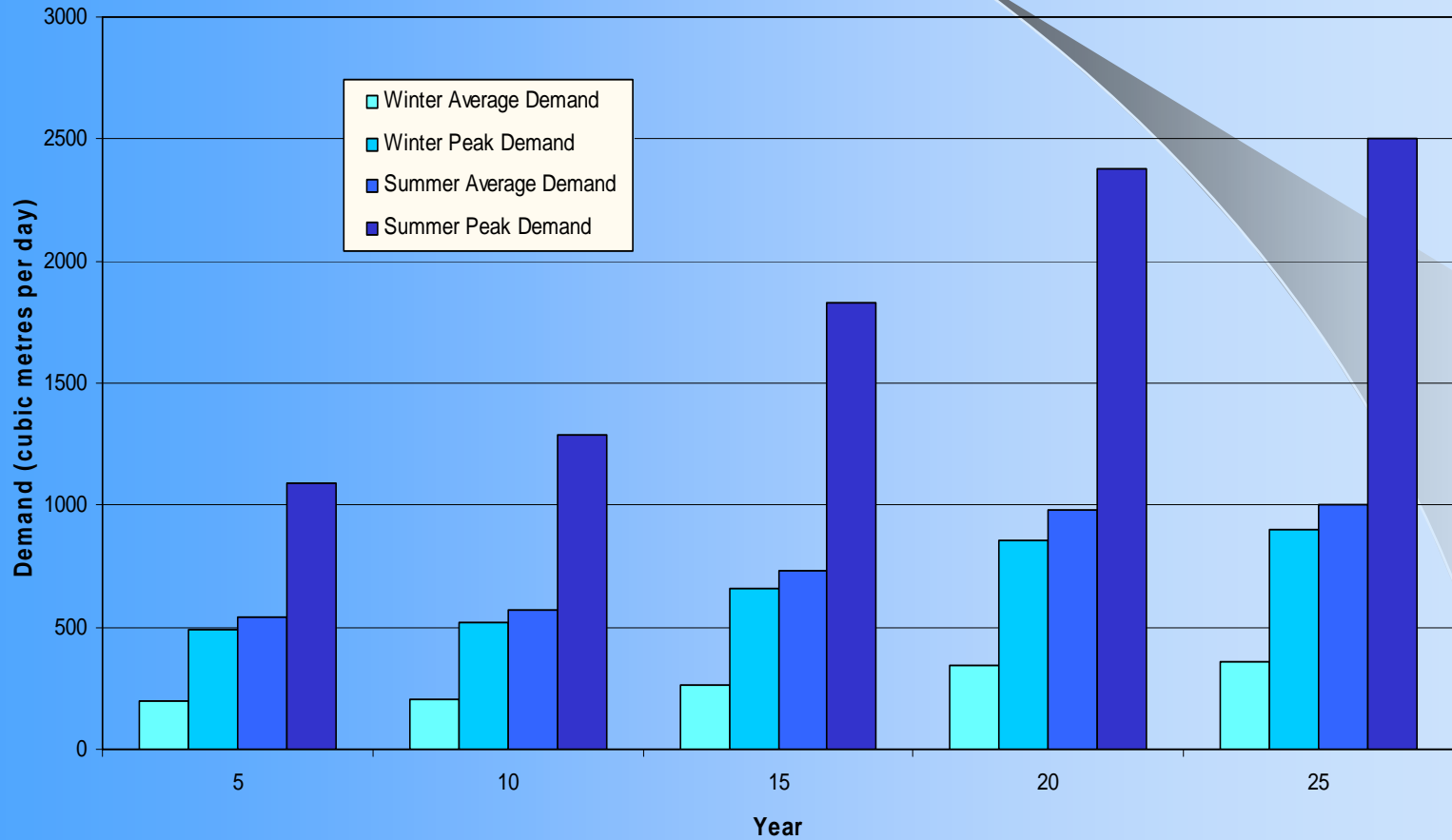


Water Use Projections

- For 25-year period
- Population –growth rate – 1% per year
 - Permanent – 1400
 - Non-permanent – 2500
- Water Use
 - 5-year increments
 - Seasonal average & peak day

Water Use Projections

Town of Regina Beach
Municipal Waterworks Projected Demands



Wastewater Management

- Treatment process cleaning
- Quality varies with treatment process
- Volume
 - 5 to 10% depending on efficiency
 - May be higher for some processes
- Need to consider reuse opportunities (i.e. Irrigation)

Water Treatment Processes

- **Treatment Targets**

 - Iron less than 0.3 mg/L**

 - Manganese less than 0.05 mg/L**

 - Free chlorine of greater than 0.1 mg/L**

 - Turbidity less than 0.3 NTU**

 - Bacteriological Control – virus inactivation**

- **Options**

 - Granular media filtration**

 - Membrane filtration**

Manganese Greensand Filtration

- Considerable use in the province
- Pretreatment
 - Chlorine
 - Potassium Permanganate
- Filters
 - Dual Media
 - Anthracite
 - Manganese Greensand
- Bench Scale Tests

| | Iron, mg/L | Manganese, mg/L |
|----------------|---------------|--------------------|
| Alexander | 1.05 | >0.8 |
| Road Allowance | 0.26 | 0.47 |
| Well A | >3.30 | 0.285 |

| Well(s) | Iron, mg/L | Manganese, mg/L | Turbidity, NTU |
|----------------------------|---------------|--------------------|-------------------|
| Alexander & Road Allowance | 0.02 | 0.086 | 0.25 |
| Well A only | Not detected | 0.049 | 0.1 |
| All Wells | Not detected | 0.045 | 0.14 |

Manganese Greensand Filtration

Filter Types

- Rapid rate gravity**
- Pressure**
- Treatment rates are similar**

Gravity

- Sedimentation System Upstream
- Concrete



Pressure

- Need pumped inflow
- Circular Steel Vessels
- Size restricted



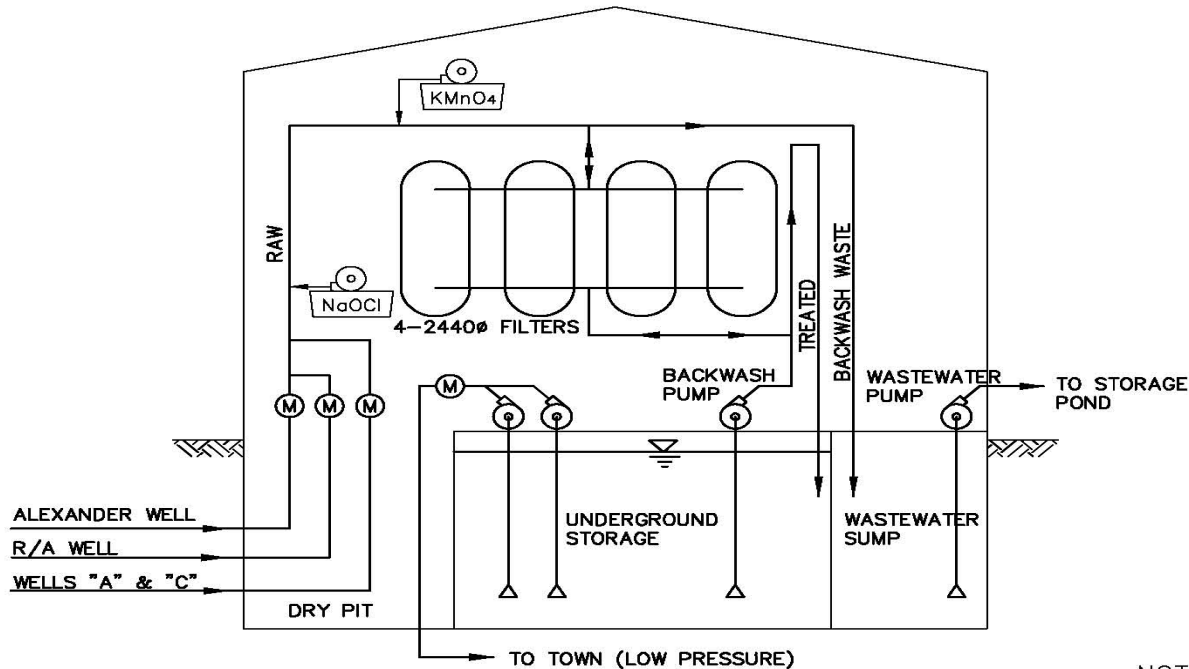
- **Requirements**

- **Design 4 – 2.4 m (8 foot) diameter filter**
- **Storage options**

Underground Storage

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LEGEND
 (M) - FLOW METER

NOTE:
 NOT ALL PIPING AND EQUIPMENT
 SHOWN FOR CLARITY.

TOWN OF REGINA BEACH
 WATER TREATMENT PLANT - MANGANESE GREENSAND PROCESS
 OPTION No.1 - UNDERGROUND STORAGE - PROCESS SCHEMATIC

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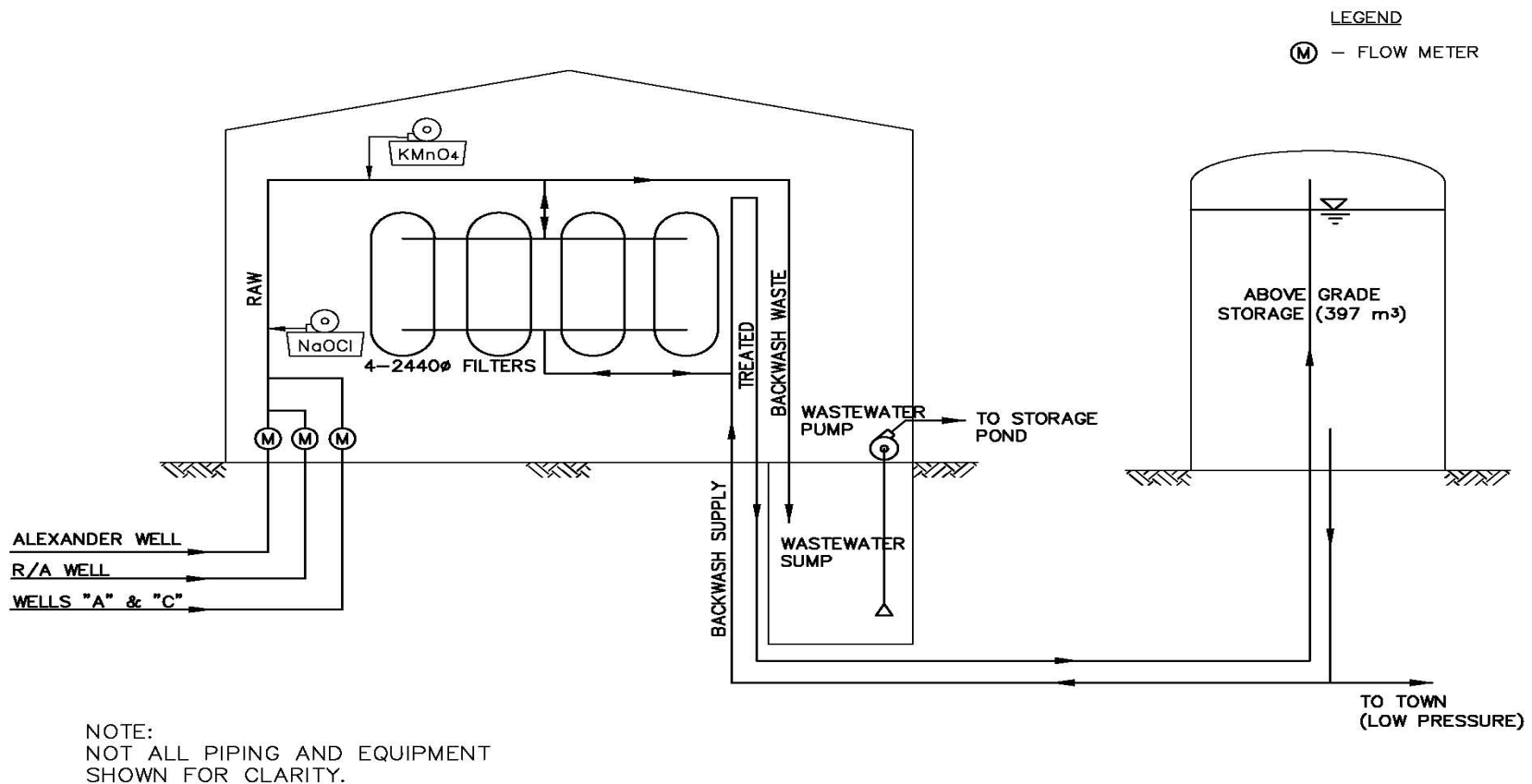


| | | |
|-----------|---------|--------|
| DATE | PROJECT | FIGURE |
| JUNE 2006 | 6048.2 | 4.3 |

Above Ground Storage

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TOWN OF REGINA BEACH
 WATER TREATMENT PLANT - MANGANESE GREENSAND PROCESS
 OPTION No.2 - ABOVE GRADE STORAGE - PROCESS SCHEMATIC

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DATE
 JUNE 2006

PROJECT
 6048.2

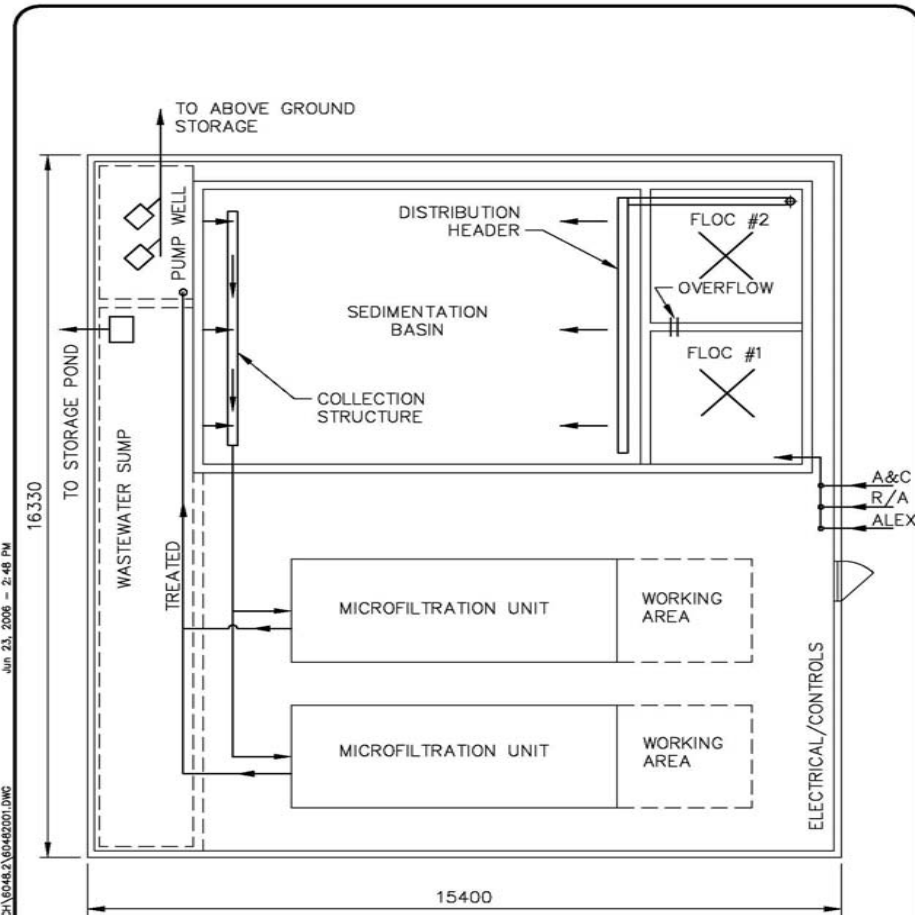
FIGURE
 4.4

Membrane

- **Micro or Ultra Filtration**
 - **Small hollow fibre – very small openings**
 - **Require good pretreatment**
 - **Chemicals chlorine + potassium permanganate**
 - **Coagulant**



Microfiltration Layout



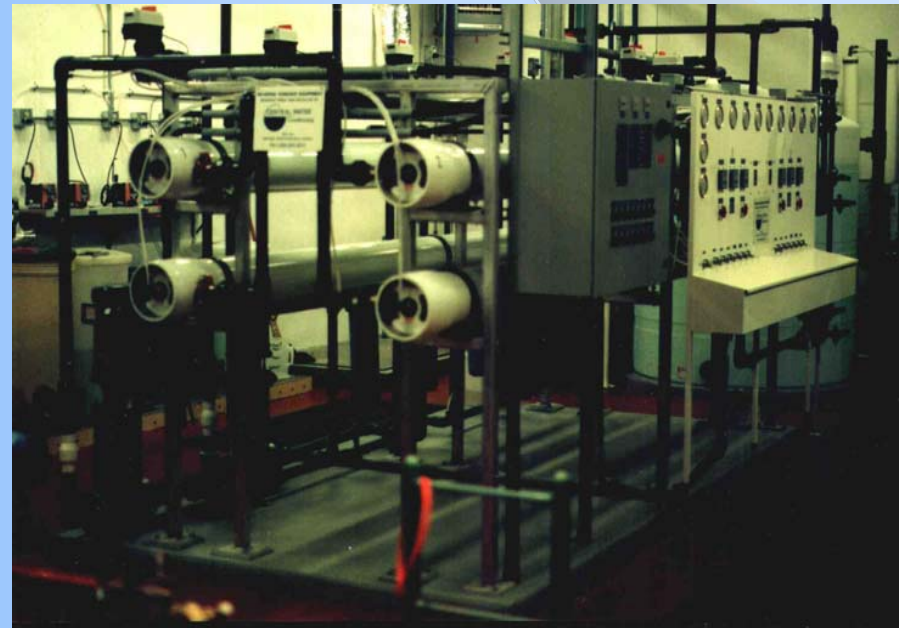
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TOWN OF REGINA BEACH
 WATER TREATMENT PLANT
 MICROFILTRATION WITH PRETREATMENT

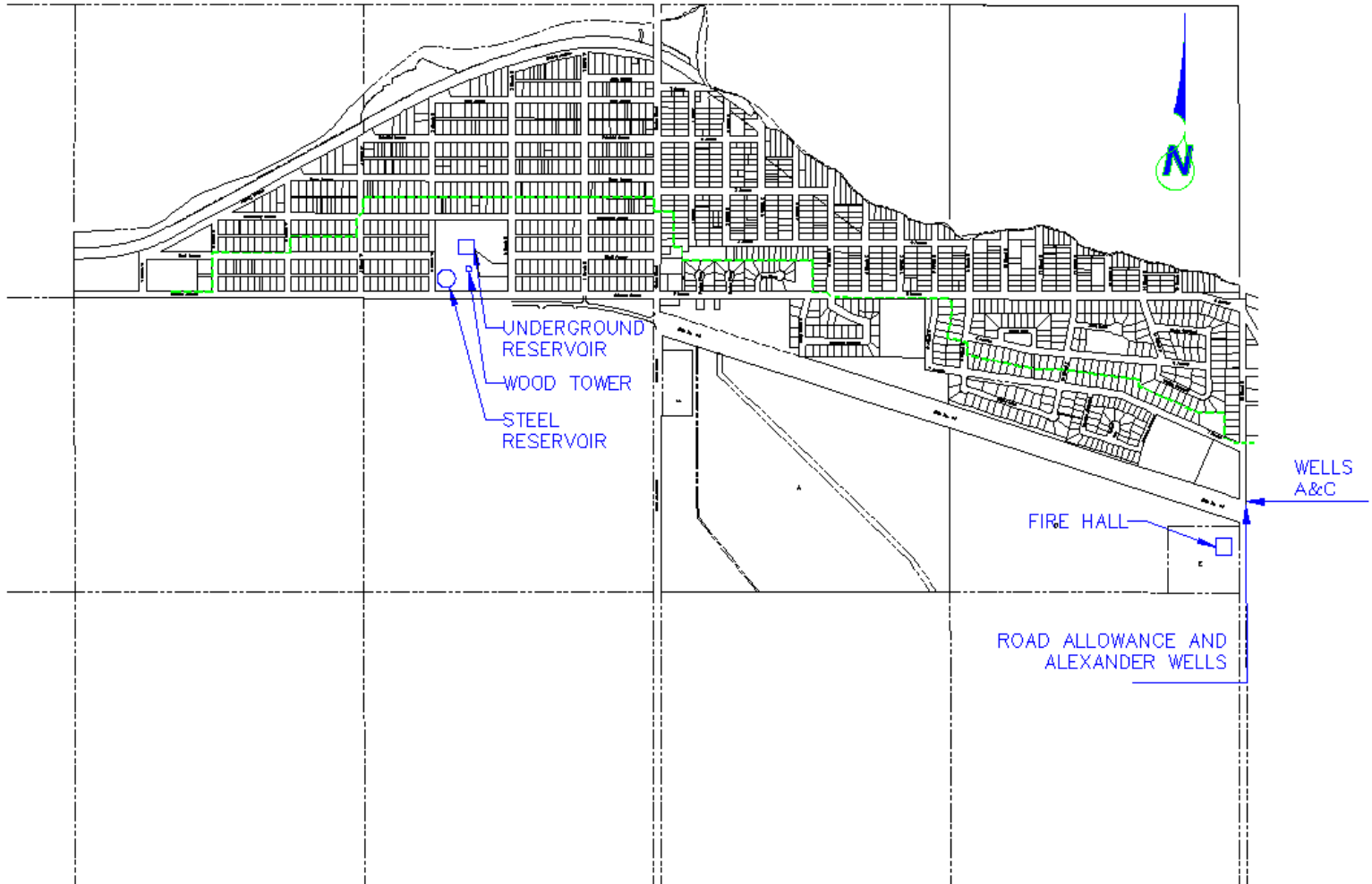
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| M•R•2 - McDONALD & Associates | | | |
| DATE | PROJECT | FIGURE | |
| JUNE 2006 | 6048.2 | 4.5 | 4.5 |

- **Nanofiltration**

- **Removes some dissolved salts – softening effect**
- **Anti-fouling chemicals**
- **pH adjustments**
- **Production losses**



Siting



Treated Water Storage/Distribution

- **Seasonal Storage**
- **Water Tower**
 - **Controls**
 - **End of life**
- **Fire Pump**
- **Flow Direction**

Implementation/Costs

- **Schedule**
 - **MRIF Grant**
 - **Submission – August/September 2006**
 - **Project Completion – March 31, 2009**
 - **Regulatory**
 - **December 31, 2008**

●Cost Estimates

- Preliminary Estimates – well modifications, raw water delivery, treatment, treated water storage (based on elevated storage).

●Existing Storage Site

- Manganese Greensand - 2,225,000
- Micro/Ultra Filtration - 2,725,000
- Nano Filtration - 3,170,000

●Fire Hall Site

- Manganese Greensand - 1,845,000
- Micro/Ultra Filtration - 2,345,000
- Nano Filtration - 2,795,000

Discussion

- **Treatment**
 - Iron and manganese removal recommended
 - Need to accommodate seasonal uses
 - No compelling reason to remove dissolved salts
 - Manganese greensand process would be appropriate
- **Wastewater**
 - Manage by storage and irrigation
- **Siting**
 - Fire Hall site has some advantages
 - Good location for elevated storage