

Oregon Department of Environmental Quality

2022 National Training Workshop on
Water Quality Data, Assessment, and Plans
Session 8: Breakout
TMDL Revisions: Examples and Lessons
State of Oregon Experience

Friday June 3, 2022

Some reasons why ODEQ has revised TMDLs:

- NPDES permittee requests a change and provides resources to assist with revising the TMDL (Tualatin)
- Original TMDL addresses limited reaches and parameters
 - Often only reaches impacted by point sources
 - Revised TMDLs address additional impaired water bodies and parameters (Bear Creek, Klamath, Molalla-Pudding, Coquille, Tualatin)
- Revisions due to revised water quality standards (Western Hood, North Coast, Tualatin)
- Court ordered revisions (temperature TMDLs including the 2006 Willamette T TMDL)
- Complex TMDLs require revisions to address certain WLAs (Willamette, Tualatin)

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Tualatin River Watershed



Lower Tualatin River



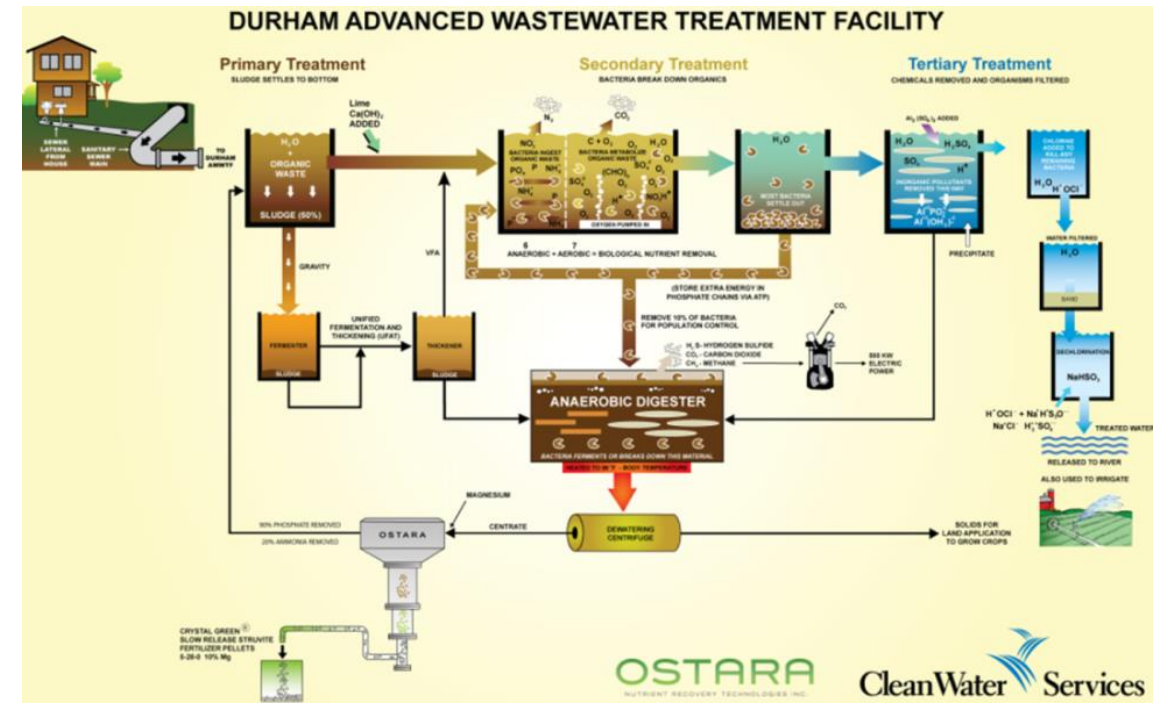
Clean Water Services

- Special service district
- Service population: ~600,000
- Operate 4 WWTFs
- Municipal stormwater program (MS4) in urban Wash. Co.
- Watershed enhancement activities
- Implement programs cooperatively
 - 12 member cities
 - Washington County



Rock Creek and Durham AWTFs

- RC: 46.4 mgd; DM: 25.7 mgd
- Tertiary treatment facilities
- Resource recovery
- Effluent Limits (dry season)
 - CBOD/TSS: <5 mg/L
 - Ammonia: <0.5 mg/L
 - Phosphorus: 0.1 mg/L
- Effluent Quality (dry season)
 - CBOD: 2 – 4 mg/L; TSS: <2 mg/L
 - Ammonia: <0.1 mg/L
 - Phosphorus: <0.1 mg/L



Forest Grove WWTF/NTS and Hillsboro WWTF

Forest Grove WWTF/NTS:

- Year-around discharge from Forest Grove WWTF authorized in 2016
- Secondary treatment at WWTF followed by a 95-acre natural treatment system (NTS)
 - 5 acre active (engineered) system
 - 90 acre passive system – nutrient & temperature reduction and effluent polishing
- Operational in 2017

Hillsboro WWTF:

- Conventional secondary treatment facility
- Operates only during wet season
- Flows routed to either Rock Creek or Forest Grove during dry season



TMDLs for the Tualatin Subbasin:

- 1988 – Ammonia N – DO criteria – Point Sources
- 1993 – Total Phosphorus – Algae – Point Sources
- 2001 – Entire watershed – Point and Nonpoint
 - 19 Temperature TMDLs
 - 49 Bacteria TMDLs
 - 23 DO TMDLs (settleable organic matter)
 - 10 Chlorophyll *a* and pH (total phosphorus)
- 2012 – Revisions to 2001 TMDL
 - New discharges
 - Trading

1988 – Ammonia N – DO criteria

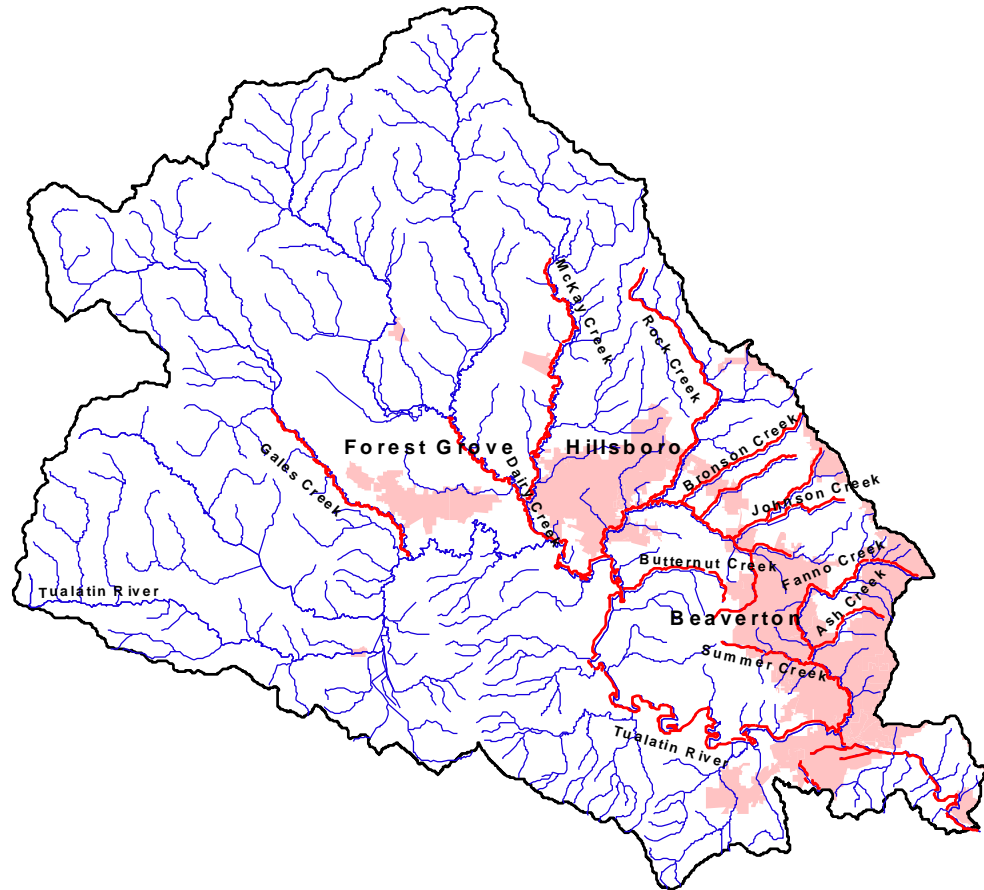
- Loading Capacity – Ammonia N
 - Applies during “Summer” (May 1 – Nov 15)
 - Upper – RM 16 to 39 – 1.0 mg/L
 - Lower – RM 4 to 16 – 0.85 mg/L
- Wasteload Allocations
 - Rock Creek WWTP: 516 lb/day (greater at higher river flows)
 - Durham WWTP: 265 lb/day
 - Effluent concentrations Ammonia-N < 2 mg/L
- Load Allocations
 - Tualatin upstream: 16 lb/day
 - Tributaries: 2-5 lb/day
- Reserve Capacity – silent
- Margin-of-Safety – silent

1993 – Phosphorus – Nuisance Algae and pH

- Tualatin River - RM 0-38
- 15 µg/L action level for Chlorophyll *a* – pH 6.5 to 8.5
- TP sources “primarily Rock Creek facility and a multitude of nonpoint sources...”
- Loading Capacity – Total Phosphorus
 - 70 µg/L (0.070 mg/L) lower river (20 to 50 µg/L upper)
 - Applies May – October
 - Flow based
 - Also derived LC for Oswego Lake
- Wasteload Allocations
 - Rock Creek WWTP: 15.6 lb/day (low flow)
 - Durham WWTP: 9.1 lb/day
 - Effluent concentrations TP <0.1 mg/L
- Load Allocations provided for significant tribs and non-point source categories
- Silent on RC and MOS

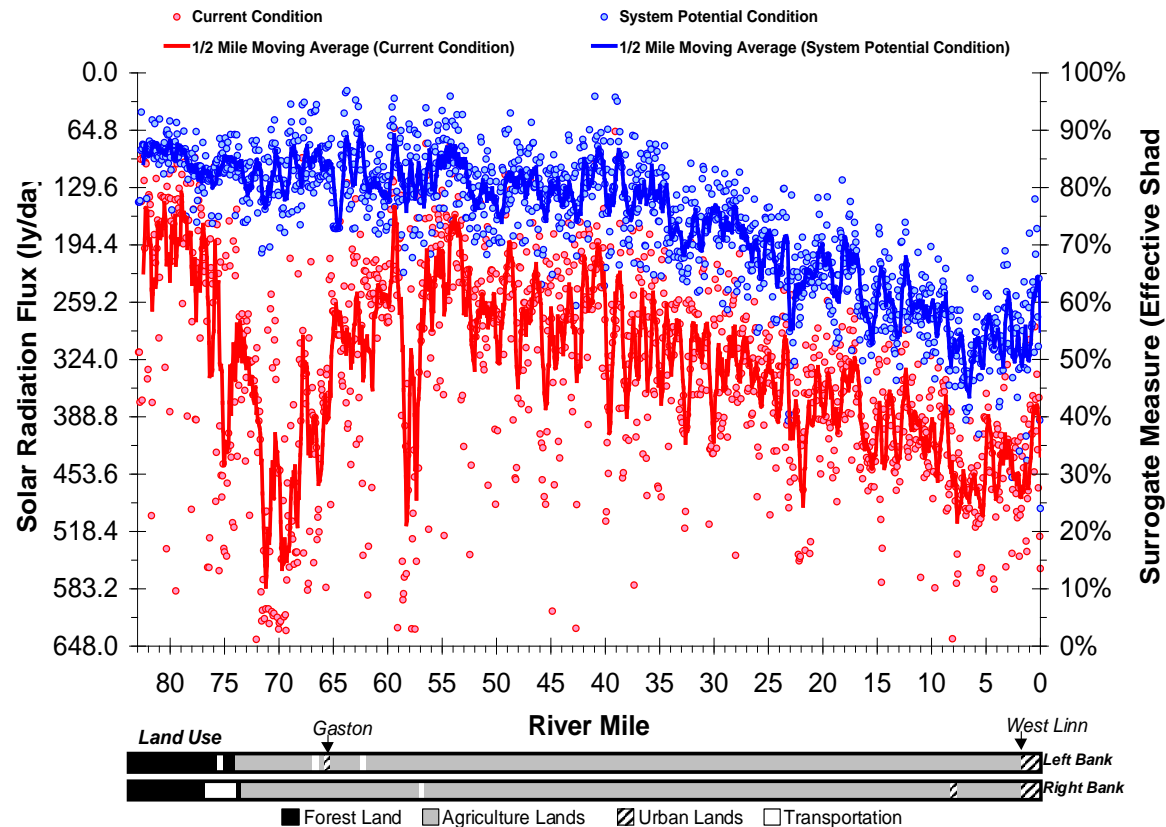
2001 – Temperature, Bacteria, DO, Algae, pH

Temperature - 19 reaches - mainstem and tributaries



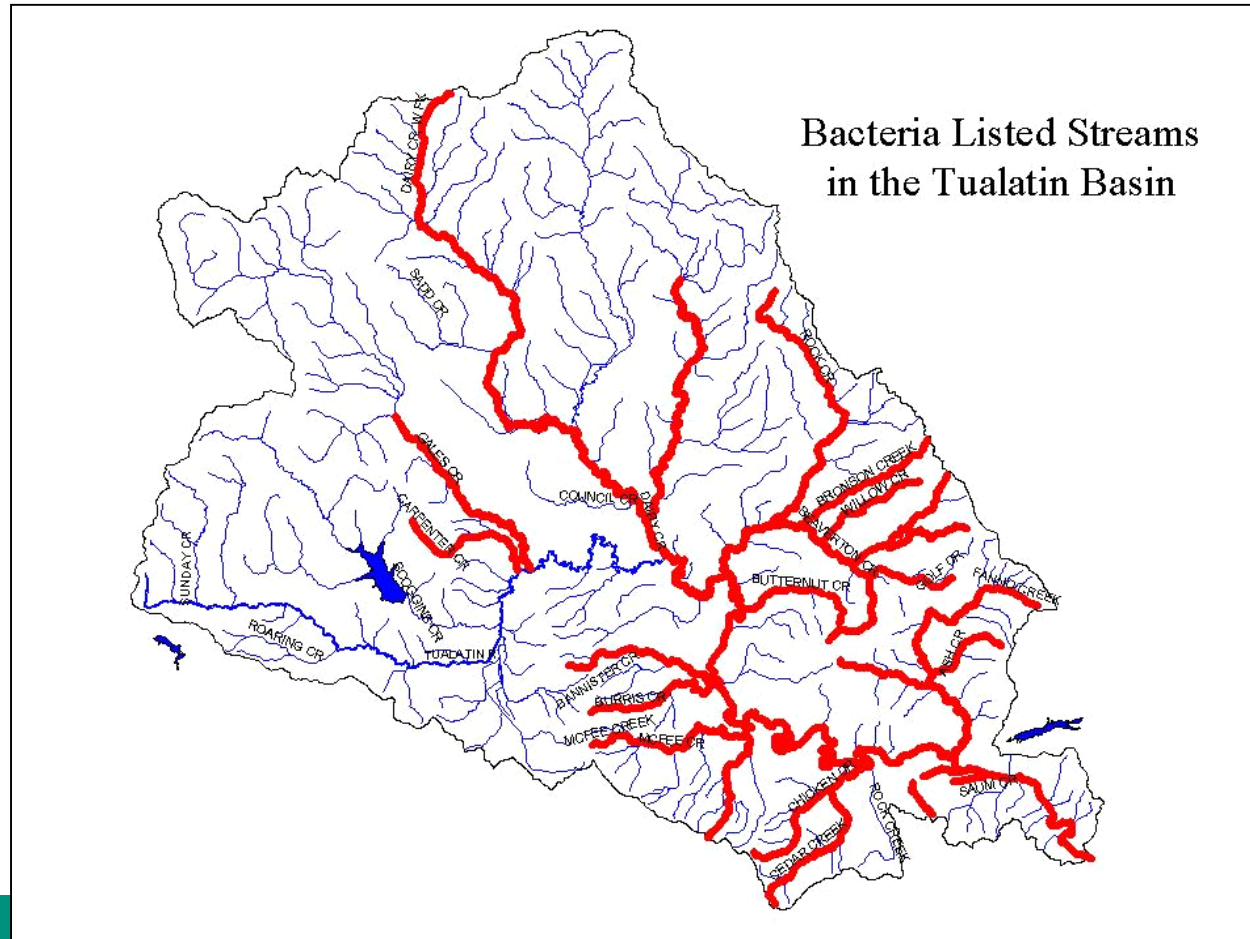
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Temperature - 19 reaches - mainstem and tributaries



2001 – Temperature, Bacteria, DO, Algae, pH

Bacteria - 49 reaches - mainstem and tributaries



2001 – Temperature, Bacteria, DO, Algae, pH

TP TMDLs – WLAs set to bgd concentrations of 0.10 and 0.11 mg/L

Tualatin River Subbasin Estimated Total Phosphorus Background Concentrations During TMDL Season

Source: Table 43 of the 2001 TMDL

Stream Segment	Total Phosphorus Concentrations (Summer Median – mg/L)
Lower River	
Main stem Tualatin River @ Stafford Road (RM 5.5)	0.10
Main stem Tualatin River @ Highway 99W (RM 11.6)	0.11
Main stem Tualatin River @ Elsner (RM 16.2)	0.11
Main stem Tualatin River @ Farmington (RM 33.3)	0.10
Upper River	
Main stem Tualatin River @ Rood Road (RM 38.4)	0.09
Main stem Tualatin River @ Golf Course Road (RM 51.5)	0.04
Main stem Tualatin River above Dairy Creek	0.04

2001 – Temperature, Bacteria, DO, Algae, pH

- Tualatin River CE-QUAL-W2 Model
 - Hydrodynamics, temperature, and water quality
 - 2-D - longitudinal and vertical
 - Developed by USGS and initially calibrated for May-Oct 1991, 1992, and 1993
 - Expanded and improved over the years
- Heat Source temperature models – tributaries
- QUAL2E water quality models - tributaries

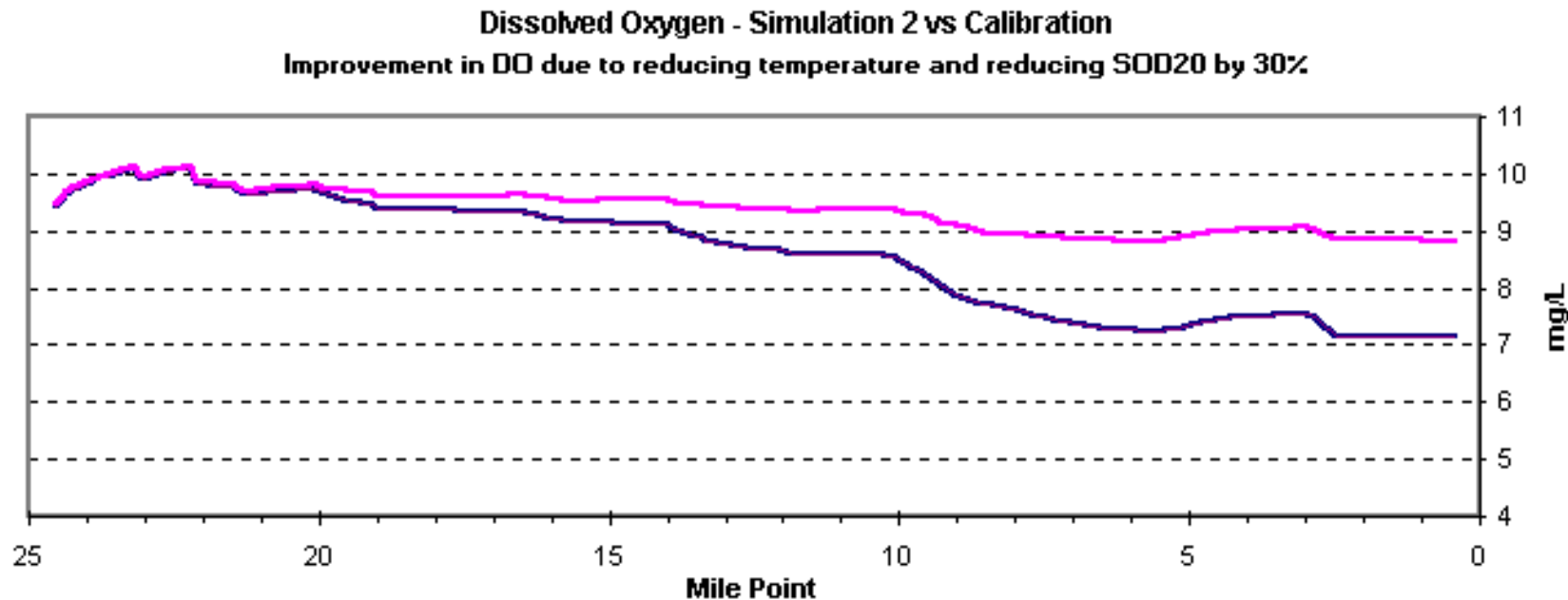
2001 – Temperature, Bacteria, DO, Algae, pH

Ammonia

- CE-QUAL-W2 model used to revise earlier TMDLs
 - Greater ammonia removal needed during summer
 - Less ammonia removal needed other times
- Ammonia allocations = f(river flow, river DO, and month)

2001 – Temperature, Bacteria, DO, Algae, pH

Dissolved Oxygen - 23 reaches – tributaries



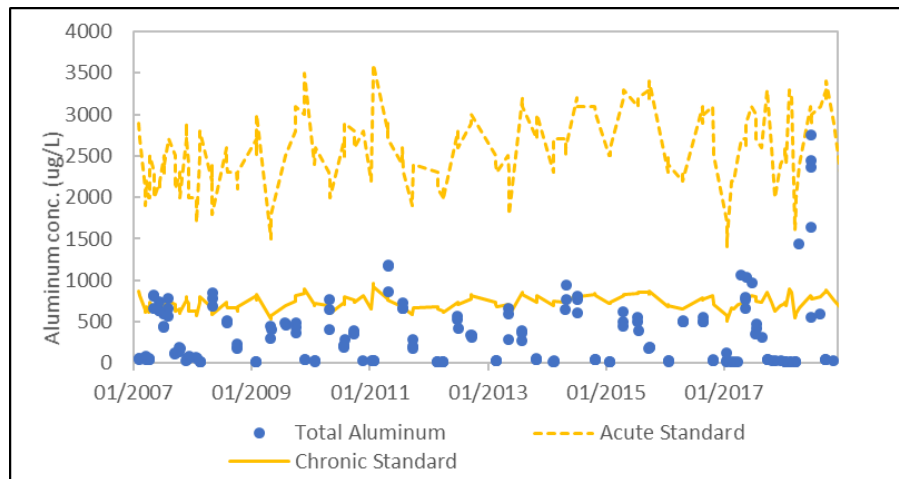
Sensitivity to Temperature and Sediment Oxygen Demand (SOD)

2012 – Amendment for phosphorus and ammonia

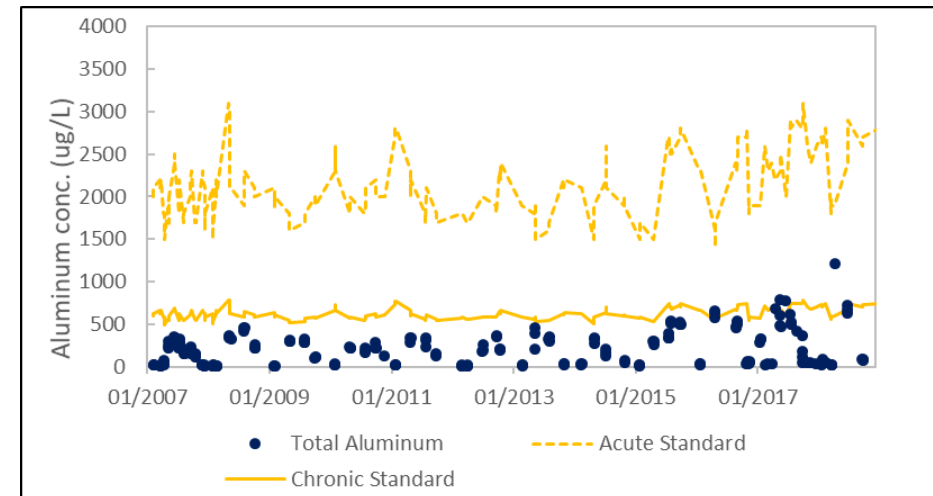
- Revisions to 2001 TMDLs
 - Accommodate new summer discharges
 - Allow phosphorus “trading” between two small upstream plants and the large Rock Creek WWTP
 - Allow some of allocated ammonia load to be discharged at new locations

Future Revisions

- New Aluminum criteria
 - f(hardness, pH, DOC)
 - Total recoverable
- Transition from chemical phosphorus removal to biological removal
 - Tertiary alum (aluminum sulfate) addition
 - Ostara process for phosphorus recovery
 - Tertiary natural treatment system at Forest Grove WWTP
- Regulatory risk of current alum usage



Durham WWTP



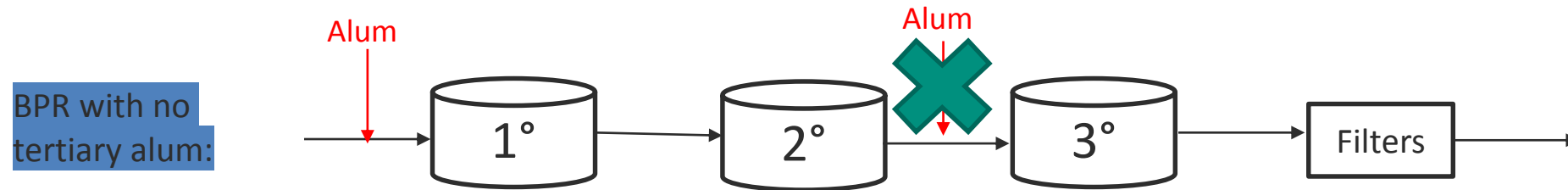
Rock Creek WWTP

Future Revisions

- Changes in river flow and depth
 - Increased flow from storage
 - Reduced depth
 - Reduced time-of-travel
- Algae and pH criteria met but DO criteria still exceeded,
- Modeling shows lack of sensitivity of DO to TP
- Consideration to WLAs as orthophosphate vs TP

Studies underway to evaluate alternatives

- Effectiveness of RC and DM WWTFs in removing TP w/o tertiary alum addition



- Assess effect on the river
- Fill in modeling data gaps
- 2 1/2 week study in 2019
- Summer 2020 and 2021: Tertiary alum shut off all summer
- Samples collected from WWTFs and river
- Continuous water quality monitoring devices
 - Near-real time data available
 - 2 locations in lower section of Tualatin River
 - Parameters (specific conductance, temp, DO, turbidity, pH, chlorophyll)

Lessons learned – Discussion
