Appendix 3.6 Hydrocarbon Emission Calculations (Non-working Hours)

Appendix 3.6 - Hydrocarbon emission calculations (Non-working Hours)

Koc | windspeed 1 m/s | Average soil contaminant Concentration (mg/kg)

	organic carbon partition coefficient (L/Kg)	Dimensionless Henry's constant	air diffusion coeff (cm2/day)	water diffusion coeff (cm2/day)	Dgair (cm2/s)	Dgair (m2/s)	Kinematic viscosity of air ν	Friction velocity V* [0.01 x windspeed x SQRT(6.1+0.63 x windspeed)]	Schmidt number Sc [Dgair / ν]	boundary layer thickness (cm) [26 x ν / (V* x Sc^(1/3))]	Zone 1A West & 3 (Zone 1A+3)	Zone 2	Zone 1A East & 1B (Zone 1B+1C)	Zone 4, 5A & 5B
Naphthalene	1.995E+03	1.99E-02	5.098E+03	6.480E-01	0.059	5.9E-06	1.5E-05	0.03	3.9E-01	2.052	2.747E-01	7.849E-02	1.660E-01	5.955E-02
Phenanthrene	1.413E+04	2.50E-01	2.877E+03	6.454E-01	0.033	3.3E-06	1.5E-05	0.03	2.2E-01	2.483	3.377E-01	8.900E-01	7.968E-01	2.625E-01
Anthracene	1.413E+04	2.78E+00	2.799E+03	6.687E-01	0.032	3.2E-06	1.5E-05	0.03	2.2E-01	2.506	2.504E-01	4.094E-01	5.225E-01	1.524E-01
Fluoranthene	3.802E+04	2.76E+00	2.609E+03	5.486E-01	0.030	3.0E-06	1.5E-05	0.03	2.0E-01	2.565	4.197E-01	1.526E+00	2.946E+00	7.679E-01
Pyrene	3.802E+04	2.89E-07	1.961E+03	6.255E-01	0.023	2.3E-06	1.5E-05	0.03	1.5E-01	2.821	4.363E-01	1.897E+00	3.569E+00	9.091E-01
Benzo(a)pyrene	1.023E+06	4.66E-05	3.715E+03	7.776E-01	0.043	4.3E-06	1.5E-05	0.03	2.9E-01	2.280	3.631E-01	1.269E+00	2.748E+00	9.151E-01
Benzene	5.888E+01	2.29E-01	7.603E+03	8.467E-01	0.088	8.8E-06	1.5E-05	0.03	5.9E-01	1.796	1.550E-01	1.083E-01	1.413E-01	1.055E-01
Toluene	1.349E+02	2.60E-01	7.344E+03	8.122E-01	0.085	8.5E-06	1.5E-05	0.03	5.7E-01	1.817	2.056E-01	1.083E-01	1.413E-01	1.055E-01
Ethylbenzene	3.631E+02	3.25E-01	6.480E+03	6.739E-01	0.075	7.5E-06	1.5E-05	0.03	5.0E-01	1.894	2.056E-01	1.083E-01	1.413E-01	1.055E-01
Xylenes (Total)	1.288E+02	2.17E-01	7.517E+03	8.640E-01	0.087	8.7E-06	1.5E-05	0.03	5.8E-01	1.803	7.056E-01	3.250E-01	4.238E-01	3.164E-01
Acenaphthylene	6.823E+03	4.51E-03	3.802E+03	6.480E-01	0.044	4.4E-06	1.5E-05	0.03	2.9E-01	2.263	2.384E-01	4.472E-01	8.773E-01	1.778E-01
Acenaphthene	6.823E+03	7.38E-03	3.637E+03	6.644E-01	0.042	4.2E-06	1.5E-05	0.03	2.8E-01	2.296	2.262E-01	9.771E-02	2.184E-01	4.827E-02
Fluorene	1.073E+04	3.94E-03	3.136E+03	6.808E-01	0.036	3.6E-06	1.5E-05	0.03	2.4E-01	2.412	2.374E-01	2.309E-01	2.455E-01	6.255E-02
Chrysene	5.031E+05	2.13E-04	2.143E+03	5.365E-01	0.025	2.5E-06	1.5E-05	0.03	1.7E-01	2.739	3.175E-01	8.360E-01	1.609E+00	5.233E-01
Benzo(a)anthracene	4.012E+05	4.92E-04	4.406E+03	7.776E-01	0.051	5.1E-06	1.5E-05	0.03	3.4E-01	2.154	2.854E-01	1.096E+00	1.357E+00	5.555E-01
Benzo(b)fluoranthene	1.230E+06	4.55E-03	1.953E+03	4.804E-01	0.023	2.3E-06	1.5E-05	0.03	1.5E-01	2.825	5.026E-01	1.047E+00	2.770E+00	8.287E-01
Benzo(k)fluoranthene	9.922E+05	2.38E-05	1.953E+03	4.804E-01	0.023	2.3E-06	1.5E-05	0.03	1.5E-01	2.825	2.110E-01	9.055E-01	1.303E+00	6.173E-01
Dibenz (a,h)anthracene	2.453E+06	5.74E-06	1.745E+03	4.476E-01	0.020	2.0E-06	1.5E-05	0.03	1.3E-01	2.933	2.646E-01	3.065E-01	4.682E-01	2.419E-01
Indeno(1,2,3-cd)pyrene	3.858E+06	1.39E-05	1.642E+03	4.890E-01	0.019	1.9E-06	1.5E-05	0.03	1.3E-01	2.993	3.114E-01	5.138E-01	9.391E-01	4.035E-01
Benzo(g,h,i)perylene	3.077E+06	1.35E-05	1.737E+03	4.579E-01	0.020	2.0E-06	1.5E-05	0.03	1.3E-01	2.938	3.153E-01	6.943E-01	1.153E+00	7.265E-01

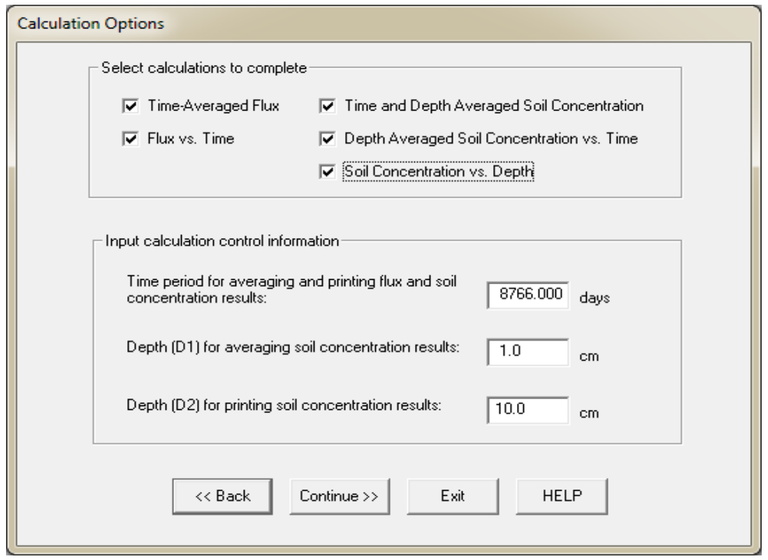
(mg/cm2/day)	Zone 1A West & 3	Zone 2	Zone 1A East & 1B	Zone 4, 5A & 5B	g/m2/s Zone 1A West & 3	Zone 2	Zone 1A East & 1B	Zone 4, 5A & 5B
Naphthalene	6.465E-13		3.905E-13		7.482E-17		4.520E-17	
Phenanthrene	4.468E-07		1.054E-06		5.171E-11		1.220E-10	
Anthracene	2.228E-06		4.648E-06		2.578E-10		5.379E-10	
Fluoranthene	2.427E-06		1.704E-05		2.809E-10		1.972E-09	
Pyrene	2.344E-16		1.917E-15		2.712E-20		2.219E-19	
Benzo(a)pyrene	5.173E-10		3.915E-09		5.987E-14		4.531E-13	
Benzene	9.234E-15		8.416E-15		1.069E-18		9.740E-19	
Toluene	2.100E-10		1.442E-10		2.430E-14		1.669E-14	
Ethylbenzene	4.930E-08		3.387E-08		5.706E-12		3.920E-12	
Xylenes (Total)	9.766E-11		5.866E-11		1.130E-14		6.789E-15	
Acenaphthylene	1.148E-15		4.225E-15		1.329E-19		4.890E-19	
Acenaphthene	2.151E-13		2.077E-13		2.489E-17		2.403E-17	
Fluorene	2.361E-14		2.441E-14		2.733E-18		2.825E-18	
Chrysene	4.736E-10		2.400E-09		5.482E-14		2.778E-13	
Benzo(a)anthracene	2.468E-09		1.174E-08		2.856E-13		1.358E-12	
Benzo(b)fluoranthene	1.081E-08		5.957E-08		1.251E-12		6.895E-12	
Benzo(k)fluoranthene	4.101E-11		2.532E-10		4.746E-15		2.931E-14	
Dibenzo(a,h)anthracene	9.831E-12		1.740E-11		1.138E-15		2.014E-15	
Indeno(1,2,3-cd)pyrene	2.314E-11		6.976E-11		2.678E-15		8.074E-15	
Benzo(g,h,i)perylene	2.590E-11		9.471E-11		2.998E-15		1.096E-14	

Appendix 3.6 - Hydrocarbon emission calculations (Non-working Hours)

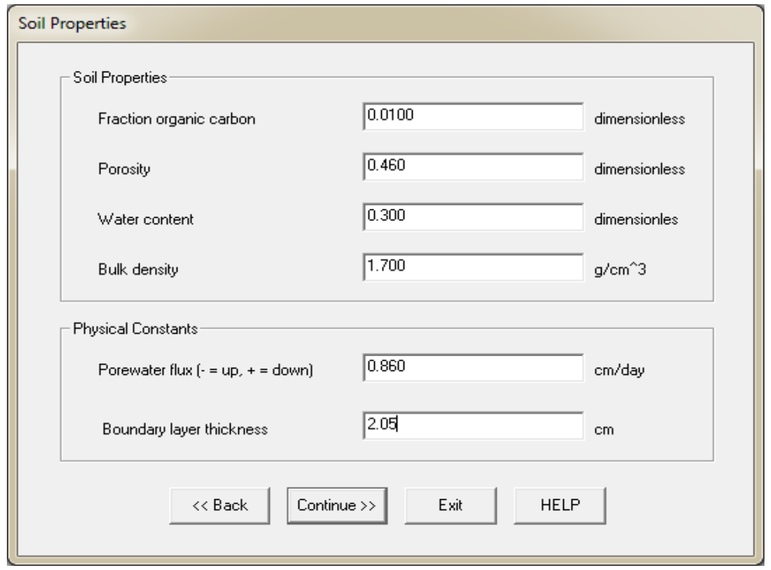
(mg/cm2/day)	Zone 1A West & 3	Zone 2	Zone 1A East & 1B	Zone 4, 5A & 5B	g/m2/s Zone 1A West & 3	Zone 2	Zone 1A East & 1B	Zone 4, 5A & 5B
Naphthalene	6.465E-13	1.847E-13			7.482E-17	2.13785E-17		
Phenanthrene	4.468E-07	1.1773E-06			5.171E-11	1.36262E-10		
Anthracene	2.228E-06	3.6419E-06			2.578E-10	4.21516E-10		
Fluoranthene	2.427E-06	8.8223E-06			2.809E-10	1.0211E-09		
Pyrene	2.344E-16	1.0192E-15			2.712E-20	1.17963E-19		
Benzo(a)pyrene	5.173E-10	1.8079E-09			5.987E-14	2.09248E-13		
Benzene	9.234E-15	6.4536E-15			1.069E-18	7.46944E-19		
Toluene	2.100E-10	1.1061E-10			2.430E-14	1.28021E-14		
Ethylbenzene	4.930E-08	2.5972E-08			5.706E-12	3.00602E-12		
Xylenes (Total)	9.766E-11	4.4982E-11			1.130E-14	5.20625E-15		
Acenaphthylene	1.148E-15	2.1536E-15			1.329E-19	2.49259E-19		
Acenaphthene	2.151E-13	9.2913E-14			2.489E-17	1.07538E-17		
Fluorene	2.361E-14	2.2961E-14			2.733E-18	2.65752E-18		
Chrysene	4.736E-10	1.2469E-09			5.482E-14	1.44317E-13		
Benzo(a)anthracene	2.468E-09	9.4797E-09			2.856E-13	1.09719E-12		
Benzo(b)fluoranthene	1.081E-08	2.2516E-08			1.251E-12	2.60602E-12		
Benzo(k)fluoranthene	4.101E-11	1.7599E-10			4.746E-15	2.03692E-14		
Dibenzo(a,h)anthracene	9.831E-12	1.1391E-11			1.138E-15	1.3184E-15		
Indeno(1,2,3-cd)pyrene	2.314E-11	3.8168E-11			2.678E-15	4.41759E-15		
Benzo(g,h,i)perylene	2.590E-11	5.704E-11			2.998E-15	6.60185E-15		

(mg/cm2/day)	Zone 1A West & 3	Zone 2	Zone 1A East & 1B	Zone 4, 5A & 5B	g/m2/s Zone 1A West & 3	Zone 2	Zone 1A East & 1B	Zone 4, 5A & 5B
Naphthalene				1.401E-13				1.622E-17
Phenanthrene				3.473E-07				4.019E-11
Anthracene				1.356E-06				1.569E-10
Fluoranthene				4.441E-06				5.140E-10
Pyrene				4.883E-16				5.652E-20
Benzo(a)pyrene				1.304E-09				1.509E-13
Benzene				6.284E-15				7.273E-19
Toluene				1.077E-10				1.247E-14
Ethylbenzene				2.529E-08				2.927E-12
Xylenes (Total)				4.380E-11				5.069E-15
Acenaphthylene				8.560E-16				9.908E-20
Acenaphthene				4.590E-14				5.313E-18
Fluorene				6.220E-15				7.199E-19
Chrysene				7.804E-10				9.033E-14
Benzo(a)anthracene				4.805E-09				5.561E-13
Benzo(b)fluoranthene				1.782E-08				2.062E-12
Benzo(k)fluoranthene				1.200E-10				1.389E-14
Dibenzo(a,h)anthracene				8.988E-12				1.040E-15
Indeno(1,2,3-cd)pyrene				2.998E-11				3.469E-15
Benzo(g,h,i)perylene				5.968E-11				6.908E-15

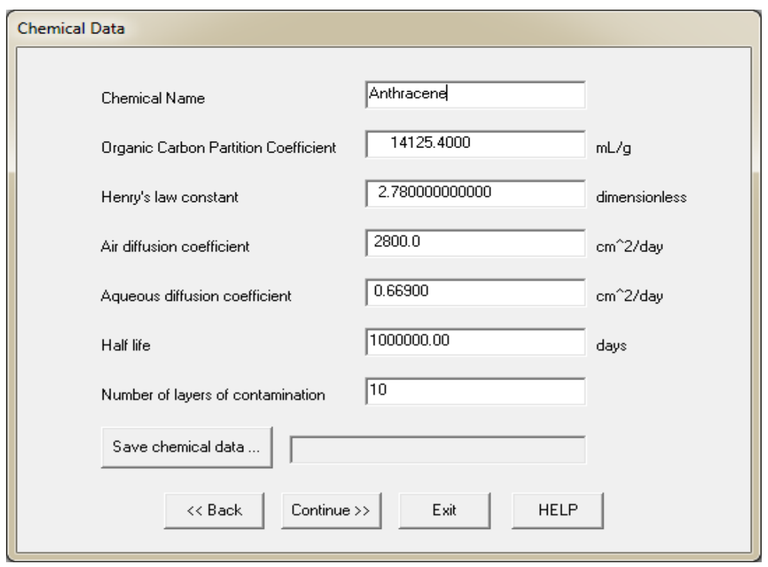
Appendix 3.6 - Hydrocarbon emission calculations (Non-working Hours)



Asumming time period is from end 2003 (when the soil concentrations were measured) until the end of the proposed works period, 2027



Based on an wind speed of 1 m/s, pollutant specific air gas diffusion coefficient, and a kinematic viscosity of air = 1.5E-05 m2/s



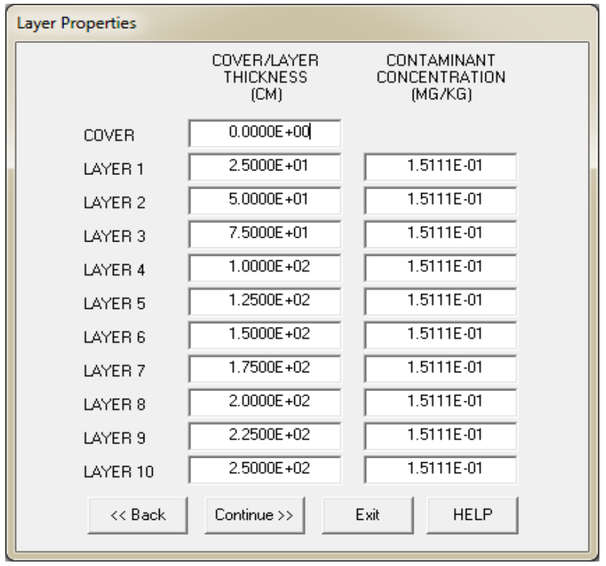
Column B

Column C

Coulmn D

Column E

Based on the EMSOFT User's Guide the value of 1,000,000 is used to disregard degredationand transformation of the pollutant by decay processes (Biodegredation, photolysis, oxidation etc.) as site-specific decay constants are not known



Note the concentration is pollutant and zone specific