



State of Oregon
Department of
Environmental
Quality

Guidance for Applying the Low-Impact Site Rule to UST Cleanup Sites

(OAR 340-122-0243)

Oregon Department of Environmental Quality

Land Quality Division

Underground Storage Tank Program

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Portland, OR 97204

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Note 1: The Department made revisions to this document in October 1999 in order to bring it up-to-date with the guidance on *Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites* (RBDM Guidance) (DEQ, 1999).

Revisions were limited to the following:

- (1) Risk-based concentrations (RBCs) were added. These RBCs were taken from the Table of RBCs in the Department's RBDM guidance.
- (2) More explanatory notes were added to the Table of Toxic Contaminants of Concern. These notes correspond to those found in Table 2.1 in the Department's RBDM guidance.
- (3) To provide consistency between the two guidance documents, the Table of RBCs in this document has been moved to Appendix A, and the list of Toxic Contaminants has been moved to Appendix B.

No changes were made to any of the procedures or guidelines that were originally included in the December 1998 version of this document.

Note 2: No Substantive changes were made to this document in January 2008 or May 2009. Although the *Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites* reference document was updated on September 22, 2003, the references herein are still related to the RBDM Guidance – DEQ, 1999.

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1. Introduction

Oregon's *Cleanup Rules for Leaking Petroleum Underground Storage Tank (UST) Systems* (OAR 340-122-0205 through 340-122-0360) include an option for designating certain petroleum-contaminated properties as "low-impact sites." The requirements for the low-impact site (LIS) option are found in OAR 340-122-0243. This guidance document is intended to provide you with additional information about the LIS option.

1.1 Guidance Overview

An important factor to consider when selecting a cleanup option is that its usefulness may depend as much on your plans for the petroleum-contaminated property as it does on the magnitude and extent of contamination found there. Therefore, before deciding whether the low-impact site option is one that you may want to use, you should understand:

- The purpose of the option;
- How it compares to other UST cleanup options; and
- The conditions and restrictions on its use.

Section 2 of this guidance document describes the purpose of the low-impact site option, and provides answers to some basic questions about its use. If your site fits into the framework described in Section 2 you may be able to benefit from the LIS option.

If you think that the LIS option may be a good way to manage your petroleum-contaminated property, and if this option is applicable to your site, you then need to review the low-impact site requirements. Although many of the initial requirements -- reporting the release, initial response and abatement, site investigation, etc. -- are the same as for the other UST cleanup rule options, you need to know how this information is used at low-impact sites and what must be submitted to the Department.

Section 3 of this guidance document summarizes the steps you should take if you want to propose the low-impact site option for your site.

1.2 Limitations

Although this guidance document is intended to assist you in applying certain portions of the UST cleanup rules to your site, you should always refer to the rules for the specific requirements. If you have questions about low-impact sites or other aspects of the UST cleanup rules, it is recommended that you contact UST cleanup staff in the region where your site is located. Please refer to Appendix E for a list of regional office addresses and phone numbers.

This document may be revised at any time. For the current version of this and other UST program documents, please visit the program's website at:

<http://www.deq.state.or.us/lq/tanks/ust/index.htm>

2. Purpose

The purpose of the low-impact site option is to provide a streamlined process for use at gas stations or other industrial or commercial properties that allows these facilities to remain in operation while the responsible parties manage any potential risk from contamination remaining at these sites. This section describes what low-impact sites are and answers some basic questions about them so that you can decide if this option is appropriate for your site.

2.1 Low-Impact Site Definition

Although there is no simple definition, generally speaking, low-impact sites are those where:

- The release and lateral extent of contaminant plumes are relatively small;
- Contaminant migration has stopped (i.e., contaminant plumes are stable);
- The threat to human health and the environment is minimal;
- Actions have been taken to control future exposure (e.g., institutional controls); and
- Site use will not change while contamination remains and controls are in place.

The basic premise behind these conditions is that if they are met we should be able to safely allow the time for natural attenuation to further reduce the levels of contamination.

So, although low-impact sites are contaminated, if that contamination is not causing a current problem, and if you can implement and maintain controls or continue monitoring to make sure that future problems don't occur, then you can continue to use the site while allowing time for natural attenuation to continue the remediation.

2.2 Low-Impact Site Questions and Answers

If the impact is “low,” why not just close the site using soil matrix or generic risk-based cleanup levels?

At sites where contaminant concentrations are quite low, it may be better to seek a no further action (NFA) letter solely on the basis of soil matrix or generic risk-based standards. Low-impact sites, however, may have moderately high TPH or constituent concentrations that exceed these standards. To determine if the current impact is low you must take into account not only contaminant concentrations, but also contaminant location, site use, and other site-specific factors like institutional or engineering controls. Therefore, if a site meets the LIS requirements it means that the risk is low *due to the current conditions at the site*. If site use or conditions change, risk must be reevaluated to ensure that it remains at or below acceptable levels.

If contamination remains, won't it eventually have to be cleaned up?

Possibly, but not necessarily. For example, if you plan to sell a low-impact site you may have to reevaluate the levels of contamination and decide if additional action is necessary at that time. Remember, however, that one of the factors on which the low-impact site idea is based is the known tendency for petroleum contamination to undergo natural attenuation. Reevaluation may

show that contaminant concentrations have dropped due to natural attenuation. This may allow you to remove some or all of the restrictions that were placed on the site when it was originally designated as a low-impact site, and additional cleanup may not be necessary.

How are low-impact sites different from risk-based corrective action sites?

In many respects they are the same. Both have to be reported, both have to be investigated, both may require some cleanup, both may need institutional or engineering controls, and both have to be protective. However, there are a couple of very important differences.

- For risk-based corrective action you have to use site-specific data to demonstrate that what you are proposing to do meets acceptable risk levels. For low-impact sites you only have to demonstrate that they meet a set of predetermined conditions which are assumed to be adequately protective.
- For risk-based corrective action you have the flexibility of evaluating risk for a variety of potential future uses of the property. For low-impact sites you are limited to a predetermined site use.

In general, low-impact sites are just a clearly-defined subset of sites which, if handled in the prescribed manner, will meet the requirements for dealing with petroleum-contamination from leaking USTs.

If a site meets the LIS requirements, will the owner receive a “No Further Action” (NFA) letter?

The Department will be issuing letters to sites that meet all of the LIS requirements. Since the purpose of the low-impact site designation is to allow time to see if natural attenuation will reduce contaminant levels, low-impact site letters might have more conditions than standard NFA letters. LIS closure letters will describe the basis for the Department’s determination, list all restrictions that must be maintained, and notify responsible parties that they are required to contact the Department if site use changes, and reevaluate their sites at that time. A sample LIS letter is provided in Appendix D.

Will restrictions be placed on all low-impact sites?

Restrictions will probably be required on all LIS sites. This is because the LIS requirements are designed to take into account the current use of the site, including not only the land and water use, but in some cases the specific location of buildings relative to the contamination. Since these factors are taken into account when making the determination that the current risk is acceptable, maintaining such conditions will be necessary to ensure that future risk also remains acceptable.

How can restrictions be removed from a site?

Removing restrictions will require a reevaluation of the site. This would likely include collection of additional samples and, if a change in site use is being proposed, a reassessment of potential site exposures for the proposed site use. Depending on the results, additional cleanup may also be necessary before some or all of the restrictions would be removed. For example, if a

site is required to maintain a paved surface to prevent contact with contaminated soils, you would have to collect additional soil samples to demonstrate that degradation has reduced concentrations to the point where the risk from contact with the soil is no longer unacceptable. If concentrations were still too high, additional soil treatment or removal would be necessary before the restrictions could be removed.

Can the LIS option be applied to any site?

No. Because this is a generic approach, the low-impact site rules were developed specifically for sites where contamination is not excessive, the source has been removed and contaminant movement has stabilized, the site meets acceptable risk levels under its current use, and restrictions will be used to control potential future risks. In particular, sites where the release was significant enough to result in free-product on the water table are specifically excluded from using this option. Also, as mentioned earlier, this option can only be applied to gas stations and other industrial or commercial sites where children will not be regularly exposed. The LIS option cannot be used on properties that are now or may soon be used for residential purposes. Finally, this option can only be applied to the remediation of *petroleum* contamination under OAR 340-122-0205 through 340-122-0360. Sites contaminated with chlorinated solvents or other products that may have been released from waste oil tanks, surface spills, etc. are not eligible for designation as low-impact sites.

3. Using the LIS Option

The low-impact site option is just one step in the overall UST cleanup rule process. The guidance in this section is intended to put the LIS option into context with the rest of the process, provide you with the information necessary to implement the LIS portion of the process, and describe what future actions may be needed at your site as a result of using the LIS option.

3.1 Conditions for Use

Before the low-impact site requirements in OAR 340-122-0243 can be applied to your site you must have carried out all applicable requirements of OAR 340-122-0205 through 340-122-0240. This means that you should have completed, as necessary:

- Initial Response (340-122-0220);
- Initial Abatement Measures and Site Check (340-122-0225);
- Initial Site Characterization (340-122-0230); and
- Investigation for Magnitude and Extent of Contamination (340-122-0240).

It also means that appropriate sampling and analysis for this work must have been carried out as specified in OAR 340-122-0218.

In addition to having completed these requirements, there are some conditions which preclude a site from being taken through the LIS option. Specifically, the LIS option CANNOT be used unless:

- The source of the release has been repaired or removed, and all tanks, lines, and associated equipment at the site have been upgraded to meet applicable technical and regulatory standards;
- The facility will continue to be used as a gas station or other industrial or commercial use precluding potential routine exposure to children; and
- Other than minimal amounts of petroleum product in the tank pit at the time of tank removal, no measurable free product was found on the groundwater.

If your site does not meet these three requirements you should be considering one of the other cleanup options listed in OAR 340-122-0217(1)(d). The LIS option cannot be applied to these types of sites.

3.2 Site Investigation

A site investigation for low-impact sites does not differ significantly from that carried out for the other UST cleanup options. Assuming that you have already reported the release, determined the source, stopped the release, and taken all steps to eliminate imminent hazards, the site investigation should generally cover the following two goals:

- Determining the nature, magnitude and extent of the resulting contamination, and
- Assessing the likelihood that the contamination will present an unacceptable risk.

With these two goals in mind, this section presents a summary of some of the things that you should include when carrying out your site investigation on a potential low-impact site. Although this list of tasks is intended to be representative, it should not necessarily be considered all inclusive.

3.2.1 Magnitude and Extent of Contamination

Different aspects of the overall site investigation are covered by the requirements of OAR 340-122-0225, 0230 and 0240. As such, the following work may require several phases before it is completed.

- Check for free product in and near the current or former UST cavity. (If free product is found at the site then the LIS option cannot be used. Note, however, that by "free product" the Department is not referring to sheen or the presence of petroleum droplets in water samples, but to readily measurable amounts in monitoring wells or excavations.)
- Collect sufficient samples to determine the magnitude and lateral/vertical extent of petroleum-contaminated soil and groundwater. (Refer to OAR 340-122-0218 for sampling and analysis requirements.)

For soil contamination:

- Use Method NWTPH-HCID to identify the type of product or products released at your site (e.g., gasoline, diesel, lube oil).
- Use Method NWTPH-Gx and/or NWTPH-Dx as appropriate to analyze samples for lateral and vertical extent of contamination.
- Analyze representative soil samples (typically those having the higher TPH levels) for applicable contaminants of concern (see Appendix B).

For groundwater contamination:

- Unless the soil data demonstrate that it is unlikely for contamination to have reached the water table, groundwater samples will be necessary. Push-probe samplers may be used to determine the presence and location of groundwater contamination. If a plume is found it will generally be necessary to install monitoring wells.
- A minimum of three wells are required, with one located upgradient from the source. More may be needed to delineate the plume.
- Initially, groundwater samples must be analyzed for all applicable contaminants of concern.
- A minimum of four consecutive quarters of groundwater monitoring must be completed before site closure will be considered. Additional monitoring may be needed to demonstrate plume stability at sites where contaminant concentrations pose a potential future threat. In this case data from the initial four quarters of monitoring may be used to demonstrate that the additional monitoring is only needed for a limited number of wells and/or constituents.

For both soil and groundwater:

- It is not generally necessary to have reached non-detects for all constituents in all directions in order to demonstrate the extent of contamination. It is usually adequate to have reached a point where the TPH and constituent levels are below the most stringent cleanup levels and low enough relative to other samples to demonstrate that they are very near the edge of the plume.

3.2.2 Exposure Assessment

Since the LIS option is designed to be a streamlined generic risk assessment, contaminant concentration data can only be properly interpreted when combined with information about potential exposure to those contaminants. For this reason you will also need to collect information about:

- Current and reasonably likely use of your site including the locations of all current and proposed buildings.
- Current and reasonably likely future land use of neighboring properties. (Sources of this information may include local master plan documents and state-wide planning documents.)
- For sites with groundwater contamination, current and reasonably likely future water use including a list of all wells within one-quarter mile of the source(s) of the petroleum release. To the extent practicable include information about the distance to the well, screened interval, total well depth, date of well installation, well use, presence/absence of a seal, and other relevant information. (Sources of this information may include the Oregon Water Resources Department, U.S. Geological Survey, and neighborhood interviews.)

3.3 LIS Requirements

The information collected during the various phases of the site investigation should be used to determine if your site meets the low-impact site requirements specified in OAR 340-122-0243. A summary of these requirements is provided below. A checklist is provided in Appendix C.

3.3.1 Summary of Requirements

In addition to showing that your site meets the conditions for using the LIS option mentioned in Section 3.1, the results of the site investigation must provide sufficient information to demonstrate that:

- Concentrations of gasoline in the contaminated soil do not exceed 1000 ppm TPH, and concentrations of diesel and other non-gasoline fraction hydrocarbon in the contaminated soil do not exceed 10,000 ppm TPH.
- Contaminated soil remaining at the site is not located within 3 feet of the land surface, unless:

- = Contaminant concentrations do not exceed the Department's generic risk-based concentrations (RBCs) for direct contact (see Appendix A); or
- = Department-approved institutional or engineering controls have been implemented and will be maintained to prevent direct contact with affected soils.
- Contamination is not located in utility corridors, unless:
 - = The contamination is shown to have been stabilized and is unlikely to result in vapor or groundwater problems;
 - = Contaminant concentrations do not exceed the Department's generic risk-based concentrations for a trench worker scenario (see Appendix A); and
 - = The corresponding utility has been notified of the contamination.
- Service station and other nonresidential buildings are not located over or within 10 lateral feet and residences are not located over or within 50 lateral feet of contaminated soil, unless:
 - = Contaminant concentrations do not exceed the Department's generic risk-based concentrations for volatilization from soils into buildings (see Appendix A); or
 - = It is demonstrated that potential exposure from volatilization into buildings from this contamination does not exceed acceptable risk levels; or
 - = Department-approved actions have been taken to mitigate potential vapor problems.

If groundwater contamination is found at the site you must also demonstrate that:

- There are no water supply wells located within one-quarter mile of the source of contamination;
- The groundwater plume is less than 250 feet in length as measured from the center of the source;
- Monitoring data show that the groundwater plume has stabilized or is diminishing in size;
- The groundwater plume does not leave the source property at concentrations exceeding the Department's generic risk-based concentrations (see Appendix A) unless owners of other affected properties consent to institutional or engineering controls necessary to prevent exposure due to the contaminated groundwater; and
- Service station and other nonresidential buildings are not located over or within 10 lateral feet and residences are not located over or within 50 lateral feet of contaminated groundwater, unless:
 - = Contaminant concentrations within the plume do not exceed the Department's generic risk-based concentrations for volatilization from groundwater into buildings (see Appendix A); or

- = It is demonstrated that potential exposure from volatilization into buildings from this contamination does not exceed acceptable risk levels; or
- = Department-approved actions have been taken to mitigate potential vapor problems.

If any of these requirements are not met, sufficient information should have been obtained during the investigation to help you determine if it is practical to remediate the site to meet the LIS requirements, or if another remediation option is better suited to your site.

3.3.2 Options

You will notice that some of the low-impact site requirements summarized above include a list of compliance options similar to the following:

- There is no pathway for exposure (e.g., there is no building over or close to the soil or groundwater contamination so the indoor air pathway is not a problem); or
- There is a pathway for exposure but the risk is acceptable (e.g., there is a building over some soil contamination but the contaminant concentrations in that soil are below the generic standards for that exposure pathway); or
- There is a pathway for exposure and concentrations exceed generic standards, but actions have been taken to prevent exposure (e.g., the crawl space is being ventilated to prevent vapors from entering the building).

In these situations you may use whatever option is best for your site. Please note, however, that some of the options may require you to propose and implement engineering or institutional controls (see Section 3.5). In some cases you may prefer to carry out additional cleanup at your site to avoid the need for these controls. You should decide what is best for your site based not only on the results of the site investigation, but also on your business needs, land use plans, etc.

3.4 Reporting Requirements

3.4.1 General Reporting Requirements

The UST cleanup rules contain a number of different reporting requirements. In addition to the requirement to initially report a release (OAR 340-122-0220), there are requirements for:

- A 20-day report (OAR 340-122-0220);
- A 45-day report (OAR 340-122-0230); and
- Reports on the magnitude and extent of contamination, and groundwater monitoring (OAR 340-122-0240).

Depending on the conditions at your site, you may have to submit one or more of these reports before you reach the point where the low-impact site report required by OAR 340-122-0243 is submitted. You may want to discuss reporting requirements with the Department since, except for the requirement to report the release within 24 hours, the Department has the authority to approve alternative report submission schedules. For example, at a relatively simple site it may

be reasonable to combine the 20-day and 45-day reports with the final LIS report. A more complex site might require 20-day and 45-day reports followed by a combined groundwater monitoring/low-impact site report.

3.4.2 Low-Impact Site Reporting Requirements

If you are combining a low-impact site report with another report as mentioned above, you should refer to the appropriate section in the rules to determine what additional information may be required. The low-impact site portion of the report must include all of the relevant information listed below.

- A site summary with appropriate scaled maps, a discussion of current and reasonably likely future land uses for the site and adjacent properties, including information from local government comprehensive planning plans and zoning ordinances, and information on geology, hydrogeology, topography, and other relevant factors on which the low-impact closure is based.
- Information about the release, including a history of all actions taken, data from all samples collected at the site, and a description of all contamination, including scaled maps showing the locations of contamination that was treated or removed from the site and contamination remaining at the site at the time of the report.

(Note: If previous reports have been submitted to the Department which cover most of the information listed in the two bullets above, the summary can be brief as long as key points are made and references are provided to the relevant reports.)

- Sufficient discussion and supporting data to address each of the specific low-impact site requirements listed in Section 3.3 of this guidance document.
- If groundwater contamination is present at concentrations exceeding the Department’s generic risk-based concentrations, a discussion of current and reasonably likely future water uses.
- If groundwater contamination is present at concentrations exceeding the Department’s generic risk-based concentrations and the site is located within a certified drinking water protection area (DWPA), a description of the DWPA and what additional information has been gathered and measures taken to ensure that there are no current or potential future adverse impacts to the groundwater in the aquifer within the DWPA.

(Note: To obtain information about certified drinking water protection areas, contact the Oregon Health Division's Drinking Water Program at 503-731-4010.)

- A proposal, subject to Department approval, for any institutional or engineering controls necessary to maintain low-impact site conditions.

3.5 Institutional and Engineering Controls

The LIS rules state that “The responsible person must implement institutional or engineering controls, in a form acceptable to the Department, necessary to ensure that a site’s designation as

a low-impact site remains unchanged.” There are two types of common situations that will require institutional or engineering controls at low-impact sites:

- When they are needed to protect against current exposures; and
- When they are needed to prevent potential future exposures.

The Department expects that at low-impact sites such controls will generally be limited to passive or "low-tech" controls such as deed restrictions, site capping, passive ventilation, etc.

3.5.1 Preventing Current Exposure

Current exposure means that contaminants have been found at the site in locations and at concentrations that are likely to exceed acceptable risk levels given the current use of the site. For example, if contaminated soil is located under a building and the benzene levels in the soil exceed the acceptable levels for volatilization from soils into buildings, then there is a current exposure that must be addressed. If this is the case at your site then you must include in your report a proposal for the actions you intend to take to prevent exposure to vapors entering the building. You could propose to clean up the site to the point where the benzene levels no longer exceed acceptable levels, or you could propose some type of engineering control to prevent the vapors from entering the building.

3.5.2 Preventing Future Exposure

Future exposure means that contaminants have been found at the site at concentrations that could exceed acceptable risk levels if the site use changes. Current risk may be acceptable due to the location of the contaminants.

For example, let's assume again that you have soil contamination with benzene concentrations that exceed acceptable levels for volatilization from soils into buildings. However, in this case the soil is located in the southwest corner of your site and the building is located in the northeast corner. Therefore, the exposure pathway is not complete *today*. However, to ensure that the pathway remains incomplete *in the future* you could propose a deed restriction which prevents construction over the area where the contaminated soils are located. Or, you could remediate the soils so that such a restriction is not necessary.

Note that in cases where contamination exists but all concentrations are below acceptable standards, engineering or institutional controls would not be required because *current and potential future exposures* are assumed to meet acceptable risk levels.

3.6 Department Review and Approval

When you have completed your LIS report it should be submitted to the Department office in the region where your site is located. For simple sites you may have completed all of the necessary site work before submitting the report. However, in cases where institutional or engineering controls are likely to be necessary, you may want to wait to see if the Department approves your proposal before completing the project. In either case, after the Department reviews your report it has three options:

- Approve the report and, upon receipt of adequate documentation showing that any necessary institutional or engineering controls have been implemented and will be maintained, issue a low-impact site closure letter stipulating the site conditions that must be maintained;
- Request that additional information be submitted or work be performed in support of the proposed low-impact closure; or
- Determine that the site does not meet the conditions for low-impact closure and require that additional actions be taken under other relevant sections of OAR 340-122-0205 through 340-122-0360.

3.7 Public Notice

The Department is required to give public notice consistent with applicable requirements of OAR 340-122-0260. For low-impact sites, public notice will be provided for any site that requires institutional or engineering controls to meet the low-impact site conditions.

3.8 Future Actions

The low-impact site rules state that the “owner of any property requiring controls under the low-impact site option must notify the Department of any future changes that might affect the facility’s designation as a low-impact site.” This means that if you are proposing either institutional or engineering controls as part of your low-impact site designation, then you may have to reevaluate your site in the future if changes are planned for the site.

For example, let’s again consider the site mentioned in Section 3.5.2 where you have soil contamination with benzene concentrations that exceed acceptable levels for volatilization from soils into buildings. Since the contaminated soil is located in the southwest corner of your site and the building is located in the northeast corner, you agreed to a deed restriction that prevents construction in or over the area where the contaminated soils are located. However, five years later you are planning to expand your business and put a new building over the contaminated area. Before you can do that you will have to notify the Department, and then collect more samples to determine if there is still a potentially unacceptable risk due to vapors. If not, the deed restriction can be removed. If so, that risk will have to be addressed in your plans for the site.

Appendix A: Table of Risk-Based Concentrations (RBCs)

(See Notes on Page B-4.)

Contaminated Medium		SOIL mg/kg (ppm)						SOIL mg/kg (ppm)				SOIL mg/kg (ppm)			
Exposure Pathway		Surface Soil Ingestion, Dermal Contact, and Inhalation RBC _{ss}						Volatilization to Outdoor Air RBC _{so}				Vapor Intrusion into Buildings RBC _{si}			
Receptor Scenario		Residential		Occupational		Excavation Worker		Residential		Occupational		Residential		Occupational	
Contaminant of Concern	Note		Note		Note		Note		Note		Note		Note		Note
Benzene	c, v	8.2		29		1100	>Csat	11		21		0.091		0.5	
Toluene	nc, v	1700	>Csat	31000	>Csat	40000	>Csat	540	=Csat	540	=Csat	190		540	=Csat
Ethylbenzene	nc, v	2000	>Csat	47000	>Csat	85000	>Csat	330	=Csat	330	=Csat	330	=Csat	330	=Csat
Xylenes	nc, v	4100	>Csat	63000	>Csat	72000	>Csat	360	=Csat	360	=Csat	360	=Csat	360	=Csat
Acenaphthene	nc, v	800	>Csat	25000	>Csat	110000	>Csat	100	=Csat	100	=Csat	100	=Csat	100	=Csat
Anthracene	nc, v	4400	>Csat	180000	>Csat	750000	>Csat	6.4	=Csat	6.4	=Csat	6.4	=Csat	6.4	=Csat
Benz[a]anthracene	c, nv	0.21		2.7		270	>Csat	19	=Csat	19	=Csat	19	=Csat	19	=Csat
Benzo[b]fluoranthene	c, nv	0.21		2.7		270	>Csat	9.2	=Csat	9.2	=Csat	9.2	=Csat	9.2	=Csat
Benzo[k]fluoranthene	c, nv	2.1		27	>Csat	2700	>Csat	4.9	=Csat	4.9	=Csat	4.9	=Csat	4.9	=Csat
Benzo[a]pyrene	c, nv	0.021		0.27		27	>Csat	8.3	=Csat	8.3	=Csat	8.3	=Csat	8.3	=Csat
Chrysene	c, nv	21	>Csat	270	>Csat	27000	>Csat	3.2	=Csat	3.2	=Csat	3.2	=Csat	3.2	=Csat
Dibenz[a,h]anthracene	c, nv	0.021		0.27		27	>Csat	4.7	=Csat	4.7	=Csat	4.7	=Csat	4.7	=Csat
Fluoranthene	nc, nv	600	>Csat	29000	>Csat	110000	>Csat	110	=Csat	110	=Csat	110	=Csat	110	=Csat
Fluorene	nc, v	570	>Csat	23000	>Csat	94000	>Csat	140	=Csat	140	=Csat	140	=Csat	140	=Csat
Indeno[1,2,3-cd]pyrene	c, nv	0.21		2.7	>Csat	270	>Csat	0.38	=Csat	0.38	=Csat	0.38	=Csat	0.38	=Csat
Naphthalene	nc, v	24		270		1000	>Csat	230		310	=Csat	290		310	=Csat
Pyrene	nc, nv	450	>Csat	21000	>Csat	84000	>Csat	71	=Csat	71	=Csat	71	=Csat	71	=Csat
MTBE (methyl t-butyl ether)	nc, v	19000	>Csat	280000	>Csat	310000	>Csat	6600	=Csat	6600	=Csat	1600		6600	=Csat
EDB (1,2-dibromoethane)	c, v	0.0033		0.030		3.6		0.43		0.78		0.026		0.17	
EDC (1,2-dichloroethane)	c, v	2.2		9.0		330		3.6		6.6		0.039		0.26	
Lead	NA, nv	400	L	1000	L	1000	L		NA		NA		NA		NA
iso-Propylbenzene	nc, v	140		2900	>Csat	4300	>Csat	330	=Csat	330	=Csat	140		330	=Csat
n-Propylbenzene	nc, v	140		2900	>Csat	4300	>Csat	200	=Csat	200	=Csat	180		200	=Csat
1,2,4-Trimethylbenzene	nc, v	47	>Csat	720	>Csat	960	>Csat	4.8	=Csat	4.8	=Csat	4.8	=Csat	4.8	=Csat
1,3,5-Trimethylbenzene	nc, v	47		720	>Csat	810	>Csat	210	=Csat	210	=Csat	15		65	

Appendix A: Table of RBCs (continued)

Contaminated Medium		SOIL mg/kg (ppm)				GROUNDWATER µg/L (ppb)				GROUNDWATER µg/L (ppb)			
Exposure Pathway		Leaching to Groundwater RBC _{sw}				Groundwater Ingestion RBC _{dw}				Volatilization to Outdoor Air RBC _{wo}			
Receptor Scenario		Residential		Occupational		Residential		Occupational		Residential		Occupational	
Contaminant of Concern	Note		Note		Note		Note		Note		Note		Note
Benzene	c, v	0.044		0.10		1.8		4.3		2600		5800	
Toluene	nc, v	390		540	=Csat	6300		8900		530000	=S	530000	=S
Ethylbenzene	nc, v	330	=Csat	330	=Csat	3200		4400		170000	=S	170000	=S
Xylenes	nc, v	360	=Csat	360	=Csat	63000		89000		180000	=S	180000	=S
Acenaphthene	nc, v	100	=Csat	100	=Csat	1900		2700		4200	=S	4200	=S
Anthracene	nc, v	6.4	=Csat	6.4	=Csat	9500	>S	13000	>S	43	=S	43	=S
Benz[a]anthracene	c, nv	8.6		19	=Csat	0.072		0.17		9.4	=S	9.4	=S
Benzo[b]fluoranthene	c, nv	9.2	=Csat	9.2	=Csat	0.072		0.17		1.5	=S	1.5	=S
Benzo[k]fluoranthene	c, nv	4.9	=Csat	4.9	=Csat	0.72		1.7	>S	0.80	=S	0.80	=S
Benzo[a]pyrene	c, nv	2.2		5.2		0.0072		0.017		1.6	=S	1.6	=S
Chrysene	c, nv	3.2	=Csat	3.2	=Csat	7.2	>S	17	>S	1.6	=S	1.6	=S
Dibenz[a,h]anthracene	c, nv	4.7	=Csat	4.7	=Csat	0.0072		0.017		0.25	=S	0.25	=S
Fluoranthene	nc, nv	110	=Csat	110	=Csat	1300	>S	1800	>S	210	=S	210	=S
Fluorene	nc, v	140	=Csat	140	=Csat	1300		1800		2000	=S	2000	=S
Indeno[1,2,3-cd]pyrene	c, nv	0.38	=Csat	0.38	=Csat	0.072	>S	0.17	>S	0.022	=S	0.022	=S
Naphthalene	nc, v	310	=Csat	310	=Csat	630		890		31000	=S	31000	=S
Pyrene	nc, nv	71	=Csat	71	=Csat	950	>S	1300	>S	140	=S	140	=S
MTBE (methyl t-butyl ether)	nc, v	0.16		0.16		20	M	20	M	51000000	=S	51000000	=S
EDB (1,2-dibromoethane)	c, v	0.0000079		0.000019		0.00062		0.0015		520		1100	
EDC (1,2-dichloroethane)	c, v	0.0057		0.013		0.58		1.4		1900		4200	
Lead	NA, nv	0.40	L	1.5	L	4.0	L	15	L		NA		NA
iso-Propylbenzene	nc, v	210		300		320		440		30000	=S	30000	=S
n-Propylbenzene	nc, v	200	=Csat	200	=Csat	320		440		14000	=S	14000	=S
1,2,4-Trimethylbenzene	nc, v	4.8	=Csat	4.8	=Csat	1600	>S	2200	>S	260	=S	260	=S
1,3,5-Trimethylbenzene	nc, v	210	=Csat	210	=Csat	1600		2200		50000	=S	50000	=S

Appendix A: Table of RBCs (continued)

Contaminated Medium		GROUNDWATER µg/L (ppb)				GROUNDWATER µg/L (ppb)				GROUNDWATER µg/L (ppb)		AIR (see notes) µg/m ³			
Exposure Pathway		Vapor Intrusion into Buildings RBC _{wi}				Ingestion & Inhalation from Tapwater RBC _{tw}				GW in Excavation RBC _{we}		Inhalation RBC _{air}			
Receptor Scenario		Residential		Occupational		Residential		Occupational		Excavation Worker		Residential		Occupational	
Contaminant of Concern	Note		Note		Note		Note		Note		Note		Note		Note
Benzene	c, v	180		1200		0.44		1.0		820		0.30		0.65	
Toluene	nc, v	210000		530000	=S	740		1000		30000		420		580	
Ethylbenzene	nc, v	170000	=S	170000	=S	1300		1800		45000		1000		1500	
Xylenes	nc, v	180000	=S	180000	=S	1400		2000		55000		730		1000	
Acenaphthene	nc, v	4200	=S	4200	=S	440		620		4200	=S	290		400	
Anthracene	nc, v	43	=S	43	=S	43	=S	43	=S	43	=S	1400	Pv	2000	Pv
Benz[a]anthracene	c, nv	9.4	=S	9.4	=S		NA		NA	4.1		0.028		0.061	
Benzo[b]fluoranthene	c, nv	1.5	=S	1.5	=S		NA		NA	1.5	=S	0.028		0.061	
Benzo[k]fluoranthene	c, nv	0.80	=S	0.80	=S		NA		NA	0.80	=S	0.28	Pv	0.61	Pv
Benzo[a]pyrene	c, nv	1.6	=S	1.6	=S		NA		NA	0.24		0.0028		0.0061	
Chrysene	c, nv	1.6	=S	1.6	=S		NA		NA	1.6	=S	2.8		6.1	
Dibenz[a,h]anthracene	c, nv	0.25	=S	0.25	=S		NA		NA	0.088		0.0028	Pv	0.0061	Pv
Fluoranthene	nc, nv	210	=S	210	=S		NA		NA	210	=S	190	Pv	270	Pv
Fluorene	nc, v	2000	=S	2000	=S	290		410		2000	=S	190		270	
Indeno[1,2,3-cd]pyrene	c, nv	0.022	=S	0.022	=S		NA		NA	0.022	=S	0.028	Pv	0.061	Pv
Naphthalene	nc, v	29000		31000	=S	6.2		8.7		240		3.1		4.4	
Pyrene	nc, nv	140	=S	140	=S		NA		NA	140	=S	140	Pv	200	Pv
MTBE (methyl t-butyl ether)	nc, v	13000000		51000000	=S	20		20		240000		3100		4400	
EDB (1,2-dibromoethane)	c, v	130		830		0.00060		0.0014		8.6		0.011		0.024	
EDC (1,2-dichloroethane)	c, v	250		1700		0.14		0.32		280		0.094		0.21	
Lead	NA, nv		NA		NA		NA		NA		NA		NA		NA
iso-Propylbenzene	nc, v	15000		30000	=S	74		100		1800		48		67	
n-Propylbenzene	nc, v	14000	=S	14000	=S	74		100		1600		48		67	
1,2,4-Trimethylbenzene	nc, v	260	=S	260	=S	16		23		260	=S	8.2		11	
1,3,5-Trimethylbenzene	nc, v	4200		18000		16		23		630		8.2		11	

Notes and References for Table of RBCs:

Appendix A is taken directly from *Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites* (RBDM Guidance) (DEQ, 1999). You should refer to that document for information about how these numbers were calculated, and for more detailed explanations of the notes below. The numbers in this table will be updated as new information becomes available. The current version of this guidance document can be found on the Department's UST program web site at <http://www.deq.state.or.us/wmc/tank/ust-lust.htm>

The symbols in the "Note" columns have the following meanings:

- c This chemical is a known or suspected carcinogen. The RBCs in this row were calculated using equations for carcinogens described in Appendix B of the RBDM Guidance.
- $>C_{\text{sat}}$ This soil RBC exceeds the limit of three-phase equilibrium partitioning. Refer to Appendix D in the RBDM Guidance for the corresponding value of C_{sat} . Soil concentrations in excess of C_{sat} indicate that free product might be present. See Section B.2.2.3 in the RBDM Guidance for additional information.
- $=C_{\text{sat}}$ This number is NOT a risk-based concentration. It can be assumed that this constituent can not create an unacceptable risk by this pathway. However, concentrations in excess of this value indicate that free product may be present. See Section B.2.2.3 in the RBDM Guidance for additional information.
- L The values for lead reported in this table are not derived from the equations used for the other constituents. See Section B.3.4.1 in the RBDM Guidance for the source of the lead numbers and information on applying them.
- M Because there is no published oral reference dose (RfDo) for MTBE, the following modifications have been made:
(1) The RBC_{ss} and RBC_{we} values for MTBE are based solely on inhalation.
(2) An interim standard for groundwater ingestion (RBC_{dw}) has been set at 20 $\mu\text{g}/\text{L}$ (ppb) based on EPA guidance (EPA, 1997d).
(3) An interim leaching-to-groundwater concentration (RBC_{sw}) has been calculated on the basis of the interim groundwater ingestion value. See Section B.3.4.2 in the RBDM Guidance for more information about MTBE.
- NA This pathway is not applicable to the chemical of interest.
- nc This chemical is a noncarcinogen. The RBCs in this row were calculated using equations for noncarcinogens described in Appendix B of the RBDM Guidance.
- nv This chemical is classified as "nonvolatile" for purposes of the exposure calculations in this document.
- P_v The air concentration reported for the RBC exceeds the vapor pressure of the pure chemical. It can be assumed that this constituent can not create an unacceptable risk by this pathway. See Section B.2.2.3 in the RBDM Guidance for additional information.
- $>S$ This groundwater RBC exceeds the solubility limit. Refer to Appendix D in the RBDM Guidance for the corresponding value of S . Groundwater concentrations in excess of S indicate that free product may be present. See Section B.2.2.3 in the RBDM Guidance for additional information.
- $=S$ This number is NOT a risk-based concentration. It can be assumed that this constituent can not create an unacceptable risk by this pathway. However, concentrations in excess of this value indicate that free product might be present. See Section B.2.2.3 in the RBDM Guidance for additional information.
- v This chemical is classified as "volatile" for purposes of the exposure calculations in this document.

Appendix B: Toxic Contaminants of Concern for Petroleum Products¹

Constituents of Concern	Gasolines	Kerosene, Jet Fuel, Diesel, Light Fuel Oils & Heating Oil	Heavy Fuel Oils	Used or Waste Oil
Benzene, toluene, ethylbenzenes, and xylenes (BTEX)	X	X	X ²	X
Polynuclear aromatic hydrocarbons (PAHs)	X ³	X	X	X
Methyl t-butyl ether (MTBE ⁴)	X			X
Lead, EDC, EDB ⁵	X			
Lead, Cadmium, Chromium ⁶				X
Chlorinated Solvents				X
Polychlorinated biphenyls (PCBs)				X ⁷

¹ An “X” denotes the constituents most likely to be present in a given petroleum product. Depending on site-specific conditions, the Department may require that additional constituents be analyzed.

² Test in groundwater if heavy fuel oil contamination is suspected.

³ If only gasoline contamination is present, the PAH test can be limited to naphthalene. The Department has approved a BTEX+N analytical method for such situations.

⁴ MTBE should be considered at sites where gasoline may have been released after 1975. Other oxygenated additives may also be included if suspected.

⁵ Test if leaded gasoline releases are suspected.

⁶ Test waste-oil contaminated soil for leachable metals to determine if it is a hazardous waste.

⁷ PCB tests required for commercial waste oil tanks only.

Appendix C: Low-Impact Site Criteria Checklist

It is recommended that you use the following two-part checklist to ensure that your site meets all of the requirements for low-impact site designation. A completed copy should be submitted to the Department along with the final LIS report.

PART 1: Complete the following checklist for <u>all</u> low-impact sites.		
Select <u>Yes</u> or <u>No</u> to indicate how your site compares to each condition listed in 1-9.	Yes	No
1. All applicable requirements of OAR 340-122-0205 through 340-122-0240 have been completed.	<input type="checkbox"/>	<input type="checkbox"/>
2. The source of the release has been repaired or removed.	<input type="checkbox"/>	<input type="checkbox"/>
3. All tanks, lines and associated equipment meet all current regulations.	<input type="checkbox"/>	<input type="checkbox"/>
4. Land use will remain unchanged and does not include potential routine exposure to children.	<input type="checkbox"/>	<input type="checkbox"/>
5. No significant amounts of free product were found in the tank pit or in groundwater monitoring wells at the site.	<input type="checkbox"/>	<input type="checkbox"/>
6. Remaining gasoline-contaminated soil does not exceed 1000 ppm TPH-Gx.	<input type="checkbox"/>	<input type="checkbox"/>
7. Remaining diesel-contaminated soil does not exceed 10,000 ppm TPH-Dx.	<input type="checkbox"/>	<input type="checkbox"/>
8. The Department has approved any institutional and/or engineering controls needed at this site.	<input type="checkbox"/>	<input type="checkbox"/>
9. Reports that summarize all of the work done at the site, and provide adequate data to support the answers on this checklist have been submitted to the Department.	<input type="checkbox"/>	<input type="checkbox"/>
Select the <u>one</u> item in each of sections 10-13 that <u>best</u> describes the conditions at your site.		
10. There is no shallow soil contamination (0 - 3 feet deep) remaining at the site. There is shallow soil contamination but all levels meet the RBCs* for direct contact. Shallow soil contamination exceeds the RBCs but approved action has been taken.	<input type="checkbox"/>	<input type="checkbox"/>
11. There is no soil contamination within utility corridors. There is contamination in utility corridors, but levels have stabilized, are unlikely to result in vapor or groundwater problems, and the utility has been notified.	<input type="checkbox"/>	<input type="checkbox"/>
12. No contaminated soil is under or within 10 lateral feet of a <u>service station building</u> . Contaminated soil is under a service station building, but levels meet RBCs for vapors to indoor air. Contaminated soil under a building exceeds RBCs but monitoring data shows no unacceptable risks. Soil contamination exceeds the RBCs but approved action has been taken.	<input type="checkbox"/>	<input type="checkbox"/>
13. No contaminated soil is under or within 50 lateral feet of a <u>residence</u> . Contaminated soil is under a residence, but levels meet RBCs for vapors to indoor air. Contaminated soil under a residence exceeds RBCs but monitoring data show no unacceptable risks. Soil contamination exceeds the RBCs but approved action has been taken.	<input type="checkbox"/>	<input type="checkbox"/>

*RBCs = Risk-Based Concentrations (see Appendix A)

Low-Impact Site Criteria Checklist (Continued)

PART 2: Complete the following checklist for all low-impact sites with <u>groundwater</u> contamination.		
Select <u>Yes</u> or <u>No</u> to indicate how your site compares to each condition listed in 14-17.	Yes	No
14. The site is located within the boundaries of a Certified Drinking Water Protection Area.	<input type="checkbox"/>	<input type="checkbox"/>
15. Water supply wells are located within 1/4 mile of the source of contamination.	<input type="checkbox"/>	<input type="checkbox"/>
16. The plume is less than 250 feet long as measured from the center of the source.	<input type="checkbox"/>	<input type="checkbox"/>
17. GW monitoring data demonstrate that the plume has stabilized or is diminishing in size.	<input type="checkbox"/>	<input type="checkbox"/>
Select the <u>one</u> item in each of sections 18-20 that <u>best</u> describes the conditions at your site.		
18. The GW plume does <u>not</u> leave the property at concentrations exceeding appropriate RBCs. The GW plume does leave the property at concentrations exceeding appropriate RBCs, but the adjacent owner consents to controls needed to prevent exposure.	<input type="checkbox"/> <input type="checkbox"/>	
19. No contaminated groundwater is under or within 10 lateral feet of a <u>service station building</u> . Contaminated GW is under a service station building, but levels meet RBCs for vapors to indoor air. Contaminated GW under a building exceeds RBCs but monitoring data shows no unacceptable risks. GW contamination exceeds the RBCs but approved action has been taken.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
20. No contaminated groundwater is under or within 50 lateral feet of a <u>residence</u> . Contaminated GW is under a residence, but levels meet RBCs for vapors to indoor air. Contaminated GW under a residence exceeds RBCs but monitoring data shows no unacceptable risks. GW contamination exceeds the RBCs but approved action has been taken.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	

Appendix D: Example Low-Impact Site Letter

Note: This letter is only an example. Site-specific LIS letters will vary depending on site conditions, and may contain different restrictions or requirements.

January 1, 1999

Mr. Samuel S. Simpson
Simpson Superfuel
Hometown, OR 99999

Re: **Low-Impact Site Designation**
Simpson Superfuel
File No. 88-95-0001

Dear Mr. Simpson:

The Department of Environmental Quality (DEQ) has reviewed the file for the leaking underground storage tank cleanup project located at the Simpson Superfuel facility. Based on information in the file, the DEQ has determined that all applicable response, abatement, and site characterization and investigation requirements in OAR 340-122-0205 through 340-122-0240 have been completed, and that the site meets the criteria specified in OAR 340-122-0243 for designation as a Low-Impact Site (LIS). Therefore, no further action is required at this time. Important information supporting this determination includes:

- A petroleum release was observed on March 15, 1995 at the Simpson Superfuel facility during the decommissioning of three 10,000 gallon gasoline underground storage tanks.
- Groundwater entering the tank excavation during decommissioning activities appeared to have a slight petroleum sheen. Subsequently, no free product has been observed at the site.
- Approximately 1,000 cubic yards of petroleum contaminated soil (PCS) were excavated from beneath the tanks and pump islands in June 1995. An estimated 500 cubic yards of PCS remains in the SE quadrant of the property at a depth 6 to 10 feet below ground surface. The maximum concentration of gasoline detected in the PCS remaining on-site is 750 parts per million TPH-Gx.
- The service station building is located within 10 lateral feet of contaminated soil and groundwater. Although benzene concentrations in the soil exceed generic risk-based standards for volatilization to indoor air, quarterly soil gas samples collected adjacent to and beneath the structure indicate that soil contamination is not likely to have an adverse impact on air quality within the building.
- A network of six groundwater monitoring wells were used to delineate the extent of the contaminant plume and to monitor fluctuations in groundwater contaminant levels

from November 1995 through January 1998. The results of the monitoring indicate the magnitude and extent of groundwater contamination has been declining since the remedial soil excavation work was completed. Since June 1996, the length of the plume of groundwater contamination has been approximately 125 feet and does not extend beyond the boundaries of the source property. The results of a groundwater usage survey indicate there are no groundwater supply wells located within one-quarter mile of the subject property and the site is not located within the boundaries of a certified drinking water protection area.

- Subsequent to earlier discussions with the Department, an Equitable Servitude and Easement has been filed for this property to prevent well installation and use of the contaminated groundwater, and require that measures be taken if development is likely to result in future risk from contaminated soils which remain at the site.

Please note that certain types of development or uses of the property may be incompatible with the site conditions and remaining petroleum contamination noted above. The Department must be notified of any proposed changes in property use or development before they occur. The Department will evaluate the proposed changes to ensure they will not result in adverse impacts to human health, safety or the environment.

Continued designation as a low-impact site is contingent on the following:

1. The current use and development of the property remains unchanged; and
2. The site remains in compliance with the terms of the Equitable Servitude and Easement.

If either of these two conditions are violated without consent of the Department, the LIS designation and no further action declaration in this letter become void. You will then have to reevaluate the site to determine if the LIS designation is still appropriate, or if one of the other remedial options in OAR 340-122-0217 is better suited to the new site conditions.

The LIS designation will not apply if new or undisclosed facts show the cleanup does not comply with the referenced rules. This determination also does not apply to any conditions at the site other than the release of the petroleum products specifically addressed in the Department of Environmental Quality's leaking underground storage tank file # 88-95-0001.

If you have any questions regarding this matter, feel free to contact me at (555) 555-5555.

Sincerely,

Stan Tankman
Underground Storage Tanks
Northwest Region

Appendix E: DEQ Regional Offices

THE DEPARTMENT OF ENVIRONMENTAL QUALITY UST PROGRAM REGIONAL OFFICES

NORTHWEST REGION

2020 SW 4th Avenue, Suite 400
Portland, OR 97201-5884
Phone: (503) 229-5263
Fax: (503) 229-6945

EASTERN REGION / THE DALLES

400 E. Scenic Drive
Building 2, Suite #307
The Dalles, OR 97058
Phone: (541) 298-7255
Fax: (541) 298-7330

WESTERN REGION / SALEM

750 Front Street NE, Suite 120
Salem, OR 97310
Phone: (503) 378-8240
Fax: (503) 373-7944

WESTERN REGION / COOS BAY

381 N Second Street
Coos Bay, OR 97420
Phone: (541) 269-2721 ext 31
Fax: (541) 269-7984

WESTERN REGION / EUGENE

165 East 7th Avenue, Suite 100
Eugene, OR 97401
Phone: (541) 686-7838
Fax: (541) 686-7551

Questions can also be left on the
UST HELPLINE: 1-800-742-7878
(Toll free in Oregon)