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Alex Mofidi, Chris Martin, Bob Ward, Simon Hernandez: AECOM
Steve Donovan: SHN Engineering

SURFACE WATER TREATMENT PLANT DESIGN

Achieving multiple objectives while minimizing cost

WTP Design: Max Objectives & Min Cost

- Background
- Treatment Requirements
- Alternatives
  - Treatment
  - River intake system
- Costs / Benefits
- Solutions
- Next Steps

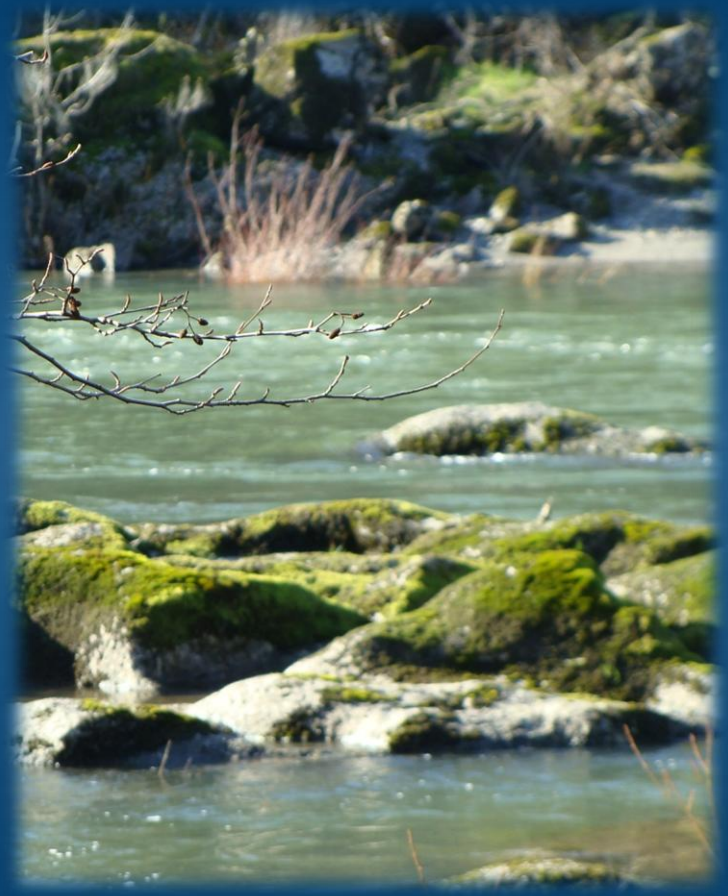
South Umpqua River, Southern Oregon

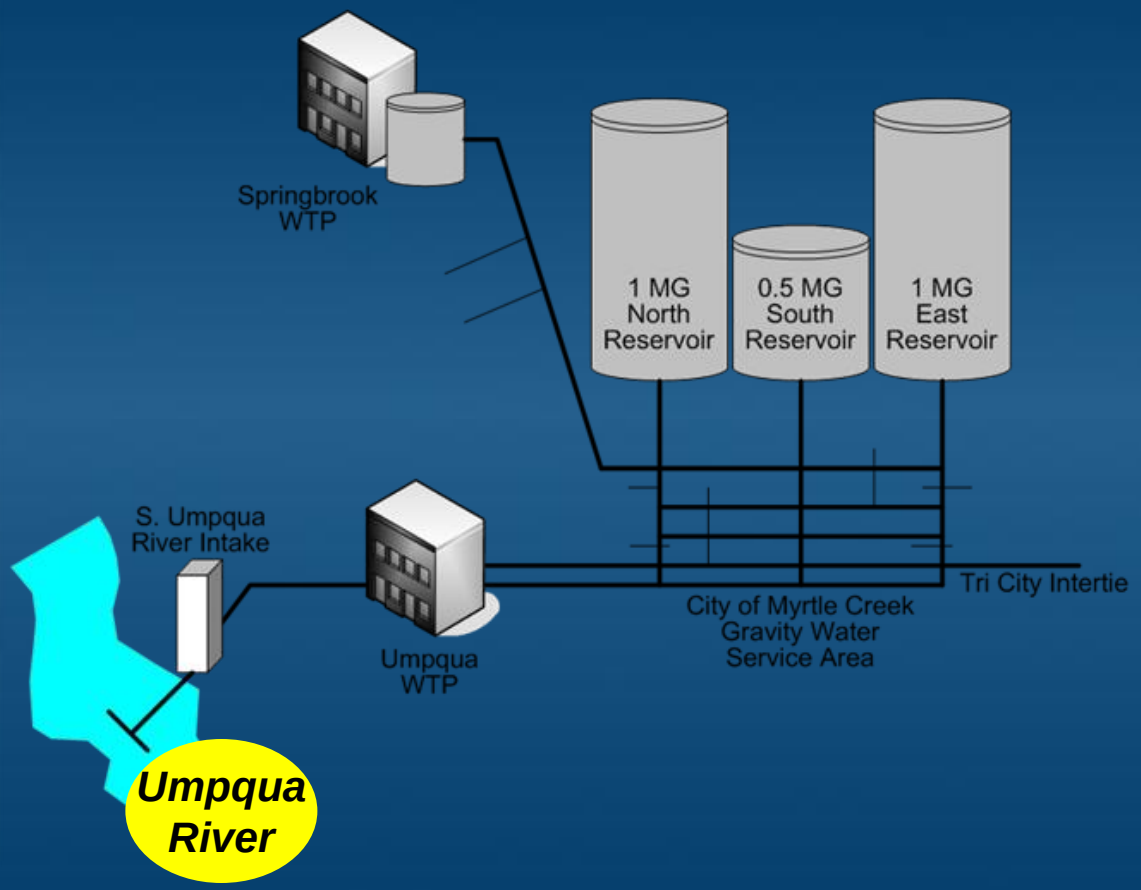
Background: Location

South Umpqua River, Southern Oregon

Background: Source

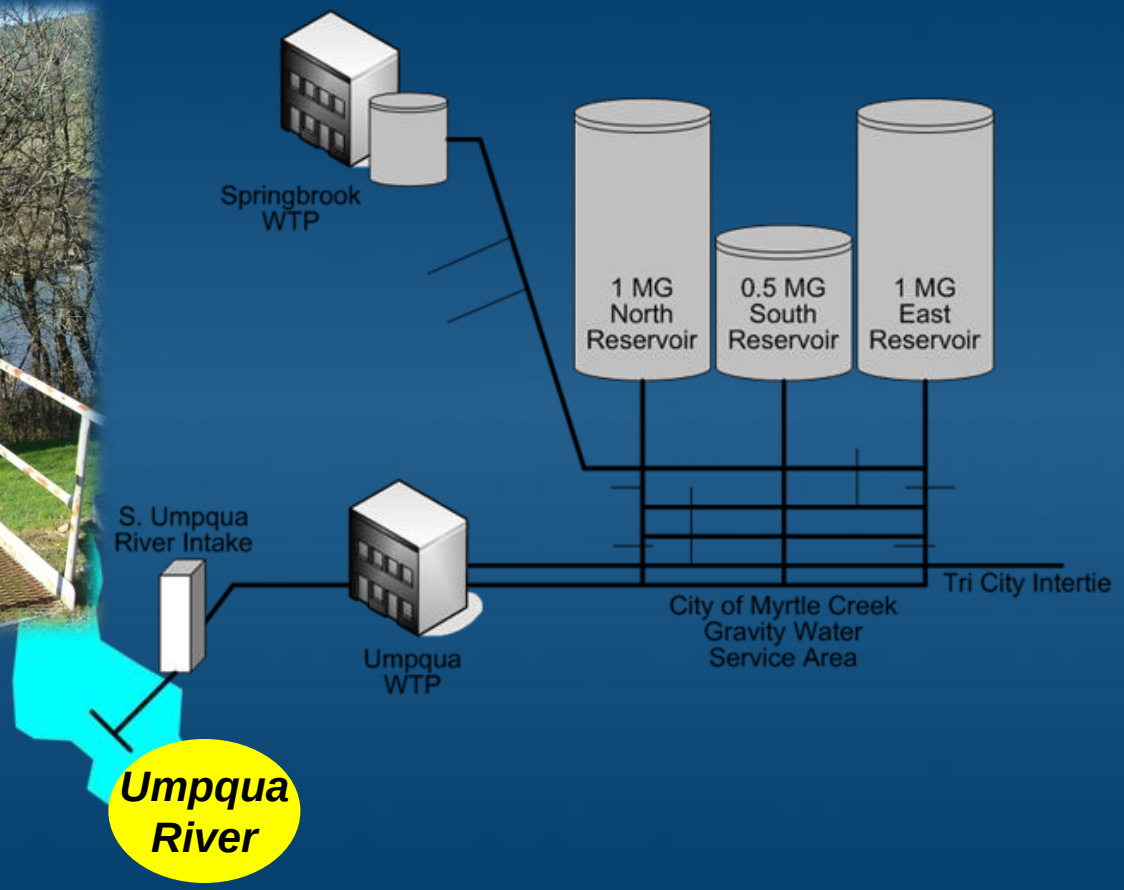
South Umpqua River, Southern Oregon





Background: Source

Existing Intake Structure



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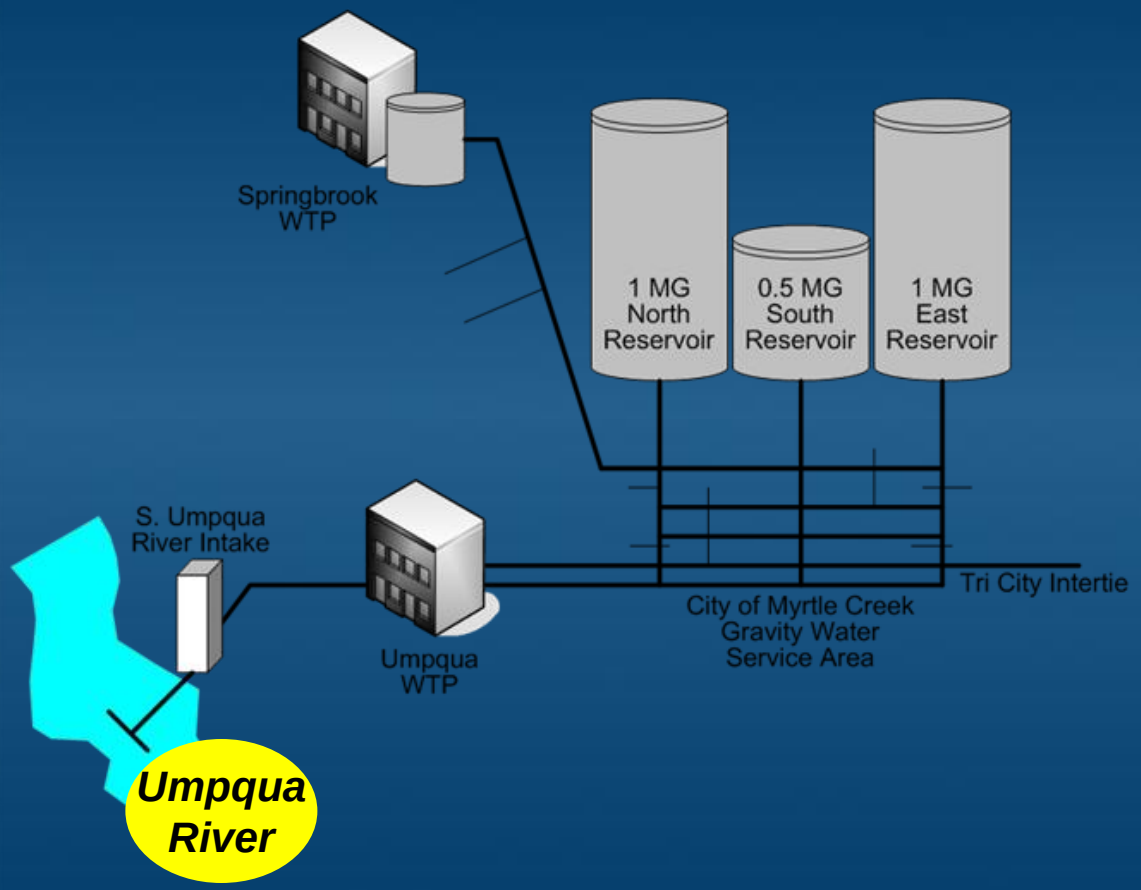
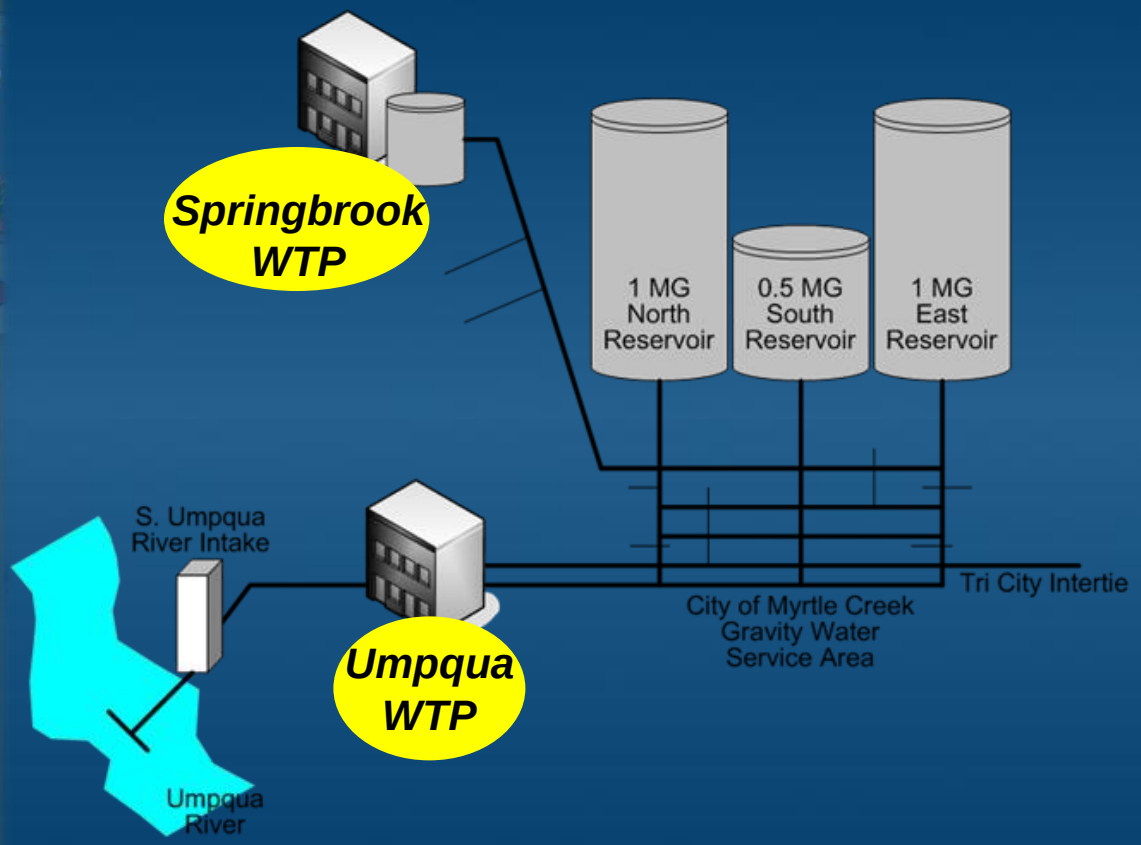
Existing Intake Structure



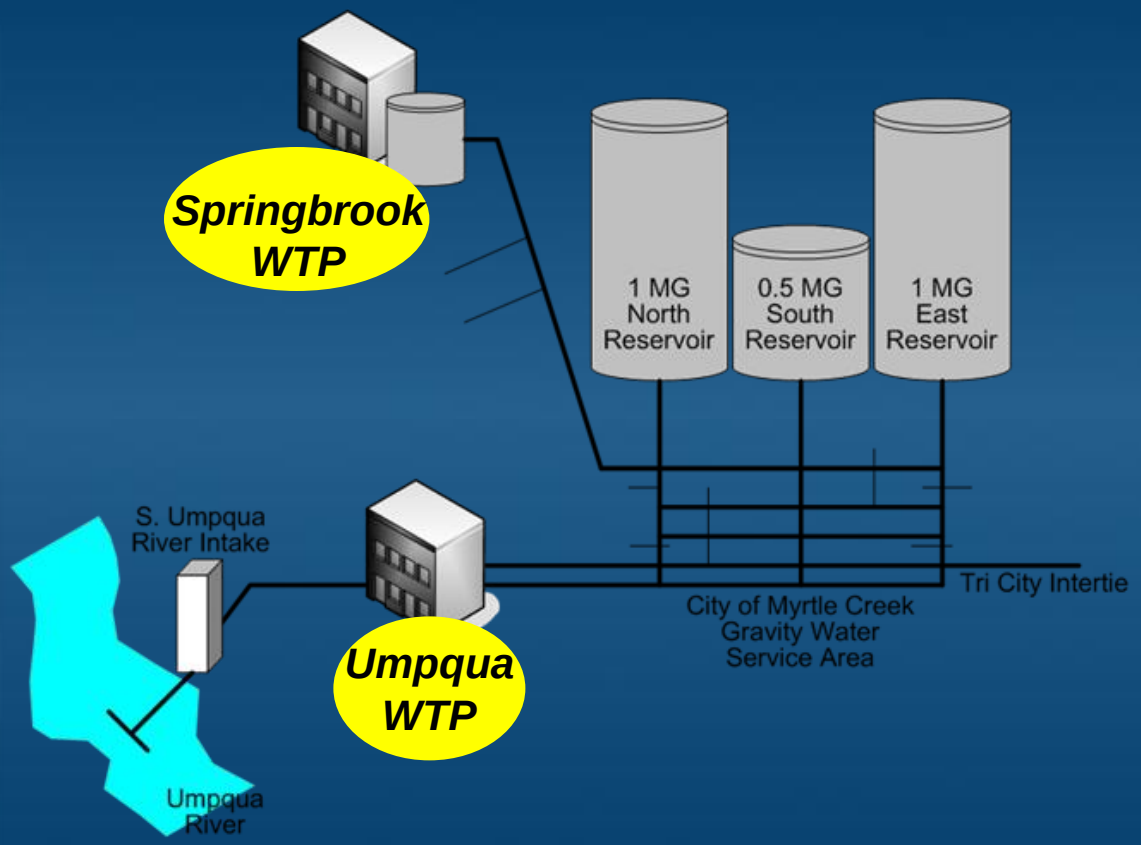
Background: Existing WTP

Existing Umpqua WTP



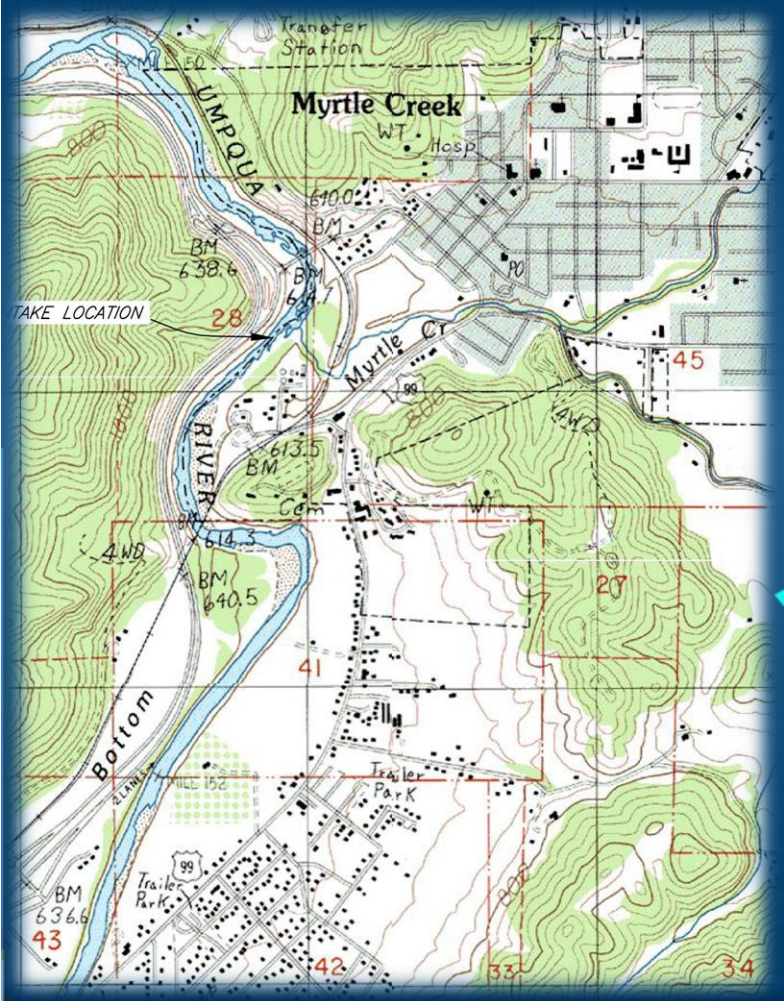
Background: Existing WTP

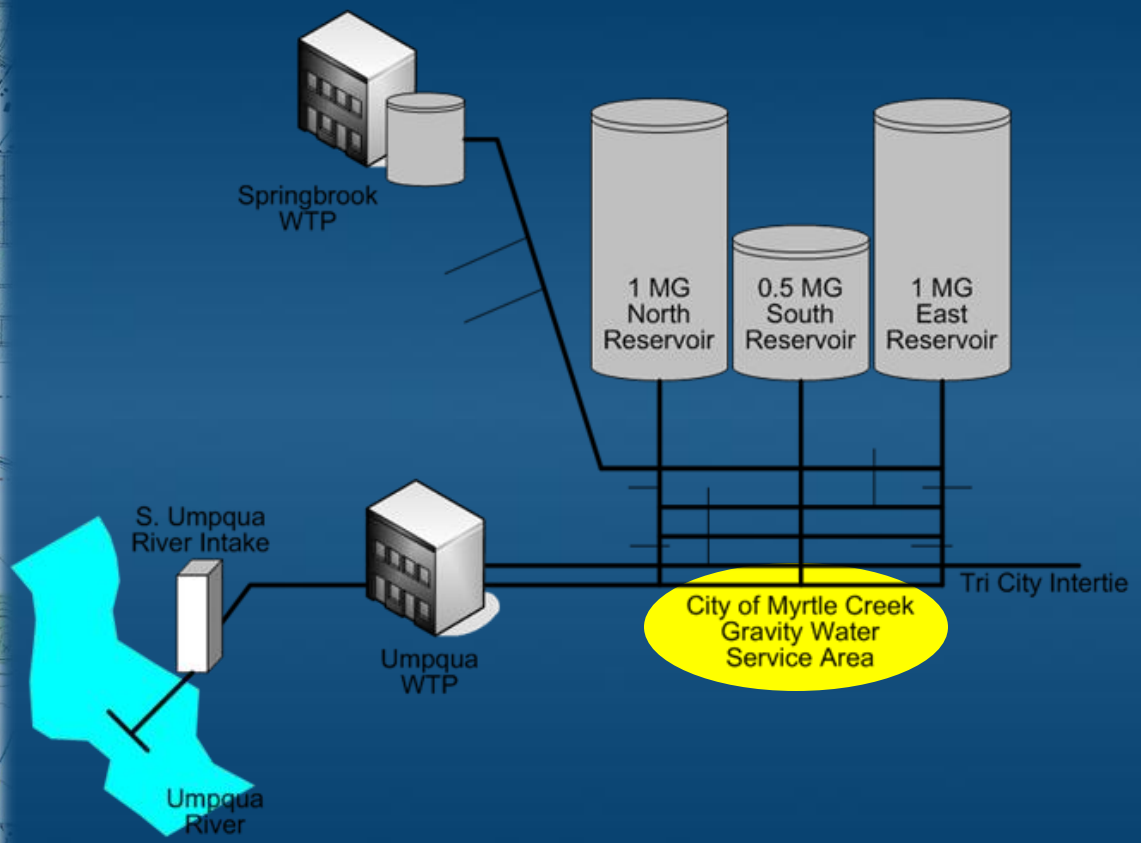
Existing Umpqua WTP



Background: Service Area

Existing Supply Zone





WTP Design: Max Objectives & Min Cost

- Background
- Treatment Requirements
- Treatment Alternatives
  - Benefits
  - Challenges
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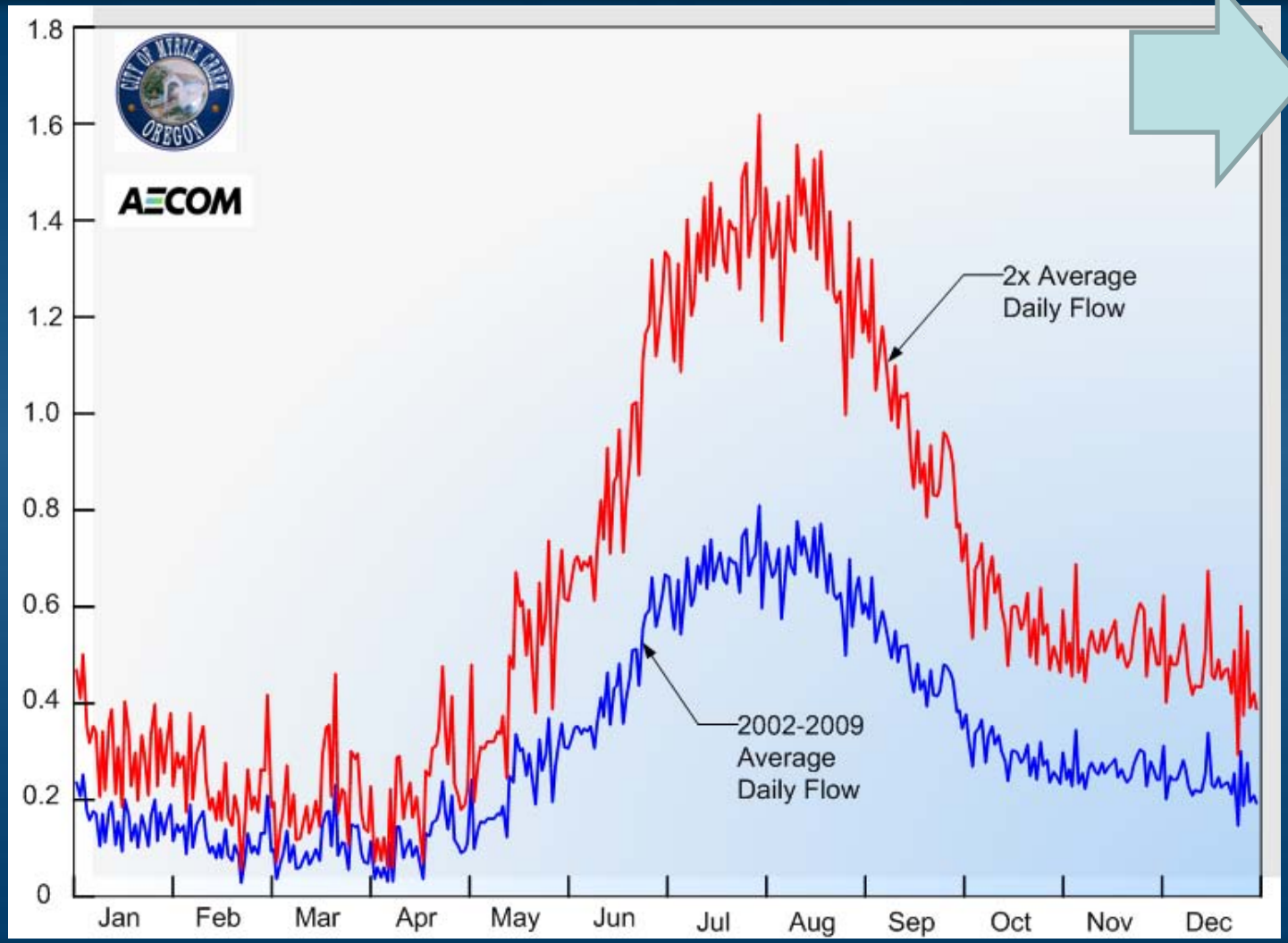
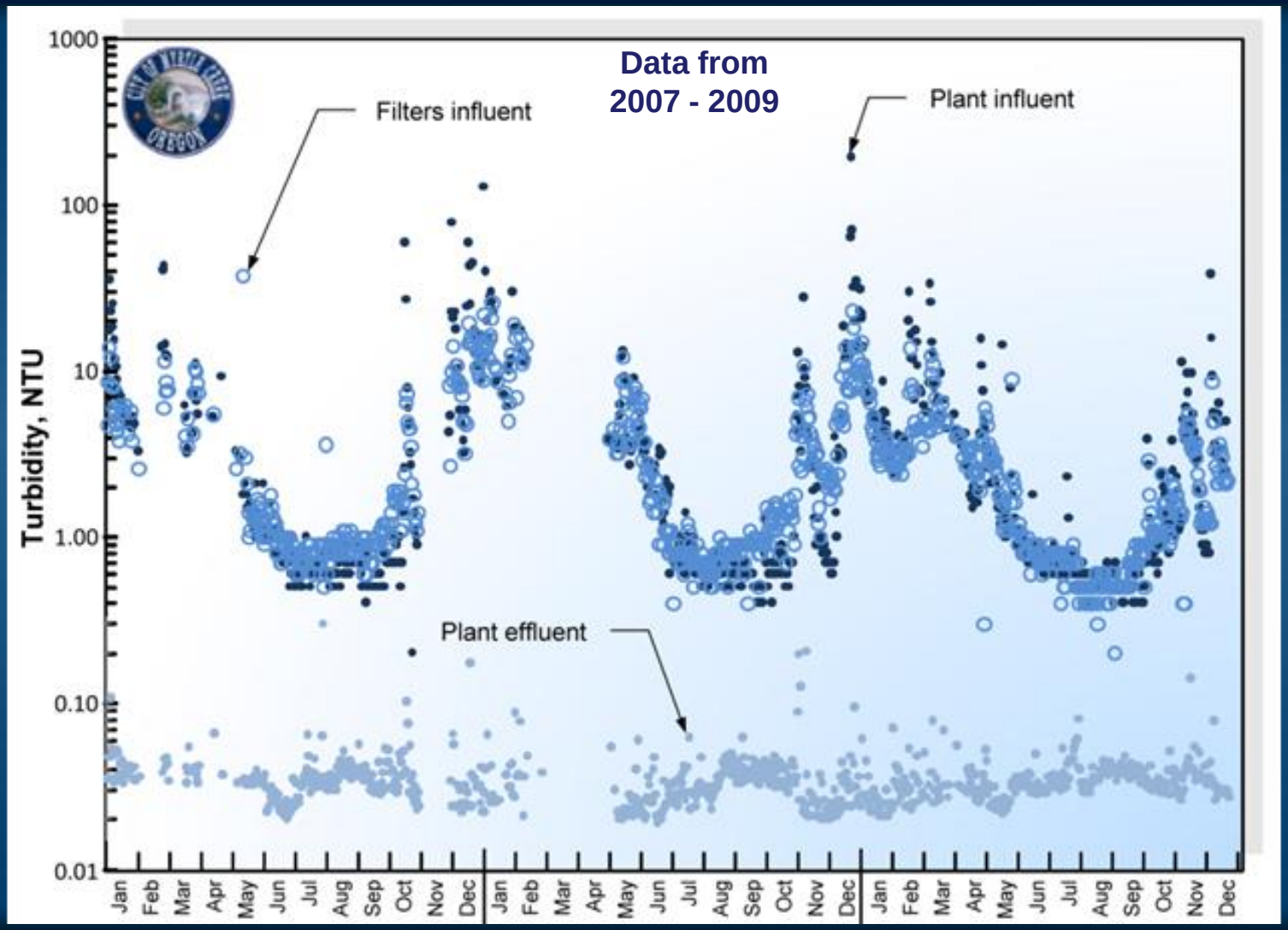
South Umpqua River, Southern Oregon

Treatment Requirements: Flow

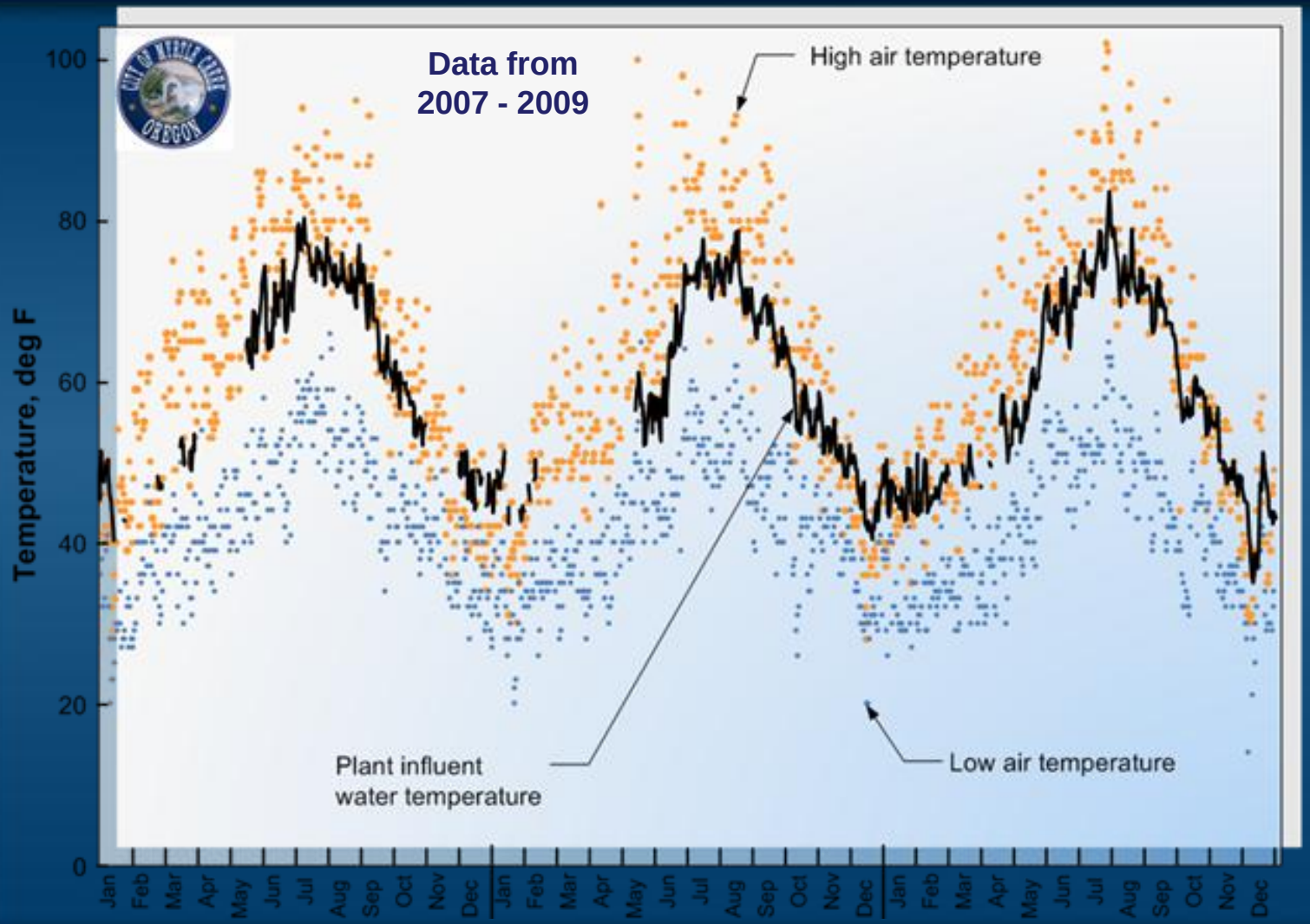


- **2 MGD Design**
- **Must allow for flow variability**

Treatment Requirements: Turbidity



Treatment Requirements: Temperature



Treatment Requirements: Water Quality

- Seasonal Turbidity
- Algae / Tastes and Odors (Geosmin)
- Temperature (Summer)
- Pathogen Loading

Parameter	Units	Average	Range
Alkalinity (as CaCO3)	mg/L	45	31 – 61
pH	units	7.5	6.4 – 8.7
Temperature	deg C	15	2 – 29
Total organic carbon	mg/L	1.95	1.4 – 2.4
Turbidity	NTU	4.8	0.2 – 196

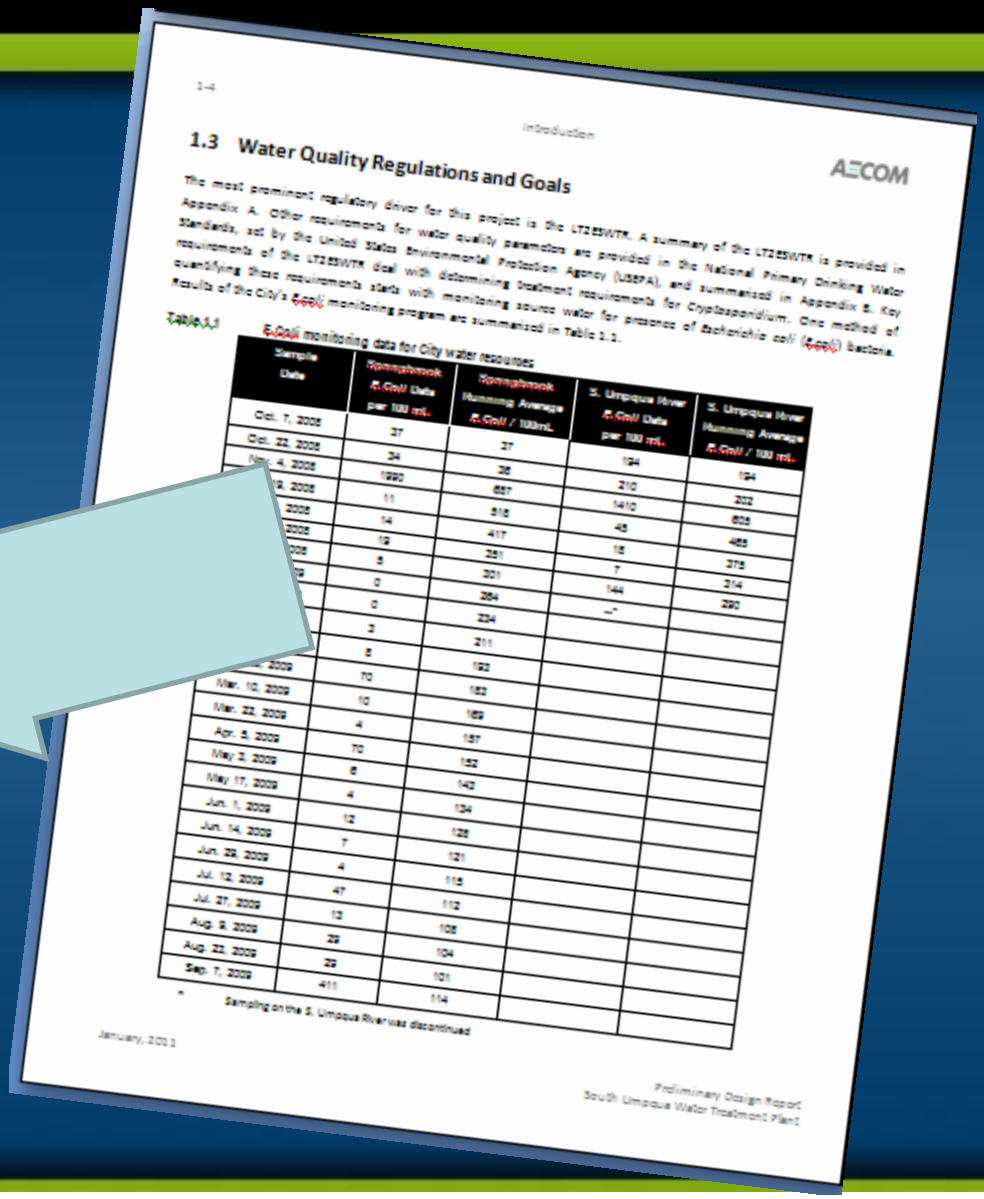
Treatment Requirements: Pathogen Control

- Seasonal Turbidity
- Algae / Tastes and Odors
- Temperature (Summer)
- Pathogen Loading

Average *E.coli* = 290 per 100 mL

(Ranges from 7 to 1,410)

Crypto 'trigger' = 50 per 100 mL



1-4

Introduction

AECOM

1.3 Water Quality Regulations and Goals

The most prominent regulatory driver for this project is the LT2ESWTR. A summary of the LT2ESWTR is provided in Appendix A. Other requirements for water quality parameters are provided in the National Primary Drinking Water Standards, set by the United States Environmental Protection Agency (USEPA), and summarized in Appendix B. Key requirements of the LT2ESWTR deal with determining treatment requirements for Cryptosporidium. One method of quantifying these requirements starts with monitoring source water for presence of fecaloid coli (E.coli) bacteria. Results of the City's E.coli monitoring program are summarized in Table 1.1.

Table 1.1 E.Coli monitoring data for City water resources

Sample Date	Yoncalla Creek E.Coli Data per 100 mL	Yoncalla Creek Running Average E.Coli / 100mL	S. Umpqua River E.Coli Data per 100 mL	S. Umpqua River Running Average E.Coli / 100 mL
Oct. 7, 2008	37	37	194	194
Oct. 22, 2008	34	36	210	202
Nov. 4, 2008	1290	687	1410	805
[illegible]	11	515	45	485
[illegible] 2008	14	417	15	375
[illegible] 2008	19	351	7	314
[illegible]	5	301	144	290
[illegible]	0	264	--*	
[illegible]	0	234		
[illegible]	2	211		
[illegible] 2009	5	193		
Mar. 10, 2009	70	183		
Mar. 22, 2009	10	169		
Apr. 5, 2009	4	157		
May 3, 2009	70	152		
May 17, 2009	6	143		
Jun. 1, 2009	4	134		
Jun. 14, 2009	12	128		
Jun. 29, 2009	7	121		
Jul. 12, 2009	4	115		
Jul. 27, 2009	47	112		
Aug. 9, 2009	13	108		
Aug. 23, 2009	29	104		
Sep. 7, 2009	29	101		
*	411	114		

* Sampling on the S. Umpqua River was discontinued

January, 2011

Preliminary Design Report
South Umpqua Water Treatment Plant

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- Treatment Alternatives
  - Benefits
  - Challenges
- Costs / Benefits
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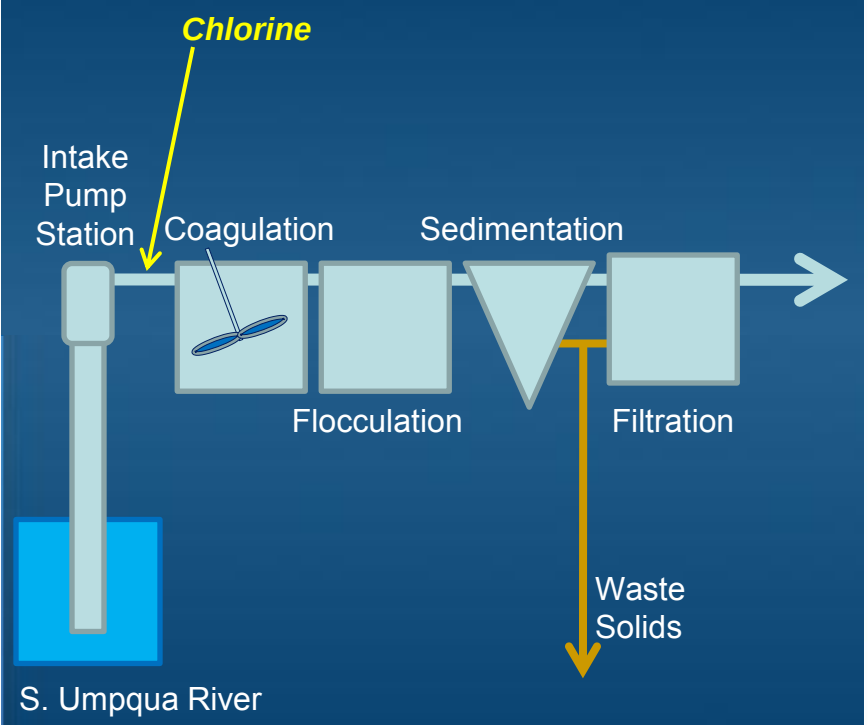
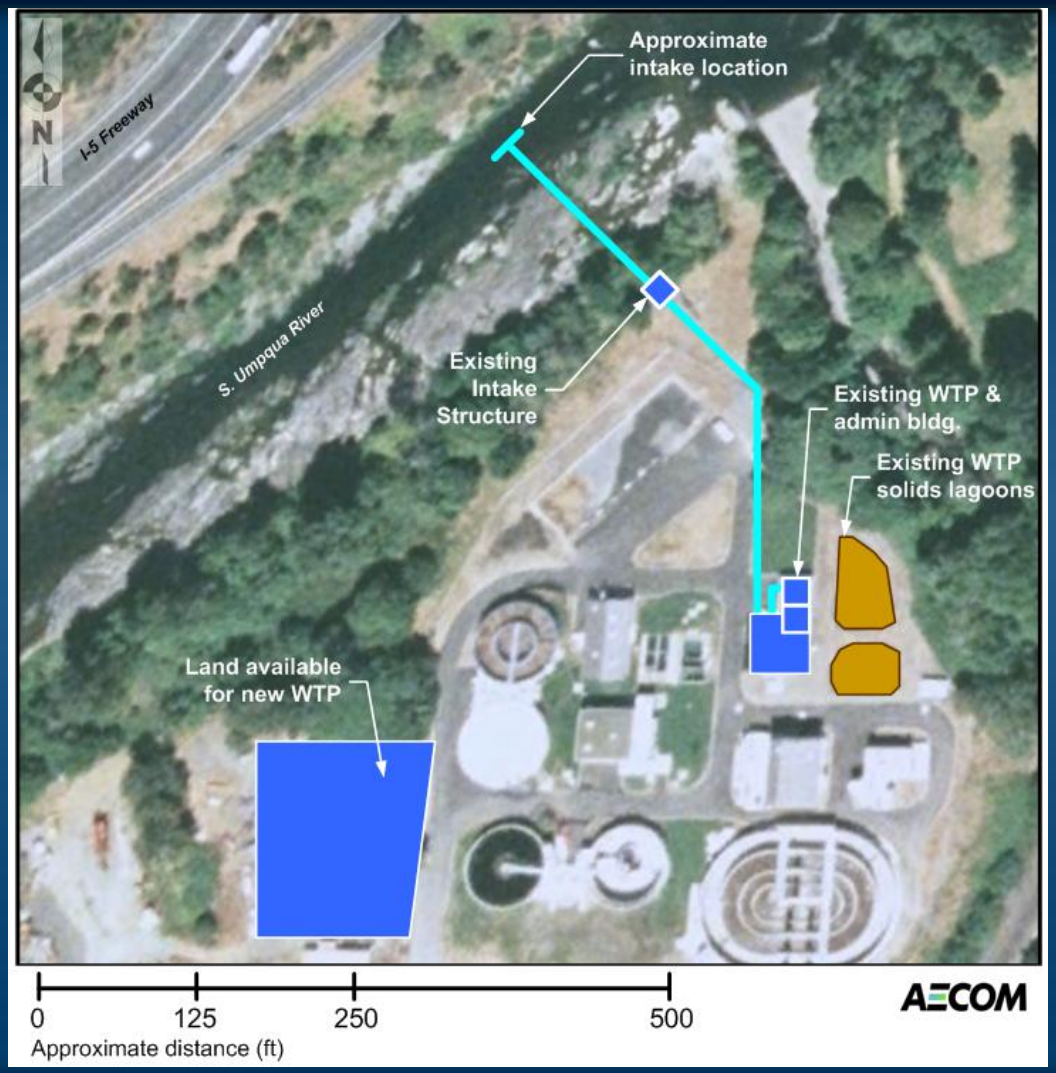
South Umpqua River, Southern Oregon

Alternatives: Existing Facilities





Alternatives to Existing Facilities

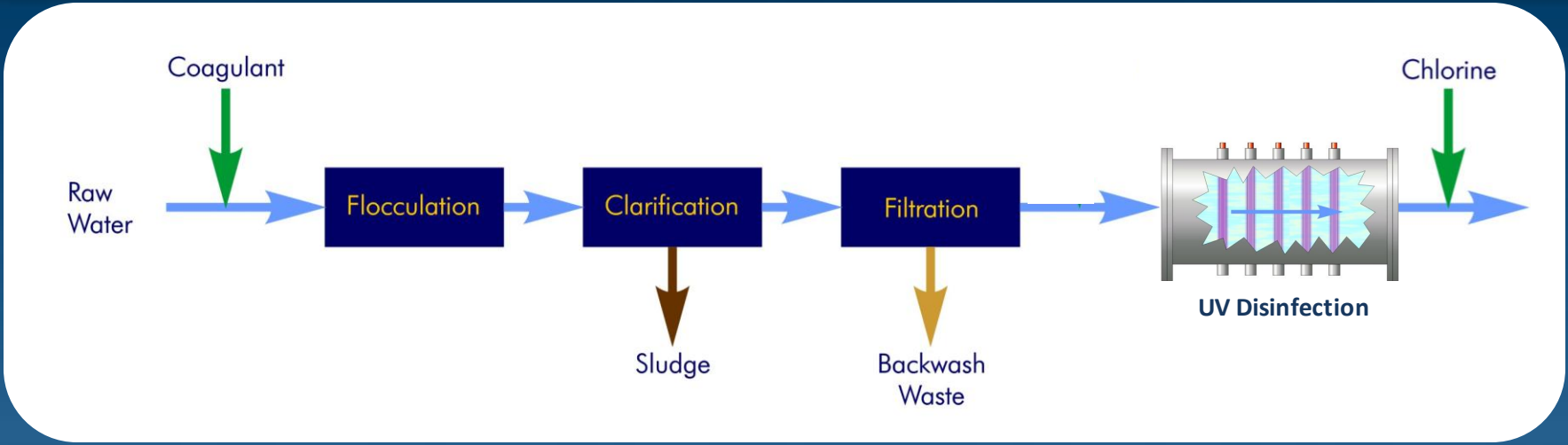
- Needs of the City
  - Regulatory compliance (treatment, intake)
  - Improving aesthetics
  - Minimizing staff labor
  - Maintaining strict budget requirements
- Meeting City Needs
  - Rapid alternatives analysis
  - Cost:benefit assessment
  - Assessment of non-cost issues

Alternatives to Existing Facilities

Alternative	Description

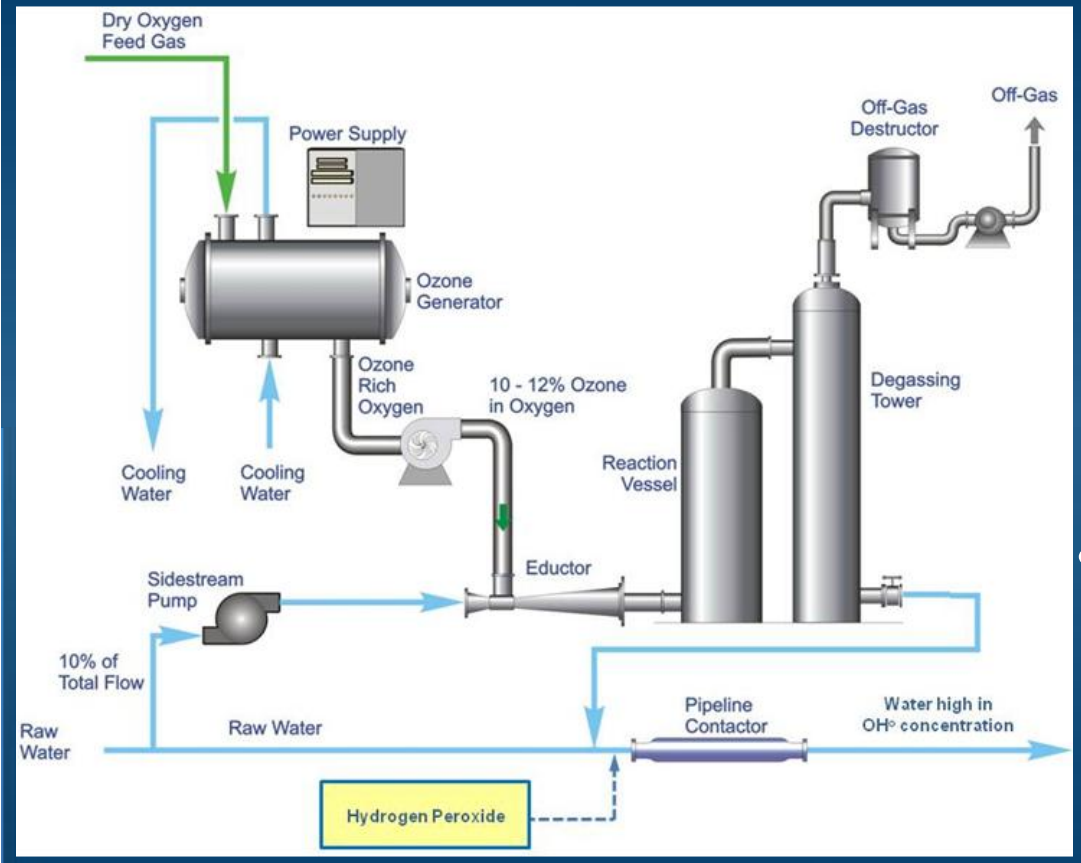
- Meeting City Needs
  - Rapid alternatives analysis
  - Cost:benefit assessment
  - Assessment of non-cost issues

Alternative 1: Conventional, UV



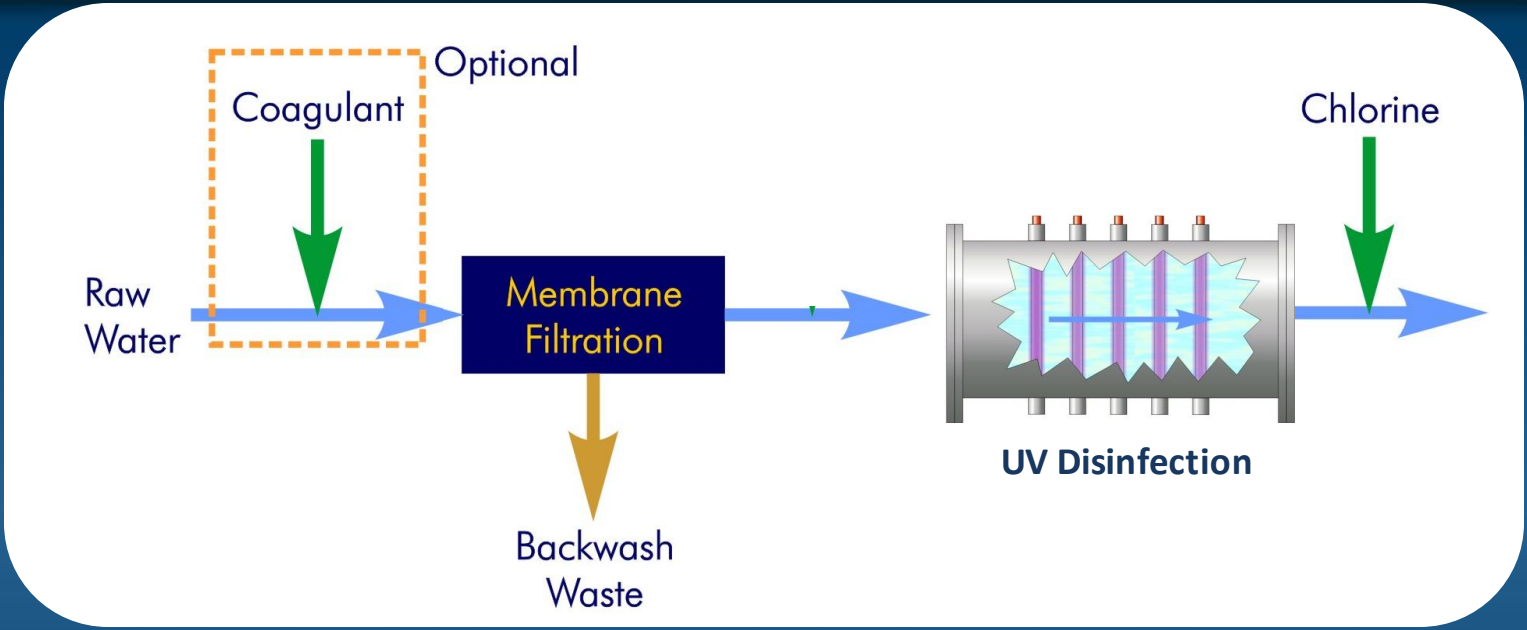
- **Benefits**
  - Familiar technology
  - Similar O&M cost
- **Challenges**
  - Labor requirements
  - No 'net gain' in capabilities
  - Best pre-treatment choice for UV disinfection (?)

Alternative 2: Ozone, Conventional, UV



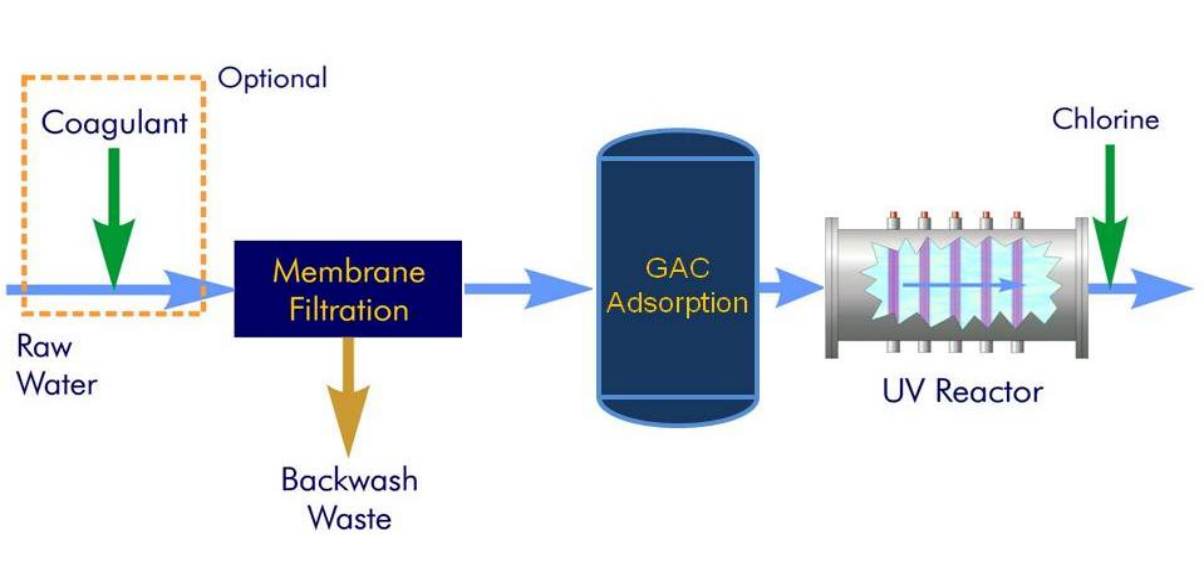
- **Benefits**
  - Familiar technology
  - Many ozone capabilities (aesthetics, future regulated contaminants, improved conventional/filter operation?)
  - Multiple barriers
- **Challenges**
  - Labor requirements
  - Increased carbon footprint
  - Best pre-treatment choice for UV disinfection (?)

Alternative 3: LP Membranes, UV



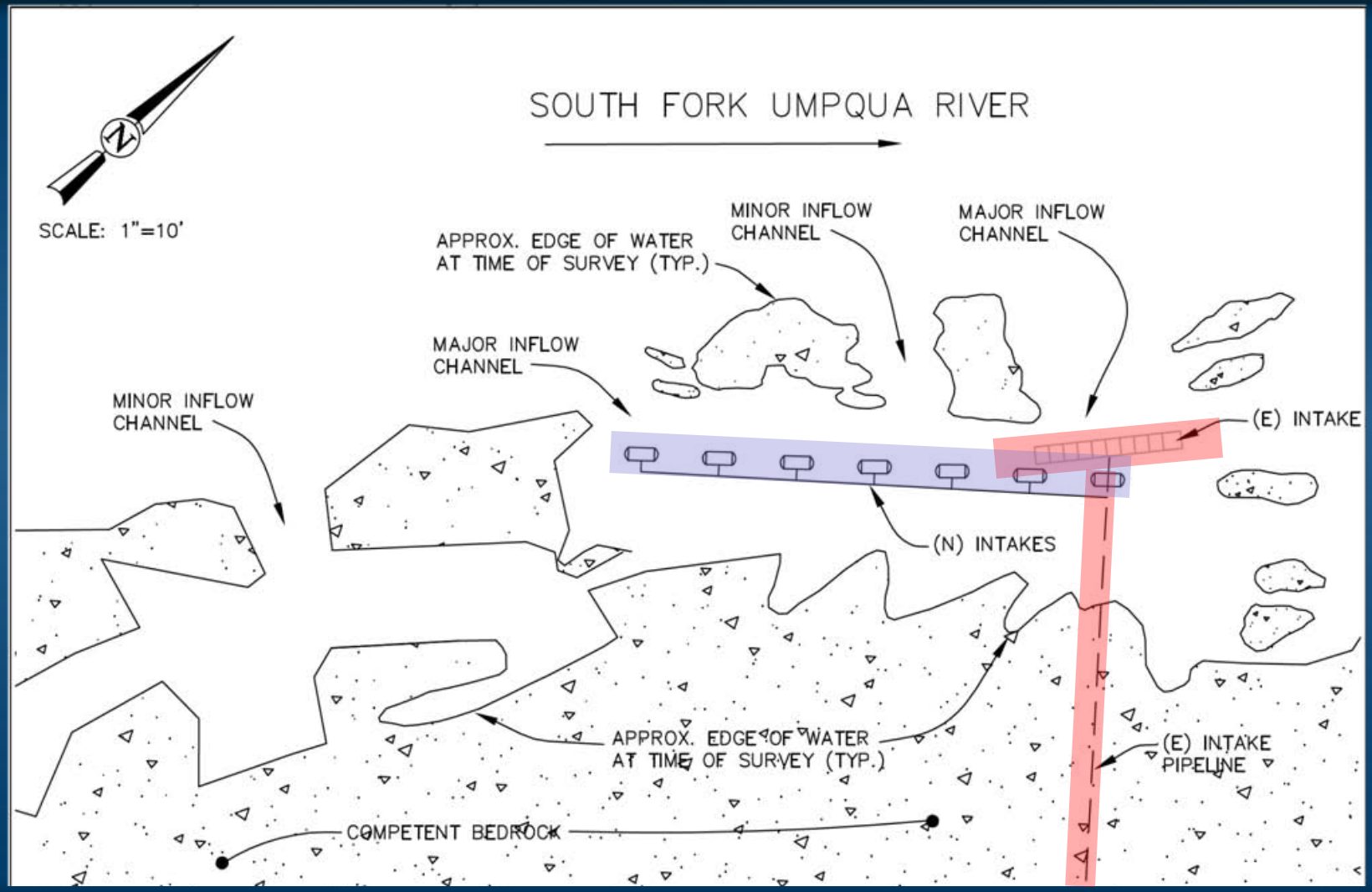
- **Benefits**
  - Minimal operator attention
  - Minimal chemical use
- **Challenges**
  - Bigger carbon footprint
  - Increased O&M (?)
  - Pilot testing needs (?)
  - Best pre-treatment choice for UV disinfection (?)

Alternative 4: LP Membranes, GAC, UV

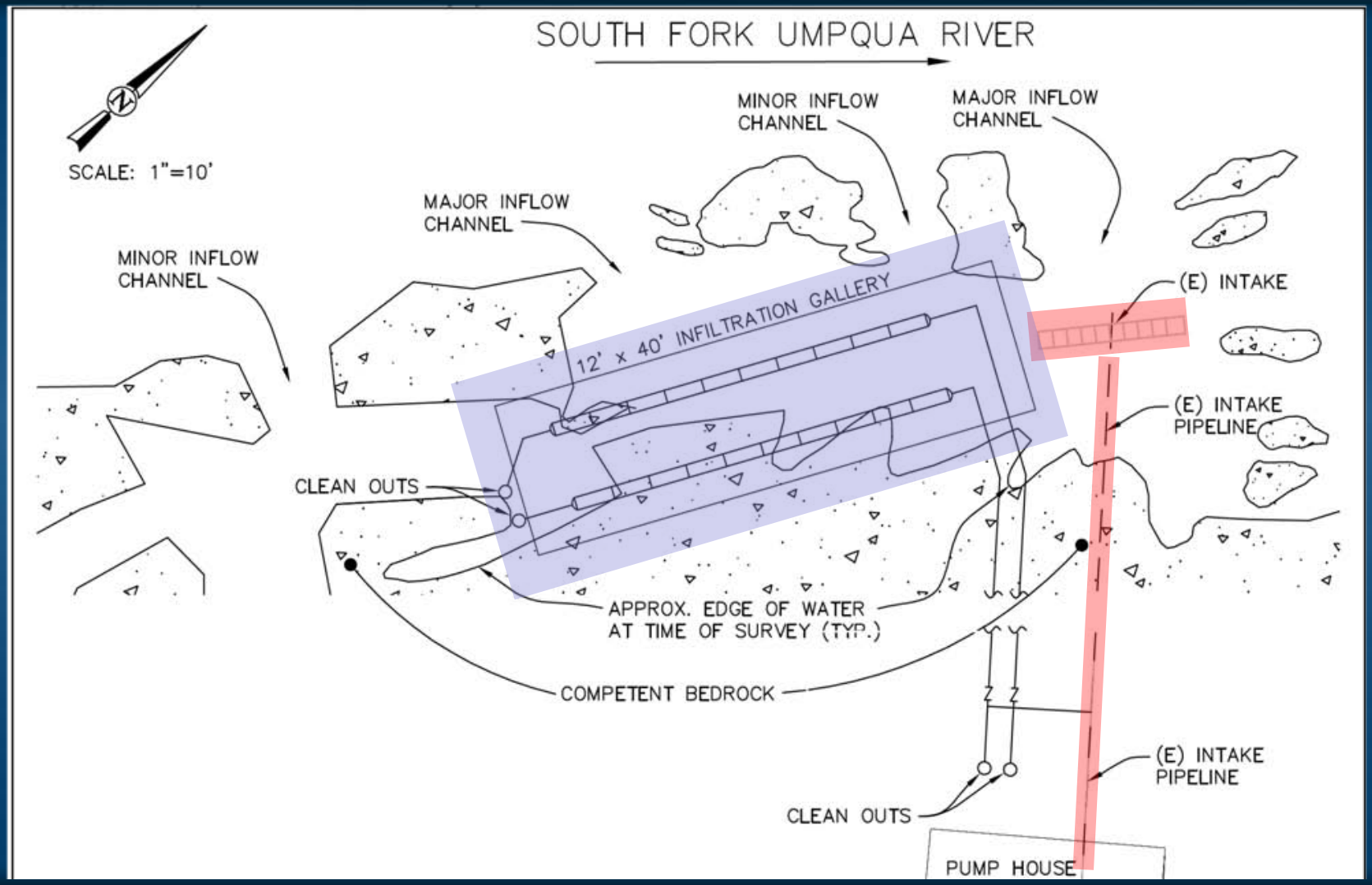


- **Benefits**
  - Minimal operator attention
  - Minimal chemical use
  - T&O control
- **Challenges**
  - Bigger carbon footprint
  - Increased O&M (?)
  - Pilot testing needs (?)
  - Best pre-treatment choice for UV disinfection (?)

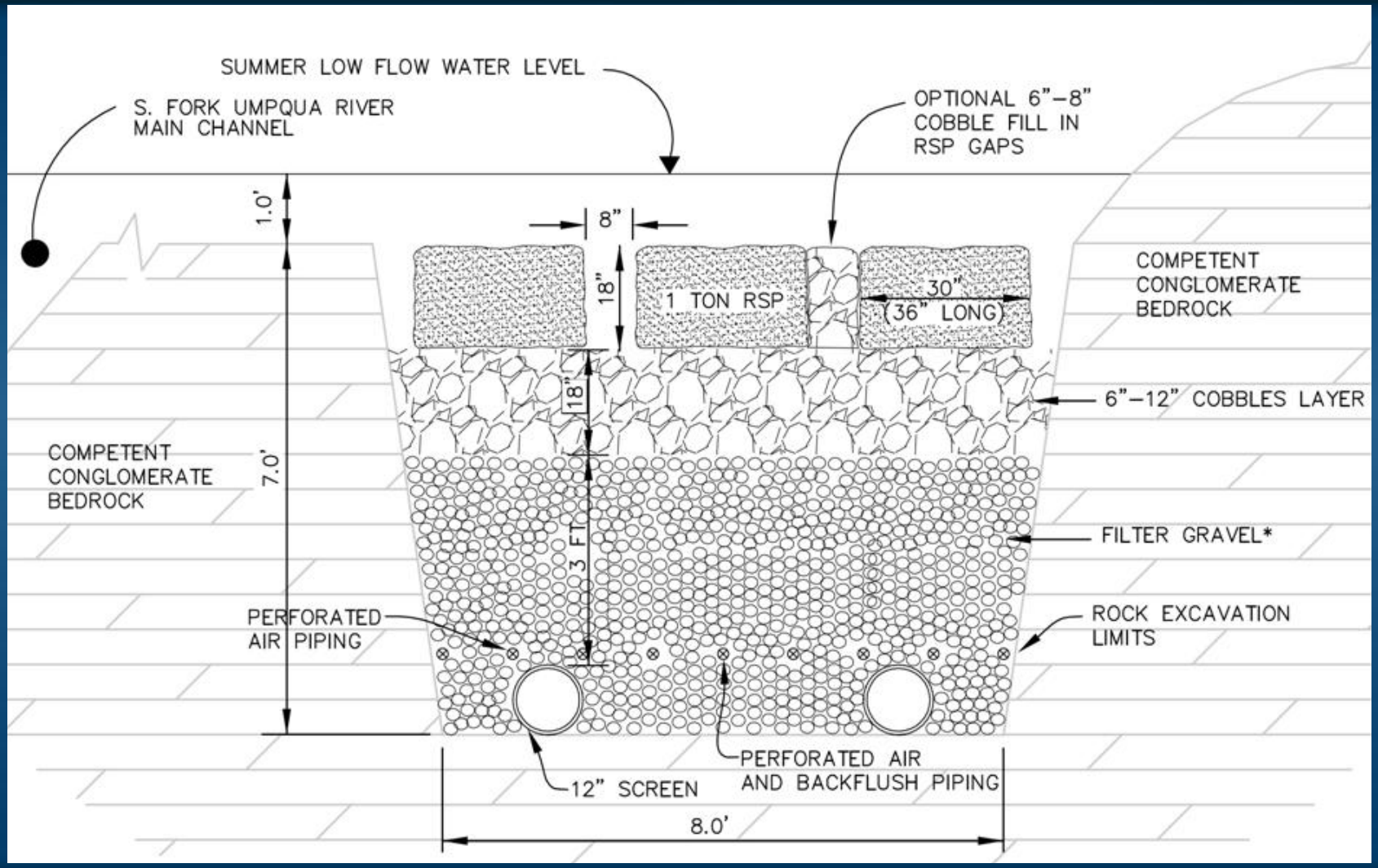
Current Intake: Tee-Screen



Intake Re-Design: Infiltration Gallery



Intake Re-Design: Infiltration Gallery



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South Umpqua River, Southern Oregon

Preliminary (5%) Cost

Treatment Option	Capital Cost	O&M Per Year	Life Cycle Cost
Conventional, UV	$3.23	0.21	$8.1
Ozone, Conventional, UV	$4.29	0.29	$11.0
Membranes, UV	$2.89	0.21	$7.7
Membranes, GAC, UV	$3.64	0.21	$8.7

30-year life
3% Interest rate

Intake Option	Capital Cost
New Tee Screen	$0.32
Infiltration Gallery	$0.25

WTP Design: Max Objectives & Min Cost

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South Umpqua River, Southern Oregon

Solutions and Next Steps

- Replace the Aging WTP!

- Selection of LP Membranes, GAC, UV
  - Piloting conducted up-river at another facility
  - Setting membrane flux requirements
  - Low operational demands
  - Meets budgetary requirements
  - Infiltration gallery – seeking external funding

Solutions and Next Steps

- Maintain Program Schedule
  - Selecting membrane manufacturer
    - Recommended
    - Contracting underway
  - Design / Construction / Startup
  - Compliance well prior to 2014 requirement (LT2)

Thank You!

CITY OF MYRTLE CREEK
OREGON
South Umpqua
Water Treatment Plant
AECOM