

Algae Control with Dissolved Air Flotation in Bellingham, WA



PNWS-AWWA Conference 2016

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Bill Evans/City of Bellingham



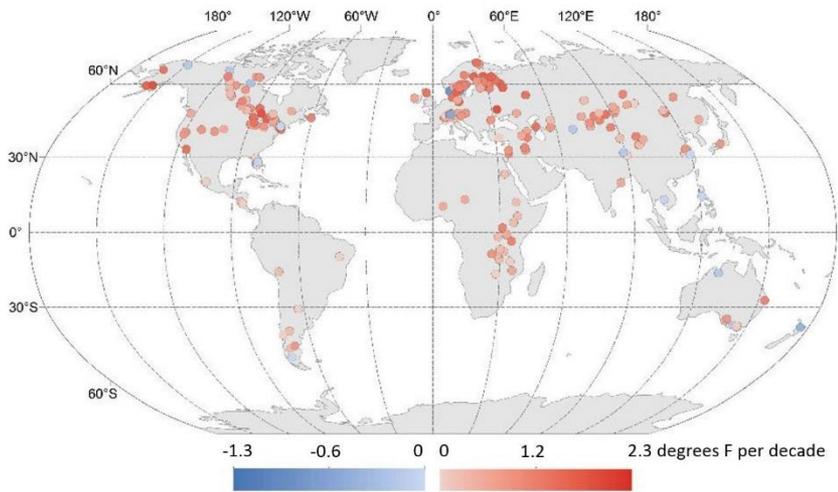
Outline

- Algae in the Pacific Northwest
- Bellingham WTP background
- Alternatives and pilot study
- Chlorine gas conversion
- Conclusion



Climate change and algal blooms

- Increased temperatures result in rising lake temperatures
- Increased Proliferation of Algae & Algal Toxins



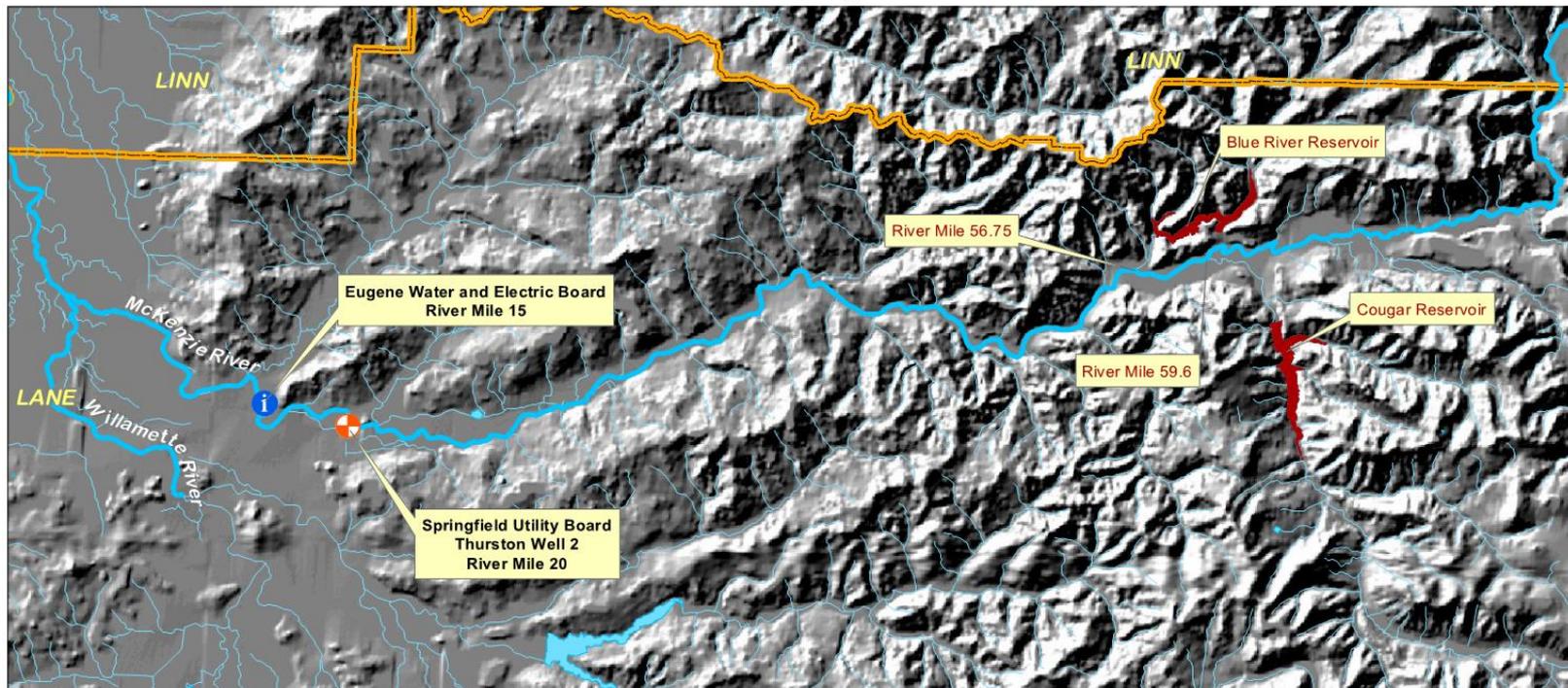
Worldwide Lake Warming 2015, Source: NASA



Lake Erie Algal Bloom, 2013, Source: NOAA

Algal blooms in Oregon

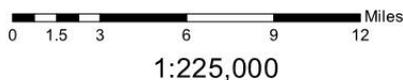
McKenzie River Basin - Public Water System HAB Response Network



Public Water System Contact Information			
PWS Name	PWS No.	Phone #	River Mile
Springfield Utility Board	00837	541-744-3730	20
Eugene Water & Electric Board	00287	541-434-5787	15

Harmful Algae Bloom Locations

Bloom locations are in red. In many cases, the locations are connected by tributaries downstream from the original bloom. The confluence with major drinking water sources are shown in red text and include river mileage. Generally, the river miles were estimated from U.S. Geological Survey 7.5 minute topographical maps.



Other Relevant Contacts		
Organization	Contact	Phone/Email
U.S. Army Corps of Engineers	Christie Johnson	541-942-5631 christie.l.johnson@usace.army.mil
U.S. Forest Service	Al Johnson	541-225-6431 ajohnson@fs.fed.us
DEQ TMDL Program Willamette Basin	Pamela Wright	541-686-7719 Eugene wright.pamela@deq.state.or.us

- Surface Water Intakes
- GWUDI Wells
- Rivers
- Harmful Algae Blooms
- Lakes
- County Boundaries



Drafted by S. Stevenson G.I.T.
Map Revised 11/19/2012

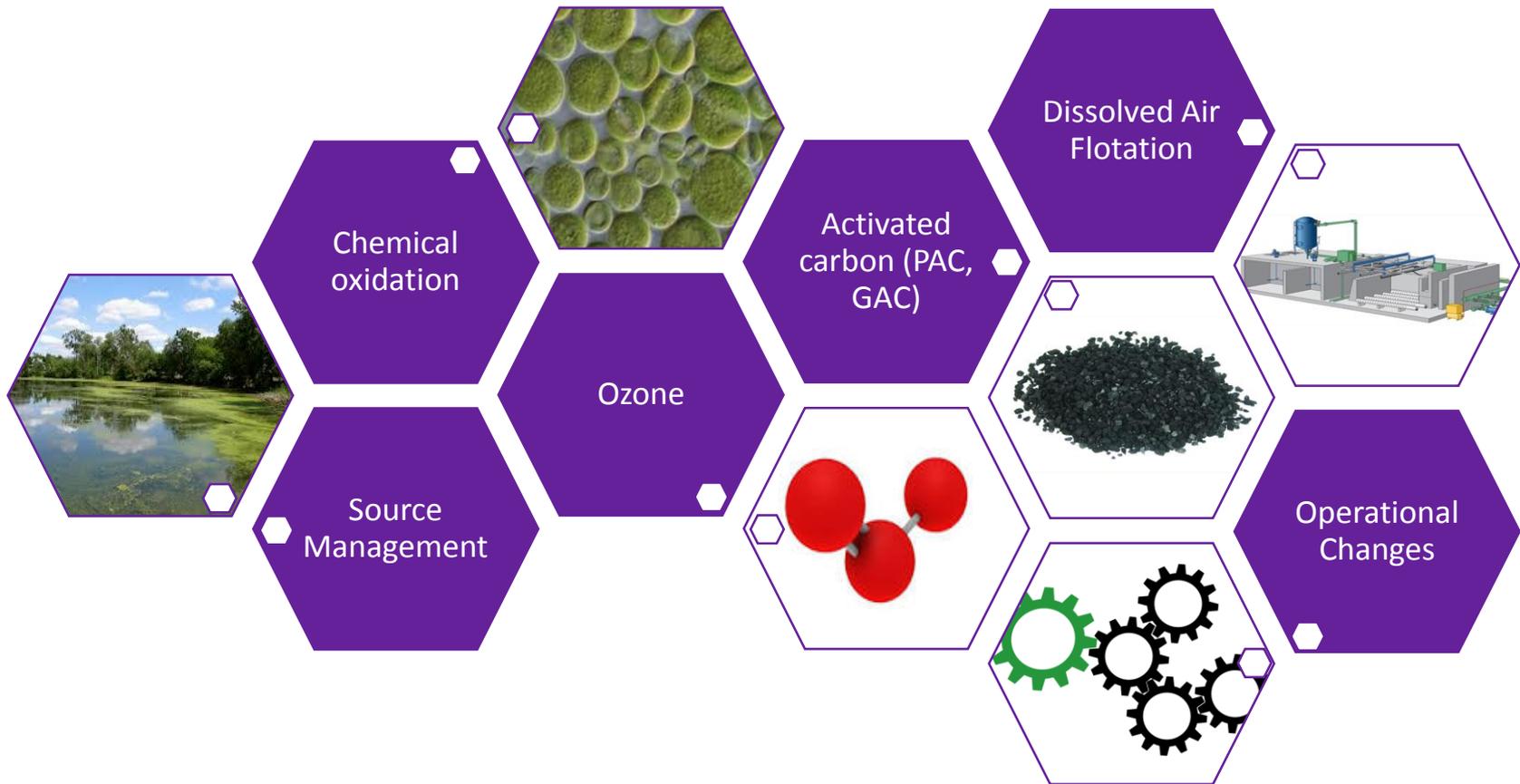


Source: <https://public.health.oregon.gov/HealthyEnvironments/DrinkingWater/Operations/Treatment/Pages/algae.aspx>

Impacts of algae



Impacts of algae: Mitigation techniques



Bellingham WTP Background

Whatcom Falls Treatment Plant background

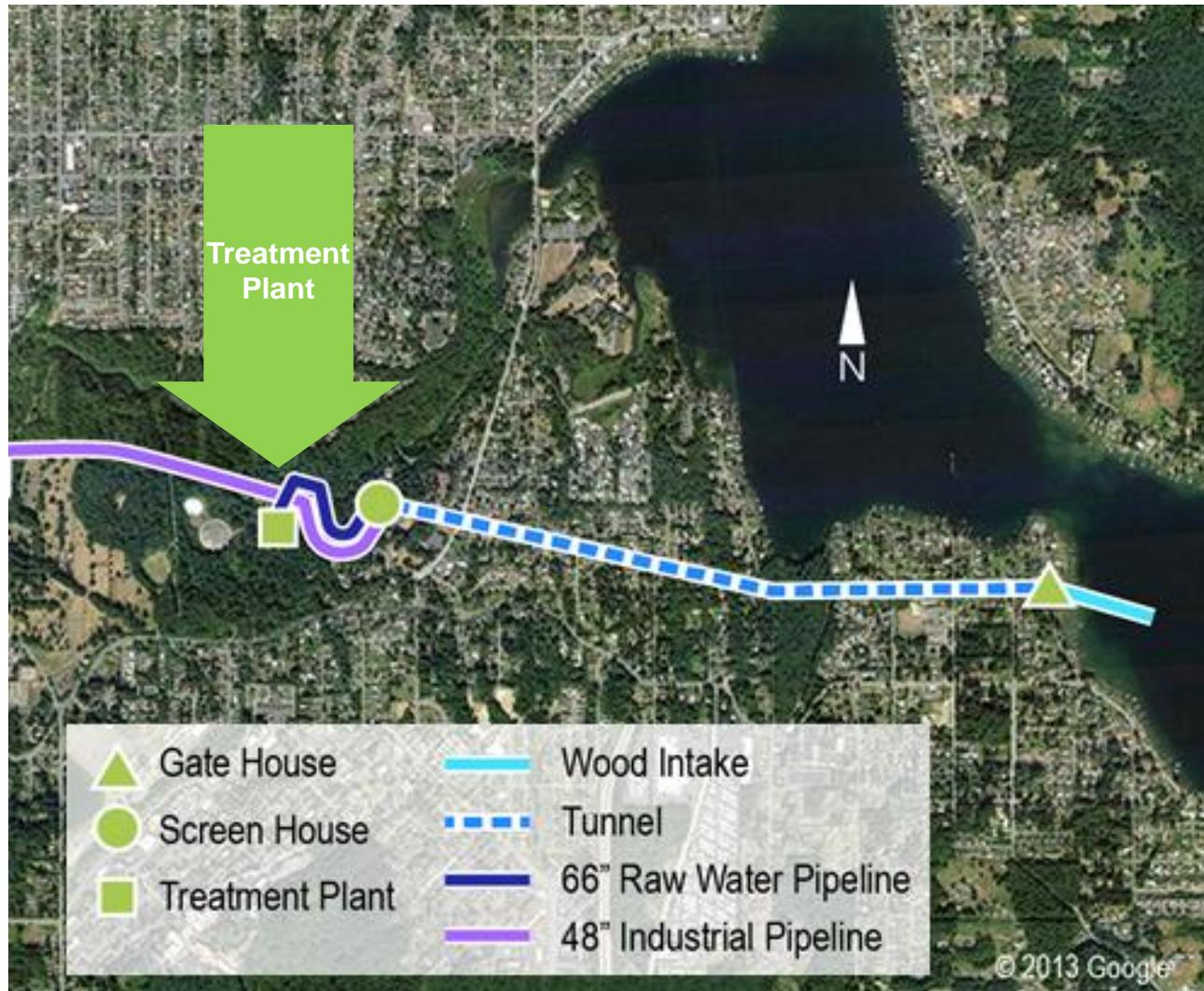
Constructed
in 1968

In-line
Filtration Plant

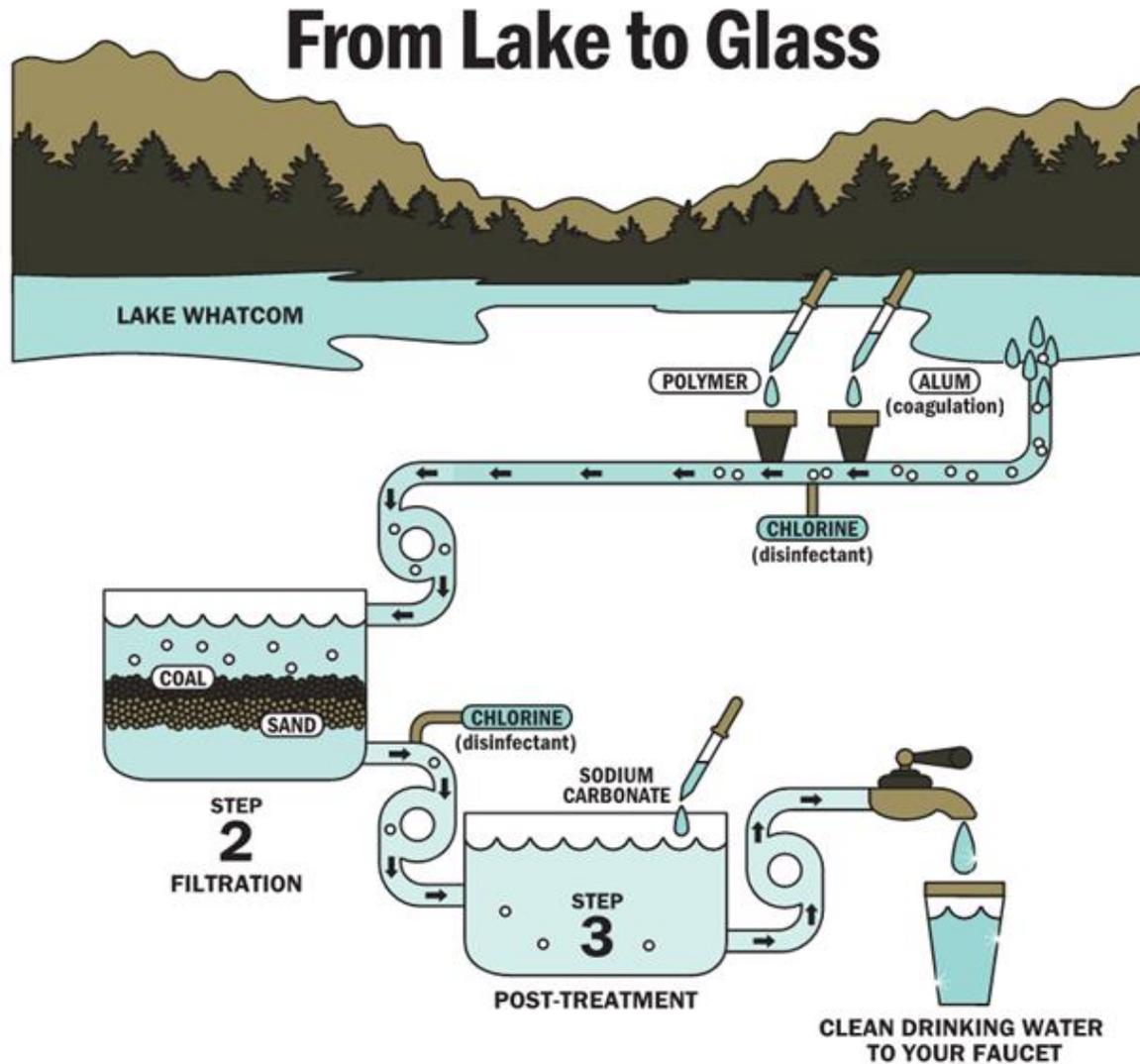
Limited pre-
treatment



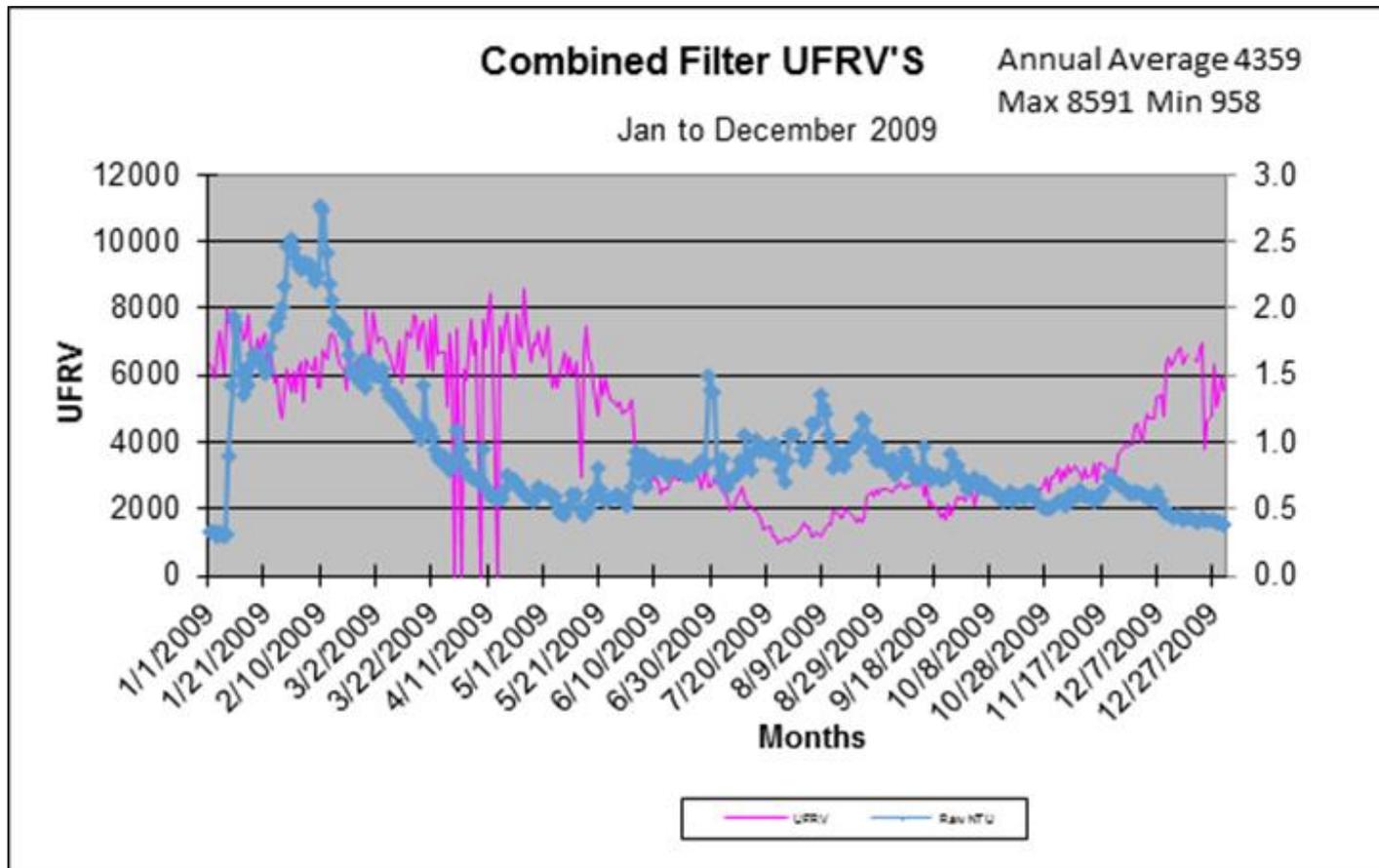
Whatcom Falls Treatment Plant background



Whatcom Falls Treatment Plant background



Whatcom Falls Treatment Plant background: 2009 algae event



Alternatives and Pilot Study

Treatment alternatives

No action

Relocation of the intake

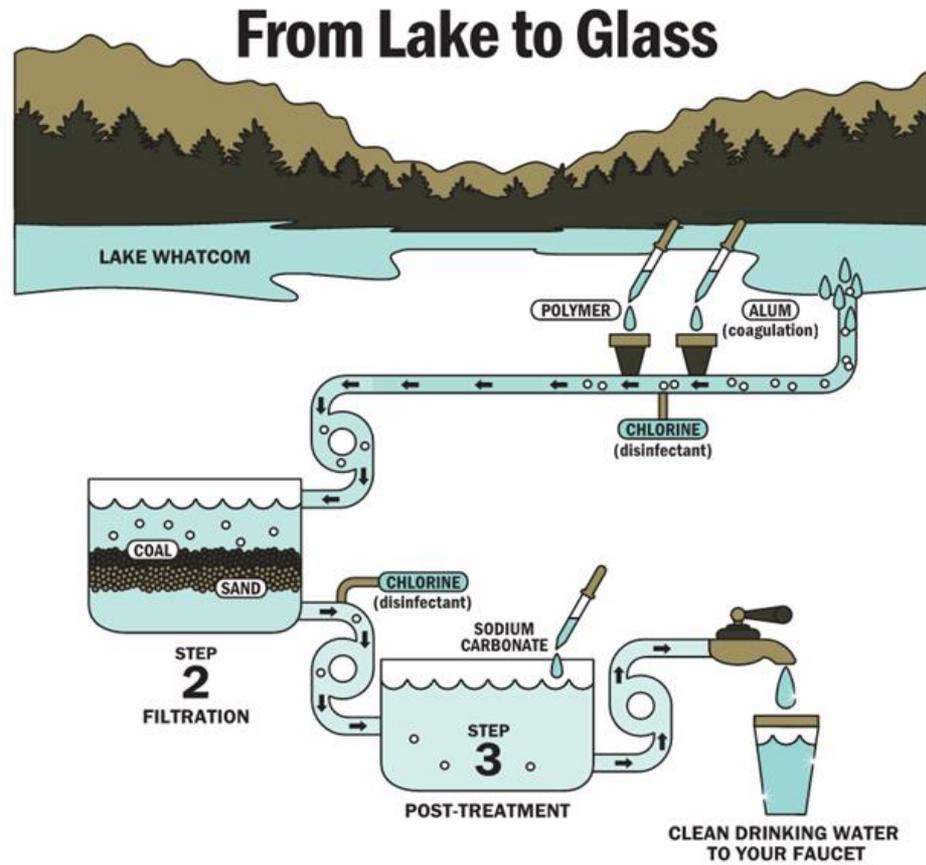
Filter expansion

Construction of a pretreatment facility

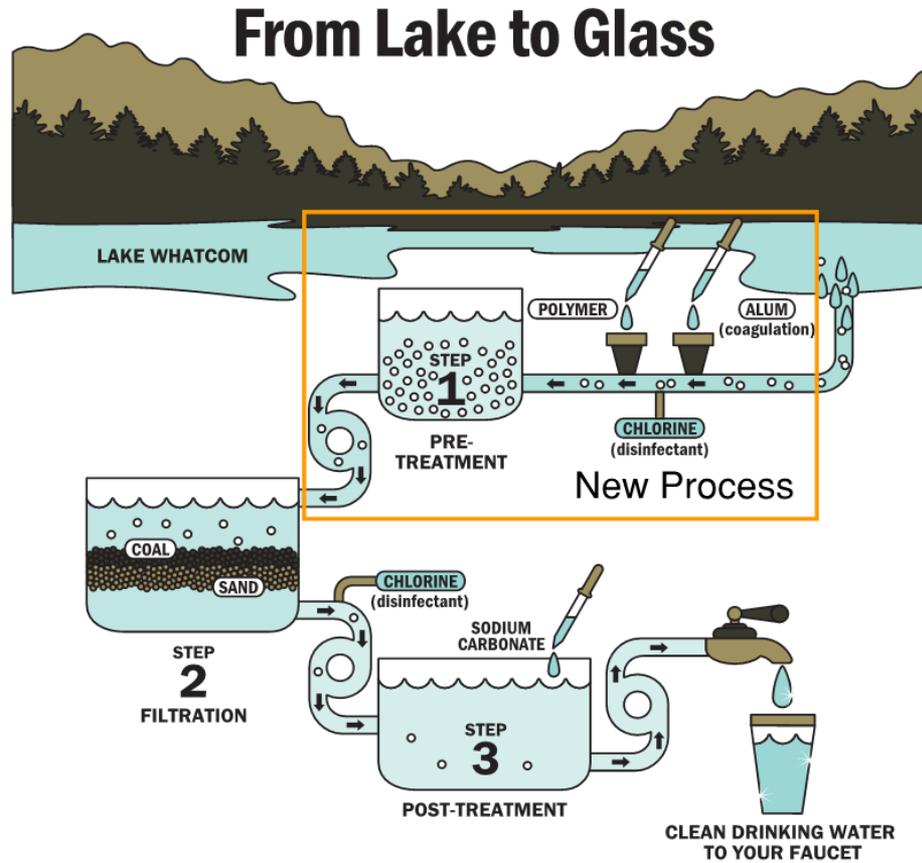


Triple bottom line scoring was used for evaluation

Chosen alternative



Chosen alternative



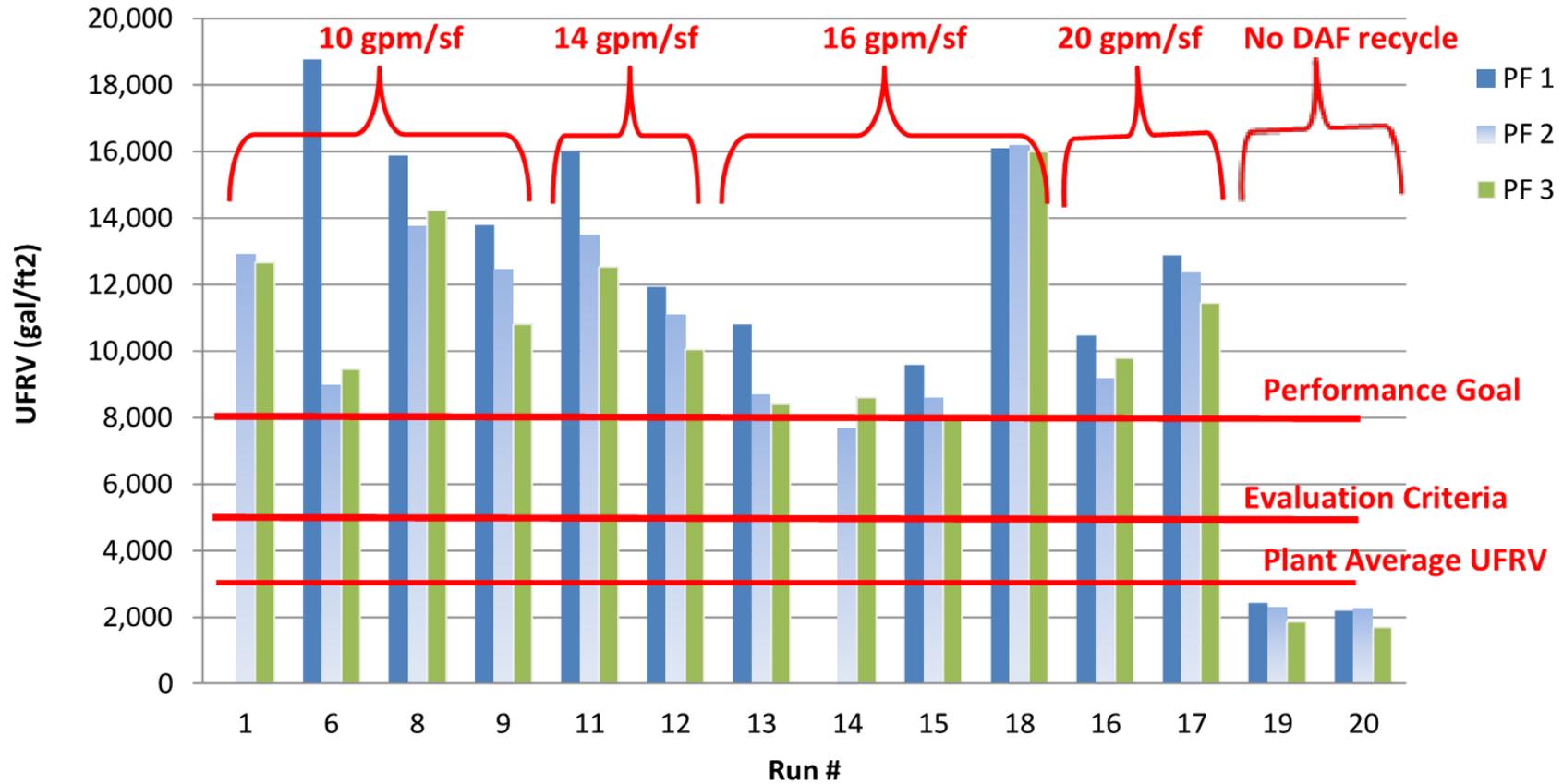
Pilot study



- Rented DAF unit, used existing pilot filter columns
- Tested loading rates of 10 to 20 gpm/sf
- Varied polymer dose and flocculation times

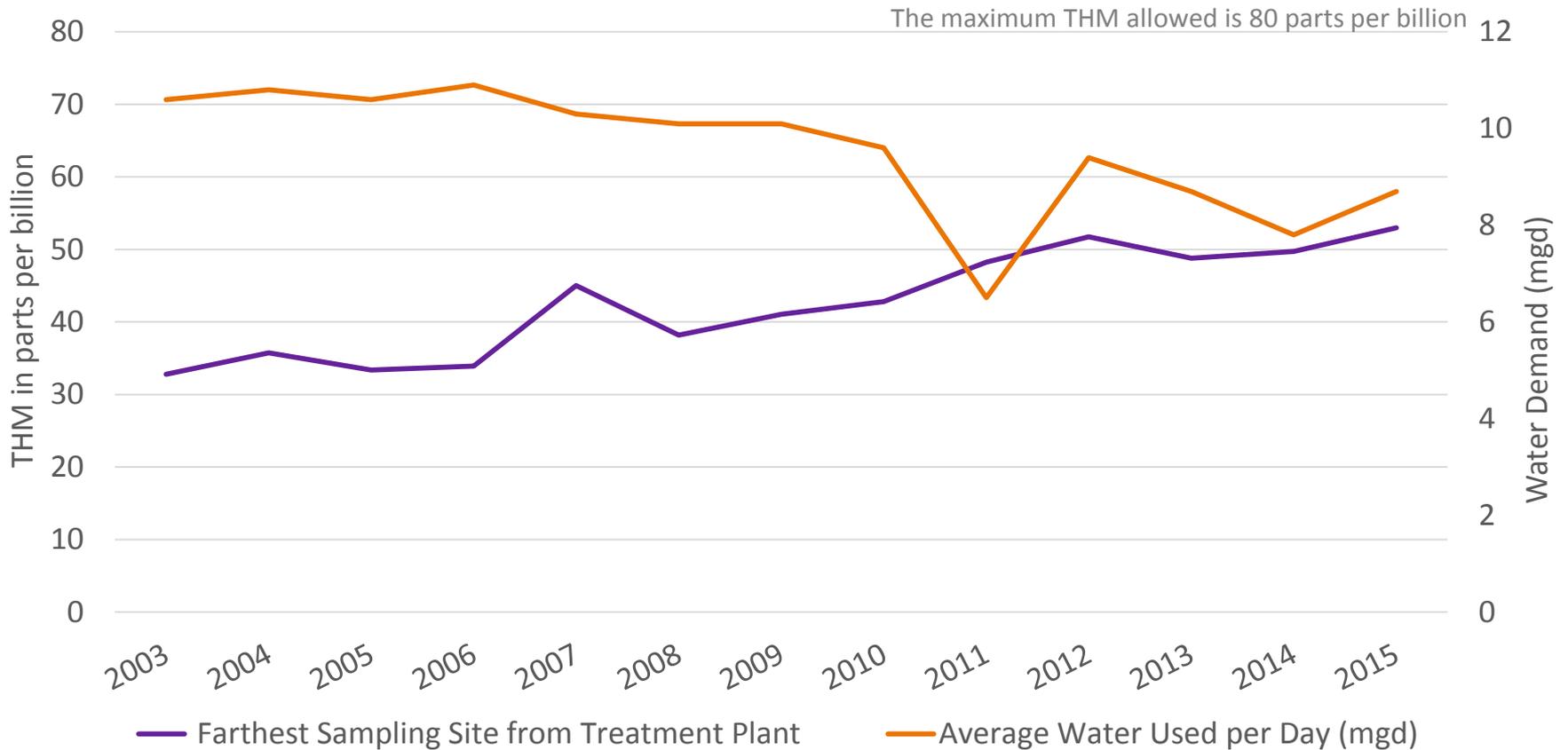


Pilot study: Results



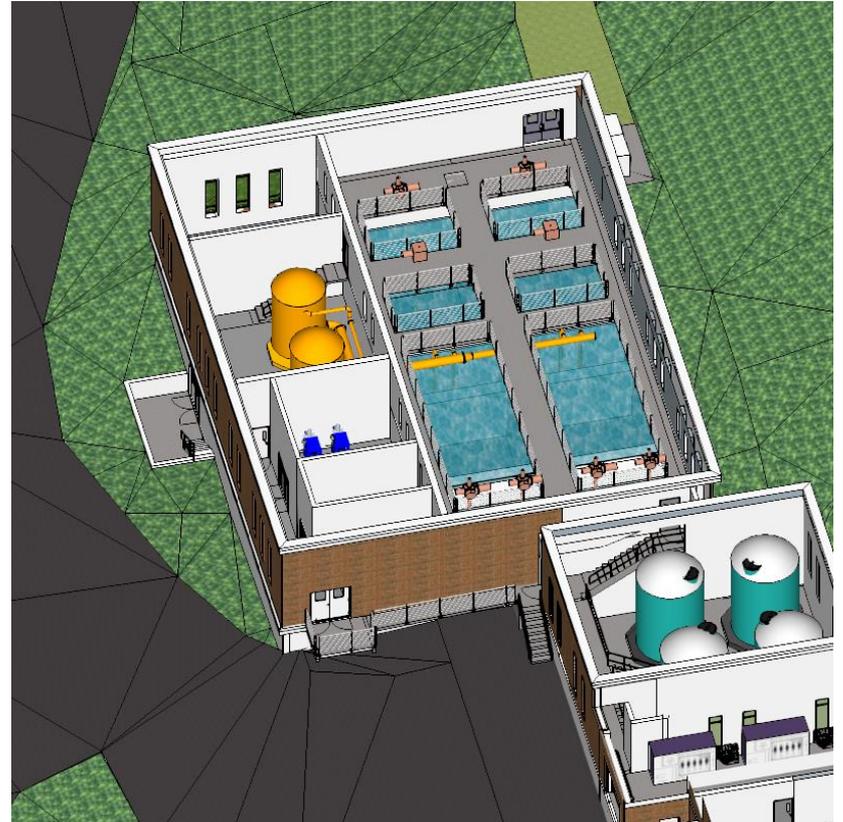
Whatcom Falls Treatment Plant background

Total Trihalomethane (THM) Averages and Water Demand 2003-2015



Moving forward with DAF

- First DAF installation for drinking water in the NW
- One of the highest rate DAF units ever designed
- Climate considerations



Chlorine gas conversion

Chlorine gas conversion



Opportunistic time to consider conversion

Several associated risks

- Chlorine gas
- No scrubbers
- Outdoor storage
- Park Setting
- Operator space/parking nearby
- Supply chain issues

Chlorine gas conversion: Alternatives Analysis

On-site generation

- Selected based on safety and O&M considerations

Bulk hypo

- Not selected due to potential environmental impacts and off-gassing

Gas chlorine

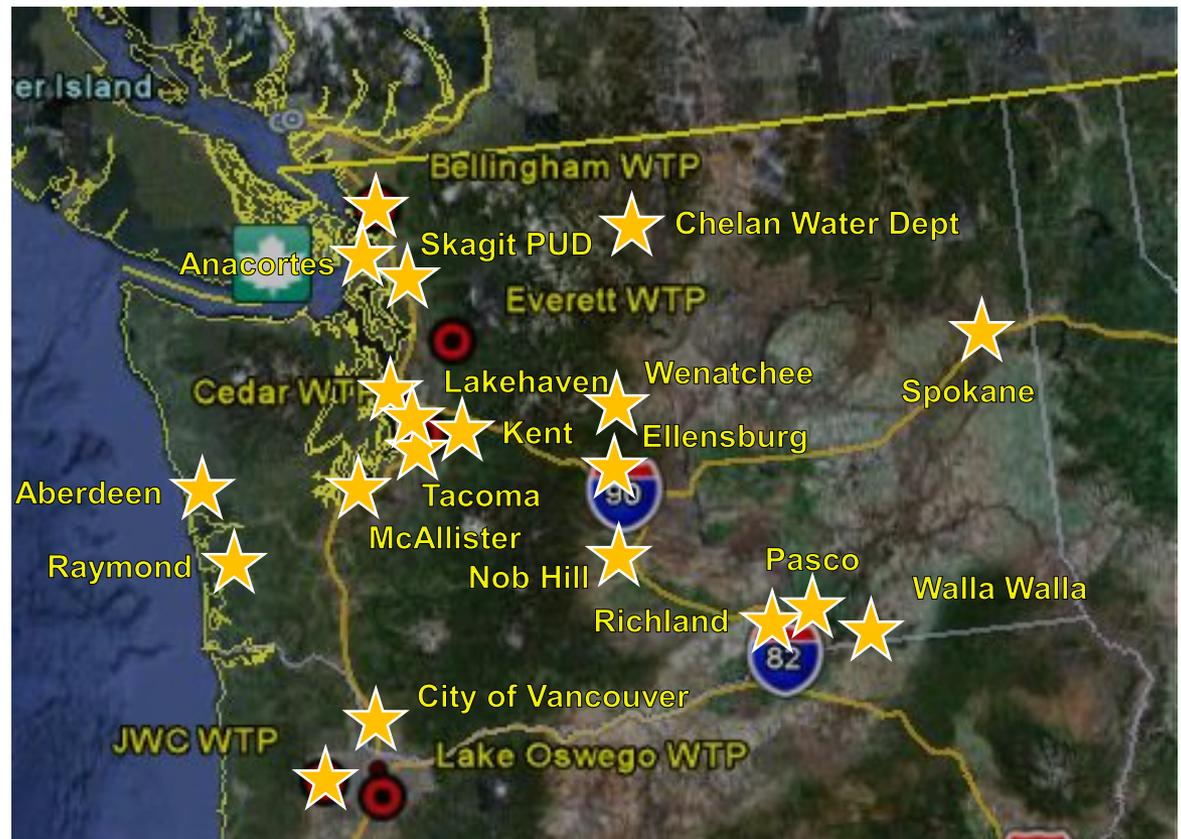
- Most familiar technology but not deemed safe for the City moving forward



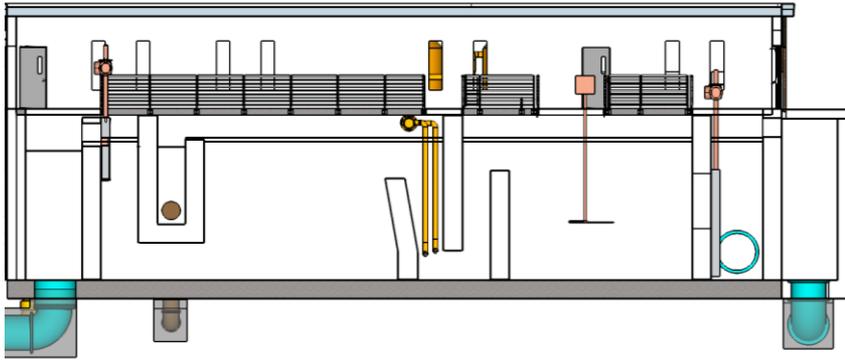
Chlorine gas conversion: Key benefits



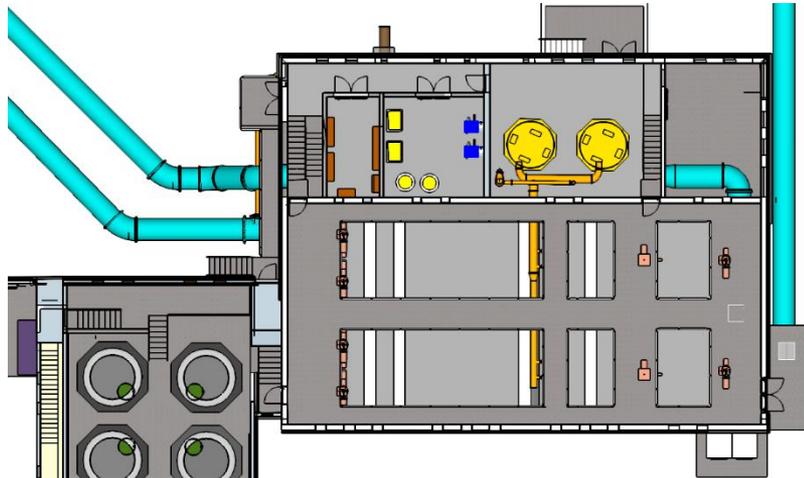
★ Chlorine gas



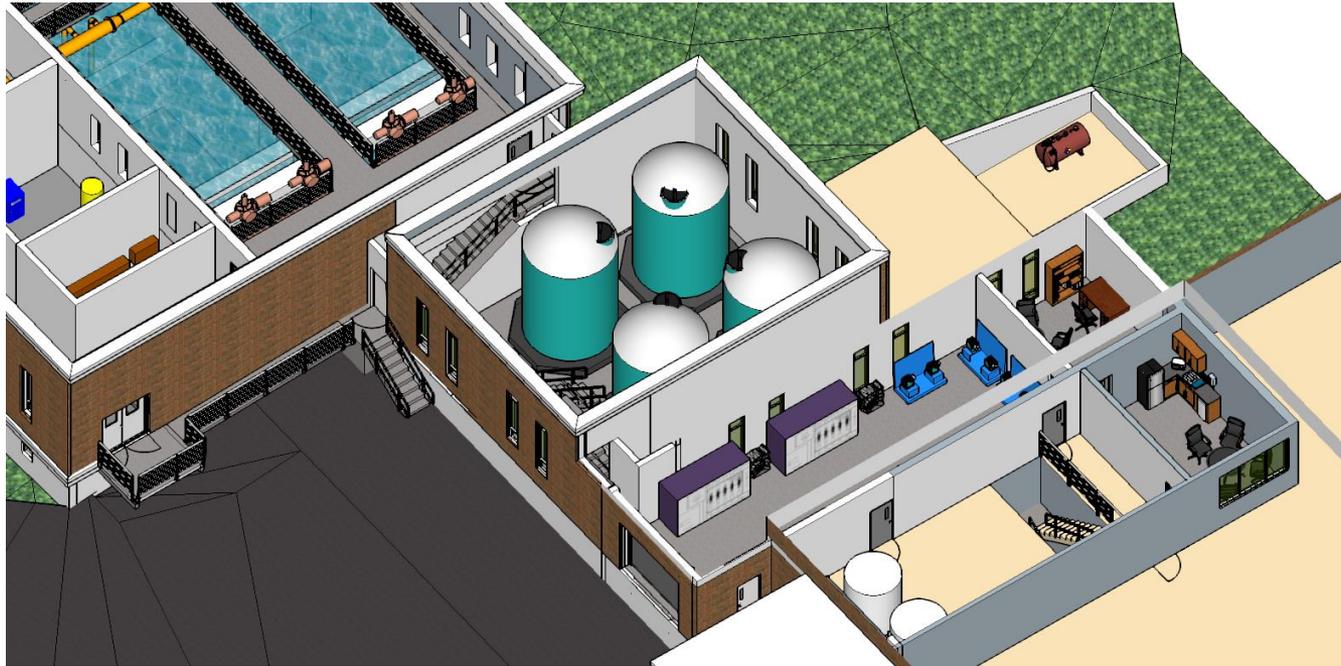
Bellingham project status



Going out to
bid for
construction
this year



Bellingham project approach



Quickly and
efficiently
analyzing
alternatives

Early generation
of 3D models
and site layouts

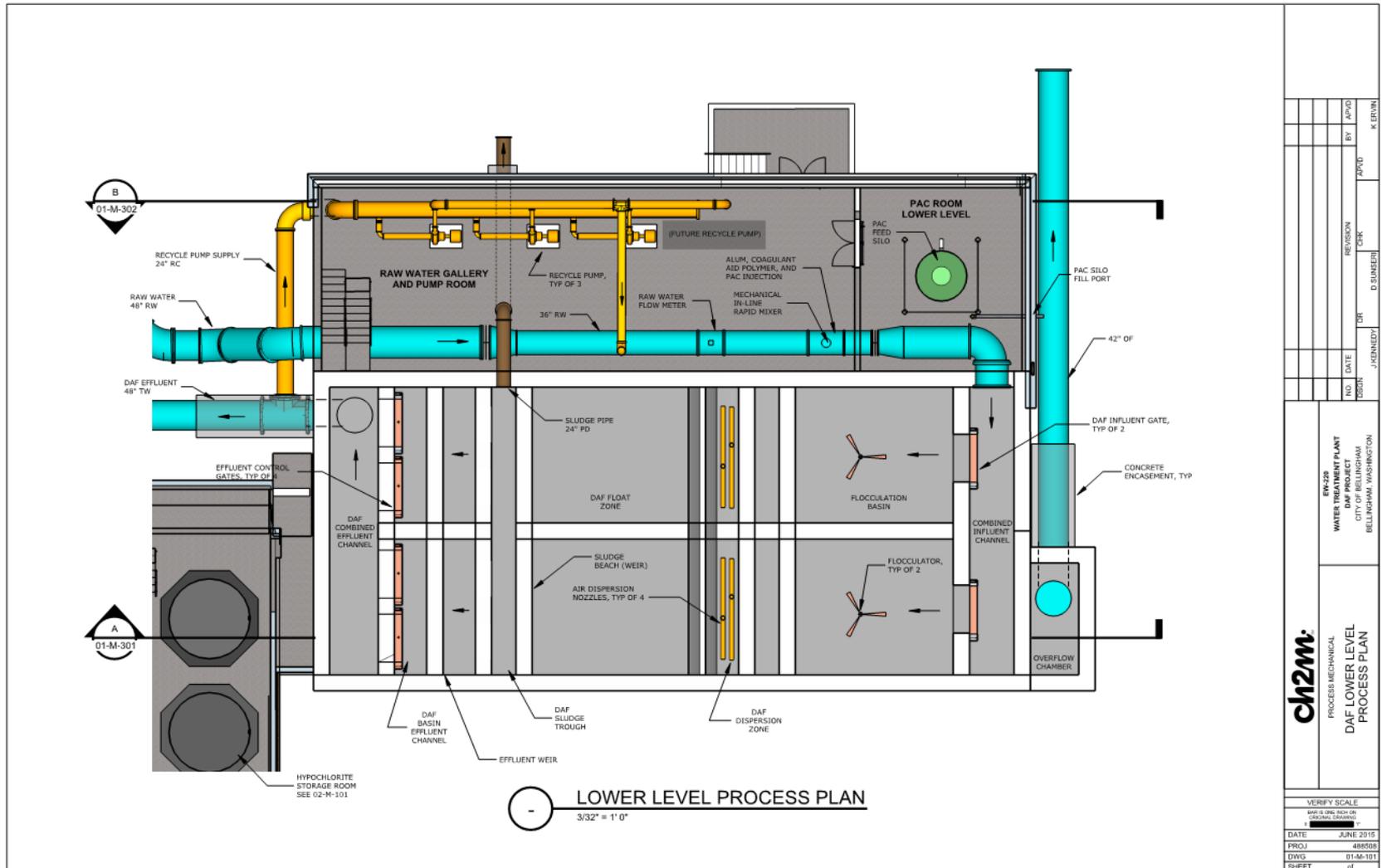
CH2M CPES™
Cost estimating
tool

30% deliverable
drawings
created in
SketchUp

Bellingham project approach



Bellingham project approach



NO.	DATE	BY	CHK	APP
1		J. KENNEDY	D. SUNGSEI	K. KERVIN
REVISION D. SUNGSEI J. KENNEDY				
PROJECT: BELLINGHAM PLANT WATER TREATMENT DAF PROJECT CITY OF BELLINGHAM BELLINGHAM, WASHINGTON				
DWG: 01-M-101 SHEET: of				

ch2m
 PROCESS MECHANICAL
 DAF LOWER LEVEL
 PROCESS PLAN

VERIFY SCALE
 BASED ON: 1/8" = 1'-0"
 1/4" = 1'-0"
 1/2" = 1'-0"
 3/4" = 1'-0"
 1" = 1'-0"

DATE: JUNE 2015
 PROJ: 488508
 DWG: 01-M-101
 SHEET: of

30% REVIEW SUBMITTAL

Thank You



ch2m.SM