



A Citizen's Guide to Monitored Natural Attenuation

The Citizen's Guide Series

EPA uses many methods to clean up pollution at Superfund and other sites. If you live, work, or go to school near a Superfund site, you may want to learn more about cleanup methods. Perhaps they are being used or are proposed for use at your site. How do they work? Are they safe? This Citizen's Guide is one in a series to help answer your questions.

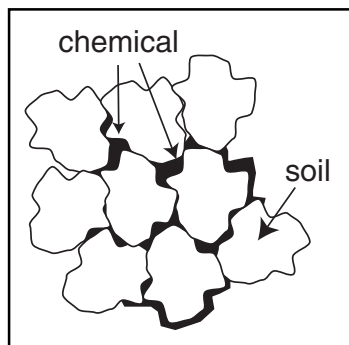
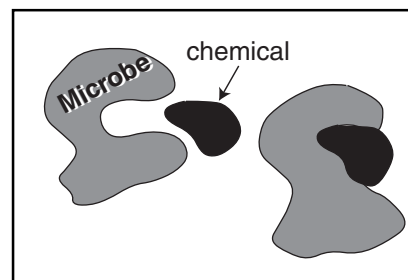
What is monitored natural attenuation?

Natural attenuation relies on natural processes to clean up or *attenuate* pollution in soil and groundwater. Natural attenuation occurs at most polluted sites. However, the right conditions must exist underground to clean sites properly. If not, cleanup will not be quick enough or complete enough. Scientists *monitor* or test these conditions to make sure natural attenuation is working. This is called *monitored natural attenuation* or *MNA*.

How does it work?

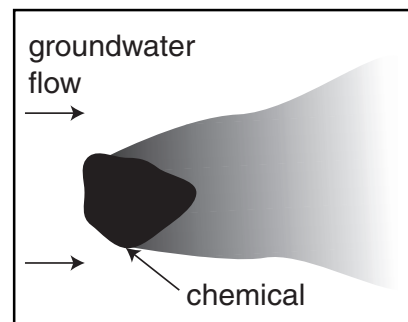
When the environment is polluted with chemicals, nature can work in four ways to clean it up:

1. Tiny bugs or *microbes* that live in soil and groundwater use some chemicals for food. When they completely digest the chemicals, they can change them into water and harmless gases. (A *Citizen's Guide to Bioremediation* [EPA 542-F-01-001] describes how microbes work.)

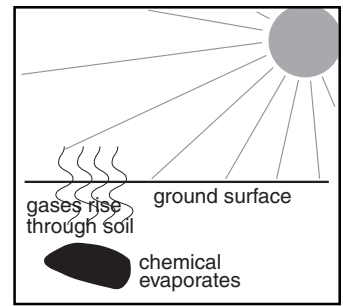


2. Chemicals can stick or *sorb* to soil, which holds them in place. This does not clean up the chemicals, but it can keep them from polluting groundwater and leaving the site.

3. As pollution moves through soil and groundwater, it can mix with clean water. This reduces or *dilutes* the pollution.



4. Some chemicals, like oil and solvents, can *evaporate*, which means they change from liquids to gases within the soil. If these gases escape to the air at the ground surface, sunlight may destroy them.



MNA works best where the source of pollution has been removed. For instance, buried waste must be dug up and disposed of properly. Or it can be removed using other available cleanup methods. After the source is removed, the natural processes get rid of the small amount of pollution that remains in the soil and groundwater. The soil and groundwater are monitored regularly to make sure they are cleaned up.

Is it safe?

MNA can be a safe process if used properly. No one has to dig up the pollution, and nothing has to be added to the land or water to clean it up. But MNA is not a “do nothing” way to clean up sites. Regular monitoring is needed to make sure pollution doesn’t leave the site. This ensures that people and the environment are protected during cleanup.

How long will it take ?

The time it takes for MNA to clean up a site depends on several factors:

- type and amounts of chemicals present
- size and depth of the polluted area
- type of soil and conditions present

These factors vary from site to site, but cleanup usually takes years to decades. MNA is used when other methods will not work or are expected to take almost as long. Sometimes MNA is used as a final cleanup step after another method cleans up most of the pollution.



For more information

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Further information also
can be obtained at
www.cluin.org or
[www.epa.gov/
superfund/sites](http://www.epa.gov/superfund/sites).

Why use monitored natural attenuation?

Depending on the site, MNA may work just as well and almost as fast as other methods. Because MNA takes place underground, digging and construction are not needed. As a result, there is no waste to dispose of in landfills. This is less disruptive to the neighborhood and the environment. Also, it allows cleanup workers to avoid contact with the pollution. MNA requires less equipment and labor than most methods. Therefore, it can be cheaper. Monitoring for many years can be costly, but it may cost less than other methods.

MNA is the only cleanup method being used at a few Superfund sites with groundwater pollution. At over 60 other sites with polluted groundwater, MNA is just one of the cleanup methods being used. MNA also is used for oil and gasoline spills from tanks.

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