Case Study:
Planning for the Future with Consolidated Wastewater Treatment in Montgomery Township, New Jersey

Erin Dovel, EIT, Kleinfelder

Co-author: Brian Friedlich, PE, Kleinfelder

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Overview

- State of Wastewater Infrastructure
- Overview of Montgomery Twp & WWTPs
- 2012 Montgomery Twp Master Planning Study
  - Consolidation Analysis
  - Current & Future Flows Buildout Analysis
  - Cost Effectiveness of Alternatives
- Consolidation Design Components
- Wrap up
State of Wastewater Infrastructure

**National Ranking***:

- ~750,000 miles of sewer pipe
- ~14,780 wastewater treatment facilities
- 98% of public facilities are municipally owned
- Capital investment estimated at ~300 billion over next 20 years

**New Jersey Ranking**:

- ~90% of NJ is served by 200 public wastewater systems
- Most plants in NJ are relatively small (<2.5 MGD), and will not meet growing needs
- Capital investment estimated at ~32.5 billion over next 20 years

*2013 ASCE Infrastructure Report Card
**2016 ASCE Infrastructure Report Card
State of Wastewater Infrastructure… Pennsylvania!

**Pennsylvania Ranking***:

D

- ~10,000 permitted wastewater systems in PA (municipal + industrial)
- Approx. 1,569 CSOs in PA
- Capital investment estimated at ~28 billion over next 20 years

*2014 ASCE Infrastructure Report Card
Montgomery Twp (Somerset County, NJ)

Sources: NJDOT, Somerset County Planning Board
Existing
Montgomery Township
Sewer Service Areas

Reference: Somerset County Wastewater Management Plan
# Montgomery Township

<table>
<thead>
<tr>
<th>WWTP Name</th>
<th>Year Constructed</th>
<th>Year(s) Upgraded</th>
<th>Design Capacity (gpd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pike Brook</td>
<td>1990</td>
<td>2012</td>
<td>700,000</td>
</tr>
<tr>
<td>Stage II</td>
<td>1970</td>
<td>1985 &amp; 2002</td>
<td>680,000</td>
</tr>
<tr>
<td>Skillman Village</td>
<td>1938</td>
<td>1980s &amp; 2012</td>
<td>500,000</td>
</tr>
<tr>
<td>Cherry Valley</td>
<td>1993</td>
<td>-</td>
<td>286,000</td>
</tr>
<tr>
<td>Riverside Farms</td>
<td>1982</td>
<td>-</td>
<td>145,000</td>
</tr>
<tr>
<td>Oxbridge</td>
<td>1994</td>
<td>-</td>
<td>80,000</td>
</tr>
<tr>
<td>High School</td>
<td>1968</td>
<td>-</td>
<td>35,000</td>
</tr>
<tr>
<td>Burnt Hill School</td>
<td>1960</td>
<td>-</td>
<td>15,300</td>
</tr>
</tbody>
</table>

- School Plants closed in 2012, consolidated to Skillman Village
- Oxbridge and Riverside approaching end of service life; will require near-term capital improvements.
Why Consolidate Wastewater Treatment?

- Ensure water quality protection and satisfy effluent limitations through treatment and upgraded facilities
- Utilize new advanced treatment plants (Pike Brook and Skillman Village) to improve receiving streams
- Avoid cost of rebuilding aging treatment plants
- Operation logistics of multiple small treatment plants versus a few larger ones
- Reduce O&M costs through economies of scale
Evaluated 9 consolidation alternatives:

- Oxbridge flow to Pike Brook
- Oxbridge flow to Skillman Village
- Oxbridge flow (east of 206) to Pike Brook & Oxbridge flow (west of 206) to Skillman Village
- Riverside flow to Pike Brook
- Riverside & Oxbridge flow to Pike Brook
- Riverside flow to Somerset Raritan Valley Sewerage Authority
- Cherry Valley flow to Skillman Village
- Cherry Valley & Oxbridge flow to Skillman Village
- Stage II flow to Stony Brook Regional Sewerage Authority
Consolidation Force Main Routes Considered
Current and Future Wastewater Flow Analysis

- Current flows utilized DMR data January 2008 – August 2011
- Build-out analyses performed in accordance with NJDEP’s Projected Flow Criteria

Total Future Build-out Calculations:
- Max. Daily = 1.5(Future Avg. Annual) + Current Max. Daily
- Peak Hourly = 2.5(Future Avg. Annual) + Current Peak Hourly

Note: NJDEP Projected Flow Criteria include allowances for I&I and are more representative of the maximum monthly flows
Build Out Analysis – Riverside WWTP Example
Total Build-Out Flows

Gallons Per Day (gpd)

- Average
- Max Monthly
- Max Daily
- Peak Hourly

Riverside | Oxbridge | Cherry Valley | Pike Brook | Skillman Village | Stage II
--- | --- | --- | --- | --- | ---
0 | 1,000,000 | 2,000,000 | 2,500,000 | 3,000,000 |
Build-Out Flows – Consolidation To Pike Brook

Gallons Per Day (gpd)

- Average
- Max Monthly
- Max Daily
- Peak Hourly

Oxbridge to Pike Brook
Oxbridge to Pike Brook (w/o lots west of 206)
Riverside to Pike Brook
Oxbridge + Riverside to Pike Brook
Oxbridge + Riverside to Pike Brook (w/o lots west of 206)
Build-Out Flows – Consolidation To Skillman

- Skillman Village (with Oxbridge lots west of 206)
- Oxbridge to Skillman Village
- Cherry Valley to Skillman Village
- Oxbridge + Cherry Valley to Skillman Village

Gallons Per Day (gpd)

- Average
- Max Monthly
- Max Daily
- Peak Hourly
Cost Effectiveness Evaluation Metrics

- Capital cost estimates for improvements required for plant shut down and receiving plant improvements
- Capital cost estimates for receiving plant improvements (if any) to have sufficient capacity
- Capital cost estimates for the future improvements that would be avoided via shut down of aging plants
- Development of net reduction in annual O&M costs
- Comparison of the sum of capital costs for conveyance plus treatment vs sum of capital costs avoided plus net savings in O&M
Cost Analysis Summary of Consolidation

- Oxbridge flow to Pike Brook
- Oxbridge flow to Skillman Village
- Oxbridge flow (east of 206) to Pike Brook & Oxbridge flow (west of 206) to Skillman Village
- Riverside flow to Pike Brook
- Riverside & Oxbridge flow to Pike Brook
- Riverside flow to Somerset Raritan Valley Sewerage Authority
- Cherry Valley flow to Skillman Village
- Cherry Valley & Oxbridge flow to Skillman Village
- Stage II flow to Stony Brook Regional Sewerage Authority

Green = cost effective (recommended)
Red = not cost effective (not recommended)
## Net Savings from Cost Effective Alternatives

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Capital Costs for Consolidation Conveyance &amp; Treatment</th>
<th>Savings from Avoided Future Capital Improvements</th>
<th>O&amp;M Savings</th>
<th>Net Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxbridge to Pike Brook</td>
<td>2,100,000</td>
<td>3,400,000</td>
<td>1,800,000</td>
<td>3,100,000</td>
</tr>
<tr>
<td>Oxbridge (east of 206) to Pike Brook &amp; Oxbridge (west of 206) to Skillman Village</td>
<td>2,600,000</td>
<td>3,400,000</td>
<td>1,800,000</td>
<td>2,600,000</td>
</tr>
<tr>
<td>Riverside &amp; Oxbridge to Pike Brook</td>
<td>8,100,000</td>
<td>7,200,000</td>
<td>3,000,000</td>
<td>2,100,000</td>
</tr>
<tr>
<td>Riverside to Pike Brook</td>
<td>3,700,000</td>
<td>3,800,000</td>
<td>1,200,000</td>
<td>1,300,000</td>
</tr>
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</table>
**Recommended Alternative**

<table>
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<tr>
<th>Scenario</th>
<th>Capital Costs for Consolidation Conveyance &amp; Treatment</th>
<th>Savings from Avoided Future Capital Improvements</th>
<th>O&amp;M Savings or Costs (+/-)</th>
<th>Net Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riverside &amp; Oxbridge (East of 206) to Pike Brook; Oxbridge (West of 206) to Skillman Village</td>
<td>8,100,000</td>
<td>7,200,000</td>
<td>3,000,000</td>
<td>2,100,000</td>
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- Consolidation will avoid the need to upgrade Riverside and Oxbridge in the near future
- No immediate plan to remove lots West of 206 from septic, however spatially located closer to Skillman Village if connected in future
- Exclusion of lots West of 206 reduces the extent of capacity expansion required at Pike Brook in the future
- Montgomery Twp is planning sewer rehabilitation to maximize available capacity at the receiving WWTPs
Existing Montgomery Township Sewer Service Areas

Source: Somerset County WMP
Proposed
Montgomery Township
Sewer Service Areas
Environmental Improvements

- Anti-degradation analysis
  - No measurable change in downstream water quality as a result of expanded flows
  - Does not give “credit” for plants taken off line

- Overall pollutant load decrease
  - Pike Brook / Skillman Village versus Oxbridge / Riverside
  - TP decreases from 1.96 mg/L to 0.13 mg/L
  - Nitrate decreases from 33.6 mg/L to 6.8 mg/L
  - Flow-weighted concentrations used for comparison

- Conclusions
  - No measurable impact from expanded plants
  - Significant decrease in pollutant load
  - WIN-WIN!!
2016 Consolidation Design Components

- New Pump Station at Riverside WWTP
- Force Main from Oxbridge to Pike Brook (4,000 LF)
- Force Main from Riverside to Pike Brook (14,000 LF)
- New Pump Station at Oxbridge WWTP
- Demolition of Riverside and Oxbridge WWTPs
Oxbridge Force Main Route

Tie into Belvedere Homes Sewer Manhole

Proposed Force Main Route

Pike Brook WWTP

Oxbridge WWTP

Proposed Force Main Route

Oxbridge WWTP Property

Pike Brook WWTP Property

WWTP
Oxbridge Site Conditions

Equalization/ Clarifier Tank

Control/ Operations Bldg

Post Aeration Tank

Source: Bing Maps
Oxbridge Site Conditions

Source: Bing Maps

Generator & Enclosure

Splitter Box

Rear of Operations Bldg
Oxbridge Site Conditions

Effluent Pump Station

Source: Bing Maps

Wet Well & Dry Well
Riverside Force Main Route

- Tie Into Existing Sewer
- Proposed Force Main Route
- Pike Brook WWTP Property
- Riverside WWTP Property
- WWTP

Pike Brook WWTP

Riverside Farms WWTP
Riverside Site Conditions

Aeration Tanks

Source: Bing Maps

Chemical Storage, Sand Filters, & Office Bldg
Riverside Site Conditions

- Rapid Sand Filter Tank
- Chemical Reactor Tank
- Wet Well

Source: Bing Maps
Riverside Site Conditions

Source: Bing Maps

Grassed Access Path

Wet Well

Aerobic Sludge Digester
Riverside Site Plan
Next Steps

- August 2016: 90% Design milestone
- August 2016: Permit Submission
  - Freshwater Wetlands Presence/Absence Verification
  - Flood Hazard Area Individual Permit
  - Delaware & Raritan Canal Commission Application
- January 2017: Response to Permit Comments
  - Riparian vegetation disturbance mitigation (riverside)
- Spring 2017: 100% Design & Go out to Bid
Questions?

Contact Information:
Edovel@Kleinfelder.com
609-454-4551

Bfriedlich@Kleinfelder.com
609-454-4562