
Portage la Prairie
City of Possibilities

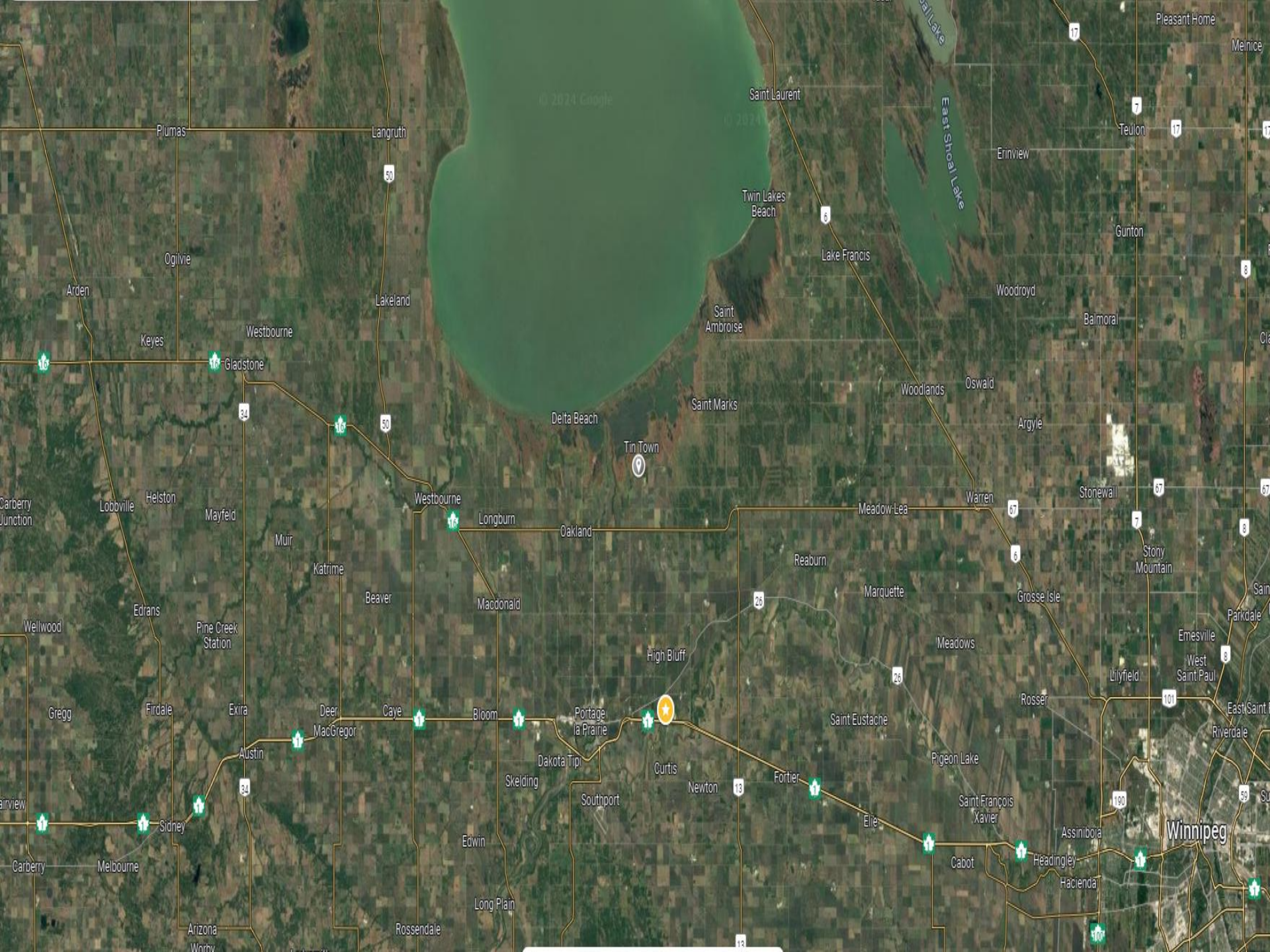
National Water & Wastewater Conference
2024

Expansion of City of Portage la Prairie Water Treatment Plant

Presented By: Karly Friesen
Director of Utility
City of Portage la Prairie

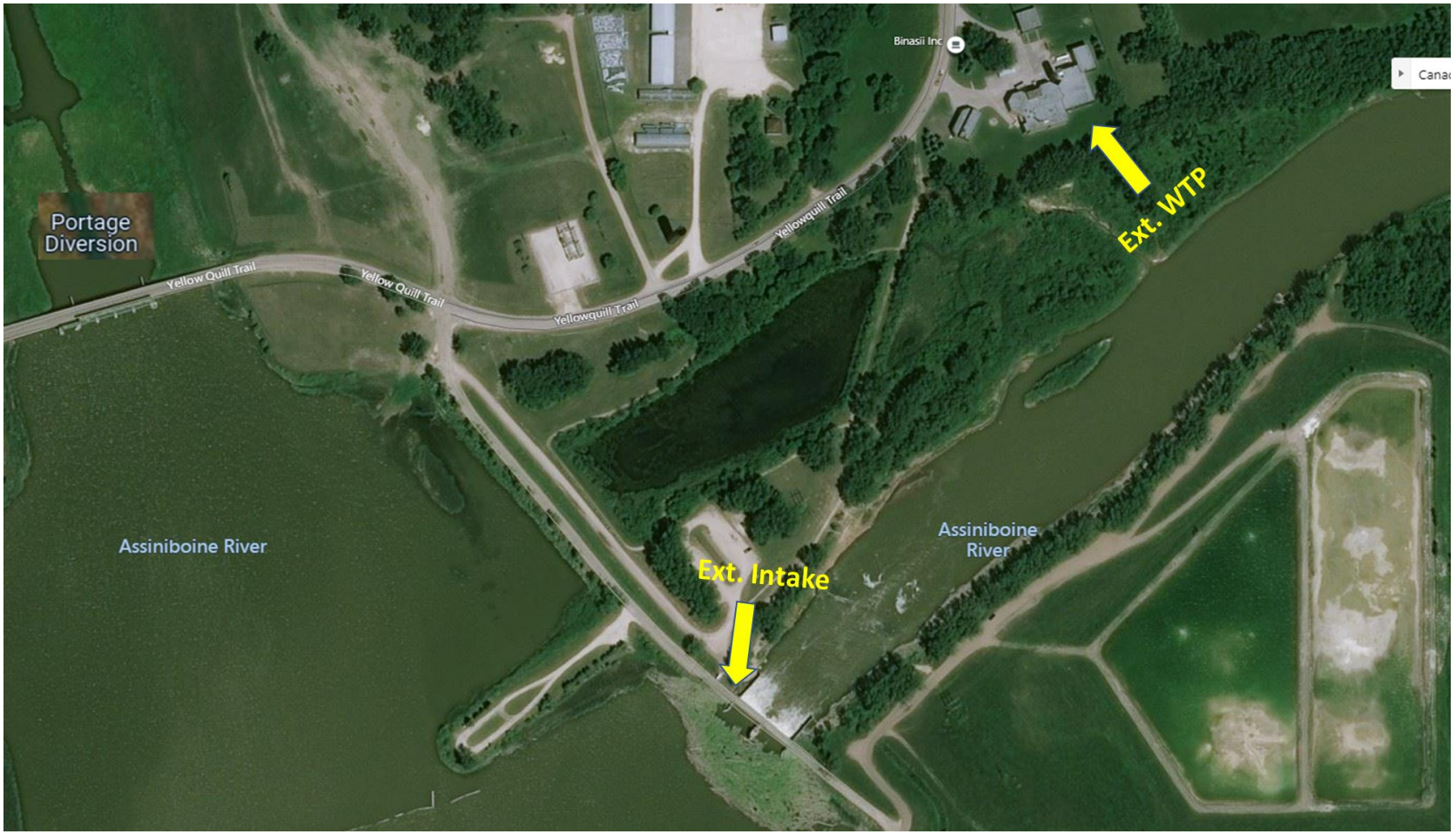
Presentation Outline

- Project Background
- Design Considerations and Basis
- Detail Design
- Cost estimates & timelines
- Q and A


Pleasant Home
Melnice
Saint Laurent
East Shoal Lake
Plumas
Langruth
Teulon
Erinview
Twin Lakes Beach
Gunton
Lake Francis
Ogilvie
Arden
Lakeland
Woodroyd
Saint Ambroise
Balmoral
Keyes
Westbourne
Gladstone
Woodlands
Oswald
Saint Marks
Delta Beach
Argyle
Tin Town
Carberry Junction
Lobbville
Helston
Mayfeld
Westbourne
Longburn
Oakland
Meadow Lea
Warren
Stonewall
Muir
Reaburn
Stony Mountain
Katrime
Marquette
Grosse Isle
Beaver
Macdonald
Edrans
Wellwood
Pine Creek Station
Meadows
Emesville
Parkdale
High Bluff
West Saint Paul
Lilyfield
Gregg
Firdale
Exira
Deer
Caye
Bloom
Portage la Prairie
Rosser
Saint Eustache
MacGregor
Riverdale
Austin
Dakota Tipi
Curtis
Pigeon Lake
Skelding
Newton
Fortier
Southport
Saint François Xavier
Sidney
Elie
Assiniboia
Winnipeg
Edwin
Carberry
Melbourne
Cabot
Headingley
Hacienda
Long Plain
Arizona
Rossendale

Portage la Prairie

Location of Water Plant



Background

- WTP built in 1978
- Produces on average
  24 ML/day
- Provides potable water supply to:
  - 13,000 local population
  - Regional Customers: Southport, RM of Portage, YRWC, CRWC
  - Several Industries - McCain Foods, Roquette, Nutri Pea, Simplot, Richardson Milling, Avena Foods

Existing Treatment Plant

- Conventional lime-softening plant
- Actiflo pre-clarification
- Biologically activated dual media filtration
- Ozonation
- Carbon dioxide for recarbonization
- Granular activated carbon filters
- Chlorine disinfection for the distribution system
- Design capacity of 34 million litres/day (net)


AIR


Primozone
Primozone


NO
NO

Need and Design Basis

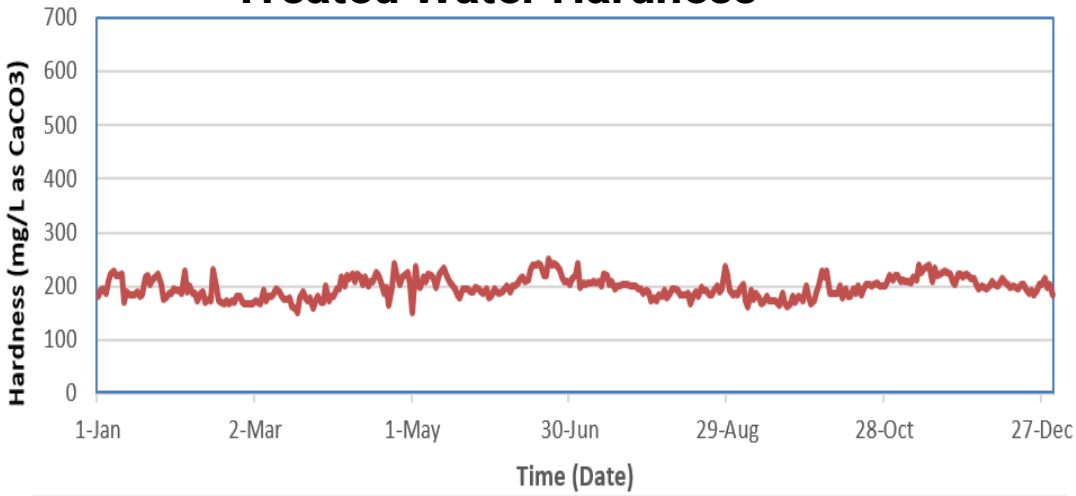
- Redundancy
  - The existing WTP design capacity:
  - 34 MLD (total)
  - 17 MLD (firm) - largest solid contact clarifier out of service
- Increased Capacity
  - Industrial water demand and Population growth to 2050
    - Projected Water Production Capacity = 55 MLD
  - Required additional capacity = 55 MLD – 17 MLD = **38 MLD**
- Water Quality
  - High THMs in the Regional System
  - Water Hardness
- Intake Issues

Water Quality

Raw Water

Parameter	Min	Max
Total Alkalinity (mg/L)	54	406
Conductivity (umhos/cm)	862	1110
Total Hardness (mg/L)	220	600
Iron (mg/L)	0.006	26.2
Manganese (mg/L)	0.045	1.61
pH	6.94	9.29
TDS (mg/L)	480	797
TOC (mg/L)	9.8	17
True Color (CU)	17	75
Turbidity (NTU)	7	3922

Treated Water Hardness



THM DATA:

- **City- 23 µg/L- 26 µg/L**
- **Regional- 115 µg/L- 353 µg/L**

HAA DATA:

- **City- 23 µg/L- 26 µg/L**
- **Regional- 32 µg/L- 53 µg/L**

Pre-treatment Expansion (Actiflo)

- Actiflo process twinned - provides redundancy and operational flexibility
- Pilot testing indicated UF prone to fouling with Actiflo treating water vs enhanced coagulation
  - Only use Actiflo pre-treatment during high turbidity events in spring/fall
  - System will be designed to feed the membrane plant directly from the raw water pumphouse (enhanced coagulation) or Actiflo effluent (as needed)
  - Expansion allows redundancy/flexibility for conventional process operation

Integrated Membrane System

- An Integrated Membrane System (two-stage) for DBP control and capacity
  - 1st Stage submerged UF followed by 2nd Stage RO
  - Enhanced coagulation (CO_2 for pH reduction)
  - 2-50% Break tanks in between
  - Accounts for 64% of the treated water production
- Total of four (4) trains:
  - Total/Firm UF production capacity: 37.5 MLD (net)
  - RO capacity: 30 MLD (total), 22.5 MLD (firm)
- Several chemical feed system
- Process wastewater diverted back to Assiniboine River

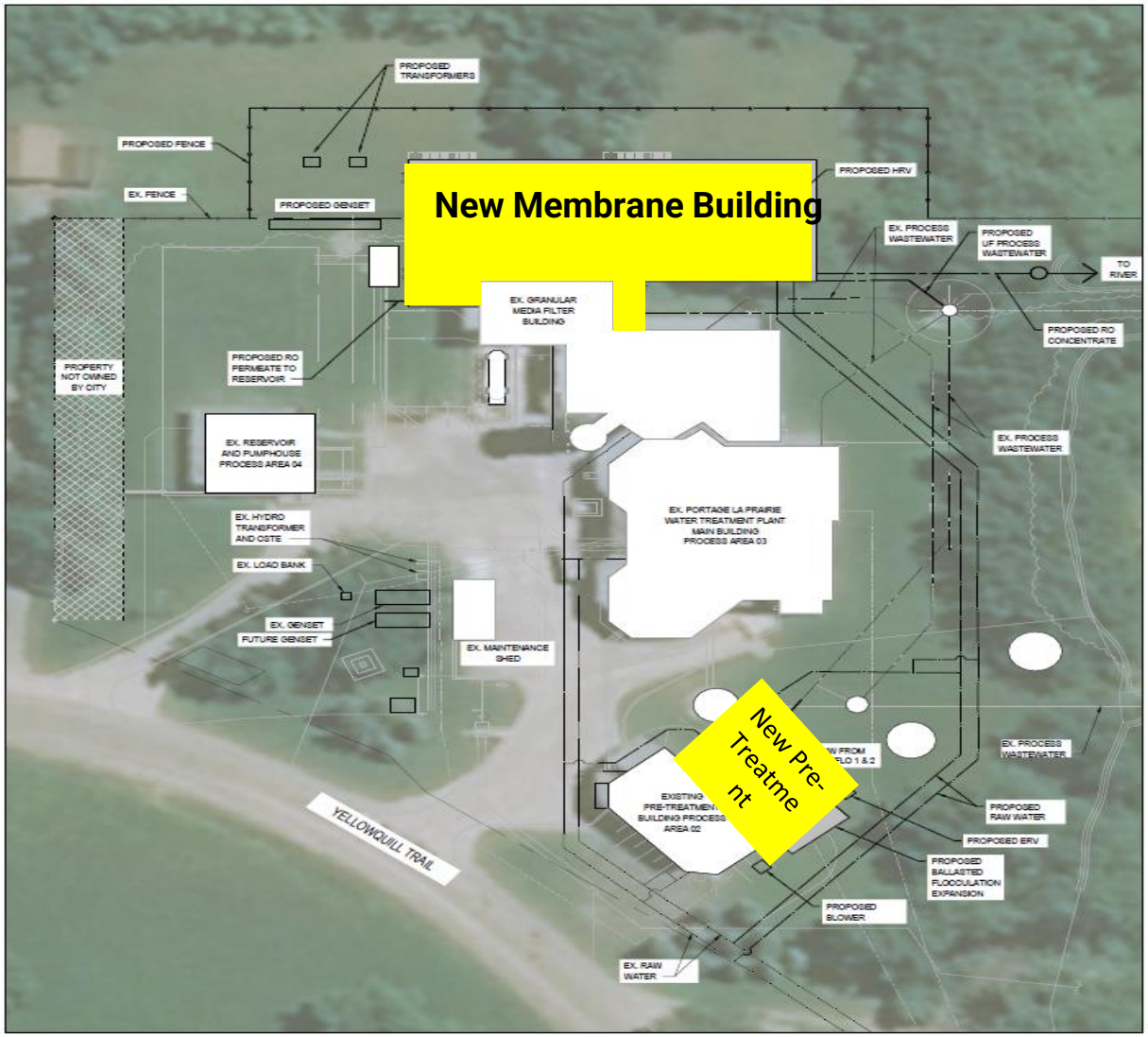
Pilot Testing

- Veolia (Suez) selected via competitive process
- Side-by-side evaluation of two (2) UF systems:
  - Immersed system (ZW500D)
  - Pressurized system (ZW1500)
- Evaluate performance of second-stage RO treating permeate from ZW500D or the ZW1500
- Compare the effect of alternative pre-treatment systems on performance of ZW500D and ZW1500
  - Enhanced Coagulation of raw water from Assiniboine River
  - Treated effluent from Ballasted Flocculation (Actiflo) process
- Establish sustainable flux rates, identify effective pre-treatment chemicals, optimum cleaning regimes and recovery, and identify any specific operating protocols.
- Pilot testing from March 19 ~ September 19, 2020 at the WTP with seven (7) key phases

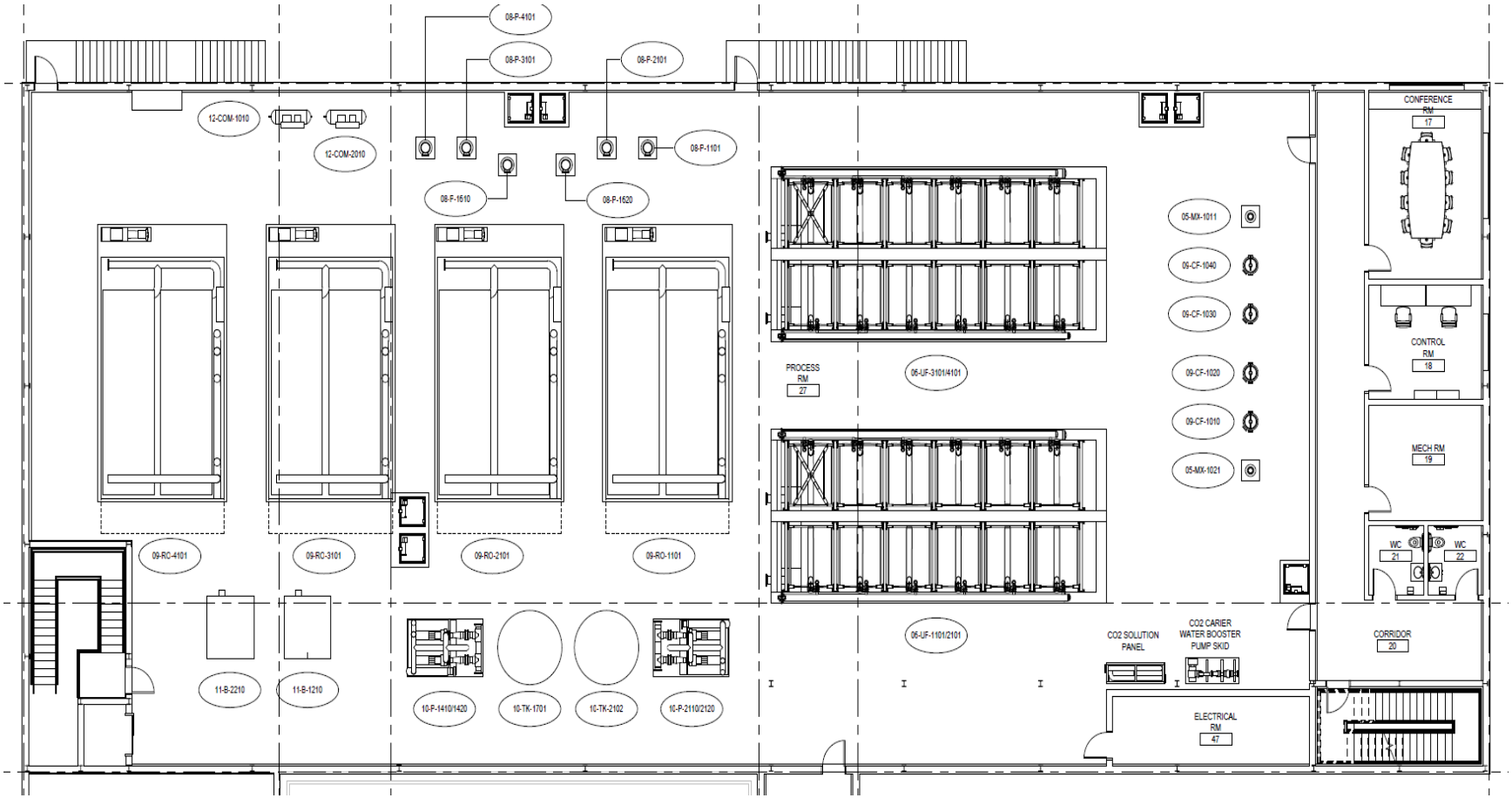
Pilot Testing – Key Conclusions

- ZW500D had better overall performance than the ZW1500 pressurized membrane system - robustness, maintaining higher long-term permeability and operating with higher instantaneous flux during production.
  - ZW500D: max instantaneous flux 35 gfd during production at 95% recovery.
  - ZW1500 : max instantaneous flux 22 gfd at 92%recovery
- Enhanced coagulation better suited than Actiflo for pre-treatment
- Throughout the six (6) month pilot study, the RO system maintained stable and reliable performance while operating on either ZW500D or ZW1500 permeate
  - Avg. flux of 13.2 gfd with a recovery of 70%
  - Avg. TOC = 0.68 mg/L (typical < 0.5 mg/L); Avg Hardness = < 2 mg/L
- Design development based on Immersed UF followed by RO

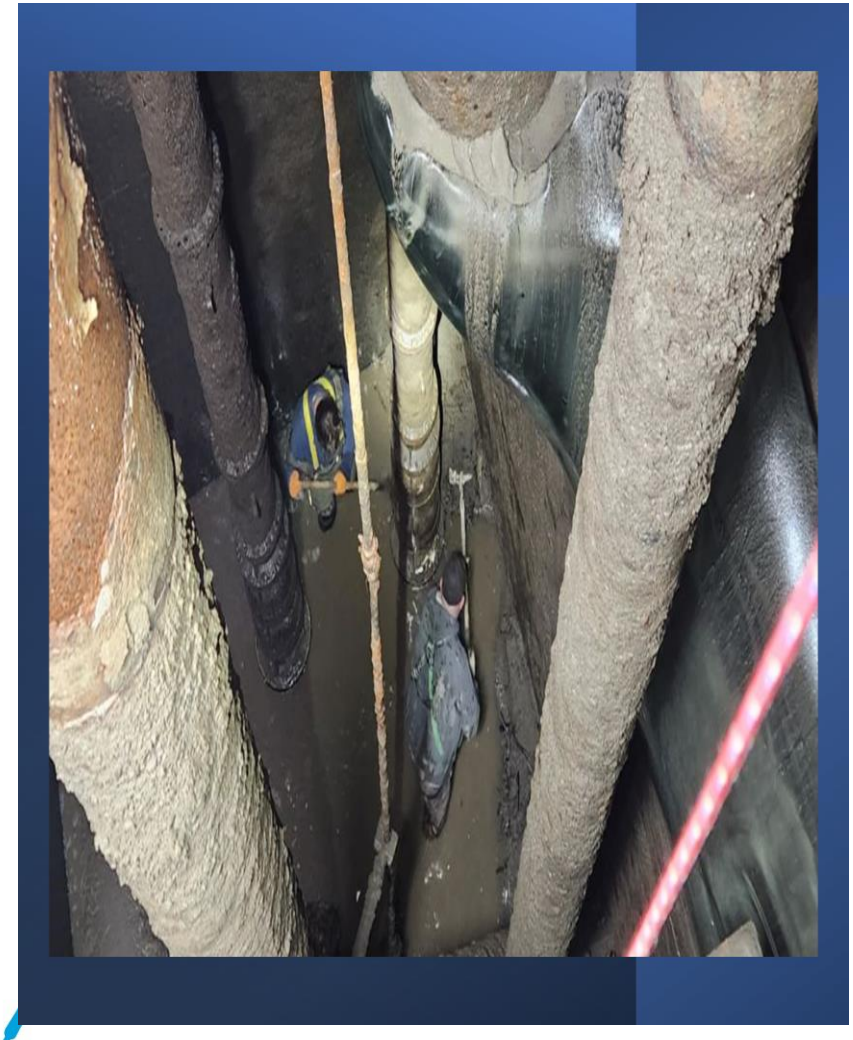
Expansion layout



Expansion Design- Upper Level



Intake and Raw Water Supply



- Existing intake issues
- Frazzle Ice – spring and fall
- Ice Jams
- Debris
- Reliance on MITT to control water levels to keep intake flooded
- Regulatory Compliance
- Lack of pumping capacity and room for expansion

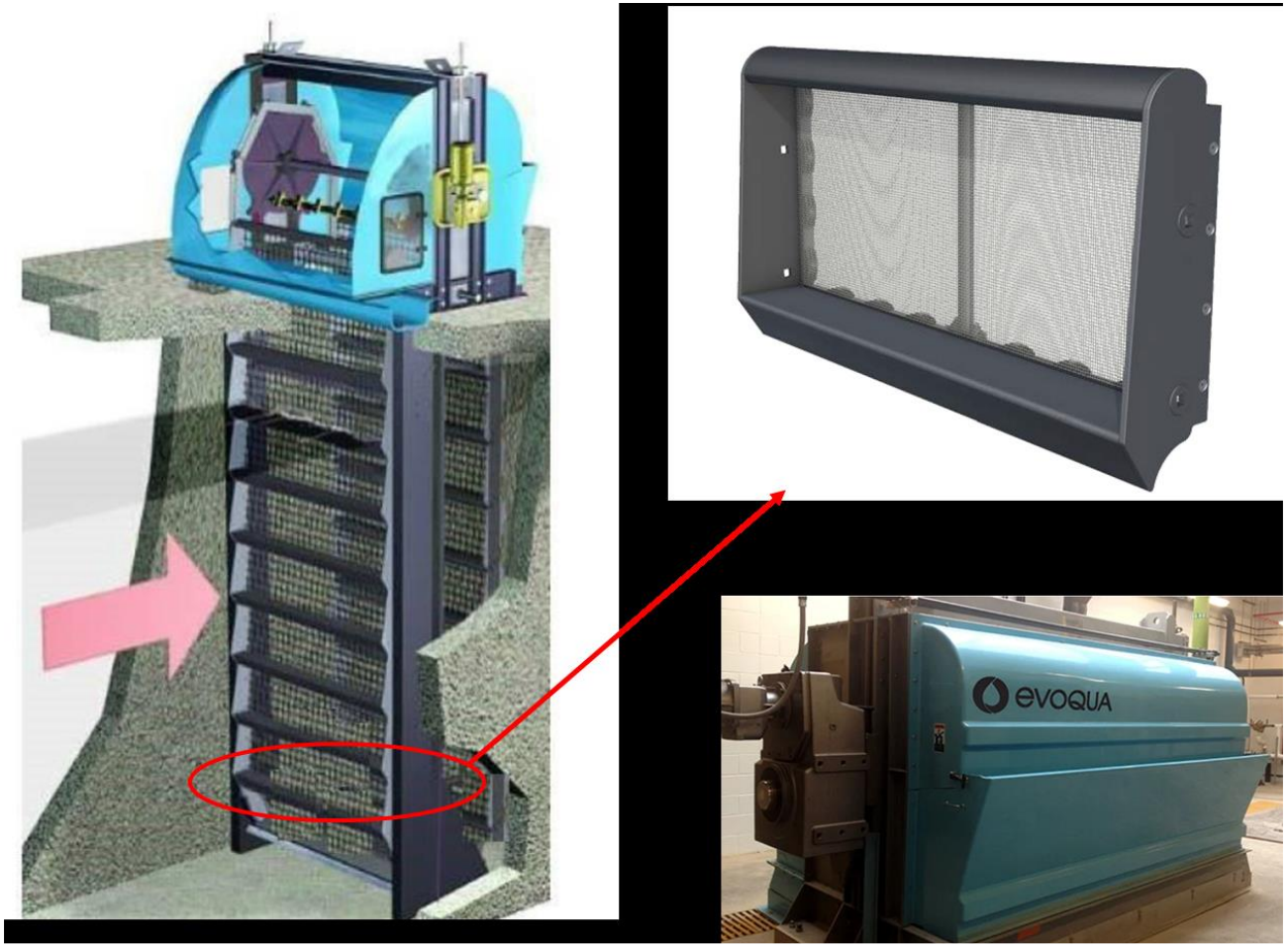
Intake


Portage Spillway Provincial Park
Assiniboine River
Image © 2024 Maxar Technologies


Portage Spillway Provincial Park

Proposed new location

Travelling screens



New- Owner owned Hydro Substation

Cost estimate

Original Estimate- $80,000,000 (including detail design)

- Cost Shared 50% by Province of Mb & MWSB
- Revised cost estimate (Sept 2024)- $96,600,00
  - No increase in funding
  - $56,600,000 Utility debt- water rates

Timelines

- Continue on detail design throughout winter/spring
- EAP has been submitted and DFO contacted
  - Heritage Resource Branch
- RFPs currently open for Membrane system and pre-treatment- likely RFP for hydro substation
- Issue tender in late summer 2025
- Construction – 2-3 years

Project Contributors

- Stantec Engineering
  - Saibal Basu
  - Jamie Brewster
  - Dave Pernitsky
- Manitoba Water Services Board
  - Nathan Wittmeier
- City of Portage la Prairie
  - Jared Smith
  - WTP Operations & Maintenance Staff

Questions?

American Water Works Association
Western Canada Section

Winner of the Best of the West Water Taste Test

City of Portage la Prairie

Held in conjunction with the
Western Canada Water Annual Conference and Exhibition

September 18 2024

AWWA COMPETITION
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