Cleaning Up Brownfield Sites

Unsafe levels of environmental contamination on a brownfield may result from past or current industrial, commercial, residential, agricultural or recreational uses and practices. Contaminants may be found in soil, water or air. Cleaning up contaminants on a brownfield reduces or eliminates potential health risks to residents, workers, pets and the surrounding environment. How much cleanup is needed depends on the specific contaminants found at the brownfield, the extent of contamination, and how the property will be reused.

Risk levels. States and tribes use a risk-based cleanup approach to determine the required level of cleanup necessary at brownfield properties. These levels are set to pose minimal risk to human health and the environment, in accordance with federal standards. States and tribes require cleanup to meet risk-based standards based on contaminants present and the planned reuse for the brownfield.

Planned reuse for the brownfield. The amount of cleanup required at a brownfield depends on how the site will be reused. The risk of future exposure to contaminants may be greater for residents and workers who will spend much of their time living or working there. Children, elderly, pregnant women and occupants who are ill can be especially sensitive to contaminants. The risk-based cleanup will consider sensitivities of the specific populations and their time spent on the property.

Residential

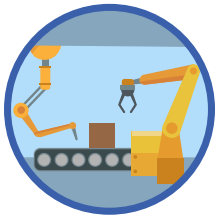
Residents (including children and elderly) spend a lot of time at home every day.

Green Space

Children and adults may frequently enjoy outdoor sports, play or other recreation.

Commercial

Workers and customers typically enter commercial settings during business hours only.



Industrial

Employers establish safety controls to minimize contaminant exposure to adults working onsite throughout day or night.

An effective brownfields cleanup protects the population from potentially harmful exposures by **removing or containing** site contaminants. For example:

- A residential site, where children may play or elderly live, requires a cleanup that **removes** contaminants above residential risk levels, so the property poses minimal risk from contaminant exposure.
- A factory with legacy contaminants associated with past uses may require cleanup in specific areas of the site to **remove** contaminants where workers could be exposed to levels above industrial standards. In low-access areas, such as power generation or vehicle storage, residual contaminants may be **contained**.

How can my community clean up a brownfield site?

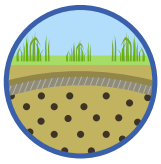
Identify the planned reuse for the site and seek out experts who can help you navigate the cleanup process.

- Through experience, U. S. EPA, state and tribal cleanup programs have learned a great deal about cleanup and contaminated site reuse. State and tribal programs oversee cleanups to ensure safe reuse standards are met.
- Cleaning up a brownfield requires assistance from an environmental professional to create a site cleanup plan based on assessment findings and to conduct the cleanup according to state, tribal and local requirements.

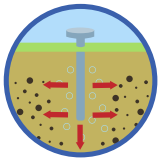
The specific approach used to clean up a site depends on the way the site will be reused. Site reuse will dictate the need for clean soil; geotextile or cover/cap; land use controls; and whether lead or asbestos abatement is required. Various technologies are available to clean up contaminated properties. The technology selected will largely depend on cost and contamination characteristics of the site. The following are some of the commonly-used methods for cleaning up brownfields and other contaminated sites.

Excavation. Contaminants and contaminated soil on the surface or subsurface are dug up from the site and transported offsite for treatment or disposal in a landfill. Clean soil or other material can be used to fill the excavated area and create a level surface for reuse.

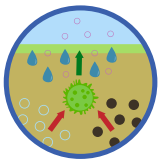
Tank removal. Soil contaminated with gasoline or other fuels is dug up from the site to expose and remove the underground storage tanks and piping system. Then the soils under the tank can be examined for contamination and removed as needed.



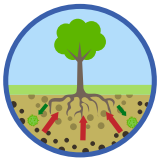
Capping. Creating or adding a barrier between the surface and contaminants by using a geotextile, a layer of clean soil or both. Capping protects areas of cleanup, reduces exposures and prevents the spread of contamination.



On site or 'In-situ' treatment. Chemicals are injected into the soil to break down contaminants or convert them into less harmful or toxic substances. Solidification or stabilization adds binding or chemical agents to prevent contaminant movement.



Bioremediation. Naturally-occuring or adapted microbes consume organic contaminants. Active management at bioremediation sites includes adding nutrients, oxygen or chemicals that release oxygen to increase microbial growth, allowing them to degrade the contaminants over time to water, gas or less harmful or toxic substances.



Phytoremediation. Plant root systems release substances which help plants neutralize, stabilize or increase microbial degradation of contaminants in contaminated soil or water near roots. Select plants can also take up contaminants through their roots, reducing soil and water contamination over time.

Lead and asbestos abatement. Lead and asbestos are inspected and removed by specially-trained licensed contractors. The training, inspection and abatement may be regulated by environmental or public agencies separate from brownfield programs. Lead and asbestos removal involve removal of contaminated material in contained areas using specialized equipment.

The U.S. EPA's Contaminated Site Clean-Up Information (CLU-In) and the U.S. EPA Series: A Citizen's Guide to Cleanup Technologies are web and fact sheet resources developed to introduce and explain common cleanup technologies, approaches and equipment used at Superfund, brownfield and other contaminated sites. Citizen's guide fact sheets focused on Excavation, Capping, Bioremediation, Phytoremediation, In-Situ Treatment, Solidification and Stabilization were consulted in the preparation of this fact sheet.

United States Environmental Protection Agency

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