Wyoming Street Hydraulic Improvements

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Keith, David and Bruney, Colbey Wayne, "Wyoming Street Hydraulic Improvements" (2019). Carroll College Student Undergraduate Research Festival. 9.
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Wyoming Street
Hydraulic
Improvements

Colbey Bruney & David Ryan Keith
Introduction

❖ Wyoming Street corridor, Missoula MT
❖ Hydraulic improvements design
  ➢ 11 new tie-on locations
❖ Brownfields Site
  ➢ Former industrial site with contamination
❖ Location of a former sawmill
  ➢ Existing bio-waste
❖ Methane remediation
  ➢ Shield water system from intrusion
❖ Future design is for residential and commercial redevelopment
Existing Project Conditions and Facilities

- Existing water main: 8-inch and 10-inch ductile iron pipe (DIP)
  - Located 7-feet below Wyoming street
- Flat grassy field with sandy top soil
- Ditch running along northern quarter of site
  - Methane concentrated north of ditch
  - Methane extends 25-feet down
- Geotechnical Report filed by Tetra Tech
Design Criteria

❖ Missoula City Water Specs, AWWA, DEQ
❖ Pipe Requirements
  ➢ Class 350 Ductile Iron Pipe
  ➢ Minimum 8-inch diameter
  ➢ Minimum 12-inch commercial
❖ Pressure Requirements
  ➢ 35-to-80 psi
❖ Fire Flow/ Flow Requirements
  ➢ 1,626 gallons/minute for 2 hours
❖ Methane Intrusion
  ➢ Prevent methane intrusion
  ➢ 0.005 mg/L maximum concentration
Design Constraints

- Brownfields project status
  - No new wells
- Traffic control permitting
Summary of Preliminary Design Analysis

Flowable fill Trench Plugs

❖ Concrete backfill around pipes
  ➢ 3-feet laterally and vertically outside trench
  ➢ Sufficiently shields methane
  ➢ Installed North of Wyoming Street
  ➢ Cost effective

Cutoff Wall with Geotextile Membrane

❖ 25-foot deep cement cutoff wall
  ➢ Placed along Southern border of methane concentration
  ➢ Requires significant excavation

❖ Geomembrane liner placed against wall
❖ Sufficiently shields methane
❖ Would require
  ➢ 5000 CY of excavation
  ➢ 2500 CY of reinforced concrete
  ➢ 3750 square yards of HDPE liner

❖ No cost alternative was made for the cutoff wall due to constructability and cost issues.
Design Alternative (pipes)

Pipe Size Options

- 8 inch
  - Satisfies flow demands
  - Not cost effective

- 10, 8, 6 inch combo
  - Satisfies flow demands
  - Cost effective
  - Design approved by Missoula city Water
Recommended Alternative Description

❖ Mixed 10, 8, and 6-inch DIP
  ➢ Satisfies fire flow requirements
  ➢ Approved by Missoula City Water
  ➢ Cheapest pipe option

❖ Flowable fill trench plugs
  ➢ Sufficient protection against methane intrusion
  ➢ Cheapest option
  ➢ Ease of constructability
Technical Evaluation

- System Modeled in EPANET
- Models future development flow requirements
  - Verifies pipe size functionality
- Ran a model for each pipe size alternative

**Input**
- Pipe properties: diameter, length, Friction Coefficient.
- Water demand

**Output**
- Pipe flows: sum of all flow equals zero
- Node pressures: system pressure is approximately 70 psi.

- Flowable backfill trench plug mix design in accordance with ASTM D4380.
Cost Evaluation

Pipe Alternatives

<table>
<thead>
<tr>
<th></th>
<th>8” DIP</th>
<th>Mixed DIP</th>
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</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td><strong>$202,289</strong></td>
<td><strong>$199,839</strong></td>
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</table>

Methane Alternatives

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<tr>
<th>Item Num</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Total</th>
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</thead>
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<tr>
<td>1</td>
<td>Water Main Trench Plug</td>
<td>6 EA</td>
<td></td>
<td>800</td>
<td>4,800.00</td>
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</tbody>
</table>

- No cost alternative was made for the cutoff wall due to constructability and cost issues.
  - 5000 CY of excavation
  - 2500 CY of reinforced concrete
  - 3750 square yards of HDPE liner
Environmental and Societal Impacts

Benefits

❖ Shield methane intrusion
  ➢ Clean drinking water
❖ 11 new tie-in locations
  ➢ Allows future development

Negative Impacts

❖ Dust* and noise pollution
❖ Significant traffic control needed
  ➢ Wyoming Street is an arterial route
  ➢ Construction inhibits baseball park access

*Dust pollution will be controlled with water as stipulated by the Montana DEQ
Sustainable Options

❖ Flowable Backfill Trench Plugs provide sustainability
  ➢ Alternative to crushed aggregate course backfill
  ➢ Surrounds pipe with concrete
  ➢ Prevents rust
  ➢ Shields against methane intrusion

❖ Strict Missoula City standards restrict design options
  ➢ Regulated by city and state organizations
Conclusion

Questions?