

DIRECTIONAL
Technologies, Inc
Horizontal Directional Drilling Services

Horizontal Remediation Wells

Horizontal Remediation Technologies • Installation • Design • Engineered Well Screens • Services



In-situ Testing, Operating and Troubleshooting Of Horizontal Remediation Wells

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Before the Project:

Remedial Feasibility Testing



- Site testing is performed utilizing vertical monitoring wells for remedial feasibility:
- Soil Vapor Extraction, (SVE)
- Air Sparging (AS)
- Total Phase Extraction (TPE)
- Biosparging

Vertical Well Testing is Performed to Determine :



- Radius of Influence (SVE and AS)
- Cone of Depression (TPE)
- Increase in Dissolved Oxygen (Biosparging)

Results of Vertical Well Tests



- Remedial feasibility tests determine vertical well spacing required to remediate the site.
- Indicate blower/pump/ treatment required for operation

Downfalls to

Vertical Well Feasibility Tests

- Tests indicate necessity of high density network of vertical wells for effective remediation
- Intensive network requires costly trenching, piping, electrical, blower pump, and treatment infrastructure
- Site constraints provide an obstacle to effective remediation network throughout contaminant plume

Why Use Horizontal Remediation Wells (HRWs)

- Site Constraints
- Traditional vertical equipment could not fit in tight spacing



Why Use Horizontal Remediation Wells (HRWs) cont.



- No Business Disruptions
- Larger ROI
- Rapid Site Closure
- More Efficient



Comparison of Costs: HRW vs Vertical Well Network



- Effectiveness of Treatment Area
- Accelerated Remediation Timeframes
- Installation Feasibility with Site Constraints
- Reduction in infrastructure costs

Decision to Utilize HRWs as most cost effective option



- Based upon above listed considerations
- Consultation with the Professionals for:
 - Optimal well placement
 - Well screen design
 - Constructability

Coordination with the Professionals



- Target zones of impact (well depth and length)
- Expected geologic profile
- Well screen design
- Review anticipated spacing of HRWs based on previous testing
- Review site constraints (utilities, buildings, property and rights-of-way issues).
- Consideration of Ground Conditions

So now your HRWs are successfully installed: What's next?



- Proper well development
 - Remove/breakdown drilling fluids
 - Formation restoration
- In-Situ, As Built Testing
 - Determines actual pressure and flow rate capabilities of each well (SVE and AS)
 - Determine increased DO dispersion of Biosparge wells
 - Trough of influence for TPE wells
 - Other influence of chemox/thermox technologies

Review of in-situ/as-built testing data



- Results of testing data utilized to design and specify optimal remediation equipment sizes
- Eliminates speculative equipment specification based on vertical well data
- Provides design data for cost effective waste stream treatment options if applicable
- Indicates possibility of manipulating flow/pressure/vacuum as desired by the environmental professional

Troubleshooting existing HRWs



- HRWs can be developed during their functional lifespan.
- Development removes:
 - Biologic fouling
 - Mineral fouling
 - Formational abnormalities due to over pressurization or over pumping
 - Siltation

Necessity of well development



- Indicated by changes in site data over time
 - Vacuum
 - Pressure
 - D.O.
 - Fluid flow rate

Necessity of HRW development cont.



- Typically formation dependent
 - Some formations are more susceptible to fouling
 - Biologic (presence of fertilizers or bacteria in groundwater)
 - Mineralization (high Iron/Manganese) oxidation
 - Siltation due to presence of fines in the treatment zone

Methods of HRW Development




- Gentle pressurized flushing throughout the screened section of the well utilizing proprietary, environmentally safe chemicals and nozzle array
- Total extraction of fluids throughout the screened section in a thorough, stepwise manner.
 - Determined by inspection of fluids generated during the process
 - Should be performed by experienced personnel

Follow-up Testing



- Recommended to determine increase in effectiveness of development techniques
- Effectiveness of development process determines future well development schedule to maintain optimum HRW operation



Founded in 1992, Directional Technologies, Inc. has installed over 1,000 horizontal remediation wells throughout the world.

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