A SYNERGISTIC APPROACH TO OVERALL PHOSPHORUS COMPLIANCE: THE VILLAGE OF SAUKVILLE PLAN

2019 Government Affairs Seminar
Dave Arnott, P.E. Ruekert & Mielke, Inc.
Topics

- Background
- Optimization Activities
- Alternatives Considered
- Selected Alternative
- Pilot Study
- Schedule for Implementation
Background

- Village Population: 4,419
- Activated Sludge
- Oxidation Ditch
- ADF: 1.0 MGD
- Discharge to Milwaukee River
- Milwaukee River Basin TMDL
VILLAGE OF SAUKVILLE WTF
FLOW DIAGRAM
Background

- **TP Permit Limits**
  - **WQBEL - 0.075 mg/L**
    - Removed in Future
  - **TMDL Mass Limits**
    - 0.16 mg/L
    - Most Stringent at DAF
Background

- MS4
  - TP Add’l Reduction Req’d
    - 291 Pounds/Yr.
  - TSS Add’l Reduction Req’d
    - 55,077 Pounds/Yr.
## Background

### Phosphorus Compliance Schedule

<table>
<thead>
<tr>
<th>Description</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>OER</td>
<td>6/30/2016</td>
</tr>
<tr>
<td>Compliance Alternatives</td>
<td>6/30/2017</td>
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<tr>
<td>Preliminary Compliance</td>
<td>6/30/2018</td>
</tr>
<tr>
<td>Final Compliance</td>
<td>6/30/2019</td>
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<tr>
<td>Final Plans and Specifications</td>
<td>6/30/2021</td>
</tr>
<tr>
<td>Achieve Compliance</td>
<td>6/30/2024</td>
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</tbody>
</table>
Optimization Activities

- OER Reduction and Optimization Activities
  - Speciation (snrp)
  - Dose/Response (Lab and Plant-Wide)
  - New Chemical Injection Location
  - New Chemical
Optimization Activities - sNRP

Figure 1 – Portions of Soluble and Reactive Phosphorus
Optimization Activities

Dose-Resp.

Figure 6 – Phosphorus Removal Efficiency (%) vs. Ferric Chloride Dose Level

\[ y = -0.0002x^2 + 0.016x + 0.0533 \]

\[ R^2 = 0.8189 \]
Optimization Activities

Total Phosphorus and Fe Cl₃ Dose

- Effluent Total P
- Dose

Effluent TP Conc. (mg/L) vs. Dose (gal/day) from 16-Aug to 18-Oct.

Dose increases significantly from 23-Aug to 30-Aug and again from 6-Sep to 13-Sep.
Alternatives Considered

- Water Quality Trading
  - Farmers
  - Streambank Stabilization (Village land)
- Adaptive Management
- MDV
- Traditional Variance
- WWTF Upgrade
Selected Alternative

- WWTF Upgrade
  - Control
  - Certainty
  - Long Term Solution
  - Economical
    - Second Pump Station Not Needed
    - Fit in Hydraulic Profile
- Extra Credits to MS4
  - TP 516 Lbs./Yr.
  - TSS 28,110 Lbs./Yr.
## Selected Alternative

<table>
<thead>
<tr>
<th>Design Flow (MGD)</th>
<th>1.6</th>
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<tr>
<td>Treatment Level (mg/L)</td>
<td>0.09</td>
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### Phosphorus

<table>
<thead>
<tr>
<th>Month</th>
<th>Allocation (pounds per day)</th>
<th>Allocation (pounds)</th>
<th>Actual (pounds)</th>
<th>Pounds Below Allocation</th>
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<tbody>
<tr>
<td>Jan</td>
<td>2.83</td>
<td>88</td>
<td>37</td>
<td>51</td>
</tr>
<tr>
<td>Feb</td>
<td>3.11</td>
<td>87</td>
<td>34</td>
<td>53</td>
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<tr>
<td>Mar</td>
<td>2.40</td>
<td>74</td>
<td>37</td>
<td>37</td>
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<tr>
<td>Apr</td>
<td>2.76</td>
<td>83</td>
<td>36</td>
<td>47</td>
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<tr>
<td>May</td>
<td>2.35</td>
<td>73</td>
<td>37</td>
<td>36</td>
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<tr>
<td>Jun</td>
<td>3.04</td>
<td>91</td>
<td>36</td>
<td>55</td>
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<tr>
<td>Jul</td>
<td>2.55</td>
<td>79</td>
<td>37</td>
<td>42</td>
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<tr>
<td>Aug</td>
<td>2.50</td>
<td>78</td>
<td>37</td>
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<tr>
<td>Sep</td>
<td>2.53</td>
<td>76</td>
<td>36</td>
<td>40</td>
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<tr>
<td>Oct</td>
<td>2.05</td>
<td>64</td>
<td>37</td>
<td>26</td>
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<tr>
<td>Nov</td>
<td>2.82</td>
<td>85</td>
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<td>49</td>
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<tr>
<td>Dec</td>
<td>2.52</td>
<td>78</td>
<td>37</td>
<td>41</td>
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**Total** | **516**
Pilot Study
Pilot Study
Pilot Study
Pilot Study

![Graph showing effluent TP (mg/L) over time for different dates from 6/27/2018 to 7/17/2018. The graph compares AASI Eff, Cardinal Eff, and Average Eff against date sample collected and polymer dose in mg/L.](image-url)
<table>
<thead>
<tr>
<th>Schedule</th>
<th>Dates</th>
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<tbody>
<tr>
<td>USDA Grant Coordination</td>
<td>Summer 2019</td>
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<tr>
<td>Start Design</td>
<td>May 2020</td>
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<tr>
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<td>June 2021</td>
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<td>Bidding</td>
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<tr>
<td>Start Construction</td>
<td>September 2021</td>
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<tr>
<td>Complete Construction</td>
<td>September 2022</td>
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</tbody>
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Questions

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