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iFLUX

iFLUX SAMPLER

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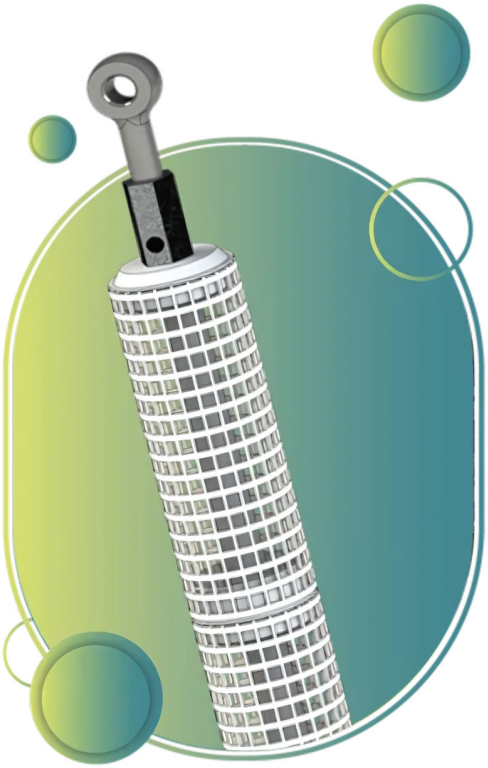
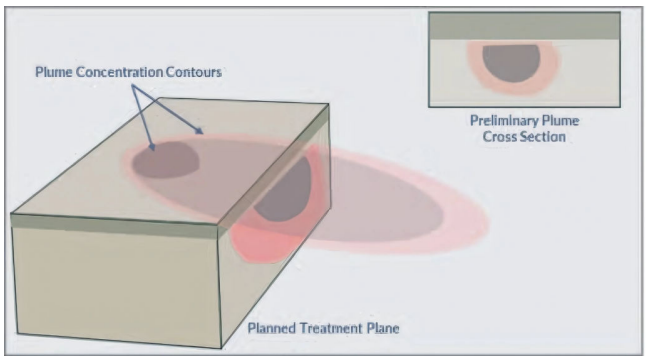
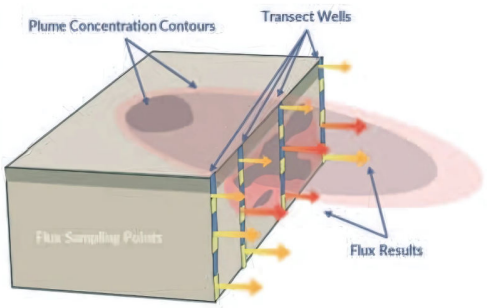


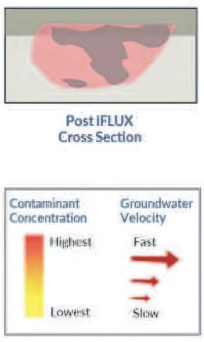
The iFLUX Samplers enable faster and more cost-efficient remediation projects, by measuring groundwater and contaminant movement over time. Groundwater and mass flux results provide soil experts with the key insights they need to reduce the risk and uncertainty of soil contamination management.

Due to the hydrogeological complexities and the inherently heterogeneous nature of subsurface environments, uniformly treating an entire aquifer to address contaminants is often economically prohibitive and unrealistic.

The patented iFLUX characterization technology offers a groundbreaking solution by accurately measuring discrete groundwater and contaminant mass flux simultaneously. This technology enhances the existing conceptual site model (CSM) by generating 2D flux maps that identify critical treatment zones and evaluate a treatment's efficacy. Incorporating iFLUX into characterization and remediation plans ultimately enables more cost-efficient projects and reduces the time required to achieve remediation goals.







The primary site management goal is to reduce risk and uncertainty. The iFLUX characterization technology enhances the understanding of the subsurface, allowing risk managers to incorporate both high and low-flux zones into the conceptual site model (CSM).

Certain situations justify proactive iFLUX data gathering to ensure an evidence-based groundwater management strategy.

Hydrogeological Characterization

Aquifer remediation efforts may be necessary due to suspected contaminant release or detection in the subsurface. Early detection and understanding of the Constituents of Concern's (CoC) fate and transport mechanisms can significantly reduce remediation costs, which is often based solely on treating a contaminant's plume geometry.

According to a report[1] by the U.S. Environmental Protection Agency (EPA), the cost of preventing contamination through regular monitoring and early intervention is substantially lower than the costs associated with stand-alone groundwater cleanup efforts.

Remediation Design and Performance Monitoring

The iFLUX characterization technology provides a clearer understanding of the impact of a contaminant source by analyzing how a plume transect behaves over time and at discrete depths. This approach ultimately narrows down the treatment footprint to critical zones. The iFLUX characterization technology is ideal for determining remediation targets and assessing remediation performance.

[1] Cost Analyses for Selected Groundwater Cleanup Projects: Pump and Treat Systems and Permeable Reactive Barriers, *https://www.epa.gov/sites/default/files/04-2015/documents/cost_analysis_groundwater.pdf*

What Differentiates
The iFLUX Samplers From Other Methods?

Features & Benefits

True Groundwater and Mass Flux Discrete Measurements

The patented iFLUX Samplers are groundbreaking for their ability to simultaneously, easily, and accurately measure both mass flux and water flux. iFLUX measurements provide detailed insights into localizing contaminant sources, their transport speed and orientation, and contaminant outflow. This technology enables the assessment of risks at complex sites impacted by difficult contaminant mixtures.

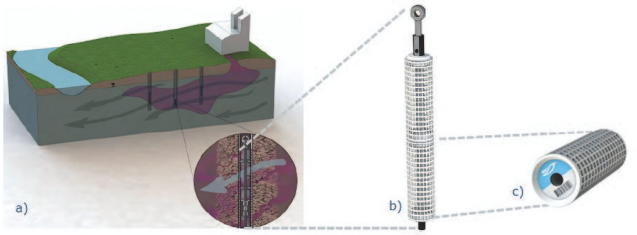


Figure 1: iFLUX sampler, a) field concept, b) sampler assembly, c) sampler cartridge

Improved Characterization Technique

Conventional sampling rounds to assess contamination extent rely on groundwater samples from screened monitoring wells that provide a simple "snapshot in time." Interpreting these results oversimplifies the observed behavior of contaminants over time and space. This in turn significantly impacts remediation design and costs, leading to inefficient or often failed cleanup attempts.

In contrast, iFLUX Characterization Technology uses time-averaged flux measurements that incorporate exposure time and localized flow dynamics. This approach not only enhances the reliability of measurements by smoothing out peaks and dips and reducing detection limits, but also ultimately improves the conceptual site model (CSM).

Check the latest iFLUX analytical package

Customizable and Modular

iFLUX Samplers are tailored to fit any well size and allow simultaneous measurements of multiple compounds at discrete depths.

Easy-to-install

The patented design allows installation times of around 10 minutes per location, including groundwater level and monitoring well depth measurements.

Wide Array of Measurable Analytes

The iFLUX Samplers are validated for +150 different contaminant types, and the list is still growing. Validation of new analyses can be provided upon request. Sampler cartridges are available for organics, metals & heavy metals, nutrients, 1,4-dioxane, cyanides, PFAS, and water flux.

IsoFLUX Samplers accurately distinguish sources of a compound or measure their natural or stimulated degradation over time or space.

When to use
the iFLUX Sampler?

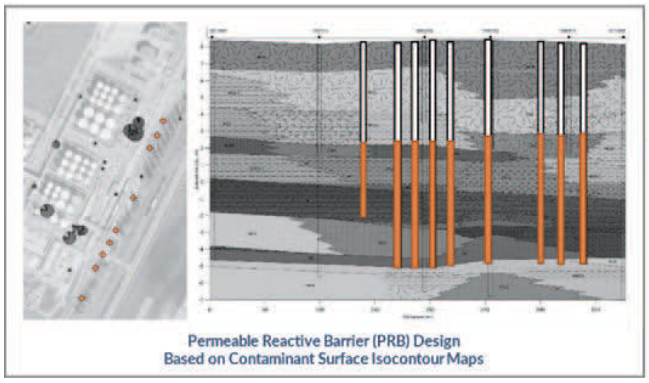
- For projects where evaluating risks requires understanding contaminant transport mechanisms through saturated porous subsurface media.
- For projects where it is important to identify preferential flow paths in a heterogeneous subsurface environment when characterizing or modeling aquifer behavior.
- At sites where unpredictable factors cause complex groundwater dynamics (e.g., pumping activities, infiltration activities, tides, or high groundwater level fluctuations).
- At sites where the quantities of remediation products and injection methodologies significantly impact project costs, and where accurately placing the materials is critical to meet remediation goals. Insights into high flux zones allow for better dimensioning and injection or pumping methodologies.

- Bedrock aquifers where contamination moves through fractures.
- Sites where a flow hypothesis has not been developed because initial investigations into contaminant type and subsurface description have not begun.
- Situations where traditional measurements and simple remediation strategies, such as excavation, suffice to meet remedial goals and do not justify fine-tuning the understanding of contaminant flow dynamics.
- Transects with pure phase contaminants. Typically, very high dissolved phase concentrations (above %10 of the contaminant's solubility in water) indicate the presence of pure phase contaminants or NAPL. At these discrete locations, concentration changes are better described through concentration gradient drivers rather than groundwater flow mechanisms.

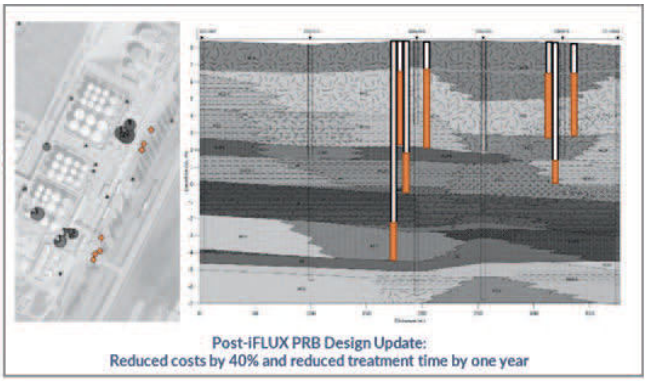
Case Study

To preclude a dissolved PAH contaminant plume from offsite migration, a permeable reactive barrier (PRB) was planned to be installed at the site's boundary.

The initial design targeted the geological horizons with highest contaminant soil and groundwater concentrations. iFLUX monitoring campaigns allowed distinguishing preferential pathways, understanding the expected contaminant loadings and life of the PRB, and ultimately improving PRB's performance and reducing remedial costs and time.



Permeable Reactive Barrier (PRB) Design
Based on Contaminant Surface Isocontour Maps



Post-iFLUX PRB Design Update:
Reduced costs by 40% and reduced treatment time by one year

About Tersus

We research, develop and commercialize innovative soil and groundwater remediation solutions through university and professional relationships to meet the advancing technological requirements at contaminated sites. Our proven technologies help our clients reduce uncertainty, minimize risks, and achieve cost-effective results.

We have a passion for supporting our clients by delivering outstanding Customer Service every day. Not focused on a single technology, Tersus Environmental offers the right solution for your sitespecific needs.

Soil and Groundwater Remediation of:

- Chlorinated Solvents
- Petroleum Hydrocarbons
- Per- and Polyfluoroalkyl Substances
- Pesticides
- Metals

About iFLUX

Our mission is to provide sustainable groundwater management for a better future. iFLUX improves groundwater management by giving groundwater the visibility it deserves.

At iFLUX, we combine state-of-the-art measurements with in-depth expertise to produce actionable insights.

www.iFLUX.be/sampler | www.tersusnv.com/iflux | www.surbec.com