Appendix A

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Hamburg Lead Site- Geary Drive

Incidental Ingestion of Soil

The soil ingestion exposure dose can be estimated as follows:

$$\frac{C \times IR \times EF\ (10^{-6})}{BW} = IDs$$

where:

IDs	=	soil ingestion exposure dose (mg/kg/day);
C	=	contaminant concentration (mg/kg);
IR	=	soil ingestion rate (mg/day): 100 mg/day for trespassers;
EF	=	exposure factor (unit less);
BW	=	body weight (kg): trespasser (average 10 kg child and 70 kg adult) = 40 kg

A conversion factor of 10^{-6} kg/mg is required to convert the soil contaminant concentration (C) from mg/kg soil to mg/mg soil.

EF = (exposure frequency x exposure duration) / exposure time

where:

exposure frequency: trespasser = two days/week x 50 weeks
residential = five days/week x 50 weeks

exposure duration: trespasser = 7 years
residential = 30 years

exposure time: exposure duration * 365 days/year

$$EF_{(trespasser)} = \frac{(2\ days/week) \times (50\ weeks/year) \times (7\ years)}{(365\ days/year) \times (7\ years)} = 0.27$$

$$EF_{(residential)} = \frac{(5\ days/week) \times (50\ weeks/year) \times (30\ years)}{(365\ days/year) \times (30\ years)} = 0.69$$

Ingestion of soil

(using average concentration for a trespasser)

$$\frac{[102\ mg/kg] \times 100\ mg/day \times 0.27 \times 1E^{-06}}{40\ kg} = 6.9E^{-05}\ mg/kg/day$$

Ingestion of soil

(using action level value for a residential exposure)

$$\frac{[400\ mg/kg] \times 100 mg/day \times 0.69 \times 1E^{-06}}{40\ kg} = 6.9E^{-04}\ mg/kg/day$$

Assumptions for Estimating Human Exposure Dose:

- A soil ingestion rate (IR) of 100 mg/day for trespassers was based on an assumption that soil on the hands is incidentally ingested while eating or playing, and that soil adheres to the palms of the hands. A more typical value for ingestion over an entire day is probably less than 50 mg/day. The soil ingestion rate also assumes that the contaminant in the soil is bioavailable as the pure chemical, whereas the actual bioavailability could be substantially less.
- The exposure frequency, or number of exposure events per year, was assumed to be 100 days per year for juvenile trespassers. This assumes that a juvenile might have spent 2 days per week at the Geary Drive site almost every week of the year (i.e., 50 weeks). Although nearby residents might access the site, there is no indication that it was a frequently visited site or meeting place for juveniles. ATSDR believes that this assumption overestimates exposure.
- The duration of exposure was assumed to have occurred over 7 years for a (for instance) juvenile trespasser from the age of 7 through the age of 14.
- The exposure time (trespassers) for noncancer effects was assumed to be seven years, 365 days/year.

Likelihood of Health Effects From Incidental Ingestion of Soil at the Geary Drive site

The estimated exposure dose for a juvenile trespasser (7 to 14 years) exposed to the average concentration of lead 2 days per week for 50 weeks over 7 years is lower than the dose calculated from the EPA action level and therefore does not pose a public health hazard. Inhalation and dermal exposures would not contribute significantly to the total dose.

Reference:

Agency for Toxic Substances and Disease Registry. Public health assessment guidance manual. Chelsea, Michigan: Lewis Publishers; 1992.