REGENESIS®

PFAS Source Treatment Eliminates Need for Long-Term System

SourceStop Barrier Intercepts PFAS in the Capillary Fringe



Summary

At a large, active municipal site in Colorado, PFAS (per- and polyfluoroalkyl substances) contamination threatened groundwater quality and downgradient receptors. Working in partnership with Integral Consulting Inc., REGENESIS Remediation Services (RRS) implemented a full-scale in situ remedy using SourceStop® Liquid Activated Carbon to immobilize PFAS within the subsurface. By converting the capillary fringe and upper saturated zone at three separate source areas into highly efficient PFAS filters, the team was able to meet treatment objectives with minimal site disruption.

99.5% - 99.9%

Total PFAS reductions within Injection Area 1

Site type

Former firefighting training area at Colorado municipal facility

Contaminants of concern

- Perfluorooctane sulfonate (PFOS)
- Perfluorooctanoic acid (PFOA)
- Other long- and short-chain PFAS from historical AFFF use

Geology

Fine- to medium-grained aeolian and alluvial soils overlying a weathered claystone with varying moisture content

Project driver

Ongoing PFAS leaching from source area soils



Treatment objective

Immobilize PFAS to reduce leachability and prevent migration to groundwater. Treatment targeted the capillary fringe and upper saturated zone.

Technologies applied

- SourceStop applied as a sorptive barrier
- Integrated with excavation of PFAS-impacted vadose zone soils

Site Background

The site is a municipally owned maintenance facility in Colorado with known releases of PFAS, including PFOA and PFOS from historical operations. Located within an urbanized corridor and surrounded by sensitive downgradient receptors, including potable water sources, the site posed long-term liability risks if migration from PFAS-impacted soils and shallow groundwater continued unchecked.

Integral Consulting Inc. (Integral), a U.S.-based multidisciplinary environmental engineering and consulting firm, led site investigations and identified soil leaching into groundwater from two separate, uncapped source areas as the dominant migration pathway. Initial actions, such as capping and excavations, reduced surface risk and removed mass but could not fully address subsurface mass flux. To eliminate ongoing source leaching, Integral and REGENESIS collaborated on an in situ remedy using SourceStop.



Remedial Approach

The selected remedy focused on direct-push technology (DPT) injections of SourceStop into the capillary fringe and saturated zone, creating an in situ sorptive barrier. This approach immobilizes PFAS in place, eliminating mass flux and halting migration from source areas. This sustainable, passive strategy offers several key benefits:

- **Long-Term Effectiveness:** PFAS is adsorbed to the aquifer matrix, reducing leachability
- **Passive Solution:** No active operation or long-term energy inputs required
- **Minimal Site Disruption:** Injections avoided the need for extensive excavation
- **Cost-Effective:** Estimated to save millions compared to dig-and-haul alternatives

The treatment design incorporated site-specific hydrogeology, including seasonal water table fluctuations, and leveraged data from a pre-application injectability test to optimize amendment volume and spacing. Injection intervals targeted the capillary fringe (i.e., the smear zone) where PFAS mass was concentrated to create a horizontal barrier capable of intercepting PFAS leaching from the vadose zone above.

Excavation and SourceStop In Situ Treatment Integration

To reduce mass loading, approximately 2,100 cubic yards of PFAS-impacted soil were excavated, removing an estimated 2,200 grams of PFAS. Roughly 86% of detected PFAS mass was located within the top 5 to 10 feet of soil and removed. Following excavation, SourceStop was injected across two target areas to form a horizontal barrier at the capillary fringe, halting vertical leachate migration.

While excavation removed the majority of vadose-zone PFAS, the SourceStop treatment replaced the need for expensive, long-term maintenance. The integrated approach offered a sustainable solution to contain and immobilize PFAS at the source.

"The remedial efforts here are focused on stopping the migration pathway of PFAS from soil to groundwater. One of the reasons we chose SourceStop is it allows us to work around existing infrastructure, while ultimately mitigating our impact on site operations."

Brandon Tufano
Consultant, Integral Consulting

integral consulting inc

Treatment Technology: SourceStop

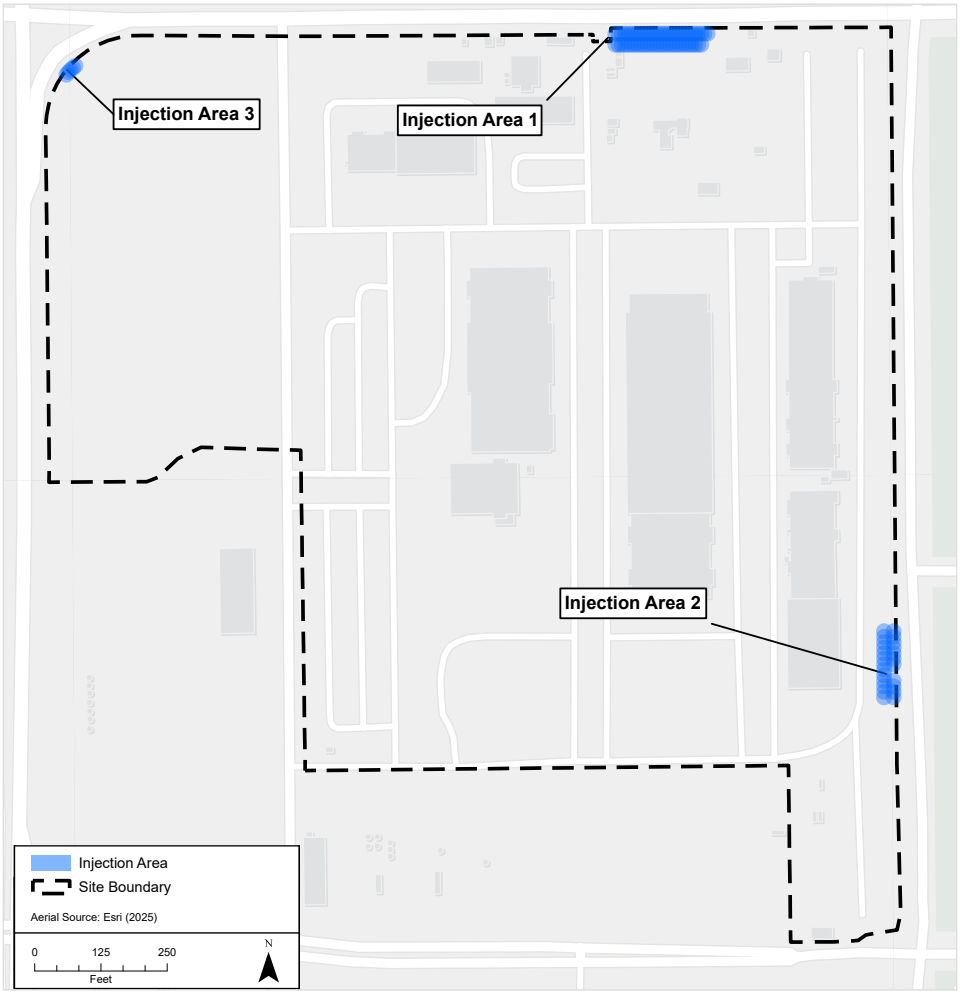
SourceStop Liquid is a colloidal activated carbon (CAC) formulation developed for in situ treatment of PFAS in source areas. Designed for precise subsurface distribution, it bonds to soil and aquifer particles, forming a sorptive matrix that permanently immobilizes PFAS. Key attributes include:

- **Capillary Fringe Targeting:** Engineered to treat the zone where leaching is most active
- **High Sorption Efficiency:** Rapid uptake of dissolved-phase PFAS
- **No Waste Generation:** Injected in liquid form—no excavation, no offsite handling
- **Barrier Durability:** Carbon particles bind effectively to alluvial soil matrices

SourceStop®

Figure 1 Site Plan

Site plan showing remediation areas.
Image credit: Integral



Application

RRS completed the full-scale SourceStop injections across two targeted areas:

Injection Area 1

Injection Points	135
Depth	23–40 ft bgs
Volume Injected	34,900 gallons
SourceStop Applied	52,800 lbs

Injection Area 2

Injection Points	78
Depth	25–30 ft bgs
Volume Injected	14,700 gallons
SourceStop Applied	22,200 lbs

Injection Area 3

Injection Points	5
Depth	25–35 ft bgs
Volume Injected	1,300 gallons
SourceStop Applied	2,200 lbs

Injection volumes and SourceStop quantities rounded to nearest 100-gallons.

The injection program was tailored to each area's unique subsurface conditions. At Injection Area 1, RRS navigated shallow refusal zones and infrastructure obstructions, making real-time adjustments and redistributing volume to maintain consistent barrier coverage. Injection Area 2 required a tighter injection grid due to nearby structures, but achieved high uniformity in product distribution. Injection Area 3 was a focused barrier application downgradient of a retention pond.

Across all areas, injection was completed within the allotted four-week schedule, with minimal surfacing or site disruption. Utility clearance, daily health and safety briefings, and constant field communication ensured smooth execution. The successful application demonstrates the flexibility and speed of SourceStop treatments.



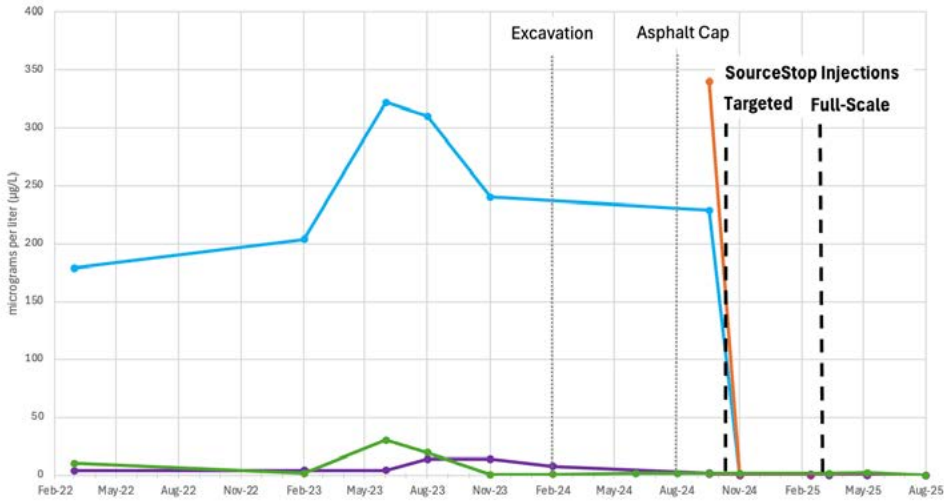
Results

Preliminary performance monitoring indicates that the SourceStop treatment is already delivering substantial reductions in total PFAS concentrations across multiple areas of the site.

Figure 2 Performance Monitoring Results

Preliminary remedial results in the treatment areas.

- Area 1 - MW-A
- Area 1 - MW-B
- Area 2 - MW-C
- Area 2 - MW-D
- Area 3 - MW-E



Injection Area 1

- >99.9% reduction at MW-A
- >99.9% reduction at MW-B

Injection Area 2

- 94% reduction at MW-C, approaching non-detect levels
- MW-D reduced to non-detect

Injection Area 3

- 94% reduction at MW-E

In the treated areas, the average total PFAS reduction is 98%. These reductions reflect the early effectiveness of SourceStop in intercepting and immobilizing PFAS mass flux. Follow-up sampling is ongoing to confirm long-term stability.

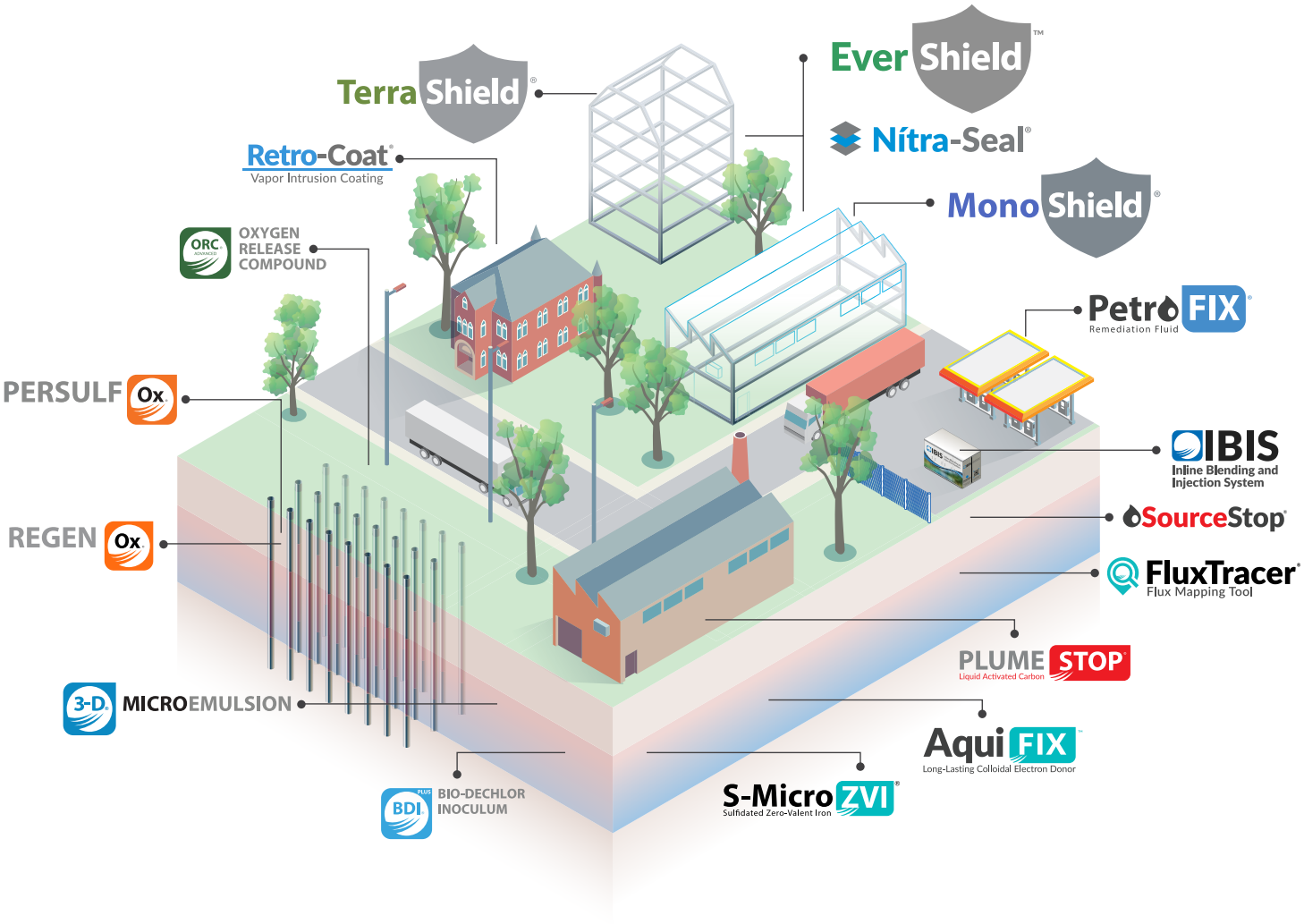




Conclusion

The use of SourceStop at the Colorado municipal site has resulted in rapid and significant reductions in PFAS concentrations at multiple performance monitoring locations. The technology's ability to sorb PFAS in place has proven effective in reducing leachability and halting contaminant migration. This early success suggests that the SourceStop barrier to prevent PFAS migration away from the source area is performing as designed and offers a sustainable, low-maintenance alternative to conventional remedies.

By targeting key source areas and reducing contaminant flux toward sensitive downgradient receptors, the project minimizes exposure risk and long-term liability. Ongoing monitoring will confirm the persistence of these gains, but preliminary data strongly supports the use of SourceStop CAC as a best-in-class treatment for PFAS in soil and the vadose zone.



About REGENESIS

At REGENESIS we value innovation, technology, expertise and people which together form the unique framework we operate in as an organization. We see innovation and technology as inseparably linked with one being born out of the other.

Inherently, innovation imparts new and better ways of thinking and doing. For us, this means delivering expert environmental solutions in the form of the most advanced and effective technologies and services available today.

We value expertise, both our customers' and our own. We find that when our experienced staff collaborates directly with customers on complex problems, there is a high potential for success including savings in time, resources and cost.

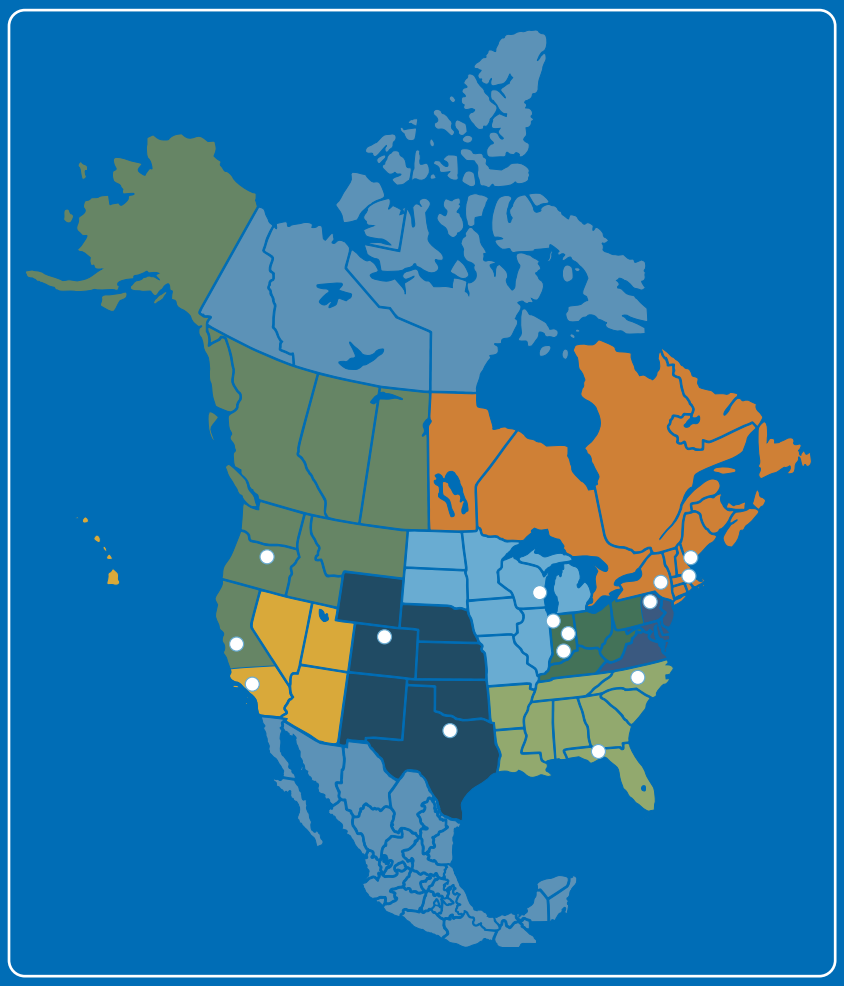
At REGENESIS we are driven by a strong sense of responsibility to the people charged with managing the complex environmental problems we encounter and to the people involved in developing and implementing our technology-based solutions. We are committed to investing in lasting relationships by taking time to understand the people we work with and their circumstances. We believe this is a key factor in achieving successful project outcomes.

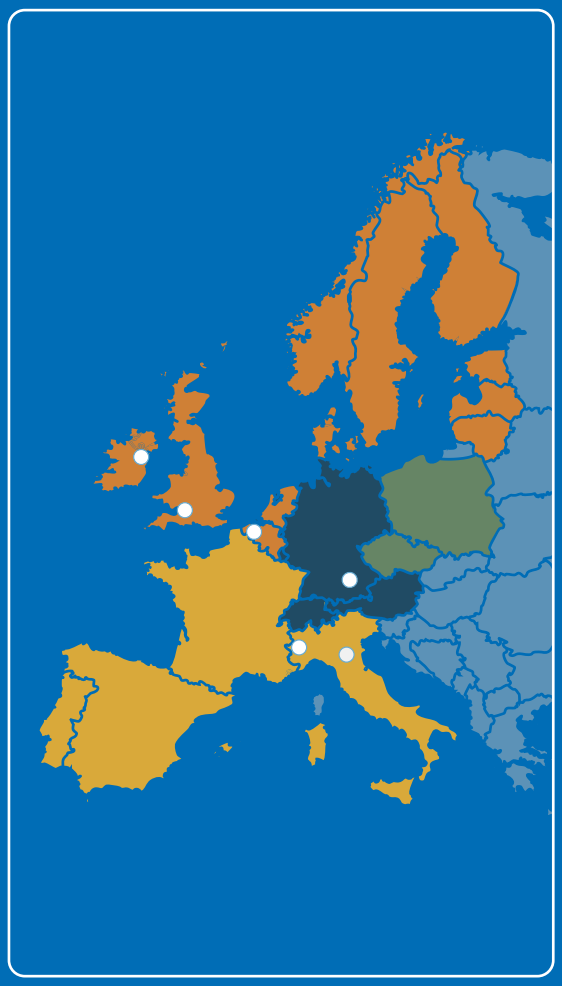
We believe that by acting under this set of values, we can work with our customers to achieve a cleaner, healthier, and more prosperous world.

REGENESIS®

Have a challenge? Let's solve it together.

Contact us today to discuss your specific needs.





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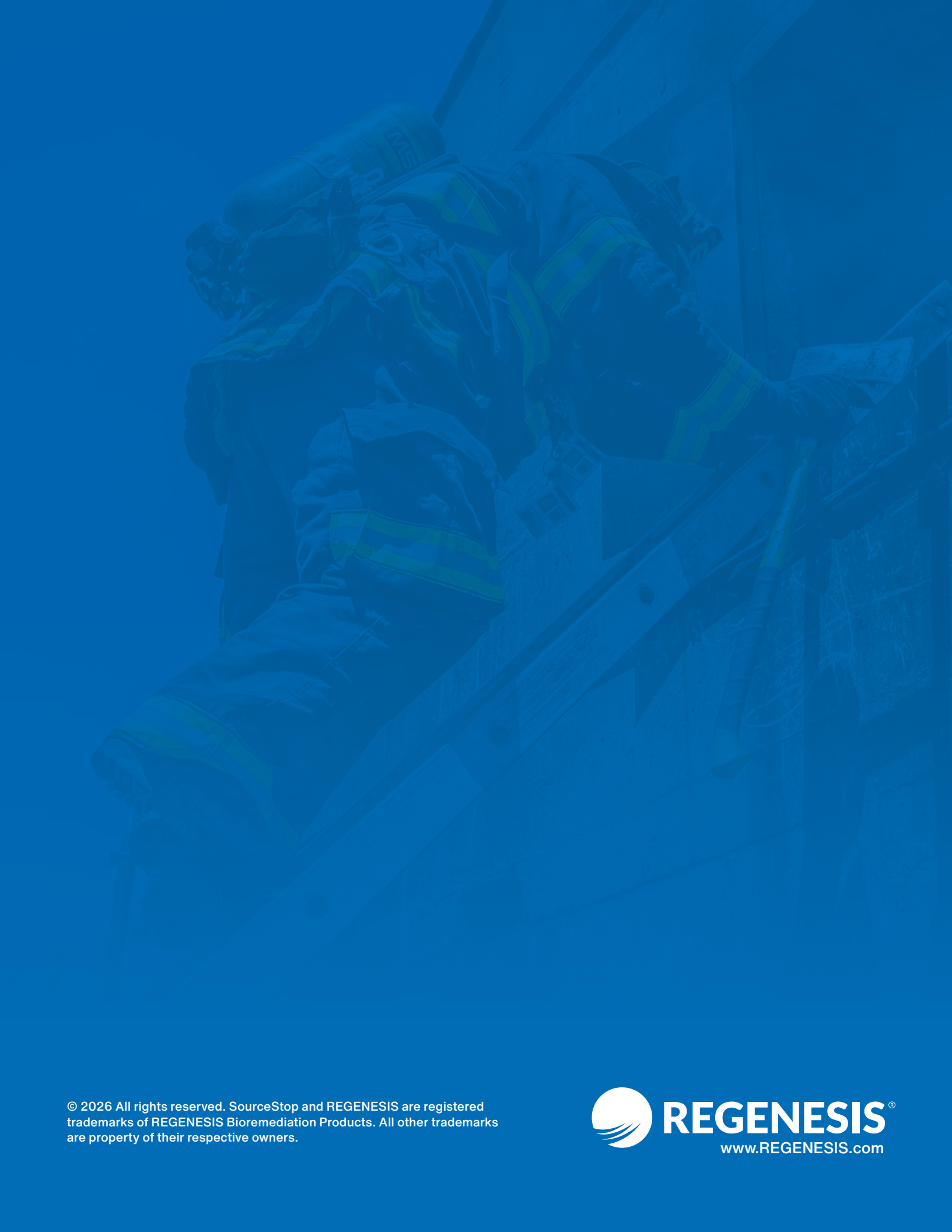
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