EXHIBIT 6-11
RESIDENTIAL EXPOSURE: INGESTION OF CHEMICALS IN DRINKING WATER
(AND BEVERAGES MADE USING DRINKING WATER)

| Equation: | Intake (mg/kg-day) = CW x IR x EF x ED  
| BW x AT |

| Where: |
| CW = Chemical Concentration in Water (mg/liter)  
IR = Ingestion Rate (liters/day)  
EF = Exposure Frequency (days/year)  
ED = Exposure Duration (years)  
BW = Body Weight (kg)  
AT = Averaging time (period over which exposure is averaged -- days) |

| Variable Values: |
| CW: Site-specific measured or modeled value  
IR: 2 liters/day (adult, 90th percentile; EPA 1989d)  
1.4 liters/day (adult, average; EPA 1989d)  
Age-specific values (EPA 1989d)  
EF: Pathway-specific value (for residents, usually daily -- 365 days/year)  
ED: 70 years (lifetime by convention)  
30 years (national upper-bound time (90th percentile) at one residence; EPA 1989d)  
9 years (national median time (50th percentile) at one residence; EPA 1989d)  
BW: 70 kg (adult, average; EPA 1989d)  
Age-specific values (EPA 1988a, 1989d)  
AT: Pathway-specific period of exposure for noncarcinogenic effects (i.e., ED x 365 days/year), and 70 year lifetime for carcinogenic effects (i.e., 70 years x 365 days/year). |

---

See Section 6.4.1 and 6.6.1 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, combine 95th or 90th percentile values for contact rate and exposure frequency and duration variables.
EXHIBIT 6-12
RESIDENTIAL EXPOSURE:
ingestion of chemicals in surface water
while swimming$^a$

<table>
<thead>
<tr>
<th>Equation:</th>
<th>Intake (mg/kg-day) = CW x IR x EF x ED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BW x AT</td>
</tr>
</tbody>
</table>

Where:

- **CW** = Chemical Concentration in Water (mg/liter)
- **CR** = Contact Rate (liters/hour)
- **IR** = Ingestion Rate (liters/day)
- **ET** = Exposure Time (hours/event)
- **EF** = Exposure Frequency (events/year)
- **ED** = Exposure Duration (years)
- **BW** = Body Weight (kg)
- **AT** = Averaging time (period over which exposure is averaged -- days)

Variable Values:

- **CW**: Site-specific measured or modeled value
- **CR**: 50 ml/hour (EPA 1989d)
- **EF**: Pathway-specific value

  - **Pathway-specific value (should consider local climatic conditions [e.g., number of days above a given temperature] and age of potentially exposed population)**
    - 7 days/year (national average for swimming; USDOI In EPA 1988b, EPA 1989d)
- **ED**: 70 years (lifetime; by convention)
- **BW**: 70 kg (adult, average; EPA 1989d)
- **AT**: Pathway-specific period of exposure for noncarcinogenic effects (i.e., ED x 365 days/year), and 70 year lifetime for carcinogenic effects (i.e., 70 years x 365 days/year).

$^a$ See Section 6.4.1 and 6.6.1 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, combine 95th or 90th percentile values for contact rate and exposure frequency and duration variables.
EXHIBIT 6-13
RESIDENTIAL EXPOSURE:
DERMAL CONTACT WITH CHEMICALS IN WATER

Equation:
\[
\text{Absorbed dose (mg/kg-day)} = \frac{\text{CW} \times \text{SA} \times \text{PC} \times \text{ET} \times \text{EF} \times \text{ED} \times \text{CF}}{\text{BW} \times \text{AT}}
\]

Where:
- \(\text{CW}\) = Chemical Concentration In Water (mg/liter)
- \(\text{SA}\) = Skin Surface Area Available for Contact (cm\(^2\))
- \(\text{PC}\) = Chemical-specific Dermal Permeability Constant (cm/hr)
- \(\text{ET}\) = Exposure Time (hours/day)
- \(\text{EF}\) = Exposure Frequency (days/year)
- \(\text{ED}\) = Exposure Duration (years)
- \(\text{CF}\) = Volumetric Conversion Factor for Water (1 liter/1000 cm\(^3\))
- \(\text{BW}\) = Body Weight (kg)
- \(\text{AT}\) = Averaging time (period over which exposure is averaged -- days)

Variable Values:

\(\text{CW}\): Site-specific measured or modeled value

\(\text{SA}\):

50th Percentile Total Body Surface Area (m\(^2\)) (EPA 1989d, 1985a)

<table>
<thead>
<tr>
<th>AGE (YRS)</th>
<th>MALE</th>
<th>FEMALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 &lt; 6</td>
<td>0.728</td>
<td>0.711</td>
</tr>
<tr>
<td>6 &lt; 9</td>
<td>0.931</td>
<td>0.919</td>
</tr>
<tr>
<td>9 &lt; 12</td>
<td>1.16</td>
<td>1.16</td>
</tr>
<tr>
<td>12 &lt; 15</td>
<td>1.49</td>
<td>1.48</td>
</tr>
<tr>
<td>15 &lt; 18</td>
<td>1.75</td>
<td>1.60</td>
</tr>
<tr>
<td>Adult</td>
<td>1.94</td>
<td>1.69</td>
</tr>
</tbody>
</table>

50th Percentile Body Part-specific Surface Areas for Males (m\(^2\)) (EPA 1989d, 1985a)

<table>
<thead>
<tr>
<th>AGE (YRS)</th>
<th>ARMS</th>
<th>HANDS</th>
<th>LEGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 &lt; 4</td>
<td>0.096</td>
<td>0.040</td>
<td>0.18</td>
</tr>
<tr>
<td>6 &lt; 7</td>
<td>0.11</td>
<td>0.041</td>
<td>0.24</td>
</tr>
<tr>
<td>9 &lt; 10</td>
<td>0.13</td>
<td>0.047</td>
<td>0.31</td>
</tr>
<tr>
<td>Adult</td>
<td>0.23</td>
<td>0.082</td>
<td>0.55</td>
</tr>
</tbody>
</table>

\(^a\) See Section 6.4.1 and 6.6.1 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, combine 50th or 90th percentile values for contact rate and exposure frequency and duration variables. Use 50th percentile values for \(\text{SA}\); see text for rationale.

(continued)
EXHIBIT 6-13 (continued)

RESIDENTIAL EXPOSURE:
DERMAL CONTACT WITH CHEMICALS IN WATER\(^a\)

**NOTE:** Values for children were calculated using age-specific body areas and the average percentage of total body surface area represented by particular body parts in children, presented in EPA 1985a. Values for adults presented in EPA 1989d or calculated from information presented in EPA 1985a. Information on surface area of other body parts (e.g., head, feet) and for female children and adults also is presented in EPA 1985a, 1989d. Differences in body part surface areas between sexes is negligible.

<table>
<thead>
<tr>
<th>PC</th>
<th>Consult open literature for values [Note that use of PC values results in an estimate of absorbed dose.]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET</td>
<td>Pathway-specific value (consider local activity patterns if information is available)</td>
</tr>
<tr>
<td></td>
<td>2.6 hrs/day (national average for swimming; USDOI in EPA 1988b, EPA 1989d)</td>
</tr>
<tr>
<td>EF</td>
<td>Pathway-specific value (should consider local climatic conditions [e.g., number of days above a given temperature] and age of potentially exposed population)</td>
</tr>
<tr>
<td></td>
<td>7 days/year (national average for swimming; USDOI in EPA 1988b, EPA 1989d)</td>
</tr>
<tr>
<td>ED</td>
<td>70 years (lifetime; by convention)</td>
</tr>
<tr>
<td></td>
<td>30 years (national upper-bound time (90th percentile) at one residence; EPA 1989d)</td>
</tr>
<tr>
<td></td>
<td>9 years (national median time (50th percentile) at one residence; EPA 1989d)</td>
</tr>
<tr>
<td>CF</td>
<td>1 liter/1000 cm(^3)</td>
</tr>
<tr>
<td>BW</td>
<td>70 kg (adult, average; EPA 1989d)</td>
</tr>
<tr>
<td></td>
<td>Age-specific values (EPA 1985a, 1989d)</td>
</tr>
<tr>
<td>AT</td>
<td>Pathway-specific period of exposure for noncarcinogenic effects (i.e., ED x 365 days/year), and 70 year lifetime for carcinogenic effects (i.e., 70 years x 365 days/year).</td>
</tr>
</tbody>
</table>

\(^a\) See Section 6.4.1 and 6.6.1 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, combine 95th or 90th percentile values for contact rate and exposure frequency and duration variables.
EXHIBIT 6-14
RESIDENTIAL EXPOSURE:
INGESTION OF CHEMICALS IN SOIL\textsuperscript{a}

<table>
<thead>
<tr>
<th>Equation:</th>
<th>Intake (mg/kg-day) = CS x IR x CF x FI x EF x ED x AT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BW x AT</td>
</tr>
</tbody>
</table>

Where:

- **CS**: Chemical Concentration in Soil (mg/kg)
- **IR**: Ingestion Rate (mg soilday)
- **CF**: Conversion Factor (10\textsuperscript{-6}kg/mg)
- **FI**: Fraction Ingested from Contaminated Source (unitless)
- **EF**: Exposure Frequency (days/year)
- **ED**: Exposure Duration (years)
- **BW**: Body Weight (kg)
- **AT**: Averaging time (period over which exposure is averaged - days)

Variable Values:

- **CS\textsubscript{a}**: Site-specific measured value
- **IR\textsubscript{a}**: 200 mg/day (children, 1 through 6 years old; EPA 1989g)
  - 100 mg/day (age groups greater than 6 years old; EPA 1989g)
- **CF\textsubscript{a}**: 10\textsuperscript{-6} kg/mg
- **FI\textsubscript{a}**: Pathway-specific value (should consider contaminant location and population activity patterns)
- **EF\textsubscript{a}**: 365 days/Year
- **ED\textsubscript{a}**: 70 years (lifetime by convention)
  - 30 years (national upper-bound time (90th percentile) at one residence; EPA 1989d)
  - 9 years (national median time (50th percentile) at one residence; EPA 1989d)
- **BW\textsubscript{a}**: 70 kg (adult, average; EPA 1989d)
  - 16 kg (children 1 through 6 years old, 50th percentile; EPA 1985a)
- **AT\textsubscript{a}**: Pathway-specific period of exposure for noncarcinogenic effects (i.e., ED x 365 days/year), and 70 year lifetime for carcinogenic effects (i.e., 70 years x 365 days/year).

\textsuperscript{a} See Section 6.4.1 and 6.6.2 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, use 95th or 99th percentile values for contact rate and exposure frequency and duration variables.
EXHIBIT 6-15
RESIDENTIAL EXPOSURE:
DERMAL CONTACT WITH CHEMICALS IN SOIL

Equation:
\[
\text{Absorbed Dose (mg/kg-day) = } \frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}
\]

Where:
- **CS**: Chemical Concentration in Soil (mg/kg)
- **CF**: Conversion Factor \((10^{-6} \text{ kg/mg})\)
- **SA**: Skin Surface Area Available for Contact \((\text{cm}^2/\text{event})\)
- **AF**: Soil to Skin Adherence Factor \((\text{mg/cm}^2)\)
- **ABS**: Absorption Factor (unitless)
- **EF**: Exposure Frequency \((\text{events/year})\)
- **ED**: Exposure Duration \((\text{years})\)
- **BW**: Body Weight \((\text{kg})\)
- **AT**: Averaging Time \((\text{period over which exposure is averaged - days})\)

Variable Values:

- **CS**: Based on site-specific measured value
- **CF**: \((10^{-6} \text{ kg/mg})\)

**SA**:

50th Percentile Total Body Surface Area \((\text{m}^2)\) (EPA 1989d, 1985a)

<table>
<thead>
<tr>
<th>AGE (YRS)</th>
<th>MALE</th>
<th>FEMALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 &lt; 6</td>
<td>0.728</td>
<td>0.711</td>
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<td>6 &lt; 9</td>
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<td>1.60</td>
</tr>
<tr>
<td>Adult</td>
<td>1.94</td>
<td>1.69</td>
</tr>
</tbody>
</table>

50th Percentile Body Part-specific Surface Areas for Males \((\text{m}^2)\) (EPA 1989d, 1985a)

<table>
<thead>
<tr>
<th>AGE (YRS)</th>
<th>ARMS</th>
<th>HANDS</th>
<th>LEGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 &lt; 4</td>
<td>0.096</td>
<td>0.040</td>
<td>0.18</td>
</tr>
<tr>
<td>6 &lt; 7</td>
<td>0.11</td>
<td>0.041</td>
<td>0.24</td>
</tr>
<tr>
<td>9 &lt; 10</td>
<td>0.13</td>
<td>0.057</td>
<td>0.31</td>
</tr>
<tr>
<td>Adult</td>
<td>0.23</td>
<td>0.082</td>
<td>0.55</td>
</tr>
</tbody>
</table>

**NOTE**: Values for children were calculated using age-specific body surface areas and the average percentage of total body surface area represented by particular body parts. Values for adults presented in EPA 1989d or calculated from information presented in EPA 1985a.

\(^a\) See Section 6.4.1 and 6.6.1 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, combine 95th or 90th percentile values for contact rate and exposure frequency variables. Use 50th percentile values for SA; see text for rationale.

(continued)
EXHIBIT 6-15 (continued)

RESIDENTIAL EXPOSURE:
DERMAL CONTACT WITH CHEMICALS IN SOIL

NOTE (continued: Information on surface area of other body parts (e.g., head, feet) and for female children and adults also is presented in EPA 1985a, 1989d. Differences in body part surface areas between sexes is negligible.

AF: 1.45 mg/cm² -- commercial potting soil (for hands; EPA 1989d, EPA 1988b)
2.77 mg/cm² -- kaolin clay (for hands; EPA 1989d, EPA 1988b)

ABS: Chemical-specific value (this value accounts for desorption of chemical from the soil matrix and absorption of chemical across the skin; generally, information to support a determination of ABS is limited — see text)

EF: Pathway-specific value (should consider local weather conditions [e.g., number of rain, snow and frost-free days] and age of potentially exposed population)

ED: 70 years (lifetime; by convention)
30 years (national upper-bound time (90th percentile) at one residence; EPA 1989d)
9 years (national median time (50th percentile) at one residence; EPA 1989d)

BW: 70 kg (adult, average; EPA 1989d)
Age-specific values (EPA 1985a, 1989d)

AT: Pathway-specific period of exposure for noncarcinogenic effects (i.e., ED x 365 days/year), and 70 year lifetime for carcinogenic effects (i.e., 70 years x 365 days/year)

See Section 6.4.1 and 6.6.1 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, combine 95th or 90th percentile values for contact rate and exposure frequency and duration variables.
## EXHIBIT 6-16

**RESIDENTIAL EXPOSURE:**

**INHALATION OF AIRBORNE (VAPOR PHASE) CHEMICALS \(^a\)\(^b\)**

| Equation | \[
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Intake (mg/kg-day) = CA x IR x ET x EF x ED x BW x AT</td>
<td></td>
</tr>
</tbody>
</table>

### Where:

- **CA**: Chemical Concentration in Air (mg/m\(^3\))
- **IR**: Inhalation Rate (m\(^3\)/hour)
- **ET**: Exposure Time (hours/day)
- **EF**: Exposure Frequency (days/year)
- **ED**: Exposure Duration (years)
- **BW**: Body Weight (kg)
- **AT**: Averaging Time (period over which exposure is averaged – days)

### Variable Values:

- **CA**: Site-specific measured or modeled value
- **IR**: 30 m\(^3\)/day (adult, suggested upper bound value; EPA 1989d)
  20 m\(^3\)/day (adult, average; EPA 1989d)
  Hourly rates (EPA 1989d)
  Age-specific values (EPA 1985a)
  Age, sex, and activity based values (EPA 1985a)
  0.6 m\(^3\)/hr – showering (all age groups; EPA 1989d)
- **ET**: Pathway-specific value (dependent on duration of exposure-related activities)
  12 minutes – showering (90th percentile; EPA 1989d)
  7 minutes – showering (50th percentile; EPA 1989d)
- **EF**: Pathway-specific value (dependent on frequency of showering or other exposure-related activities)
- **ED**: 70 years (lifetime by convention)
  30 years (national upper-bound time (90th percentile) at one residence; EPA 1989d)
  9 years (national median time (50th percentile) at one residence; EPA 1989d)
- **BW**: 70 kg (adult, average; EPA 1989d)
  Age-specific values (EPA 1985a, 1989d)
- **AT**: Pathway-specific period of exposure for noncarcinogenic effects
  (i.e., ED x 365 days/year), and 70 year lifetime for carcinogenic effects
  (i.e., 70 years x 365 days/year).

---

\(^a\) See Section 6.4.1 and 6.6.3 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, use 95th or 90th percentile values for contact rate and exposure frequency and duration variables.

\(^b\) The equation and variable values for vapor phase exposure can be used with modification to calculate particulate exposure. See text.
EXHIBIT 6-17
RESIDENTIAL EXPOSURE: FOOD PATHWAY --
INGESTION OF CONTAMINATED FISH AND SHELLFISH \(^a\)

<table>
<thead>
<tr>
<th>Equation:</th>
<th>Intake (mg/kg-day) = CF x IR x FI x EF x ED x BW x AT</th>
</tr>
</thead>
</table>

Where:
- **CF** = Chemical Concentration in Fish (mg/kg)
- **IR** = Ingestion Rate (kg/meal)
- **FI** = Fraction Ingested from Contaminated Source (unitless)
- **EF** = Exposure Frequency (meals/year)
- **ED** = Exposure Duration (years)
- **BW** = Body Weight (kg)
- **AT** = Averaging time (period over which exposure is averaged -- days)

**Variable Values**

- **CF**: Site-specific measured or modeled value
- **IR**: 0.284 kg/meal (95th percentile for fln fish; Pea et al. 1982)
  - 0.113 kg/meal (50th percentile for fln fish; Pea et al. 1982)
- **FI**: 132 g/day (95th percentile daily intakes averaged over three days for consumers of fln fish; Pea et al. 1982)
- **EF**: 20 g/day (50th percentile daily intake averaged over three days for consumers of fln fish; Pea et al. 1982)
- **ED**: 6.5 g/day (daily intake averaged over a year; EPA 1989d).
  - **NOTE**: Daily intake values should be used in conjunction with an exposure frequency of 365 days/year.
  - Specific values for age, sex, race, region and fish species are available (EPA 1989d, 1989b).
- **AT**: Pathway-specific value (should consider local usage patterns)
- **EF**: Pathway-specific value (should consider local population patterns)
  - Information is available
- **ED**: 48 days/year (average per capita for fish and shellfish; EPA Tolerance Assessment System in EPA 1989h)
- **BW**: 70 kg (adult, average EPA 1989d)
  - Age-specific values (EPA 1985a, 1989d)
- **AT**: Pathway-specific period of exposure for noncarcinogenic effects
  - (i.e., ED x 365 days/year, and 70 year lifetime for carcinogenic effects
  - (i.e., 70 years x 365 days/year).

\(^a\) See Section 6.4.1 and 6.4.4 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, use 95th or 90th percentile values for intake rate and exposure frequency and duration variables.
# EXHIBIT 6-18

**RESIDENTIAL EXPOSURE: FOOD PATHWAY -- INGESTION OF CONTAMINATED FRUITS AND VEGETABLES**  

<table>
<thead>
<tr>
<th>Equation:</th>
<th>Intake (mg/kg-day) = CF x IR x FI x EF x ED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BW x AT</td>
</tr>
</tbody>
</table>

**Where:**

- **CF**: Contaminant Concentration in Food (mg/kg)
- **IR**: Ingestion Rate (kg/meal)
- **FI**: Fraction Ingested from Contaminated Source (unitless)
- **EF**: Exposure Frequency (meals/year)
- **ED**: Exposure Duration (years)
- **BW**: Body Weight (kg)
- **AT**: Averaging time (period over which exposure is averaged -- days)

**Variable Values:**

- **CF**: Site-specific measured value or modeled value based on soil concentration and plant-soil accumulation factor or deposition factors
- **IR**: Specific values for a wide variety of fruits and vegetables are available (Poa et al. 1982)
- **FI**: Pathway-specific value (should consider location and size of contaminated area relative to that of residential areas, as well as anticipated usage patterns)
- **EF**: Pathway-specific value (should consider anticipated usage patterns)
- **ED**: 70 years (lifetime by convention)  
  - 30 years (national upper-bound time (90th percentile) at one residence; EPA 1989d)  
  - 9 years (national median time (50th percentile) at one residence; EPA 1989d)
- **BW**: 70 kg (adult, average; EPA 1989d)  
  - Age-specific values (EPA 1985a, 1989d)
- **AT**: Pathway-specific period of exposure for noncancer risks (i.e., ED x 365 days/year), and 70 year lifetime for cancer risks (i.e., 70 years x 365 days/year).

---

*a See Section 6.4.1 and 6.6.4 for discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, use 95th or 90th percentile values for contact rate and exposure frequency and duration variables.
EXHIBIT 6-19
RESIDENTIAL EXPOSURE: FOOD PATHWAY -- INGESTION OF CONTAMINATED MEAT, EGGS, AND DAIRY PRODUCTS

Equation:

\[
\text{Intake (mg/kg-day)} = CF \times IR \times FI \times EF \times ED \times \frac{1}{BW \times AT}
\]

Where:

- **CF**: Chemical Concentration in Food (mg/kg)
- **IR**: Ingestion Rate (kg/meal)
- **FI**: Fraction Ingested from Contaminated Source (unitless)
- **EF**: Exposure Frequency (meals/year)
- **ED**: Exposure Duration (years)
- **BW**: Body Weight (kg)
- **AT**: Averaging time (period over which exposure is averaged -- days)

Variable Values:

- **CF**: Site-specific measured or modeled value. Based on soil concentrations, plant (feed) accumulation factors, and feed-to-meat or feed-to-dairy product transfer coefficients
- **IR**: 0.28 kg/meal -- beef (95th percentile; Poa et al. 1982)
  - 0.112 kg/meal -- beef (50th percentile; Poa et al. 1982)
  - Specific values for other meats are available (Poa et al. 1982)
- **FI**: 0.150 kg/meal -- eggs (95th percentile; Poa et al. 1982)
  - 0.064 kg/meal -- eggs (50th percentile; Poa et al. 1982)
  - Specific values for milk, cheese and other dairy products are available (Poa et al. 1982)
- **EF**: Pathway-specific value (should consider location and size of contaminated area relative to that of residential areas, as well as anticipated usage patterns)
- **ED**: 70 years (lifespan by convention)
  - 30 years (national upper-bound time (90th percentile) at one residence; EPA 1989d)
  - 9 years (national median time (50th percentile) at one residence; EPA 1989d)
- **BW**: 70 kg (adult, average; EPA 1989d)
  - Age-specific values (EPA 1985a, 1989d)
- **AT**: Pathway-specific period of exposure for noncarcinogenic effects (i.e., ED x 365 days/year), and 70 year lifetime for carcinogenic effects (i.e., 70 years x 365 days/year).

\(^a\) See Section 6.4.1 and 6.6.4 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, use 95th or 90th percentile values for contact rate and exposure frequency and duration.
## EXHIBIT 6-20

**EXAMPLE OF TABLE FORMAT FOR SUMMARIZING VALUES USED TO ESTIMATE EXPOSURE**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Range</th>
<th>Midpoint</th>
<th>Value Used</th>
<th>Brief Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCB concentration in soil (mg/kg)</td>
<td>ND - 3,500</td>
<td>250</td>
<td></td>
<td>(arithmetic mean)</td>
</tr>
<tr>
<td>Chronic exposure (mg/kg)</td>
<td></td>
<td>1,400</td>
<td></td>
<td>95th percentile upperbound estimate of mean concentration</td>
</tr>
<tr>
<td>Acute exposure (mg/kg)</td>
<td></td>
<td>3,500</td>
<td></td>
<td>Maximum detected concentration</td>
</tr>
<tr>
<td>Adult soil ingestion rate (mg/d)</td>
<td>0 - 170</td>
<td>17</td>
<td>100</td>
<td>(arithmetic mean) Range based on assumptions regarding soil adherence and percent ingestion. Value used is from EPA 1989g.</td>
</tr>
<tr>
<td>Exposure frequency (days/wk)</td>
<td>1 - 7</td>
<td>3</td>
<td>5</td>
<td>Best professional judgement.</td>
</tr>
<tr>
<td>Exposure duration (years)</td>
<td>1 - 20</td>
<td>10</td>
<td>20</td>
<td>Best professional judgement.</td>
</tr>
</tbody>
</table>
## EXHIBIT 6-21
EXAMPLE OF AN UNCERTAINTY TABLE FOR EXPOSURE ASSESSMENT

<table>
<thead>
<tr>
<th>ASSUMPTION</th>
<th>EFFECT ON EXPOSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental Sampling and Analysis</strong></td>
<td></td>
</tr>
<tr>
<td>Sufficient samples may not have been taken to characterize the media being evaluated, especially with respect to currently available soil data.</td>
<td>Moderate</td>
</tr>
<tr>
<td>Systematic or random errors in the chemical analyses may yield erroneous data.</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Fate and Transport Modeling</strong></td>
<td></td>
</tr>
<tr>
<td>Chemicals in fish will be at equilibrium with chemical concentrations in water.</td>
<td>Low</td>
</tr>
<tr>
<td>Use of Gaussian dispersion model to estimate air concentrations offsite.</td>
<td>Low</td>
</tr>
<tr>
<td>Use of a box model to estimate air concentrations onsite.</td>
<td>Low</td>
</tr>
<tr>
<td>Use of Cowherd’s model to estimate vehicle emission factors.</td>
<td>Moderate</td>
</tr>
<tr>
<td><strong>Exposure Parameter Estimation</strong></td>
<td></td>
</tr>
<tr>
<td>The standard assumptions regarding body weight, period exposed, life expectancy, population characteristics, and lifestyle may not be representative of any actual exposure situation.</td>
<td>Moderate</td>
</tr>
<tr>
<td>The amount of media intake is assumed to be constant and representative of the exposed population.</td>
<td>Moderate</td>
</tr>
<tr>
<td>Assumption of daily lifetime exposure for residents.</td>
<td>Moderate to High</td>
</tr>
<tr>
<td>Use of “hot spot” soil data for upper-bound lifetime exposure.</td>
<td>Moderate to High</td>
</tr>
</tbody>
</table>

\*As a general guideline, assumptions marked as “low” may affect estimates of exposure by less than one order of magnitude; assumptions marked “moderate” may affect estimates of exposure by between one and two orders of magnitude; assumptions marked “high” may affect estimates of exposure by more than two orders of magnitude.*
**EXHIBIT 6-22**

**EXAMPLE OF TABLE FORMAT FOR SUMMARIZING THE RESULTS OF THE EXPOSURE ASSESSMENT – CURRENT LAND USE**

<table>
<thead>
<tr>
<th>Population</th>
<th>Exposure Pathway</th>
<th>Chemical</th>
<th>Chronic Daily Intake (CDI) (mg/kg-day)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Carcinogenic Effects</td>
</tr>
<tr>
<td>Residents</td>
<td>Ingestion of ground water that has migrated from the site to downgradient local wells</td>
<td>Benzene</td>
<td>0.00025</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chlorodane</td>
<td>0.00015</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phenol</td>
<td>... $^c$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cyanide</td>
<td>... $^c$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nitrobenzene</td>
<td>... $^c$</td>
</tr>
<tr>
<td></td>
<td>Inhalation of chemicals that have volatilized from ground water during use</td>
<td>Benzene</td>
<td>0.000013</td>
</tr>
<tr>
<td></td>
<td>Ingestion of fish that have accumulated chemicals in nearby lake</td>
<td>Chlorodane</td>
<td>0.00008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MFK</td>
<td>... $^c$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phenol</td>
<td>... $^c$</td>
</tr>
</tbody>
</table>

*a* Similar tables should be prepared for all subchronic daily intake (SDI) estimates as well as for all CDI and SDI estimates under future land use conditions.

$b$ CDI for noncarcinogenic effects not calculated for benzene because it does not have an EPA-verified chronic reference dose (as of the publication date of this manual).

$c$ CDI for carcinogenic effects not calculated for chemicals not considered by EPA to be potential human carcinogens (as of the publication date of this manual).