

Petroleum-Contaminated Soils Treatment Options



State of Oregon
Department of
Environmental
Quality

Land Quality Division Underground Storage Tank Program

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This guidance document is designed to provide assistance in the preparation of plans for treating petroleum contaminated soils. It lists requirements for completing the soil treatment and outlines final treatment levels for the treated soil. A written Soil Treatment Plan must be submitted with the *Solid Waste Letter Authorization (SWLA)* permit application for each project, whether on-site or off-site treatment is proposed.

General Information

Soil aeration works best for gasoline contaminated soils. Due to the low volatility of diesel and heavier hydrocarbons, soil aeration for these contaminants is very slow or requires frequent maintenance (tilling, etc.) and **often does not work at all**. Aeration of gasoline contaminated soils works best on sandy or silty soils with low clay content, and is most effective in warm, dry weather.

Bioremediation, a biological soil treatment process, is often a more effective method for treating non-gasoline fraction hydrocarbon petroleum contaminated soil. The basic procedures outlined in this guidance may also apply to bioremediation projects. However, since there are some major differences in the actual treatment process, you should contact the DEQ regional office (see Page 3) to discuss your particular project prior to submitting the written plans for bioremediation.

A *Solid Waste Letter Authorization* is valid for six months, although a one-time renewal may be possible. Therefore, proposals for soil aeration that provide for treatment up to a maximum of one year duration may be acceptable. If treatment has not been completed in that time, the Department may require that the soils be removed for alternative treatment or disposal. The Department may rescind authorization for treatment at any time if the soil is not being managed properly.

Please be aware that local jurisdictions may have different requirements for how - or if - soil treatment or stockpiling may occur. You must check with local land use authorities before initiating treatment activities to ensure that this type of activity is allowed at your site and, in the

case of off-site treatment, have a representative from the local jurisdiction sign the *Land Use Compatibility Statement*.

Treatment Site

On-site and off-site treatment areas should be chosen with care. Ideal locations are at a reasonable distance (ie: >100 feet) from wetlands, streams, residential areas, or other locations where potential run-off or fugitive vapors may result in threats to the environment or cause public exposure or nuisance conditions. Proposed treatment within a 100 year flood area will require a case by case review.

You must have the property owner's written approval to use their site for treatment of contaminated soils. Public access to the aerating soil must be restricted. This may require fencing the area and/or posting signs at the site to alert the public of potential health hazards.

The treatment area must be prepared to meet certain conditions including lining, berming, and covering the contaminated soil (except during active treatment times). This is necessary to prevent surface water run on and run off within the treatment area.

Ideally, the petroleum contaminated soil should be spread within the prepared treatment area at a depth of 6 to 12 inches and left exposed to the atmosphere. The contaminated soil should be covered with plastic sheeting during rainy periods. The plastic sheeting should be weighted or anchored so that the soil does not become exposed during storms or windy conditions. Periodic tilling or turning of the soil is generally necessary in order to facilitate complete treatment. The treatment site must be checked periodically to ensure that site security remains intact, to make progress checks on the treatment, and to generally assure that everything is going according to plan. This is especially important in order to prevent problems from developing.

Leachate

Leachate is the water that has percolated through the contaminated soil, and which may in turn be contaminated as a result of contact with the contaminated soil. The leachate must be collected whenever enough water collects on the

liner to make removal feasible. This may involve installation of a fluid level activated pump. The water may require treatment prior to disposal.

Departmental approval of the proposed leachate collection system is required prior to building the system. If discharge to a surface stream or land surface is proposed, you must apply for a *Water Quality Discharge Permit* from the Department. If discharge to a sanitary sewer is proposed, coordinate with the local sewer authority first.

Soil Sampling

Initial soil sampling must include a Hydrocarbon Identification test (HCID). The sampling methods used throughout the treatment process must be specific to the types of contamination found during the HCID test. The samples must be collected from the soil that is furthest from the surface of the pile or is otherwise the most likely to contain the highest level of remaining contamination. The samples must be analyzed for Total Petroleum Hydrocarbons (TPH) using the appropriate *Northwest Total Petroleum Hydrocarbon Methods* (NWTPH-G or NWTPH-D based on the type of contamination.) **A site diagram which shows sample depths and locations must be submitted each time samples are collected.**

Soil sampling will take place in four (4) phases as follows. The first phase will be the **HCID** test, followed by quarterly **interim** sampling used as a progress check, **final** sampling to gauge final compliance, and lastly **closure** sampling of soil from under the treatment area. One discrete soil sample is required for approximately every 50 cubic yards of treated soil. In some situations sampling rates may be more or less than this. Regardless of soil volume, a minimum of two samples must be collected during each sampling event for each treatment site. If review of the written plan indicates that the number of samples proposed will not adequately assess the treatment effectiveness for a particular site, the Department may require that modifications to the plan be made. Although composite samples are not acceptable for final or closure sampling, the use of composite samples for interim sampling to measure treatment effectiveness may be appropriate. Samples must be collected quarterly to demonstrate that treatment is effective. Alternate sampling schedules may be proposed in the Soil Treatment Plan depending on site-specific circumstances.

Target Treatment Levels

Cleanup levels are established using the *Soil Matrix Rules*. These levels are site specific as

they address such issues as depth to groundwater, native soil types, sensitivity of the uppermost aquifer, etc. If the treated soil will be reused in the original excavation at that site, the matrix level established for your site may be appropriate as a target treatment level. If the contaminated soil is to be treated at an off-site location, it must be treated to levels at or below the most stringent (matrix level I) cleanup standard. If you wish to reuse treated soils at a site where groundwater was encountered, be sure to discuss this ahead of time with the local DEQ regional office.

Treatment to levels below the most stringent matrix levels (40 ppm by Method NWTPH-G for gasoline, or 100 ppm method NWTPH-D for diesel or other non-gasoline fraction hydrocarbon contaminated soil) is always preferred. Another way of saying this is that cleaner is better where soil treatment is concerned. Treatment meeting the most stringent cleanup standards will also give you more flexibility if you wish to reuse this treated soil at another location. In addition, soils must be field-screened for pockets of contamination as they are moved to the final fill location. Any identified pockets should be sampled again and treated further if necessary.

Reporting

If soil treatment is not completed within three months after beginning treatment, quarterly progress reports must be submitted to the Department. The quarterly reports should contain an update of all activities that have occurred since the last report (site visits, etc.); a copy of all sample results and chain of custody forms must be attached. **Include a site diagram with sample locations and depths.**

Quarterly reports are due on the 1st of January, April, July, and October. If the 1st of the month is the weekend or a holiday, it will be due on the following business day. A quarterly report form has been developed for your use. You must notify the Department if there is a need for any significant deviation from the Treatment Plan at any time during the project.

Once the soils undergoing treatment have met the appropriate cleanup level, a **final report** detailing the results of the treatment process must be submitted. This report is due near the time of permit expiration (as specified in the permit) regardless of the outcome of the remediation process. This report must summarize the entire project including all previous sampling events and indicate whether the goals outlined in the written Soil Treatment Plan were achieved.

Include the results of analysis conducted on final soil samples along with the site/sampling diagram. If the treatment levels are not reached within the time allowed, this report must include plans for disposal of the soil at an approved acceptance facility and a time frame for doing so. The Department must review this report and make a recommendation prior to any reuse or movement of soil.

NOTE: The results of the final sampling round must be reviewed with the local DEQ regional office prior to final placement of the treated soils.

A follow-up or **closure report** which documents soil disposal or reuse is due at the time of project completion. This report must document soil disposal or reuse and the results of analysis conducted on soil samples taken from under the treatment area.

Reuse of Soils

If groundwater is encountered at your site, it may not be appropriate to reuse the soil at the same location. Note that "treated" does not equal "clean" and caution must be exercised when reusing the soil. Because these soils generally are not considered "clean", you must ensure that the soils will be placed out of human contact and above seasonal high groundwater levels. In most cases this will require placing a minimum of one foot of clean fill on top of the treated soil to isolate it from human contact and a minimum of two feet of clean fill or native soil between the treated soil and the high groundwater level to protect groundwater. Treated soils may not be placed in or near wetlands, 100-year floodplain, or other sensitive environmental areas. Treated soils may not be moved from the treatment area until you have contacted the local DEQ regional office.

Because there may still be some residual contamination levels remaining after treatment, the property owners of sites where soils will be reused must sign a statement indicating they are aware of what they are receiving and how it must be handled. Please note that this is necessary even if the same person or company owns both the property where the contaminated soils originated and the property where they will be reused.

Closure Sampling

If plastic sheeting is used as the liner in the treatment area, samples must be collected and analyzed from the native soil underneath the treatment area. This is done after treatment is

complete and the treated soils have been removed. The purpose of this sampling is to ensure that contamination has not impacted the soil underneath the treatment area. If any contamination is detected below the treatment cell liner, additional cleanup work and sampling may be required.

The total number of treatment area samples generally required is equal to one half of the amount of samples required during final sampling. If the treatment cell liner has obvious rips and tears, or if soil staining is encountered, samples must be collected from each of those areas. If the treatment area was lined with a heavy impermeable liner, tilling was limited to a specific depth by the use of precision equipment, and/or had a leachate collection system, sampling of the native soil may not be necessary. Consult with your local DEQ regional office regarding the specific requirements for your site. The sampling requirements may be considerably less stringent.

Written Plan Format

A Soil Treatment Plan report form has been designed to be used for the majority of treatment projects in order to save both your time in preparation and DEQ time in review.

As already noted, a final report that summarizes the information contained in quarterly reports must be submitted prior to moving any treated soil to another location or placing them back in the original excavation. The final report should describe the actions taken during treatment and indicate whether the goals outlined in the written Soil Treatment Plan were achieved.

Summary

Because treatment conditions for each site are unique, the specific requirements listed in this guidance document may be more or less stringent than what is actually needed for your site. Careful coordination and prior approval from your local DEQ regional office at specific junctures in the treatment process is extremely important. A final determination that "no further action is required" for the entire cleanup project will not be made by the Department until all details regarding the treated soils have been satisfactorily addressed and documented.

Publications Available on Tanks Website

Publications mentioned in this Fact Sheet may be downloaded from the Tanks Website at:
<http://www.deq.state.or.us/lq/tanks/index.htm>.

Contacting DEQ Regional Tank Staff

Tank Staff are available at the following offices:

In Northwest Oregon (Clatsop, Clackamas, Columbia, Multnomah, Tillamook and Washington counties):

- Portland, 2020 SW Fourth Ave., Suite 400, 503-229-5263

In Western Oregon (Benton, Coos, Curry, Douglas, Jackson, Josephine, Lane, Lincoln, Linn, Marion, Polk and Yamhill counties):

- Salem office: 750 Front St. NE, Suite 120, 503-378-8240
- Eugene office: 165 E. 7th Avenue, Suite 100, 541-686-7838
- Coos Bay office: 381 N. Second Street., 541-269-2721 ext 31

In Eastern Oregon (Baker, Crook, Deschutes, Gilliam, Grant, Harney, Hood River, Jefferson, Klamath, Lake, Malheur, Morrow, Sherman, Umatilla, Union, Wallowa, Wasco and Wheeler counties):

- The Dalles office: Columbia Gorge Community College, 400 E. Scenic Drive, Building 2, 541-298-7255

Alternative formats

Alternative formats (Braille, large type) of this document can be made available. Contact DEQ's Office of Communications & Outreach, Portland, at (503) 229-5696, or toll-free in Oregon at 1-800-452-4011, ext. 5696.