

APPENDIX B

Exposure Equations and Default Input Parameters

Gkhoury

Table B-1.1

Scenario 1- General Residential Exposure

Pathway R1- Incidental Ingestion of Radionuclides in Soil

Equation for age -integrated (adult/child) receptors

$$Intake_{res-sol-Ing.}(pCi) = \frac{C_S \left(\frac{pCi}{g} \right) * (1 - e^{-\lambda t_r}) * IFS_{R-adj} \left(\frac{120mg}{day} \right) * EF_r \left(350 \frac{day}{yr} \right) * ED_r (30 yr) * \left(\frac{g}{1000mg} \right)}{t_r(yr) * \lambda \left(\frac{1}{yr} \right)}$$

$$IFS_{R-adj} \left(120 \frac{mg}{day} \right) = \frac{(IRS_{r-c} \left(\frac{200mg}{day} \right) * ED_{r-c}(6 yr) + IRS_{r-a} \left(100 \frac{mg}{day} \right) * ED_{r-a}(24yr))}{ED_r(30 yr)}$$

Where:

Variable	Value
C _s (UCL or maximum detected concentration in soil) pCi/g	Site-specific
ED _{r-a} (exposure duration - resident adult) yr	24
EF _r (exposure frequency - resident) day/yr	350
IRS _{r-a} (soil intake rate - resident adult) mg/day	100
IRS _{r-c} (soil intake rate - resident child) mg/day	200
IFS _{r-adj} (age-adjusted soil ingestion factor - resident) mg/day	120
ED _{r-c} (exposure duration - resident child) yr	6
ED _r (exposure duration - resident) yr	30
T _r (time-resident) yr	30
λ (lambda decay constant)	Isotopic-specific

Table B-1.2

Scenario 1- General Residential Exposure

Pathway R2- External Exposure to Ionizing Radiation from Contaminants in Soil

$$External_{res-sol-ext} = \frac{C_s \left(\frac{pCi}{g} \right) * (1 - e^{-\lambda t_r}) * ACF * EF_r \left(\frac{350 \text{ days}}{yr} \right) * \left(\frac{1yr}{365days} \right) * ED_r(30 \text{ yr}) * [ET_{r-o}(0.073) + (ET_{r-i}(0.684) * GSF_i(0.4))]}{t_r(yr) * \lambda \left(\frac{1}{yr} \right)}$$

Where:

Variable	Value
C _s (UCL or maximum detected concentration in soil) pCi/g	Site-specific
Slab size for ACF (Area Correction factor) m ³	Default (isotope-specific)
EF _r (exposure frequency-resident) day/yr	350
ED _r (exposure duration-resident) yr	30
ET _{r-o} (exposure time-outdoor resident) hr/hr	0.073
ET _{r-i} (exposure time-indoor resident) hr/hr	0.684
GSF _i (gamma shielding factor-indoor)unitless	0.4
T _r (time-resident) yr	30
λ (lambda decay constant)	Isotopic-specific

Table B-1.3

Scenario 1- General Residential Exposure

Pathway R3- Inhalation of Contaminants in Airborne Particulates

$$C_{S_{res-sol-inh}} \left(\frac{pCi}{g} \right) * (1 - e^{-\lambda t_r}) * IFA_{r-adj} \left(18 \frac{m^3}{day} \right) * EF_r \left(350 \frac{day}{yr} \right) * ED_r (30 yr) * \frac{1}{PEF \left(\frac{m^3}{kg} \right)} * ET_r \left(24 \frac{hr}{day} \right) * \left(\frac{1 day}{24 hr} \right) * \left(\frac{1000 g}{kg} \right)$$

$$Intake_{res-sol-inh.}(pCi) = \frac{C_{S_{res-sol-inh}} \left(\frac{pCi}{g} \right) * (1 - e^{-\lambda t_r}) * IFA_{r-adj} \left(18 \frac{m^3}{day} \right) * EF_r \left(350 \frac{day}{yr} \right) * ED_r (30 yr) * \frac{1}{PEF \left(\frac{m^3}{kg} \right)} * ET_r \left(24 \frac{hr}{day} \right) * \left(\frac{1 day}{24 hr} \right) * \left(\frac{1000 g}{kg} \right)}{t_r(yr) * \lambda \left(\frac{1}{yr} \right)}$$

$$IFA_{r-adj} \left(18 \frac{m^3}{day} \right) = \frac{IRA_{r-c} \left(10 \frac{m^3}{day} \right) * ED_{r-c} (6 yr) + IRA_{r-a} \left(20 \frac{m^3}{day} \right) * ED_{r-a} (24 yr)}{ED_r (30 yr)}$$

Where:

Variable	Value
C _s (UCL or maximum detected concentration in soil) pCi/g	Site-specific
IFA _{r-adj} (age-adjusted soil inhalation factor-resident) m ³ /day	18
EF _r (exposure frequency-resident) day/yr	350
ED _r (exposure duration-resident) yr	30
PEF (particulate emission factor) m ³ /kg	1.36E+09
ET _r (exposure time-resident) hr/day	24
IRA _{r-c} (inhalation rate-resident child) m ³ /day	10
IRA _{r-a} (inhalation rate-resident adult) m ³ /day	20
ED _{r-a} (exposure duration-resident adult) yr	24
ED _{r-c} (exposure duration-resident child) yr	6
T _r (time-resident) yr	30
λ (lambda decay constant)	Isotopic-specific

Table B-1.4

Scenario 1- General Residential Exposure

Pathway R4- Ingestion of Contaminants in Tap Water

Equation for age -integrated (adult/child) receptors

$$Intake_{water-ing.} (pCi) = C_w \left(\frac{pCi}{L} \right) * EF_r \left(350 \frac{day}{yr} \right) * ED_r (30 yr) * IFW_{r-adj} \left(1.8 \frac{L}{day} \right)$$

$$IFW_{r-adj} \left(1.8 \frac{L}{day} \right) = \frac{ED_{r-c} (6 yr) * IRW_{r-c} \left(1 \frac{L}{day} \right) + ED_{r-a} (24 yr) * IRW_{r-a} \left(2 \frac{L}{day} \right)}{ED_r (30 yr)}$$

Where:

Variable	Value
C_w (contaminant concentration in water) pCi/L	Site specific
ED_{r-a} (exposure duration - resident adult) yr	24
ED_{r-c} (exposure duration - resident child) yr	6
EF_r (exposure frequency - resident) day/yr	350
IRW_{r-a} (water intake rate - resident adult) L/day	2
IRW_{r-c} (water intake rate - resident child) L/day	1
IFW_{r-adj} (age-adjusted water ingestion factor - resident) L/day	1.8
ED_r (exposure duration-resident) yr	30

Table B-1.5

Scenario 1- General Residential Exposure

Pathway R5- Inhalation of Contaminants in Tap Water

Equation for age -integrated (adult/child) receptors

$$Intake_{water-inh.} (pCi) = C_w \left(\frac{pCi}{L} \right) * EF_r \left(350 \frac{day}{yr} \right) * ED_r (30 yr) * IFA_{r-adj} \left(18 \frac{m^3}{day} \right) * K \left(\frac{0.5L}{m^3} \right) * ET_r \left(\frac{24hr}{day} \right) * \left(\frac{1day}{24hr} \right)$$

$$IFA_{r-adj} \left(18 \frac{m^3}{day} \right) = \frac{ED_{r-c} (6 yr) * IRA_{r-c} \left(10 \frac{m^3}{day} \right) + ED_{r-a} (24 yr) * IRA_{r-a} \left(20 \frac{m^3}{day} \right)}{ED_r (30 yr)}$$

Where:

Variable	Value
C_w (contaminant concentration in water) pCi/L	Site specific
ED_{r-a} (exposure duration - resident adult) yr	24
ED_{r-c} (exposure duration - resident child) yr	6
EF_r (exposure frequency - resident) day/yr	350
IRA_{r-a} (water intake rate - resident adult) m^3/day	20
IRA_{r-c} (water intake rate - resident child) m^3/day	10
IFA_{r-adj} (age-adjusted water ingestion factor - resident) m^3/day	18
K (Andelman volatilization Factor) L/m^3	0.5
ED_r (exposure duration-resident) yr	30
ET_r (exposure time-resident) hr	24

Table B-1.6

Scenario 1- General Residential Exposure

Pathway R6- Ingestion of Produce (Fruits and Vegetables) Grown in Contaminated Soil

Equation for age -integrated (adult/child) receptors

$$Intake_{res-produce-ing.}(pCi) = \frac{C_s \left(\frac{pCi}{g} \right) * (1 - e^{-\lambda t_r}) * (IFF_{r-adj} \left(\frac{17.5kg}{year} \right) + IFV_{r-adj} \left(\frac{9.1kg}{year} \right)) * EF_r \left(350 \frac{day}{yr} \right) * \left(\frac{1yr}{365day} \right) * ED_r (30 yr) * \left(\frac{1000g}{kg} \right) * TF_p \left(\frac{day}{kg} \right) * CPF_r (0.25)}{t_r(yr) * \lambda \left(\frac{1}{yr} \right)}$$

Where:

$$IFF_{r-adj} \left(17.5 \frac{kg}{year} \right) = \frac{(IRF_{r-c} \left(\frac{5.4kg}{year} \right) * ED_{r-c}(6 yr) + IRF_{r-a} \left(20.5 \frac{kg}{year} \right) * ED_{r-a}(24yr))}{ED_r(30 yr)}$$

and

$$IFV_{r-adj} \left(9.1 \frac{kg}{year} \right) = \frac{(IRV_{r-c} \left(\frac{3.8kg}{year} \right) * ED_{r-c}(6 yr) + IRV_{r-a} \left(10.4 \frac{kg}{year} \right) * ED_{r-a}(24yr))}{ED_r(30 yr)}$$

Table B-1.6 (Contd.)**Scenario 1- General Residential Exposure****Pathway R6- Ingestion of Produce (Fruits and Vegetables) Grown in Contaminated Soil- Continued.**

Parameters for age -integrated (adult/child) receptors

Variable	Value
C_s (UCL or maximum detected concentration in soil) pCi/g	Site-specific
IFF_{r-adj} (age-adjusted fruit ingestion-resident) kg/yr	17.5
IFV_{r-adj} (age-adjusted vegetables ingestion-resident) kg/yr	9.1
EF_r (exposure frequency-resident) day/yr	350
ED_r (exposure duration-resident) yr	30
TF_p (Soil to plant transfer factor) pCi/gram-plant per pCi/gram-soil	Isotope- specific
CPF_r (Contaminated Plant Fraction-resident) unitless	0.25
IRF_{r-c} (Ingestion of fruit rate-resident child) kg/year	5.4
IRF_{r-a} (Ingestion of fruit rate-resident adult) kg/year	20.5
IRV_{r-c} (Ingestion of vegetable rate-resident child) kg/year	3.8
IRV_{r-a} (ingestion of vegetable rate-resident adult) kg/year	10.4
ED_{r-a} (exposure duration-resident adult) yr	24
ED_{r-c} (exposure duration-resident child) yr	6
T_r (time-resident) yr	30
λ (lambda decay constant)	Isotopic-specific

Table B-1.7

Scenario 1- General Residential Exposure

Pathway R7- Inhalation of Ambient Air (without half-life decay)

Equation for age -integrated (adult/child) receptors

$$Intake_{res-air-inh.-no\ decay}(pCi) = C_a \left(\frac{pCi}{m^3} \right) * ET_r \left(\frac{24hr}{day} \right) * \left(\frac{1day}{24hr} \right) * IFA_{r-adj} \left(\frac{18m^3}{day} \right) * EF_r \left(350 \frac{day}{yr} \right) * ED_r (30\ yr)$$

$$IFA_{r-adj} \left(18 \frac{m^3}{day} \right) = \frac{(IRA_{r-c} \left(\frac{10m^3}{day} \right) * ED_{r-c}(6\ yr) + IRA_{r-a} \left(\frac{20m^3}{day} \right) * ED_{r-a}(24yr))}{ED_r(30\ yr)}$$

Where:

Variable	Value
C_a (concentration in air) pCi/m ³	Site-specific
IFA_{r-adj} (age-adjusted air inhalation factor-resident) m ³ /day	18
EF_r (exposure frequency-resident) day/yr	350
ED_r (exposure duration-resident) yr	30
ET_r (exposure time-resident) hr/day	24
IRA_{r-c} (inhalation rate-resident child) m ³ /day	10
IRA_{r-a} (inhalation rate-resident adult) m ³ /day	20
ED_{r-a} (exposure duration-resident adult) yr	24
ED_{r-c} (exposure duration-resident child) yr	6

Table B-1.8

Scenario 1- General Residential Exposure

Pathway R8- External Exposure to Ionizing Radiation in Ambient Air

(without half-life decay)

Equation for adult receptors

$$Intake_{res-air-inh.-no\ decay}(pCi - yr)/m^3 = C_a \left(\frac{pCi}{m^3} \right) * ET_r \left(\frac{24hr}{day} \right) * \left(\frac{1day}{24hr} \right) * EF_r \left(350 \frac{day}{yr} \right) * ED_r (30\ yr) * \left(\frac{1yr}{365day} \right) * GSF_o(1.0)$$

Where:

Variable	Value
C _a (concentration in air - submersion) pCi/m ³	Site-specific
EF _r (exposure frequency-resident) day/yr	350
ED _r (exposure duration-resident) yr	30
ET _r (exposure time-outdoor resident) hr/day	24
GSF _o (gamma shielding factor-outdoor)unitless	1.0

Table B-2.1

Scenario 2- Farmer Exposure

Pathway R1- Incidental Ingestion of Contaminants in Soil

Equation for age -integrated (adult/child) receptors

$$Intake_{f-sol-ing.}(pCi) = \frac{C_s \left(\frac{pCi}{g} \right) * (1 - e^{-\lambda t_f}) * IFS_{f-adj} \left(\frac{115mg}{day} \right) * EF_f \left(350 \frac{day}{yr} \right) * ED_f(40 yr) * \left(\frac{g}{1000mg} \right)}{t_f(yr) * \lambda \left(\frac{1}{yr} \right)}$$

$$IFS_{f-adj} \left(115 \frac{mg}{day} \right) = \frac{(IRS_{f-c} \left(\frac{200mg}{day} \right) * ED_{f-c}(6 yr) + IRS_{f-a} \left(100 \frac{mg}{day} \right) * ED_{f-a}(34yr))}{ED_f(40 yr)}$$

Where:

Variable	Value
C _s (UCL or maximum detected concentration in soil) pCi/g	Site-specific
ED _{f-a} (exposure duration - adult farmer) yr	34
EF _f (exposure frequency - farmer) day/yr	350
IRS _{f-a} (soil intake rate – adult farmer) mg/day	100
IRS _{f-c} (soil intake rate – child farmer) mg/day	200
IFS _{f-adj} (age-adjusted soil ingestion factor - farmer) mg/day	115
ED _{f-c} (exposure duration – child farmer) yr	6
ED _f (exposure duration - farmer) yr	40
T _f (time-farmer) yr	40
λ (lambda decay constant	Isotopic-specific

Table B-2.2

Scenario 2- Agriculture Farmer Exposure

Pathway R2- External Exposure to Ionizing Radiation from Contaminants in Soil

$$External_{f-sol-ext} = \frac{C_s \left(\frac{pCi}{g} \right) * (1 - e^{-\lambda t_f}) * ACF * EF_f \left(\frac{350 \text{ days}}{yr} \right) * \left(\frac{1yr}{365days} \right) * ED_f(40 \text{ yr}) * [ET_{f-o}(0.507) + (ET_{f-i}(0.417) * GSF_i(0.4))]}{t_f(yr) * \lambda \left(\frac{1}{yr} \right)}$$

Where:

Variable	Value
C _s (UCL or maximum detected concentration in soil) pCi/g	Site-specific
Slab size for ACF (Area Correction factor) m ³	Default (isotope-specific)
EF _f (exposure frequency-farmer) day/yr	350
ED _f (exposure duration-farmer) yr	40
ET _{f-o} (exposure time-outdoor farmer) hr/hr	0.507
ET _{f-i} (exposure time-indoor farmer) hr/hr	0.417
GSF _i (gamma shielding factor-indoor) unitless	0.4
T _f (time-farmer) yr	40
λ (lambda decay constant)	Isotopic-specific

Table B-2.3

Scenario 2- Agriculture Farmer Exposure

Pathway R3- Inhalation of Contaminants in Airborne Particulates

$$CS_{f-sol-inh} \left(\frac{pCi}{g} \right) * (1 - e^{-\lambda t_r}) * IFA_{f-adj} \left(18.5 \frac{m^3}{day} \right) * EF_f \left(350 \frac{day}{yr} \right) * ED_f (40 yr) * \frac{1}{PEF \left(\frac{m^3}{kg} \right) * ET_f \left(24 \frac{hr}{day} \right) * \left(\frac{1 day}{24 hr} \right) * \left(\frac{1000 g}{kg} \right)}$$

$$Intake_{f-sol-inh} (pCi) = \frac{CS_{f-sol-inh} \left(\frac{pCi}{g} \right) * (1 - e^{-\lambda t_r}) * IFA_{f-adj} \left(18.5 \frac{m^3}{day} \right) * EF_f \left(350 \frac{day}{yr} \right) * ED_f (40 yr) * \frac{1}{PEF \left(\frac{m^3}{kg} \right) * ET_f \left(24 \frac{hr}{day} \right) * \left(\frac{1 day}{24 hr} \right) * \left(\frac{1000 g}{kg} \right)}}{t_f (yr) * \lambda \left(\frac{1}{yr} \right)}$$

$$IFA_{f-adj} \left(18.5 \frac{m^3}{day} \right) = \frac{IRA_{f-c} \left(10 \frac{m^3}{day} \right) * ED_{f-c} (6 yr) + IRA_{f-a} \left(20 \frac{m^3}{day} \right) * ED_{f-a} (34 yr)}{ED_f (40 yr)}$$

Where:

Variable	Value
C _s (UCL or maximum detected concentration in soil) pCi/g	Site-specific
IFA _{f-adj} (age-adjusted soil inhalation factor-farmer) m ³ /day	18.5
EF _f (exposure frequency- farmer) day/yr	350
ED _f (exposure duration- farmer) yr	40
PEF (particulate emission factor) m ³ /kg	1.36E+09
ET _f (exposure time- farmer) hr/day	24
IRA _{f-c} (inhalation rate-child farmer) m ³ /day	10
IRA _{f-a} (inhalation rate-adult farmer) m ³ /day	20
ED _{f-a} (exposure duration-adult farmer) yr	34
ED _{f-c} (exposure duration- child farmer) yr	6
T _f (time- farmer) yr	40
λ (lambda decay constant)	Isotopic-specific

Table B-2.4

Scenario 2- Agriculture Farmer Exposure

Pathway R4- Ingestion of Produce (Fruits and Vegetables) Grown in Contaminated Soil

Equation for age -integrated (adult/child) receptors

$$Intake_{f-produce-ing.}(pCi) = \frac{C_s \left(\frac{pCi}{g} \right) * (1 - e^{-\lambda t_r}) * IFF_{f-adj} \left(\frac{18.235 kg}{year} \right) + IFV_{f-adj} \left(\frac{9.41 kg}{year} \right) * EF_f \left(350 \frac{day}{yr} \right) * \left(\frac{1 yr}{365 day} \right) * ED_f (40 yr) * \left(\frac{1000 g}{kg} \right) * TF_p \left(\frac{day}{kg} \right) * CPF_f (1.0)}{t_f (yr) * \lambda \left(\frac{1}{yr} \right)}$$

Where:

$$IFF_{f-adj} \left(18.235 \frac{kg}{year} \right) = \frac{(IRF_{f-c} \left(\frac{5.4 kg}{year} \right) * ED_{f-c} (6 yr) + IRF_{f-a} \left(20.5 \frac{kg}{year} \right) * ED_{f-a} (34 yr))}{ED_f (40 yr)}$$

and

$$IFV_{f-adj} \left(9.41 \frac{kg}{year} \right) = \frac{(IRV_{f-c} \left(\frac{3.8 kg}{year} \right) * ED_{f-c} (6 yr) + IRV_{f-a} \left(10.4 \frac{kg}{year} \right) * ED_{f-a} (34 yr))}{ED_f (40 yr)}$$

Table B-2.4 (Contd.)**Scenario 2- Agriculture Farmer Exposure****Pathway R4- Ingestion of Produce (Fruits and Vegetables) Grown in Contaminated Soil- Continued.**

Parameters for age -integrated (adult/child) receptors

Variable	Value
C_s (UCL or maximum detected concentration in soil) pCi/g	Site-specific
IFF_{f-adj} (age-adjusted fruit ingestion-farmer) kg/yr	18.235
IFV_{f-adj} (age-adjusted vegetables ingestion-farmer) kg/yr	9.41
EF_f (exposure frequency-farmer) day/yr	350
ED_f (exposure duration-farmer) yr	40
TF_p (Soil to plant transfer factor) pCi/gram-plant per pCi/gram-soil	Isotope- specific
CPF_f (Contaminated Plant Fraction-farmer) unitless	1.0
IRF_{f-c} (Ingestion of fruit rate- child farmer) kg/year	5.4
IRF_{f-a} (Ingestion of fruit rate-adult farmer) kg/year	20.5
IRV_{f-c} (Ingestion of vegetable rate-child farmer) kg/year	3.8
IRV_{f-a} (ingestion of vegetable rate-adult farmer) kg/year	10.4
ED_{f-a} (exposure duration-adult farmer) yr	34
ED_{f-c} (exposure duration-child farmer) yr	6
T_f (time-farmer) yr	40
λ (lambda decay constant)	Isotopic-specific

Table B-2.5

Scenario 2- Agriculture Farmer Exposure

Pathway R5- Consumption of Beef

Equation for age -integrated (adult/child) receptors

$$Intake_{soil-f-beef-ing.}(pCi) = C_s \left(\frac{pCi}{g} \right) * (1 - e^{-\lambda t_f}) * IFB_{f-adj} \left(\frac{43.375 kg}{year} \right) * EF_f \left(350 \frac{day}{yr} \right) * \left(\frac{1 yr}{365 day} \right) * ED_f (40 yr) * \left(\frac{1000 g}{kg} \right) * \\ \frac{\{ (TF_{beef} * FI_{beef} * TF_p) + (TF_{beef} * FI_{beef-s}) + (TF_{beef} * FI_{beef-w} * (1/(K_d + \sigma * \left(\frac{s}{\rho} \right) * \left(\frac{1}{DF_w} \right) \})}{t_f(yr) * \lambda \left(\frac{1}{yr} \right)}$$

Where:

$$IFB_{f-adj} \left(43.375 \frac{kg}{year} \right) = \frac{(IRB_{f-c} \left(\frac{4.7 kg}{year} \right) * ED_{f-c}(6 yr) + IRB_{f-a} \left(50.2 \frac{kg}{year} \right) * ED_{f-a}(34 yr)}{ED_f(40 yr)}$$

Table B-2.5 (Contd.)**Scenario 2- Agriculture Farmer Exposure****Pathway R5- Consumption of Beef**

Parameters for age -integrated (adult/child) receptors

Variable	Value
C_s (UCL or maximum detected concentration in soil) pCi/g	Site-specific
IFB_{f-adj} (age-adjusted beef ingestion rate-farmer) kg/yr	43.375
FI_{beef} (beef fodder intake rate) kg/day	11.77
EF_f (exposure frequency-farmer) day/yr	350
ED_f (exposure duration-farmer) yr	40
TF_p (Soil to plant transfer factor) pCi/gram-plant per pCi/gram-soil	Isotope- specific
FI_{beef-s} (beef soil intake rate) kg/day	0.39
FI_{beef-w} (beef water intake rate) L/day	53
K_d (soil to water partition coefficient) L/kg	Isotopic-specific
σ (Total soil porosity) L water/L pore space	0.5
S (Fraction water content) L water/L porespace	0.3
P (Soil bulk density) kg/L soil	1.5
IRB_{f-c} (beef Ingestion rate- child farmer) kg/year	4.7
IRB_{f-a} (beef Ingestion rate-adult farmer) kg/year	50.2
DF_w (Dilution factor for drinking water) unitless	1
TF_{beef} (Beef transfer factor) day/kg	Isotopic-specific
ED_{f-a} (exposure duration-adult farmer) yr	34
ED_{f-c} (exposure duration-child farmer) yr	6
T_f (time-farmer) yr	40
λ (lambda decay constant)	Isotopic-specific

Table B-2.6

Scenario 2- Agriculture Farmer Exposure

Pathway R6- Consumption of Milk From Locally Raised Cows

Equation for age -integrated (adult/child) receptors

$$Intake_{soil-f-dairy-ing.}(pCi) = C_S \left(\frac{pCi}{g} \right) * (1 - e^{-\lambda t_f}) * IFD_{f-adj} \left(\frac{43.375 kg}{year} \right) * EF_f \left(350 \frac{day}{yr} \right) * \left(\frac{1 yr}{365 day} \right) * ED_f(40 yr) * \left(\frac{1000 g}{kg} \right) * \\ \frac{\{ (TF_{dairy} * FI_{dairy} * TF_p) + (TF_{dairy} * FI_{dairy-s}) + (TF_{dairy} * FI_{dairy-w} * (1/(K_d + \sigma * (\frac{S}{\rho}) * (\frac{1}{DF_w}))) \}}{t_f(yr) * \lambda \left(\frac{1}{yr} \right)}$$

Where:

$$IFF_{f-adj} \left(43.375 \frac{kg}{year} \right) = \frac{(IRD_{f-c} \left(\frac{4.7 kg}{year} \right) * ED_{f-c}(6 yr) + IRD_{f-a} \left(50.2 \frac{kg}{year} \right) * ED_{f-a}(34 yr)}{ED_f(40 yr)}$$

Table B-2.6 (Contd.)**Scenario 2- Agriculture Farmer Exposure****Pathway R6- Consumption of Milk**

Parameters for age -integrated (adult/child) receptors

Variable	Value
C_s (UCL or maximum detected concentration in soil) pCi/g	Site-specific
IFD_{f-adj} (age-adjusted milk ingestion rate-farmer) kg/yr	205.275
FI_{dairy} (dairy fodder intake rate) kg/day	16.9
EF_f (exposure frequency-farmer) day/yr	350
ED_f (exposure duration-farmer) yr	40
TF_p (Soil to plant transfer factor) pCi/gram-plant per pCi/gram-soil	Isotope- specific
$FI_{dairy-s}$ (Dairy soil intake rate) kg/day	0.41
$FI_{dairy-W}$ (dairy water intake rate) L/day	92
K_d (soil to water partition coefficient) L/kg	Isotopic-specific
σ (Total soil porosity) L water/L pore space	0.5
S (Fraction water content) L water/L porespace	0.3
P (Soil bulk density) kg/L soil	1.5
IRD_{f-c} (milk Ingestion rate- child farmer) kg/year	96.9
IRD_{f-a} (milk Ingestion rate-adult farmer) kg/year	224.4
DF_w (Dilution factor for drinking water) unitless	1
TF_{dairy} (dairy transfer factor) day/kg	Isotopic-specific
ED_{f-a} (exposure duration-adult farmer) yr	34
ED_{f-c} (exposure duration-child farmer) yr	6
T_f (time-farmer) yr	40
λ (lambda decay constant)	Isotopic-specific

Table B-2.7

Scenario 2- Agriculture Farmer Exposure

Pathway R7- Consumption of Home Raised Poultry

Equation for age -integrated (adult/child) receptors

$$Intake_{soil-f-po-ing.}(pCi) = C_s \left(\frac{pCi}{g} \right) * (1 - e^{-\lambda t_f}) * IFP_{f-adj} \left(\frac{31.18kg}{year} \right) * EF_f \left(350 \frac{day}{yr} \right) * \left(\frac{1yr}{365day} \right) * ED_f (40 yr) * \left(\frac{1000g}{kg} \right) * \\ \frac{\left\{ (TF_{po} \left(\frac{day}{kg} \right) * FI_{po} \left(\frac{0.2kg}{day} \right) * TF_p \left(\frac{pCi}{g-plant} \text{ per } \frac{pCi}{g-soil} \right)) + \left(TF_{po} \left(\frac{day}{kg} \right) * FI_{po-s} \left(\frac{0.022kg}{day} \right) \right) \right\}}{t_f(yr) * \lambda \left(\frac{1}{yr} \right)}$$

Where:

$$IFP_{f-adj} \left(31.18 \frac{kg}{year} \right) = \frac{(IRP_{f-c} \left(\frac{5kg}{year} \right) * ED_{f-c}(6 yr) + IRD_{f-a} \left(35.8 \frac{kg}{year} \right) * ED_{f-a}(34yr)}{ED_f(40 yr)}$$

Table B-2.7 (Contd.)**Scenario 2- Agriculture Farmer Exposure****Pathway R7- Consumption of Poultry**

Parameters for age -integrated (adult/child) receptors

Variable	Value
C_s (UCL or maximum detected concentration in soil) pCi/g	Site-specific
IFP_{f-adj} (age-adjusted poultry ingestion rate-farmer) kg/yr	31.18
FI_{po} (poultry intake rate) kg/day	0.2
EF_f (exposure frequency-farmer) day/yr	350
ED_f (exposure duration-farmer) yr	40
TF_p (Soil to plant transfer factor) pCi/gram-plant per pCi/gram-soil	Isotope- specific
FI_{po-s} (poultry soil intake rate) kg/day	0.022
IRP_{f-c} (poultry Ingestion rate- child farmer) kg/year	5
IRP_{f-a} (poultry Ingestion rate-adult farmer) kg/year	35.8
TF_{po} (poultry transfer factor) day/kg	Isotopic-specific
ED_{f-a} (exposure duration-adult farmer) yr	34
ED_{f-c} (exposure duration-child farmer) yr	6
T_f (time-farmer) yr	40
λ (lambda decay constant)	Isotopic-specific

Table B-2.8

Scenario 2- Agriculture Farmer Exposure

Pathway R8- Consumption of Eggs From Home Raised Poultry

Equation for age -integrated (adult/child) receptors

$$Intake_{soil-f-egg-ing.}(pCi) = C_s \left(\frac{pCi}{g} \right) * (1 - e^{-\lambda t_f}) * IFP_{f-adj} \left(\frac{13.01kg}{year} \right) * EF_f \left(350 \frac{day}{yr} \right) * \left(\frac{1yr}{365day} \right) * ED_f (40 yr) * \left(\frac{1000g}{kg} \right) * \\ \frac{\left\{ (TF_e \left(\frac{day}{kg} \right) * FI_{po} (0.2 \frac{kg}{day}) * TF_p \left(\frac{pCi}{g-plant} per \frac{pCi}{g-soil} \right) + \left(TF_e * FI_{po-s} \left(\frac{0.022kg}{day} \right) \right) \right\}}{t_f(yr) * \lambda \left(\frac{1}{yr} \right)}$$

Where:

$$IFE_{f-adj} \left(31.01 \frac{kg}{year} \right) = \frac{(IRE_{f-c} \left(\frac{2.3kg}{year} \right) * ED_{f-c} (6 yr) + IRE_{f-a} \left(14.9 \frac{kg}{year} \right) * ED_{f-a} (34yr))}{ED_f (40 yr)}$$

Table B-2.8 (Contd.)**Scenario 2- Agriculture Farmer Exposure****Pathway R8- Consumption of Eggs**

Parameters for age -integrated (adult/child) receptors

Variable	Value
C_s (UCL or maximum detected concentration in soil) pCi/g	Site-specific
IFE_{f-adj} (age-adjusted egg ingestion rate-farmer) kg/yr	31.01
FI_{po} (poultry intake rate) kg/day	0.2
EF_f (exposure frequency-farmer) day/yr	350
ED_f (exposure duration-farmer) yr	40
TF_p (Soil to plant transfer factor) pCi/gram-plant per pCi/gram-soil	Isotope- specific
FI_{po-s} (poultry soil intake rate) kg/day	0.022
IRE_{f-c} (egg Ingestion rate- child farmer) kg/year	2.3
IRE_{f-a} (egg Ingestion rate-adult farmer) kg/year	14.9
TF_e (egg transfer factor) day/kg	Isotopic-specific
ED_{f-a} (exposure duration-adult farmer) yr	34
ED_{f-c} (exposure duration-child farmer) yr	6
T_f (time-farmer) yr	40
λ (lambda decay constant)	Isotopic-specific

Table B-3.1

Scenario 3- General Residential Exposure

Pathway R1- Incidental Ingestion of Chemicals in Soil

Equation for age -integrated (adult/child) receptors – **Non-Cancer**

$$Intake_{res-sol-ing.} \left(\frac{mg}{Kg-day} \right) = \frac{C_s \left(\frac{mg}{Kg} \right) * IFS_{r-adj} \left(\frac{114mg-yr}{Kg-day} \right) * EF_r \left(350 \frac{day}{yr} \right) * (10^{-6} \frac{Kg}{mg})}{ATr (30 years) * \left(\frac{365days}{year} \right)}$$

$$IFS_{r-adj} \left(114 \frac{mg-yr}{Kg-day} \right) = \frac{(IRS_{r-c} \left(\frac{200mg}{day} \right) * ED_{r-c} (6 yr))}{BW_c (15 Kg)} + \frac{+IRS_{r-a} \left(100 \frac{mg}{day} \right) * ED_{r-a} (24yr)}{BW_a (70 Kg)}$$

Where:

Variable	Value
C _s (UCL or maximum detected concentration in soil) mg/Kg	Site-specific
ED _{r-a} (exposure duration - resident adult) yr	24
EF _r (exposure frequency - resident) day/yr	350
IRS _{r-a} (soil intake rate - resident adult) mg/day	100
IRS _{r-c} (soil intake rate - resident child) mg/day	200
IFS _{r-adj} (age-adjusted soil ingestion factor - resident) mg-yr/Kg-day	114
ED _{r-c} (exposure duration - resident child) yr	6
ED _r (exposure duration - resident) yr	30
AT _r (time-resident) yr	30

Table B-3.2

Scenario 3- General Residential Exposure

Pathway R2- Inhalation of Chemicals in Airborne Particulates

Non-Cancer

$$Intake_{res-sol-inh.} \left(\frac{mg}{m^3} \right) = \frac{C_{s_{res-sol-inh}} \left(\frac{mg}{Kg} \right) * EF_r \left(350 \frac{day}{yr} \right) * \frac{1}{PEF \left(\frac{m^3}{kg} \right)} * ET_r \left(24 \frac{hr}{day} \right) * \left(\frac{1day}{24hr} \right) * ED_r (30 yr)}{AT_r (30yr) * \frac{365days}{year}}$$

Where:

Variable	Value
C _s (UCL or maximum detected concentration in soil) mg/Kg	Site-specific
EF _r (exposure frequency-resident) day/yr	350
ED _r (exposure duration-resident) yr	30
PEF (particulate emission factor) m ³ /kg	1.36E+09
ET _r (exposure time-resident) hr/day	24
AT _r (time-resident) yr	30

Table B-3.3

Scenario 3- General Residential Exposure

Pathway R3- Dermal Contact of Chemicals in Soil

Equation for age -integrated (adult/child) receptors – **Non-Cancer**

$$Intake_{res-sol-ing.} \left(\frac{mg}{Kg-day} \right) = \frac{C_s \left(\frac{mg}{Kg} \right) * DFS_{r-adj} \left(\frac{361mg-yr}{Kg-day} \right) * EF_r \left(350 \frac{day}{yr} \right) * \left(10^{-6} \frac{Kg}{mg} \right) * ABS_d / ABS_o}{ATr (30 years) * \left(\frac{365days}{year} \right)}$$

$$DFS_{r-adj} \left(361 \frac{mg-yr}{Kg-day} \right) = \frac{SA_{r-c} \left(\frac{2800cm^2}{day} \right) * ED_{r-c} (6 yr) * AF_c \left(\frac{0.2mg}{cm^2} \right)}{BW_c (15 Kg)} + \frac{SA_{r-a} \left(\frac{5700cm^2}{day} \right) * ED_{r-a} (24yr) * AF_a \left(\frac{0.07mg}{cm^2} \right)}{BW_a (70 Kg)}$$

Table B-3.3 (Contd.)**Scenario 3- General Residential Exposure****Pathway R3- Dermal Contact with Chemicals in Soil- Continued**Equation for age -integrated (adult/child) receptors – **Non-Cancer**

Variable	Value
C_s (UCL or maximum detected concentration in soil) mg/Kg	Site-specific
DFS_{r-adj} (age-adjusted soil inhalation factor-resident) mg-yr/Kg-day	361
EF_r (exposure frequency-resident) day/yr	350
ED_r (exposure duration-resident) yr	30
SA_{r-c} (Skin surface area- resident child) cm^2	2800
SA_{r-a} (skin surface area-resident adult) cm^2	5700
AF_{r-c} (Adherence factor-resident child) mg/cm^2	0.2
AF_{r-a} (inhalation rate-resident adult) mg/cm^2	0.07
ED_{r-a} (exposure duration-resident adult) yr	24
ED_{r-c} (exposure duration-resident child) yr	6
AT_r (time-resident) yr	30
BW_c (body weight-child) Kg	15
BW_a (body weight- adult)Kg	70
ABS_d (dermal absorption) unitless	Chemical specific
ABS_o (oral or GI absorption) unitless	Chemical specific

Table B-3.4

Scenario 3- General Residential Exposure

Pathway R4- Incidental Ingestion of Chemicals in Soil

Equation for age -integrated (adult/child) receptors – **Carcinogens**

$$Intake_{res-sol-ing.} \left(\frac{mg}{Kg-day} \right) = \frac{C_s \left(\frac{mg}{Kg} \right) * IFS_{r-adj} \left(\frac{114mg-yr}{Kg-day} \right) * EF_r \left(350 \frac{day}{yr} \right) * (10^{-6} \frac{Kg}{mg})}{LT_r (70 years) * \left(\frac{365days}{year} \right)}$$

$$IFS_{r-adj} \left(114 \frac{mg-yr}{Kg-day} \right) = \frac{(IRS_{r-c} \left(\frac{200mg}{day} \right) * ED_{r-c} (6 yr) + IRS_{r-a} \left(100 \frac{mg}{day} \right) * ED_{r-a} (24yr))}{BW_c (15 Kg) + BW_a (70 Kg)}$$

Where:

Variable	Value
C _s (UCL or maximum detected concentration in soil) mg/Kg	Site-specific
ED _{r-a} (exposure duration - resident adult) yr	24
EF _r (exposure frequency - resident) day/yr	350
IRS _{r-a} (soil intake rate - resident adult) mg/day	100
IRS _{r-c} (soil intake rate - resident child) mg/day	200
IFS _{r-adj} (age-adjusted soil ingestion factor - resident) mg-yr/Kg-day	114
ED _{r-c} (exposure duration - resident child) yr	6
ED _r (exposure duration - resident) yr	30
LT _r (Life time-resident) yr	70

Table B-3.5

Scenario 3- General Residential Exposure

Pathway R5- Inhalation of Chemicals in Airborne Particulates Emitted from Soil

Carcinogens

$$Intake_{res-sol-inh.} \left(\frac{\mu g}{m^3} \right) = \frac{C_{s_{res-sol-inh}} \left(\frac{mg}{Kg} \right) * 1000 \left(\frac{\mu g}{mg} \right) * EF_r \left(350 \frac{day}{yr} \right) * \frac{1}{PEF \left(\frac{m^3}{kg} \right)} * ET_r \left(24 \frac{hr}{day} \right) * \left(\frac{1day}{24hr} \right) * ED_r (30 yr)}{LT_r (70yr) * \frac{365days}{year}}$$

Where:

Variable	Value
C _s (UCL or maximum detected concentration in soil) mg/Kg	Site-specific
EF _r (exposure frequency-resident) day/yr	350
ED _r (exposure duration-resident) yr	30
PEF (particulate emission factor) m ³ /kg	1.36E+09
ET _r (exposure time-resident) hr/day	24
LT _r (Life time-resident) yr	70

Table B-3.6

Scenario 3- General Residential Exposure

Pathway R6- Dermal Contact of Chemicals in Soil

Equation for age -integrated (adult/child) receptors – **Carcinogenic**

$$Intake_{res-sol-ing.} \left(\frac{mg}{Kg-day} \right) = \frac{C_s \left(\frac{mg}{Kg} \right) * DFS_{r-adj} \left(\frac{361mg-yr}{Kg-day} \right) * EF_r \left(350 \frac{day}{yr} \right) * \left(10^{-6} \frac{Kg}{mg} \right) * ABS_d / ABS_o}{LTr (70 years) * \left(\frac{365days}{year} \right)}$$

$$DFS_{r-adj} \left(361 \frac{mg-yr}{Kg-day} \right) = \frac{SA_{r-c} \left(\frac{2800cm^2}{day} \right) * ED_{r-c} (6 yr) * AF_c \left(\frac{0.2mg}{cm^2} \right)}{BW_c (15 Kg)} + \frac{SA_{r-a} \left(5700 \frac{cm^2}{day} \right) * ED_{r-a} (24yr) * AF_a \left(\frac{0.07mg}{cm^2} \right)}{BW_a (70 Kg)}$$

Table B-3.6 (Contd.)**Scenario 3- General Residential Exposure****Pathway R6- Dermal Contact with Chemicals in Soil- Continued**Equation for age -integrated (adult/child) receptors – **Carcinogens**

Variable	Value
C_s (UCL or maximum detected concentration in soil) mg/Kg	Site-specific
DFS_{r-adj} (age-adjusted soil inhalation factor-resident) mg-yr/Kg-day	361
EF_r (exposure frequency-resident) day/yr	350
ED_r (exposure duration-resident) yr	30
SA_{r-c} (Skin surface area- resident child) cm^2	2800
SA_{r-a} (skin surface area-resident adult) cm^2	5700
AF_{r-c} (Adherence factor-resident child) mg/cm^2	0.2
AF_{r-a} (Adherence factor-resident adult) mg/cm^2	0.07
ED_{r-a} (exposure duration-resident adult) yr	24
ED_{r-c} (exposure duration-resident child) yr	6
LT_r (Life time-resident) yr	70
BW_c (body weight-child) Kg	15
BW_a (body weight- adult)Kg	70
ABS_d (dermal absorption) unitless	Chemcial specific
ABS_o (oral or GI absorption) unitless	Chemical specific

Table B-3.7

Scenario 3- General Residential Exposure

Pathway R7- Ingestion of Chemical Contaminants in Tap Water-Metal-Cancer

Equation for age -integrated (adult/child) receptors

$$Intake_{water-ca-ing.} \left(\frac{mg}{Kg-day} \right) = \frac{C_w \left(\frac{\mu g}{L} \right) * EF_r \left(350 \frac{day}{yr} \right) * IFW_{r-adj} \left(1.086 \frac{L-yr}{Kg-day} \right)}{AT_r \left(365 \frac{day}{yr} \right) * LT_r(70years) * (1000 \frac{\mu g}{mg})}$$

$$IFW_{r-adj} \left(1.086 \frac{L-yr}{Kg-day} \right) = \frac{ED_{r-c} (6 yr) * IRW_{r-c} \left(1 \frac{L}{day} \right)}{BW_c(15 Kg)} + \frac{ED_{r-a}(24 yr) * IRW_{r-a} \left(2 \frac{L}{day} \right)}{BW_a(70 Kg)}$$

Where:

Variable	Value
C _w (contaminant concentration in water) µg/L	Site specific
ED _{r-a} (exposure duration - resident adult) yr	24
ED _{r-c} (exposure duration - resident child) yr	6
EF _r (exposure frequency - resident) day/yr	350
IRW _{r-a} (water intake rate - resident adult) L/day	2
IRW _{r-c} (water intake rate - resident child) L/day	1
IFW _{r-adj} (age-adjusted water ingestion factor - resident) L-yr/Kg-day	1.086
BW _a (Body weight-resident adult) Kg	70
BW _c (Body weight-resident child) Kg	15
LT _r (Life time-resident) yr	70

Table 3.8

Scenario 3- General Residential Exposure

Pathway R8- Dermal Contact of Chemical Contaminants in Tap Water-Inorganics-Cancer

Equation for age -integrated (adult/child) receptors

$$Intake_{water-Ca-der.} \left(\frac{mg}{Kg-day} \right) = \frac{C_w \left(\frac{\mu g}{L} \right) * K_p \left(\frac{cm}{hr} \right) * EF_r \left(350 \frac{day}{yr} \right) * DFW_{r-adj} \left(8811.4 \frac{cm^2-event-yr}{Kg-day} \right) * ET_{rw-adj} \left(0.664 \frac{hr}{event} \right)}{AT_r \left(365 \frac{day}{yr} \right) * LT_r(70years) * \left(1000 \frac{\mu g}{mg} \right) * \left(1000 \frac{cm^3}{L} \right) * GIABS}$$

$$DFW_{r-adj} \left(8811.4 \frac{cm^2-event-yr}{Kg-day} \right) = \frac{ED_{r-c} (6 yr) * EV_{r-c} \left(1 \frac{event}{day} \right) * SA_c(6,600 cm^2)}{BW_c(15 Kg)} + \frac{ED_{r-a}(24 yr) * EV_{r-a} \left(1 \frac{event}{day} \right) * SA_c(18,000 cm^2)}{BW_a(70 Kg)}$$

$$ET_{rw-adj} \left(0.664 \frac{hr}{event} \right) = \frac{ET_{rwc} \left(1 \frac{hr}{event} \right) * ED_c (6 years) + ET_{rwa} \left(0.58 \frac{hr}{event} \right) * ED_a (24 years)}{ED_r(30 years)}$$

Table B-3.8 (Contd.)**Scenario 3- General Residential Exposure****Pathway R8- Dermal Contact with Chemicals in Tap Water-Metals-Cancer- Continued**Equation for age -integrated (adult/child) receptors – **Carcinogens**

Variable	Value
C_w (contaminant concentration in water) $\mu\text{g/L}$	Site-specific
$DFW_{r\text{-adj}}$ (age-adjusted water dermal factor - resident) $\text{cm}^2\text{-event-yr/Kg-day}$	8811.4
EF_r (exposure frequency-resident) day/yr	350
ED_r (exposure duration-resident) yr	30
$SA_{r\text{-c}}$ (Skin surface area- resident child) cm^2	6,600
$SA_{r\text{-a}}$ (skin surface area-resident adult) cm^2	18,000
K_p (dermal permeability coefficient) cm/hr	Chemical specific
$ET_{rw\text{-adj}}$ (exposure time-age adjusted-resident water) hr/event	0.664
ET_{rwc} (exposure time-water resident child) hr	1
ET_{rwa} (exposure time-water resident adult) hr	0.58
$ED_{r\text{-a}}$ (exposure duration-resident adult) yr	24
$ED_{r\text{-c}}$ (exposure duration-resident child) yr	6
LT_r (Life time-resident) yr	70
BW_c (body weight-child) Kg	15
BW_a (body weight- adult)Kg	70
$GIABS_o$ (oral or GI absorption) unitless	Chemical specific

Table B-3.9

Scenario 3- General Residential Exposure

Pathway R9- Ingestion of Chemical Contaminants in Tap Water-Metal-NonCancer

Equation for age -integrated (adult/child) receptors

$$Intake_{water-nc-ing.} \left(\frac{mg}{Kg-day} \right) = \frac{C_w \left(\frac{\mu g}{L} \right) * EF_r \left(350 \frac{day}{yr} \right) * IFW_{r-adj} \left(1.086 \frac{L-yr}{Kg-day} \right)}{AT_r \left(365 \frac{day}{yr} \right) * ED_r (30 years) * (1000 \frac{\mu g}{mg})}$$

$$IFW_{r-adj} \left(1.086 \frac{L-yr}{Kg-day} \right) = \frac{ED_{r-c} (6 yr) * IRW_{r-c} \left(1 \frac{L}{day} \right)}{BW_c (15 Kg)} + \frac{ED_{r-a} (24 yr) * IRW_{r-a} \left(2 \frac{L}{day} \right)}{BW_a (70 Kg)}$$

Where:

Variable	Value
C _w (contaminant concentration in water) µg/L	Site specific
ED _r (exposure duration - resident) yr	30
ED _{r-a} (exposure duration - resident adult) yr	24
ED _{r-c} (exposure duration - resident child) yr	6
EF _r (exposure frequency - resident) day/yr	350
IRW _{r-a} (water intake rate - resident adult) L/day	2
IRW _{r-c} (water intake rate - resident child) L/day	1
IFW _{r-adj} (age-adjusted water ingestion factor - resident) L-yr/Kg-day	1.086
BW _a (Body weight-resident adult) Kg	70
BW _c (Body weight-resident child) Kg	15

Table B-3.10

Scenario 3- General Residential Exposure

Pathway 10- Dermal Contact of Chemical Contaminants in Tap Water-Inorganics-NonCancer

Equation for age -integrated (adult/child) receptors

$$Intake_{water-nc-der.} \left(\frac{mg}{Kg-day} \right) = \frac{C_w \left(\frac{\mu g}{L} \right) * K_p \left(\frac{cm}{hr} \right) * EF_r \left(350 \frac{day}{yr} \right) * DFW_{r-adj} \left(8811.4 \frac{cm^2-event-yr}{Kg-day} \right) * ET_{rw-adj} \left(0.664 \frac{hr}{event} \right)}{AT_r \left(365 \frac{day}{yr} \right) * ED_r(30years) * \left(1000 \frac{\mu g}{mg} \right) * \left(1000 \frac{cm^3}{L} \right) * GIABS}$$

$$DFW_{r-adj} \left(8811.4 \frac{cm^2-event-yr}{Kg-day} \right) = \frac{ED_{r-c} (6 yr) * EV_{r-c} \left(1 \frac{event}{day} \right) * SA_c(6,600 cm^2)}{BW_c(15 Kg)} + \frac{ED_{r-a}(24 yr) * EV_{r-a} \left(1 \frac{event}{day} \right) * SA_c(18,000 cm^2)}{BW_a(70 Kg)}$$

$$ET_{rw-adj} \left(0.664 \frac{hr}{event} \right) = \frac{ET_{rwc} \left(1 \frac{hr}{event} \right) * ED_c (6 years) + ET_{rwa} \left(0.58 \frac{hr}{event} \right) * ED_a (24 years)}{ED_r(30 years)}$$

Table B-3.10 (Contd.)

Scenario 3- General Residential Exposure

Pathway R10- Dermal Contact with Chemicals in Tap Water-Metals-NonCancer- Continued

Equation for age -integrated (adult/child) receptors – **Carcinogens**

Variable	Value
C_w (contaminant concentration in water) $\mu\text{g/L}$	Site-specific
$DFW_{r\text{-adj}}$ (age-adjusted water dermal factor - resident) $\text{cm}^2\text{-event-yr/Kg-day}$	8811.4
EF_r (exposure frequency-resident) day/yr	350
ED_r (exposure duration-resident) yr	30
$SA_{r\text{-c}}$ (Skin surface area- resident child) cm^2	6,600
$SA_{r\text{-a}}$ (skin surface area-resident adult) cm^2	18,000
K_p (dermal permeability coefficient) cm/hr	Chemical specific
$ET_{rw\text{-adj}}$ (exposure time-age adjusted-resident water) hr/event	0.664
ET_{rwc} (exposure time-water resident child) hr	1
ET_{rwa} (exposure time-water resident adult) hr	0.58
$ED_{r\text{-a}}$ (exposure duration-resident adult) yr	24
$ED_{r\text{-c}}$ (exposure duration-resident child) yr	6
BW_c (body weight-child) Kg	15
BW_a (body weight- adult)Kg	70
$GIABS_o$ (oral or GI absorption) unitless	Chemical specific