East Bethel – Case Study in Water Reclamation and Recycle

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By

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Presentation Outline

- Project Need
- Regulatory Acceptance
- Existing Conditions
- Project Technical Issues
- Project Description
- Community Acceptance
Regional Wastewater System
Long-Term Service Areas

- County Boundary
- Community Boundary
- Gravity
- Force main
- Siphon
- Outfall
- Proposed Interceptor
- MCES Transportation Plan
- Regional Parks
- Lakes and Rivers
- Rural Center
- Metro
- Blue Lake
- Empire
- Eagles Point
- St Croix Valley
- Hastings
- Rogers
- Proposed East Bethel
- Potential East Bethel
- Potential Sewered Development
- Scott County Urban Expansion Area
- Potential Metro
- Potential Blue Lake
- Potential Seneca
- Potential Empire
- Potential Eagles Point
- Potential St Croix Valley
- Potential Hastings

Note: Rosemount WWTP site will be retained for potential future WWTP to supplement Empire WWTP in serving central Dakota County. Hastings WWTP will be relocated from downtown to east edge of city.

Potential service areas are illustrative of what can be served. Significant natural resources are expected to be protected through local comprehensive plans and federal, state, and local regulations.
East Bethel
Proposed Service Area
“City’s Approved Comprehensive Plan 2007”
Project Need

• Growth Anticipated in Area
• Surface discharge of treated effluent not being an option
  – Reuse option “if you build it they will come”
• Lack of information in-house on hydrogeology of the area
  – Surface water discharge not available
  – High groundwater
  – Surface waters and wetlands
  – Unique biological communities
Identified Permitting Process

• Absence of surface water in which to discharge
• MPCA SDS Permitting Process for RIBs
  – Multiple discussions
  – Submit proposed facility plan, site soils and hydrogeologic work plans and reports
  – Preliminary approval
  – Submit final plans, specifications and supporting documents
• Other Agencies
  – MnDNR
  – MnDOH
Site Selection

- Obtain limited field data to verify site conditions
- Obtain property rights
  - Sale or agreement
- Focus on two sites for initial development
- Obtain detailed field data on selected sites
Site Selection Criteria Were Chosen to Protect Groundwater

• Conduct a desktop study on sites meeting criteria
  – Out of 100 year flood zone
  – Out of parks and natural areas
  – Out of wetlands
  – 15 feet above the groundwater level
  – Within an economic radius of the plant
  – Proximity to existing wells
Land outside 100-year Flood Plain and Wetlands with Unsaturated Zone at least 15-feet thick
Site Selection

- Obtain limited field data to verify site conditions
  - Measured groundwater levels
  - Reviewed data on water quality and well logs
  - Soil Borings and Cross Sections
EXPLANATION

SURFICIAL AQUIFER

UNDETERMINED GLACIAL TILL

REDROCK

GROUNDWATER TABLE

SURFACE WATER

MINNESOTA UNIQUE WELL NUMBER USED IN CROSS SECTION

NOTE

EMPIRICAL BASED ON AQUIFERS REGIONS IN COUNTY WELL INDEX 1999 2000

EAST BETHNAL PRELIMINARY HYDROGEOLOGIC STUDY

HYDROGEOLOGIC CROSS SECTION A-A

FIGURE 6.2
Site Selection

- Conduct a desktop study on sites meeting criteria
- Obtain limited field data to verify site conditions
- Obtain property rights
  - Purchase
  - Easement Agreement
Site Selection

- Obtain limited field data to verify site conditions
- Obtain property rights
  - Sale or agreement
- Focus on two sites for initial development
  - Site A
  - Site E
Hydrogeologic Program at Sites A and E

- Obtain detailed field data on selected sites
  - Emerging contaminants
  - Permeability Testing
  - Additional wells – Total of four at each site
  - Groundwater flow modeling
    - Multi-Layer Analytical Element Model
    - Infiltration tests and travel times
# Emerging Contaminants

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<tr>
<th>Contaminant</th>
<th>MW-A2</th>
<th>MW-A3</th>
<th>MW-E3</th>
<th>MW-ED3</th>
<th>Limit</th>
<th>Units</th>
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<td>4-Nonylphenol Diethoxylate</td>
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Site A - Groundwater Flows and Wells
Site E - Groundwater Flows and Wells
Site A – Travel Times

Site A – Travel times from R1B to groundwater discharge points (in days)
Site E – Travel Times

One-year tick marks on flow trace lines

Site E – Travel times from RIB to groundwater discharge points (in days)
Design

- Overall Layout
- Plant Process
- Effluent Characteristics
- Land Application Basins
- Reuse
Effluent Design Targets Surpass Permit Requirements to Protect Groundwater Quality

- Initial Construction 0.41 mgd
- 2030 Design Capacity 1.22 mgd
- Reclaimed Water Planning and Design Targets

<table>
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<tr>
<th>Parameter</th>
<th>Effluent Target</th>
<th>SDS Permit</th>
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<tr>
<td>CBOD5</td>
<td>5 mg/L</td>
<td>25 mg/L</td>
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<tr>
<td>TSS</td>
<td>5 mg/L</td>
<td>30 mg/L</td>
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<tr>
<td>Total N</td>
<td>5 mg N/L</td>
<td>10 mg/L</td>
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<tr>
<td>Total P</td>
<td>0.5 mg P/L</td>
<td>1.0 mg/L</td>
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<tr>
<td>Disinfection</td>
<td>&lt;2.2 total coliform/100 mL</td>
<td>&lt;2.2 total coliform/100 mL</td>
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5 Stage Process with MBRs Protects Groundwater Quality
Land Application Site A
Land Application Site E
Insulated and Perforated Laterals Provide Even Distribution Year Round

ELEVATIONS

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<thead>
<tr>
<th></th>
<th>SITE A</th>
<th>SITE E</th>
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<tr>
<td>MAXIMUM GRADE</td>
<td>EL 920.20</td>
<td>EL 920.50</td>
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<tr>
<td>MINIMUM GRADE</td>
<td>EL 917.70</td>
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- Native Seed
- Topsoil
- General Fill
- General Fill
- Geotextile
- 6” Ø Perforated PVC Pipe
- Lateral Pipe Bedding Material
- Top of Select Fill, EL = Pipe Invert EL
- Select Fill
- Native Soil

TYPICAL PERFORATED BASIN LATERAL (PBL) SECTION

3
C2
NO SCALE
Land Application Basin (LAB) Piping Layout
Start-up Plant Effluent Flow (50,000 gpd) –
Changes in Groundwater Head (C.I. = 0.2 ft)
Expected Operational Maximum Plant Flow (205,000 gpd) – Changes in Groundwater Head (C.I. = 0.2 ft)
Maximum Plant Effluent Capacity (410,000 gpd) – Changes in Groundwater Head (C.I. = 0.2 ft)
Reuse Opportunities

Spray Irrigation Opportunities Golf Courses

Water Reclamation Plant Site
Public Communications

- City Council Meetings
- Public Meetings
- Public Hearings
- Neighborhood Meetings
- School Board Meetings
- Met Council Meetings
Public Communications

• **Groundwater quality**
  - Background testing
  - Future monitoring
  - Advanced treatment at water reclamation plant
  - Enhancement of groundwater quality

• **Load/rest cycles**
  - Individual basins not continuously loaded
  - Loading cycles approximately one week long – possibly longer during winter
  - Flexibility provided by two separate rapid infiltration areas
Long Term Reuse

- Dual potable and reclaimed water distribution systems
- Reclaimed water for
  - Irrigation in new development
  - Commercial and industrial non-potable reuse
  - Water features in new development – ponds and fountains
Conclusion

• E. Bethel is MCESs first water reuse treatment plant in the region.
• Start-up planned this June
• Questions.