

## UNITS CONVERSIONS

This information is being provided to help community stakeholders better understand the relationships between the various measured quantities (i.e., concentrations) that are reported for DTSC's Chemical Soil Background Study's analytes.

I. The standard unit of mass in the metric system is the gram. The standard units used by laboratories for environmental work that involve the background Study's target analytes include:

1 kilogram (kg) = 1,000 grams (g)

1 milligram (mg) = 0.001 gram (e.g., metals) - or  $1 \text{ mg} = 10^{-3} \text{ g}$

1 microgram ( $\mu\text{g}$ ) = 0.000001 gram (e.g., pesticides-herbicides) - or  $1 \mu\text{g} = 10^{-6} \text{ g}$

1 picogram (pg) = 0.000000000001 gram (e.g., dioxins) - or  $1 \text{ pg} = 10^{-12} \text{ g}$

For reference, 1 gram is about the mass of a paper clip. One kilogram is about the mass of a liter of water.

In general, the background Study's labs reported concentrations on a per-kg basis as:

- “mg/kg” (e.g., metals) - often referred to as “parts per million,” or “ppm,” and
- “ $\mu\text{g/kg}$ ” (e.g., pesticides-herbicides) - often referred to as “parts per billion,” or “ppb.”

However, dioxin concentrations are reported as “pg/g” - often referred to as “parts per trillion” (ppt) because it is on a per-gram basis - and these concentrations can be converted to mg/kg or  $\mu\text{g/kg}$  (see below).

II. Examples - (a) convert pg/g to mg/kg; (b) convert pg/g to  $\mu\text{g/kg}$ ; or (c) convert mg/kg to  $\mu\text{g/kg}$ :

(a)  $1 \text{ pg/g} = 1 \times 10^{-9} \text{ mg} / 1 \times 10^{-3} \text{ kg}$ . Thus,  $1 \text{ pg/g} = 10^{-6} \text{ mg/kg}$ . So, if you want to convert, say, 125 pg/g to mg/kg, you get 0.000125 mg/kg, or  $125 \times 10^{-6} \text{ mg/kg}$ .

(b)  $1 \text{ pg/g} = 1 \times 10^{-6} \mu\text{g} / 1 \times 10^{-3} \text{ kg}$ . Thus,  $125 \text{ pg/g} = 0.125 \mu\text{g/kg}$ , or  $125 \times 10^{-3} \mu\text{g/kg}$ .

(c)  $1 \text{ mg/kg} = 1 \times 10^3 \mu\text{g/kg}$  (note the plus exponent). Thus,  $1 \text{ mg/kg} = 1,000 \mu\text{g/kg}$ .

III. There are many free, on-line unit-conversion utilities. Some examples are:

<http://www.asknumbers.com/WeightConversion.aspx>

<http://www.unit-conversion.info/metric.html>

Metric System Prefix Table			
Prefix	Symbol	Multiplication Factor	Power of 10
yotta	Y	1,000,000,000,000,000,000,000,000	+24
zetta	Z	1,000,000,000,000,000,000,000	+21
exa	E	1,000,000,000,000,000,000	+18
peta	P	1,000,000,000,000,000	+15
tera	T	1,000,000,000,000	+12
giga	G	1,000,000,000	+9
mega	M	1,000,000	+6
kilo	k	1,000	+3
hecto	h	100	+2
deka	da	10	+1
deci	d	0.1	-1
centi	c	0.01	-2
milli	m	0.001	-3
micro	μ	0.000,001	-6
nano	n	0.000,000,001	-9
pico	p	0.000,000,000,001	-12
femto	f	0,000,000,000,000,001	-15
atto	a	0,000,000,000,000,000,001	-18
zepto	z	0,000,000,000,000,000,000,001	-21
yocto	y	0,000,000,000,000,000,000,000,001	-24