**Overview of Revised Quantitative Risk Estimates in Response to CEAA (September 2016)**

The CEAA review panel identified several suggested revisions to the quantitative methods used in the November 2015 HHRA, which have been incorporated into revised quantitative risk calculations tabulated below. In addition, during performance of these revisions an error in the air inhalation and water ingestion rates for the toddler receptors was identified, and corrected. Details of the revisions made to the exposure and calculated threshold hazard quotients are presented below. These revisions were performed in sequence, and each subsequent revision includes the influence of the revisions before it. In addition to the following short overviews and the associated table of numerical risk estimates that follow below, reviewers should also see the Proponent's responses to CEAA's IRs related to HHRA.

1. **Correction of Modelled Inhalation Rate:** It was noted that the air inhalation rate and surface water ingestion rates for the toddler receptor were incorrectly entered into the model. The inhalation and surface water ingestion rates that were used to calculate the November 2015 toddler exposures were those for an adult receptor. This erroneously *overestimated* the exposure of Compounds of Potential Concern (COPCs) through these routes of exposure for toddlers. This is the driver behind the negative %change between the November 2015 and September 2016 Hazard Quotients (HQs) for inhalation and water ingestion pathways. The Proponent has confirmed that appropriate inhalation and surface water ingestion rates have been used in all scenarios.

2. **Ingestion rates of Labrador tea and berries (CEAA 40):** As suggested by the CEAA review panel, amortization of ingestion rates for berry consumption has been removed. Numerical modeling allows for a full serving of berries (43 wet weight grams per day for adults, and 1.7 x this amount for toddlers) based on the maximum consumption data obtained from the local community. This ingestion rate has been allowed to persist for 365 days per year.

3. **Revised Mercury Speciation and Toxicity Reference Value (TRV) (CEAA 41; CEAA 42):** The TRV for mercury has been set to the more stringent TDI for methylmercury. This TDI is specific to children under 12 years of age or women of child bearing age. Since these represent the most sensitive receptor groups potentially using the site, this TRV was adopted universally. The species of fish sampled were lake trout (n=5) and brook trout (n=5) which were obtained from Pinette Lake and Triangle Lake. In both case the fish were not aged, but were not considered adults. The elevated methyl mercury risk estimates are associated with the <u>baseline</u> exposure scenario and are not expected to change with the Project or Cumulative scenarios due to no expectation in changes in future water quality or Caribou tissue quality. In addition to the tabulated quantitative results below, see also the responses to CEAA 41 and CEAA 42.

4. **Negation of Toddler Consumption of Labrador Tea (CEAA 40; CEAA 48):** As queried by CEAA, toddler Labrador tea ingestion has been assumed to be zero. This has resulted in a 100% decrease of toddler exposure to COPCs as a result of this route of exposure. Inspection of the table below indicates the most notable effect is a reduction in related manganese intake which previously was considered marginally elevated via this pathway.

5. **Revised Berry Contaminant Level Allowing for Dust Deposition (CEAA 50):** The CEAA review panel questioned whether the impact of dust accumulation on berries was incorporated in the quantitative assessment. Accordingly, an additional exposure pathway has been included in the

revised numerical modeling to account for dust accumulation on unwashed berries. The Proponent's quantitative assessment assumed 1 months' worth of dry deposition onto the top half of a hanging berry, assuming a 1 cm berry diameter, 0.43 cups of berry ingested per day 365 days per year (i.e., assumed frozen stores are consumed daily year-round), and a maximum theoretical packing density of 74% (i.e. In a cup of berries, the minimum void space achievable would be 26%). Mass of accumulated dust was estimated for blast and non-blast conditions, and a weighted average was calculated assuming one day of blasting per week (1/7 = 0.14) and non-blasting conditions for the remaining 6 days per week (6/7 = 0.86). Conservative assumptions include:

a. Using the $90^{th}$ percentile dry deposition rate for the 40 critical receptor locations including the off-property maximum locations for all collected berries
b. 30d cumulative dust deposition to berries without effect of precipitation. 1971 – 2000 climate norms for Schefferville indicate 5 days of rain >=5mm per month during berry season.

6. **Tabulation of Revised HQs for Toddlers (Table 1 below):** The final predicted hazard quotients for toddlers reported in November 2015 and subsequent to the above revisions (September 2016) are presented in the table below along with calculated % change. There are some specific components of the table below that warrant some clarification/discussion:

a) HQs predicted as a result of particulate inhalation, surface water ingestion, and Labrador tea ingestion show a decrease compared to what was reported in Nov. 2015. This is due to corrections made as a result of revision 1, and eliminating toddler ingestion of Labrador tea. In the case of some COPCs where these pathways played an important controlling role on the total dose, the net effect is a reduced total predicted HQ.

b) HQs for total mercury show a 50% increase for all scenarios tested. This is a result of employing a more potent TRV (recommended by Health Canada) to account for a revised mercury speciation which is assumed as 100% methylmercury.

c) The greatest increases are seen in berry consumption HQs and total HQs where berry consumption is a controlling factor. These changes arise from two computational revisions (i) increased berry consumption (now assumes daily year round consumption with no amortization), and (ii) added contamination from 30d of dust deposition without berry washing. Some of the % increases appear at first glance to be high, however it is critical to consider the following:

i. Extremely large increases are seen for a limited number of COPCs, but these large % changes occur for COPCs where previously calculated HQs were extremely low (i.e., well below the *de minimis* level by an order of magnitude or more). The large % change (relative to November 2015) is a reflection of a small change in the 2016 revised risk estimate relative to a *very* small denominator (i.e., the 2015 risk estimate). In spite of some large relative changes, the resultant risk magnitude (significance) remains negligible, with the exception of iron. Under these conservative assumptions, the added iron from dust residue combined with the revised berry consumption rate result in a marginally elevated hazard quotient. Importantly however, an elevated iron HQ via berry consumption is observed for the revised <u>baseline</u> berry consumption scenario (based on measured berry chemistry and daily consumption) and this *exceeds* the forecasted values for the revised Project and Cumulative scenarios.

**ii.** Increases in berry HQs are driven by a combination of increased consumption rate as well as the addition of ingestion of dust deposited to berry surfaces. For the case of modelled dust on berries, the dust metal content was defined by the Howse ore-body geochemistry, as this was considered to be the dominant form of future dust. For certain metals, there is a larger relative abundance in the dust (e.g., iron). Thus the relative abundance of the metal in the dust, combined with the initial magnitude of the 2015 risk estimate combine to ultimately determine the relative percent increase in risk magnitude from 2015 to the 2016 revision reported below. For the cumulative scenario, the revised 2016 chromium HQ from berry consumptions is ~6800% larger than that for 2015. This reflects the combination of the extremely low value computed in 2015, combined with the relative increase associated with dust deposition. Importantly however, this remains at a de minis risk magnitude, and the associated total chromium HQ is actually 30% less than the 2015 estimate due to correction of a conservative error that overestimated exposure from drinking water and inhalation.

7. **Calculation of Composite Total Weighted Incremental Lifetime Cancer Risk (ILCR) Estimates (Tables 2 and 3) (CEAA 43):** The ILCR using the Composite Total Weighted ILCR method, as described in Section 6.3.2 of Health Canada's Part V: Guidance on Human Health Detailed Quantitative Risk Assessment for Chemicals (September 2010) was re-assessed. The Proponent previously assessed ILCR by allowing adult exposure characteristics to persist for 80 years of an 80 year lifetime. The composite weighted incremental cancer risk assesses cancer risks to individual age classes (some more sensitive than others) then provides a weighted total ILCR based on the fraction of an 80 year lifespan each age class represents.

   **Note:** Calculation of the composite receptor weighted ILCR occurred after all previous revisions and quantitative adjustments described above had been implemented. Determining the sensitivity of the analysis between the 80/80 adult as previously reported versus the composite receptor is difficult due to the influence of factors other than the ILCR calculation method (i.e., increased berry ingestion, inclusion of dust deposition onto berries)

   Results of the composite total weighted incremental cancer risk estimates for oral non-threshold contaminants, along with the previously reported values, are presented in Table 2. Results for inhalation non-threshold contaminants are presented in Table 3.

   a. The only non-threshold contaminant included in the list of COPCs for which an oral slope factor exists is arsenic.
      i. Calculated weighted ILCRs range from 6.19E-04 under baseline conditions, to a maximum of 6.33E-04 under the cumulative exposure scenario.
      ii. Calculated weighted ILCRs for oral arsenic exposure increased relative to the November 2015 80/80 adult by 29%, 34% and 36% for the baseline, project and cumulative scenarios respectively.

iii. All ILCRs continue to exceed Health Canada's de minimis level of 1E-05, but continue to be classified as potentially elevated (i.e., > 1E-04) following the Proponent's classifications for interpretative insight with unique appreciation for conservatism inherently applied through various risk assessment assumptions, some of which are elaborated on below:

1. The two greatest sources of arsenic exposure are the ingestion of fish and caribou.
    a. All fish tissue was assumed to be equal to the maximum measured concentration in fish tissue samples from either Triangle Lake or Pinette Lake. These are two very small lakes (Pinette is a headwater lake) in close proximity to the Howse deposit. Based on fishing efforts carried out in preparation of the baseline risk assessment these lakes do not support fish populations of sufficient size or abundance for fish tissue ingestion at the rate modelled. Fish tissues collected from larger downstream lakes would be expected to have lower concentrations of COPCs.
    b. Caribou tissues were modelled based on literature derived COPC concentrations from various herds in Canada. Site specific or region specific caribou tissue content of arsenic is unknown. Additionally, anecdotal information suggests that caribou have not occurred in the area for a very long time.
    c. Oral intake of arsenic through dietary ingestion of country foods was assumed to be 100% bioavailable. This is considered to be highly conservative. Bioaccessibility of arsenic from country foods has been determined at other locations in Canada. Mean bioaccessibility of arsenic was lowest in berries (12%) and Labrador tea (45%), and higher in mushrooms and hare meat (22-76%)[1]. The assumption of 100% bioaccessibility is considered conservative and introduces additional uncertainty into the toxicological impact of dietary ingestion.
    d. 100% of the arsenic present in tissues was assumed to be the toxic inorganic form. Arsenic speciation of country foods conducted by others has identified substantial portions of less toxic organoarsenic species in animal tissues, including non-toxic arsenobetaine [1]. Additionally, inorganic arsenic in five fish species collected from Great Slave Lake (NWT) has been determined to constitute only ~7.5% of the total arsenic concentration[2]. The assumption of 100% inorganic arsenic in animal tissue is considered highly conservative and introduces considerable uncertainty into the toxicological impact of dietary ingestion.

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[1]Koch I1, Dee J, House K, Sui J, Zhang J, McKnight-Whitford A, Reimer KJ. 2013. Bioaccessibility and speciation of arsenic in country foods from contaminated sites in Canada. Sci Total Environ. 2013 Apr 1;449:1-8.

[2] S. de Rosemond , Xie Q and Liber K. 2008. Arsenic concentration and speciation in five freshwater fish species from Back Bay near Yellowknife, NT, CANADA.
Environ Monit Assess. 2008 Dec;147(1-3):199-210.

b. Revised total composite weighted ILCR risks due to inhalation exposures were calculated to increase by 16% in all scenarios, owing to the difference in calculation methods between what was reported in Nov 2015 and today. All ILCRs presented in Table 3 are below the *de minimis* level of 1E-05.

# Table 1. Revised (September 2016) HQs for Toddlers

**Baseline Assessment**

| PCOC | Soil Ingestion | | | Particulate Inhalation | | | Soil Dermal Contact | | | Surface Water Ingestion | | | Berry Consumption | | | Labrador Tea Consumption | | | Game Bird Consumption | | | Small Mammal Consumption | | | Large Mammal Consumption | | | Fish Consumption | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change |
| Arsenic | 1.74E-01 | 1.74E-01 | 0% | 0.00 | 0.00 | -50% | 0.00 | 0.00 | 0% | 0.15 | 0.06 | -60% | **0.26** | **0.80** | 203% | 0.08 | 0.00 | -100% | 0.05 | 0.05 | 0% | 0.00 | 0.00 | 0% | **1.18** | **1.18** | 0% | **0.43** | **0.43** | 0% | **2.33** | **2.70** | 16% |
| Barium | 8.36E-05 | 8.36E-05 | 0% | 0.00 | 0.00 | -50% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | -60% | 0.02 | 0.07 | 203% | 0.02 | 0.00 | -100% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | | 0.00 | 0.00 | 0% | 0.05 | 0.08 | 42% |
| Berylium | 6.28E-07 | 6.28E-07 | 0% | 0.00 | 0.00 | -50% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | -60% | 0.00 | 0.00 | 203% | 0.00 | 0.00 | -100% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | | 0.00 | 0.00 | 0% | 0.00 | 0.00 | -11% |
| Chromium | 1.26E-05 | 1.26E-05 | 0% | 0.00 | 0.00 | -50% | 0.00 | 0.00 | 0% | **0.23** | 0.09 | -60% | 0.00 | 0.00 | 203% | 0.00 | 0.00 | -100% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | | 0.04 | 0.04 | 0% | **0.26** | 0.13 | -51% |
| Iron | **3.40E-01** | **3.40E-01** | 0% | 0.00 | 0.00 | -50% | 0.03 | 0.03 | 0% | 0.14 | 0.06 | -60% | 0.16 | **0.49** | 203% | **0.27** | 0.00 | -100% | 0.10 | 0.10 | 0% | 0.01 | 0.01 | 0% | **0.23** | **0.23** | 0% | 0.04 | 0.04 | 0% | **1.32** | **1.30** | -1% |
| Lead | 8.37E-02 | 8.37E-02 | 0% | 0.00 | 0.00 | -50% | 0.07 | 0.07 | 0% | 0.02 | 0.01 | -60% | 0.05 | 0.16 | 203% | 0.05 | 0.00 | -100% | **0.40** | **0.40** | 0% | 0.03 | 0.03 | 0% | **0.82** | **0.82** | 0% | 0.04 | 0.04 | 0% | **1.57** | **1.62** | 3% |
| Manganese | 1.68E-03 | 1.68E-03 | 0% | 0.00 | 0.00 | -50% | 0.04 | 0.04 | 0% | 0.07 | 0.03 | -60% | **0.56** | **1.71** | 203% | **0.68** | 0.00 | -100% | 0.01 | 0.01 | 0% | 0.01 | 0.01 | 0% | 0.00 | 0.00 | | 0.01 | 0.01 | 0% | **1.37** | **1.79** | 30% |
| Mercury | 1.29E-03 | 1.94E-03 | 50% | 0.00 | 0.00 | -25% | 0.00 | 0.00 | 50% | 0.02 | 0.01 | -40% | 0.02 | 0.07 | 355% | 0.01 | 0.00 | -100% | 0.01 | 0.02 | 50% | 0.00 | 0.00 | 50% | **0.53** | **0.80** | 50% | **3.82** | **5.73** | 50% | **4.41** | **6.62** | 50% |
| Molybdenum | 4.72E-07 | 4.72E-07 | 0% | 0.00 | 0.00 | -50% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | -60% | 0.00 | 0.00 | 203% | 0.00 | 0.00 | -100% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 90% |
| Selenium | 6.26E-07 | 6.26E-07 | 0% | 0.00 | 0.00 | -50% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | -60% | 0.00 | 0.00 | 203% | 0.00 | 0.00 | -100% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | -1% |

**Project Assessment**

| PCOC | Soil Ingestion | | | Particulate Inhalation | | | Soil Dermal Contact | | | Surface Water Ingestion | | | Berry Consumption | | | Labrador Tea Consumption | | | Game Bird Consumption | | | Small Mammal Consumption | | | Large Mammal Consumption | | | Fish Consumption | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change |
| Arsenic | 1.74E-01 | 1.74E-01 | 0% | 4.22E-04 | 2.11E-04 | -50% | 0.00 | 0.00 | 0% | 0.15 | 0.06 | -60% | **2.64E-01** | **8.09E-01** | 207% | 0.08 | 0.00 | -100% | 0.05 | 0.05 | 0% | 0.00 | 0.00 | 0% | **1.18** | **1.18** | 0% | **0.43** | **0.43** | 0% | **2.34** | **2.71** | 16% |
| Barium | 8.38E-05 | 8.38E-05 | 0% | 2.38E-06 | 1.19E-06 | -50% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | -60% | 1.52E-04 | 6.17E-04 | 306% | 0.00 | 0.00 | -100% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | | 0.00 | 0.00 | 0% | 0.01 | 0.00 | -43% |
| Berylium | 6.29E-07 | 6.29E-07 | 0% | 3.38E-07 | 1.69E-07 | -50% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | -60% | 5.69E-06 | 2.53E-05 | 345% | 0.00 | 0.00 | -100% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | | 0.00 | 0.00 | 0% | 0.00 | 0.00 | -11% |
| Chromium | 1.46E-05 | 1.46E-05 | 0% | 1.34E-04 | 6.68E-05 | -50% | 0.00 | 0.00 | 0% | **0.23** | 0.09 | -60% | 4.67E-04 | 1.01E-02 | 2067% | 0.00 | 0.00 | -100% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | | 0.04 | 0.04 | 0% | **0.27** | 0.14 | -48% |
| Iron | **3.41E-01** | **3.41E-01** | 0% | 1.69E-02 | 9.33E-04 | -94% | 0.03 | 0.03 | 0% | 0.14 | 0.06 | -60% | 5.03E-02 | **2.01E-01** | 300% | 0.01 | 0.00 | -100% | 0.10 | 0.10 | 0% | 0.01 | 0.01 | 0% | **0.23** | **0.23** | 0% | 0.04 | 0.04 | 0% | **0.96** | **1.00** | 5% |
| Lead | 8.38E-02 | 8.38E-02 | 0% | 1.67E-04 | 8.37E-05 | -50% | 0.07 | 0.07 | 0% | 0.02 | 0.01 | -60% | 5.30E-02 | 1.65E-01 | 212% | 0.05 | 0.00 | -100% | 0.02 | 0.02 | 0% | 0.03 | 0.03 | 0% | **0.82** | **0.82** | 0% | 0.04 | 0.04 | 0% | **1.19** | **1.24** | 4% |
| Manganese | 1.68E-03 | 1.68E-03 | 0% | 4.85E-05 | 2.43E-05 | -50% | 0.04 | 0.04 | 0% | 0.07 | 0.03 | -60% | 4.07E-02 | 1.24E-01 | 205% | **0.21** | 0.00 | -100% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | | 0.01 | 0.01 | 0% | **0.36** | 0.20 | -45% |
| Mercury | 1.29E-03 | 1.94E-03 | 50% | 3.08E-04 | 2.31E-04 | -25% | 0.00 | 0.00 | 50% | 0.02 | 0.01 | -40% | 1.55E-02 | 7.05E-02 | 355% | 0.01 | 0.00 | -100% | 0.00 | 0.00 | 50% | 0.00 | 0.00 | 50% | **0.53** | **0.80** | 50% | **3.82** | **5.73** | 50% | **4.40** | **6.61** | 50% |
| Molybdenum | 4.72E-07 | 4.72E-07 | 0% | 6.78E-10 | 3.39E-10 | -50% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | -60% | 9.95E-06 | 3.02E-05 | 203% | 0.00 | 0.00 | -100% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 93% |
| Selenium | 6.26E-07 | 6.26E-07 | 0% | 6.26E-10 | 3.13E-10 | -50% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | -60% | 5.01E-07 | 1.52E-06 | 205% | 0.00 | 0.00 | -100% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | -1% |

**Cumulative Assessment**

| PCOC | Soil Ingestion | | | Particulate Inhalation | | | Soil Dermal Contact | | | Surface Water Ingestion | | | Berry Consumption | | | Labrador Tea Consumption | | | Game Bird Consumption | | | Small Mammal Consumption | | | Large Mammal Consumption | | | Fish Consumption | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change | Nov-15 | Sep-16 | % Change |
| Arsenic | 1.74E-01 | 1.74E-01 | 0% | 0.00 | 0.00 | -50% | 0.00 | 0.00 | 0% | 0.15 | 0.06 | -60% | **2.7E-01** | **8.7E-01** | 226% | 0.08 | 0.00 | -100% | 0.06 | 0.06 | 0% | 0.00 | 0.00 | 0% | **1.18** | **1.18** | 0% | **0.43** | **0.43** | 0% | **2.34** | **2.77** | 19% |
| Barium | 8.42E-05 | 8.42E-05 | 0% | 0.00 | 0.00 | -50% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | -60% | 1.5E-04 | 1.4E-03 | 834% | 0.00 | 0.00 | -100% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | | 0.00 | 0.00 | 0% | 0.01 | 0.00 | -30% |
| Berylium | 6.31E-07 | 6.31E-07 | 0% | 0.00 | 0.00 | -50% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | -60% | 5.8E-06 | 6.8E-05 | 1074% | 0.00 | 0.00 | -100% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | | 0.00 | 0.00 | 0% | 0.00 | 0.00 | -9% |
| Chromium | 1.91E-05 | 1.91E-05 | 0% | 0.00 | 0.00 | -50% | 0.00 | 0.00 | 0% | **0.23** | 0.09 | -60% | 8.2E-04 | 5.7E-02 | 6790% | 0.00 | 0.00 | -100% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | | 0.04 | 0.04 | 0% | **0.27** | 0.19 | -30% |
| Iron | **3.43E-01** | **3.43E-01** | 0% | 0.05 | 0.00 | -95% | 0.03 | 0.03 | 0% | 0.14 | 0.06 | -60% | 5.1E-02 | **4.6E-01** | 795% | 0.01 | 0.00 | -100% | 0.10 | 0.10 | 0% | 0.01 | 0.01 | 0% | **0.23** | **0.23** | 0% | 0.04 | 0.04 | 0% | **1.00** | **1.26** | 27% |
| Lead | 8.39E-02 | 8.39E-02 | 0% | 0.00 | 0.00 | -50% | 0.07 | 0.07 | 0% | 0.02 | 0.01 | -60% | 5.3E-02 | 1.9E-01 | 256% | 0.05 | 0.00 | -100% | 0.02 | 0.02 | 0% | 0.03 | 0.03 | 0% | **0.82** | **0.82** | 0% | 0.04 | 0.04 | 0% | **1.19** | **1.27** | 7% |
| Manganese | 1.68E-03 | 1.68E-03 | 0% | 0.00 | 0.00 | -50% | 0.04 | 0.04 | 0% | 0.07 | 0.03 | -60% | 4.1E-02 | 1.3E-01 | 215% | **0.21** | 0.00 | -100% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | | 0.01 | 0.01 | 0% | **0.36** | **0.20** | -44% |
| Mercury | 1.29E-03 | 1.94E-03 | 50% | 0.00 | 0.00 | -25% | 0.00 | 0.00 | 50% | 0.02 | 0.01 | -40% | 1.6E-02 | 7.1E-02 | 355% | 0.01 | 0.00 | -100% | 0.00 | 0.00 | 50% | 0.00 | 0.00 | 50% | **0.53** | **0.80** | 50% | **3.82** | **5.73** | 50% | **4.40** | **6.61** | 50% |
| Molybdenum | 4.73E-07 | 4.73E-07 | 0% | 0.00 | 0.00 | -50% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | -60% | 1.0E-05 | 3.0E-05 | 204% | 0.00 | 0.00 | -100% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 94% |
| Selenium | 6.26E-07 | 6.26E-07 | 0% | 0.00 | 0.00 | -50% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | -60% | 5.0E-07 | 1.6E-06 | 213% | 0.00 | 0.00 | -100% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | 0% | 0.00 | 0.00 | -1% |

**Table 2. Revised (September 2016) Total Composite Weighted ILCR Estimates for Oral Exposure**

| Exposure Scenario | Previously Calculated ILCR (Nov. 2015) | ARSENIC Oral Cancer Slope Factor (mg/kg bw/day)-1 | Revised Total Oral Dose (mg/kg bw/day) | | | | Weighted Cancer Risk Estimate | | | | REVISED TOTAL ORAL ILCR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Toddler | Child | Teen | Adult | Toddler | Child | Teen | Adult | |
| | | | Fraction of 80 yr. lifetime | | | | Fraction of 80 yr. lifetime | | | | |
| | | | 0.06 | 0.09 | 0.1 | 0.75 | 0.06 | 0.09 | 0.1 | 0.75 | |
| Baseline | 4.81E-04 | 1.8 | 8.07E-04 | 3.89E-04 | 4.33E-04 | 0.000289 | 8.72E-05 | 6.31E-05 | 7.79E-05 | 3.91E-04 | **6.19E-04** |
| Project | 4.65E-04 | 1.8 | 8.13E-04 | 3.92E-04 | 4.36E-04 | 0.000291 | 8.78E-05 | 6.35E-05 | 7.85E-05 | 3.93E-04 | **6.23E-04** |
| Cummulative | 4.66E-04 | 1.8 | 8.31E-04 | 4.01E-04 | 4.46E-04 | 0.000295 | 8.97E-05 | 6.50E-05 | 8.03E-05 | 3.99E-04 | **6.33E-04** |

**Table 3. Revised (September 2016) Total Composite Weighted ILCR Estimates for Inhalation Exposure**

| COPCs/Exposure Scenario | Previously Calculated ILCR (Nov. 2015) | Inhalation Cancer Slope Factor (mg/kg bw/day)-1 | Revised Total Inhalation Dose (mg/kg bw/day) | | | | Weighted Cancer Risk Estimate | | | | REVISED TOTAL INHALATION ILCR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Toddler | Child | Teen | Adult | Toddler | Child | Teen | Adult | |
| | | | Fraction of 80 yr. lifetime | | | | Fraction of 80 yr. lifetime | | | | |
| | | | 0.06 | 0.09 | 0.1 | 0.75 | 0.06 | 0.09 | 0.1 | 0.75 | |
| **Baseline** | | | | | | | | | | | |
| Arsenic | 2.72E-07 | 27 | 2.16E-08 | 1.89E-08 | 1.12E-08 | 1.00868E-08 | 3.50E-08 | 4.60E-08 | 3.03E-08 | 2.04E-07 | **3.16E-07** |
| Berylium | 2.54E-09 | 7.3 | 7.44E-10 | 6.52E-10 | 3.87E-10 | 3.47496E-10 | 3.26E-10 | 4.29E-10 | 2.82E-10 | 1.90E-09 | **2.94E-09** |
| Chromium | 8.64E-09 | 46 | 4.02E-10 | 3.53E-10 | 2.09E-10 | 1.87836E-10 | 1.11E-09 | 1.46E-09 | 9.62E-10 | 6.48E-09 | **1.00E-08** |
| **Project** | | | | | | | | | | | |
| Arsenic | 7.98E-07 | 27 | 6.33E-08 | 5.55E-08 | 3.29E-08 | 2.95519E-08 | 1.03E-07 | 1.35E-07 | 8.88E-08 | 5.98E-07 | **9.25E-07** |
| Berylium | 1.15E-08 | 7.3 | 3.38E-09 | 2.96E-09 | 1.75E-09 | 1.57587E-09 | 1.48E-09 | 1.94E-09 | 1.28E-09 | 8.63E-09 | **1.33E-08** |
| Chromium | 1.43E-06 | 46 | 6.68E-08 | 5.85E-08 | 3.47E-08 | 3.11775E-08 | 1.84E-07 | 2.42E-07 | 1.60E-07 | 1.08E-06 | **1.66E-06** |
| **Cummulative** | | | | | | | | | | | |
| Arsenic | 2.09E-06 | 27 | 1.66E-07 | 1.45E-07 | 8.61E-08 | 7.73707E-08 | 2.69E-07 | 3.53E-07 | 2.32E-07 | 1.57E-06 | **2.42E-06** |
| Berylium | 3.22E-08 | 7.3 | 9.44E-09 | 8.27E-09 | 4.90E-09 | 4.40511E-09 | 4.13E-09 | 5.43E-09 | 3.58E-09 | 2.41E-08 | **3.73E-08** |
| Chromium | 4.46E-06 | 46 | 2.08E-07 | 1.82E-07 | 1.08E-07 | 9.69613E-08 | 5.73E-07 | 7.53E-07 | 4.96E-07 | 3.35E-06 | **5.17E-06** |