REGENESIS®

Cleanup Goals Met Post PetroFix Application

Case Study: Florida UST Release Site Now Poised for Closure

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Background

Nisey's Bait & Tackle, a former gasoline station located in the Florida Panhandle, was recognized as a petroleum release site more than 30 years ago. The release was reported in 1990, stemming from the property's underground storage tank (UST) system. Property owners of the site later applied and became eligible for state cleanup funds under the Abandoned Tank Restoration Program (ATRP).

Advanced Environmental Technologies, LLC (AET), a leading environmental consulting and engineering firm based in the Southeast, completed a site assessment to define the magnitude and extent of the petroleum hydrocarbon (PHC) contamination at the site in 2002. In 2006, an air sparge/multi-phase extraction (AS/MPE) system was installed, running for several years until suspending its operation due to state budget cuts. A Remedial Action Plan (RAP) was submitted in 2010 to modify the MPE system for reinjection of the treated water. The system ran for two years, was shut down for several years, modified, and restarted in early 2017. While in use, the AS/MPE system provided significant reductions to PHC concentrations, but was unable to meet required cleanup levels. As a result, the system was permanently shut off at the close of 2017.

Remediation

Timeline

1990
Petroleum Release from a leaking UST

2002
AET completes a site assessment to define the extent of the PHC contamination

2006
AS/MPE system installed

2010
Remedial Action Plan submitted to modify MPE system for reinjection of treated water.

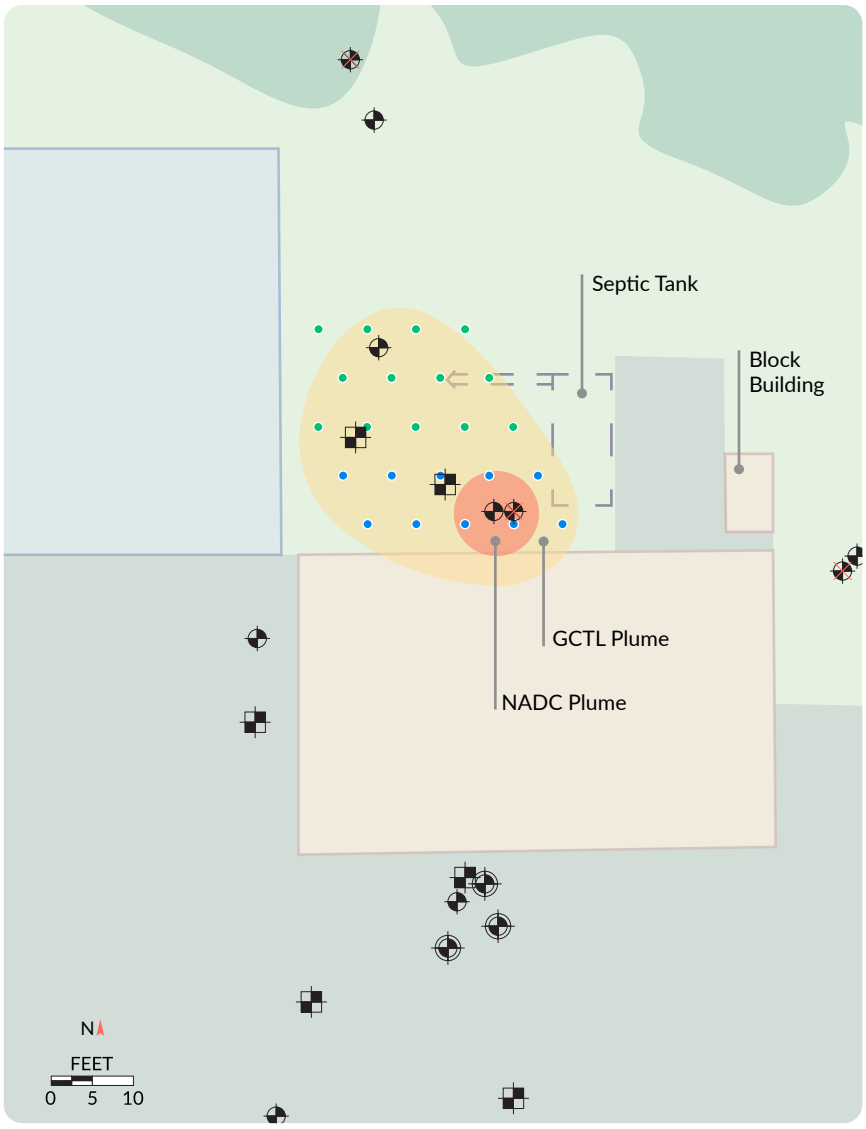
2017
AS/MPE system permanently shut down

2019
AET submitted a LSRAP to treat the residual PHC contamination

2020
PetroFix injections completed

Injecting PetroFix is Lowest Cost, Fastest Route to Site Closure

The AS/MPE system significantly reduced the contaminant mass during its operational lifetime. However, residual PHC contamination remained above the Florida Department of Environmental Protection's (FDEP's) groundwater cleanup target levels (GCTLs), requiring further remediation. The PHC impacts were contained in shallow saturated soils and groundwater in a relatively confined area north of the former station building.



- Treatment Area A Injection Point
- Treatment Area B Injection Point
- Monitoring Well
- Air Sparge Well
- Abandoned Monitoring Well
- Deep Monitoring Well

After reviewing the available remedial options, AET determined PetroFix® Remediation Fluid would provide the most economical and efficient means to reduce concentrations below the GCTLs and achieve site closure through the ATRP. Injection of PetroFix, a field-proven, colloidal activated carbon technology developed for PHC treatment, is a highly targeted and minimally invasive *in situ* approach, requiring low pressure for injection delivery. Since this was an active business, these features were favored for the minimal impact on operations compared to other approaches.

In 2019, AET submitted a Limited Scope RAP (LSRAP) to the FDEP to treat the residual PHC contamination. Following FDEP approval of the LSRAP, AET completed the injection of PetroFix in January 2020.

PetroFix Design Details

Treatment Surface Area	850 square feet
Baseline BTEX Concentration	2,132 µg/L
Injection Points	23
Vertical Treatment Interval	13 feet
PetroFix Quantity	2,400 pounds
PetroFix Injection Volume	9,400 gallons

AET's PetroFix Mixing and Injection Delivery System

Injection of PetroFix using direct push injection methods

Results

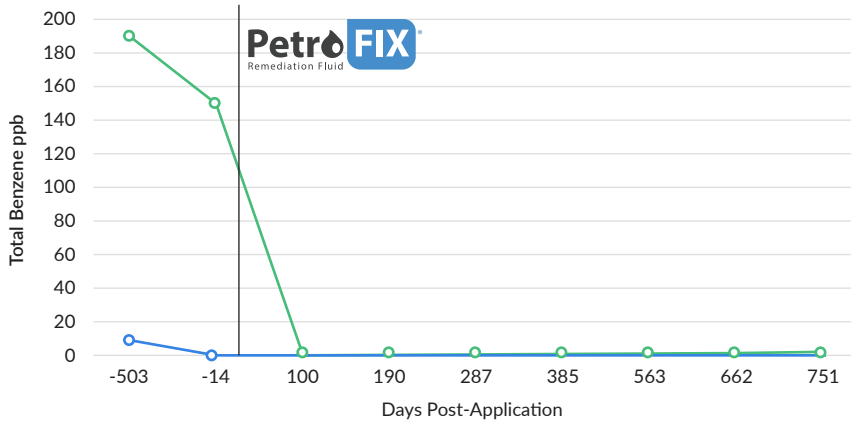
PetroFix Application Quickly Achieves Cleanup Goals and Sustains Reductions for Over Two Years, Poising the Site for Regulatory Closure

AET conducted the first quarterly sampling event three months after the PetroFix treatment. Laboratory results showed that the application had reduced all contaminants below the stringent GCTLs. These complete contaminant reductions have been maintained for over 30 months, with total BTEX reduced from over 2,000 micrograms per liter (µg/L) to 1 µg/L or less during the entire monitoring period, a 99.95% BTEX reduction.

Benzene Performance Data

Benzene concentrations in groundwater at two most-impacted monitoring wells (MW-10R and OW-1) following the PetroFix application. Results are shown in micrograms per liter or parts per billion (ppb).

Key: MW-10R OW-1



Evidence for the anaerobic biological reduction of the PHCs includes an initial increase, followed by a reduction in sulfate --an electron acceptor additive in PetroFix. Nitrate was also reduced below the baseline concentrations.

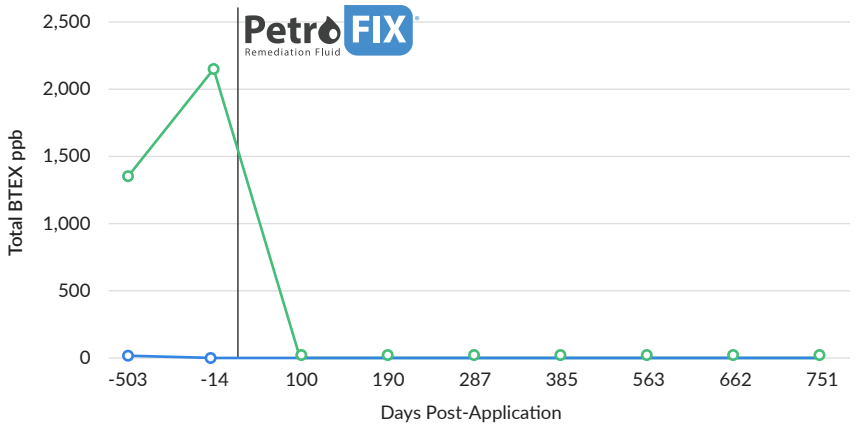
Finally, two Underground Injection Control (UIC) parameters, ammonia and aluminum, had concentrations increase above background concentrations after the injection and were required to be monitored along with other parameters such as sodium and total dissolved solids. Following the PetroFix application, ammonia and aluminum decreased below background concentrations at 2 of 3 wells monitored for UIC parameters within the first year. The final well reached background concentrations at roughly 2 years.

Based on these performance results, the site meets the criteria for ATRP closure and is pending review by the FDEP. The PetroFix application has effectively resolved a release incident that has remained open for over three decades.

BTEX Performance Data

Total BTEX concentrations in groundwater at two most-impacted monitoring wells (MW-10R and OW-1) following the PetroFix application. Results are shown in micrograms per liter or parts per billion (ppb).

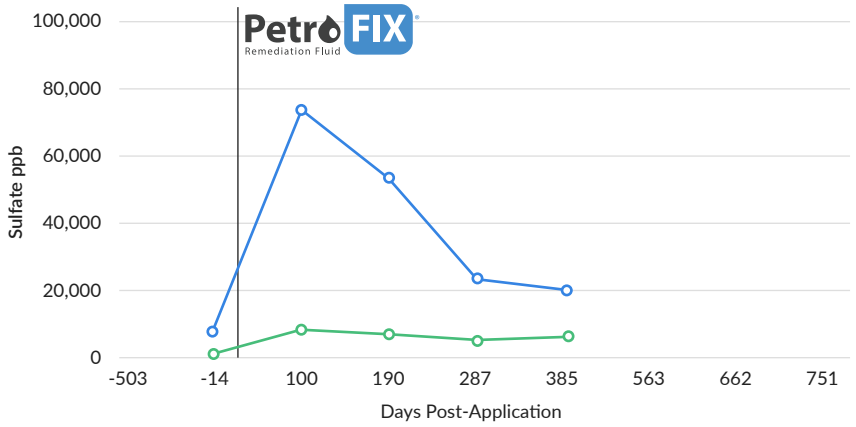
Key: MW-10R OW-1



Sulfate Concentration Data

Sulfate concentrations in groundwater following PetroFix application, providing a line of evidence for anaerobic bioremediation of the PHCs. Results are shown in micrograms per liter or parts per billion (ppb).

Key: MW-10R OW-1



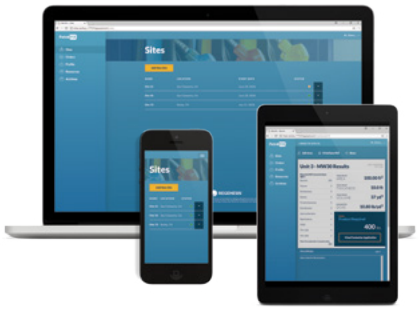
Technology

PetroFix Remediation Fluid®

PetroFix is a cost-effective, dual-functioning activated carbon solution designed to remediate petroleum spills and provide immediate results for gas station and UST sites. This safe and effective technology works with the PetroFix Design Assistant™, an online design tool that enables users to individually tailor their site designs and self-apply PetroFix.

PetroFix has a dual function: it removes hydrocarbons from the dissolved phase by adsorbing them on to activated carbon particles and then stimulates hydrocarbon biodegradation by adding electron acceptors. PetroFix is a highly concentrated water-based suspension consisting of micron-scale activated carbon and biostimulating electron acceptors. The environmentally-compatible formulation of micron-scale activated carbon (1-2 microns) is combined with both slow and quick-release inorganic electron acceptors. Practitioners can select between a sulfate and nitrate combination blend (recommended) or sulfate only for the additional electron acceptors required.

The PetroFix Design Assistant: You Design



Use our Online Software to Generate an Estimate When You Need it

To make applying PetroFix simple and easy to use, REGENESIS created an innovative and effective online tool for developing recommended dosage and designs for your site. The PetroFix Design assistant equips environmental professionals with the tools to design individually tailored remediation plans. This self-design, self-apply tool guides users toward effective designs that will yield the best results and allows users to easily order PetroFix through REGENESIS' customer service department. Educational resources and best practices are also offered, along with an online video tutorial that walks the user step-by-step through the design and ordering process.

1. Create Your Account

Begin by creating an account with details about your site, including the surface area and average vertical thickness and whether NAPL is present.

2. Recommended Treatment

After providing the soil grain size and the groundwater contaminant levels, the Design Assistant will provide results showing the suggested treatment, including the recommended volume, dosing, and product required for treatment.

3. Order PetroFix

Once all areas for the site are submitted, start the order process directly within the Design Assistant.

Simple
Easy to Use

Flexible
Designs Tailored to Your Site

Fast
No Waiting for a Design

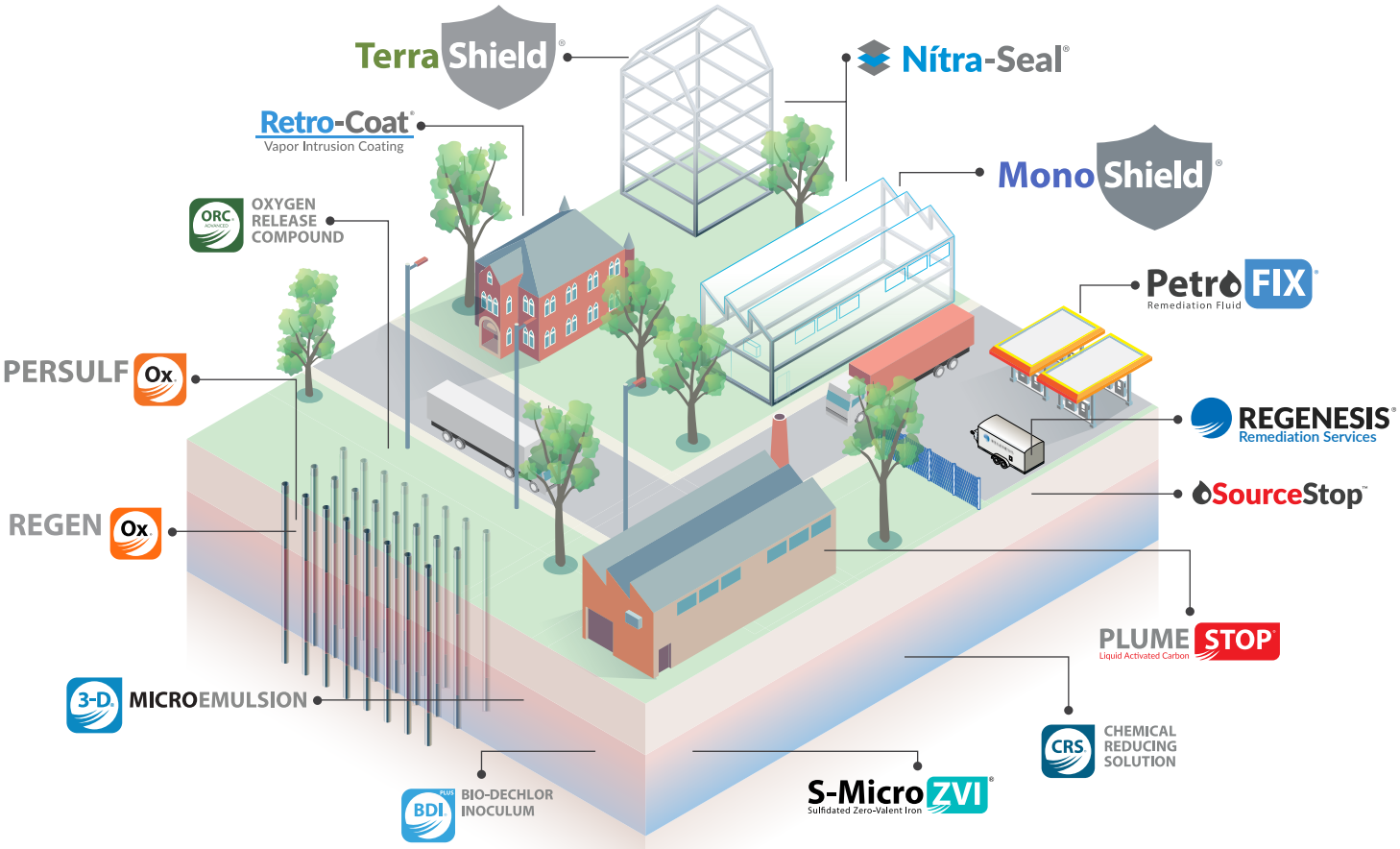
About the Consultant

Advanced Environmental Technologies, LLC

Advanced Environmental Technologies, LLC (AET) is a nationally recognized provider of comprehensive environmental solutions. We are experts in environmental science and engineering with the ability to translate that experience into on-site construction and field logistics.

Established in 1998, AET offers a complete range of environmental services from initial site reconnaissance through site remediation and closure. In today's business climate of increasingly complex environmental issues, regulations, and requirements, as well as increasing public and private sector awareness of environmental issues, AET provides a unique alternative to meeting our clients' diverse environmental service needs.

Our staff has practical, hands-on experience treating the full range of environmental contaminants in multiple media. This includes solving problems involving hydrocarbons, solvents, pesticides, toxic metals, asbestos, and other chemicals that may be present in soils, sediments, sludge, groundwater, surface water, and air. AET's streamlined structure supports a proactive project management style to control schedules and costs and provides efficient and equitable service to our clients.



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.

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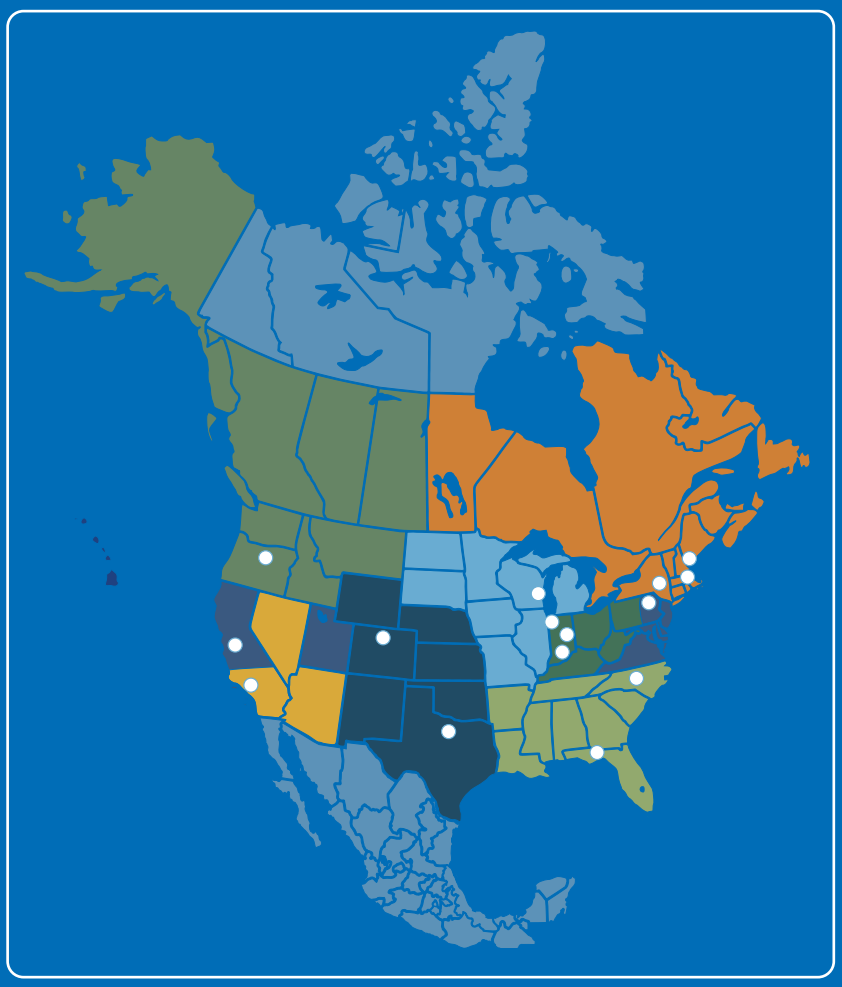
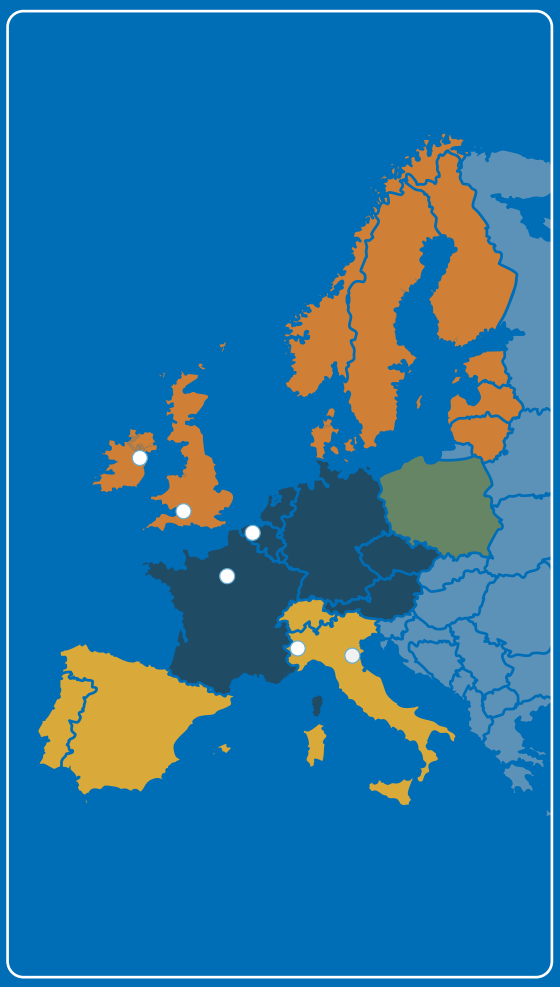
We're Ready to Help You Find the Right Solution For Your Site





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Visit www.REGENESIS.com to learn more.

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