

**Appendix C: Summary of Carcinogenic Risk Levels and Daily Doses of Arsenic from  
Various Pathways**

## Appendix C. Carcinogenic CoCs

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**Summary of Carcinogenic Risk Levels and Daily Doses of Arsenic Resulting from Combined Exposure Through Various Pathways to a Given Residential Soil Arsenic Concentration:**

|               |                                                                                                             |                            |         |               |
|---------------|-------------------------------------------------------------------------------------------------------------|----------------------------|---------|---------------|
| <b>Param1</b> | CoC Concentration in Soil (mg As/kg soil) (A soil As Conc. of 80.0779 mg/kg produces a risk of 1.00000E-05) | <b>Conc<sub>Soil</sub></b> | 46.0000 | mg As/kg soil |
| <b>Param2</b> | Exposure Duration - Adult - Residential (yr)                                                                | <b>ED<sub>Ad.Res</sub></b> | 30      | yr            |

| Item #            | Result for Exposure Pathway                                                  | Term                            | Value            | Units |
|-------------------|------------------------------------------------------------------------------|---------------------------------|------------------|-------|
| <b>Risk - 3.1</b> | Carcinogenic Risk Level for Soil Ingestion                                   | <b>Soil<sub>RL</sub>Ing-C</b>   | 1.620E-06        | -     |
| <b>Risk - 7.1</b> | Carcinogenic Risk Level for AbgVeg Ingestion                                 | <b>AbgVeg<sub>RL</sub>Ing-C</b> | 2.418E-06        | -     |
| <b>Risk - 7.3</b> | Carcinogenic Risk Level for BgVeg Ingestion                                  | <b>BgVeg<sub>RL</sub>Ing-C</b>  | 6.914E-07        | -     |
| <b>Risk - 2.1</b> | Carcinogenic Risk Level for Soil Dermal Contact                              | <b>Soil<sub>RL</sub>Derm-C</b>  | 9.971E-07        | -     |
| <b>Risk - 1.1</b> | Carcinogenic Risk Level for Air/Dust Inhalation                              | <b>Air<sub>RL</sub>Inh-C</b>    | 1.755E-08        | -     |
| <b>Risk - Tot</b> | Total Risk from Soil & Vege Ingestion, Dust Inhalation, and Dermal Contact = |                                 | <b>5.744E-06</b> | -     |

| Item #          | Result for Exposure Pathway                                                 | Term                              | Value            | Units                  |
|-----------------|-----------------------------------------------------------------------------|-----------------------------------|------------------|------------------------|
| <b>DD - 3.1</b> | Daily Dose of As from Soil Ingestion                                        | <b>Soil<sub>Dose</sub>Ing-C</b>   | 1.080E-06        | mg As/kg BW/day        |
| <b>DD - 7.1</b> | Daily Dose of As from AbgVeg Ingestion                                      | <b>AbgVeg<sub>Dose</sub>Ing-C</b> | 1.612E-06        | mg As/kg BW/day        |
| <b>DD - 7.3</b> | Daily Dose of As from BgVeg Ingestion                                       | <b>BgVeg<sub>Dose</sub>Ing-C</b>  | 4.609E-07        | mg As/kg BW/day        |
| <b>DD - 2.1</b> | Daily Dose of As from Soil Dermal Contact                                   | <b>Soil<sub>Dose</sub>Derm-C</b>  | 6.647E-07        | mg As/kg BW/day        |
| <b>DD - 1.1</b> | Daily Dose of As from Air/Dust Inhalation                                   | <b>Air<sub>Dose</sub>Inh-C</b>    | 1.166E-09        | mg As/kg BW/day        |
| <b>DD - Tot</b> | Total Daily Dose of As from Soil & Vege Ing, Dust Inh, and Dermal Contact = |                                   | <b>3.819E-06</b> | <b>mg As/kg BW/day</b> |

**Risk - 3.1 Ingestion of Carcinogenic CoCs in Soil - Soil Risk Ing-C (mg/kg)**

| Item #            | Exposure Factor                                    | Term                                | Value            | Units                           |
|-------------------|----------------------------------------------------|-------------------------------------|------------------|---------------------------------|
| 1                 | CoC Concentration in Soil (mg As/kg soil)          | <b>Conc<sub>Soil</sub></b>          | 46.00            | mg As/kg soil                   |
| 2                 | Age-Adjusted Soil Ingestion Rate                   | <b>IR<sub>soil.AgeAdj.res</sub></b> | 100.0            | mg soil/day                     |
| 3                 | Conversion Factor (mg:kg)                          | <b>CF<sub>mg:kg</sub></b>           | 1.00E-06         | kg soil/mg soil                 |
| 4                 | Exposure Frequency - Adult - Residential (days/yr) | <b>EF<sub>Ad.Res</sub></b>          | 350              | days/yr                         |
| 5                 | Exposure Duration - Adult - Residential (yr)       | <b>ED<sub>Ad.Res</sub></b>          | 30.0             | yr                              |
| 6                 | Oral Slope Factor (mg/kg/day) <sup>-1</sup>        | <b>SFo</b>                          | 1.5              | (mg As/kg BW/day) <sup>-1</sup> |
| 7                 | Modifying Factor (for As) (unitless)               | <b>MF</b>                           | 0.1              | -                               |
| 8                 | Relative Bioavailability Factor (unitless)         | <b>RBAF</b>                         | 0.4              | -                               |
| 9                 | Averaging Time - Carcinogens                       | <b>ATC</b>                          | 70.0             | yr                              |
| 10                | Average Body Weight - Adult (kg BW)                | <b>Avg<sub>BW</sub>Ad</b>           | 70.0             | kg BW                           |
| 11                | Days per Year                                      | <b>DpY</b>                          | 365              | days/yr                         |
| <b>Risk - 3.1</b> | Carcinogenic Risk Level for Soil Ingestion         | <b>Soil<sub>RL</sub>Ing-C</b>       | <b>1.620E-06</b> | -                               |
| <b>DD - 3.1</b>   | Daily Dose of As from Soil Ingestion               | <b>Soil<sub>Dose</sub>Ing-C</b>     | <b>1.080E-06</b> | <b>mg As/kg BW/day</b>          |

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## Risk - 7.1 Ingestion of Carcinogenic CoCs in Above-Ground Vegetables - AbgVeg Risk Ing-C (mg/kg)

| Item #            | Exposure Factor                                                | Term                          | Value            | Units                           |
|-------------------|----------------------------------------------------------------|-------------------------------|------------------|---------------------------------|
| 1                 | CoC Concentration in Soil (mg As/kg soil)                      | ConC <sub>Soil</sub>          | 46.00            | mg As/kg soil                   |
| 2                 | Ingestion Rate for Above-Ground Vegetables (g AC/day)          | IR <sub>Abg.AgeAdj.Res</sub>  | 34.306           | g AC/day                        |
| 3                 | Exposure Frequency (days/yr)                                   | EF <sub>Ad.Res</sub>          | 350              | days/yr                         |
| 4                 | Exposure Duration - Adult - Residential (yr)                   | ED <sub>Ad.Res</sub>          | 30.0             | yr                              |
| 5                 | Conversion Factor (g As Consumed to g Dry Weight)              | CF <sub>AC:DW</sub>           | 17.4%            | g DW/g AC                       |
| 6                 | Partition coefficient for As in Abg vege vs soil (g soil/g DW) | PC <sub>Abg:Soil</sub>        | 0.01             | g soil/g DW                     |
| 7                 | Oral Slope Factor (mg/kg/day) <sup>-1</sup>                    | SF <sub>Or</sub>              | 1.5              | (mg As/kg BW/day) <sup>-1</sup> |
| 8                 | Modifying Factor (for As) (unitless)                           | MF <sub>As</sub>              | 0.1              | -                               |
| 9                 | Relative Bioavailability Factor                                | RBAF                          | 1                | -                               |
| 10                | Conversion Factor (g/kg)                                       | CF <sub>kg:g</sub>            | 1.000E+03        | g soil/kg soil                  |
| 11                | Lifetime Average body weight (males & females combined)        | Avg BW <sub>0-70</sub>        | 70.0             | kg BW                           |
| 12                | Days per Year                                                  | DpY                           | 365              | days/yr                         |
| 13                | Averaging Time - Carcinogens                                   | AT <sub>C,Ad.Res</sub>        | 70               | yr                              |
| <b>Risk - 7.1</b> | <b>Carcinogenic Risk Level for AbgVeg Ingestion</b>            | AbgVeg <sub>RL</sub> Ing-C    | <b>2.418E-06</b> | <b>-</b>                        |
| <b>DD - 7.1</b>   | <b>Daily Dose of As from AbgVeg Ingestion</b>                  | AbgVeg <sub>Dose</sub> Ing-NC | <b>1.612E-06</b> | <b>mg As/kg BW/day</b>          |

## Risk - 7.3 Ingestion of Carcinogenic CoCs in Below-Ground Vegetables - BgVeg RBEL Ing-C (mg/kg)

| Item #            | Exposure Factor                                               | Term                         | Value            | Units                           |
|-------------------|---------------------------------------------------------------|------------------------------|------------------|---------------------------------|
| 1                 | CoC Concentration in Soil (mg As/kg soil)                     | ConC <sub>Soil</sub>         | 46.00            | mg As/kg soil                   |
| 2                 | Ingestion Rate for Below-Ground Vegetables (g AC/day)         | IR <sub>Bg.AgeAdj.Res</sub>  | 9.610            | g AC/day                        |
| 3                 | Exposure Frequency (days/yr)                                  | EF <sub>Ad.Res</sub>         | 350              | days/yr                         |
| 4                 | Exposure Duration (yr)                                        | ED <sub>Ad.Res</sub>         | 30               | yr                              |
| 5                 | Conversion Factor (As Eaten to Dry Weight)                    | CF <sub>AE:DW</sub>          | 22.2%            | g DW/g AC                       |
| 6                 | Partition coefficient for As in Bg vege vs soil (g soil/g DW) | PC <sub>Bg:Soil</sub>        | 0.008            | g soil/g DW                     |
| 7                 | Oral Slope Factor (mg/kg/day) <sup>-1</sup>                   | SF <sub>Or</sub>             | 1.5              | (mg As/kg BW/day) <sup>-1</sup> |
| 8                 | Modifying Factor (for As) (unitless)                          | MF <sub>As</sub>             | 0.1              | -                               |
| 9                 | Relative Bioavailability Factor                               | RBAF                         | 1                | -                               |
| 10                | Conversion Factor (kg to g)                                   | CF <sub>kg:g</sub>           | 1.000E+03        | g soil/kg soil                  |
| 11                | Lifetime Average body weight (males & females combined)       | Avg BW <sub>0-70</sub>       | 70.00            | kg BW                           |
| 12                | Days per Year                                                 | DpY                          | 365              | days/yr                         |
| 13                | Averaging Time - Carcinogens                                  | AT <sub>C,Ad.Res</sub>       | 70               | yr                              |
| <b>Risk - 7.3</b> | <b>Carcinogenic Risk Level for BgVeg Ingestion</b>            | BgVeg <sub>RL</sub> Ing-C    | <b>6.914E-07</b> | <b>-</b>                        |
| <b>DD - 7.3</b>   | <b>Daily Dose of As from BgVeg Ingestion</b>                  | BgVeg <sub>Dose</sub> Ing-NC | <b>4.609E-07</b> | <b>mg As/kg BW/day</b>          |

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## Risk - 2.1 Dermal Contact with Carcinogenic CoCs in Soil - Soil RBEL Derm-C (mg/kg)

| Item #     | Exposure Factor                                 | Term                       | Value     | Units                           |
|------------|-------------------------------------------------|----------------------------|-----------|---------------------------------|
| 1          | CoC Concentration in Soil (mg As/kg soil)       | Conc <sub>Soil</sub>       | 46.00     | mg As/kg soil                   |
| 2          | Exposure Frequency - Residential                | EF <sub>Res</sub>          | 350       | days/yr                         |
| 3          | Dermal Slope Factor (mg/kg-day) <sup>-1</sup>   | SF <sub>D</sub>            | 1.5       | (mg As/kg BW/day) <sup>-1</sup> |
| 4          | Dermal Adjustment Factor (mg/kg/day)-yrs        | DF <sub>Adj</sub>          | 351.6     | (mg soil/kg BW/day)-yrs         |
| 5          | Dermal Absorption Fraction (unitless)           | ABS <sub>d</sub>           | 0.03      | -                               |
| 6          | Conversion Factor (mg to kg)                    | CF <sub>mg:kg</sub>        | 1.00E-06  | kg soil/mg soil                 |
| 7          | Modifying Factor for Arsenic (unitless)         | MF                         | 0.1       | -                               |
| 8          | Averaging Time - Carcinogens                    | AT <sub>c</sub>            | 70        | yr                              |
| 9          | Days per Year                                   | DpY                        | 365       | days/yr                         |
| Risk - 2.1 | Carcinogenic Risk Level for Soil Dermal Contact | Soil <sub>RL-Derm-C</sub>  | 9.971E-07 | -                               |
| DD - 2.1   | Daily Dose of As from Soil Dermal Contact       | Soil <sub>DoseDerm-C</sub> | 6.647E-07 | mg As/kg BW/day                 |

## RBEL - 2.1b Calculation of Dermal Adjustment Factor (mg/kg/day)-yrs - DF.Adj

| Item # | Parameter Description                                         | Term                | Value | Units                        |
|--------|---------------------------------------------------------------|---------------------|-------|------------------------------|
| 1      | Age-Specific Skin Surface Area 0-6 (cm <sup>2</sup> )         | SA <sub>0-6</sub>   | 2200  | cm <sup>2</sup>              |
| 2      | Age-Specific Adherence Factor 0-6 (mg/cm <sup>2</sup> /day)   | AF <sub>0-6</sub>   | 0.2   | mg soil/cm <sup>2</sup> /day |
| 3      | Age-Specific Exposure Duration 0-6 (yr)                       | ED <sub>0-6</sub>   | 6     | yr                           |
| 4      | Age-Specific Body Weight 0-6 (kg)                             | BW <sub>0-6</sub>   | 15    | kg BW                        |
| 5      | Age-Specific Skin Surface Area 6-18 (cm <sup>2</sup> )        | SA <sub>6-18</sub>  | 3500  | cm <sup>2</sup>              |
| 6      | Age-Specific Adherence Factor 6-18 (mg/cm <sup>2</sup> /day)  | AF <sub>6-18</sub>  | 0.1   | mg soil/cm <sup>2</sup> /day |
| 7      | Age-Specific Exposure Duration 6-18 (yr)                      | ED <sub>6-18</sub>  | 12    | yr                           |
| 8      | Age-Specific Body Weight 6-18 (kg)                            | BW <sub>6-18</sub>  | 45    | kg BW                        |
| 9      | Age-Specific Skin Surface Area 18-30 (cm <sup>2</sup> )       | SA <sub>18-30</sub> | 4800  | cm <sup>2</sup>              |
| 10     | Age-Specific Adherence Factor 18-30 (mg/cm <sup>2</sup> /day) | AF <sub>18-30</sub> | 0.1   | mg soil/cm <sup>2</sup> /day |
| 11     | Age-Specific Exposure Duration 18-30 (yr)                     | ED <sub>18-30</sub> | 12    | yr                           |
| 12     | Age-Specific Body Weight 18-30 (kg)                           | BW <sub>18-30</sub> | 70    | kg BW                        |
| 13     | Dermal Adjustment Factor (mg/kg/day)-yrs                      | DF <sub>Adj</sub>   | 351.6 | (mg soil/kg BW/day)-yrs      |

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Risk - 1.1 Inhalation of Carcinogenic CoCs in Air - Air RBEL Inh-C (mg/m<sup>3</sup>)

| Item #            | Exposure Factor                                                | Term                                      | Value            | Units                                 |
|-------------------|----------------------------------------------------------------|-------------------------------------------|------------------|---------------------------------------|
| 1                 | CoC Concentration in Soil (mg As/kg soil)                      | Conc <sub>Soil</sub>                      | 46.00            | mg As/kg soil                         |
| 2                 | Suspended Particulate Level (kg soil/m <sup>3</sup> )          | SPL                                       | 2.16E-10         | kg soil/m <sup>3</sup>                |
| 3                 | Conversion Factor (mg:μg)                                      | CF <sub>mg:μg</sub>                       | 1000             | μg As/mg As                           |
| 4                 | Exposure Frequency - Adult - Residential (days/yr)             | EF <sub>Res</sub>                         | 350              | days/yr                               |
| 5                 | Exposure Duration - Adult - Residential (yr)                   | ED <sub>Ad,Res</sub>                      | 30               | yr                                    |
| 6                 | Inhalation Unit Risk Factor (μg/m <sup>3</sup> ) <sup>-1</sup> | URF                                       | 0.0043           | (μg As/m <sup>3</sup> ) <sup>-1</sup> |
| 8                 | Days per Year                                                  | DpY                                       | 365              | days/yr                               |
| 9                 | Averaging Time - Carcinogens (yr)                              | AT <sub>c</sub>                           | 70               | yr                                    |
| <b>Risk - 1.1</b> | <b>Carcinogenic Risk Level for Air/Dust Inhalation</b>         | <b>Air<sup>RL</sup><sub>Inh-C</sub></b>   | <b>1.755E-08</b> | <b>-</b>                              |
| 10                | Respiratory Daily Volume - Adult (m <sup>3</sup> /day)         | RDV <sub>Ad</sub>                         | 20.0             | m <sup>3</sup> /day                   |
| 11                | Average Body Weight - Adult 0-70 (kg)                          | Avg <sub>BW</sub> <sub>Ch 0-6</sub>       | 70.0             | kg BW                                 |
| <b>DD - 1.1</b>   | <b>Daily Dose of As from Air/Dust Inhalation</b>               | <b>Air<sup>Dose</sup><sub>Inh-C</sub></b> | <b>1.166E-09</b> | <b>mg As/kg BW/day</b>                |

## Risk - 1.1b Calculation of Particulate Emission Factor (PEF) and Suspended Particulate Level (SPL) for Air RBEL

| Item # | Parameter Description                                                      | Term                 | Value            | Units                        |
|--------|----------------------------------------------------------------------------|----------------------|------------------|------------------------------|
| 1      | Width of Contaminated Area (m)                                             | LS                   | 45               | m                            |
| 2      | Wind Speed in Mixing Zone (m/sec)                                          | V                    | 2.25             | m/sec                        |
| 3      | Diffusion Height (m)                                                       | DH                   | 2                | m                            |
| 4      | Conversion Factor (hr to sec)                                              | CF <sub>Hr:Sec</sub> | 3600             | sec/hr                       |
| 5      | Conversion Factor (kg to g)                                                | CF <sub>kg:g</sub>   | 1000             | g soil/kg soil               |
| 6      | Area of Contamination (2023.5 m <sup>2</sup> = 0.5 acre) (m <sup>2</sup> ) | A                    | 2025             | m <sup>2</sup>               |
| 7      | Respirable Fraction (g/m <sup>2</sup> -hr)                                 | RF                   | 0.036            | g/m <sup>2</sup> -hr         |
| 8      | Fraction of Vegetative Cover (unitless)                                    | G                    | 0                | -                            |
| 9      | Mean Annual Wind Speed (m/sec)                                             | U <sub>m</sub>       | 4.5              | m/sec                        |
| 10     | Equivalent Threshold Value of Wind Speed at 10 m (m/sec)                   | U <sub>t</sub>       | 12.8             | m/sec                        |
| 11     | Function Dependent on U <sub>m</sub> /U <sub>t</sub> (unitless)            | F(x)                 | 0.0497           | -                            |
| 12     | <b>Particulate Emission Factor (m<sup>3</sup>/kg soil)</b>                 | <b>PEF</b>           | <b>4.631E+09</b> | <b>m<sup>3</sup>/kg soil</b> |
| 13     | <b>Suspended Particulate Level (kg soil/m<sup>3</sup>)</b>                 | <b>SPL</b>           | <b>2.160E-10</b> | <b>kg soil/m<sup>3</sup></b> |