Decentralized WW Management: Issues for Small-Scale WWTPs

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MWEA Local Sections Committee
Frankenmuth, MI
Topics

• What is “Decentralized” Wastewater Treatment?
• What are small-scale facilities?
• How are they regulated?
• Treatment technologies
• Issues of concern
• Decentralized infrastructure
What is “Decentralized” Wastewater Treatment?

“A method of wastewater treatment that collects wastewater from the source, conveys it to a treatment system, and disperses the water near the point of origin.”

Dividing our wastewater infrastructure into smaller, more manageable, pieces.
Decentralized Wastewater Facilities

- Rural treatment facilities
- Satellite treatment facilities
- Cluster treatment facilities
- Onsite treatment facilities
- Small-scale WWTPs
Small-Scale WWTP’s

• Small Flows (1,000 to 50,000 GPD)
• Privately owned WWTF
  – Mobile home parks, campgrounds, recreational facilities, apartments, schools
• Privately-Owned Public Facilities
  – Site condominiums, shopping centers, HOAs
• Both groundwater or surface water discharges
Collection options

Gravity sewers
Low-pressure sewer using septic tanks & effluent pumps (STEP)
Low-pressure sewer using grinder pumps
Gravity collection of septic tank effluent (STEG)
Vacuum collection sewers
### Treatment options

<table>
<thead>
<tr>
<th>Fixed film processes</th>
<th>Peat filters</th>
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</thead>
<tbody>
<tr>
<td>Suspended growth processes</td>
<td>High-rate, mixed media filters</td>
</tr>
<tr>
<td>SBR’s, MBR’s, RBC’s</td>
<td>U.V. disinfection</td>
</tr>
<tr>
<td>Aerated lagoons</td>
<td>Chlorination</td>
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<td>Facultative lagoons</td>
<td>Ozonation</td>
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<tr>
<td>Oxidation ditches</td>
<td>Nitrification designs</td>
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<tr>
<td>Storage ponds</td>
<td>De-nitrification designs</td>
</tr>
<tr>
<td>Intermittent sand filters</td>
<td>Phosphorus removal by chemical precipitation</td>
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<tr>
<td>Recirculating sand filters</td>
<td>Post aeration</td>
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<tr>
<td>Geo-textile filters</td>
<td>Bacteria “generators” &amp; enzymes</td>
</tr>
<tr>
<td>Foam cube filters</td>
<td></td>
</tr>
</tbody>
</table>
## Dispersal options

- Gravity trenches & beds
- Synthetic “gravel” technologies
- Gravel-less technologies
- Drip irrigation
- Spray irrigation
- Overland sheet flow
- Ridge and furrow distribution
- Surface water discharge
- Seepage ponds
- Pressure or siphon dosed trenches & beds
- Rapid infiltration basins
- Wetland dispersal
- Evapotranspiration systems
- Recycle/reuse systems
Regulations

• Permitting
  – Construction Permits (Part 41 for public systems)
  – MI Criteria for Subsurface Disposal
  – Part 22 Groundwater Discharge Rules
  – NPDES Surface Water Discharge Permits

• Facility Classifications
  – Some reclassified as Municipal Facilities
  – Many classified under Industrial / Commercial
Regulations

• Part 22 Rules
  – Governs soil-based discharges
  – Largely based upon flow categories

• MI Criteria for Subsurface Disposal
  – Currently re-drafted by committee
  – Criteria only for “subsurface” discharges
  – New guidelines will place more emphasis on management
Issues – Risk

- Largely based upon the selected collection and treatment options
- Risk of failure offset by homeowner’s perception on impact to lifestyle
- Smaller systems = smaller problems
- Smaller problems = easier/cheaper fixes
Issues - Financial

- Emphasis on up-front costs, while long-term O&M costs are overlooked
- Most facilities cannot afford a full-time operator
- Build-out rates may create lack of funding
- Discharge permits do not account for “phase up” of system risk
- Accounting responsibility changes hands
  - Developer, HOA with elected officers
Issues - Maintenance

• Lack of operators trained in innovative technologies
• Current municipal operator examinations are not geared toward small-scale technologies
• Still no comprehensive database of small-scale WWTPs < 10,000 GPD
• Many saddled with long-term O & M costs
Issues – Regulatory Oversight

Collection System

• New connections – Who is responsible?
• Adherence to standards overlooked

Part 41 Rules

“Every sewage treatment works subject to this part shall be under the supervision of a properly certified operator.”

Current permitting structure and administration is fragmented.
The Positives

1. Private sector service companies are growing
2. No shortage of available and affordable technologies
3. Manufacturer support/training is available
4. DEQ is open to reviewing affordable & sustainable management plans for these facilities
The Positives

5. Very cost effective, by comparison
6. Remote telemetry is extremely valuable and affordable for managing small-scale WWTPs
Remote Management
The Positives

5. Very cost effective, by comparison
6. Remote telemetry is extremely valuable and affordable for managing small-scale WWTPs
7. Management is now emphasized
8. Perception of “public sewer”
9. Effluent quality is exceptional
### POPTW System Performance

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Average – mg/l</th>
<th>Range – mg/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBOD</td>
<td>0.8</td>
<td>0 – 2.0</td>
</tr>
<tr>
<td>TSS</td>
<td>3.9</td>
<td>0 – 14.7</td>
</tr>
<tr>
<td>Total P</td>
<td>0.56</td>
<td>0.03 – 1.02</td>
</tr>
<tr>
<td>Ammonia N</td>
<td>0.01</td>
<td>0 – 0.04</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>0 (#/100 ml)</td>
<td>0 – 2 (#/100 ml)</td>
</tr>
<tr>
<td>D.O.</td>
<td>10.3</td>
<td>7.1 – 14.0</td>
</tr>
</tbody>
</table>

*This is a summary of 12 composite samples of effluent over a 4-year period.*
# Small-Scale WWTP System Performance

<table>
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<tr>
<th>Parameter</th>
<th>Average – mg/l</th>
<th>Range – mg/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD</td>
<td>2.0</td>
<td>0 – 8</td>
</tr>
<tr>
<td>TSS</td>
<td>4.1</td>
<td>0 – 15</td>
</tr>
<tr>
<td>Total P</td>
<td>1.31</td>
<td>0.83 – 2.10</td>
</tr>
<tr>
<td>Ammonia N</td>
<td>0.04</td>
<td>0 – 0.22</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>2.8 (#/100 ml)</td>
<td>0 – &lt;10</td>
</tr>
<tr>
<td>D.O.</td>
<td>11.9</td>
<td>9.9 – 15.6</td>
</tr>
</tbody>
</table>

* This is a summary of 26 composite samples of discharged effluent and 7 pre-discharge grab samples over a 4-year period.
EPA lists these advantages of decentralized systems:

• Protect Public Health and the Environment
• Appropriate for Low Density Communities
• Appropriate for Varying Site Conditions
• Suitable for Ecologically Sensitive Areas
• Can Achieve Significant Cost Savings
• Will Recharge Local Aquifers
• Provide Water Re-use Opportunities Close to Points of Wastewater Generation
Our Historical WW Infrastructure
Conventional Centralized Approach
Integrated Wastewater Management
Onsite wastewater treatment is here to stay!

“... on-site systems are not only a major component of the current wastewater infrastructure in Michigan, but will continue to serve an important function in the treatment of sanitary sewage in the future.”

(DEQ Whitepaper on Statewide Code)

“Proper use of these treatment technologies will require properly trained soil evaluators, system designers, regulators, and system service providers along with effective management programs.”

(DEQ Whitepaper on Statewide Code)
“Properly managed decentralized wastewater systems can provide the treatment necessary to protect public health and meet water quality standards, just as well as centralized systems.”

US EPA, April 1997
Questions???

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