Horizontal Wells: Avoiding Obstructions and Minimizing Disruptions

Presenter: Mike Sequino  Mike@directionaltech.com
Presentation Outline

• Introduction
  – Applications of Horizontal Remediation Wells (HRWs)
  – Why Use HRWs

• Case Studies
  – Gas Station (NY)
  – Pipeline Terminal (FL)
  – Soil Sampling (FL)

How accurate is directional drilling? Extremely!
Why Use Horizontal Remediation Wells

- Access
- Larger Areas
- Better for in situ because of contact with the well screen
- Business activities can continue during remedial construction
- Rapid Site Closure
- HRW makes any vertical technology more efficient
Applications for Horizontal Remediation Wells

- Soil Sampling
- Air Sparge and SVE
- Bio Sparge
- Vapor Mitigation/SVE
- Injection
- Electrical Resistivity Heating
- And any other vertical technology

Installing first ever horizontal remediation wells (HRWs) in South Korea
Air Sparge and SVE

- 3.5 Acres (>14,000 m²) site remediated using 8 HRWs
- Access restricted areas
Vapor Mitigation and SVE

- Creates large zones of influence
- Achieve both clean up and indoor air quality control via one system
- Wells can be used for future means of injection for final clean up
Bio Sparge

In situ Remediation versus Excavation and Pump and Treat and... other costly remediation technologies
Injection

- Large area covered by a single Horizontal Remediation Well
- Able to deliver large volumes of product
- Cover various depths along one alignment
Electrical Resistivity Heating

- Place electrode into inaccessible sites
- Brings soil to required temperature in shorter period of time
- Project demonstrated versatility of HRWs
Horizontal Soil Sampling
HRWs provide solutions for many projects that were previously not feasible.
Why Use Horizontal Remediation Wells

- Limited or No Access
- Larger Areas to Remediate
- Better for *in situ* due to contact with well screen
- Business activities can continue during remedial construction
- Rapid Site Closure
- HRWs increase efficiency when comparing to vertical technology or vertical application
Access

• Under buildings and other surface obstructions, highways, parks, wetlands....
• Inside buildings
Normal Business Activities Continue During Remedial Construction

- Directional drilling equipment is set up out of way... and discreetly installs engineered wells... from a distance
### Rapid Site Closure

- HRW achieve rapid site closure due to ability of well screen to have maximum contact

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<th>Designation</th>
<th>Baseline BTEX (µg/l) Nov 2008</th>
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Large Areas

- Radius of Influence (ROI) greater in a HRW than a traditional vertical well
- HRW have more well screen
More Contact with Well Screen

Water being pumped through horizontal remediation well to demonstrate uniform flow through well screen

Example of stainless steel well screen
Case Studies

- Operating Gas Station
  - Horizontal Air Sparge and Soil Vapor Extraction
- Active Bulk Petroleum Terminal
  - Horizontal Air Sparge Wells
- Former Power Plant
  - Horizontal Soil Sampling
Operating Gas Station

• Impacts from underground storage tanks at a retail gas station.
• Plume not only under station, but also migrated across the street and under a restaurant.
• Vapor intrusion concerns for restaurant across the street.
• Remediation needed to both treat the petroleum impacts and to mitigate vapor intrusion.
Operating Gas Station

• Horizontal BioSparge (HBS) and Soil Vapor Extraction (HSVE)
  – 2x HBS wells, 280-ft screen, 24-ft BGS
  – 1x HSVE well, 280-ft screen, 10-ft BGS
• Blind well installation of 3” PVC well materials
• Wells drilled from restaurant property
• Additional header piping and electrical conduit installed
Operating Gas Station
Operating Gas Station

- Rig and Remediation System
- Treatment Area
- Header Piping and Electrical Conveyance
- Gas Station
- Restaurant
- Street Crossing
Operating Gas Station

- Avoided disruption to operating businesses
  - No loss to client revenue
  - Worked in back corner of parking lot
- Avoided costly restoration by entry/exit in grass
- Avoided traffic by drilling under roads
- Active vapor mitigation to protect restaurant
Active Bulk Petroleum Terminal

- Terminal Operates 24hrs, 7 days a week
- Petroleum impacts stretched on-site and off-site
- On-site impacts are below bulk fueling racks, roads, buildings/ offices, above ground storage tanks.
- Off-site impacts travel below busy roads (4 lanes of traffic), and operating gas station, and a building supply warehouse.
Active Bulk Petroleum Terminal

- 21 Horizontal Air Sparge Wells
- All wells “blind” (no exit)
- Over 10,000 linear feet of boring/wells
- 3” diameter HDPE wells, with screens at 35 ft BGS
- Horizontal screen lengths varied between 400 – 840 ft
- Complimentary horizontal SVE system trenched on site
Active Bulk Petroleum Terminal

Area 1

Area 2

Area 3
Active Bulk Petroleum Terminal
Active Bulk Petroleum Terminal

Area 2

SW Onsite Area Currently Undergoing Active Remediation
Active Bulk Petroleum Terminal

- Avoided disruption to on-site operations and truck traffic, which were continuous (24/7)
- Avoided disruption to businesses affected by impacts
  - No loss to client revenue
  - Worked out of sight of customers
- Avoided costly restoration by entry/exit in grass
- Wireline navigation allowed drilling under roads with no disruption to traffic from above ground locator
Former Power Plant

- Former power plant site (demolished and removed)
  - Operating substation on site
- Impacts from arsenic discovered on-site
- Delineation required to determine off-site impacts
- Off-Site area is a residential neighborhood
Former Power Plant

• Needed to avoid disturbance to neighboring homes in the area of concern

• Horizontal drilling and sampling from on-site area was selected due to low impact on community

• 6 discrete horizontal soil samples were obtained from 3 borings under homes
Former Power Plant

Area of Concern

Property Line

Drilling equipment and entry from on-site property
Former Power Plant

- Horizontal Soil Sampling (HSS) can reduce impact to residential homes.
- HSS can be used to avoid obstructions like buildings, roads, or sensitive facilities.
- HSS allows for samples from multiple points within a single bore-path.
Summary

• Horizontal Remediation Wells (HRWs) systems are mature technology with 24+ years of case studies and site closures

• HRWs are flexible, adjustable and allow for a creative placement to avoid obstructions and minimize disruptions

• HRW can lower project costs... if planning five (5) or more vertical wells
Horizontal Remediation Wells

Questions?

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