Changes we have made to the CLEA framework documents

This document describes the changes we have made to the CLEA framework documents to take into account comments received during the 3 month evaluation period in 2008.

ENVIRONMENT AGENCY, 2009. Human health toxicological assessment of contaminants in soil. Science Report Final SC050021/SR2. Bristol: Environment Agency

Amendment	Report Section
We have added a list of information boxes to the contents page	Contents page
We have referenced Figure 2.8 in Section 2.6 as it provides a useful summary of the risk assessment process.	2.0
We have added information relating to Figure 2.1; to clarify when a sigmoidal curve might be expected.	2.2.1
We have added information relating to the benchmark response (BMR); we have said that typically, the change in response (BMR) is 5% or 10% and we have added that other response levels may be used. We have also added that the endpoint and data being modelled will influence BMR selection.	2.2.1, Box 2.1
We have inserted a footnote to note that MDI must be converted to units of mass per kg bw per day before comparison with the TDI. We have also clarified that the "rules" for taking into account background exposure in the calculation of Soil Guideline Values are "conceptual" rules.	3.4.1
We have corrected the last paragraph in section 3.5.3 so that 'If the HI exceeds unity (i.e. is above one), this equates to exceeding a TDI from potential dose addition' now reads 'If the HI exceeds unity (i.e. is above one), this equates to exceeding a TD(S)I from potential dose addition'.	3.5.3
We have clarified the use of the equation in Figure 3.2 by changing "via a single contaminant" to "via a single contaminant via a single route of exposure".	3.5.4
We have added 'Soil Guideline Values' to the glossary	Glossary
We have corrected the referenced figure in the first paragraph of 2.24 to 'Figure 2.7'.	2.2.4
We have corrected the reference to section 3.6.1 in the last paragraph of section 3.5.3.	3.5.3

ENVIRONMENT AGENCY, 2009. Updated technical background to the CLEA model. Science Report Final SC050021/SR3. Bristol: Environment Agency

Amendment	Report Section
We have added a new text box to the introduction to ensure that it is clear that other media such as groundwater are not considered by the CLEA model.	1.3
We have reworded in section 2.3.2 so that it does not imply that dermal exposure is limited to ten per cent of total exposure	2.3.2
We have changed the Living Space Height for the commercial land use in Table 3.10 to the correct value of 9.6m.	3.4.6
We have made it more explicit about whether the land-use scenario descriptions are using the average or high end homegrown fraction.	3.2.4 and 3.3.4
We have reviewed the calculation of the soil gas ingress rate. The soil gas ingress rate is based on the worst-case combination of soil and building type. This is consistent with the building types selected in Chapter 3 because they are based on the worst-case indoor air concentration. However because the sandy soil type is not geographically widespread and in order to adjust the values to a reasonable worst-case, we have revised the calculations using sandy loam soil. This has the effect of halving the default values although both are in the range observed in field studies. New default values of 25 and 150 cm^3 s^{-1} are used for the residential and commercial land-use scenarios respectively.	10.3
We have revised the text to make it clear that in evaluating the applicability of an SGV to an allotment, the assessor should consider whether tracked back contamination is more likely to occur because of factors such as the proximity of the site to home and the location where tools, plants, and outdoor clothes are stored. Overflow text in this section has been moved to section 3.3.4	3.3.4 and 3.3.6
We have provided further explanatory text to Figure 4.1: Soil classification scheme according to particle size distribution. There was insufficient information in the data sources reviewed for soil properties to derive a class average value for UK top soils for three of the eleven textural classes. Further guidance on using the UK system can be found in the Soil Survey Handbook and the reproduced diagram here should be for illustration purposes only.	4.3.1
We have amended the units for van Genuchten shape parameter α in Table 4.3 and Table 4.4 to be consistent with Equation 4.1.	4.3.1
We have removed the word inorganic from the soil-to-dust transport factor description in Table 4.2. it is relevant to both inorganic and organic compounds.	4.2
We have changed the description of molecular weight in Table 4.2 to delete the sentence that refers to its use in calculating the dimensionless form Henry's Law constant when measured values are not available. Property estimation methods are now discussed in Environment Agency (2008) *Compilation of chemical data for priority organic pollutants for derivation of Soil Guideline Values*. Report SC050021/SR7. Bristol: Environment Agency	4.2
We have replaced 'dimensionless Henry's Law Constant' with 'air-water	10.1 and 10.2

partition coefficient' in Equation 10.1 Section 10.1.2 and Equation 10.2 Section 10.2.	
We have changed the depth to top of source from 10cm to the soil surface (0cm) to be in line with the generic conceptual site models.	10.2
We have changed the soil-to-dust transport factor to reflect a more reasonable worst-case. The transport factor has been revised to 50 per cent from 70 per cent (thereby reflecting an average value).	4.3.2
We have changed the sentence "the lead concentration in house dust is on average a factor of three higher than in the exterior soil" to "the lead concentration in house dust is on average a factor of three times higher than in the exterior soil".	4.3.2
We have revised the text box in section 5.2.1 using data from the CLEA report and Environment Agency (2008) *Compilation of chemical data for priority organic pollutants for derivation of Soil Guideline Values.* Report SC050021/SR7. Bristol: Environment Agency	5.2.1
We have made a minor edit to the labels in Equations 7.1 and 7.2 from "C_s is the total soil concentration in soil, mg g^{-1} dw soil" to "C_s is the total soil concentration, mg g^{-1} dw soil".	7.1.2
We have amended Equation 9.6 on page 122 to place the unit conversion adjacent to the parameter it converts.	9.3
We have revised the indoor dust loading factor for a residential property to a default value of 50 μg m-3 to reflect a more reasonable worst case.	9.3
We have amended the footnote in section 10.2 to refer to Table 4.21.	10.2

ENVIRONMENT AGENCY, 2009. CLEA Software (Version 1.04) Handbook, Science Report SC050021/SR4. Bristol: Environment Agency.

Amendment	Report Section
We have added some further guidance on the installation of the CLEA software.	1.3
We have changed the output reports 'Print Results' and 'Print Settings' to include the software filename in header. This addition has been stated in section 2.2	2.2 and 3.3.3(Step 1)
Following changes to the CLEA software, we have changed the traffic light system that reports on exceedance of saturated soil limits and included the basis upon which the assessment criteria are flagged (as green, amber or red). The trigger now relates only to the vapour pathway, plant uptake will not necessarily be limited by solubility. All assessment criteria are now checked against the outdoor and indoor vapour pathways.	2.2 and 3.3.3 (Step 5)
We have expanded the text box in section 3.3.3 to include information from section 4.3..3 explaining how the 50% rule is implemented within the software.	3.3.3 (Step 2)
We have provided information on how the restored pH function is used within the software. We have also provided guidance on how to enter formula in the 'Chemicals' database of 'Chemical Data' for calculation of a soil-to-plant concentration factor to take into account soil organic matter content or soil pH.	3.3.3 (Step 2) and 4.6.3

We have amended the relevant sections of the handbook to include the new generic soil type 'sandy silt loam' that has been added to the CLEA software and CLEA report.	3.3.3 (Step 2) and 3.4.7
We have amended the guidance to make it clear that a site measured media concentration for soil gas air concentrations does not apply when selecting use of the finite source option.	3.3.3 (Step 3)
We have provided further advice, on selecting chemicals, in the grey text box in section 3.3.3. If you are running a new simulation and chemicals selected within Step 3 from a previous run are present that you want to use again, you do not need to clear all the chemicals and reselect them.	3.3.3 (Step 3)
We have amended information providing advice on what site-measured media concentrations can be added to the software; soil-to-plant concentration factors have been amended to chemical concentrations in edible portions.	3.3.3 (Step 3)
We have amended the relevant sections of the handbook to include the parameters that are now available for user amendment in a generic and/or site specific assessment. These are the time average period for surface emissions, the effective air permeability and the sub-surface soil to indoor air correction factor.	3.3.3 (Step 4); 3.4.5; 3.5 and 4.6.7
We have added to the list of parameters that have some form of restricted values (either text or numeric) on the data that can be entered into the cells in the 'Chemicals' database. We have added information on the amendment to the soil-to-plant concentration factor cell to allow a formula specifying the exact calculation of a soil-to-plant concentration factor, including provision of an example in a grey text box. We have also added the new parameter sub-surface soil to indoor air correction factor which must be entered as a value equal to or greater than one.	3.4.5
We have amended the information on how the 50% rule is calculated so that it is written in terms of calculating the TDSI, since the basic formula is soil ADE / TDSI.	4.3.3
We have made amendments to the receptor data that is available for selection in the software following addition of further data from the CLEA report into the software.	4.4.1
We have changed the default value for Soil Organic Matter that is used within the CLEA software (and in the derivation of Soil Guideline Values) from a SOM content of 2.5% to a SOM content of 6%. This is representative of an average value for sandy loam soil.	4.5.4; 4.6.3
We have expanded section 4.5.4 to include the use of soil organic matter content in the calculation of plant uptake of contamination from soil.	4.5.4
We have made changes to the default soil to indoor dust transport factor to reflect changes to the CLEA report.	4.6.5; 4.6.6
We have provided more information on the surface and sub-surface ambient air models and the differences between them.	4.6.8
We have made changes to the default soil gas ingress rate to reflect changes to the CLEA report.	4.7.1
We have changed the depth to top of source (no building) from 10cm to 0cm to be in line with amendments to the CLEA report. We have also provided further guidance on changing the depth to top of source (no building). You should only change the depth to the top of the contaminant source to a value greater than 100cm if there is no contamination between the sub-surface contaminant source and the soil surface.	4.8.2

We have provided further guidance on using the finite source model. Neither of the finite source models depend on the soil vapour concentration directly and therefore cannot be used with a fixed soil gas concentration.	4.9
We have amended the unit conversion to 1,000,000 cm^3 m^{-3} in Equation 4.7	4.9.1
We have added missing brackets to Equation 4.8	4.9.1
We have added guidance on changing the default time period for calculation of the surface volatilisation factor	4.11
We have added a new section to provide guidance on interpreting assessment criteria that exceed the theoretical soil saturation limits.	4.12

JEFFRIES, J., 2009. A review of body weight and height data used within the Contaminated Land Exposure Assessment model (CLEA). Project SC050021/ Technical Review 1. Bristol: Environment Agency.

Amendment	Report Section
We have amended Table 3.4 to remove the rounding of the 2003 Health Survey for England mean body weight for age class 4 so that the table includes the value of 15.1kg rather than 15.0kg. This change has been made to ensure that the rounding used is consistent with elsewhere in the report and the CLEA software	3.1.3
The observation of 'a decrease in male mean body heights for age classes 4, 5, 10 and 12' has been amended to include age class 15.	4.2
The second recommendation was a duplication of the first and has been replaced with 'The arithmetic mean values for body height reported in Table 3.7 for female and Table 3.8 for male, according to age class category, are recommended for use in Soil Guideline values for generic site assessment.'	4.3

ENVIRONMENT AGENCY, 2009. CLEA Software, version 1.04. Bristol: Environment Agency

Amendments	Software section
We have added the air dispersion factor at a height of 0.8m to the commercial land use. The indoor air concentration is calculated from the ambient air concentration plus the indoor dust loading. The indoor air concentration should in theory be independent of height (because of assumed indoor mixing) and therefore the software uses the child Q/C factor as being more health protective. However, this factor was erroneously missing from the current commercial land use dataset, leading to the ambient dust component being set to zero.	Library dataset worksheet 'Land Use data'
Commercial land use site occupancy period values are reported to one decimal place in the generic land use database contained within the software. We have changed the user interface and output report to also report the value to one decimal place rather than no decimal places.	Step 2 Advanced Settings 'Land Use and Receptor Data' and 'Print Settings' output report
We have changed the format to scientific for the diffusion coefficient in water within the chemical database	chemical database

We have changed the traffic light system that reports on exceedance of saturated soil limits. The trigger now relates only to the vapour pathway, all assessment criteria are only checked against the outdoor and indoor vapour pathways. Further information and guidance on these changes, including the trigger for flagging green, amber or red, are included within section 3.3.3, step 5 of the CLEA software handbook. We have also carried the traffic light colouring system through to the output report 'Print Results'	Step 5 'Print Results' and 'Print Results' output report
We have amended the software to allow a user defined effective air permeability to be used within site specific assessment. We have amended the 'Print Settings' output report to provide this value.	Step 2 Advanced Settings 'Soil and Building Data' and 'Print Settings' output report
We have amended the software to allow for decimal places when entering building parameters Living space height (above ground) & Living space height (below ground).	buildings database
We have changed the output reports to include the filename of the software in the header.	'Print Results' and 'Print Settings' output reports
We have changed the job number cell within Step 1 'Report Results' so that data entered will be displayed exactly as entered and not as a date.	Step 1 'Report Details'
We have applied freeze panes in Step 5 'Print Results' so that the chemical names remain in view as the user scrolls through data in the right hand columns.	Step 5 'Print Results'
We have changed the default value for Soil Organic Matter (SOM) that is used within the CLEA software from a SOM content of 2.5% to a SOM content of 6%. This is representative of an average value for sandy loam soil which is the default soil type used in the derivation of Soil Guideline Values.	Step 2 'Basic Settings'
We have added an option in Step 4 Advanced Settings 'Soil and Building Data' for the user to enter a time average period for surface emissions. This value will over ride the default time period for the surface volatilisation factor model and allowing the user to set the time duration in the surface volatilisation factor model on a site-specific basis. The value is reported in the 'Print Settings' output report. Further guidance is provided in Section 4.11 of the CLEA software handbook.	Step 4 Advanced Settings 'Soil and Building Data' and 'Print Settings' output report
We have added an option for the user to enter a chemical-specific correction factor for the indoor air attenuation factor to account for conservatism in the estimation of indoor vapour intrusion using the Johnson and Ettinger model. Further information and guidance on changing the sub-surface soil to indoor air correction factor can be found within Section 4.6.7 of the CLEA software handbook.	Chemicals database and Step 4 Advanced Settings 'Chemical Data'
We have made amendments to the receptor data that is available for selection in the software by adding data that is available in the CLEA report into the software. Section 4.1.1 provides guidance on the receptor data available for selection.	Worksheet 'Receptor Data'
We have increased the capacity of the chemicals database to allow insertion of up to three hundred chemicals.	Chemicals database

We have restored the pH function in the software and have changed the cell for entry of a soil-to-plant concentration factor to allow the user to insert an equation which may include pH or soil organic matter content. Formulas can be entered in the format "= CONST x soil_pH" or "= CONST x som" provided that answer is not less than zero	Step 2 'Basic Settings'; chemicals database and Step 4 Advanced Settings 'Chemical Data'
We have updated the validation text for the soil-water partition coefficient (K_d) to make it more explicit why this value is not required for organic chemicals. K_d is automatically calculated by the software for organic chemicals and no value is required.	Chemicals database and Step 4 Advanced Settings 'Chemical Data'
We have changed the depth to top of source (no building) from 10cm to 0cm to be in line with amendments to the CLEA report. Further guidance on changing the depth to top of source (no building) is provided in Section 4.8.2 of the CLEA software handbook. You should only change the depth to the top of the contaminant source to a value greater than 100cm if there is no contamination between the sub-surface contaminant source and the soil surface.	Step 4 Advanced Settings 'Soil and Building Data' and 'Print Settings' output report
We have made changes to the default soil gas ingress rate to reflect changes to the CLEA report. We have amended the values to 25 cm^3 s^{-1} for residential properties and 150 cm^3 s^{-1} for commercial properties.	Step 4 Advanced Settings 'Soil and Building Data' and 'Print Settings' output report
We have amended the dust loading factor for residential properties to 50 μg m^{-3} to reflect the updates to the final CLEA report.	Step 4 Advanced Settings 'Soil and Building Data' and 'Print Settings' output report
We have added generic data for a new soil type, sandy silt loam soil, available for selection in Step 2 'Basic Settings'.	Step 2 'Basic Settings'