

**ERRATA**

1. Phenol (Chapter 40) - Please replace pages 40-9 and 4-10 within your original S4UL document with the replacement pages included within this Errata (see S4UL FAQ entry 16).
2. Petroleum Hydrocarbons (Chapter 17) (no replacement pages issued, see S4UL FAQ entry 12):
  - a. Replace first column heading of Table 17-14 with 'Residential without homegrown produce' (table title is correct)
  - b. Replace first column heading of Table 17-17 with 'POS<sub>resi</sub>' (table title is correct)
  - c. Replace first column heading of Table 17-18 with 'POS<sub>park</sub>' (table title is correct)
3. Cadmium (Chapter 5) (no replacement pages issued) – Within Table 5-4 (page 5-5) replace published POS<sub>park</sub> value of 532mg kg<sup>-1</sup> with correct value of 560mg kg<sup>-1</sup> (see S4UL FAQ entry 5).
4. The Chromium III inhalation TDI stated in the 3rd sentence of paragraph 39 of Section 6.4.1.4 should read "*An inhalation TDI of 0.03 µg kg<sup>-1</sup> BW day<sup>-1</sup> was selected ...*". The units stated in the published document (*mg chromium III m<sup>-3</sup>*) are incorrect. Note that the correct units and value of the TDI have been used in deriving the S4ULs presented in Table 6-3. (No replacement pages issued).

## 40.5 The LQM/CIEH Sutable 4 Use Levels for Phenol

(83) The methodology followed in deriving the Sutable 4 Use Levels (S4ULs) and the associated limitations are described in Chapter 1 of this report. Phenol was modelled under a unique name within the CLEA software, as the software already contains an entry for "phenol".

(84) In deriving the updated SGVs for phenol, Environment Agency (2009b) noted that contact with phenol in aqueous solution can cause significant corrosive or irritant effects in humans at concentrations as low as 1% by weight. Therefore, to be protective of direct bodily contact with phenol-contaminated soils and account for uncertainties in the modelling, Environment Agency (2009b) limited the SGV to a level at which the corresponding soil solution concentration would be 1 g L<sup>-1</sup> (i.e. 0.1% by weight). This is a cautious approach as Environment Agency (2009b) also pointed to evidence that phenol in soil (compared to an aqueous solution) may be less available to cause such effects and that its availability decreases further as the contamination ages. We have adopted the same protective approach to ensure that the S4ULs are protective of direct skin contact with contaminated soils. Consequently, the S4ULs are set at either the chronic exposure level predicted by the CLEA software or at the soil concentration associated with a soil solution concentration of 1 g L<sup>-1</sup>, whichever is the lowest.

(85) The LQM/CIEH S4ULs for phenol for the different generic land-uses are presented in Table 40-4. The land-uses are the generic ones described in SR3 (Environment Agency, 2009e) and the Public Open Space scenarios developed as part of the Defra SP1010 project (Defra, 2014). For each land-use, three Soil Organic Matter (SOM) contents were considered: 1%, 2.5% and 6% by weight. The ADE:HCV ratios and percentage contribution of each pathway calculated by the CLEA software for each generic land-use are presented in Table 40-5, Table 40-6 and Table 40-7. Pathway contributions have not been presented for those land-uses where the S4ULs are based on a threshold protective of direct skin contact.

(86) The following observations can be made:

- The S4ULs for the commercial, public open space near residential housing and public park land-uses are all based on the protection from direct skin contact.
- The chronic exposure levels calculated by CLEA for the residential without homegrown produce land-use are almost identical to those derived for the protection from direct skin contact. However, only at the lowest SOM (1%) is the S4UL actually based on the protection from direct skin contact. For higher SOMs, the S4UL is limited by the TDI<sub>inhal</sub> and the indoor vapour inhalation pathway.
- Oral exposures, principally the consumption of homegrown produce, is the most significant pathway for both the residential with homegrown produce and allotment land-uses. Thus, the accuracy of the soil-to-plant modelling within the CLEA software are of importance for these land-uses.

**Table 40-4: LQM/CIEH Sutable 4 Use Levels (S4ULs) for phenol according to land use and SOM**

Land use	LQM/CIEH S4ULs for Phenol (mg kg <sup>-1</sup> DW) <sup>a,b,c,d,e</sup>		
	1% SOM	2.5% SOM	6% SOM
Residential <u>with</u> homegrown produce	120	200	380
Residential <u>without</u> homegrown produce	440 <sup>dir</sup> (460)	690	1200
Allotment	23	42	83
Commercial	440 <sup>dir</sup> (26000 <sup>f</sup> )	690 <sup>dir</sup> (30000)	1300 <sup>dir</sup> (34000)
POS <sub>resi</sub>	440 <sup>dir</sup> (10000)	690 <sup>dir</sup> (10000)	1300 <sup>dir</sup> (10000)
POS <sub>park</sub>	440 <sup>dir</sup> (7600)	690 <sup>dir</sup> (8300)	1300 <sup>dir</sup> (9300)

<sup>a</sup> Based on a sandy loam soil as defined in SR3 (Environment Agency, 2009b) and 1, 2.5 and 6% soil organic matter (SOM).

<sup>b</sup> S4ULs for phenol will vary according to SOM for all land uses

<sup>c</sup> Figures are rounded to two significant figures

<sup>d</sup> S4ULs assume that free phase contamination is not present

<sup>e</sup> S4ULs based on a sub-surface soil to indoor air correction factor of 1

<sup>f</sup> This value also exceeds the vapour saturation limit of 24200 mg kg<sup>-1</sup>

<sup>dir</sup> S4ULs Based on a threshold protective of direct skin contact with phenol (guideline in brackets based on health effects following long term exposure provided for illustration only).

**Table 40-5 Contribution to total exposure for the relevant pathways as calculated by the CLEA software (Environment Agency, 2009d) for the residential with homegrown produce land-use at various SOM**

	ADE to HCV ratios		
	1% SOM	2.5% SOM	6% SOM
Oral ADE to HCV ratio at S4ULs	0.76	0.71	0.68
Inhalation ADE to HCV ratio at S4ULs	0.24	0.29	0.32
	Contribution to total exposure <sup>1</sup> (%)		
Ingestion of soil and indoor dust <sup>2</sup>	0.2	0.4	0.8
Consumption of homegrown produce and attached soil	93.7	93.0	92.2
Dermal contact (indoor)	<0.1	<0.1	<0.1
Dermal contact (outdoor)	<0.1	<0.1	0.1
Inhalation of dust (indoor)	0.0	0.0	0.0
Inhalation of dust (outdoor)	0.0	0.0	0.0
Inhalation of vapour (indoor)	0.5	0.6	0.6
Inhalation of vapour (outdoor)	0.0	0.0	0.0
Oral background	5.1	5.4	5.6
Inhalation background	0.5	0.6	0.7

<sup>1</sup> Rounded to one decimal place; <sup>2</sup> Treated as one pathway (Environment Agency, 2009b)

ADE = Average Daily Exposure; HCV = Health Criteria Value; NA = Not applicable (This exposure pathway is not included in the generic land use)

**Table 40-6 Contribution to total exposure for the relevant pathways as calculated by the CLEA software (Environment Agency, 2009d) for the residential without homegrown produce land-use at various SOM**

	ADE to HCV ratios		
	1% SOM <sup>1</sup>	2.5% SOM	6% SOM
Oral ADE to HCV ratio at S4ULs	(0.01)	0.01	0.02
Inhalation ADE to HCV ratio at S4ULs	(0.99)	0.99	0.98
	Contribution to total exposure <sup>2</sup> (%)		
Ingestion of soil and indoor dust <sup>3</sup>	(20.2)	25.4	31.9
Consumption of homegrown produce and attached soil	(NA)	NA	NA
Dermal contact (indoor)	(1.1)	1.4	1.8
Dermal contact (outdoor)	(1.6)	2.0	2.5
Inhalation of dust (indoor)	(<0.1)	0.1	0.1
Inhalation of dust (outdoor)	(0.0)	0.0	0.0
Inhalation of vapour (indoor)	(42.3)	33.8	23.0
Inhalation of vapour (outdoor)	(<0.1)	<0.1	<0.1
Oral background	(20.2)	25.4	31.9
Inhalation background	(14.5)	12.0	8.9

<sup>1</sup> The S4UL at 1% SOM is limited to the threshold protective of direct skin contact. The ratios and contributions in brackets are for illustration only)

<sup>2</sup> Rounded to one decimal place; <sup>3</sup> Treated as one pathway (Environment Agency, 2009b)

ADE = Average Daily Exposure; HCV = Health Criteria Value; NA = Not applicable (This exposure pathway is not included in the generic land use)

**Table 40-7 Contribution to total exposure for the relevant pathways as calculated by the CLEA software (Environment Agency, 2009d) for the allotment land-use at various SOM**

	ADE to HCV ratios		
	1% SOM	2.5% SOM	6% SOM
Oral ADE to HCV ratio at S4ULs	0.99	0.99	0.97
Inhalation ADE to HCV ratio at S4ULs	0.01	0.01	0.03
	Contribution to total exposure <sup>1</sup> (%)		
Ingestion of soil and indoor dust <sup>2</sup>	<0.1	<0.1	<0.1
Consumption of homegrown produce and attached soil	96.0	95.9	95.8
Dermal contact (indoor)	NA	NA	NA
Dermal contact (outdoor)	<0.1	<0.1	0.1
Inhalation of dust (indoor)	NA	NA	NA
Inhalation of dust (outdoor)	0.0	0.0	0.0
Inhalation of vapour (indoor)	NA	NA	NA
Inhalation of vapour (outdoor)	0.0	0.0	0.0
Oral background	4.0	4.0	4.0
Inhalation background	<0.1	<0.1	0.1

<sup>1</sup> Rounded to one decimal place; <sup>2</sup> Treated as one pathway (Environment Agency, 2009b)

ADE = Average Daily Exposure; HCV = Health Criteria Value; NA = Not applicable (This exposure pathway is not included in the generic land use)