WWOA Annual Meeting
October 7, 2014

Right sizing of Low Level P Technologies

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Donohue & Associates

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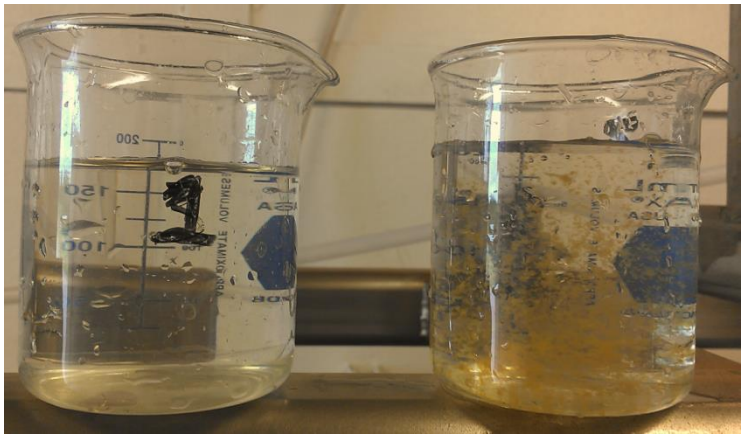
Introduction

- Typical new WI WQBEL for Impaired Waters
  - 0.075 mg/L six month seasonal limit
  - 0.225 mg/L monthly limit
- Effluent P Mainly in Solids (Chemical or Biological)
- Low P Technology used to Reach Low TSS and P



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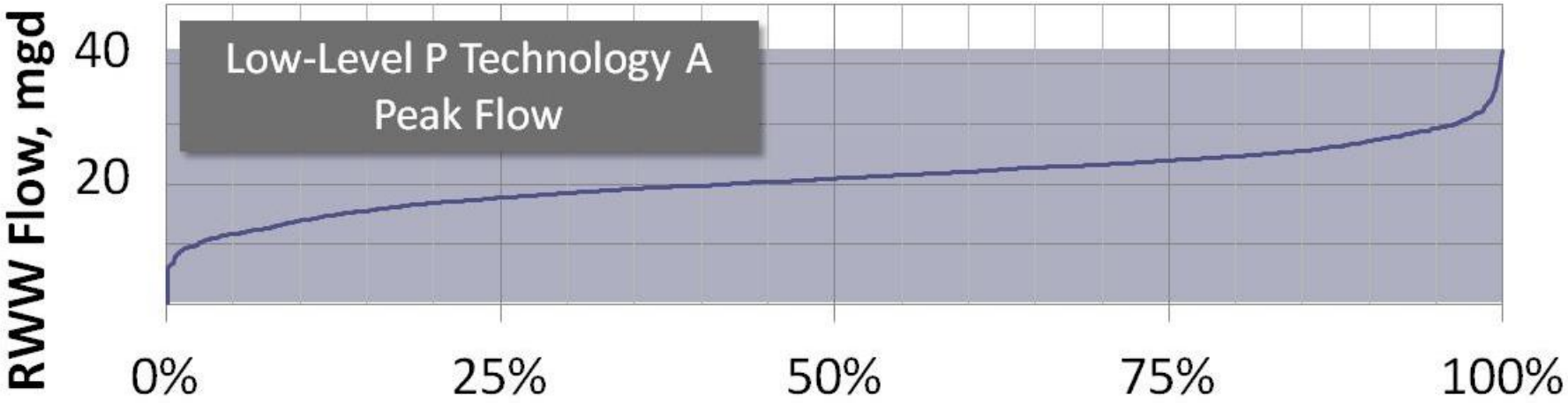
how big is big enough?

Conservative Sizing



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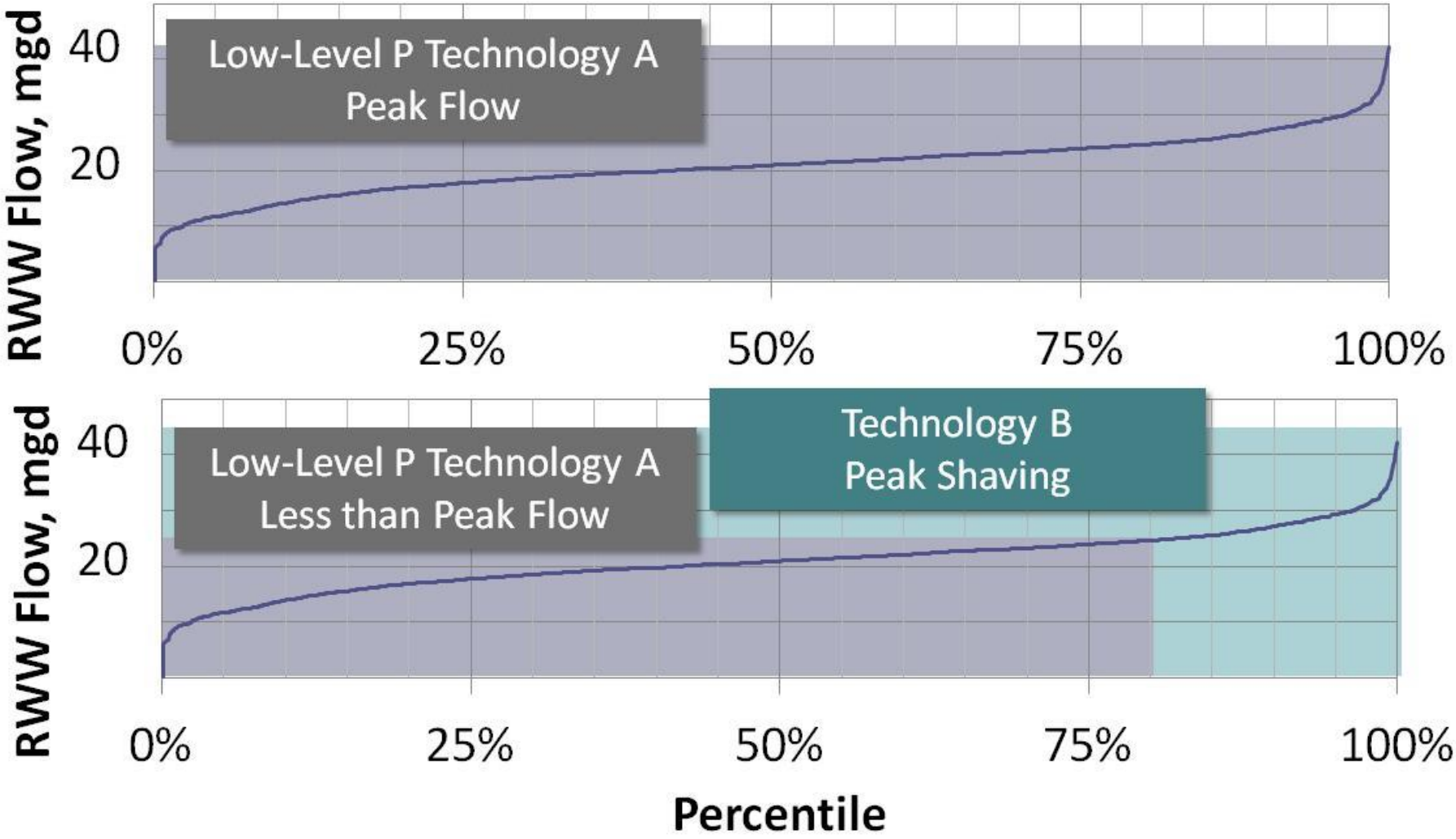
Right Sizing



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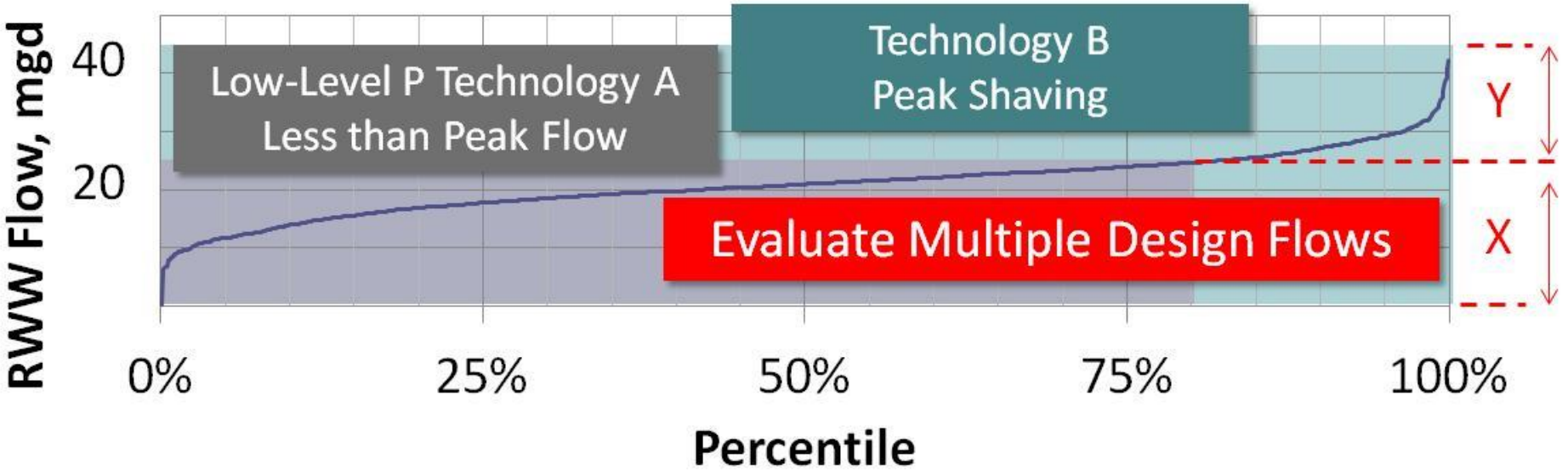
Right Sizing



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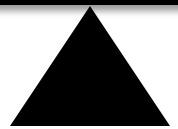
Finding a Balance

Technology A
Low-Level P Tertiary Process
Higher Cost Alternative

Technology B
Optimized Existing Processes
Lower Cost Alternative

Permit Compliance = Tech A + Tech B
Strike the “Right” Balance



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how low can we get?

Disc Filtration

Sun Prairie
Brookfield
Stevens Point
HOV
Beloit

Brookfield
Beloit
Sheboygan

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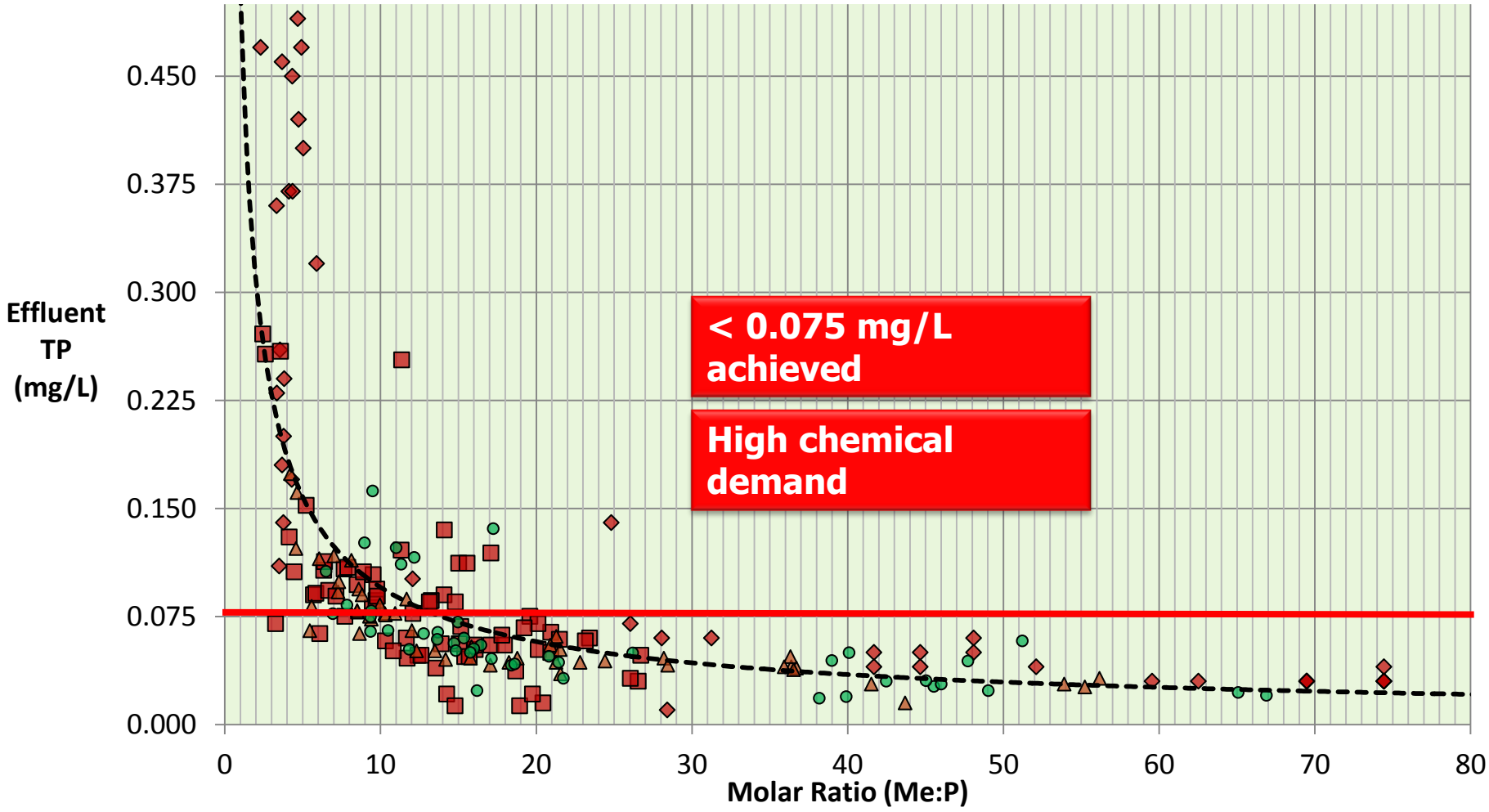
Low P Testing



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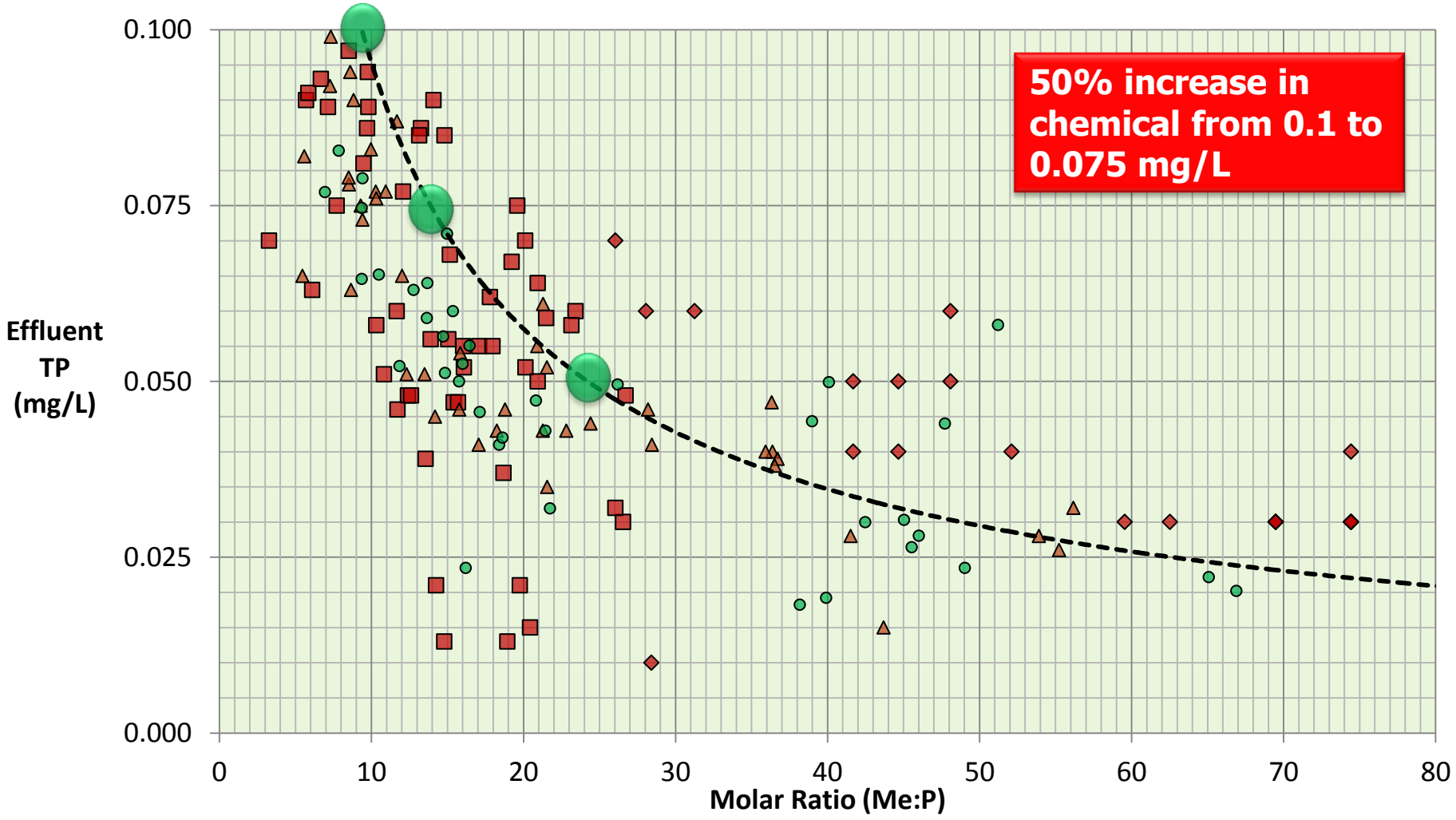
Low P Testing



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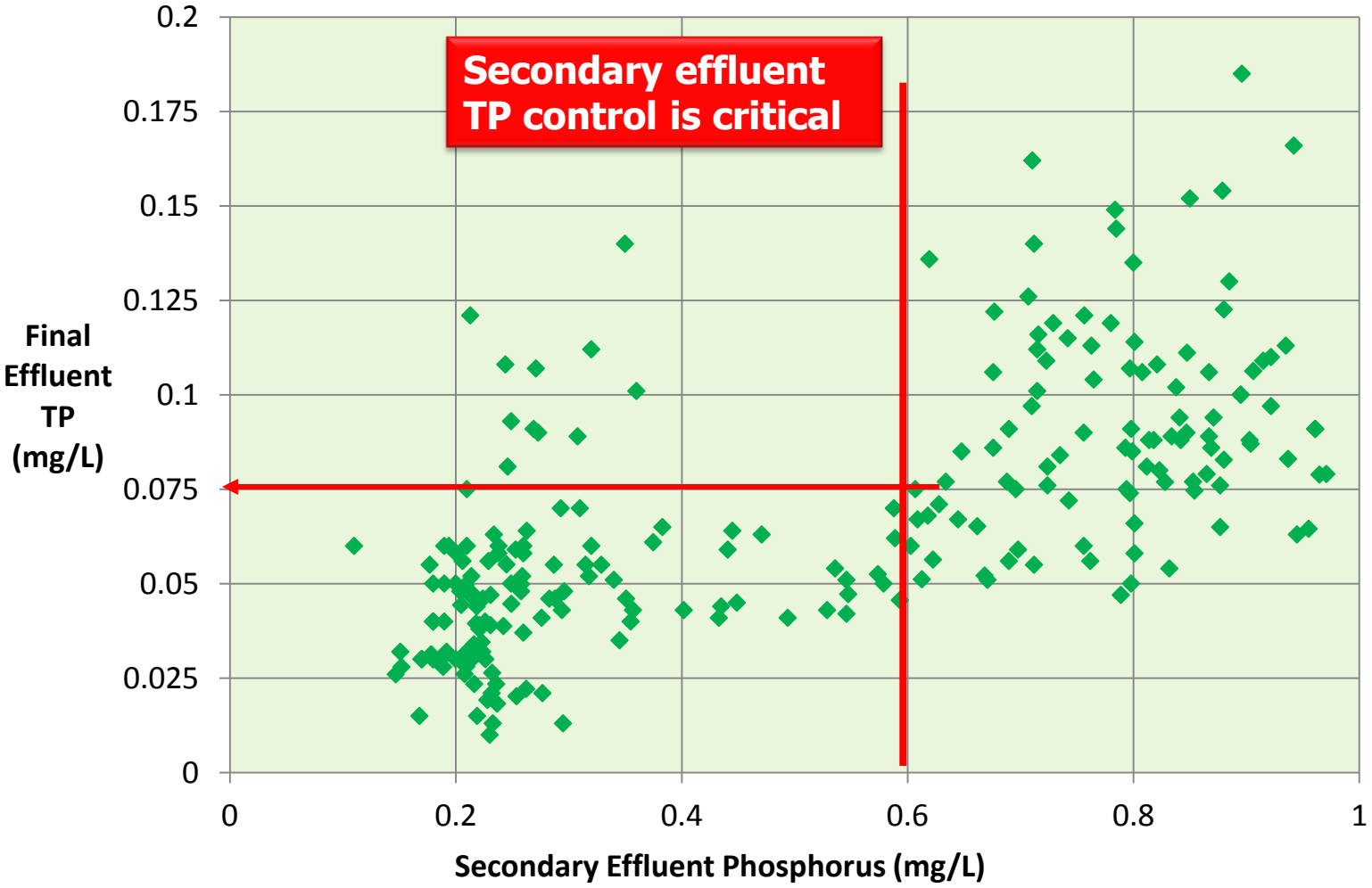
Low P Testing: A Side Note…



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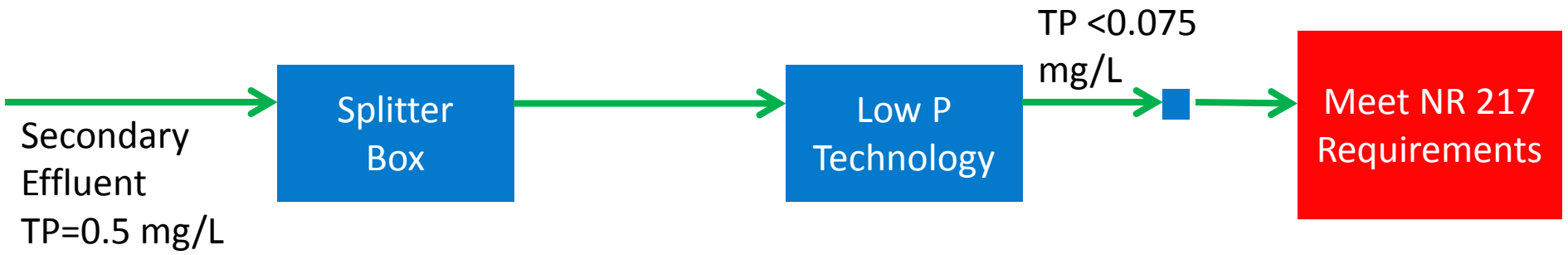
why does this matter?

Mass Balance



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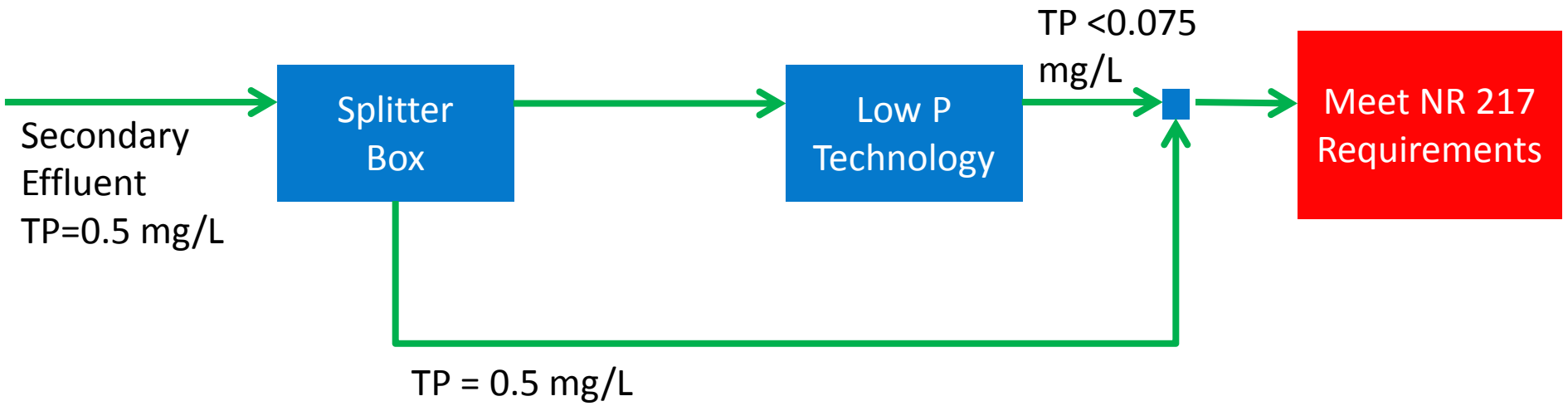
Mass Balance



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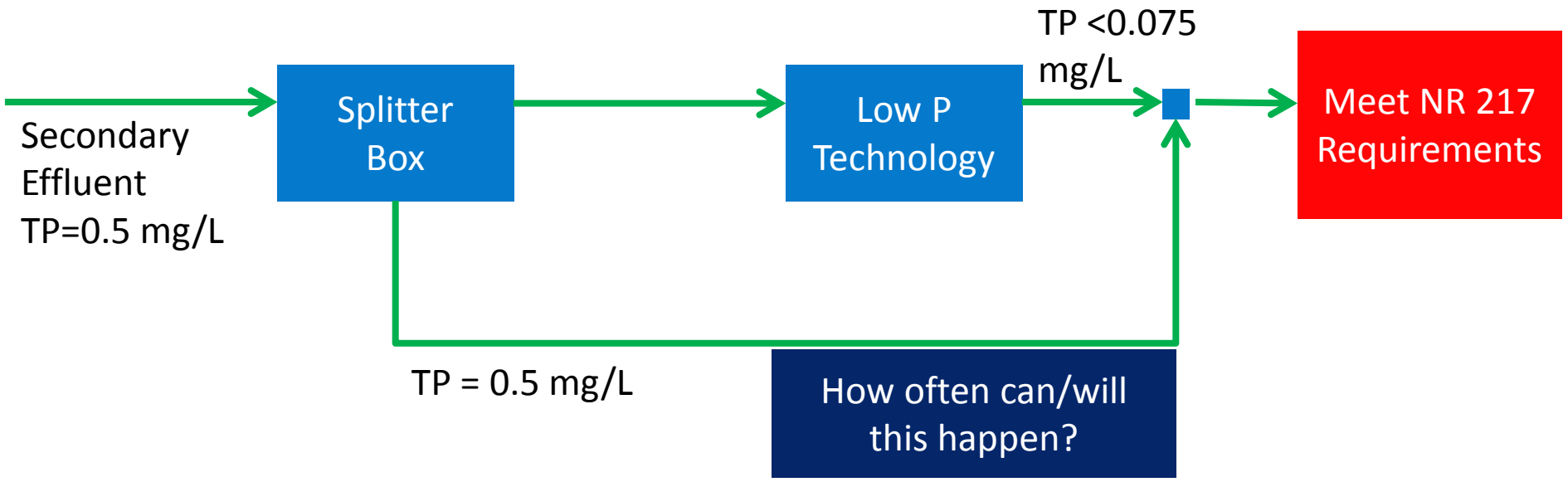
Mass Balance



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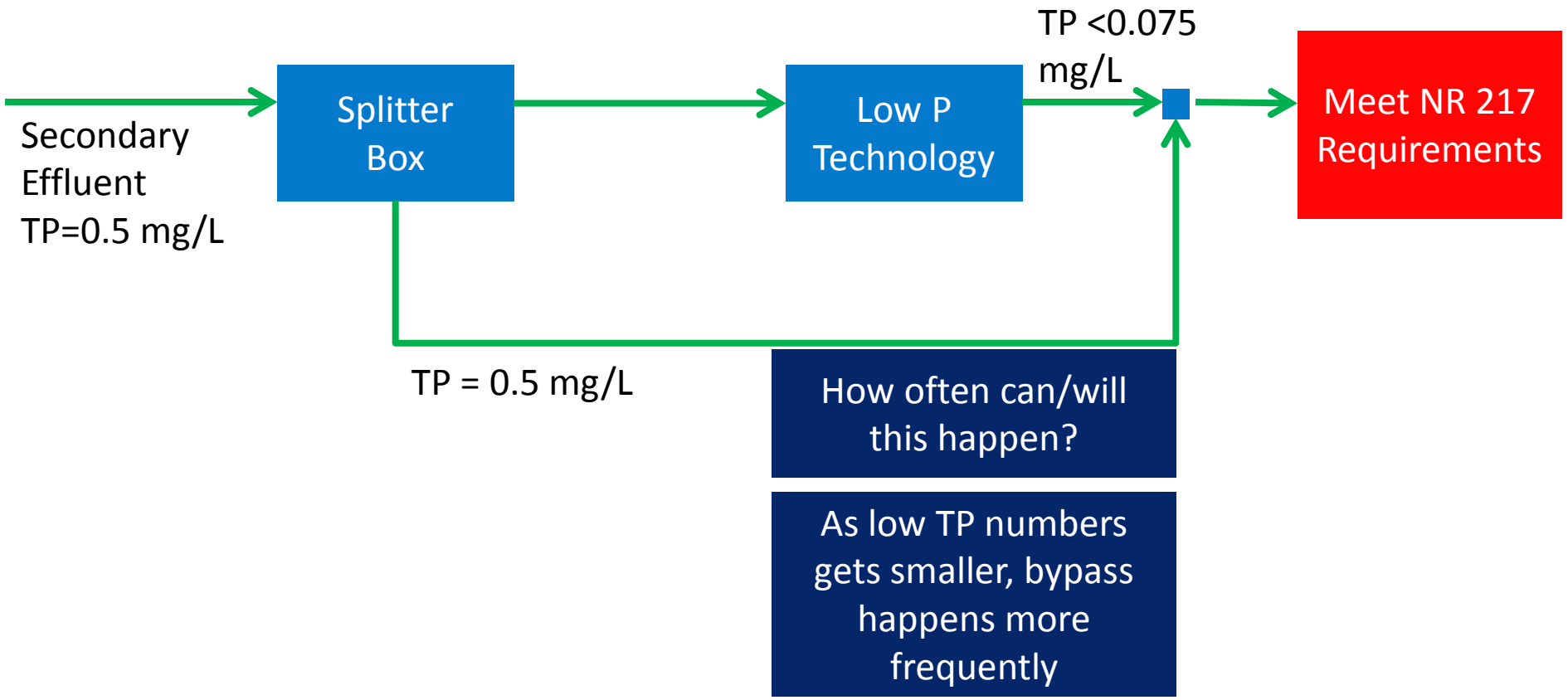
Mass Balance



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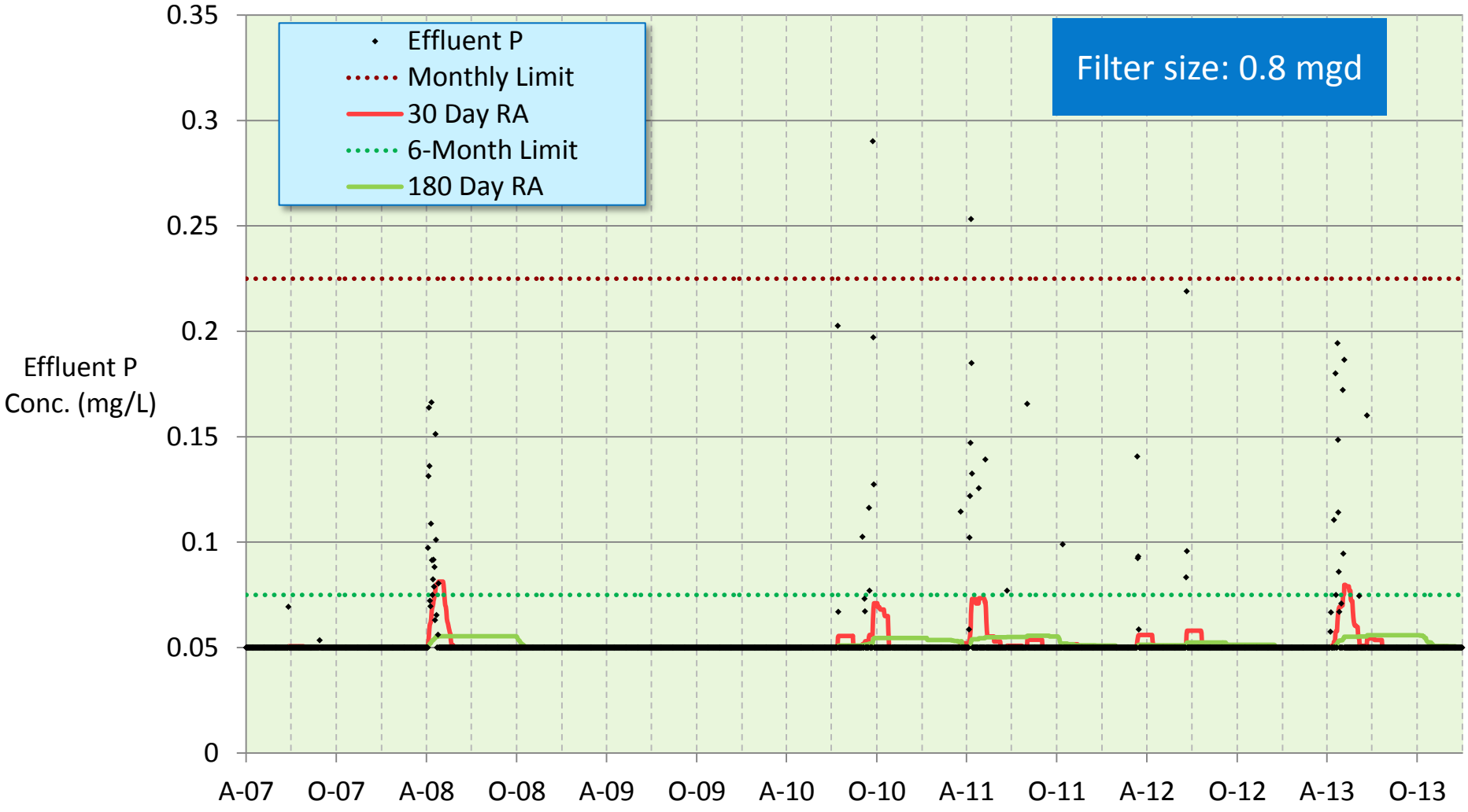
Low P Technology = 0.05 mg/L



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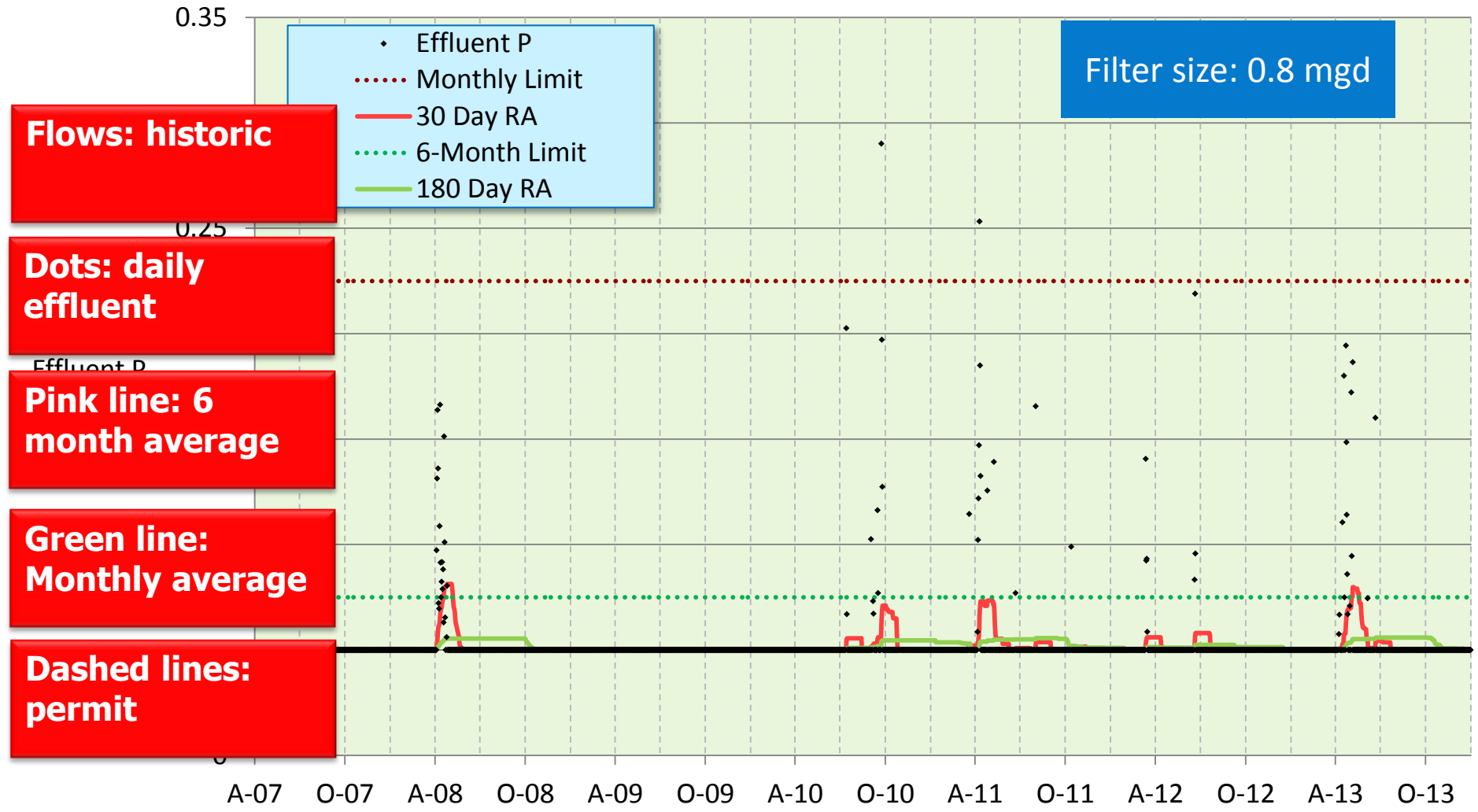

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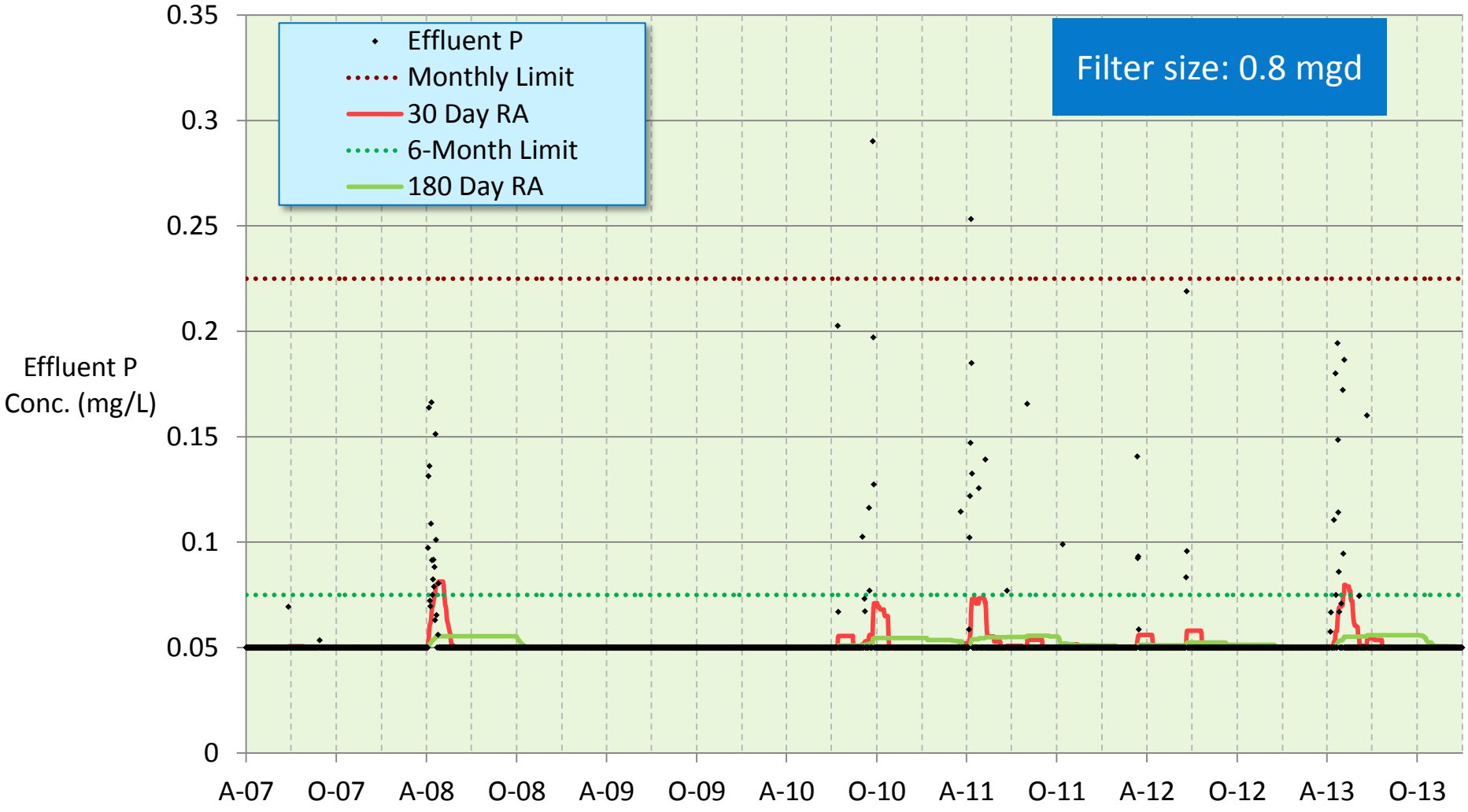
Low P Technology = 0.05 mg/L



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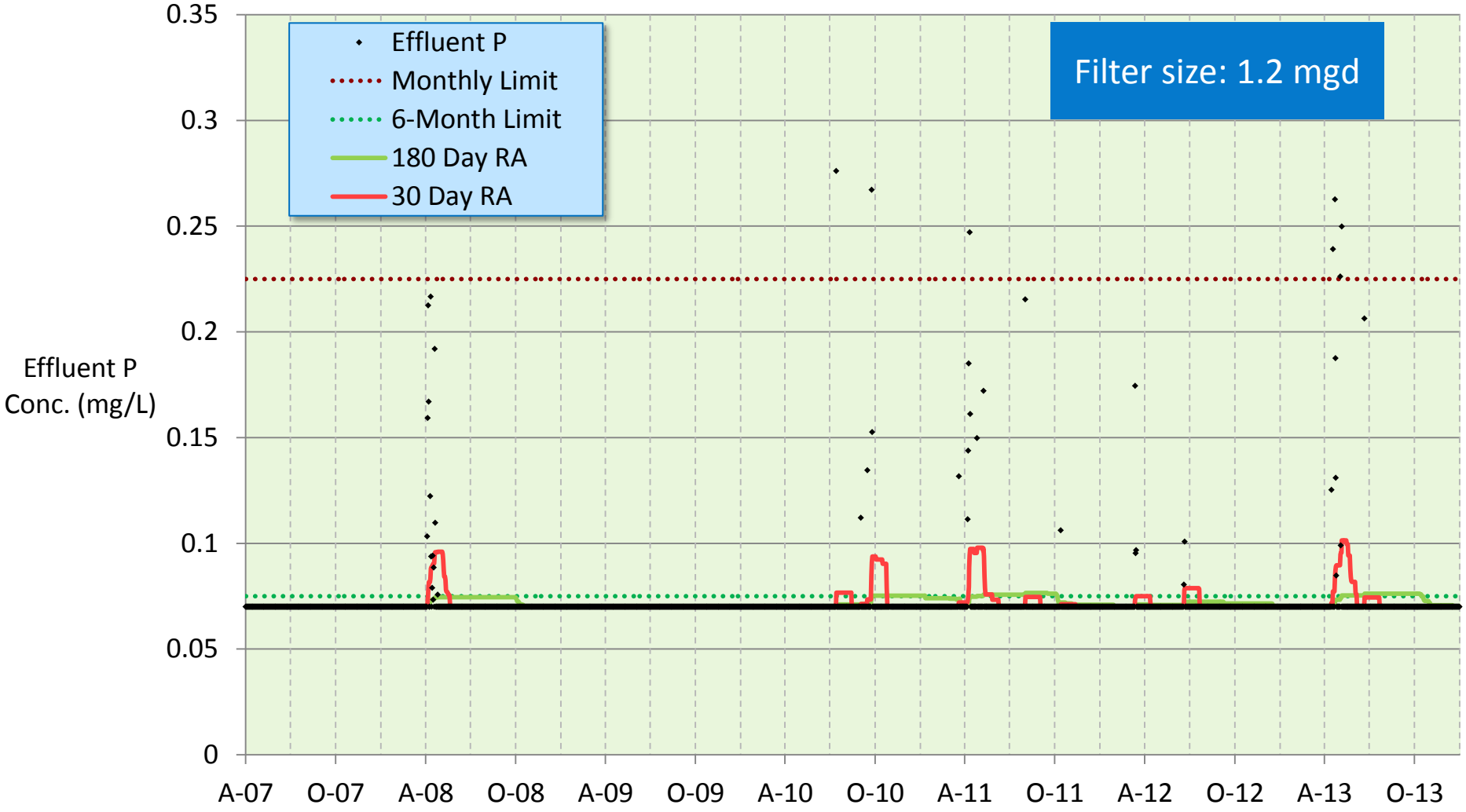
Low P Technology = 0.07 mg/L



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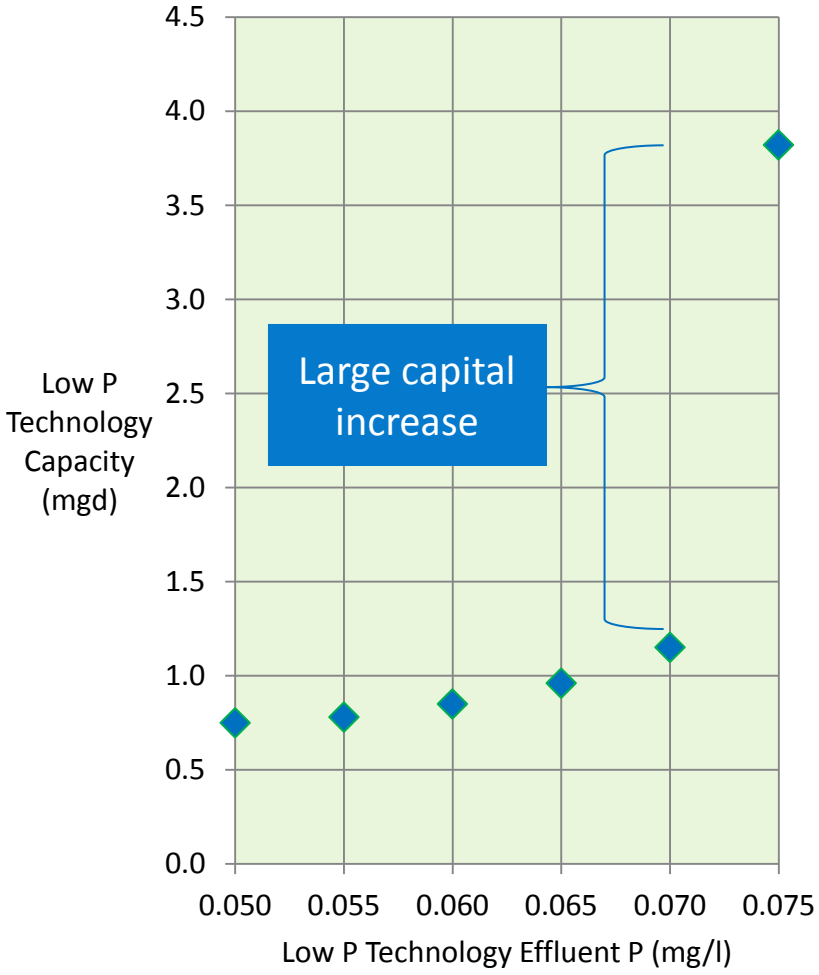
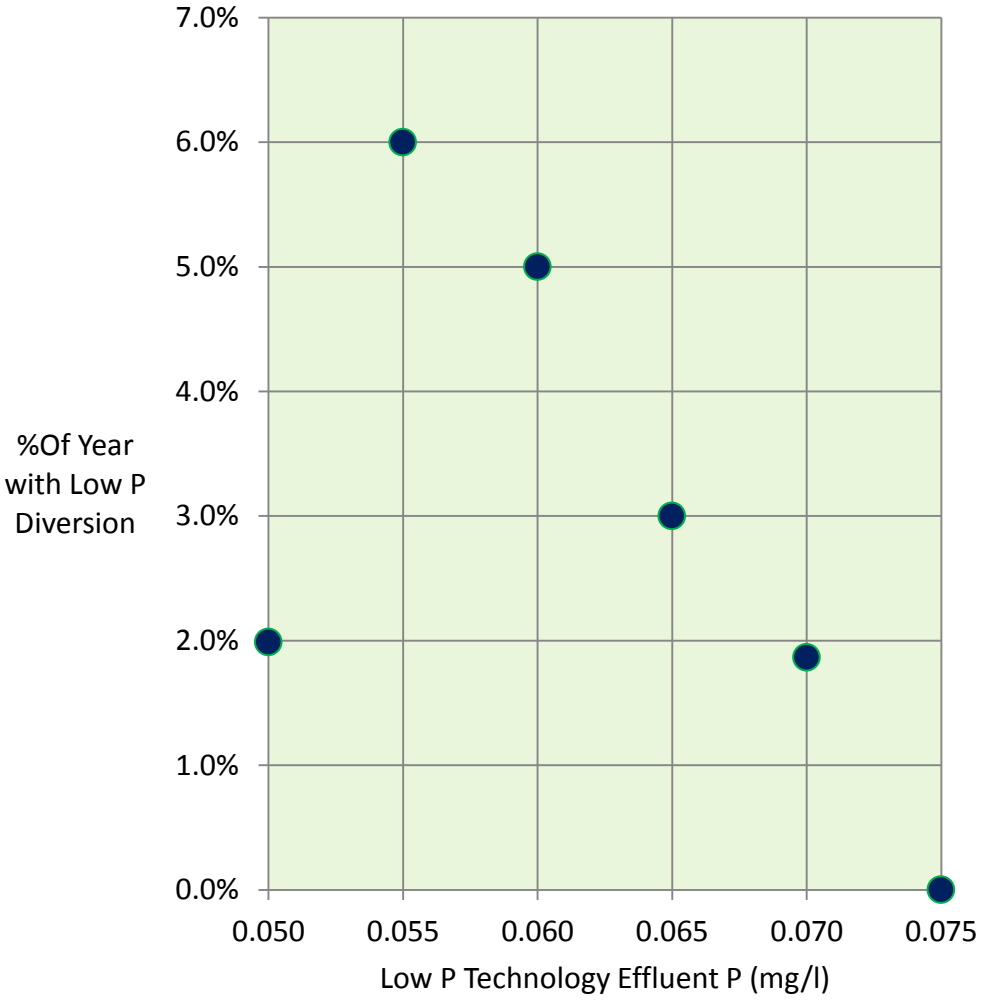
Low P Technology Impact





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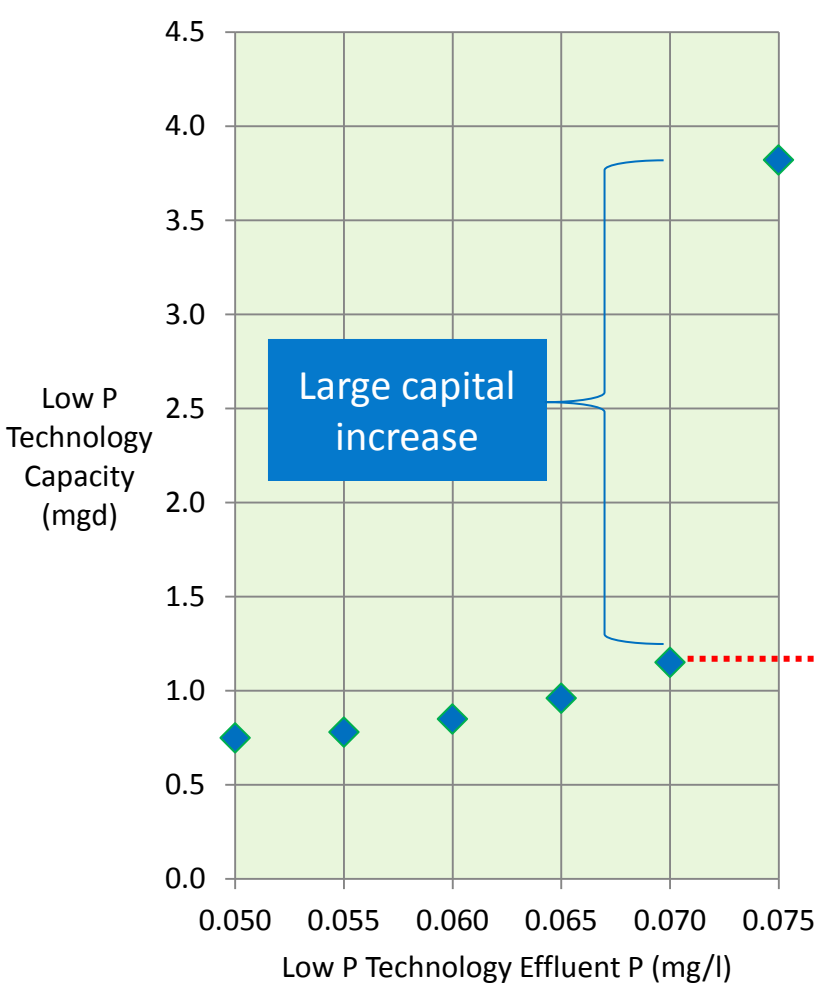
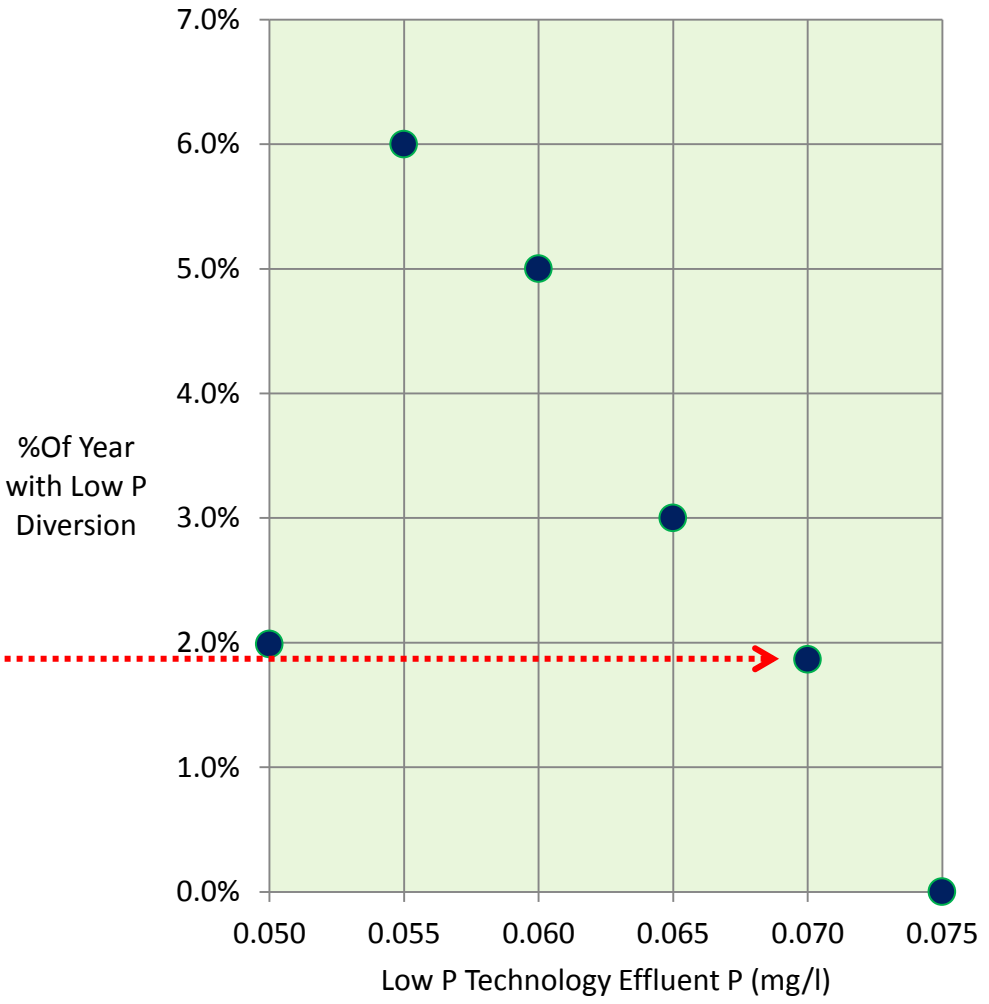
Low P Technology Impact





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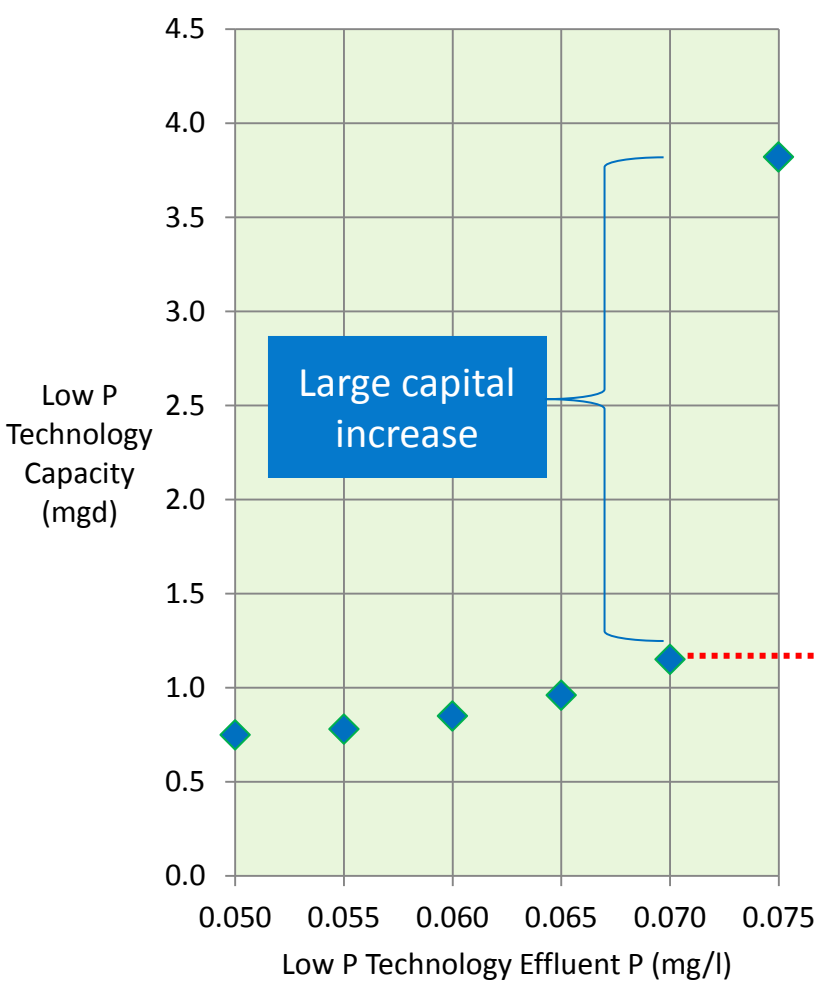
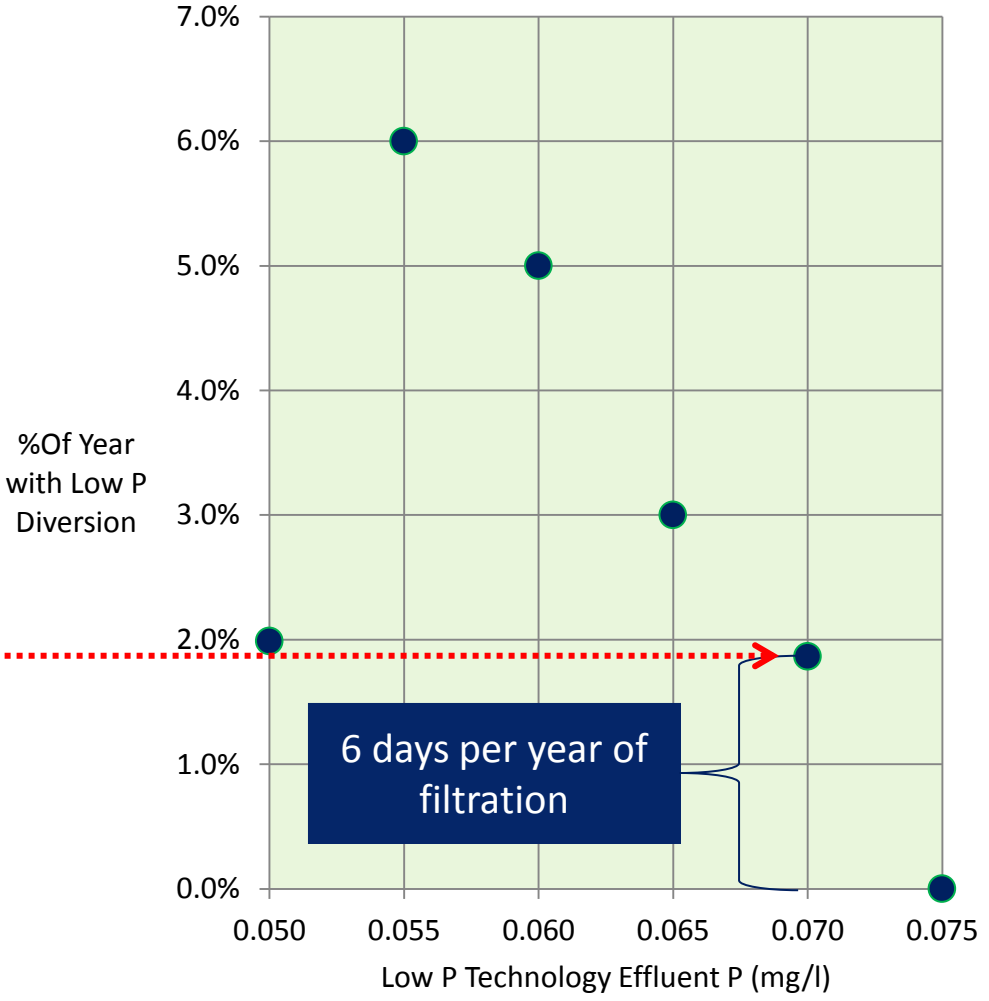
Low P Technology Impact





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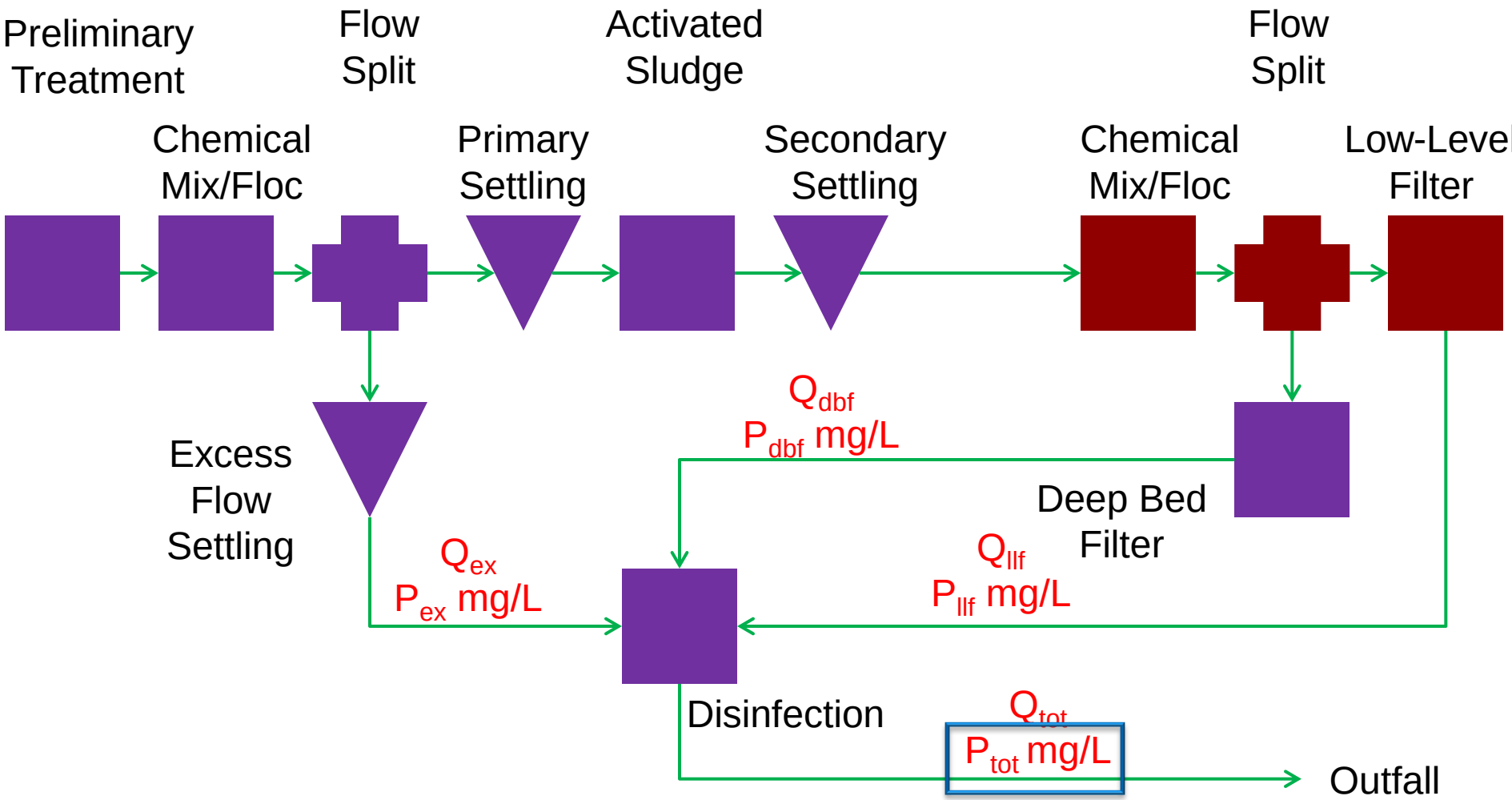
examples

Proposed Brookfield Flow Diagram



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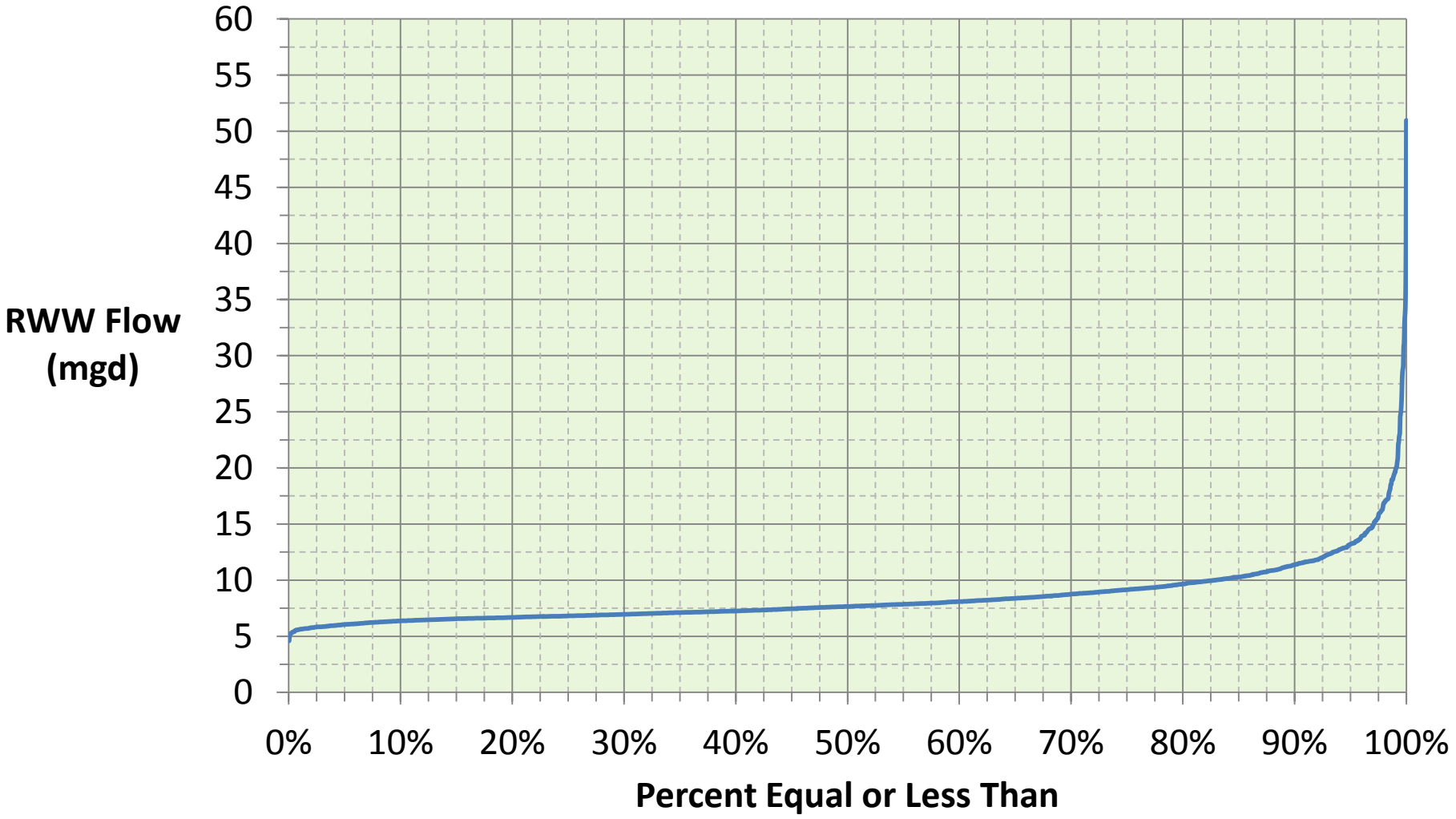
2005-2012 Brookfield Daily Flow Distribution



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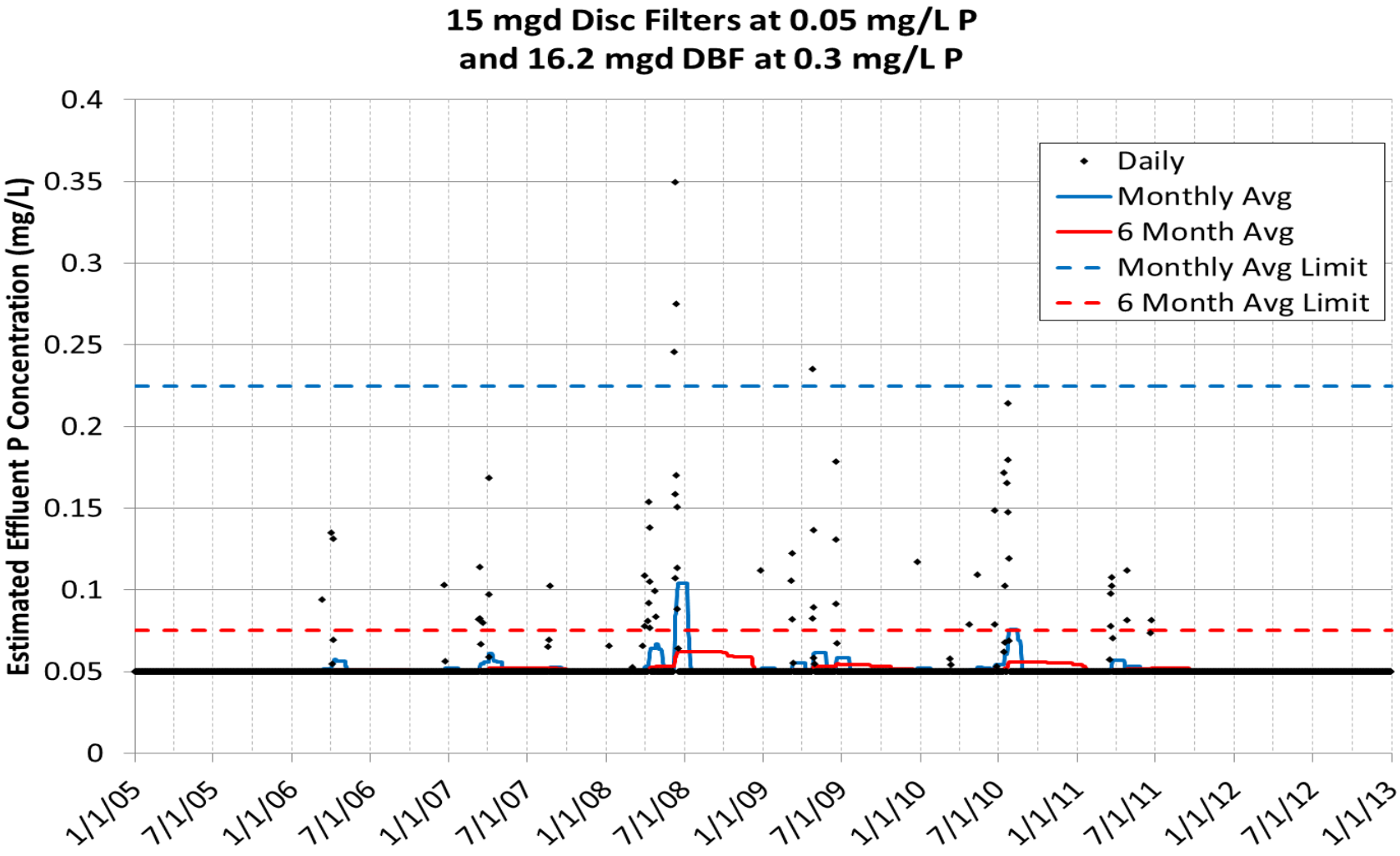
Mass Balance Approach

- $Q_{tot}\ P_{tot} = Q_{ex}\ P_{ex} + Q_{dbf}\ P_{dbf} + Q_{llf}\ P_{llf}$
- Assign Flow Rates
  - New Low-Level Filters treat flows up to 15 mgd (97.5% of daily flows)
  - Existing Deep Bed Filters treat flows from 15 – 31.2 mgd (16.2 mgd capacity)
  - Flows over 31.2 mgd are sent through excess flow clarifiers.
- For each day $Q_{tot}\ P_{tot} = Q_{ex}\ P_{ex} + Q_{dbf}\ P_{dbf} + Q_{llf}\ P_{llf}$

Daily Mass Balance



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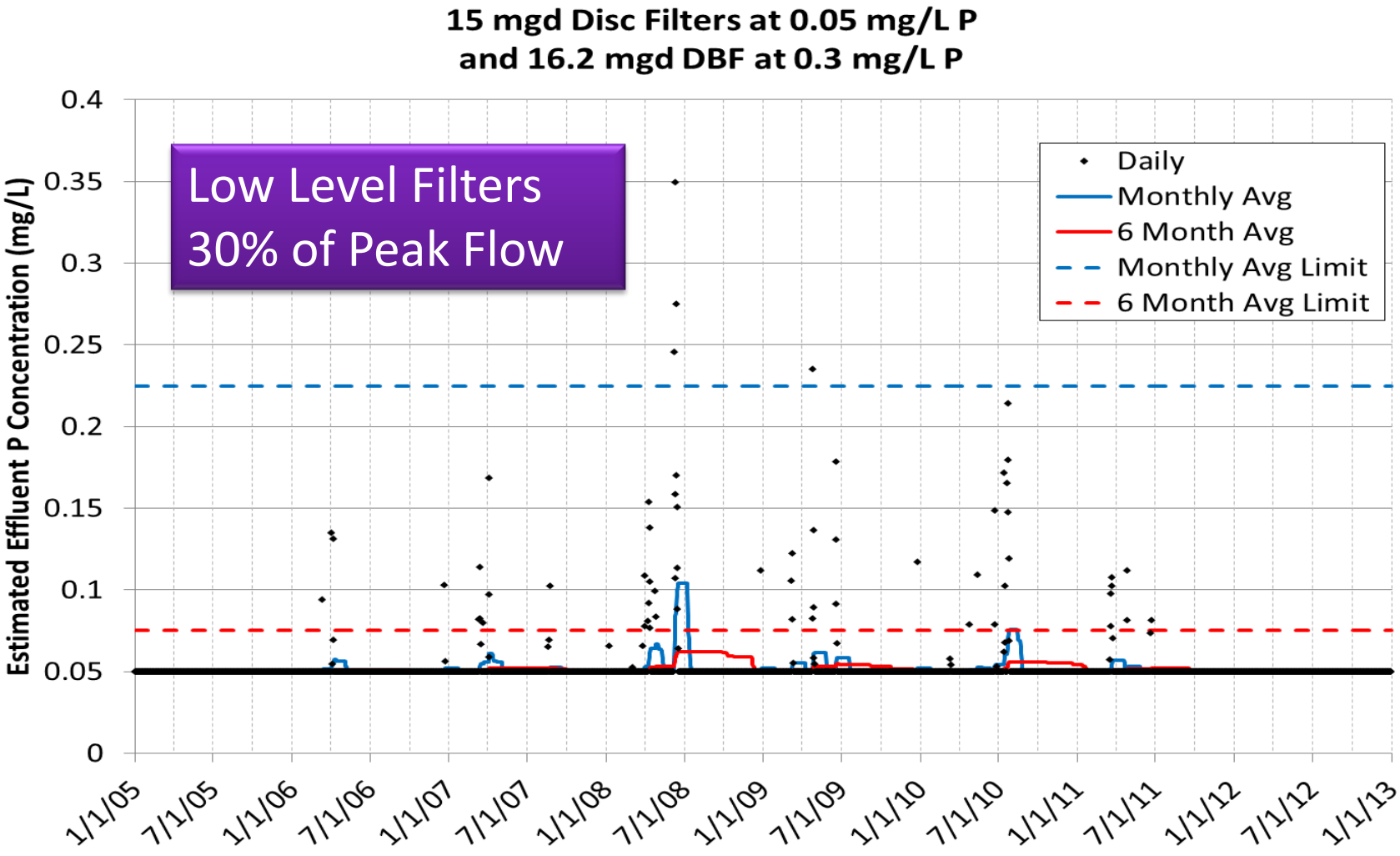
Daily Mass Balance



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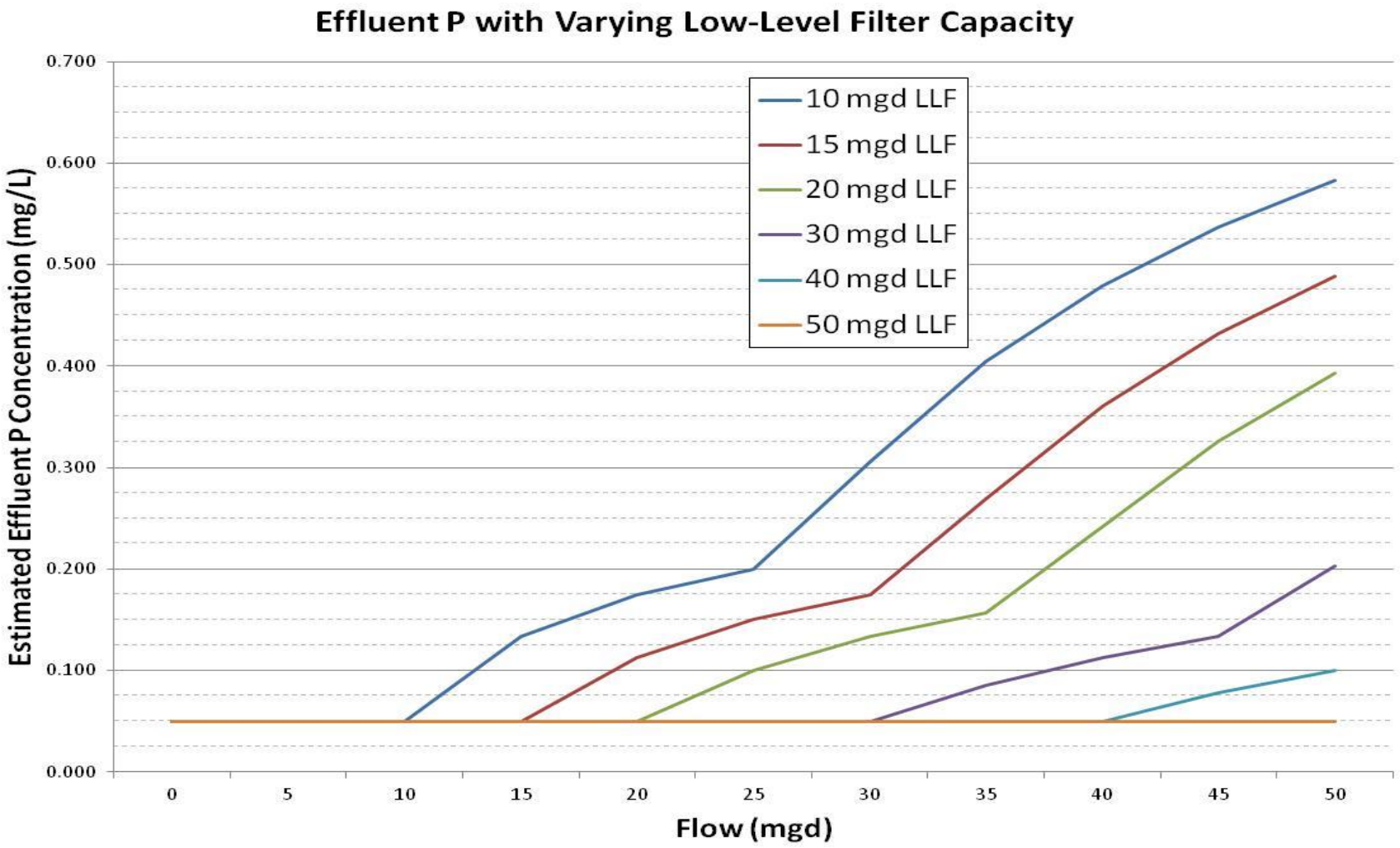
Sensitivity



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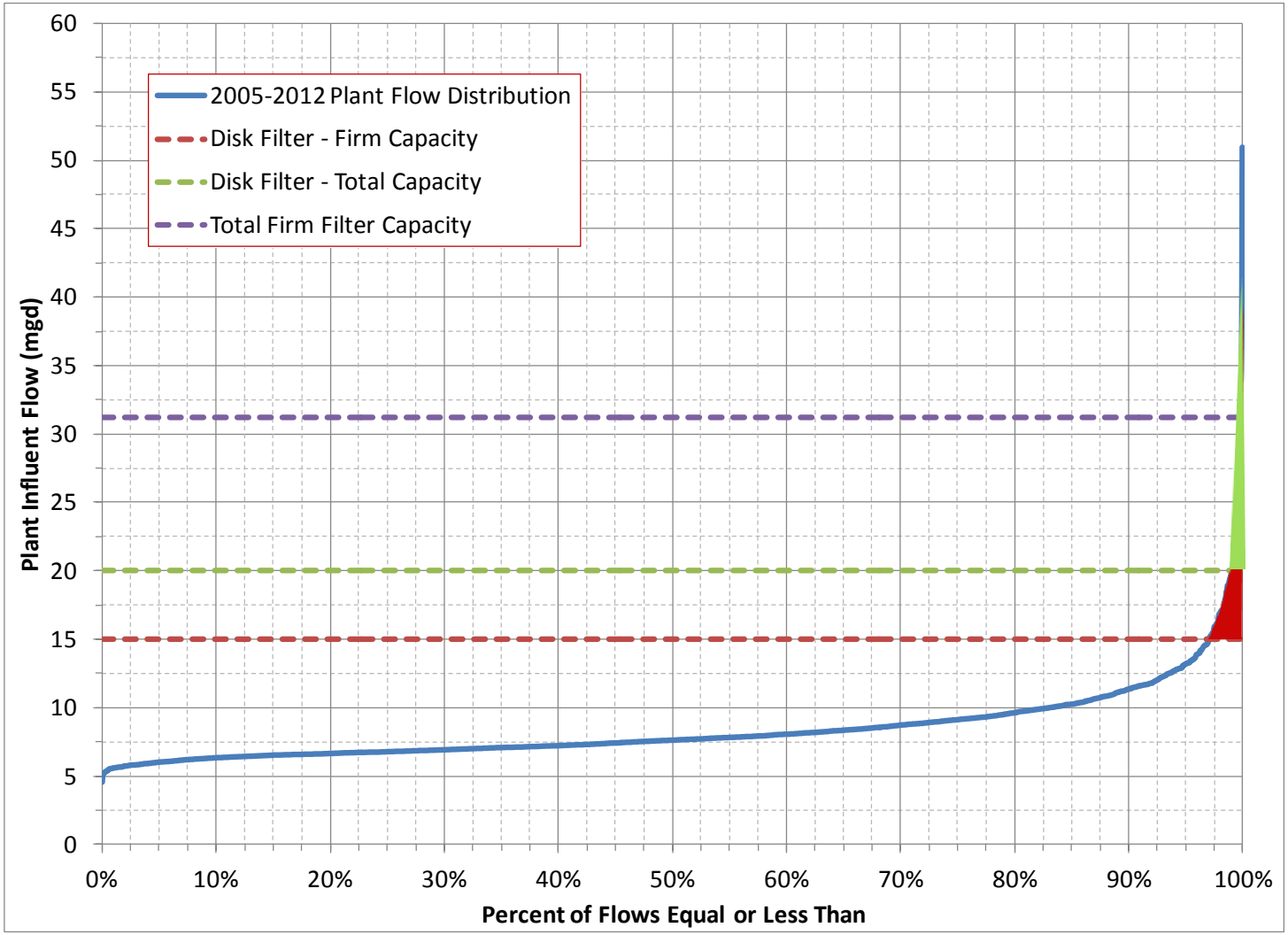
Filter Capacity



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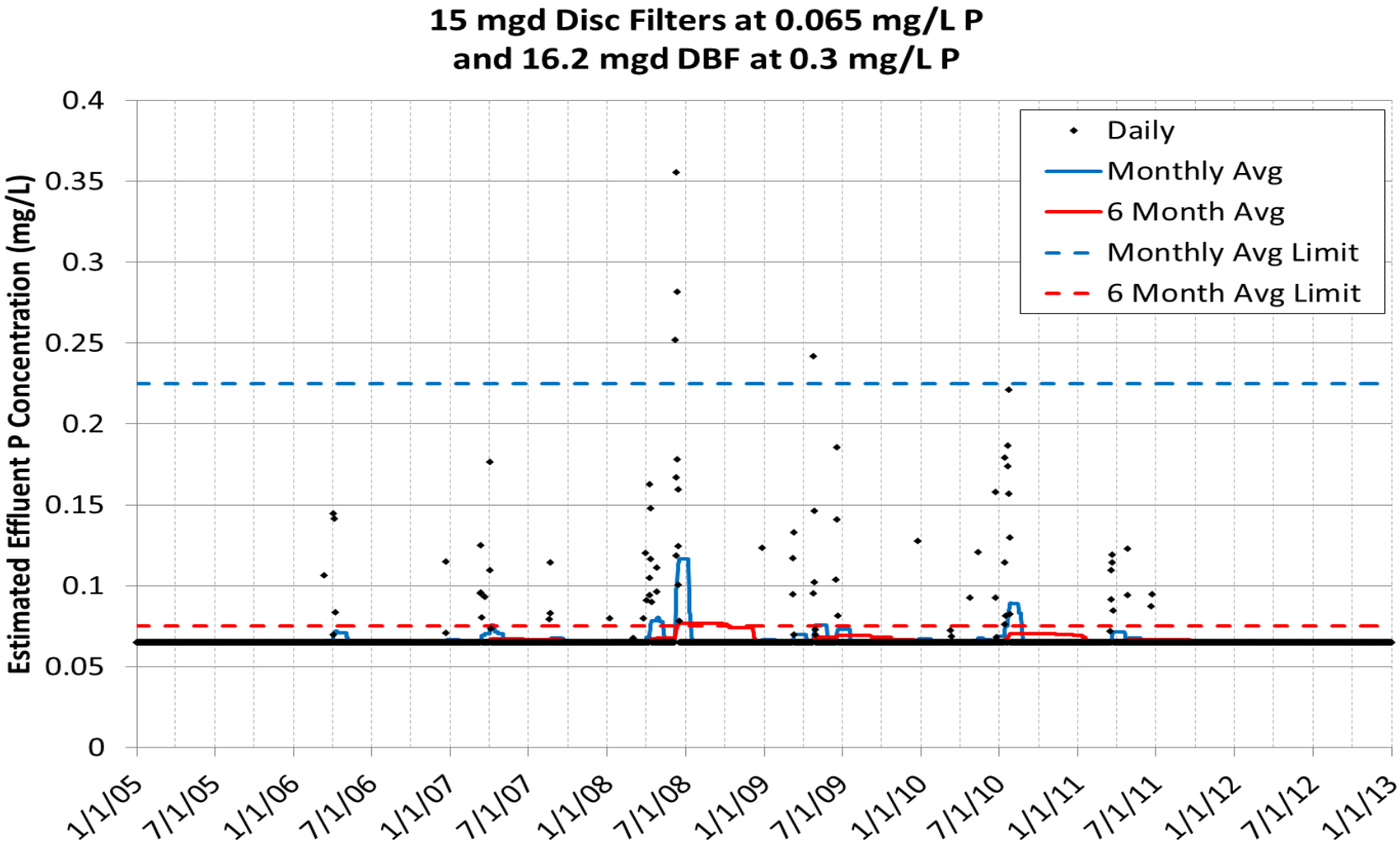
Daily Mass Balance



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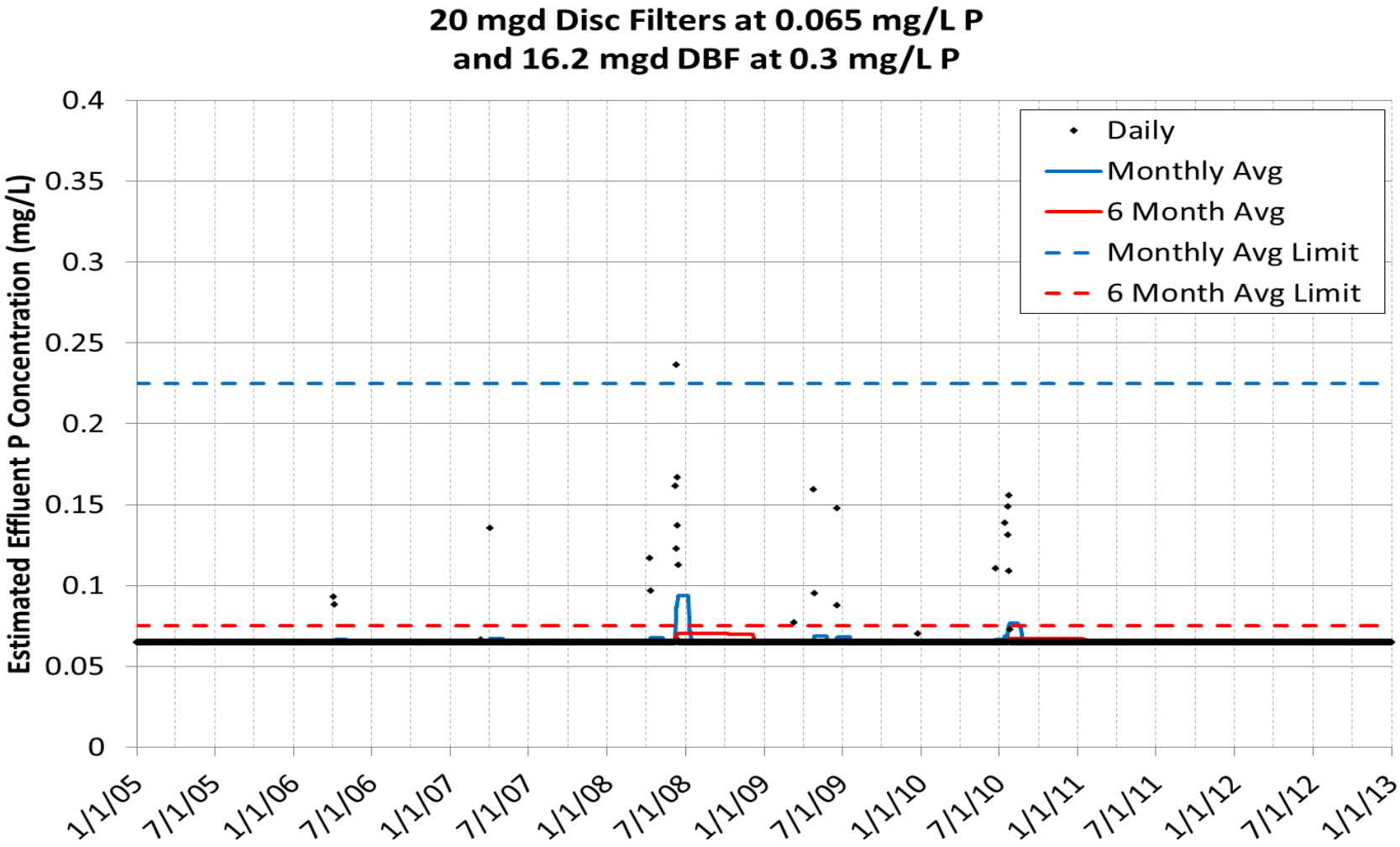

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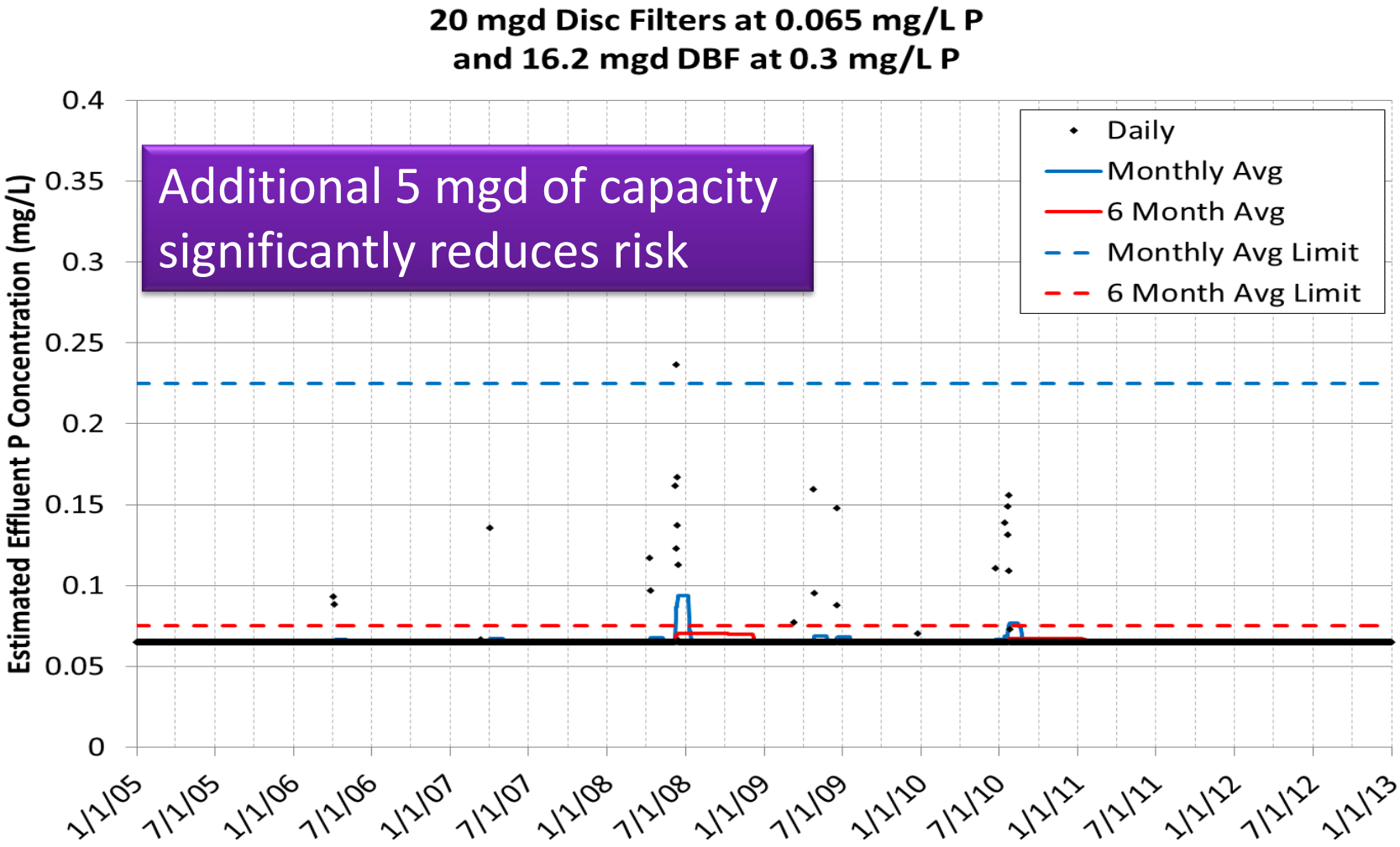
Daily Mass Balance



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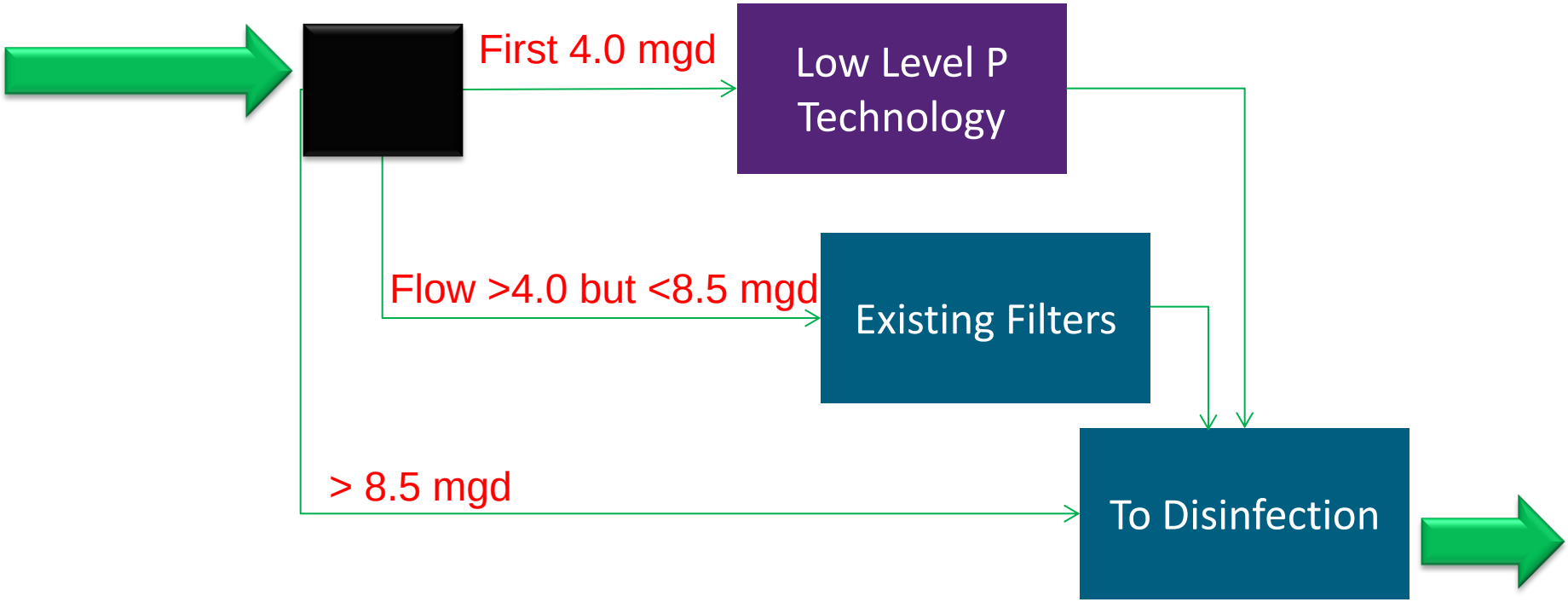
Whitewater



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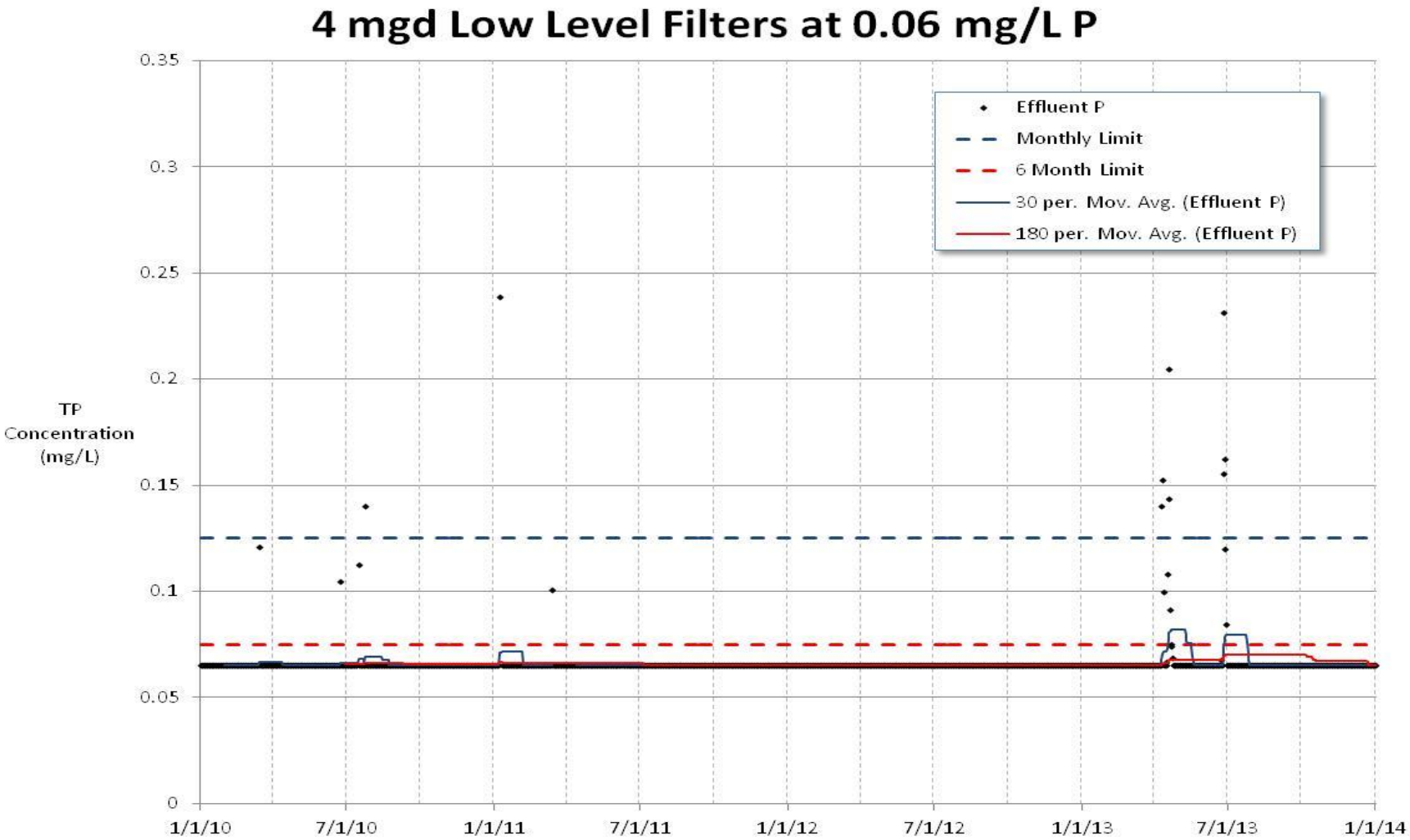
Whitewater Daily Mass Balance



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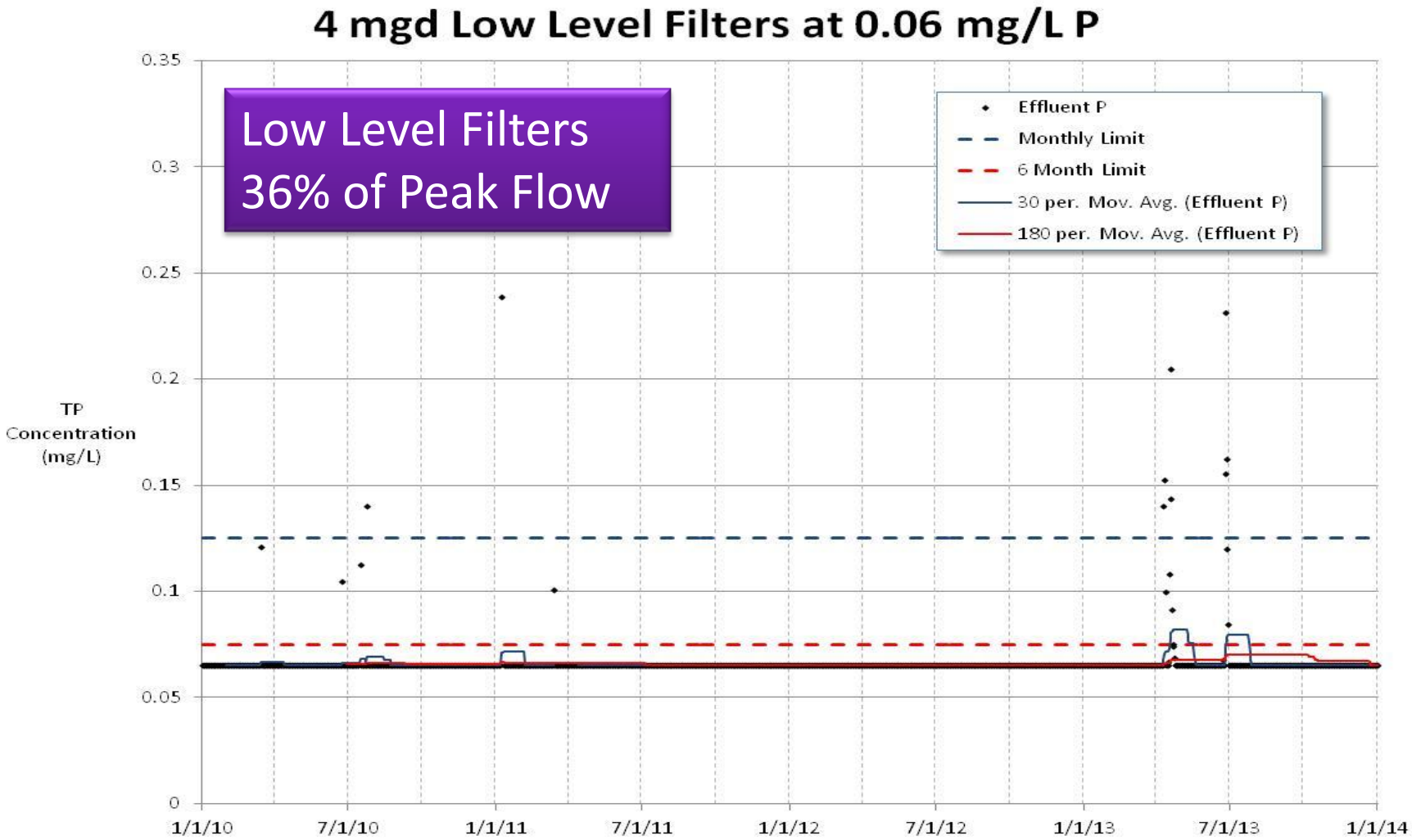
Whitewater Daily Mass Balance



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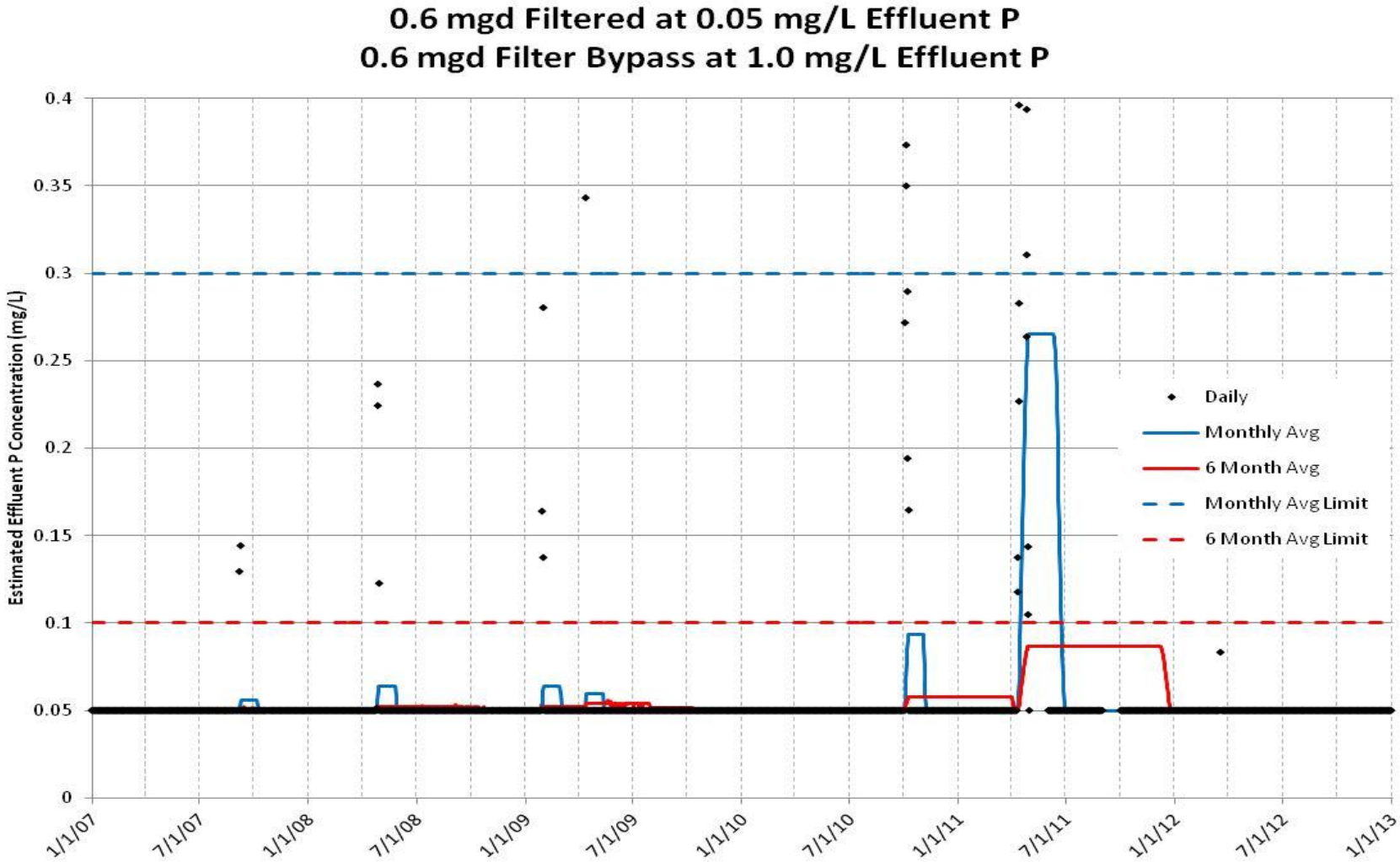
Cassville Daily Mass Balance
1.2 mgd Peak



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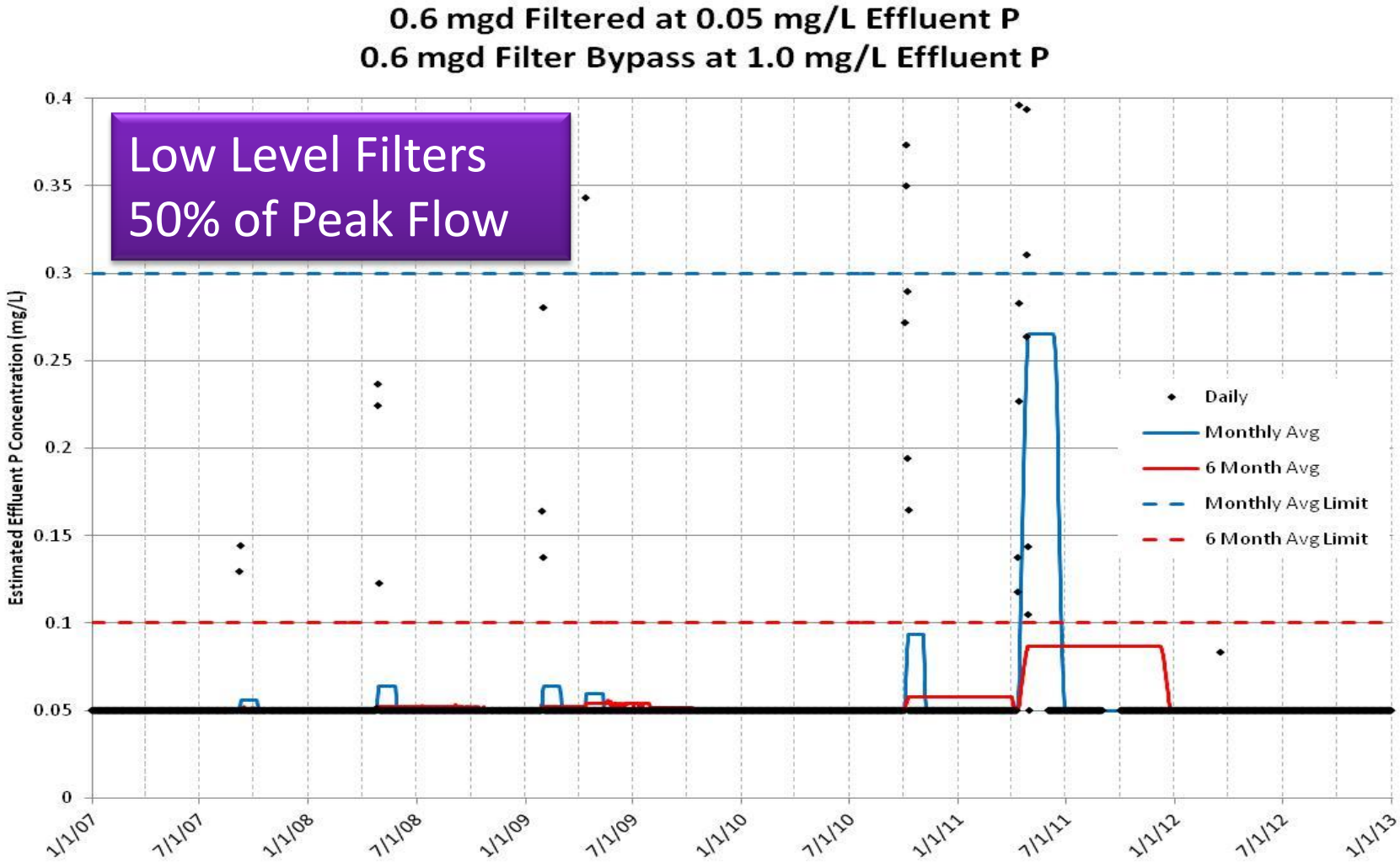
Cassville Daily Mass Balance
1.2 mgd Peak



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takeaways...

Takeaways…

- 0.075 mg/L can be achieved!
- Filtration size is critical
  - How much capacity do you really need?
  - How much is 6 extra days of filtration a year worth?
  - Risk versus capital
- Interplay of right sizing filters and adaptive management

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Questions?

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