



# **Accelerated Dry Cleaner Remediation Process Manual**

## **Virginia Voluntary Remediation Program**

**March 4, 2010**

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## 1.0 INTRODUCTION

This document describes the approach prescribed by the Virginia Department of Environmental Quality (DEQ) Voluntary Remediation Program (VRP) for the environmental assessment, risk analysis, and remediation of former and current dry cleaning establishments being addressed pursuant to the Accelerated Dry Cleaner Remediation Process (ADCRP). The procedures described in this process would be typical for a site with a suspected release of volatile organic compounds (VOCs) from current or historical dry cleaning operations. Requirements would vary for different contaminants or other sources of VOCs.

Conceptually, this process would be applicable to those sites where there is limited environmental impact, and most importantly, groundwater contamination has not migrated, and is not anticipated to migrate, beyond the site boundaries. Candidate sites include sites where there is no substantial site re-development planned, and current land uses are not anticipated to significantly change.

### 1.1 Purpose

The purpose of the ADCRP is to help streamline the site characterization and risk analysis of VRP dry cleaning sites, as well as to accelerate the implementation of appropriate remedial systems that adequately address environmental impacts in commercial buildings resulting from dry cleaning operations. In addition, this process is expected to minimize the VRP staff review time needed to move these projects forward. The manual is designed to be a stepwise general procedural document to guide the assessment and remediation of relatively uncomplicated VRP sites. This document is not intended as a detailed manual on media-specific sampling or analytical methods. The general ADCRP process is illustrated in the flow chart presented in Appendix A.

There will be minimal interaction with VRP staff during ADCRP implementation, and implementation will largely be based on field decisions made by the participant and its environmental professional. It is anticipated that only the ADCRP Final Report ("Final Report") will be evaluated by the VRP staff. An integral part of the Final Report is a signed certification by the participant's environmental professional that the process was followed and that based on the information collected the site does not pose a threat to human health or the environment. The Final Report will contain a discussion of the results and how the results support the conclusion of the environmental professional, as well as a completed draft of the Certification of Satisfactory Completion of Remediation ("Certificate"). DEQ anticipates only a cursory review of the Final Report and upon concurrence will issue the Certificate but will reserve the right to revoke the Certificate if it is determined that the process was not followed, if the data presented in the Final Report are outside of acceptable quality standards, if unacceptable risk to human health or the environment is deemed possible, or if new information becomes available that adversely affects the conclusion. It is therefore imperative that all work be performed by a qualified environmental professional so that the potential for revocation is minimized.

This process is intended to help minimize delay and expense in remediation, while continuing to protect human health and the environment. Any suggestions or questions should be sent to:

Office of Remediation  
Waste Division  
Virginia Voluntary Remediation Program  
Virginia Department of Environmental Quality  
P.O. Box 10009  
Richmond, VA 23240

Suggestions or questions concerning this manual can also be sent by e-mail to Kevin L. Greene, Remediation Program Manager, at [klgreene@deq.virginia.gov](mailto:klgreene@deq.virginia.gov).

## **1.2 Limitations**

The use of the ADCRP processes is limited to those VRP sites where groundwater contamination from a specific dry cleaning establishment has not migrated beyond, and is not expected to migrate beyond the VRP property boundary or that portion of the site under the participant's control. In the event that groundwater contamination is detected in a down-gradient sentinel monitoring point at levels exceeding VRP Tier II screening levels (See Section 4.2.2 of this manual), the participant is directed to contact the VRP Project Manager for guidance.

This process is intended for the use of the public, applicants for the ADCRP, and DEQ staff. It creates no rights, legal or equitable, in any person, and is subject to change without notice as circumstances may require.

## 2.0 VRP ELIGIBILITY DETERMINATION

A potential participant in the VRP must first submit a request for eligibility determination. This request is usually a letter supported by a signed VRP application formally declaring the desire to participate in the program. The request for eligibility determination also includes information such as operational history, identification of known contamination, and regulatory jurisdictional analysis. Information on determining eligibility for the VRP is presented in *Virginia VRP Guidance Document 99-01- Guidance for Determining Eligibility of Sites for the Voluntary Remediation Program*.

VRP staff verifies that the site is eligible by requesting the appropriate DEQ regional office to determine if remediation is mandated under its jurisdiction. Concurrently, the application is reviewed by the Office of Waste Permitting to determine if there is a corrective action requirement imposed through DEQ's RCRA corrective action authorities. Following this review a determination is made whether the site is eligible for the VRP. If DEQ deems a site eligible the participant is notified in writing. Once the participant is notified that the site is eligible, the participant can elect to either follow the ADCRP approach (subject to conditions), or proceed with the conventional VRP approach.

### 2.1 ADCRP Process Election Criteria

In order to participate in the ADCRP, the site must meet the following election criteria:

- The site must be currently or historically have been used for dry cleaning operations;
- No substantial site re-development is anticipated such that construction projects involving excavation are not expected to occur at the site;
- Deed restrictions prohibiting groundwater use and residential land use will be incorporated into the Certificate;
- No presence of potentially impacted surface water, or sediments;
- No presence of potentially impacted significant ecological habitat;
- Groundwater contamination has not migrated beyond, and is not expected to migrate beyond the VRP property boundary (or that portion of the property under the participant's control) at levels greater than VRP Tier II screening levels.

Participants electing to address the property under the ADCRP must submit their election in writing to the VRP, and then may proceed with site characterization, risk screening, and any necessary remediation. The ADCRP is outlined in the flow chart presented in Appendix A. If at any time during the implementation of the ADCRP process the participant discovers or has reason to believe any of the above selection criteria cannot be met (such as off-site groundwater migration), the participant must contact the VRP Program Manager for guidance and to discuss enrollment of the site in the conventional VRP.

## **2.2 Conventional VRP Process**

Participants electing to participate in the conventional VRP process should submit the appropriate registration fee and supporting documentation in accordance with the VRP regulations. After the fee is paid, the site is formally enrolled in the program, and DEQ will begin review of materials pertaining to the site.

## **3.0 SITE CHARACTERIZATION**

The next step in the ADCRP process is site characterization. The purpose of a site characterization is to collect sufficient information to determine whether or not a release has occurred from current or historical dry cleaning operations, and to assess the extent and magnitude of any release as it relates to potential human health risks. The participant must consider the current and future anticipated site uses, environmental setting, and potential exposure pathways when characterizing a dry cleaning site. The following procedures are the minimum requirements for assessing a dry cleaning facility under the ADCRP. Additional characterization may be necessary depending upon site-specific factors.

### **3.1 Sampling Program**

The ADCRP requires that the site characterization contain a delineation of the nature and extent of releases to all media. Sampling locations and depths must be biased to where releases are most likely to be detected, and must include potential source areas such as the locations of current and former dry cleaning units (DCUs), chemical storage areas, product piping, and waste storage areas, stained/stressed areas, and disposal areas.

#### **3.1.1 Soil**

The extent of on-site soil impacts will have to be assessed. The nature of the potential release being investigated determines the types of soil samples to be collected.

The appropriate number and locations of samples should be based on the level of detail known about the dry cleaning operations and the potential release mechanisms. In general, focused sampling is appropriate when observations and existing data indicate where a release is most likely to be detected such as in the location of former DCUs, solvent storage areas, suspected waste storage areas or adjacent sanitary sewer lines. Release mechanisms and fate and transport of contaminants must be considered.

ADCRP requires soil sampling from a minimum of five locations on each site. Subsurface soil should be sampled as appropriate based on the nature of the dry cleaning operations (i.e. petroleum vs. chlorinated solvents). When soil is sampled outside the footprint of the building it should be sampled to a depth of at least twelve feet with sampling at the surface and at four foot intervals thereafter. Each collected sample should be screened with a PID meter (or similar). The sample with the highest reading at each location shall be submitted to a laboratory for analysis (see Section 3.2 of this document). Note that it is permissible to convert the soil sample borings into groundwater monitoring points.

#### **3.1.2 Groundwater**

Groundwater samples should be collected at all dry cleaning sites characterized through the ADCRP process. The location of groundwater

sampling points should be based on information pertaining to current and historical dry cleaning operations conducted on the site. Groundwater sampling points should be located within the source area (inside the building when possible), and surround the exterior of the dry cleaner. This will, in most cases, involve installing groundwater sampling points in both the front and back of the building. ADCRP requires that a minimum of five groundwater monitoring points be installed. At least one sampling point must be installed up-gradient of current and former DCUs, and at least two groundwater monitoring “sentinel” points must be located near the hydraulically down-gradient site boundary in order to detect off-site contaminant migration.

Groundwater sampling points should be constructed so they can be re-sampled and used to determine groundwater flow direction. Re-sampling may prove beneficial to substantiate initial analytical results. Any existing on-site production wells or drinking water wells should also be sampled. The participant should demonstrate the extent of groundwater impacts to the property boundary. If groundwater contamination has migrated beyond the site boundaries at levels greater than VRP Tier II screening levels, or is expected to migrate beyond the site boundaries, the site is not eligible for participation in ADCRP, and the participant must contact the VRP Project Manager for guidance and to discuss enrollment of the site in the conventional VRP.

### **3.1.3 Sub-Slab Vapor**

Sub-slab vapor samples should be collected in any potentially affected buildings and/or commercial spaces. Sub-slab vapor sampling points are required near identified sources such as current and former DCUs, drains, or storage areas, as well as other locations within the building footprint. The potential for soil vapor migration beneath adjacent tenant spaces must also be addressed.

ADCRP requires that a minimum of three sub-slab vapor samples be collected at all dry cleaning sites inside the building or commercial space that contains the suspected source. The sampling points should be installed so that they can be re-sampled to verify analytical results (if necessary) or be used during sub-slab depressurization installation and verification. Further information on sampling considerations for sub-slab soil gas is available in the following documents.

- *Virginia VRP Vapor Intrusion Screening Fact Sheet, August 26, 2008*
- *USEPA Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, Appendix E, November 2002*
- *Vapor Intrusion Pathway, Interstate Technology & Regulatory Council (ITRC), January 2007*

Vapor point construction details, purge volume, sample volume, vacuum (before and after) and flow rate/collection time for each sample must be described

in the Voluntary Remediation Report. Documentation must also be provided of the ambient site conditions at the time of sampling, such as temperature, humidity, barometric pressure and recent rain events prior to or during sampling.

If the installation of sub-slab vapor points is not possible, the participant must contact the VRP Program Manager for additional guidance and to discuss enrollment of the site in the conventional VRP.

### **3.2 Analytical Methods**

The analyses should be targeted to the types of contaminants that would be suspected at the site based on site history. When designing the analytical plan for a site characterization investigation, the environmental professional must consider the likely contaminants, including breakdown products and constituents that result from reactions in the environment. The selected analyses must be sufficient to detect a release. The environmental professional is responsible for insuring that adequate field and laboratory quality assurance/quality control (QA/QC) procedures are followed.

The VRP regulations require the use of *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* EPA SW-846, 3rd edition, November 1986 (SW-846), Update III, December 1996. It is recommended that any applicable updates to SW-846 be used. Although not included in SW-846, the TO-15 method is recommended for sub-slab vapor samples. When possible, detection limits should be lower than the chemical screening levels discussed in the following sections.

### **3.3 Exposure Pathway Identification**

#### **3.3.1 On-Site Pathways**

As stated in Section 2.1, ADCRP election criteria include the lack of substantial site re-development (eliminating the construction worker as a receptor) and the establishment of residential use restrictions (eliminating the resident as a receptor). Therefore, the on-site receptors that will be evaluated during the ADCRP process will be limited to commercial workers and utility workers. It is assumed that commercial workers will be exposed to site soils beyond the footprint of the building and sub-slab vapors. Utility workers have the potential to be exposed to soil beyond the footprint of the building, groundwater, and vapors emanating from either soil/groundwater that accumulate in trenches. Intentional exposure to groundwater (i.e., drinking water or showering) is eliminated through the pre-requisite groundwater use restriction.

#### **3.3.2 Off-Site Pathways**

The potential for the existence of an off-site exposure pathway should be evaluated. This will be primarily accomplished by evaluating the off-site drinking water pathway by comparing sampling results from the groundwater sentinel points to VRP Tier II unrestricted groundwater screening levels. The unrestricted

groundwater screening level also serves as a conservative screen for the off-site groundwater to indoor air pathway. If an off-site pathway is potentially present, the participant is directed to contact the VRP Program Manager for guidance and to discuss enrollment of the site in the conventional VRP.

### **3.4 Comparison of Exposure Point Concentrations to Risk Screening Values**

Due to the limited number of samples, the maximum contaminant concentration detected shall be used as the exposure point concentration (EPC) for each medium. The maximum detected concentration should be compared to screening levels as described below. If all contaminant concentrations in all media are less than the screening levels, no further assessment is required and the participant should prepare and submit the Final Report to DEQ for review and concurrence. The Final Report shall be prepared in accordance with Section 5.0 of this manual. All detections should be presented on a summary table for each medium in the Final Report.

#### **3.4.1 Soil**

The EPCs for soil contaminants detected outside the footprint of the building should be entered into ADCRP Table 1.1. The screening values in this table are based on exposure to a commercial/industrial worker with an exposure duration of 25 years. They are considered protective of utility workers that come into contact with soil, typically at much reduced exposure durations, as well as on-site commercial workers. Once values for soil concentrations are entered, the table will indicate whether a given contaminant is of potential concern. The table is available in Appendix B of this manual.

#### **3.4.2 Groundwater**

To establish whether impacted groundwater is leaving the site concentrations detected in the sentinel points will be compared to VRP Tier II groundwater screening levels. These screening levels are used at VRP sites to evaluate whether groundwater is suitable to drink by a resident. They are found in ADCRP Table 1.2.

For on-site receptors the non-contact groundwater screening levels for utility workers based on 10 days exposure duration will be the default values used and are found in ADCRP Table 1.3a. If existing site utilities are in contact with groundwater the groundwater contact screening values will be used. Groundwater contact screening values for the utility worker are presented in ADCRP Table 1.3b. Once groundwater EPCs are entered, the table will indicate whether a given contaminant is of potential concern.

#### **3.4.3 Sub-slab Vapor**

Sub-slab vapor should be collected in dry cleaner buildings. The sub-slab vapor EPCs should be compared to the ADCRP Table 1.4 screening criteria. Once

values for sub-slab vapor EPCs are provided, the table will indicate whether a given contaminant is of potential concern. If the sub-slab vapor EPC is greater than the screening criteria, the participant is required to install a sub-slab depressurization system (SSDS) as described in Section 4.3 of this manual.

## **4.0 ACTIONS FOR SITES WITH EPC GREATER THAN SCREENING VALUES**

If EPCs exceed the screening levels at an ADCRP site, the participant should proceed to mitigate the potential risk as described in the following sections. If the exposure pathway cannot be eliminated with the use of the following methods, the participant is directed to contact the VRP Program Manager to discuss enrollment of the site in the conventional VRP.

### **4.1 Soil**

If soil EPCs determined for soil collected beyond the footprint of the building exceed the screening values as described in Section 3.4.1, the participant may address the potential exposures by removing the contaminated soil, if possible. This removal should be documented in the Report and the completeness of the removal validated with soil samples, which have contaminant concentrations below the appropriate soil screening values. If exceedences remain, the participant is directed to contact the VRP Program Manager for guidance.

### **4.2 Groundwater**

If groundwater contaminant EPCs exceed the screening values as described in Section 3.4.2, the participant should contact the VRP program manager.

### **4.3 Sub-Slab Vapor**

If sub-slab vapor contaminant EPCs exceed the screening values as described in Section 3.4.3 of this manual, the participant must install an active SSDS to mitigate exposure of commercial workers. Passive extraction systems or sealing are not viewed as sufficiently protective against risks associated with the vapor intrusion pathway. The minimum requirements for the installation of the SSDS are described in the following sections. Additional information is available from:

- *Guidelines for the Design, Installation, and Operation of Sub-slab Depressurization Systems, Massachusetts Department of Environmental Protection, December 1995*
- *Vapor Intrusion Pathway: A Practical Guideline, Interstate Technology & Regulatory Council (ITRC), January 2007*
- *Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings, Standard E2121, American Society of Testing and Materials (ASTM), February 2003*

### 4.3.1 SSDS Design and Installation Considerations

The SSDS should be designed and installed by a professional engineer or experienced environmental professional. The system should be designed to avoid the creation of other health, safety, or environmental hazards to building occupants (e.g., back drafting of natural draft combustion appliances such as clothes dryers). The system should be designed to minimize soil vapor intrusion effectively while minimizing excess energy usage, to avoid compromising moisture and temperature controls, and to minimize noise.

The most common approach to achieving depressurization beneath the slab is to insert the piping through the floor slab into the crushed rock or soil underneath. The USEPA, in its *"Consumer's Guide to Radon Reduction"* (EPA 402-K-03-002; revised February 2003), lists the following approaches as ways to reduce sub-slab vapor concentrations in a building, either in place of the more common sub-slab suction point method or in conjunction with that method:

- Drain tile suction
- Sump hole suction
- Block wall suction

The depressurization approach, or combination of approaches, selected for a building should be determined based on building-specific features.

To evaluate the potential effectiveness of a SSDS before it is installed, a diagnostic test should be performed to measure the ability of the vacuum radius to extend through the material beneath the entire slab. This test is conducted by applying vacuum on a centrally located hole drilled through the concrete slab and simultaneously observing the vacuum induced in holes at various distances from the suction point. The vacuum should be measured with a digital micromanometer or comparable instrument. Depending on test results, multiple vacuum points may be needed to achieve the desired effectiveness of the system. Observations should be made in adjacent tenant spaces where applicable.

The vent fan and discharge piping should not be located in or below an occupied area of the building to avoid entry of extracted subsurface vapors into the building in the event of a fan or pipe leak. To avoid entry of extracted subsurface vapors into the building, the vent pipe's exhaust should be above the highest eave of the building, at least 12 inches above the surface of the roof. The vent stack also must be 10 feet from any adjoining or adjacent buildings, or HVAC intakes or supply registers.

To avoid accidental disruption, the SSDS system should be labeled clearly. A warning device or indicator should be installed to alert building occupants if the active system stops working properly. Building occupants should be made aware of the warning device and how to respond to system malfunctions.

### 4.3.2 Post-Installation Testing

Once a SSDS is installed, its effectiveness and proper installation must be confirmed. Minimum activities for post-mitigation testing include the following:

- Reasonable and practical actions should be taken to identify and fix leaks. With the depressurization system operating, smoke tubes may be used to check for leaks through concrete cracks, floor joints, and at the suction point. Any leaks identified should be resealed until smoke is no longer observed flowing through the opening.
- In buildings with natural draft combustion appliances, the building should be tested for back drafting of the appliances. Back drafting conditions should be corrected before the depressurization system is placed in operation.
- The distance that a pressure change is induced in the sub-slab area (i.e., a pressure field extension test) should be confirmed. If adequate depressurization is not occurring to the entire floor slab of the space suspected to be impacted by sub-slab vapors, the reason (e.g., improper fan operation) should be identified and corrected.
- Adequate operation of the warning device or indicator should be confirmed.

### 4.3.3 SSDS Operation and Maintenance

ADCRP site owners that install an SSDS must develop a long-term operation and maintenance (O&M) plan. The plan becomes part of an IC that is recorded in the property deed, and a copy of the plan must be maintained on the site. The VRP retains the right to inspect SSDS systems after site closure to ensure that the system continues to mitigate the vapor migration pathway.

Routine maintenance should commence within 12 months after the system becomes operational, and should occur every 12 to 18 months thereafter. During routine maintenance, the following activities should be conducted at a minimum:

- A visual inspection of the complete system (e.g., vent fan, piping, warning device or indicator, labeling on systems, etc.),
- Identification and repair of leaks, and
- Inspection of the exhaust or discharge point to verify no air intakes have been located nearby.

- As appropriate, preventative maintenance (e.g., replacing vent fans), repairs and/or adjustments should be made to the system to ensure its continued effectiveness at mitigating exposures related to soil vapor intrusion.
- Many, if not all, of the post-installation testing activities, as described in Section 4.3.2, may be appropriate. The extent of such activities will primarily depend upon the reason for the changes and the documentation of sub-slab depressurization. Generally, air monitoring is not required if the system has been installed properly and is maintaining a vacuum beneath the entire slab.

In addition to the routine O&M activities described above, the building's owner and tenants must be given information packages that explain the system's operation, maintenance and monitoring. Therefore, at any time during the system's operation, the building's owner or tenants may check that the system is operating properly.

All design specifications, installation activities, and O&M procedures and schedules should be documented in the ADCRP Report (See Section 5.0 of this manual).

## 5.0 ADCRP FINAL REPORT

Upon completion of the SSDS installation and/or any soil removal actions, the participant prepares and submits to DEQ a voluntary remediation report which will serve as the ADCRP Final Report. The required components of the Final Report are described in the following sections.

### 5.1 Site Characterization/Risk Analysis

The site characterization presents the results of the investigations performed at the site. It must describe the nature of the release of contamination and include a delineation of the extent of contamination in all media (i.e., soil, groundwater, and sub-slab vapor), a map of sampling locations, summary tables of analytical results, adjacent tenant space impacts, and a description of the SSDS and ICs to be implemented at the site, and any other remedial actions, as appropriate. Risk analysis will be documented through the submittal of the completed ADCRP screening tables. The Final Report should include a justification for no further action if that was the conclusion. All conclusions must be supported with appropriate findings.

The remedial action description, if remediation is required, presents activities, schedules, and design plans for the SSDS in the site characterization report and a description of any soil removal actions conducted at the site. The Final Report also must contain the post-certification O&M program as described in Section 4.3.3 of this manual.

### 5.2 Certification by Environmental Professional

The Final Report will include a signed certification by the participant's environmental professional that the process was followed and that based on the information collected the site does not pose a threat to human health or the environment. The certification shall include the following language:

- *I attest that I have personally prepared or reviewed this Voluntary Remediation Report, including any and all documents accompanying this submittal. In my professional opinion and judgment, based upon application of a reasonable standard of care, to the best of my knowledge, information and belief, the response action(s) that is (are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of 9 VAC 20-160, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s), and (iii) comply (ies) with the provisions of the ADCRP. I further attest that all risks to human health and the environment have been identified and mitigated in accordance with the ADCRP manual. Furthermore I attest that the investigation and remediation activities (e.g., waste management and disposal, erosion and sedimentation controls, air emission controls, and activities that impact wetlands and other sensitive ecological habitats) comply with all applicable regulations.*

A personal statement by the environmental professional responsible for the above certification shall also be included in the Final Report. The statement should quantify the person's experience with the environmental sciences and how that experience qualifies him to provide a legitimate professional opinion regarding the conditions and activities at the site.

### **5.3 Documentation of Public Notice**

To comply with the public participation requirements of the voluntary remediation regulations (9 VAC160-120), the participant must complete the following:

- Provide a notice describing the proposed or completed remedy to the local government where the site is located.
- Provide the same notice to all adjacent property owners.
- Publish the notice once in a newspaper of general circulation in the area affected by the voluntary action.

A summary of comments and responses to comments received during public participation activities must be included in the Final Report.

### **5.4 Draft Certification of Satisfactory Completion of Remediation**

When ADCRP activities are complete, a draft Certificate must be prepared and included in the Final Report. The draft Certificate must contain an outline of conditions under which the final Certificate is to be issued. These may include, but are not limited to:

- A summary of the information that was considered.
- Restrictions on future use.
- Required institutional controls.
- Required engineering controls and their maintenance.

The participant shall include a completed draft of the Certificate for departmental review. The model format for the Certificate can be found on the VRP web page. Please be sure to include the property specific information indicated such as deed book, page number, legal survey plat of the property, existing easements affected by the use restrictions, signatories, as well as any trustees.

Since use restrictions will be specified in the Certificate, a description of the restrictions will be attached to the Certificate for the property in the form of the Declaration of Restrictive Covenants. If there is a deed of trust, the lender must be a signatory to this document. If another entity has an encumbrance on the property that would be affected by a restriction, then they too will be a signatory to the Certificate. The restriction also must be recorded with the land records for the site in the Circuit Court where the site is located. The Certificate itself may serve as the record and may be attached to the deed. The immunity accorded by the Certificate applies to the participant, but also "runs with the land" identified as the site. The Certificate and deed recorded

instruments must state that the participant and their successors shall conduct O&M activities as defined in the post-certification O&M Plan.

The standard format of the model Certificate is to be followed for all sites. A model Certificate may be found on the VRP web site:

[http://www.deq.virginia.gov/export/sites/default/vrp/Word\\_docs/vrPMC042309.doc](http://www.deq.virginia.gov/export/sites/default/vrp/Word_docs/vrPMC042309.doc)

Guidance on the completion of the Certificate is available from the following DEQ guidance document:

*Guidance Number VRP 02-2001: Guidance for the Voluntary Remediation Program Certification of Satisfactory Completion of Remediation*

## **5.5 Registration Fee**

Participants in the ADCRP must remit the appropriate registration fee with the Final Report. DEQ will commence review of the Final Report only after the registration fee has been paid. The amount of the registration fee is 1.0 percent of the total cost for remedial actions the site or \$5,000, whichever is less. If a registration fee of 1.0 percent of remediation cost is paid, a cost schedule must be prepared and submitted to DEQ. It should include costs for site investigation, report development, SSDS installation, operation and maintenance, and other costs associated with participating in the ADCRP.

## **6.0 DEQ REVIEW**

Upon submittal of the ADCRP Final Report and appropriate registration fee, DEQ will conduct a review of the Final Report. If DEQ is satisfied that the objectives of the ADCRP have been met, the DEQ will notify the participant in writing of its concurrence.

### **6.1 Certificate Issuance**

A completed Certificate is issued after a participant submits an acceptable Final Report and remits the appropriate registration fee. The Certificate provides immunity to enforcement actions under the Virginia Waste Management Act (Section 10.1-1400 et seq. of the Code of Virginia), the Virginia State Water Control Law (Section 62.1-44.2 et seq. of the Code of Virginia), the Virginia Air Pollution Control Law (Section 10.1-1300 et seq. of the Code of Virginia), or other applicable Virginia law. The immunity granted by the Certificate is limited to site conditions at the time of issuance, which are described in the ADCRP Final Report (i.e., nature and extent of contamination). Specific limitations of the Certificate are enumerated in it.

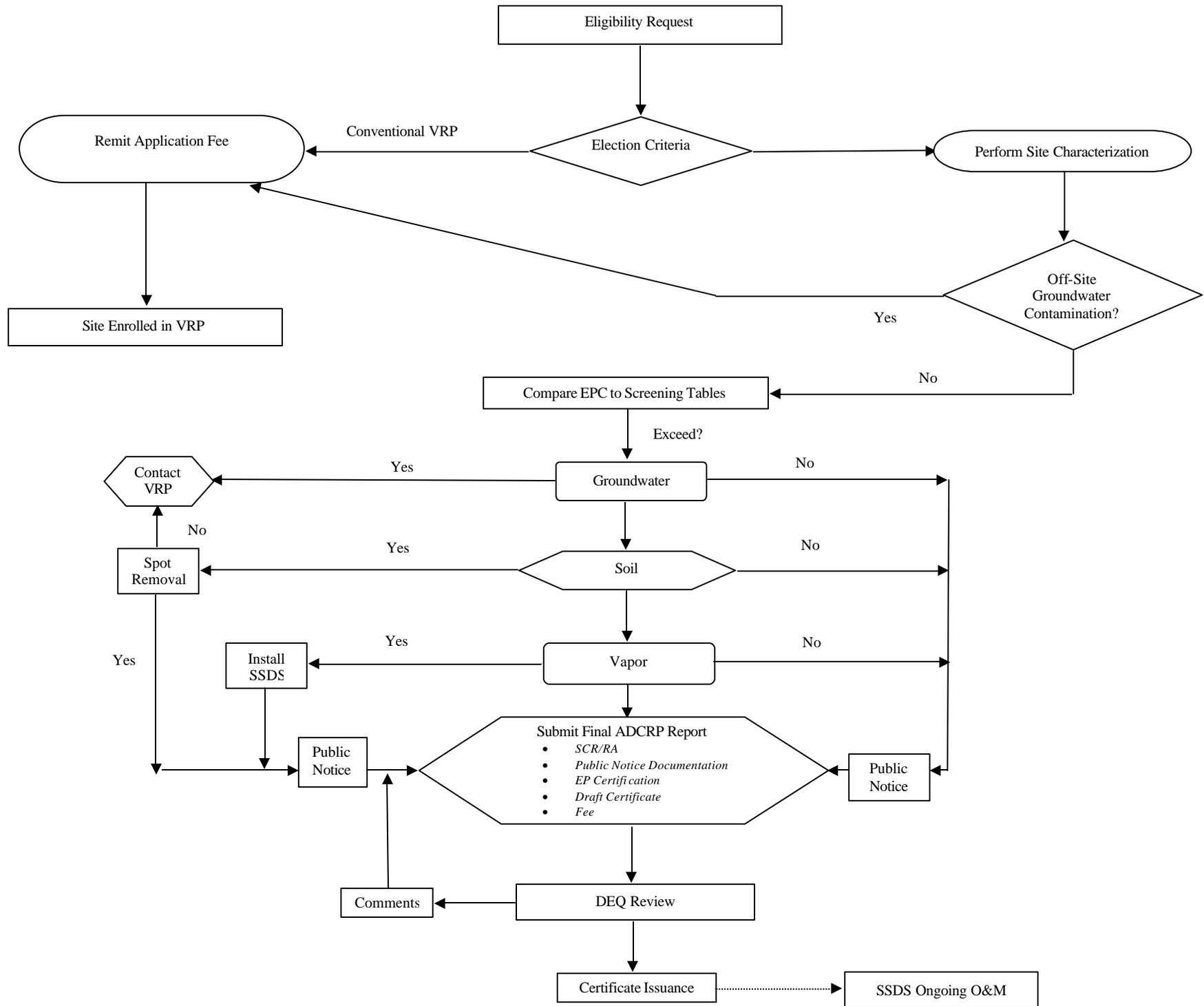
Upon issuance of the Certificate, the ADCRP process is then complete.

### **6.2 Reopeners**

DEQ reserves the right to evaluate the quality of the Final Report after Certificate issuance and if it determines the completeness and accuracy of the information in that report is invalid or that the conclusions of the environmental professional are unsupported, or if conditions have changed since Certificate issuance, it may invalidate the Certificate.

## APPENDIX A

### ADCRP Process Flow Chart



## APPENDIX B

### ADCRP Screening Tables

Revised 2/15/10

ADCRP  
Table 1.1 Selection of Contaminants of Concern  
Soil: Restricted (Commercial/Industrial)

	CAS No.	VRP Tier III Screening Concentration  mg/kg	Soil Concentration Maximum  mg/kg	Contaminant Of Potential Concern?
<b>1,1,1-Trichloroethane</b>				
<b>1,1,2-Trichloroethane</b>				
<b>1,1,2,2-Tetrachloroethane</b>				
<b>1,1,2,2,2-Pentachloroethane</b>				
<b>1,1,1,1-Tetrafluoroethane</b>				
<b>1,1,1,2-Tetrafluoroethane</b>				
<b>1,1,2,2-Tetrafluoroethane</b>				
<b>1,1,1,2,2-Pentafluoroethane</b>				
<b>1,1,1,2,2,2-Hexafluoroethane</b>				
<b>1,1,1-Trichloro-1,2,2-trifluoroethane</b>				
<b>1,1,2-Trichlorobenzene</b>				
<b>1,2,4-Trichlorobenzene</b>				
<b>1,1,1-Trichloroethane</b>				
<b>1,1,1,2-Trichloroethane</b>				
<b>1,1,2-Trichloroethane</b>				
<b>Trichloroethene</b>				
<b>Trichlorofluoromethane</b>				
<b>Vinyl Chloride</b>				
<b>Total Xylenes</b>				
<b>Other VOCs</b>				
<b>n-butylbenzene</b>				
<b>sec-butylbenzene</b>				
<b>tert-butylbenzene</b>				
<b>isopropyltoluene</b>				
<b>n-propylbenzene</b>				
<b>1,1,1,2-tetrachloroethane</b>				
<b>1,2,4-trimethylbenzene</b>				
<b>1,3,5-trimethylbenzene</b>				
<b>m-xylene</b>				
<b>o-xylene</b>				
<b>p-xylene</b>				
<b>Acetone</b>				
<b>Benzene</b>				
<b>Bromochloromethane</b>				
<b>Bromodichloromethane</b>				
<b>Bromoform</b>				
<b>Bromomethane</b>				
<b>2-Butanone (methyl ethyl ketone)</b>				
<b>Carbon disulfide</b>				
<b>Carbon tetrachloride</b>				
<b>Chlorobenzene</b>				
<b>Chloroethane</b>				
<b>Chloroform</b>				
<b>Chloromethane</b>				
<b>Cyclohexane</b>				
<b>1,2-Dibromo-3-chloropropane</b>				
<b>Dibromochloromethane</b>				
<b>1,2-Dibromoethane</b>				
<b>1,2-Dichlorobenzene (ortho)</b>				
<b>1,3-Dichlorobenzene (meta)</b>				
<b>1,4-Dichlorobenzene (para)</b>				
<b>Dichlorodifluoromethane</b>				
<b>1,1-Dichloroethane</b>				
<b>1,2-Dichloroethane</b>				
<b>1,1-Dichloroethene</b>				
<b>1,2-Dichloroethene (total)</b>				
<b>cis-1,2-Dichloroethene</b>				
<b>trans-1,2-Dichloroethene</b>				
<b>1,2-Dichloropropane</b>				
<b>1,3-Dichloropropane (total)</b>				
<b>cis-1,3-Dichloropropene</b>				
<b>trans-1,3-Dichloropropene</b>				
<b>1,4-dioxane</b>				
<b>Ethylbenzene</b>				
<b>Hexane</b>				
<b>2-Hexanone</b>				
<b>Isopropylbenzene</b>				
<b>4-Methyl-2-pentanone (methyl isobutyl ketone)</b>				
<b>Methyl acetate</b>				
<b>Methyl tert-butyl ether</b>				
<b>Methylcyclohexane</b>				
<b>Methylene chloride</b>				
<b>Styrene</b>				
<b>1,1,2,2-Tetrachloroethane</b>				
<b>Tetrachloroethene</b>				
<b>Toluene</b>				
<b>1,1,2-Trichloro-1,2,2-trifluoroethane</b>				
<b>1,2,3-Trichlorobenzene</b>				
<b>1,2,4-Trichlorobenzene</b>				
<b>1,1,1-Trichloroethane</b>				
<b>1,1,1,2-Trichloroethane</b>				
<b>1,1,2-Trichloroethane</b>				
<b>Trichloroethene</b>				
<b>Trichlorofluoromethane</b>				
<b>Vinyl Chloride</b>				
<b>Total Xylenes</b>				
<b>n-butylbenzene</b>				
<b>sec-butylbenzene</b>				
<b>tert-butylbenzene</b>				
<b>isopropyltoluene</b>				
<b>n-propylbenzene</b>				
<b>1,1,1,2-tetrachloroethane</b>				
<b>1,2,4-trimethylbenzene</b>				
<b>1,3,5-trimethylbenzene</b>				
<b>m-xylene</b>				
<b>o-xylene</b>				
<b>p-xylene</b>				

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ADCRP  
Table 1.2 Selection of Contaminants of Concern  
Groundwater: Unrestricted (Residential)  
Sentinal Well

	CAS No.	VRP Tier II Screening Level ug/L	Sentinal Well(s) Ground Water Maximum Concentration ug/L	Constituent a Concern for Migrating Off-Site?
<b>TCL Volatile Organic Compounds (VOC)</b>				
Acetone	67-64-1	2200		
Benzene	71-43-2	5		
Bromochloromethane	74-97-5	1.1		
Bromodichloromethane	75-27-4	80		
Bromoform	75-25-2	80		
Bromomethane	74-83-9	0.87		
2-Butanone (methyl ethyl ketone)	78-93-3	710		
Carbon disulfide	75-15-0	100		
Carbon tetrachloride	56-23-5	5		
Chlorobenzene	108-90-7	100		
Chloroethane	75-00-3	2100		
Chloroform	67-66-3	80		
Chloromethane	74-87-3	19		
Cyclohexane	110-82-7	1300		
1,2-Dibromo-3-chloropropane	96-12-8	0.2		
Dibromochloromethane	124-48-1	80		
1,2-Dibromoethane	106-93-4	0.0065		
1,2-Dichlorobenzene (ortho)	95-50-1	600		
1,3-Dichlorobenzene (meta)	541-73-1	0.43		
1,4-Dichlorobenzene (para)	106-46-7	75		
Dichlorodifluoromethane	75-71-8	39		
1,1-Dichloroethane	75-34-3	2.4		
1,2-Dichloroethane	107-06-2	5		
1,1-Dichloroethene	75-35-4	7		
1,2-Dichloroethene (total)	540-59-0	33		
cis-1,2-Dichloroethene	156-59-2	70		
trans-1,2-Dichloroethene	156-60-5	100		
1,2-Dichloropropane	78-87-5	5		
1,3-Dichloropropane (total)	542-75-6	0.43		
cis-1,3-Dichloropropene	10061-01-5	0.43		
trans-1,3-Dichloropropene	10061-02-6	0.43		
1,4-dioxane	123-91-1	6.1		
Ethylbenzene	100-41-4	700		
Hexane	110-54-3	88		
2-Hexanone	591-78-6			
Isopropylbenzene (cumene)	98-82-8	68		
4-Methyl-2-pentanone (methyl isobutyl ketone)	108-10-1	200		
Methyl acetate	79-20-9	3700		
Methyl tert-butyl ether	1634-04-4	12		
Methylcyclohexane	108-87-2	630		
Methylene chloride	75-09-2	5		
Styrene	100-42-5	100		
1,1,2,2-Tetrachloroethane	79-34-5	0.067		
Tetrachloroethene	127-18-4	5		
Toluene	108-88-3	1000		
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	5900		
1,2,3-Trichlorobenzene	87-61-6	19		
1,2,4-Trichlorobenzene	120-82-1	70		
1,1,1-Trichloroethane	71-55-6	200		
1,1,2-Trichloroethane	79-00-5	5		
Trichloroethene	79-01-6	5		
Trichlorofluoromethane	75-69-4	130		
Vinyl Chloride	75-01-4	2		
Total Xylenes	1330-20-7	10000		
<b>Other VOCs</b>				
n-butylbenzene	104-51-8			
sec-butylbenzene	135-98-8			
tert-butylbenzene	98-06-6			
isopropyltoluene	99-87-6	68		
n-propylbenzene	103-65-1			
1,1,1,2-tetrachloroethane	630-20-6	0.52		
1,2,4-trimethylbenzene	95-63-6	1.5		
1,3,5-trimethylbenzene	108-67-8	1.5		
m-xylene	108-38-3	140		
o-xylene	95-47-6	140		
p-xylene	106-42-3	140		

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Utilities above Groundwater Table ADCRP Table 1.3a Groundwater: Utility Worker in a Trench 10 day exposure duration		ADCRP No Contact Groundwater Concentration	Maximum Groundwater Concentration	Contaminant of Potential Concern?
CAS No.		ug/L	ug/L	
<b>TCL Volatile Organic Compounds (VOCs)</b>				
Acetone	67-64-1	5.25E+08		
Benzene	71-43-2	5.01E+03		
Bromochloromethane	74-97-5			
Bromodichloromethane	75-27-4	1.71E+04		
Bromoform	75-25-2	6.51E+06		
Bromomethane	74-83-9	8.97E+02		
2-Butanone (methyl ethyl ketone)	78-93-3	9.02E+07		
Carbon disulfide	75-15-0	1.81E+04		
Carbon tetrachloride	56-23-5	1.60E+03		
Chlorobenzene	108-90-7	1.51E+04		
Chloroethane	75-00-3	3.41E+05		
Chloroform	67-66-3	6.50E+03		
Chloromethane	74-87-3	6.60E+03		
Cyclohexane	110-82-7	2.99E+04		
1,2-Dibromo-3-chloropropane	96-12-8	2.01E+03		
Dibromochloromethane	124-48-1	7.36E+04		
1,2-Dibromoethane	106-93-4	2.97E+03		
1,2-Dichlorobenzene (ortho)	95-50-1	1.24E+06		
1,3-Dichlorobenzene (meta)	541-73-1			
1,4-Dichlorobenzene (para)	106-46-7	3.09E+04		
Dichlorodifluoromethane	75-71-8	6.58E+03		
1,1-Dichloroethane	75-34-3	8.55E+04		
1,2-Dichloroethane	107-06-2	2.15E+04		
1,1-Dichloroethene	75-35-4	6.94E+03		
1,2-Dichloroethene (total)	540-59-0			
cis-1,2-Dichloroethene	156-59-2			
trans-1,2-Dichloroethene	156-60-5	7.41E+03		
1,2-Dichloropropane	78-87-5	4.84E+03		
1,3-Dichloropropane (total)	542-75-6	1.47E+03		
cis-1,3-Dichloropropene	10061-01-5	1.78E+04		
trans-1,3-Dichloropropene	10061-02-6	2.67E+04		
1,4-dioxane	123-91-1	6.74E+06		
Ethylbenzene	100-41-4	3.86E+04		
Hexane	110-54-3	1.69E+02		
2-Hexanone	591-78-6			
Isopropylbenzene	98-82-8	4.32E+02		
4-Methyl-2-pentanone (methyl isobutyl ketone)	108-10-1	2.36E+07		
Methyl acetate	79-20-9			
Methyl tert-butyl ether	1634-04-4	3.65E+06		
Methylcyclohexane	108-87-2	8.12E+03		
Methylene chloride	75-09-2	5.49E+05		
Styrene	100-42-5	1.25E+06		
1,1,2,2-Tetrachloroethane	79-34-5	4.02E+04		
Tetrachloroethene	127-18-4	7.30E+03		
Toluene	108-88-3	7.05E+05		
1,1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	1.35E+05		
1,2,3-Trichlorobenzene	87-61-6			
1,2,4-Trichlorobenzene	120-82-1			
1,1,1-Trichloroethane	71-55-6	3.04E+05		
1,1,2-Trichloroethane	79-00-5	5.01E+04		
Trichloroethene	79-01-6	3.51E+04		
Trichlorofluoromethane	75-69-4	6.76E+04		
Vinyl Chloride	75-01-4	2.85E+03		
Total Xylenes	1330-20-7	2.30E+04		
<b>Other VOCs</b>				
n-butylbenzene	104-51-8			
sec-butylbenzene	135-98-8			
tert-butylbenzene	98-06-6			
isopropyltoluene	99-87-6			
n-propylbenzene	103-65-1			
1,1,1,2-tetrachloroethane	630-20-6	4.49E+04		
1,2,4-trimethylbenzene	95-63-6	1.53E+04		
1,3,5-trimethylbenzene	108-67-8			
m-xylene	108-38-3	1.11E+05		
o-xylene	95-47-6	1.26E+05		
p-xylene	106-42-3	9.68E+04		

(a) The Tier II Screening Level was substituted for the model estimate when the model estimate was less than the Tier II level.

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Utilities in Groundwater ADCRP Table 1.3b Groundwater: Utility Worker in a Trench 10 day exposure duration		CAS No.	ADCRP Contact with GW Concentration ug/L	Maximum Groundwater Concentration ug/L	Contaminant of Potential Concern?
<b>TCL Volatile Organic Compounds (VOCs)</b>					
Acetone	67-64-1	1.65E+05			
Benzene	71-43-2	7.03E+01			
Bromochloromethane	74-97-5	8.70E+04			
Bromodichloromethane	75-27-4	8.00E+01 (a)			
Bromoform	75-25-2	2.90E+03			
Bromomethane	74-83-9	1.29E+01			
2-Butanone (methyl ethyl ketone)	78-93-3	2.35E+04			
Carbon disulfide	75-15-0	1.60E+03			
Carbon tetrachloride	56-23-5	1.52E+02			
Chlorobenzene	108-90-7	1.41E+02			
Chloroethane	75-00-3	2.12E+04			
Chloroform	67-66-3	8.86E+01			
Chloromethane	74-87-3	1.69E+02			
Cyclohexane	110-82-7	1.44E+04			
1,2-Dibromo-3-chloropropane	96-12-8	6.34E-01			
Dibromochloromethane	124-48-1	1.05E+02			
1,2-Dibromoethane	106-93-4	4.49E+00			
1,2-Dichlorobenzene (ortho)	95-50-1	6.54E+03			
1,3-Dichlorobenzene (meta)	541-73-1	8.17E+02			
1,4-Dichlorobenzene (para)	106-46-7	2.07E+02			
Dichlorodifluoromethane	75-71-8	5.77E+03			
1,1-Dichloroethane	75-34-3	1.15E+03			
1,2-Dichloroethane	107-06-2	7.45E+01			
1,1-Dichloroethene	75-35-4	5.18E+02			
1,2-Dichloroethene (total)	540-59-0	1.67E+04			
cis-1,2-Dichloroethene	156-59-2	1.86E+05			
trans-1,2-Dichloroethene	156-60-5	1.56E+02			
1,2-Dichloropropane	78-87-5	3.70E+01			
1,3-Dichloropropene (total)	542-75-6	5.54E+01			
cis-1,3-Dichloropropene	10061-01-5	5.79E+01			
trans-1,3-Dichloropropene	10061-02-6	5.92E+01			
1,4-dioxane	123-91-1				
Ethylbenzene	100-41-4	7.62E+02			
Hexane	110-54-3	1.70E+03			
2-Hexanone	591-78-6				
Isopropylbenzene	98-82-8	1.15E+03			
4-Methyl-2-pentanone (methyl isobutyl ketone)	108-10-1	1.12E+04			
Methyl acetate	79-20-9	7.98E+07			
Methyl tert-butyl ether	1634-04-4	7.31E+03			
Methylcyclohexane	108-87-2	7.80E+03			
Methylene chloride	75-09-2	3.70E+03			
Styrene	100-42-5	8.20E+03			
1,1,2,2-Tetrachloroethane	79-34-5	4.74E+01			
Tetrachloroethene	127-18-4	4.02E+02			
Toluene	108-88-3	1.27E+04			
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	1.08E+05			
1,2,3-Trichlorobenzene	87-61-6	1.82E+03			
1,2,4-Trichlorobenzene	120-82-1	2.01E+03			
1,1,1-trichloroethane	71-55-6	1.52E+04			
1,1,2-trichloroethane	79-00-5	1.41E+02			
Trichloroethene	79-01-6	1.06E+03			
Trichlorofluoromethane	75-69-4	2.15E+04			
Vinyl Chloride	75-01-4	2.08E+02			
Total Xylenes	1330-20-7	1.00E+04 (a)			
<b>Other VOCs</b>					
n-butylbenzene	104-51-8				
sec-butylbenzene	135-98-8				
tert-butylbenzene	98-06-6				
isopropyltoluene	99-87-6				
n-propylbenzene	103-65-1				
1,1,1,2-tetrachloroethane	630-20-6	3.29E+02			
1,2,4-trimethylbenzene	95-63-6	2.03E+02			
1,3,5-trimethylbenzene	108-67-8				
m-xylene	108-38-3	1.91E+03			
o-xylene	95-47-6	1.91E+03			
p-xylene	106-42-3	1.91E+03			

(a) The Tier II Screening Level was substituted for the model estimate when the model estimate was less than the Tier II level.

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ADCRP Table 1.4  
Selection of Contaminants of Concern  
Restricted Groundwater Use  
Restricted Land Use

Inhalation of Indoor Air <b>SUBSLAB VAPOR</b>	CAS No.	Commercial Subslab Vapor Screening Level a = 0.03 ug/m3	Maximum Subslab Vapor Concentration ug/m3	Contaminant or Potential Concern?
<b>TCL Volatile Organic Compounds (VOC)</b>				
Acetone	67-64-1	4.53E+05		
Benzene	71-43-2	3.33E+02	bg	
Bromochloromethane	74-97-5			
Bromodichloromethane	75-27-4	1.10E+01		
Bromoform	75-25-2	3.72E+02		
Bromomethane	74-83-9	7.30E+01		
2-Butanone (methyl ethyl ketone)	78-93-3	7.30E+04		
Carbon disulfide	75-15-0	1.02E+04		
Carbon tetrachloride	56-23-5	3.00E+01	bg	
Chlorobenzene	108-90-7	7.30E+02		
Chloroethane	75-00-3	1.46E+05		
Chloroform	67-66-3	1.37E+02	bg	
Chloromethane	74-87-3	1.31E+03		
Cyclohexane	110-82-7	8.76E+04		
1,2-Dibromo-3-chloropropane	96-12-8	6.81E+02		
Dibromochloromethane	124-48-1	1.51E+01		
1,2-Dibromoethane	106-93-4	6.81E+01		
1,2-Dichlorobenzene (ortho)	95-50-1	2.92E+03		
1,3-Dichlorobenzene (meta)	541-73-1			
1,4-Dichlorobenzene (para)	106-46-7	3.72E+01		
Dichlorodifluoromethane	75-71-8	2.92E+03		
1,1-Dichloroethane	75-34-3	2.56E+02		
1,2-Dichloroethane	107-06-2	1.57E+01		
1,1-Dichloroethene	75-35-4	2.92E+03		
1,2-Dichloroethene (total)	540-59-0			
cis-1,2-Dichloroethene	156-59-2			
trans-1,2-Dichloroethene	156-60-5	8.76E+02		
1,2-Dichloropropane	78-87-5	4.09E+01		
1,3-Dichloropropene (total)	542-75-6	1.02E+02		
cis-1,3-Dichloropropene	10061-01-5	1.02E+02		
trans-1,3-Dichloropropene	10061-02-6	1.02E+02		
1,4-dioxane	123-91-1	5.31E+01		
Ethylbenzene	100-41-4	2.97E+02	bg	
Hexane	110-54-3	1.02E+04		
2-Hexanone	591-78-6			
Isopropylbenzene	98-82-8	5.84E+03		
4-Methyl-2-pentanone (methyl isobutyl ketone)	108-10-1	4.38E+04		
Methyl acetate	79-20-9			
Methyl tert-butyl ether	1634-04-4	1.57E+03		
Methylcyclohexane	108-87-2	4.38E+04		
Methylene chloride	75-09-2	8.70E+02		
Styrene	100-42-5	1.46E+04		
1,1,2,2-tetrachloroethane	79-34-5	7.05E+00		
Tetrachloroethene	127-18-4	1.27E+02	bg	
Toluene	108-88-3	7.30E+04		
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	4.38E+05		
1,2,3-Trichlorobenzene	87-61-6			
1,2,4-Trichlorobenzene	120-82-1			
1,1,1-Trichloroethane	71-55-6	7.30E+04		
1,1,2-Trichloroethane	79-00-5	2.56E+01		
Trichloroethene	79-01-6	2.04E+02		
Trichlorofluoromethane	75-69-4	1.02E+04		
Vinyl Chloride	75-01-4	9.29E+01		
Total Xylenes	1330-20-7	1.46E+03		
<b>Volatile Organic Compounds (VOC)</b>				
n-butylbenzene	104-51-8			
sec-butylbenzene	135-98-8			
tert-butylbenzene	98-06-6			
isopropyltoluene	99-87-6			
n-propylbenzene	103-65-1			
1,1,1,2-tetrachloroethane	630-20-6	5.52E+01		
1,2,4-trimethylbenzene	95-63-6	1.02E+02		
1,3,5-trimethylbenzene	108-67-8			
m-xylene	108-38-3	1.02E+04		
o-xylene	95-47-6	1.02E+04		
p-xylene	106-42-3	1.02E+04		

bg = Based on backcalculation from indoor air background.