

Point Source Reduction Updates

Spokane River Stewardship Partners

NPDES Permit Holders

June 8, 2017

Hayden Area Regional Sewer Board

- **2016 – 2019 BNR Process Optimization and Tertiary Treatment Pilot testing.**
- **2016 – 2017 BNR Performance.**
 - **Total Phosphorous Effluent**
Before BNR: 4 – 6 mg/l
 - **Total Phosphorous Effluent After**
BNR to Date: 0.1 - 0.6 mg/l

Hayden Area Regional Sewer Board

- **2016 to 2019 BNR Process Optimization and Tertiary Treatment Pilot Testing.**
- **2019 – 2022 Tertiary Treatment Design and Construction. \$16 M est.**
- **2023 – 2024 NPDES Compliance.**



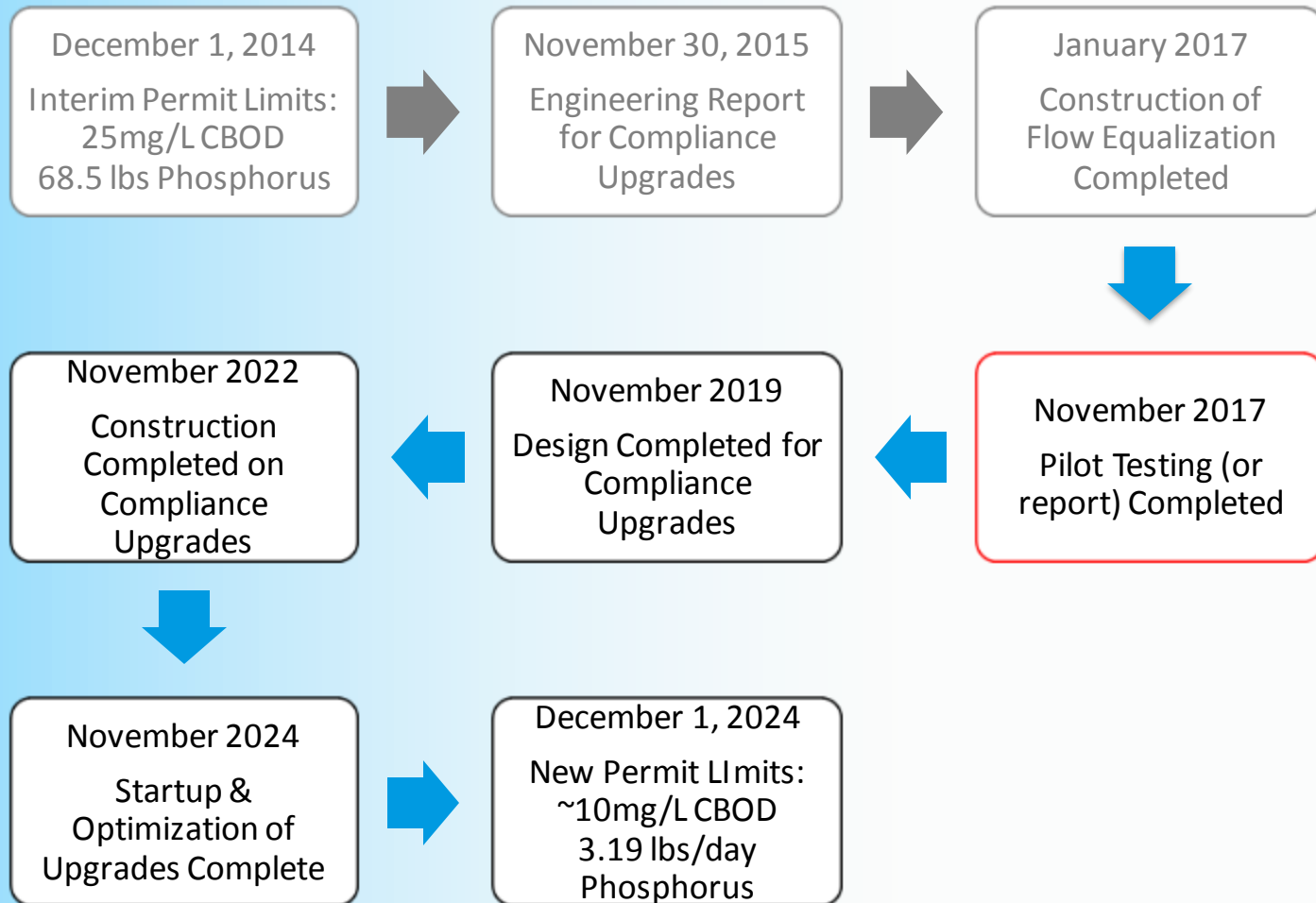
**2016 – 2024 No River
Discharge May Thru
September.**

City of Post Falls DO TMDL Update

Presented to DO TMDL Advisory Committee
John Beacham, Utilities Manager
June 8, 2017

City of Post Falls

Compliance Schedule Progress



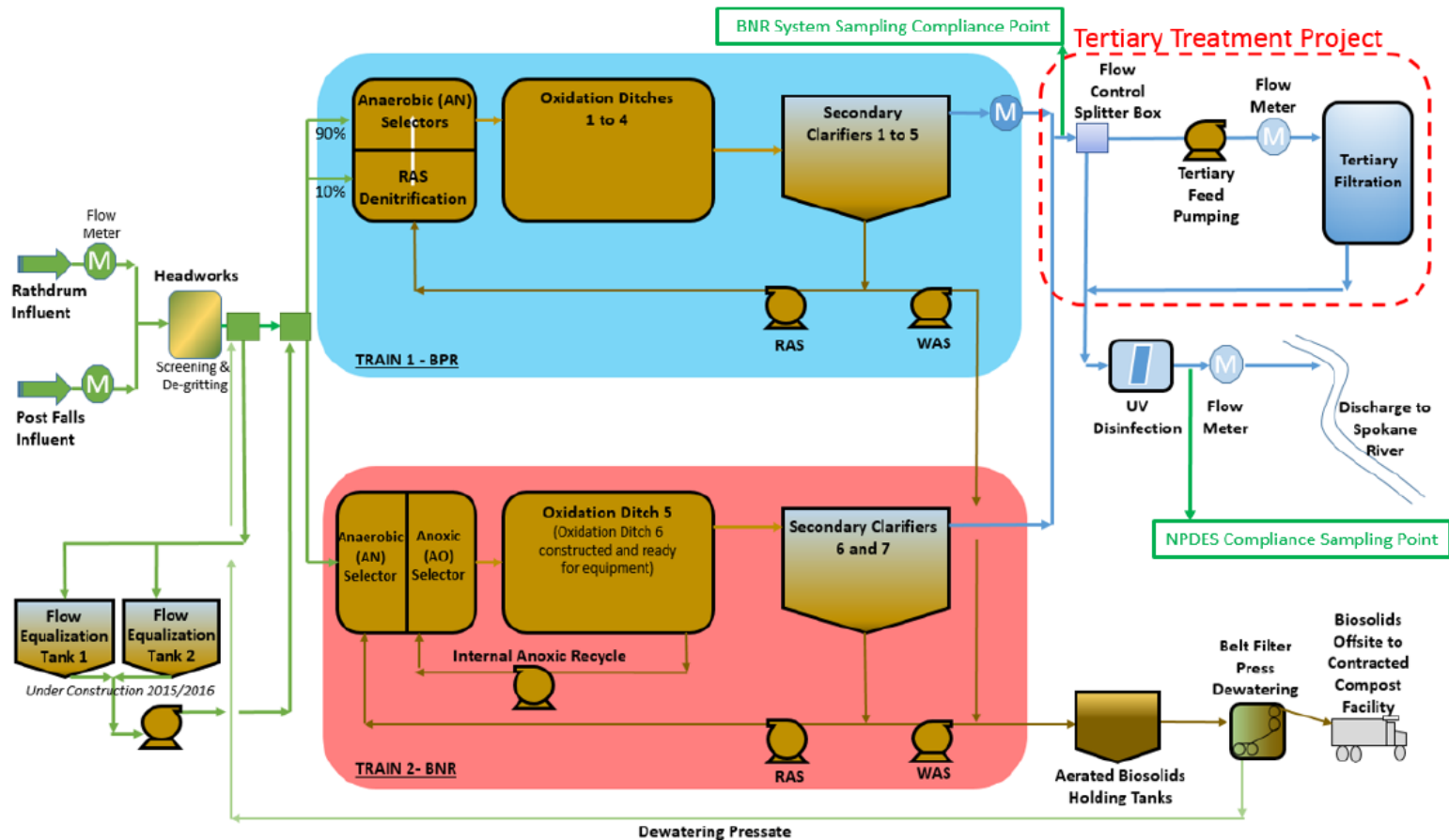
City of Post Falls

Receiving Water Testing

Sample Date	Upstream Phosphorus (P) (µg/L)	Downstream Phosphorus (P) (µg/L)
7/21/2016	19	4
7/28/2016	23	30
8/4/2016	<4	<4
8/25/2016	<2	<2
9/1/2016	<2	<2
9/15/2016	<2	<2
10/6/2016	54	<2
10/20/2016	<2	<2

2015 Compliance Schedule Report

Figure 9 – Proposed WRF Schematic with Tertiary Filtration to Meet Compliance Schedule



2014-2016 Flow Equalization Upgrade



2016 Pilot Project Goals

1. Prove that technology works
2. Allow competitive pricing
3. Allow efficient design
4. Provide training opportunity



Membrane Skid

- Currently Operational
- Goal: 50 $\mu\text{g/L}$
- Preliminary Data: 20 to 40 $\mu\text{g/L}$
- Operating through September



2016 Treatment Summary

- Influent Phosphorus – 7.4 mg/L
- Effluent Phosphorus – 0.32 mg/L
- Removal: 96%

- Effluent Load: 6.8 lbs/day
- 2024 Limit: 3.19 lbs/day

Estimated Upgrade Impacts¹

- 1318 lbs/year decrease in effluent Phosphorus
- 2,227,000 lbs/year increase in chemical usage
 - 655,000 lbs alum
 - 1,572,000 lbs sodium hydroxide (alkalinity)
- 150,000 kW/hrs increase in electrical usage
- 0.02 mg/L DO increase in Lake Spokane

1 - Values from 2013 Facility Plan

Questions?



Liberty Lake Sewer & Water District

- The Liberty Lake Sewer and Water District collects and treats the sanitary wastewater from approximately 4,000 Equivalent Residential Units (ERUs) as well as commercial and light industrial dischargers.
- Current average discharge is 0.8 MGD.



Water Reclamation Facility

- In an effort to improve the water quality of Liberty Lake, in 1973 the LLSWD initiated construction of a wastewater collection system and treatment facility that replaced existing on-site septic systems.
- The treatment facility was completed in August 1982.



Past WRF Upgrades

- The LLSWD completed minor modifications to the facility by replacing the aerobic digester blowers in 1998 and replacing the chlorination system with an ultraviolet disinfection system in 2002.



Past WRF Upgrades - Phase I

- In 2006 the LLSWD converted their facility from an extended aeration process to a biological nutrient removal treatment process.
- This reduced the phosphorous discharge from 20-25 pounds per day before the upgrade to 3-4 pounds per day after the upgrade (removal of 91% of the phosphorous that enters the facility).



Past WRF Upgrades - Phase II

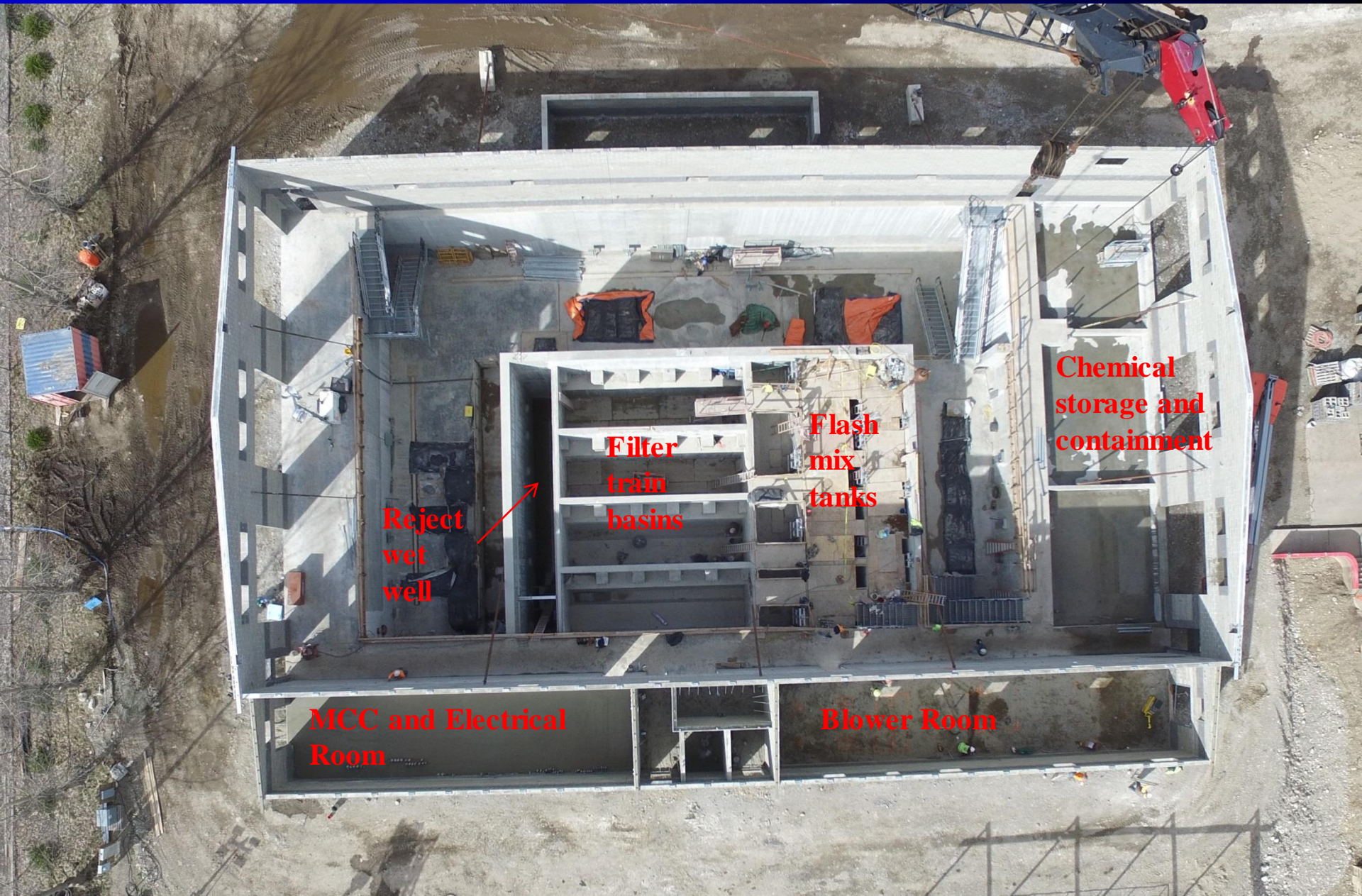
- Construction for Phase II is 60% complete and anticipated to be on-line by the end of 2017.
- This upgrade includes advanced tertiary treatment through chemical addition and membrane filtration that will further reduce phosphorous discharge to less than ½ pound per day (removal greater than 99 % of the phosphorous that enters the facility).





Drone Video 3/23/17





Reject
wet
well

Filter
train
basins

Flash
mix
tanks

Chemical
storage and
containment

MCC and Electrical
Room

Blower Room



WRF Costs

Original Construction Costs

Multifaceted restoration (1976-1984) totaled ~\$14.8 million dollars, where ~\$6.7 million came from federal grants and ~\$2.1 million came from state restoration grants.

\$14,800,000

Liberty Lake Upgrade Costs

Aerobic digester blowers (1998): \$100,000

Chlorination system with the ultraviolet disinfection system (2002): \$347,000

Liberty Lake Phase 1 Upgrade Costs

Phase 1 Plant Upgrades (2006): \$12,500,000

Liberty Lake Phase 2 Upgrade Costs

Phase II Plant Upgrades (2016): \$22,700,000

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TOTAL COST – LLSWD: \$50,447,000



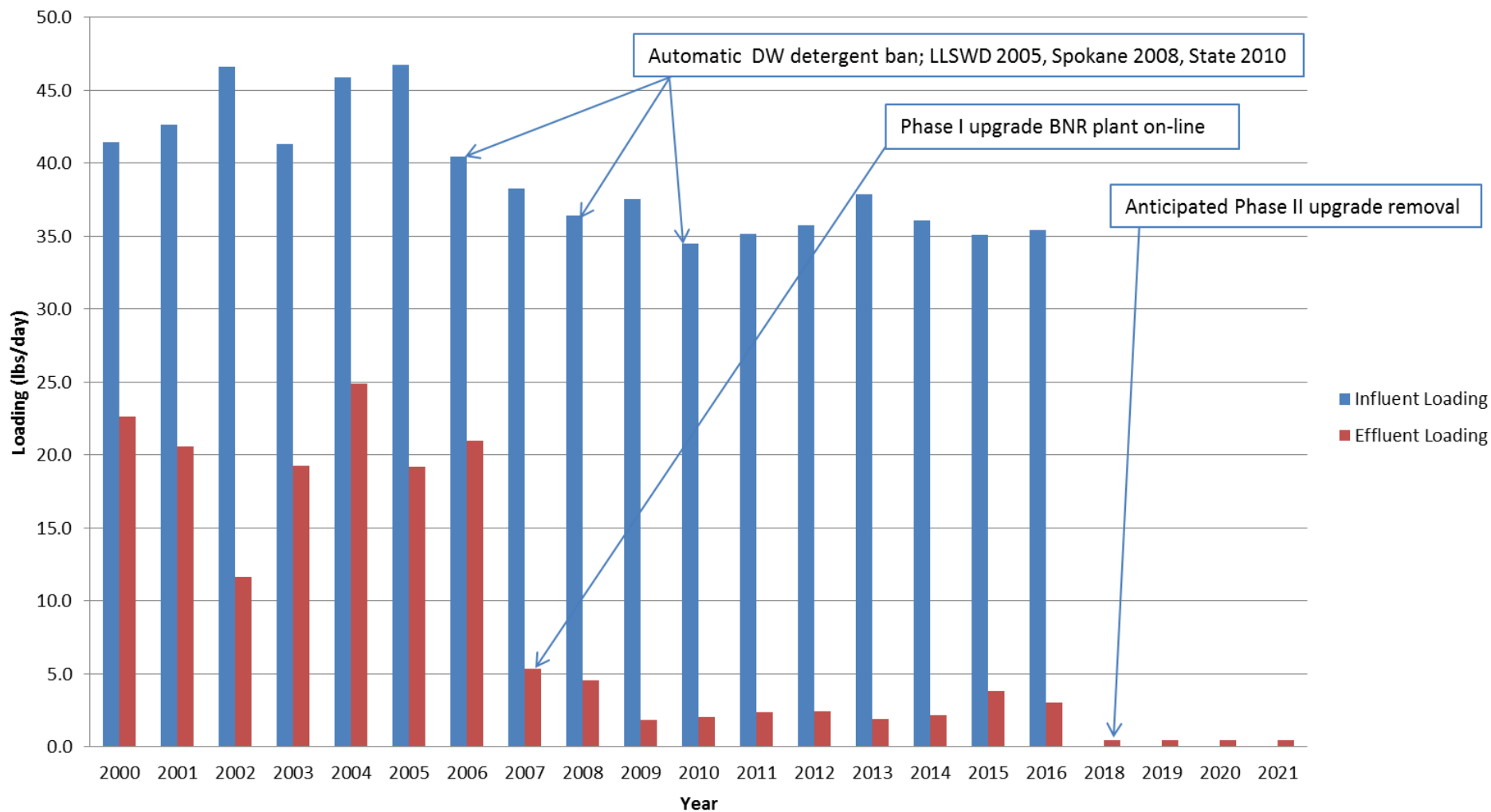
Impact to Rates

- The cost for Phase I (\$12.5M) and Phase II (\$22.7M) upgrades total \$35.2 million over a 10 year period (2006-2016). The District's 4,000 customers will see a 385% increase in sewer rates as a result of these two upgrades. Operation costs between the Phase I and Phase II upgrades have doubled from \$500,000 to \$1.0M annually.



Phosphorus Improvements

LLSWD WRF Influent and Effluent PO₄ Loading lbs/day





Phosphorus Removal Successes

Direct

- December 1989: LLSWD passed Resolution 40-89 banning phosphorus in laundry detergent.
 - A nationwide ban followed in 1993, while the state of Washington lagged a year behind with its ban in 1994.
 - Twenty years later (January 2014) Proctor and Gamble announced a plan to eliminate all phosphates from its laundry detergent worldwide within the next two years.
- July 2005: LLSWD passed Resolution 23-05 banning phosphorus in automatic dishwasher detergent.
 - Bans in Spokane, Whatcom and Clark counties followed in 2008. Proctor and Gamble (makers of Cascade) silently and without “Green” marketing removed phosphorus from its detergent formulations in 2009.
 - In Washington, a statewide ban took effect in 2010. There are now 16 states with bans against automatic dishwasher detergent containing phosphorous. All major detergent companies have now removed phosphorus from their formulations.
 - LLSWD has seen reductions of approximately 16 percent of phosphorus influent loading to our reclamation facility.



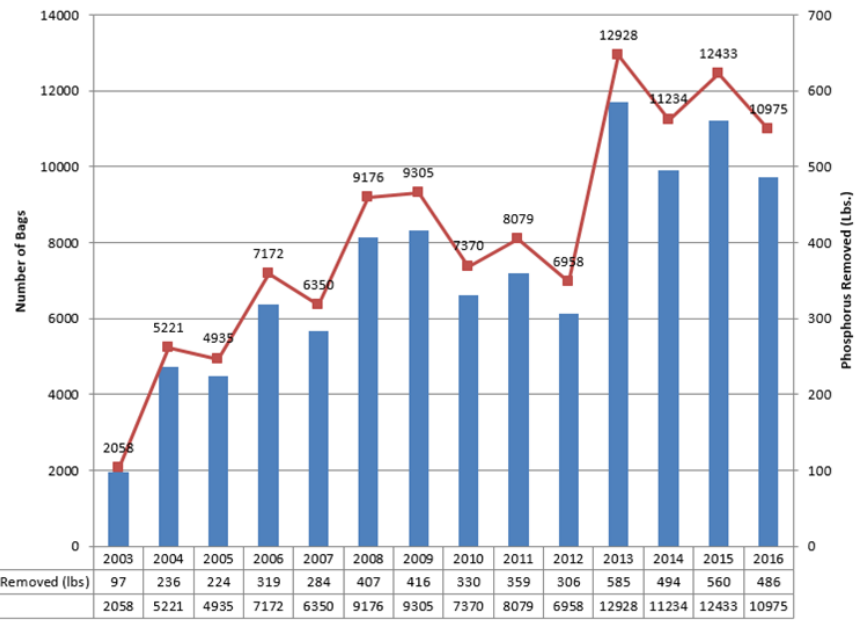
Phosphorus Removal Successes

Indirect

- November 2005: LLSWD passed Resolution 46-05 banning phosphorus in lawn fertilizer within the watershed of Liberty Lake.
 - June 2009: LLSWD amended the resolution (Resolution 18-09) banning phosphorus in lawn fertilizer district-wide.
 - Two years later in 2011, Washington State passed “Clean Fertilizers, Healthier Lakes and Rivers” legislation (ESHB 1489) into law. Washington was the eighth state to pass fertilizer legislation. Currently there are 11 states with bans against lawn fertilizer containing phosphorous. In response to these laws, fertilizer companies have reformulated their products.
- From 2005 to 2015, the LLSWD has partnered with Greenstone Homes to offer free bags of phosphorus-free fertilizer.
 - The program was discontinued in 2015 due to low participation in the program. Since the adoption of ESHB 1489 and product reformulations, participation in the program has declined.
- Annual Community Cleanups; “Beach and Leaf” and “Spring Clean”



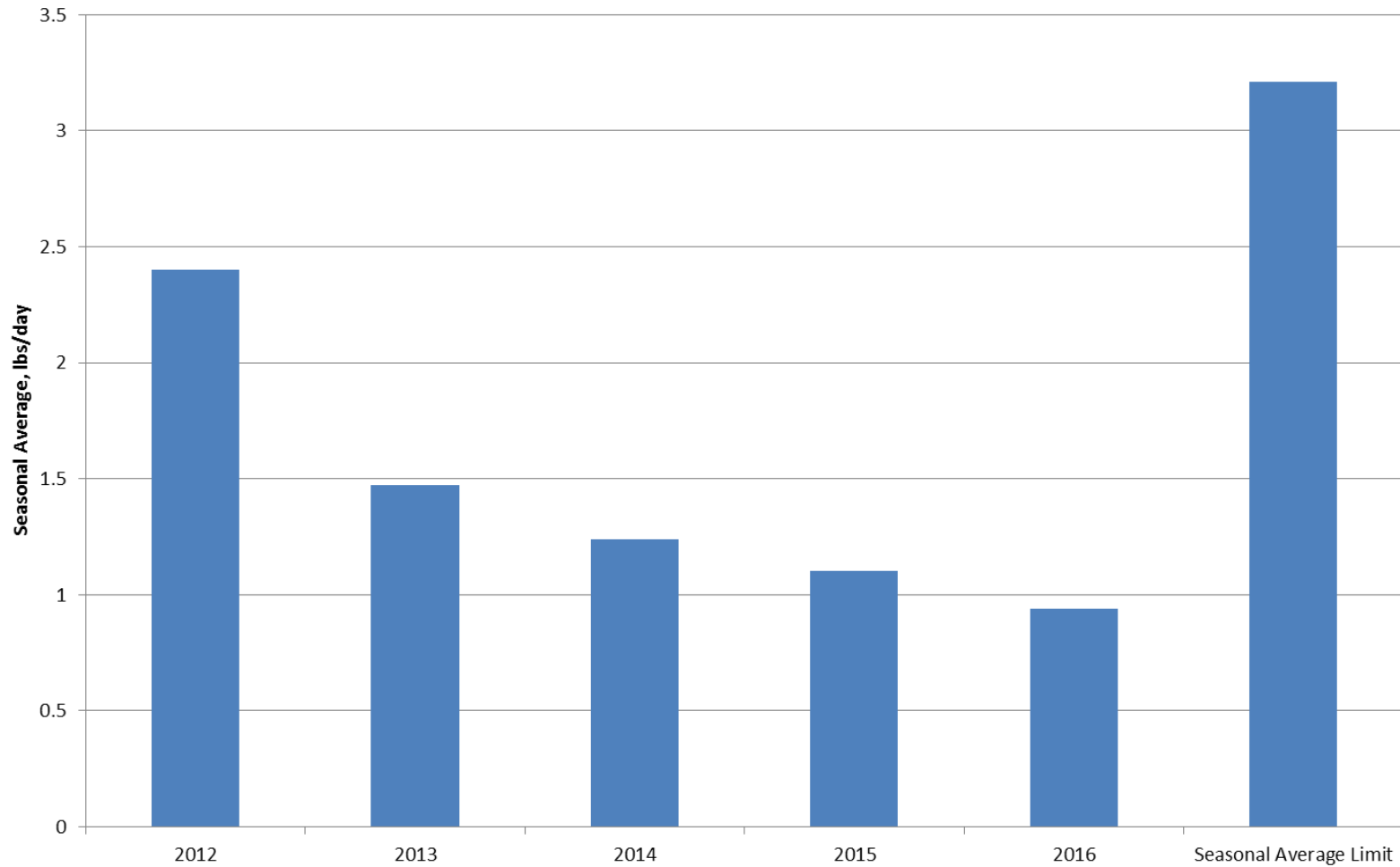
**Liberty Lake Beach and Leaf Cleanup
2003-2016**



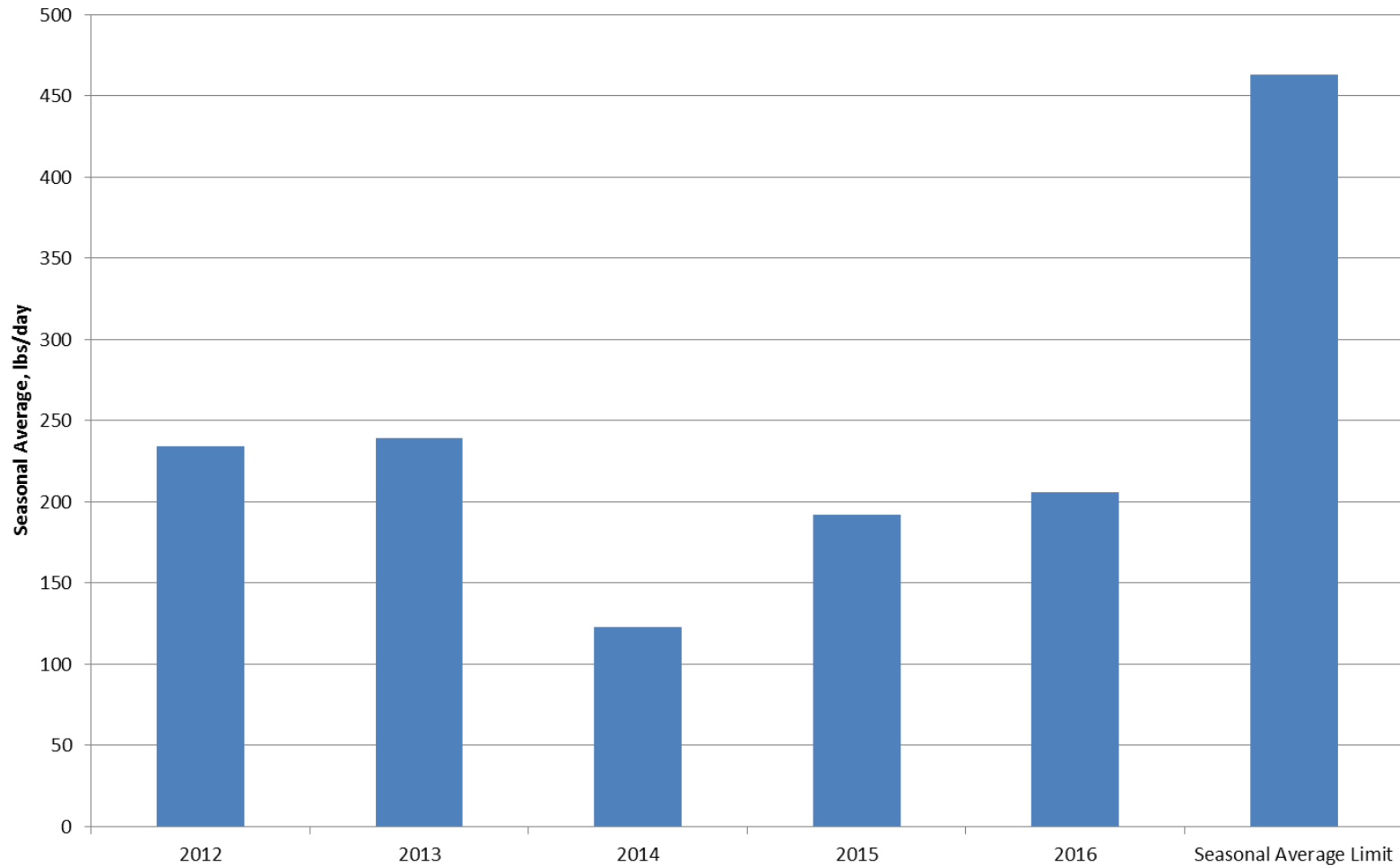
Kaiser Recent Activities

- *Discharge Volume Reduction*
 - *Flow reduction projects implemented within the facility*
 - *2012 – Annual average flow 9.40 MGD*
 - *2013 – Annual average flow 9.71 MGD*
 - *2014 – Annual average flow 8.32 MGD*
 - *2015 – Annual average flow 8.45 MGD*
 - *2016 – Annual average flow 8.79 MGD*

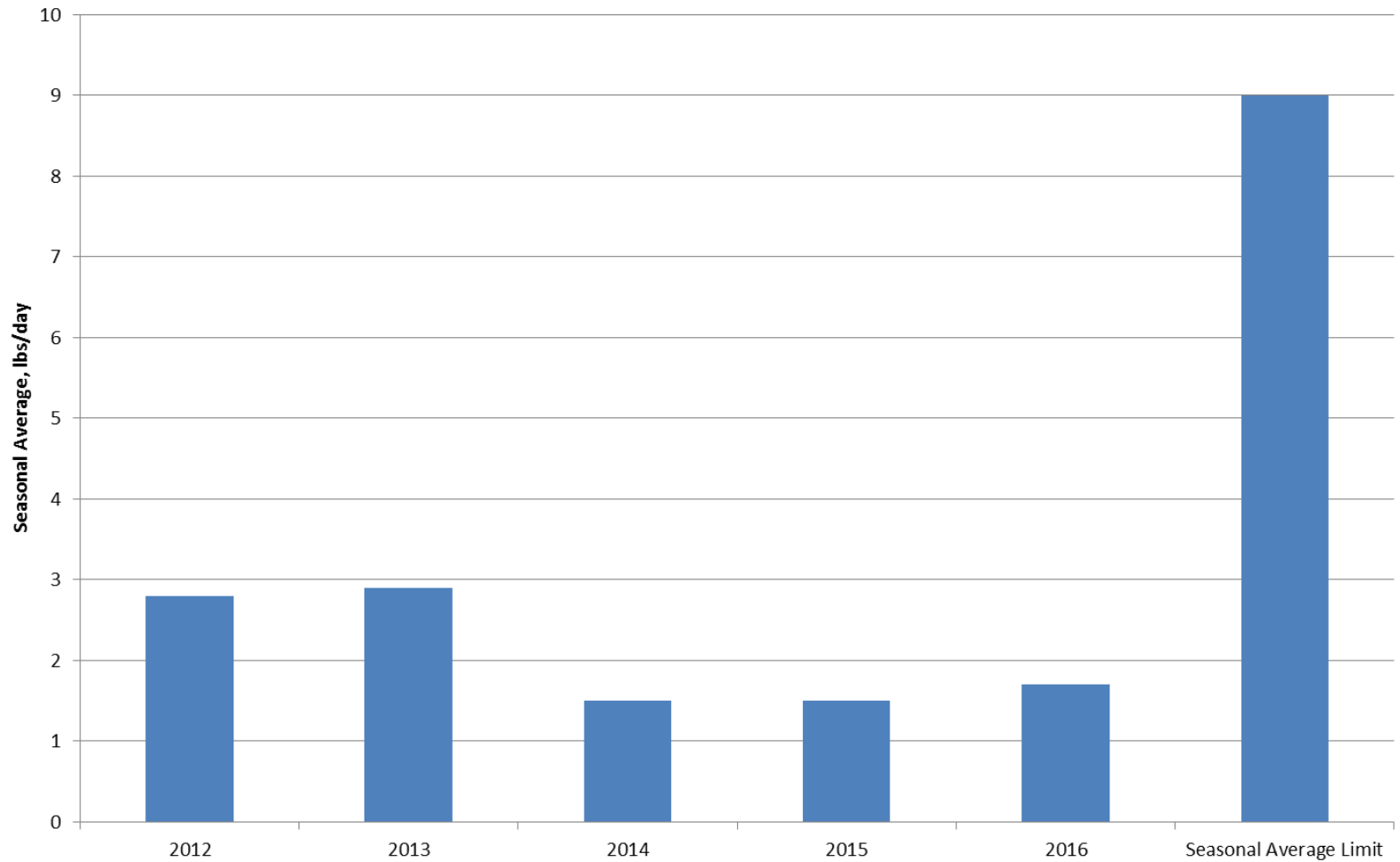
**Kaiser Trentwood
Total Phosphorous Seasonal Averages
(March - October)**



**Kaiser Trentwood
Carbonaceous Biological Oxygen Demand Seasonal Averages
(March - October)**



Kaiser Trentwood Ammonia Seasonal Averages (March - October)

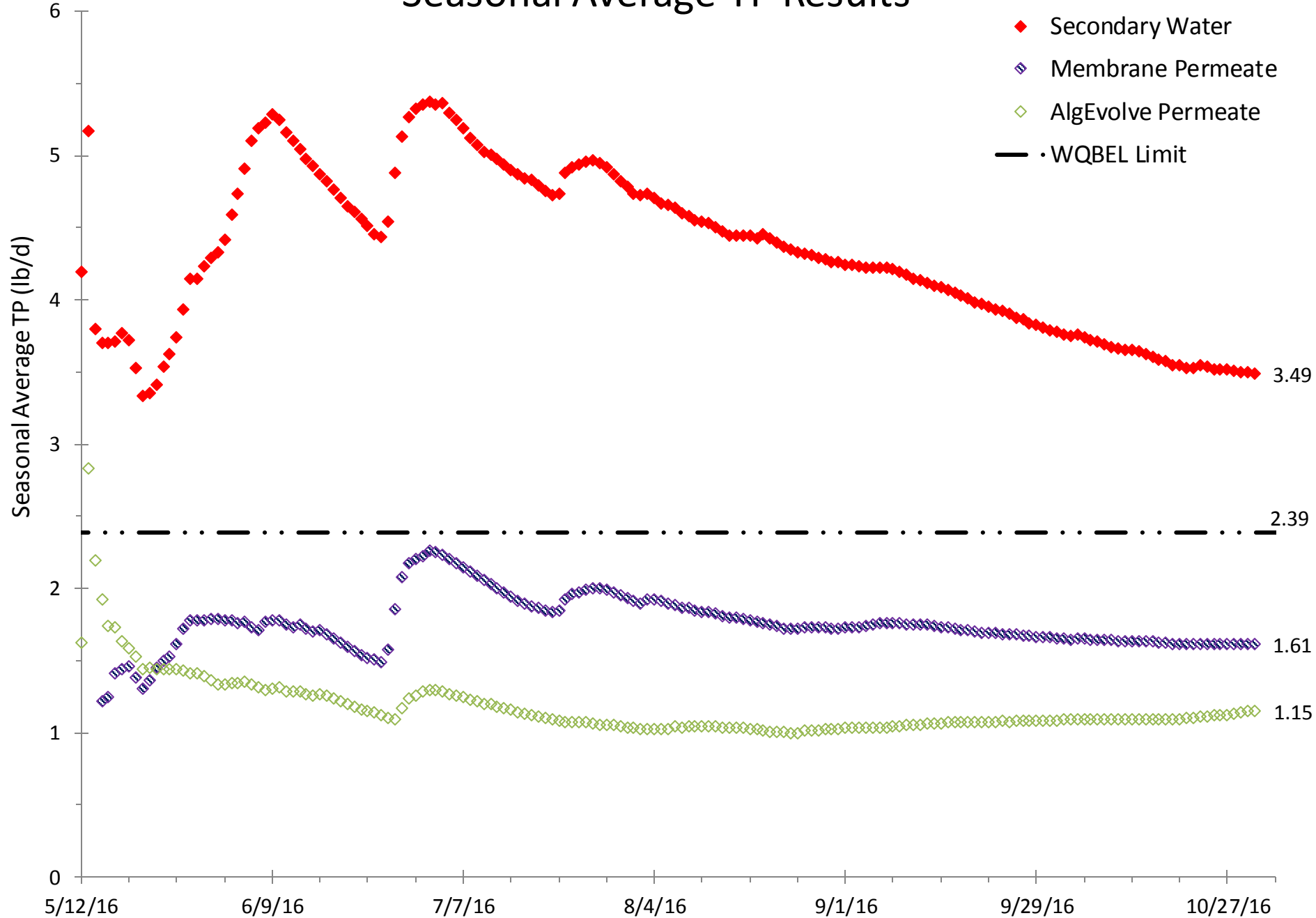


Kaiser Future Activities

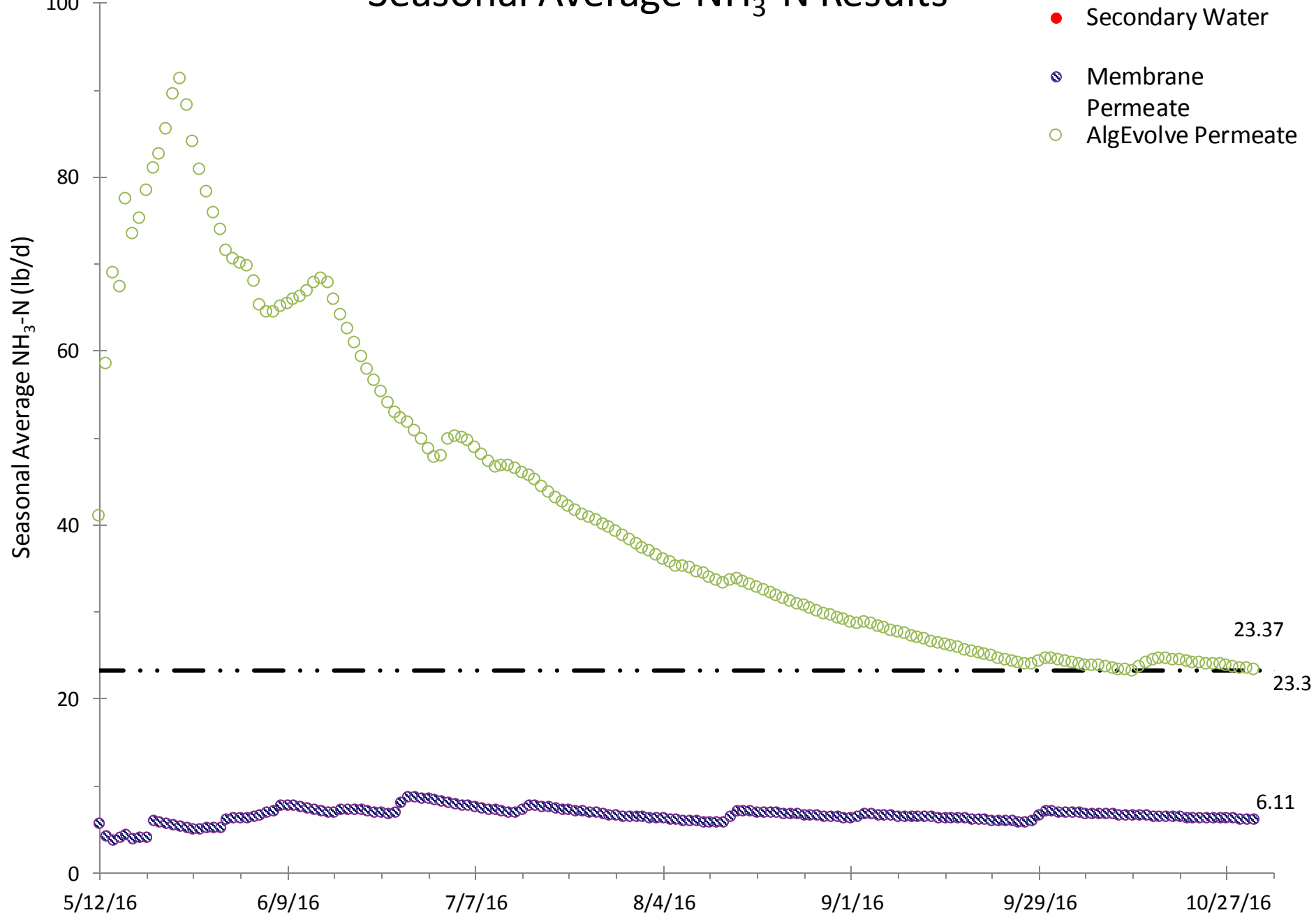
- *Discharge Reduction*
 - *Flow reduction projects*
 - *Projects under consideration could reduce flow by ~1.5 MGD*
 - *Sewage Plant Upgrades*
 - *Chemical precipitation addition by end of 2018*

Inland Empire Paper Company

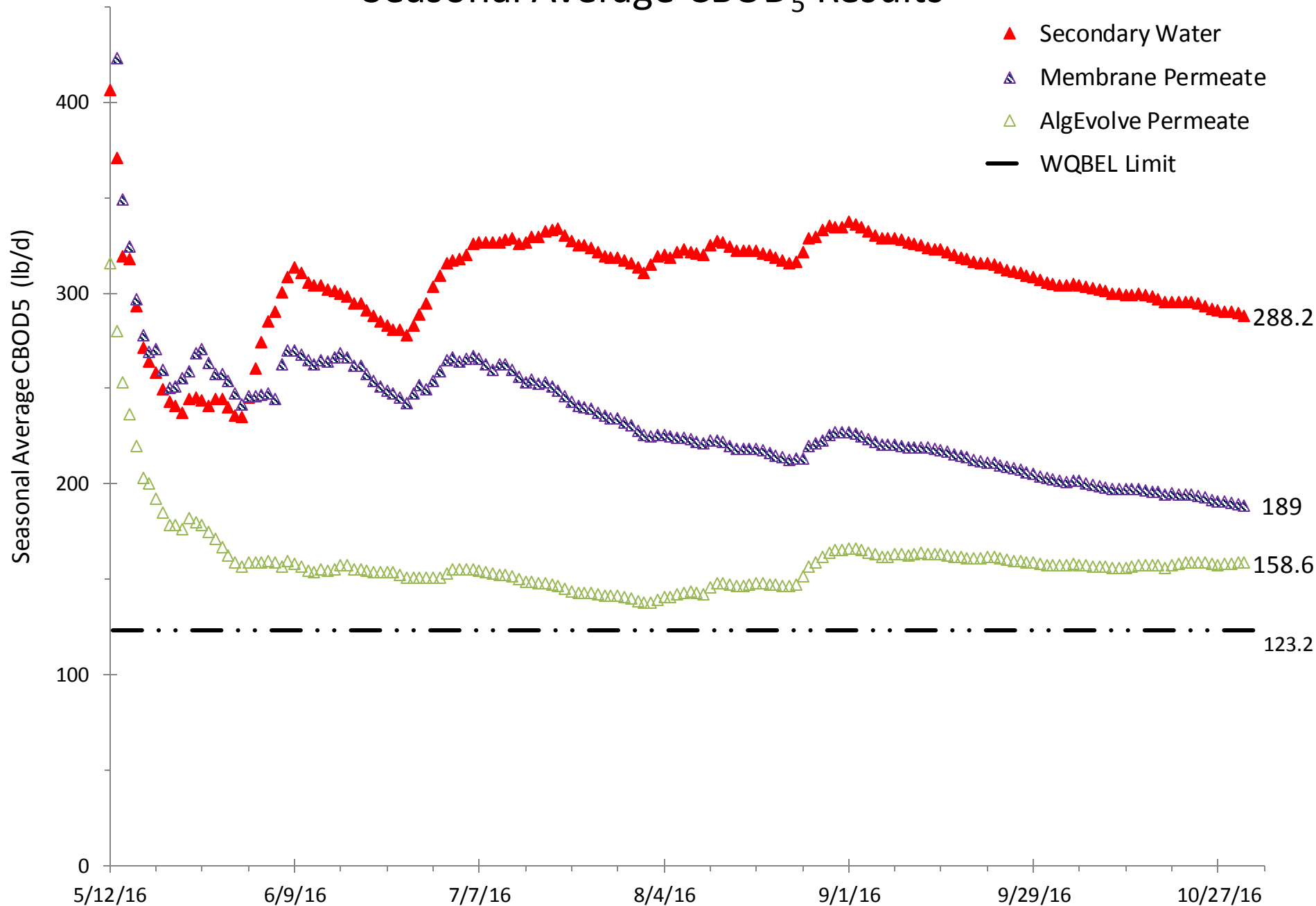
Seasonal Average TP Results



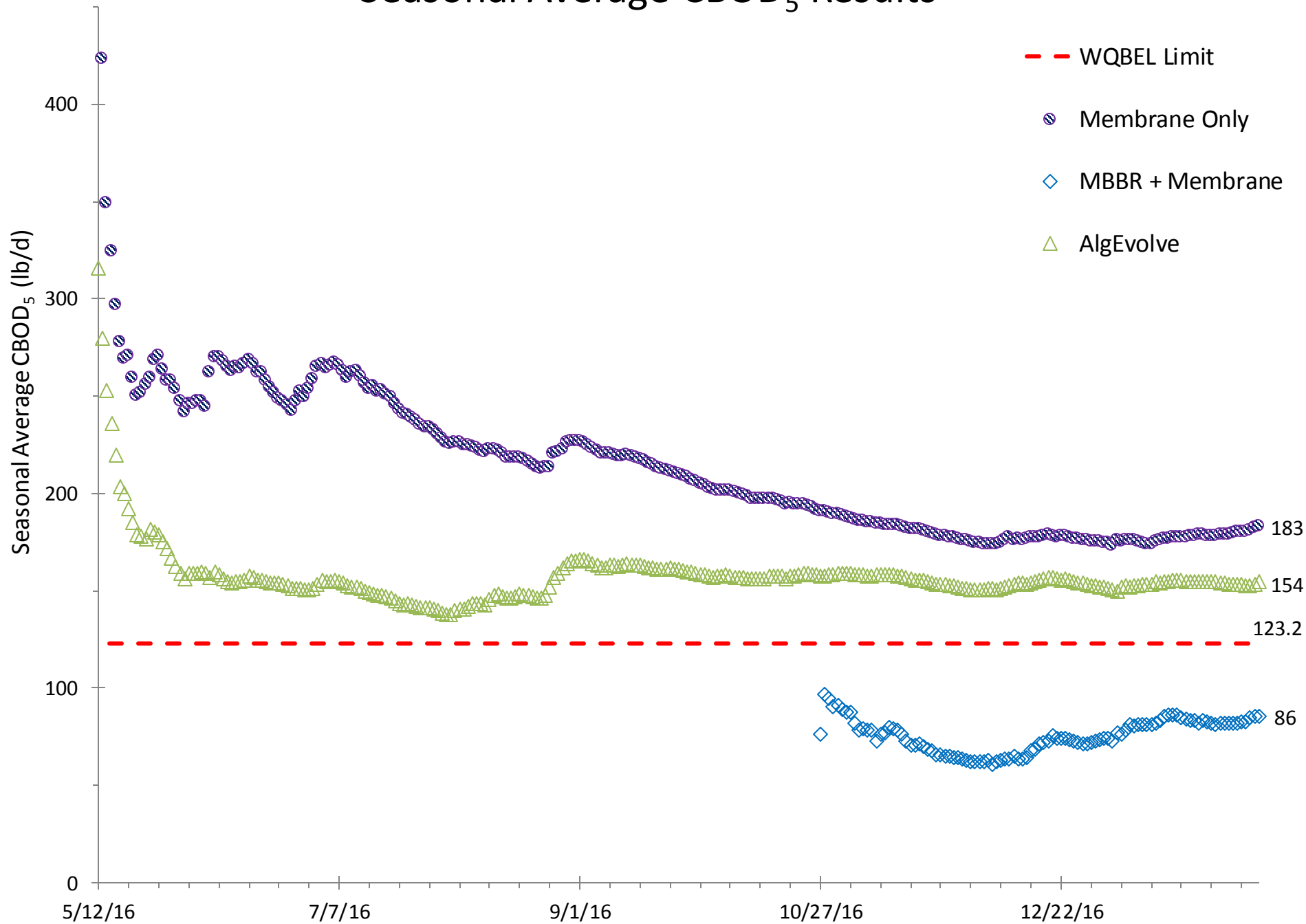
Seasonal Average NH₃-N Results



Seasonal Average CBOD₅ Results



Seasonal Average CBOD₅ Results



AlgEvolve Summary

- Achieving TP Limits
 - 46 μ g/L TP average
 - 77% Reduction
- CBOD₅ is close
 - 6.4mg/L CBOD₅ average
 - 52% reduction
- Shrinking Footprint & Costs
 - Increased throughput by a factor of 2
 - Reduced Consumables by ~75%
- Investigating biomass sales opportunities
 - Omega 3's
 - Fertilizer applications



On-going Work

- Tertiary MBBR + Membrane
 - 60min HRT
 - 0.01 μ m Filtration
- Ceramic Membranes
- Equalization Tank
- Zaps Real-time BOD measurement



The image shows a large-scale industrial operation, likely a geothermal power plant. In the background, there are several massive, conical piles of a bright yellow, granular substance, possibly sulfur or a mineral byproduct. A tall, white, rectangular structure with a small window is positioned on the left. To the right, a long, elevated conveyor belt system stretches across the scene. In the foreground, a curved, concrete-lined channel filled with water is visible. Steam or mist is rising from the water surface, and a small waterfall or spillway is seen on the right side of the channel. The sky is a clear, vibrant blue with scattered white clouds. The overall scene conveys a sense of large-scale industrial activity and natural resource processing.

Questions?



SPOKANE COUNTY ENVIRONMENTAL SERVICES

Spokane County Regional Water Reclamation Facility

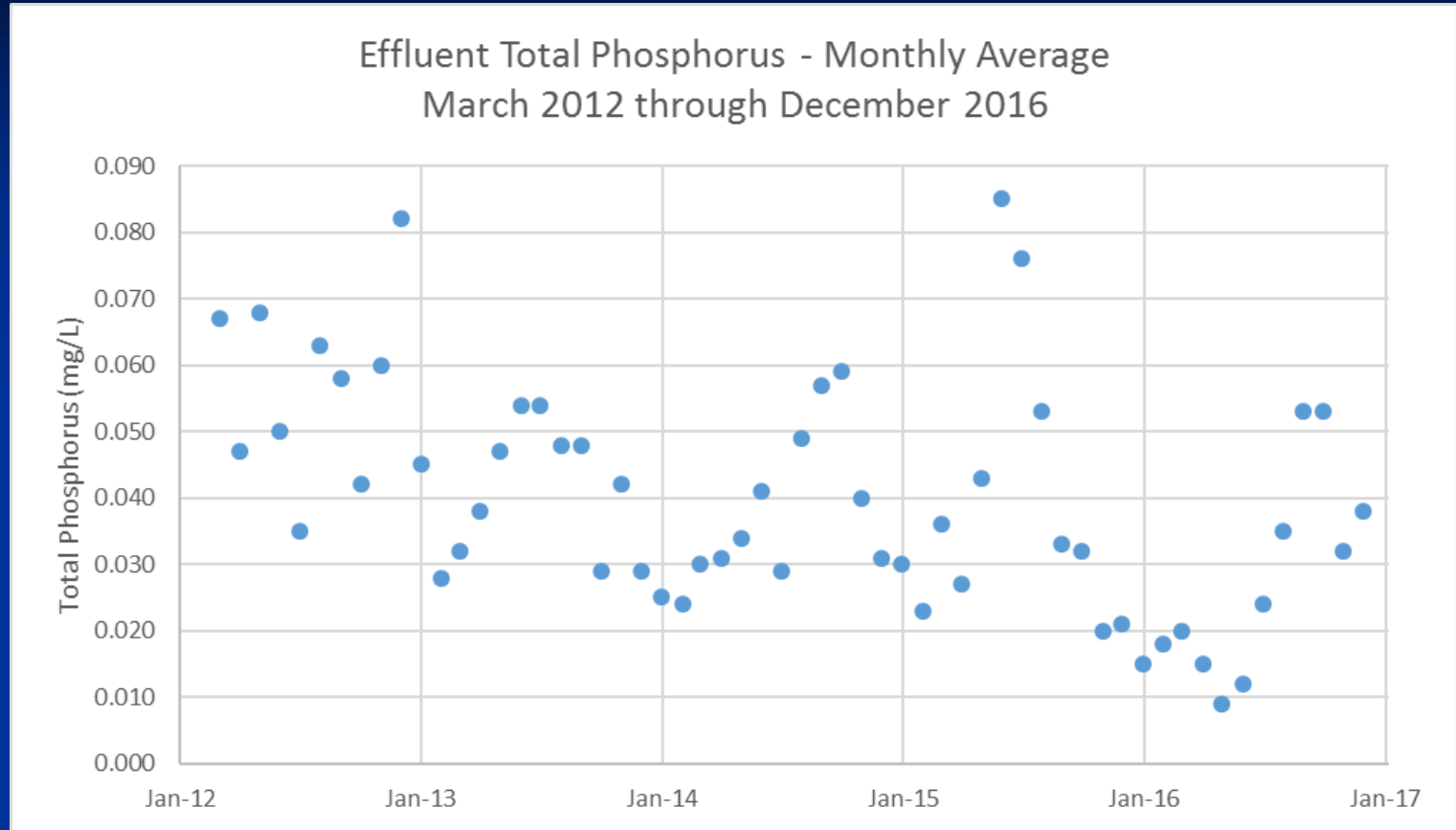


DO TMDL – POINT SOURCE REDUCTION UPDATES

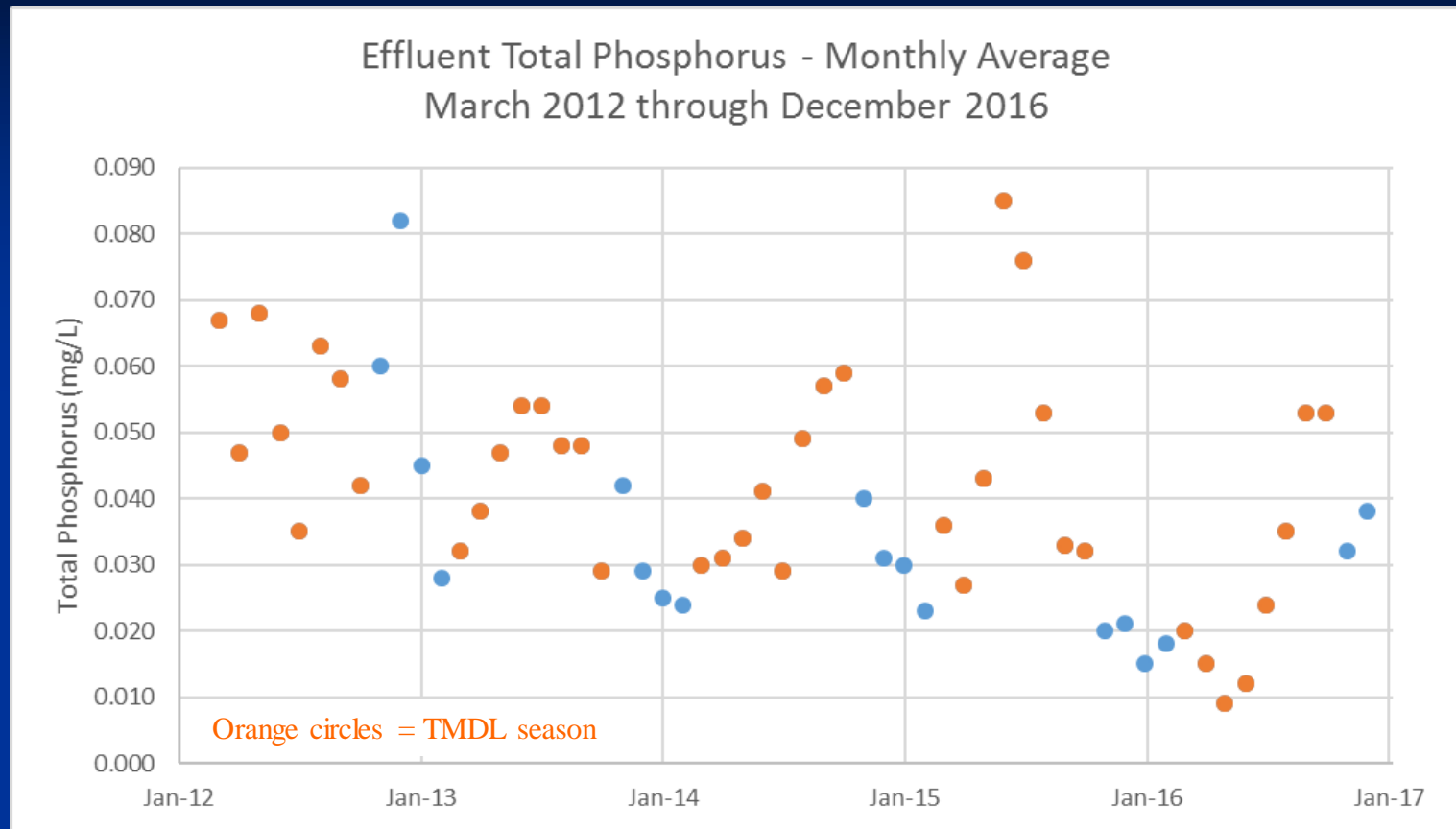
June 8, 2017

SPOKANE COUNTY ENVIRONMENTAL SERVICES

SCRWRF Effluent Total Phosphorus

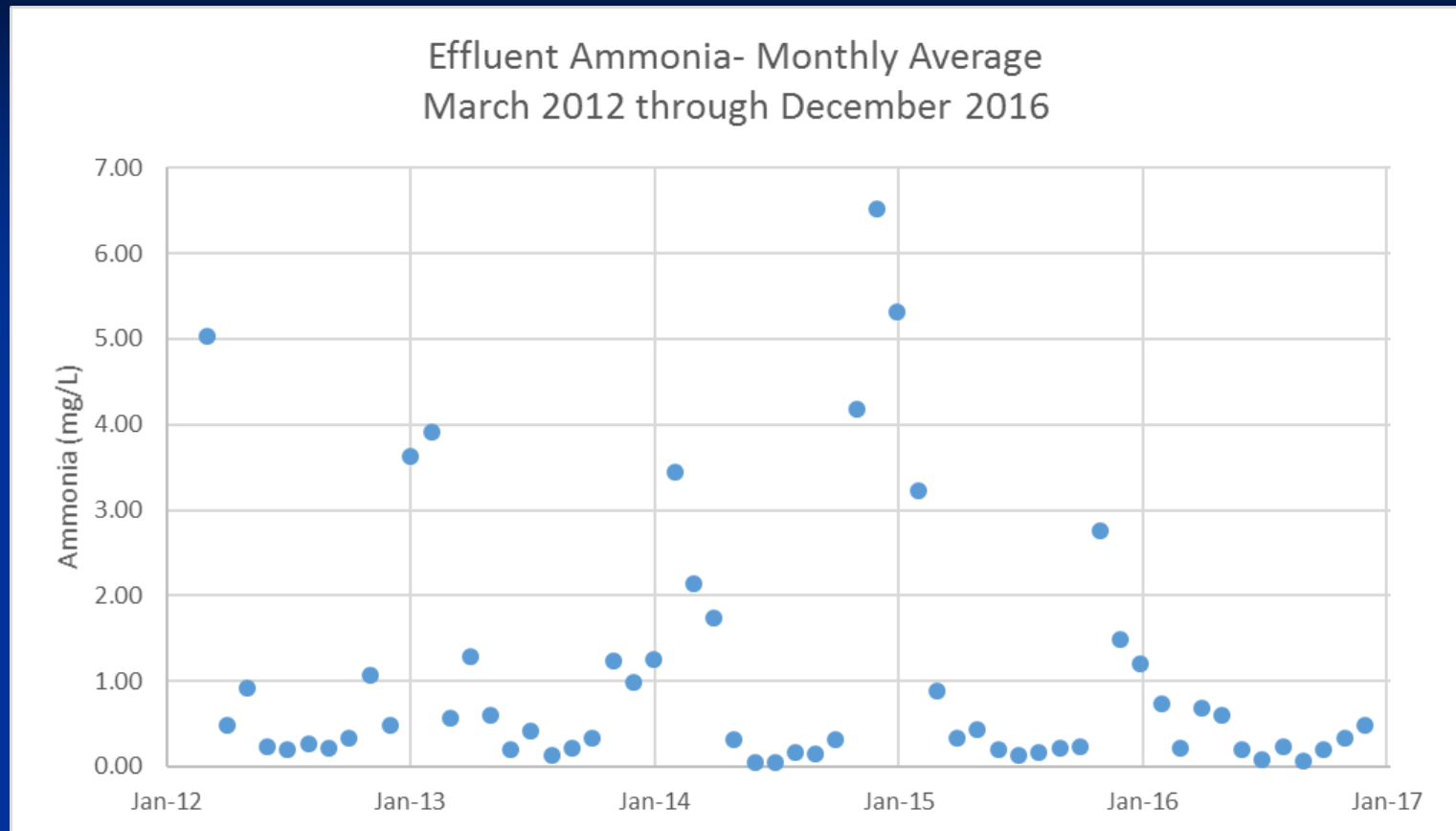


SCRWRF Effluent Total Phosphorus

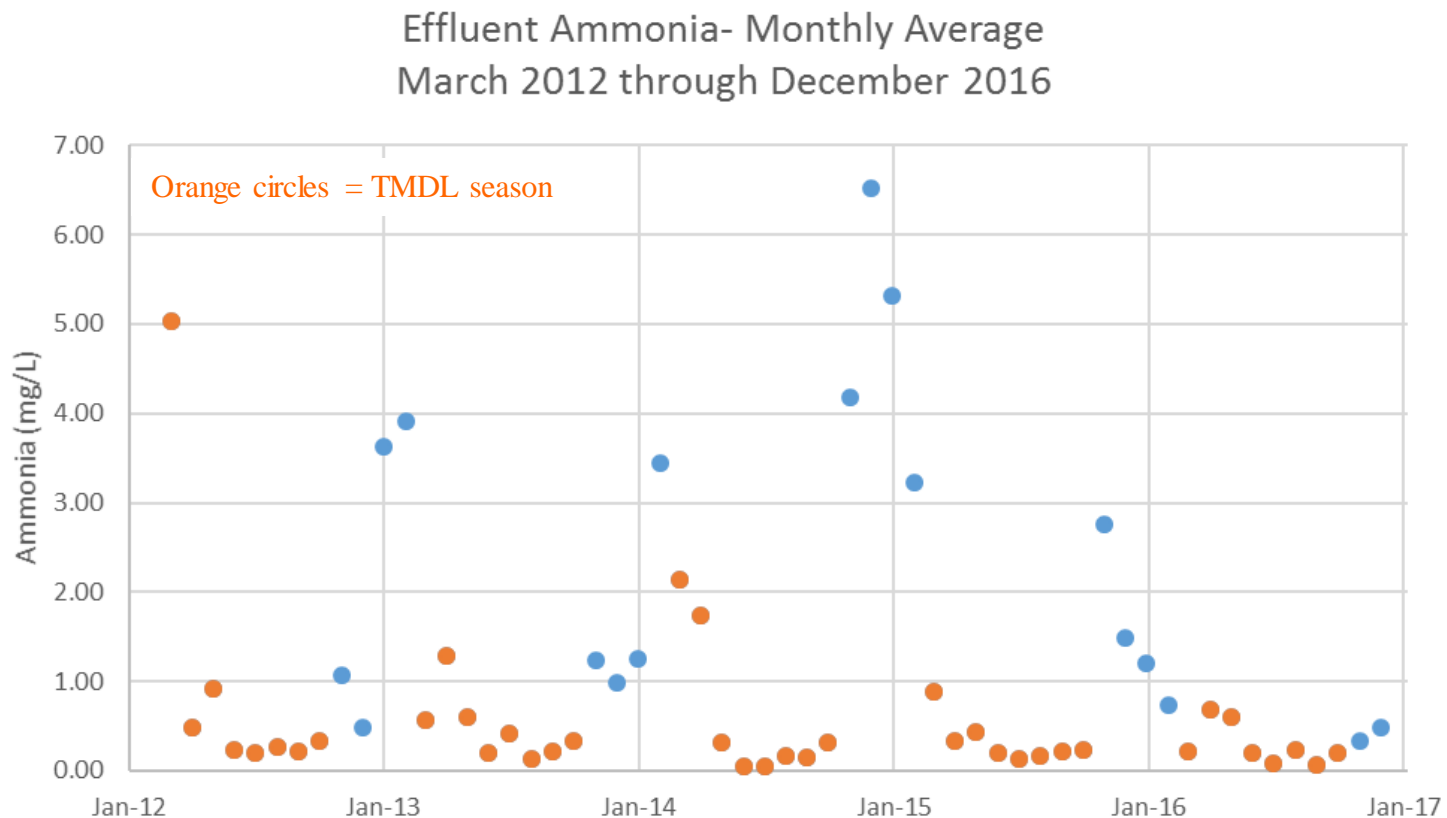


- 8-Month TMDL Season: March through October – 3.34 lbs per day
- Effluent meets TMDL limits
- At 8 MGD, 3.34 lbs/day equals 0.050 mg/L
- Average concentration of data above: 0.040 mg/L
- Average concentration of data above during TMDL seasons: 0.043 mg/L

SCRWRF Effluent Ammonia



SCRWRF Effluent Ammonia



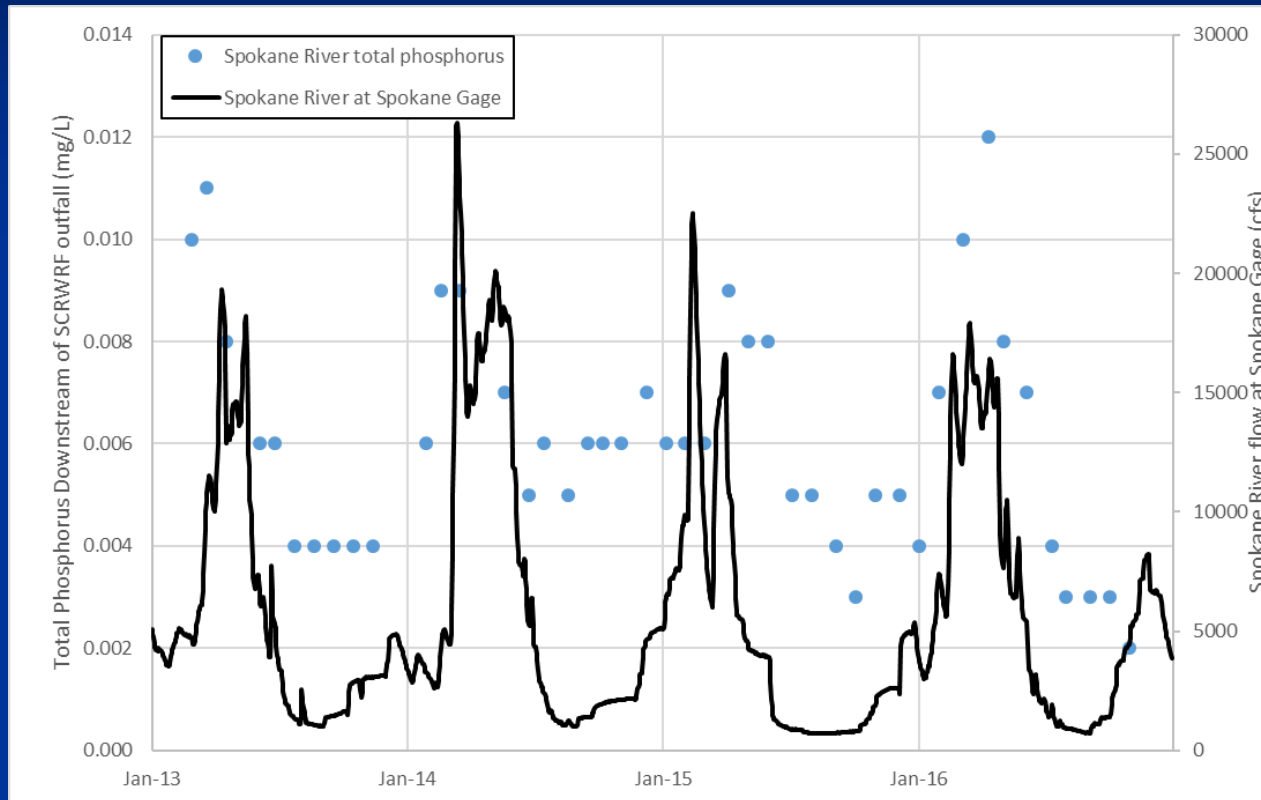
- 8-Month TMDL Season, limits vary by month, March through Oct
- Effluent meets TMDL limits
- Average concentration of data above: 1.09 mg/L
- Average concentration of data above during TMDL seasons: 0.53 mg/L

SCRWRF Effluent Carbonaceous Biochemical Oxygen Demand (CBOD)

- The County's NPDES permit limit (monthly average) for CBOD is 2.0 mg/L (133 lbs/day)
- The lab detection limit for CBOD is 2.0 mg/L
- Essentially every day is “non-detect” and the DMR value is reported as <2.0 mg/L

Spokane River Receiving Water Sampling

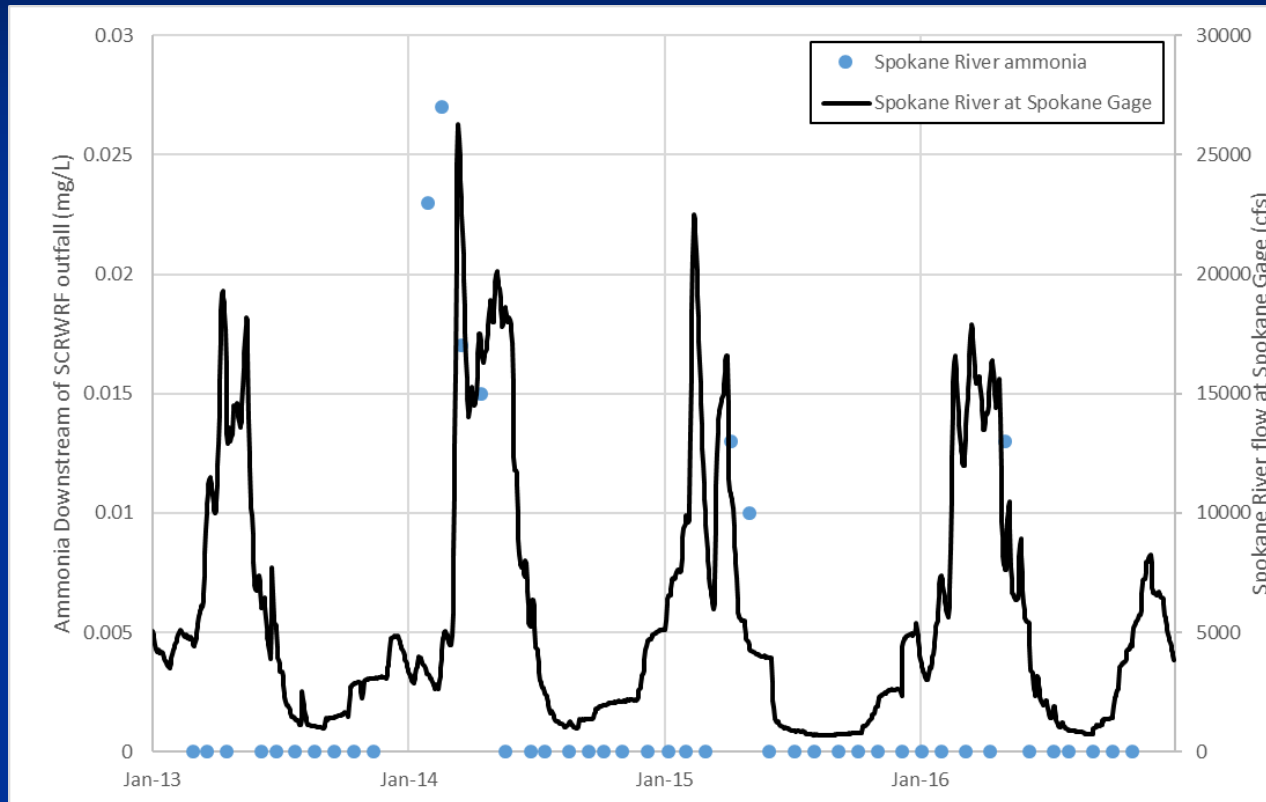
February 2013-November 2016



- Total phosphorus concentrations decline during low river flow
- Total number of samples: 45
- Average concentration: 0.006 mg/L (using ND as detection limit)

Spokane River Receiving Water Sampling

February 2013-November 2016



- Ammonia concentrations highest during periods of higher flow
- Total number of samples: 45
- 38 of 45 samples (84%) were below detection limit



SPOKANE COUNTY ENVIRONMENTAL SERVICES

City of Spokane 2017 Annual DO-TMDL Meeting Presentation

June 8th, 2017



Digester #3 Construction Progress



Chemical Storage Facility



Primary Clarifier #5

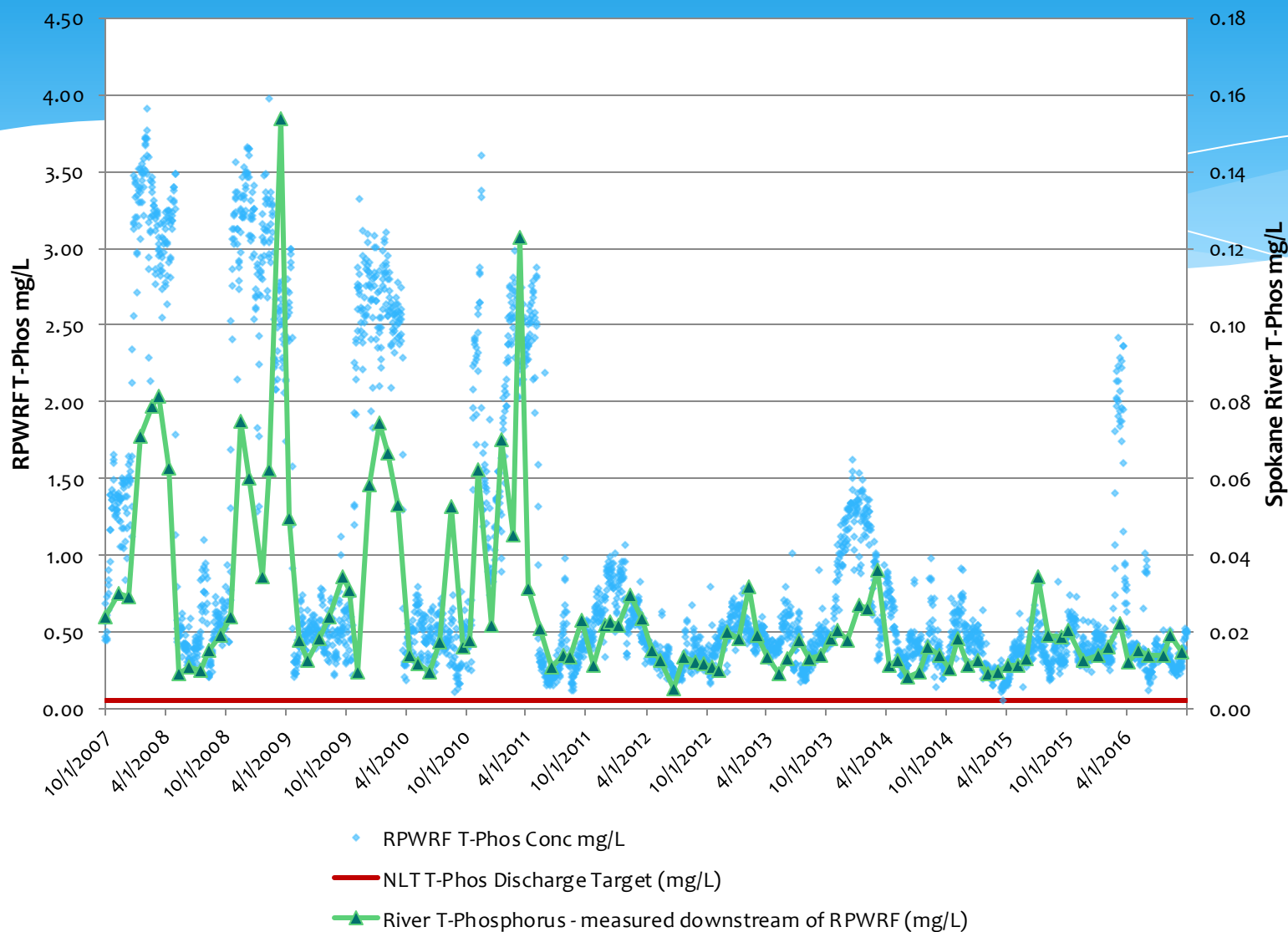


NLT Membrane Facility

- Selected Pall Membranes in 2016
- Pressurized System
- Pretreatment with drum screens



RPWRF and Spokane River Phosphorus Concentrations



CSO Tanks

in Operation

CSO Basin	Name	Location	Volume
2		A.L. White Pkwy. (East of RPWRF)	367,000
10		Northwest Spokane	137,000
16		Clark & Riverside	194,000
19	7th @ Inland Empire	High Bridge (East Side)	5,000
38	Riverton	South Riverton	431,300
42	Riverton	South Riverton	110,000
6	Shadle Bluff	NW Blvd & Garland	900,000
7	Downriver	Downriver Dr.	5,000
20	Hatch	Hatch & 43rd	205,000
33-2	East University District	East Sprague & Hamilton	366,000
34-2	Underhill	Underhill Park	1,134,000
34-3	Ray	21st & Ray	883,000
12	Doomsday Hill	Pettet Drive	694,000
		TOTAL	5,431,300

CSO Tanks

Under Construction and Ready for Construction

CSO Basin	Name	Location	Volume	Construction Start
IO3	TJ Meenach	NW Blvd & TJ Meenach	1,240,000	Middle 2017
IO4	Bosch Lot	Summit & Monroe	980,000	Early 2016
34-1	Lee	Riverside & Lee	1,600,000	Middle 2017
24	Adams	First & Adams	2,000,000	Early 2017/GCCM
26	City Hall	Spokane Falls Blvd	2,100,000	Early 2017/GCCM
33-1	Liberty Park	West of Liberty Park	2,040,000	Early 2017/Bids awarded
33-C	Third Ave Basin	Pacific & Perry	100,000	Early 2017/Bids awarded
41	Upriver	Upriver at Rebecca	10,000	Early 2017/Bid awarded
IO7	Napa	Riverside & Napa	180,000	Middle 2017
TOTAL			10,250,000	

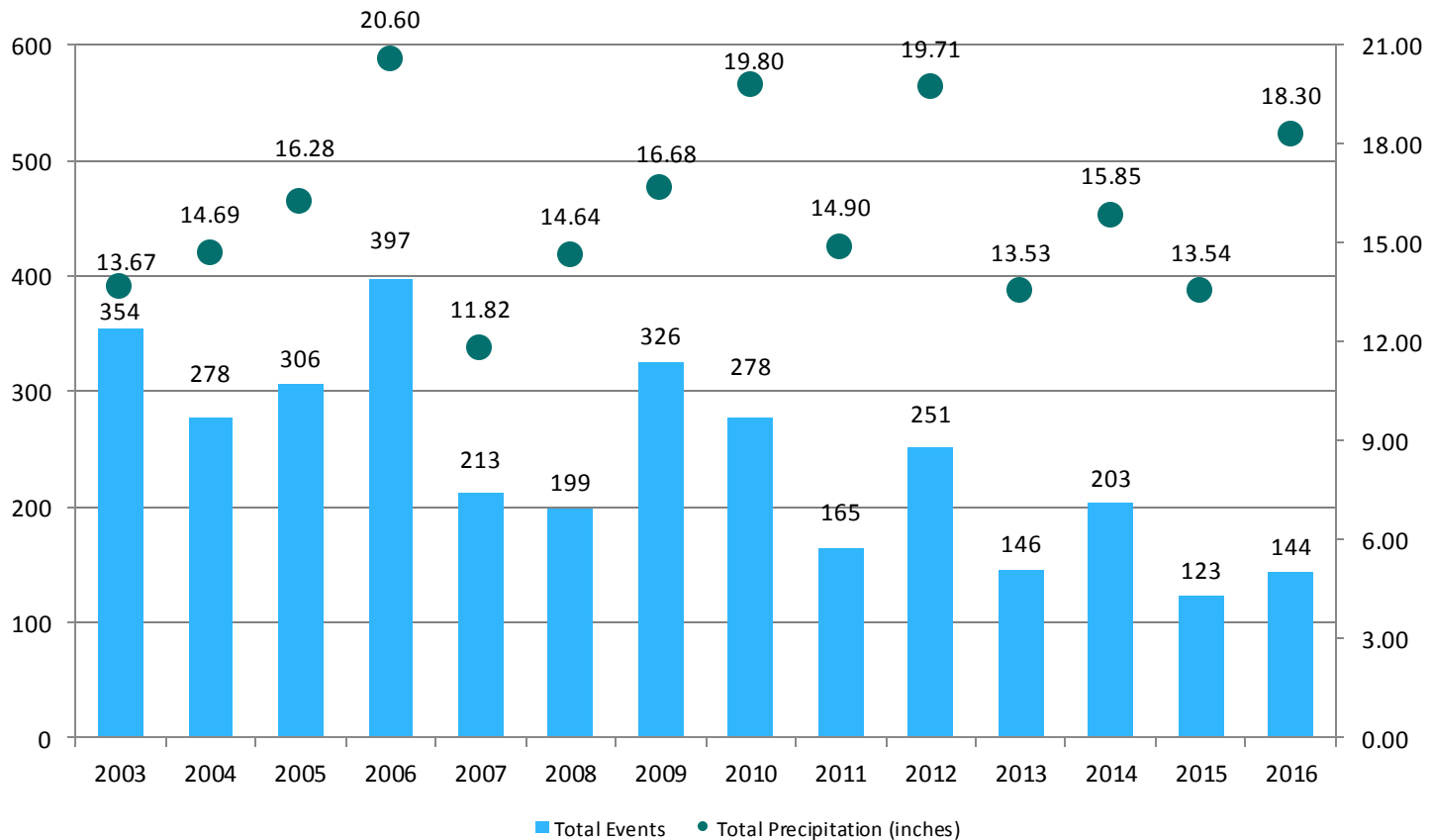
CSO Tanks

In Design

CSO Basin	Name	Location	Volume	Construction Start
14	Green solutions	West Central	51,000	2017
15	Green solutions	West Central	56,000	2017
23	Kendall Yards	West Central	50,000	2017
25	Cedar+Green	Cedar at Main	25,000	2017
TOTAL			182,000	

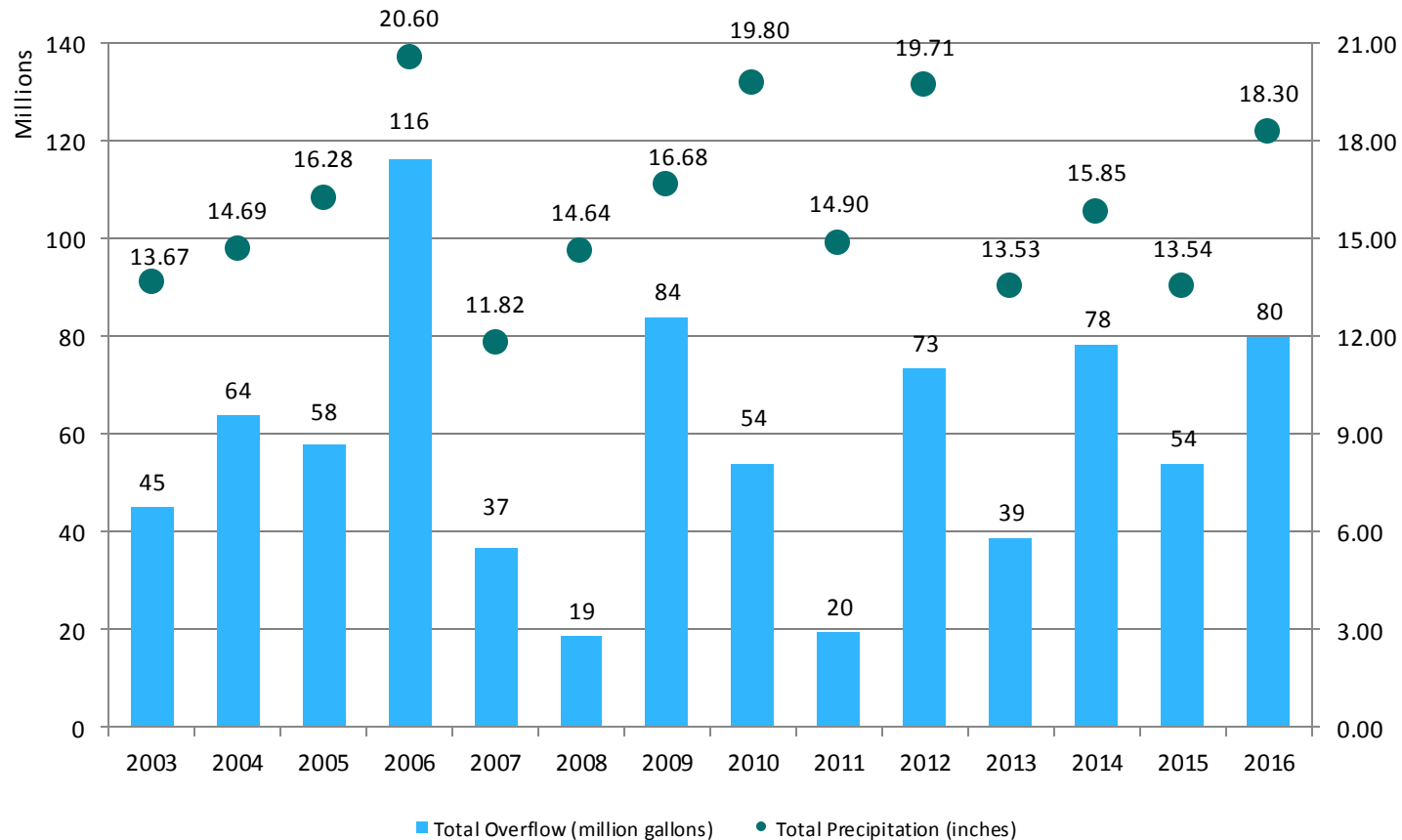
CSO Progress

CSO Events & Precipitation 2003 - 2016

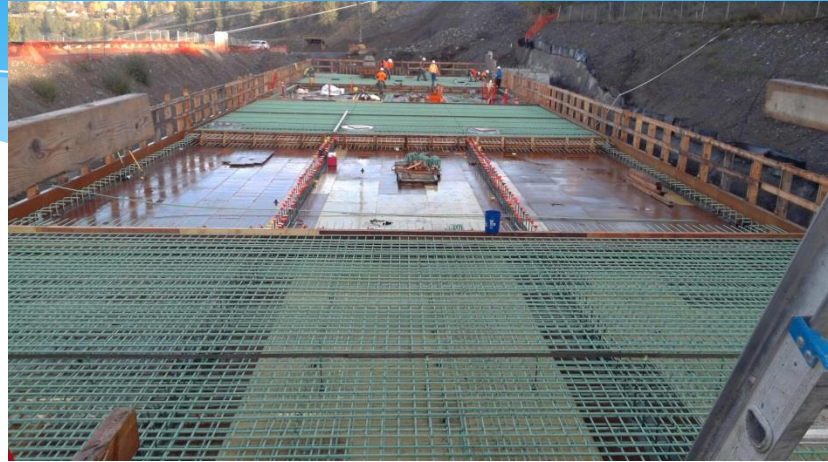


CSO Progress

CSO Volume & Precipitation 2003 - 2016



CSO Construction: CSO 12



CSO Construction: IO4



CSO Construction: CSO 26



CSO Construction: CSO 24

