Blind Horizontally Bored Remediation Well Concepts - Siltation Assessment and Cost Comparison
Presentation Overview

- Background
- Remediation System Layout
- Well Installation
- Dewatering Well Concepts
- Dewatering Well Assessment
- Remediation Results
Background

- Fuel Facility
- Tank Nest
- Pump Islands
- Apartment Building
- Commercial Strip Mall
Background

Objectives

• Remediate impacts at the apartment property
• Provide vapour intrusion control
• Minimize disturbance to the tenants
• Reduce property devaluation
• Environmental stewardship

Challenges

• Impacts were located beneath the apartment building
• Limited access to the property
• Blind horizontal remediation well installations were uncommon in area
Remediation System Layout

Horizontal Wells

Remediation System Components
Remediation System Layout

Vertical Recovery and Injection Wells
Remediation System Layout

Project Attributes

- 23 Blind Horizontal Wells Installed
- Over 1,500 m of Horizontal Borings
- 49 Vertical Recovery and Injection Wells
- Over 2,600 m of Dedicated Header Line
Remediation System Layout

Cross Section View – Facing East
(5 times vertical exaggeration)
Remediation System Layout

Cross Section View – Facing North
(5 times vertical exaggeration)

- Extraction Lines (3 mBGL)
- Sparge Lines (6.5 mBGL)
- Dewatering Lines (4.5 mBGL)
Well Installation

Vermeer 2433

Pilot Bit
Well Installation

Specialty Tooling
Well Installation

Specialty Reamer

Sparge Line
Well Installation

- **Well Development**
  - 1,000 L of water
  - 500 L of 3% - 5% Hydrogen Peroxide Solution
- **Sand Tremme** – 10/20 Filter Sand
- **Bentonite/Cement Grout Seal**
Dewatering Well Concepts

- Four different dewatering well concepts were assembled and installed
  - Nested well with inflatable packer
  - Geosynthetic well
  - Carrier casing well
  - Standard PVC well
- Evaluate the ability of the well to minimize siltation
- Evaluate the labour requirements for installation
- Evaluate the cost of the well materials
Dewatering Well Concepts

Nested Well with Inflatable Packer
Dewatering Well Concepts

Geosynthetic Well
Dewatering Well Concepts

Carrier Casing Well
Dewatering Well Concepts

Standard PVC Well
Dewatering Well Assessment

- Similar silt load observed during the initial operation
- Silt diminished shortly after operation
Dewatering Well Assessment

- Cost of well screen material: $37/m to $124/m (additional costs for inflatable packer)
- Additional drilling time required for larger diameter wells
- Increase drill cutting disposal costs for larger boreholes

<table>
<thead>
<tr>
<th>Well Type</th>
<th>Material Costs (per m of well screen)</th>
<th>Installation Time (hr)</th>
<th>Installation Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nested Well with Inflatable Packer</td>
<td>$37 + $3,900</td>
<td>11</td>
<td>- Drilling time reduced by half</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Well assembly time required</td>
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<tr>
<td>Geosynthetic Well</td>
<td>$124</td>
<td>7</td>
<td>- Easy to assemble</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Simple installation</td>
</tr>
<tr>
<td>Carrier Casing Well</td>
<td>$114</td>
<td>7.5</td>
<td>- Well assembly time required</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Additional drill time to advance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Larger diameter borehole</td>
</tr>
<tr>
<td>Standard PVC Well</td>
<td>$37</td>
<td>5.5</td>
<td>- Easy to assemble</td>
</tr>
</tbody>
</table>
Remediation Results

- Operational period: October 2013 to October 2014
- Total Groundwater Recovered – Over 1.5 M L
- Total PHC Mass Recovered – 12,000 Kg
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