Equation A-9: Migration to Ground Water Screening Levels

$$SL_{MTG} = SL_{GW} \times DAF \times \left[(K_{OC} \times f_{OC}) + \frac{\theta_W + (\theta_A \times H')}{\rho_b} \right]$$

Where

SL_{MTG} = Migration to ground water screening level, in mg/kg

SL_{GW} = Ground water screening level, in micrograms per liter (µg/L), from column seven of Table A-6. This level may be a maximum contaminant level (MCL) for some chemicals.

DAF = Dilution attenuation factor (DAF, unitless). As recommended in US E.P.A. (2011) for source areas of 0.5 acres, IDEM uses a default DAF value of 20. IDEM will accept other values that are appropriately derived using site-specific data. See Section 4.11.5 of US E.P.A. (2011) for additional information.

K_{OC} = Chemical-specific organic carbon partition coefficient, in liters per kilogram (L/kg). For most chemicals, IDEM uses K_{oc} values from the RSL Chemical-specific Parameters Supporting Table when calculating IDEM migration to ground water screening levels. For metals, IDEM uses the K_d values appearing in Section 4.11 of U.S. EPA (2011) in place of $(K_{oc} \, x \, f_{oc})$.

f_{OC} = Fraction of organic carbon, in grams per gram (g/g). IDEM uses a default value of 0.002 when calculating IDEM migration to ground water screening levels. IDEM will accept other values that are appropriately derived from site-specific data.

θ_W = Water filled soil porosity, in liters of water per liters of soil. IDEM uses a default value of 0.3 when calculating IDEM migration to ground water screening levels. IDEM will accept other values that are appropriately derived from site-specific data.

θ_A = Air filled soil porosity, in liters of air per liters of soil. IDEM uses a default value of 0.13 when calculating IDEM migration to ground water screening levels. IDEM will accept other values that are appropriately derived from site-specific data.

H' = Chemical-specific dimensionless Henry's Law constant (unitless). IDEM uses values from the RSL Chemical-specific Parameters Supporting Table when calculating IDEM migration to ground water screening levels.

ρ_b = Dry soil bulk density, in kilograms per liter (kg/L). IDEM uses a default value of 1.5 when calculating IDEM migration to ground water screening levels. IDEM will accept other values that are appropriately derived from site-specific data.

pH has a significant effect on the ability of metals and ionizing organics (i.e., carboxylic acids, phenols, and amines) to migrate through the soil column, and thus to ground water. The RSLs for migration to ground water assume a pH of 6.8[3]. The migration to ground water screening levels are not applicable outside a soil pH range of 6.0 to 8.0. Site soils outside this range merit development of site-specific migration to ground water screening levels for ionizing organics or metals at the site. U.S. EPA (1996b) provides guidance for determining pH-specific K_d values. Alternatively, see Section 9.10 for guidance on the synthetic precipitation leaching procedure.

[3] Except beryllium, cadmium, mercury, nickel, and silver.