



CONSIDERATIONS FOR MODIFICATIONS TO CHAPTER 62-777 FAC

Updated toxicity and phys/chem values

- Sources of phys/chem values have changed in 10 years
 - Affects nearly all chemicals, but changes generally small
- Toxicity values for many chemicals have changed
 - Updating CTLs with current toxicity values produces changes that are sometimes substantial
 - Largest changes occur when a chemical becomes a carcinogen

GCTLs

- Current status: Based upon lifetime exposure by an adult via ingestion only.
- Possible modification 1: Add dermal and inhalation exposure
 - This approach is used by EPA and many states
 - Required per 62-780 FAC when developing an alternative GCTL
- For a preliminary assessment of effect of this change on GCTLs, the equation in the EPA RSL tables was used
 - Sums exposure from ingestion, dermal contact, and inhalation
 - Equation includes EF and ED; adult residential exposure is assumed to occur 350 days/yr for 26 years (same as EPA)
 - Uses Andelman volatilization factor
 - Dermal and inhalation are excluded under some circumstances
 - No inhalation component for non-volatiles
 - No dermal component if a dermal toxicity value cannot be extrapolated from an oral toxicity value (because an oral toxicity value is missing)

GCTLs - adult, + dermal + inhalation

Table 1: Addition of inhalation and dermal routes to the GCTL equation

Analysis of Groundwater Cleanup Target Levels (µg/L)							
Non-carcinogen		High Dermal	Current	Updated	Add USEPA	Add USEPA	Add USEPA
Chemical	Volatile	Absorption	62-777	62-777	Inhalation	Dermal	Inhalation and Dermal
Acetone	x		6300	6300	4400	6500	4300
Dibutyl Phthalate		x	700	700	730	360	360
m-Nitrotoluene		x	140	0.7	0.7	0.6	0.6
Carcinogen		High Dermal	Current	Updated	Add USEPA	Add USEPA	Add USEPA
Chemical	Volatile	Absorption	62-777	62-777	Inhalation	Dermal	Inhalation and Dermal
4-Nitroaniline			1.7	1.8	4.9	4.7	4.7
Bromodichloromethane	x		0.6	0.6	0.1	1.4	0.1
Chloroform	x		70	1.1	0.2	2.8	0.2
1,4-Dioxane	x		3.2	0.4	0.5	1.0	0.5
1,1,2,2-Tetrachloroethane	x		0.2	0.2	0.08	0.4	0.08
Methyl chloride	x		2.7	2.7	2.2	7.3	2.2
Dieldrin		x	0.002	0.002	0.006	0.003	0.003
Chrysene		x	4.8	4.8	13	13	13

GCTLs go up, down, or stay the same depending upon combined effects of volatility, dermal absorption, and the assumption of less-than-lifetime exposure

GCTLs based on primary standard

Alachlor	Dichlorobenzene, 1,2-	Nickel
Antimony	Dichlorobenzene, 1,4-	Nickel subsulfide
Arsenic	Dichloroethane, 1,2-	Nitrate
Atrazine	Dichloroethene, 1,1-	Nitrate+nitrite
Barium	Dichloroethene, cis -1,2-	Nitite
Benzene	Dichloroethene, trans -1,2-	Oxamyl
Benzo(a)pyrene	Dichlorophenocy acetic acid, 2,4-	PCBs
Beryllium	Dichloropropane, 1,2-	Pentachlorophenol
Bis(2-ethylhexyl)adipate	Dinoseb	Picloram
Bis(2-ethylhexyl)phthalate	Dioxins, as total 2,3,7,8-TCDD equivalents	Selenium
Bromate	Diquat	Simazine
Cadmium	Endothall	Sodium
Carbofuran	Endrin	Styrene
Carbon tetrachloride	Glyphosate	Tertachloroethene
Chlordane (total)	Heptachlor	Thallium
Chlorine	Heptachlor epoxide	Toxaphene
Chlorite (sodium salt)	Hexachlorobenzene	Trichlorobenzene, 1,2,4-
Chlorobenzene	Hexachlorocyclohexane, gamma-	Trichloroethane, 1,1,1-
Chromium (total)	Hexachlorocyclopentadiene	Trichloroethane, 1,1,2-
Cyanide	Lead	Trichloroethene
Dalapon	Mercury	Trichlorophenoxy propionic acid, 2,4,5-
Dibromo-3-chloropropane, 1,2-	Methoxychlor	Vinyl chloride
Dibromoethane, 1,2-	Methylene chloride	

GCTLs based on secondary standard

Acenaphthene	Dichlorophenol, 2,6-	Phenol
Aluminum	Dichlorophenol, 3,4-	Silver
Biphenyl, 1,1- (or Diphenyl)	Ethanol	Sulfate
Butyl acetate, n-	Ethyl acrylate	Toluene
Chloride	Ethyl ether	Trichlorophenol, 2,4,5-
Chlorophenol, 3-	Ethylbenzene	Trimethylbenzene, 1,2,3-
Chlorophenol, 4-	Fluoride	Trimethylbenzene, 1,2,4-
Chloropicrin	Formaldehyde	Trimethylbenzene, 1,3,5-
Copper	Hexane, n-	Vinyl acetate
Cumene	Iron	Xylenes, total
Dichlorophenol, 2,3-	Manganese	Zinc
Dichlorophenol, 2,4-	Methyl acetate	
Dichlorophenol, 2,5-	Methyl methacrylate	

GCTLs

- Possible modification 2: Include childhood exposure
 - GCTL for non-carcinogens would be based entirely on exposure during childhood
 - GCTL for carcinogens would be based on an aggregate resident (analogous to residential soil CTLs)
- For a preliminary assessment of effect of this change on GCTLs, comparisons were made in two ways:
 - Current 62-777 equation (ingestion only), but child/aggregate resident assumptions
 - EPA ingestion + dermal + inhalation equation, but child/aggregate resident assumptions
 - All comparisons made versus current 62-777 equation with adult ingestion (only) assumptions, but updated toxicity and phys/chem values.

GCTLs – child, w/ and w/o dermal & inhalation

Analysis of GCTLs for child exposure (µg/L)			
Non-carcinogen		62-777	USEPA
Chemical	Updated 62-777	Includes Childhood Exposure	Childhood Exposure, add inhalation and dermal
Acetone	6300	3500	2800
Dibutyl Phthalate	700	390	240
m-Nitrotoluene	0.7	0.4	0.3
Carcinogen		62-777	USEPA
Chemical	Updated 62-777	Includes Childhood Exposure	Childhood Exposure, add inhalation and dermal
Bromodichloromethane	0.6	0.6	0.1
Chloroform	1.1	1.1	0.2
1,4-Dioxane	0.4	0.3	0.5
1,1,2,2-Tetrachloroethane	0.2	0.2	0.08
4-Nitroaniline	1.8	1.7	4.5
Methyl chloride	2.7	2.6	2.2
Dieldrin	0.002	0.002	0.003
Chrysene	4.8	4.7	13

GCTLs go up, down, or stay the same depending upon combined effects of volatility, dermal absorption, and the assumption of less-than-lifetime exposure

GCTLs

- Possible modification 3: Include an ADAF (age-dependent adjustment factor) for mutagenic carcinogens
 - Relevant only if GCTL includes exposure during childhood
 - Only applicable for mutagenic carcinogens
- For a preliminary assessment of effect of this change on GCTLs, comparisons were made against updated Chapter 62-777 values, with and without ADAF and with and without dermal and inhalation exposure.

GCTLs – child with ADAF

Analysis of GCTLs with ADAF (µg/L)					
Mutagens	Updated 62-777 GCTL	Add child exposure USEPA	Add USEPA inhalation and dermal routes	62-777 Add ADAF	Add USEPA ADAF and inhalation and dermal routes
Acrylamide	0.07	0.07	0.2	0.03	0.08
Benzidine	0.0002	0.0001	0.0004	0.0001	0.0002
Benzo(a)anthracene	0.05	0.05	0.007	0.02	0.003
Benzo(b)fluoranthene	0.05	0.05	0.1	0.02	0.05
Benzo(k)fluoranthene	0.5	0.5	1.3	0.2	0.5
Chrysene	4.8	4.6	13	1.9	5.4
Dibenz(a,h)anthracene	0.005	0.005	0.01	0.002	0.005
Indeno(1,2,3-cd)pyrene	0.05	0.05	0.1	0.02	0.05
Methylene bis(2-chloroaniline), 4,4-	0.4	0.3	0.5	0.1	0.2
Nitroso-di-ethylamine, N-	0.0002	0.0002	0.0006	0.00009	0.0003
Nitroso-dimethylamine, N-	0.0007	0.0007	0.0003	0.0003	0.0001
Trichloropropane, 1,2,3-	0.001	0.001	0.0006	0.0005	0.0002

SCTLs

- Current status: SCTLs are based upon exposure that includes childhood with no ADAF adjustment
- Possible modification: Include ADAF for mutagenic carcinogens
 - For a preliminary assessment of effect of this change on SCTLs, the equation in Chapter 62-777 was changed to include an ADAF term
 - As with the GCTL calculations, this was accomplished with the use of an age-weighted ADAF based upon an aggregate resident

SCTLs – include ADAF

Analysis of SCTLs with ADAF (mg/kg)			
Mutagens	Current 62-777 SCTL	Updated 62-777 SCTL	62-777 Add ADAF
Benzo(a)pyrene	0.1	0.2	0.09
Chromium (VI) (inorganic)	210	3	1.3
Dibromo-3-chloropropane, 1,2-	0.7	0.03	0.01
Methylene chloride	17	190*	152
Trichloroethylene (TCE)	6.4	1.2*	1.1
Vinyl chloride	0.2	0.6	0.3
Acrylamide	0.1	1.7	0.7
Benzidine	0.004	0.004	0.002
Benzo(a)anthracene	#	#	#
Benzo(b)fluoranthene	#	#	#

ADAF – age dependent adjustment factor

SCTL – soil cleanup target level in mg/kg

* - Based on non-carcinogenic endpoints

- Must be converted to benzo(a)pyrene equivalents before comparison with the SCTL for benzo(a)pyrene

Relative Source Contribution (RSC)

State	Uses RSC	RSC	State	Uses RSC	RSC
Alabama			Mississippi	x	b
Alaska			Missouri		
Arizona			Montana		
Arkansas			Nebraska		
California	x ^a	b	Nevada		
Colorado			New Hampshire	x	0.2
Connecticut	x		New Jersey	x	0.2
Delaware			New Mexico		
Georgia			New York	x	0.2
Hawaii			North Carolina	x	
Idaho			Ohio		
Illinois			Oklahoma		
Indiana			Oregon		
Iowa	x		Pennsylvania		
Kansas			South Carolina		
Kentucky			Texas		
Louisiana			Utah	x	b
Maine	x	c	Virginia		
Maryland			Washington		
Massachusetts			West Virginia		
Michigan	x	0.2	Wisconsin		
Minnesota	x	0.2	Wyoming		

Acute Toxicity Values

State	Uses Acute Values
Alabama	#
Alaska	
Arkansas	
California	x ^a
Delaware	
Georgia	
Idaho	
Indiana	
Kansas	
Kentucky	#
Louisiana	
Maryland	
Minnesota	x
Mississippi	
Missouri	
New Hampshire	
New Jersey	
New Mexico	
New York	x
Ohio	
Oklahoma	
Pennsylvania	
South Carolina	
Texas	#
Utah	
Washington	#

Outdoor Worker Scenario

- Current status: Default commercial/industrial SCTLs are based upon exposure assumptions that correspond to an indoor worker.
- Possible modification: Add SCTLs based upon a default outdoor worker scenario
 - Soil ingestion rate for an outdoor worker is 100 mg/day (indoor worker is 50 mg/day).
 - EPA reduces the EF from 250 to 225 days/yr to account for bad weather days preventing outdoor work
 - For a preliminary assessment of effect of this change on SCTLs, equation for SCTLs in Chapter 62-777 was used and outdoor worker SCTLs were compared with current [indoor] worker values.

SCTLs – Outdoor Worker

Non-Carcinogen	Indoor Worker	Outdoor Worker
Chemical	(mg/kg)	(mg/kg)
Acetone	490000	440000
Dibutyl Phthalate	110000	81000
m-Nitrotoluene	59	52
Copper	93000	52000
Carcinogen	Indoor Worker	Outdoor Worker
Chemical	(mg/kg)	(mg/kg)
Bromodichloromethane	0.6	0.7
Chloroform	0.7	0.7
1,4-Dioxane	20	17
1,1,2,2-Tetrachloroethane	1.4	1.5
4-Nitroaniline	120	100
Methyl chloride	3.8	4.1
Dieldrin	0.2	0.1
Chrysene	#	#

Changes vary from a slight increase to nearly a 50% decrease, depending on the extent to which the oral pathway predominates