

MassDEP Shortforms for Human Health Risk Assessment under the MCP

USER'S GUIDE

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Shortform Applicability

The Shortforms are designed to streamline the Method 3 risk assessment and review process. While Method 3 risk assessments are site-specific, some exposure scenarios are sufficiently standardized for a template approach. MassDEP has assembled recommended exposure assumptions and toxicity information into the Shortform spreadsheets to calculate risk for each of these standard scenarios.

The Shortforms have important limitations. These include, but are not limited to:

1. Exposure Assumptions - It is the risk assessor's responsibility to verify that the exposure assumptions in each Shortform are appropriate for use at their site.
2. Exposure Pathways - The Shortforms may not cover all exposure pathways present at a site. For example, the Park Visitor Shortform for contaminated soil does not assess risks associated with inhalation of volatile compounds. At sites where this pathway might be of concern (e.g., athletic fields or parks established over former landfills), additional assessment would be needed.
3. EPC Development - Development of appropriate Exposure Point Concentrations (EPCs) for each exposure pathway is vital to ensuring that the results of the Method 3 Risk Assessment are valid. Regulations and guidance describing the development of EPCs can be found in 310 CMR 40.0900 and MassDEP's 1995 *Guidance for Disposal Site Risk Characterization*. If these requirements are not met, results from the Shortform are invalid.
4. Generic IH Calculations - The Shortforms use a generic approach to evaluating imminent hazards (IH). However, MassDEP's regulations at 310 CMR 40.0955(2)(c) call for chemical-specific approaches for certain hazardous materials. While some chemicals have reminders that pop up about a chemical-specific IH hazard quotient, it is the Shortform user's responsibility to identify contaminants that require a chemical-specific approach and evaluate them accordingly.
5. Non-Calculated Risks - Some risks are not included in the Shortforms. For instance, chromium(VI) in soils poses an imminent hazard due to contact dermatitis at a level of 200 mg/kg (rounded from 170 mg/kg), though the residential Shortform yields a hazard quotient of less than one for that concentration. All calculations should be reviewed to ensure that they comply with the MCP.

Shortform Set-Up

The Shortforms are comprised of Excel workbooks, each of which addresses a specific receptor (e.g., resident, trespasser, construction worker, etc.) exposed to oil or hazardous materials (OHM) in soil, indoor air, drinking water, or surface water. Each Shortform workbook contains several worksheets, the first of which is an index with a short description of each of the subsequent worksheets. The following worksheets provide information on Exposure Point Concentration (EPCs), equations to calculate cancer and noncancer risk ("C Eq" and "N Eq"), exposure assumptions ("Exp"), and chemical-specific information ("Chem") drawn from the Vlookup workbook. Tables in the worksheets are designed to be self-explanatory and compliment a written risk assessment report.

All Shortforms are linked to the same Vlookup workbook that contains chemical-specific information such as dose-response values and physical constants. The Shortforms and the Vlookup file are intimately linked. To keep this relationship intact and the Shortforms functional, anytime a new file is available, it's best to download all of the files again.

Using the Shortforms

The Shortforms and Vlookup files should be extracted to the same folder before being opened. In order to ensure that the workbooks link correctly, the Vlookup file should be opened first. Shortforms can then be opened subsequently.

Using each Shortform is a simple two-step process:

1. Select Contaminants of Concern (COCs) in the first column of the EPCs worksheet. COCs can be added using a drop-down menu that appears when a cell in that first column is selected.
2. Enter site-specific EPCs in the cell immediately to the right of each COC. Check to be sure the units of your data match those in the Shortform. Risks associated with each COC/EPC combination are calculated automatically and displayed in the cells to the right of the EPC. Risks are only displayed for pathways that might contribute significantly to overall risk.

The total site cancer (Excess Lifetime Cancer Risk, ELCR) and noncancer (Hazard Index, HI) risks for all of the COCs are summed at the top right of the EPC spreadsheet. If there is exposure to more than one medium (soil and groundwater, for example), the total risk must be calculated by adding the HIs and ELCRs from all of the applicable Shortform files.

Notes of caution: **Under no circumstances should columns or rows be deleted or inserted between existing ones in the Shortforms.** Doing so could disrupt the intra- and inter-worksheet links, thus compromising the validity of the risk calculations. Similarly, do not change the name of the Vlookup. The risk assessor is responsible for ensuring that the most recent versions of the Shortform and Vlookup files are downloaded from the MassDEP website when used to support a risk characterization report.

If the Shortform is submitted to fulfill a Method 3 Risk Assessment requirement, it must be submitted as a component of a report that includes a comprehensive site description, hazard identification, description of site activities and uses, identification of receptors and exposure points, discussion of the applicability of any Activity and Use Limitations (AULs), EPC estimation, risk characterization summary, and an uncertainty section. The Shortform is a risk calculation tool, intended for use by risk assessors in the context of a complete risk assessment.

Adding Non-listed Chemicals to the Shortforms

Risk assessors comfortable with Excel can use the Shortforms to include additional chemicals of concern. Other than adding COCs and their respective properties and EPCs, the spreadsheets must not be modified in any way if they are to be submitted as Shortforms. If toxicity values or exposures factors for listed chemicals are altered, any **modifications should be highlighted** through the use of bold text, changed titles, and text description that clarifies that the workbooks are no longer the standard MassDEP Shortforms. The risk assessor should also describe and provide technical justification for the changes in the accompanying text.

Risk assessors may add chemicals to the COC list, provided they have the required physical and toxicological information for that chemical. The instructions below are for use with MS Excel version 2007.

1. Open the applicable Shortform and the VlookUp file.
2. Add the chemical to the COC dropdown in the Shortform:
 - a. Unhide Column A by dragging the column marker left of Column B to the right until chemical names show.

- b. Add the chemical to the *bottom* of the dropdown list, adding “zz” before the name to protect the Vlookup alphabetizing, eg “zzEthylMethylTop”.
 - c. Click in column B under Oil or Hazardous Material to select the dropdown.
 - d. Go to the Data tab, choose Data Validation
 - e. Under Settings, change Source to include the new row, ie \$\$A\$126 instead of \$\$A\$125. Add more if adding more chemical rows, ending with \$\$A\$127 or \$\$A\$128 as applicable.
3. Add the zz chemical to the Vlookup: in the last row of column A in tabs v1, v2, v3, and v4.
4. Add the necessary data for each tab. Only chemical data that is required for the media and exposures used in the Shortform that is being modified must be added.
5. Change the Vlookup named ranges used in the equations to include the new chemical info:
 - a. In the Vlookup, select the Formulas Tab -> Name Manager.
 - b. Select named range “physical_prop” -> edit.
 - c. Change the “refers to” box from “=V4!\$\$A\$2:\$F\$118” to “=V4!\$\$A\$2:\$F\$119”
 - This includes the new row. Add more if adding more chemical rows, ending with \$\$F\$120 or \$\$F\$121 as applicable.
 - d. Click “ok”
 - e. Repeat steps b. through d. to expand the “refers to” for these other named ranges:
 - RAFs
 - toxicity
 - V4Constants
 - WaterPUF
6. Hide column A in the Shortform again. Select column A, right click, and select Hide.
7. Add COCs and EPCs as usual.

Contact Information

Lydia Thompson
MassDEP, Office of Research and Standards
One Winter St.
Boston, MA 02108
617-556-1165
<mailto:lydia.thompson@state.ma.us>

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Last updated October 2012

This document provides a short description of each Shortform file.

	Imminent Hazard	Long Term Risk
Indoor Air	sf12raih.xlsx Residential (10/2012)	sf12ra.xlsx Residential (10/2012)
	sf12osaih.xlsx Office workers, students, and teachers (10/2012)	sf12osa.xlsx Office workers, students, and teachers (10/2012)
Drinking Water	sf12rwih.xlsx Residential (10/2012)	sf12rw.xlsx Residential (10/2012)
Soil	sf12rsih.xlsx Residential (10/2012)	sf12rs.xlsx Residential (10/2012)
	sf12psih.xlsx Park Visitor (10/2012)	sf12ps.xlsx Park Visitor (10/2012)
	sf12tsih.xlsx Trespasser (10/2012)	sf12ts.xlsx Trespasser (10/2012)
		sf12cw.xlsx Construction Worker (10/2012)
Supporting Files	SF Index.docx (10/2012)	This document
	Shortforms Release History.docx (10/2012)	Changes made to the ShortForms, from release through the present.
	v1012.xlsx (10/2012)	"Lookup" file with chemical specific data used in calculating risk.

MassDEP Shortforms Release History

Last updated October, 2012

2012-10-10

- Updated Vlookup to v0812.xlsx
- Updated toxicological data, RAFs, and their references in the Vlookup for many chemicals.
- Added Office and Schools Air (sf12osa) and Office and Schools Air IH (sf12osaih) Shortforms.
- Added notes that pop up to the right of the risk calculations for irregular chemicals such as lead, chromium(VI), cyanide, and perchlorate.
- Removed plant uptake from the main residential risk calculations and moved them to a separate “produce risk” tab.
- Changed the cyanide calculations:
 - Added a cyanide tab to the soil Shortforms to explain how the one-time exposure is calculated and the value for each Shortform.
 - Removed the prior cyanide calculation formula and exposure data so that the spreadsheets show the non-one-time calculations and pop up the one-time limit in a note next to the HQ.
- Made the Shortform Index hyperlinked so that Shortforms can be opened from the document.
- Updated all Shortforms to use named ranges. Revised formatting and renamed them to sf11[shortform].
- Updated the User’s Guide.

2008-09-26

- Updated vlookup to **v0808.xls**.
- Updated toxicological data in vlookup for Barium, 2-Methylnaphthalene, Xylenes, Ethylene Dibromide, and Tetrachloroethylene.
- sf07cw.xls corrected to properly state in the exposures tab that 25,550 days represents a 70 year lifetime. Changed the exposure notes to be better aligned with the Construction Worker Technical Update.
- sf06raih.xls changed to sf08raih.xls after correcting the display of the subchronic values in table RAIH-5.
- Corrected other miscellaneous spelling mistakes and typos.

2007-09-13

- Changed contact info on all shortform contacts to Lydia Thompson.

2007-02-01

- Released trespasser imminent hazard (sf06tsih) and construction worker (sf07cw)
- Removed references in User’s Guide to surface water pathway and Office Worker Receptor.
- Changes to Vlookup file

- Changed last updated date for Reference 1 (IRIS values) to January 10, 2007.
- Set Inhalation Unit Risk for Chromium (total) equal to Chromium (VI)
- sf06ps - Corrected summation of hazard quotients in calculation of hazard index.
- sf06raih – Corrected issue with reference concentrations. Previous version were using the chronic reference concentrations rather than the subchronic reference concentrations.
- Changed exposure frequencies and body weights to display 3 significant digits on all sheets.

2006-09-05

- Released park visitor (sf06ps), park visitor IH (sf06psih) and trespasser (sf06ts) shortforms.
- Added a release history
- **Updated vLookup file:**
 - Added Diffusivity in air and in water, as well as references to the V4 tab. Added references 47 and 48 to tab V5
 - The subchronic reference concentrations for C9 - C12 aliphatics and C9 - C18 aliphatics were changed from 0.2 (equal to the chronic) to 0.6, considering that originally, the chronic value was derived by applying an uncertainty value of 3 to a subchronic value.
 - The subchronic reference concentrations for C9 - C10 and C11 - C22 aromatics were changed from 0.05 (equal to the chronic value) to 0.5, considering that originally the chronic value was derived by applying an uncertainty factor of 10 to a subchronic value.
 - Added a note to the PUF column (v4) that the PUFs are based on dry weight
 - Renamed vlookup0406 to **vlookup0906**.
- Corrected miscellaneous spelling mistakes

2006-04-28

- Added residential soil (sf06rs), residential soil IH (sf06rsih), residential air (sf06ra) and residential air IH (sf06raih).
- Made minor spelling and formatting changes to sf06rw and sf06rwih.
- Clarified in the User's Guide that "If there is exposure to more than one medium (soil and groundwater, for example), the total risk must be calculated by adding the HIs and ELCRs from all of the applicable shortform files."
- Added two columns to the V2 tab of the VLookup file, one for noncancer and one for cancer inhalation RAFs. Values are defaulted to 1.
- Changed values of PUFs for chlordane and zinc to two significant digits in the Vlookup file.
- Removed the Beryllium CSF from the Vlookup file as it was removed from IRIS.

- Renamed vlookup1105 to **vlookup0406**.

2006-05-29

- Changed the title in the “references” section of vlookup0406 from "References for the Derivation of the MCP Standards" to "References used in calculating Method 3 Risk"

2006-03-31

- Initial placement on the web. Files include a “lookup” file with physical and toxicological parameters (VlookUp1105), and index, residential water and residential water imminent hazard (sf06rw and sf06rwh).

Differences of the ShortForms from Original ShortForm

The revised ShortForms are significantly different from the original ShortForm. The most notable change is that the revised version is not limited to residential scenarios, but rather includes additional receptors such as construction workers, trespassers, recreational children, and office workers. These additions increase the applicability of the revised ShortForm, allowing its use at a greater number of sites.

Several other changes should be noted. Extensive documentation has been included in the Excel spreadsheets for the revised ShortForms. This documentation accompanies the risk tables and can be incorporated directly into the risk assessment report. The documentation is intended to satisfy transparency requirements for public access.

- Determination of Compounds of Concern (COCs) by comparison to background concentrations is not included in the revised ShortForms. This step must be performed prior to ShortForm use.
- Toxicity values have been significantly updated. The ShortForms are designed to use one file (a Vlookup file, see below) that contains these toxicity values. The Vlookup file is intended to be a living document. It will be updated on an as-needed basis, with the newest version available on MA DEP’s website.
- In the original ShortForm, exposure to COCs through inhalation and dermal contact with drinking water was assumed to be a function of exposure via ingestion. The revised ShortForms calculate these exposures for a number of chemicals, based on mathematical models. A brief description and documentation of these models is available within the drinking water ShortForm. For the dermal pathway, exposure to some chemicals cannot be estimated using the model. Therefore, dermal exposure for these chemicals is assumed to be a function of exposure via ingestion.

Consistent with current risk assessment guidance and practice, dermal and inhalation exposures are estimated for showering only. The conservative assumptions incorporated into the showering exposure assessment are considered sufficiently health-protective to account for dermal absorption and inhalation exposures likely to occur during other household activities.