



Maryland
Department of
the Environment

FACTS ABOUT: Voluntary Cleanup Program Cleanup Criteria

Section 7-508 of the Environment Article, Annotated Code of Maryland, lists six cleanup criteria that VCP participants can use to develop a Response Action Plan. The participant may use one or more of these criteria when evaluating conditions and remediating the property to eliminate risk to current and future users of the property:

1. Uniform numeric risk-based standards;
2. Standards from a site-specific risk assessment;
3. Background levels;
4. Federal or State soil or water quality standards;
5. Standards based on federal or State Maximum Contaminant Levels (MCLs); and
6. Any other federal or State standards.

The use of the available cleanup criteria does not exempt applicants from meeting all other applicable Maryland environmental regulations at the property.

1. Uniform Numeric Risk-Based Standards

The Maryland Department of the Environment (the Department) published its guidance document entitled “Cleanup Standards for Soil and Groundwater, June 2008 Interim Final Guidance” to provide the regulated community with statewide uniform cleanup standards. Cleanup standards for soil were developed for both residential and non-residential land use scenarios. The standards represent concentration levels at which no further remedial action would be required at a property as long as use of the standards is consistent with the conditions provided in the document. The document is available on the Department website at: [http://mde.maryland.gov/programs/LAND/MarylandBrownfieldVCP/Documents/www.mde.state.md.us/assets/document/Final%20Update%20No%202.1%20dated%205-20-08\(1\).pdf](http://mde.maryland.gov/programs/LAND/MarylandBrownfieldVCP/Documents/www.mde.state.md.us/assets/document/Final%20Update%20No%202.1%20dated%205-20-08(1).pdf)

The Department may deny the use of these cleanup standards in situations where property conditions or expected exposures differ significantly from the assumptions used to derive the standards. The Department’s Cleanup Standards for Soil and Groundwater guidance document does not in any way imply protection of ecological receptors. At properties where adverse effects to ecological receptors may be of concern, an ecological risk assessment following methods approved by the Department will be required.

In addition, the Department’s Cleanup Standards for Soil and Groundwater guidance document does not imply protection from vapor migration to indoor air. Depending on site-specific conditions, additional evaluation, including modeling, may be required to evaluate potential risks from vapor migration to indoor air.



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410-537-3000 | 800-633-6101 | TTY Users: 800-735-2258

2. Measurable Standards Based On Site-Specific Risk Assessments

Participants may choose to complete a site-specific risk assessment to evaluate potential risk posed to human and ecological receptors based upon site-specific scenarios. The risk assessment should be based on the U.S. EPA guidance document entitled Risk Assessment Guidance for Superfund.

To expedite the review and approval of risk assessments, the VCP recommends the following outline:

A. **Introductory Information**

1. Executive Summary: Summary of risk assessment conclusions and a brief description of the estimated risks to public health and the environment.

2. Introduction:

- Brief description of the site, location, and previous/current activities which have contributed to the contamination;
- Identification of each surface water body on or adjacent to the site, and the specific use designation for each surface water body as stated in COMAR Section 26.08.02;
- Identification, location, and use of all wells within a half-mile radius of the site that utilize groundwater (e.g. residential, production, monitoring);
- Direction of groundwater flow;
- Distance to the nearest surface water body in the direction of groundwater flow and the specific use designation for this surface water body as stated in COMAR 26.08.02;
- Map or series of maps that identify the location of all samples collected at the site and used in the risk assessment;
- Data tables for all samples contained in the risk assessment including date of sample collection and analysis; depth of each soil, sediment, and groundwater sample; detection limits; analytical results; and all data qualifiers and explanations of qualifiers; and
- A data table including all samples collected at the property over time, regardless of whether the data was included in the risk assessment.

B. **Human Health Risk Assessment**

1. Hazard Identification: Screening process used to identify contaminants of potential concern in each media. Screening values recommended by the Department include:

- The Department Cleanup Standards for Soil and Groundwater;
- U.S. EPA Regional Screening Levels ;
- U.S. EPA Soil Screening Levels; and



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- Final list of chemicals of potential concern included in the human health risk assessment. It is important to note the statement in the U.S. EPA guidance that risk-based concentrations for non-carcinogenic chemicals will be divided by 10 prior to comparison. Also, please follow all appropriate guidance for screening values. Other screening values may be used if approved by the Department.

2. Exposure Assessment: When preparing the exposure assessment, the participant must include the information described below. The exposure assessment must:

- Include current and proposed specific future use of the property (e.g. housing development, office space, manufacturing facility), if known;
- Identify current and proposed future use of the property as either residential, commercial, or industrial, consistent with definitions utilized by the VCP;
- Identify all populations and subpopulations of concern. The VCP typically evaluates the following populations, based on proposed future use:
 - Residential use: adult residents, youth (between 6 and 18 years old) residents, child (less than 6 years old) residents, and construction workers;
 - Commercial use: adult on-site workers, youth (between 6 and 18 years old) intermittent visitors, child (less than 6 years old) intermittent visitors, and construction workers; and
 - Industrial use: adult on-site workers, youth (between 6 and 18 years old) intermittent visitors, and construction workers;
- Evaluate all appropriate exposure pathways, including fate and transport assumptions. Pathways typically considered include:
 - Incidental ingestion of subsurface soil (during construction/excavation activities) and surface soil;
 - Dermal contact with subsurface soil (during construction and excavation activities) and surface soil;
 - Inhalation of fugitive dust from subsurface soil (during construction/excavation activities) and surface soil;
 - Inhalation of volatiles from subsurface soils into indoor air and outdoor air;
 - Ingestion of groundwater used as a potable water supply;
 - Dermal contact with groundwater;
 - Inhalation of volatiles while showering with groundwater used as a potable water supply;
 - Inhalation of volatiles from groundwater into indoor air and outdoor air;
 - Incidental ingestion of surface water while recreating;
 - Dermal contact with surface water;
 - Incidental ingestion of sediment; and
 - Dermal contact with sediment;
- Identify the exposure point concentration for each contaminant of concern, including how the exposure point concentration was quantified, if the data are normal or lognormal, and if the exposure point concentration represents the 95th percentile



- upper confidence limit (UCL) of the arithmetic mean, the maximum concentration, or some other value;
- Document all exposure models and assumptions used, including references for all assumptions and for each exposure pathway included in the risk assessment; and
 - Calculate intakes for each exposure pathway included in the risk assessment.

If the risk assessment is based on future industrial or commercial use of the property, it may be necessary to place a restriction on the property deed. To preclude the use of a restriction, the risk assessment may also include an estimated risk for future residential use. If the estimated risks for future residential, commercial, and industrial use are within U.S. EPA's recommended levels of risk, the deed restriction may not be necessary.

"Intermittent visitors" includes trespassers, customers, and patrons. Other potentially exposed populations may be evaluated, when appropriate, based on site use. If these potentially exposed populations are not included, please provide the basis for that omission.

These exposure pathways may be evaluated either quantitatively or qualitatively. Please provide an explanation for any exposure pathway not included in the risk assessment.

3. Toxicity Assessment: When preparing the toxicity assessment, the participant must include:

- Toxicity data for all non-carcinogenic chemicals;
- Toxicity data for all carcinogenic chemicals; and
- Evaluation of all chemicals for which no toxicity data are available.

Toxicity information from the following sources is typically used: Integrated Risk Information System (IRIS), Health Effects Assessment Summary Tables (HEAST), US EPA National Center for Environmental Assessment (NCEA), and the U.S. EPA Regional Screening Levels (RSL) table. Toxicity data may be used from other sources if approved by the Department.

4. Risk Characterization: The risk characterization must include the following:

- Cumulative non-carcinogenic risk;
- Systemic non-carcinogenic risk;
- Cumulative carcinogenic risk;
- Discussion of the chemicals for which no toxicity data are available; and
- Discussion of uncertainty in the human health risk assessment.



C. Ecological Risk Assessment

1. Ecological Hazard Identification: The ecological hazard identification must include the following:

- Description of all areas of the site at which ecological receptors may frequent;
- Conceptual site model that identifies all exposure pathways, media, fate and transport assumptions, and potential receptors;
- Description of the screening process used to identify contaminants of potential ecological concern in each media. Screening values recommended by the Department include:
 - Maryland ambient water quality standards;
 - U.S. EPA recommended ambient water quality criteria;
 - U.S. EPA draft sediment quality criteria; and
 - U.S. EPA sediment quality benchmarks;
- National Oceanographic and Atmospheric Administration effects range median and low values for sediment;
- Appropriate screening values for terrestrial receptors; and
- A final list of contaminants of potential concern that are included in the ecological risk assessment.

Other screening values may be used if approved by the Department.

2. Ecological Exposure Assessment: The participant's ecological exposure assessment must include:

- Discussion of potential ecological receptors at the site;
- Discussion of the potential for exposure at the site; and
- Description of assessment endpoints.

3. Ecological Risk Characterization: The ecological characterization shall include:

- Ecological risk associated with each contaminant of potential ecological concern in each media;
- Relevant field observations; and
- Discussion of the uncertainty in the ecological risk assessment.

3. **Background Levels**

Non-anthropogenic background levels may be selected as appropriate cleanup criteria at properties located in areas characterized by high levels of naturally occurring metals. Properties with organic contaminants are not amenable to a background-level cleanup since these compounds rarely occur naturally. Background levels may not be calculated using characterization data from the VCP property.



4. Federal or State Soil or Water Quality Standards

Federal or State soil or water quality cleanup standards are used to address issues of surface water or sediment contamination at VCP sites. This is due to the fact that the VCP does not have cleanup standards for surface water and sediment and other State and federal agencies have well-established standards for these media.

5. Federal or State Maximum Contaminant Levels

MCLs are most commonly used as cleanup criteria at sites where groundwater at the site, or in the vicinity of the site, is being used for a potable supply. In these instances, MCLs are most appropriate because they are enforceable standards.

6. Any Other Federal or State Standards

The most commonly used indoor air and soil gas concentrations include those presented in the Department's Facts about Vapor Intrusion.

