



## **In-Situ® Rentals**

### *Real-Time Measurement Technologies for Groundwater Remediation Applications*

When you rent from In-Situ, you're not just getting equipment—you're getting technical support, well-maintained sensors, and confidence that your system will meet your needs and surpass your expectations.

#### **Simplify Aquifer Characterization & Pilot Studies**

The Virtual HERMIT® Pump Test Kit monitors an entire well field.

- Streamline step-drawdown and constant-rate tests.
- Simultaneously configure, start, display, or stop all connected Level TROLL® 700 Instruments.
- Step a test and capture pump and recovery data on one log.
- Display real-time data and quickly adjust test protocols.
- Minimize data processing and errors.

#### **Monitor SVE, DPE, & Air Sparging Systems**

In-Situ offers two options for tracking vacuum pressure and water level. For the highest level of accuracy, use Level TROLL 500 or 700 and BaroTROLL® Instruments. To simplify deployment, monitor trends, and reduce costs, choose the sub-2" TROLL® 9500 Instrument with barometric pressure and level sensors. For air sparging applications that require dissolved oxygen (DO), vacuum pressure, and water level monitoring, use the S2XP Restrictor with the TROLL 9500.

- Measure and log all required parameters.
- Monitor performance indicators in real time.
- Monitor radius-of-influence in real time with the Virtual HERMIT Kit and vented cable extender—ask us about this option.

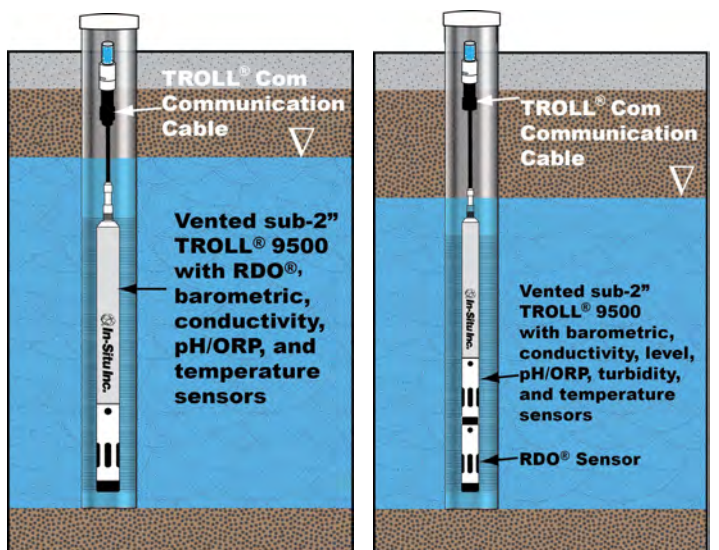
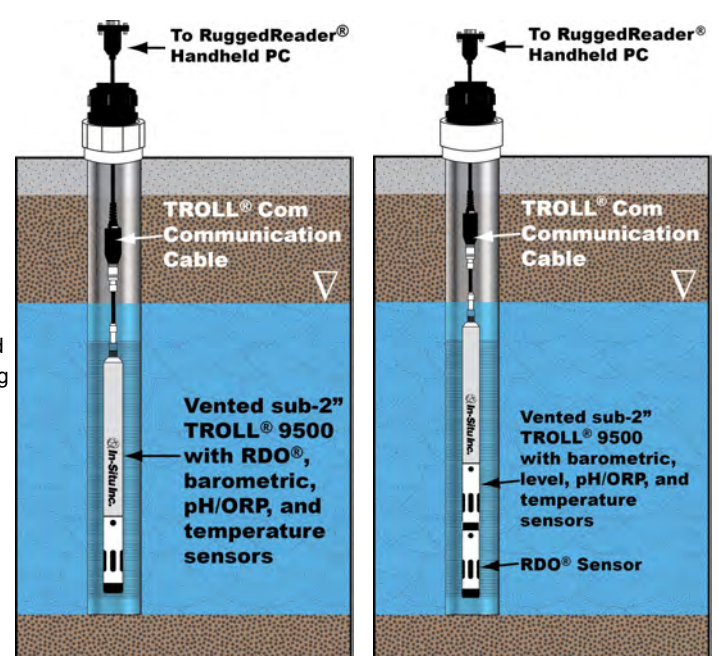
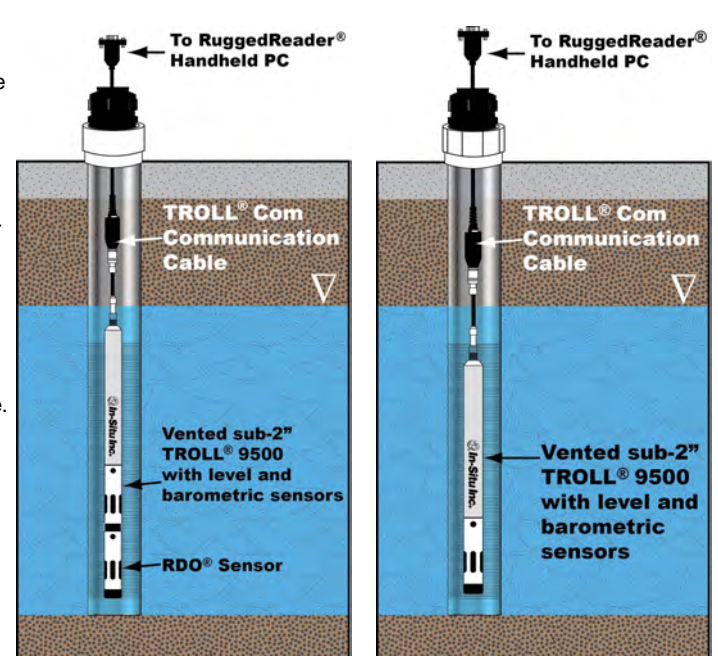
#### **Track Performance of ISCO, ISCR, & Biosparging Systems**

Use the sub-2" TROLL 9500 Water Quality Instrument for *in-situ* monitoring of remediation progress. The TROLL 9500 includes durable sensors that stand up to harsh conditions.

- Measure and log up to seven parameters with a sub-2" device, including barometric pressure/vacuum pressure, conductivity, DO, pH, ORP, temperature, and water level. Ask us about the S2XP Restrictor.
- Improve performance and reduce maintenance with the optical Rugged Dissolved Oxygen (RDO®) Sensor—now EPA approved.
- Monitor performance indicators in real time.
- Deploy one instrument to save time and money.
- Use Tefzel® RuggedCable® Systems that can be decontaminated and used in harsh environments.

#### **Additional Benefits of In-Situ Rentals**

- Pre-paid return shipping option
- Free, 24/7 technical and application support
- Factory-maintained and calibrated equipment
- Large inventory available

Treatment Technology	Chemical Oxidation (ISCO)	Chemical Reduction (ISCR)	Enhanced Bioremediation	Biosparging	Air Sparging (AS)/Soil Vapor Extraction (SVE)	Dual Phase Extraction (DPE)
<b>Online resource</b>	<a href="http://www.epa.gov/ada/gw/isco.html">http://www.epa.gov/ada/gw/isco.html</a>	<a href="http://www.clu-in.org/remediation/">http://www.clu-in.org/remediation/</a>	<a href="http://www.epa.gov/oust/cat/airsparg.htm">http://www.epa.gov/oust/cat/airsparg.htm</a>	<a href="http://www.epa.gov/oust/cat/biosparge.htm">http://www.epa.gov/oust/cat/biosparge.htm</a>	<b>AS:</b> <a href="http://www.epa.gov/oust/cat/airsparg.htm">http://www.epa.gov/oust/cat/airsparg.htm</a> <b>SVE:</b> <a href="http://www.epa.gov/oust/cat/SVE1.htm">http://www.epa.gov/oust/cat/SVE1.htm</a>	<a href="http://www.epa.gov/oust/cat/dualphas.htm">http://www.epa.gov/oust/cat/dualphas.htm</a>
<b>Synonyms</b>		In-situ reduction or reductive dechlorination	Enhanced biodegradation, enhanced bioattenuation		<b>AS:</b> <i>In-situ</i> air stripping or <i>in-situ</i> volatilization <b>SVE:</b> Soil venting or vacuum extraction	High vacuum, multi-phase extraction, vacuum-enhanced extraction, bioslurping
<b>Summary of process</b>	The most rapidly growing remedial technology applied at EPA hazardous waste sites. It involves the introduction of a chemical oxidant into the subsurface for the purpose of transforming ground- water or soil contaminants into less harmful chemical species.	In-situ reduction is an emerging technology and thus far has been applied primarily to chlorinated solvents. It is defined as the combined effect of stimulated biological oxygen consumption (via "fermentation" of complex organic carbon sources), direct chemical reduction with reduced metals, and the corresponding enhanced decomposition reactions that are realized at the lowered redox ( $E_h$ ) conditions.	This technology is designed to remediate chlorinated solvents in groundwater. An organic source, nutrients, electron acceptors, and/or microbial cultures are injected to stimulate degradation.  EISB systems may be used to remediate areas of high concentration within plumes or source areas, to help provide containment of a chlorinated solvent plume, or as part of a treatment train downgradient from a primary cleanup or containment system.	Air (or oxygen) and nutrients (if needed) are injected into the saturated zone to increase the biological activity of the indigenous microorganisms. It can be used to reduce concentrations of petroleum constituents that are dissolved in groundwater, adsorbed to soil below the water table, and within the capillary fringe.	AS is an <i>in situ</i> remedial technology that reduces concentrations of volatile constituents in petroleum products that are adsorbed to soils and dissolved in groundwater. Also known as " <i>in situ</i> air stripping" and " <i>in situ</i> volatilization." Contaminant-free air is injected into the subsurface saturated zone, enabling a phase transfer of hydrocarbons from a dissolved state to a vapor phase. Air is vented through the unsaturated zone.  When AS is combined with SVE (AS/SVE), the SVE system creates a negative pressure in the unsaturated zone through a series of extraction wells to control the vapor plume migration.	This <i>in-situ</i> technology uses pumps to remove various combinations of contaminated groundwater, separate-phase petroleum product, and hydrocarbon vapor from the subsurface.
<b>Achieved by applying</b>	Liquid hydrogen peroxide, potassium permanganate, ozone, sodium persulfate, or occasionally oxygen (no sodium hypochloride)	Dithionite, gaseous hydrogen sulfite, colloidal zero valent iron	Nutrients, electron acceptors, and/or microbial cultures	Air (5 to 50 m <sup>3</sup> /h typical) and/or nutrients.	<b>AS:</b> Air (low purity, high volume) to volatilize contaminants in sealed wells <b>SVE:</b> Vacuum	High vacuum
<b>Affected zone(s)</b>	Vadose, saturated	Groundwater and contaminant source zones	Saturated	Saturated capillary fringe	<b>AS:</b> Vadose, saturated capillary fringe <b>SVE:</b> Vadose	Vadose, saturated, capillary fringe
<b>Target contaminant</b>	VOCs (e.g., DCE, TCE, PCE); BTEX compounds (e.g., benzene, toluene, ethylbenzene, xylene); SVOCs; pesticides; PAHs; PCBs	Chlorinated organic pesticides and other CVOCs; heavy metals; other persistent compounds (e.g., perchlorate)	Chlorinated solvents	SVOCs; BTEX compounds (e.g., benzene, toluene, ethylbenzene, xylene); naphthalene	<b>AS:</b> VOCs (e.g., DCE, TCE, and PCE); fuels <b>SVE:</b> VOCs; some SVOCs but not heavy oils; metals; PCBs; dioxins	VOCs, SVOC, fuels
<b>Key parameters measured</b>	DO, conductivity/TDS, level, pH/ORP, temperature, turbidity (for S-ISCO)	DO, conductivity/TDS, level, pH/ORP, temperature, turbidity	DO, pH/ORP, temperature	DO, pH/ORP, temperature, vented level	DO, vented level, vacuum pressure	Vented level, vacuum pressure
<b>Required equipment, per well</b>	1 sub-2" TROLL® 9500 Professional with optical RDO, barometric, conductivity, pH/ORP, and temperature sensors. Add the S2XP Restrictor to accommodate level and turbidity sensors. 1 vented Tefzel® cable from 6' to 4,000'. 1 TROLL® Com USB for use with laptop or 1 TROLL Com RS232 (serial) for use with RuggedReader® Handheld PC when downloading data.		1 sub-2" TROLL 9500 Professional with optical RDO, barometric, conductivity, pH/ORP, and temperature sensors. Add the S2XP Restrictor to accommodate the level sensor. 1 vented Tefzel® cable from 6' to 4,000'. 1 well cap cable holder for sealed well applications. 1 TROLL Com USB for use with laptop OR 1 TROLL Com RS232 (serial) for use with RuggedReader Handheld PC when downloading data.		<b>AS:</b> 1 sub-2" TROLL 9500 Professional with S2XP Restrictor, optical RDO, level, and barometric sensors. 1 vented Tefzel® cable from 6' to 4,000'. 1 well cap cable holder. 1 TROLL Com USB for use with laptop OR 1 TROLL Com RS232 (serial) for use with RuggedReader Handheld PC when downloading data. <b>SVE &amp; DPE:</b> 1 sub-2" TROLL 9500 Professional with level and barometric sensors (no water quality sensors installed). 1 vented Tefzel® cable from 6' to 4,000'. 1 well cap cable holder. 1 TROLL Com USB for use with laptop OR 1 TROLL Com RS232 (serial) for use with RuggedReader Handheld PC when downloading data. For highest accuracy, use Level TROLL 500/700 Instruments.	
<b>Typical deployment in a 2" monitoring well</b>	<p><b>Key Benefits:</b></p> <ul style="list-style-type: none"> <li>Real-time measurement of mounding of the piezometric surface and geochemical parameters supported by the TROLL 9500 allows for a dynamic work strategy per the EPA Triad Approach to site remediation.</li> <li>For details on the EPA Triad Approach, visit <a href="http://www.triadcentral.org/index.cfm">www.triadcentral.org/index.cfm</a>.</li> <li>EPA-approved RDO method</li> </ul> 	<p><b>Key Benefits:</b></p> <ul style="list-style-type: none"> <li>Real-time measurement of mounding of the piezometric surface and geochemical parameters</li> <li>RDO Sensor responds quickly. For long-term studies, labor costs are reduced due to long-lasting RDO calibration.</li> <li>EPA-approved RDO method</li> </ul> 	<p><b>Key Benefits:</b></p> <ul style="list-style-type: none"> <li>Real-time monitoring of radius-of-influence and groundwater fluctuations</li> <li>Single instrument per well. Internal barometric sensor logs vacuum pressure.</li> <li>Vented pressure sensor logs water level corrected for borehole pressure.</li> <li>Well cap cable holder allows real-time access to changing well conditions.</li> </ul> 			

# Using In-Situ® Products for Your Remediation Project

## Real-Time Monitoring Solutions – Instrument Selection Guide

In-Situ Inc. offers real-time monitoring solutions suitable for most every phase of the site cleanup process. From groundwater sampling and aquifer test equipment for site characterization, to down-well physical and geochemical sensors for injection pilot studies, our systems provide rapid delivery of decision-quality data. Practitioners and stakeholders can reach their remediation goals more quickly, safely, and at a lower cost than with the use of traditional assessment and monitoring approaches.

Application	DO*	EC	pH/ ORP	Temp.	Turbidity	Vacuum or Baro Pressure	Water Level	In-Situ Solution
<b>Characterization and Remedial Investigation</b>								
DNAPL Thickness							●	Level TROLL 500
Groundwater Sampling	●	●	●	●	●			TROLL 9500 Low-Flow System
Pump Test						●	●	Virtual HERMIT Aquifer Test Kit and BaroTROLL
Slug Test						●	●	Level TROLL 500/700
Tidal or Tracer Study		●		●			●	Aqua TROLL 200
<b>Source Treatment</b>								
Air Sparging / Soil Vapor Extraction	●					●	●	TROLL 9500 with S2XP Restrictor
Dual Phase Extraction						●	●	TROLL 9500 or Level TROLL 500 and BaroTROLL
Soil Vapor Extraction						●	●	TROLL 9500 or Level TROLL 500 or Virtual HERMIT Kit with Vented Cable Extender
<b>Plume Treatment</b>								
Enhanced Bioremediation	●	●	●	●		●		TROLL 9500
ISCO/ISCR	●	●	●	●		●	●	TROLL 9500 with S2XP Restrictor
Surfactant-Enhanced ISCO	●	●	●	●	●	●	●	TROLL 9500 with S2XP Restrictor
Pump-and-Treat	●	●	●	●	●	●	●	TROLL 9500 with S2XP Restrictor or Level TROLL 500/700 with Con TROLL PRO System
<b>Long-Term Monitoring</b>								
Groundwater Sampling	●	●	●	●	●			TROLL 9500 Low-Flow System
Monitored Natural Attenuation	●	●	●	●		●		TROLL 9500
Pump-and-Treat	●	●	●	●		●	●	TROLL 9500 with S2XP Restrictor or Level TROLL 500/700 with Con TROLL PRO System

\*Known interferences of optical RDO Sensor for DO measurements: Alcohols >5%; hydrogen peroxide >3%; sodium hypochlorite (commercial bleach) >3%; gaseous sulfur dioxide; gaseous chlorine; organic solvents (e.g., acetone, chloroform, methylene chloride, etc.), which may swell the sensing element (foil matrix) and destroy it.

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