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July 9, 2015 Project 615850

Fraser Surrey Docks Limited Partnership
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ATTENTION: Jurgen Franke, Director of Engineering and Terminal Development

REFERENCE: **Addendum Report to the Human Health Risk Assessment**
Fraser Surrey Docks Direct Transfer Coal Facility

1. INTRODUCTION

In 2014, Fraser Surrey Docks LP (FSD) retained the Environment & Water business unit of SNC-Lavalin Inc. (SNC-Lavalin) to conduct a human health risk assessment (HHRA) of the Direct Transfer Coal Facility (DTCF/the Project) proposed for the existing FSD terminal site located on the Fraser River in Surrey, British Columbia (BC). Following the completion of the HHRA and other associated assessments, including an Environmental Impact Assessment (SNC-Lavalin, 2013), Port Metro Vancouver (PMV) issued a Project Permit (PP#2012-072) to FSD to allow for the construction and operation of the DTCF on the existing terminal site to facilitate the transhipment of coal. SNC-Lavalin understands that FSD is considering applying for an amendment to their existing PMV Project Permit to allow for the replacement of the barge loader with a ship loader to accommodate Panamax size vessels[1] (the Project Amendment). The 2014 HHRA has therefore been revisited to consider the Project Amendment.

Similar to the 2014 HHRA, the revised HHRA is based largely on the results of an Air Quality Assessment (AQA) conducted by Levelton Consultants Ltd. (Levelton, 2015). As part of the AQA, Levelton, in consultation with PMV, developed a detailed air dispersion model to predict potential emissions from the Project. The AQA considered proposed emission sources related to the Project operations, including the Project Amendment, in addition to the current emission sources from FSD's existing agricultural operations. The scope of the 2014 HHRA has not been altered, other than to re-estimate exposures and associated risks using the results of the Levelton (2015) revised AQA.

This addendum report summarizes updates made to the 2014 HHRA in reflection of the changes outlined for the Project Amendment.

[1] Panamax vessels range from 50,000 to 80,000 dead weight tonnes (DWT).

2. OVERVIEW OF REVISIONS TO THE HUMAN HEALTH RISK ASSESSMENT

SNC-Lavalin reviewed the 2014 HHRA (SNC-Lavalin, 2014) and, based on our understanding of the Project Amendment, identified sections of the report that required reassessment. The following table summarizes the sections in the HHRA which required revision based on the Project Amendment and provides a general overview of revisions made to each of the overarching sections of the report. The following sections of this addendum report detail the revisions by Section.

Table 2-1: General Overview of Revisions to the 2014 Human Health Risk Assessment

HHRA Section	Action Required	Rationale
1. Introduction		
Scope	Minor editing	Revisions to reflect proposed Project Amendment.
Assessment Scenarios	None	This section remains accurate.
2. HHRA Approach	None	This section remains accurate.
3. Problem Formulation		
Project Location and Description	Minor editing	Revisions to reflect proposed Project Amendment.
Data Evaluated in the HHRA	Minor editing	Revisions to this section to reflect the updated Levelton AQA results.
Chemical of potential concern (COPC) Screening	None	The COPC Screening was reviewed and it was determine no revisions were required. This section remains accurate.
Human Receptors of Concern	None	Human receptors of concern and exposure pathways identified in this section are accurately described and remain applicable. No further assessment was required.
Conceptual Site Model	None	Human receptors of concern and corresponding exposure pathways are accurately described and remain applicable. No further assessment was required.

HHRA Section	Action Required	Rationale
4. Exposure Assessment		
Exposure Point Concentrations	Further Analysis	Updated AQA results interpreted to determine Project scenario exposure point concentrations (EPCs) for COPCs associated with the increased height of the ship loader and combustion emissions from ships versus barges. Project scenario EPCs for both the maximum North Delta residential receptor and the industrial receptor were updated. Baseline scenario EPCs remain accurate and, thus, baseline conditions did not require further assessment. Additionally, the EPCs for the maximum rail corridor receptor remain accurate, and thus no further assessment was required for this receptor.
Estimation of Exposures to Potential Receptors of Concern	Further Analysis	Exposures to the maximum North Delta residential receptor and the industrial receptor were re-estimated based on the updated EPCs. Methods and equations described in this section remain accurate.
5. Toxicity Assessment	Further Analysis	The toxicity reference values (TRVs) identified in this section were determined to be appropriate for use with one exception.
6. Risk Characterization		
COPCs with Additive Effects	Further Analysis	Descriptions of COPCs with potential additive effects are accurately described and remain applicable. Further consideration of approach is presented in this addendum.
Results of the HHRA	Further Analysis	Risk estimates were re-calculated based on updated EPCs for the maximum North Delta residential receptor and the industrial receptor, reflecting changes to the Project. Risk estimates for the maximum rail corridor residential receptor remain accurate.
7. Uncertainty and Sensitivity Analysis	None	Uncertainty and sensitivity analysis section remains accurate. Although select values in the Sensitivity Analysis have changed, the conclusions remain the same, and therefore it has not been re-visited.
8. Summary and Conclusions of the HHRA	Minor editing	This section was revisited; however, the results of the conclusions of the 2014 HHRA have not changed.

3. REVISIONS TO THE HUMAN HEATH RISK ASSESSMENT BY REPORT SECTION

Each section of the original 2014 HHRA was reviewed, with any revisions pertaining to the Project Amendment identified. Only those sections that are materially changed are identified in this addendum, and minor changes to the wording that does not affect the results or conclusions of the report, such as replacing “barge” with “ship” in sections of the report following the Project description, or updates to reference dates (e.g., Levelton, 2014 to Levelton, 2015) will not be presented in this addendum letter. Sections of the 2014 HHRA that are not included in this

addendum letter have not changed materially, and the information presented in such sections in the 2014 HHRA remains accurate in light of the Project Amendment. Revisions to the select sections of the Problem Formulation, including the revised Project description, Exposure Assessment, Toxicity Assessment and Risk Characterization sections of the HHRA are described below.

3.1. Introduction

Introductory text was updated to reflect the proposed Project Amendment, as outlined above in Section 1.0. These minor edits were carried through the discussion of Project scope, as presented below.

3.1.1. Scope

The scope of the 2014 HHRA was defined by SNC-Lavalin, in consultation with PMV. As indicated, based on the Project Amendment, the results of the HHRA have been revisited; the scope of the 2014 HHRA has not been altered, other than to re-estimate exposures and associated risks using the results of the Levelton (2015) revised AQA, which was conducted based on the Project Amendment, and has estimated emissions from the Project assuming that the coal handled as part of the Project will be loaded to, and transported by, ship versus barge.

The scope of the Project, including the Project Amendment, under the jurisdiction of the PMV includes the development of the coal handling facility at FSD, including new rail within the Port Authority Rail Yard (PARY), the direct transfer of coal from rail onto ships at FSD, and the transport of coal from the Project site to the mouth of the Fraser River. The physical works and activities undertaken during or preceding the loading of coal onto rail cars, the rail transport of coal from the mine site to PARY/FSD and transport beyond the mouth of the Fraser River are outside of the jurisdiction of PMV. Additionally, neither the mining of the coal nor the ultimate use of the coal, are within the scope of PMV or of this assessment.

The HHRA focused specifically on the potential health risks associated with emissions from the Project within the Study Area (as defined in the 2014 HHRA) and associated with the sources and activities under the jurisdiction of PMV; however, to determine whether exposures to emissions generated during rail transport of the coal within the BC lower mainland could be associated with potential health risks, at the request of FSD, the rail transport of coal from the Canada/US Border to FSD was also included in the 2014 HHRA (SNC-Lavalin, 2014). The Project Amendment did not impact the estimated emissions from the rail transport of coal, and thus, exposures and risks to receptors with the potential to be exposed to such emissions (i.e., the maximum rail corridor residential receptor) were not revisited in this addendum.

3.2. Problem Formulation

The text introducing the main elements of the Problem Formulation remains unchanged from the original 2014 HHRA. The sub-sections of the Problem Formulation that required revision based on the Project Amendment are presented below.

3.2.1. Project Location and Description

The Project location and description presented in the 2014 HHRA remains unchanged for the most part; however, as indicated, the coal handled at the facility will be loaded to ship versus barge.

The main proposed change to the Project description is an increase to the current size and height of the loader which will allow for direct loading to ocean going vessels (OGV) of Panamax class size. To accommodate this change, a number of engineering and/or design modifications were made. These include the following:

- The ship loader will now be designed with a 27.4 m outreach and a height of 36.2 m. The original loader was designed with a 14.3 m outreach (length of boom) and a maximum height of 15.0 m.
- The receiving pit and rail receiving building will be shifted 12 m east and 16 m south from original design. The pit dimensions will remain the same.
- The waste water settling basins will be shifted 37 m west and rotated 90 degrees counter clockwise. Both basins are now located under the Out Feed Conveyor.
- The modifications reduced the overall water catchment area (or Facility footprint) to 3,680 m^2 from the original footprint of 5,340 m^2.
- Shed 4 will be removed, instead of relocating the front gate.

The scope of the proposed Project Amendment in terms of logistical details to the Project Permit is as follows:

- Load OGV of Panamax vessel size within the PMV Navigational Channel guidelines to fulfill the permitted volume of 4.0 million tonnes per year; and,
- Any vessels loaded with coal will be managed with the same Operational and Emergency Policies and procedures currently being exercised at FSD.

The Amendment does not propose any further changes to the approved Permit or the conditions of the permit as issued on August 21, 2014 other than those laid out above or described in detail in the FSD Amendment Package, "*Proposal for an Amendment to the Permit for the Direct to Barge Coal Transfer Facility*."

Further details on the scope of the proposed Project Amendment in terms of construction details to the Project Permit are provided in the Technical Memorandum titled *Amendment to the Fraser Surrey Docks Direct to Barge Coal Transfer Facility Project – Environmental Impact Assessment Addendum* (SNC-Lavalin, 2015).

3.2.2. Data Evaluated in the HHRA

The description of the data evaluated in the HHRA remains unchanged; however, as indicated, the AQA conducted by Levelton was revised based on the Project Amendment, with the results of the updated AQA (Levelton, 2015) used to estimate exposures to the receptors of concern in the Study Area (i.e., the maximum North Delta residential receptor and the industrial receptor).

Levelton (2015) presented the following conclusions of the AQA:

- Maximum predicted fugitive coal dust impacts have decreased from the previous AQA (Levelton, 2014).
- Predicted air quality impacts including ambient background at sensitive receptors and within residential neighbourhoods in the vicinity of FSD are generally low and remain below all ambient air quality objectives (AAQO).
- The predicted air contaminant concentrations quickly diminish as emissions disperse further away from FSD's facility.
- All maximum predicted concentrations are on FSD's facility fenceline and are not near residential or populated areas.
- For all air contaminants and averaging periods, there were no predicted exceedances of the AAQO with ambient background added, with the exception of predicted annual nitrogen dioxide (NO_2) concentrations, which is consistent with the results of the previous AQA (Levelton, 2014). Predicted annual NO_2 exceedances with ambient background added are located immediately to the west of the modelled facility fenceline and on the fenceline over the Fraser River. This is an area where the tugs and vessels operate and public access is generally limited or controlled due to terminal marine operations.
- The magnitude of the maximum predicted annual NO_2 exceedance is reduced slightly from the previous AQA (Levelton, 2014).
- The planned project and operational mitigation measures will assist in the management and mitigation of combustion and fugitive dust emissions from the Project and agricultural goods operations.

3.2.2.1. Air Quality Assessment Results

The introduction to the AQA results (2015), including the Project sources assessed (i.e., coal dust, transportation equipment and combustion sources and agricultural operations) and the guidelines used for screening, remains unchanged from the original 2014 HHRA. However, the AQA results themselves, as outlined in Table 3-2 of the 2014 HHRA have been updated to reflect the results of the Levelton (2015) AQA, and are presented in Appendix I, Table I-1. The AAQO presented in Table 3-2 of the 2014 HHRA remain unchanged, with the exception of the Metro Vancouver 1-hour AAQO for sulphur dioxide (SO_2), which was updated in May 2015 from 450 µg/m^3 to 200 µg/m^3.

As previously concluded in the 2014 HHRA, and as summarized in Table I-1, the maximum predicted concentrations (i.e., representative of maximum project emissions) were at the FSD fenceline (i.e., maximum receptor, defined in the HHRA as the industrial receptor). In addition, Levelton (2015) predicted air concentrations for a maximum residential receptor (i.e., defined in the HHRA as the maximum North Delta residential receptor). In their determination of the predicted air concentrations for the maximum residential receptor, Levelton (2015) evaluated the set of residential receptors. It is noted that a subset of the residential receptors includes the nearest sensitive receptors (e.g., schools, daycares) located nearest to the FSD facility, and predicted air concentrations at these sensitive receptors are less than the concentrations predicted at the maximum residential receptor. Therefore, evaluation of the maximum North Delta residential receptor is protective of these sensitive receptors.

The concentrations predicted at the FSD fenceline and at the maximum residential receptor are considered representative of maximum Project emissions in the immediate area of the facility; the predicted concentrations of the Criteria Air Contaminants (CAC) in this area will decrease with distance from the facility. Results are presented as maximum concentrations associated with the Project, as well as maximum concentrations plus background at both the maximum receptor (along the FSD fenceline) and at the maximum residential receptor. For all parameters, with the exception of the maximum predicted annual NO_2, the maximum concentrations plus background were below the most stringent of the municipal, provincial, national and international air quality objectives and guidelines, including the CCME “Maximum Desirable” and the BC Level A levels, as well as the Metro Vancouver and BC $PM_{2.5}$ planning goal. The 24-hour and annual $PM_{2.5}$ concentrations were also below the CCME proposed Air Quality Standards for 2015 and 2020 of 28 µg/m^3 and 10 µg/m^3 (for 2015) and 27 µg/m^3 and 8.8 µg/m^3 (for 2020), respectively (CCME, 2012).

The model predicted higher annual NO_2 concentrations in the region concentrated over the Fraser River, including at the fenceline in the immediate area of the berth; NO_2 concentrations above the AAQO were predicted for 15 receptors out of the total 10,042 modelled receptors. Ten of these receptors were located within FSD’s fenceline, while 5 receptors were located on the west side of FSD; all 15 receptors are located over the Fraser River in the area where the tugs and ships operate at the berth.

A location plot of receptors exceedances (shown as yellow crosses) for NO_2, as presented in Levelton (2015), is presented as Figure 3-1. Predicted annual average concentrations of NO_2 decrease with distance from the FSD fenceline, and are predicted to be below the AAQO of 40 µg/m^3 approximately 80 m from the fenceline, in an area over the Fraser River. All other figures pertaining to the AQA results that were presented in the 2014 HHRA have not changed materially, and can be referenced in the 2014 HHRA.

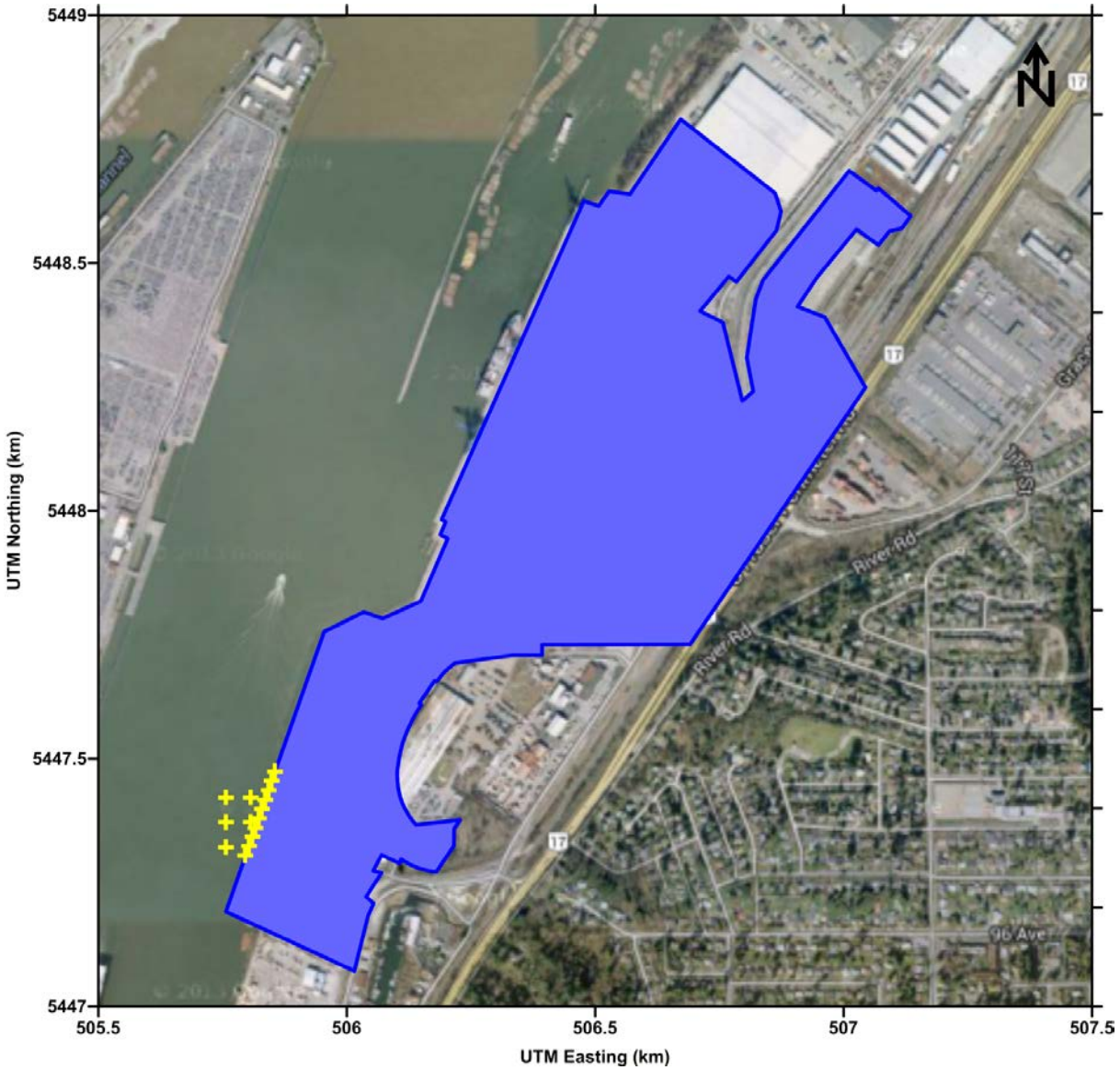

Figure 3-1: Map of Receptors with Predicted NO_2 Concentrations Greater than the Annual NO_2 AAQO of 40 µg/m^3 (from Levelton, 2015).

3.3. Exposure Assessment

EPCs for COPCs in air for the Project Scenario (and, therefore, the Cumulative Scenario which is equivalent to the Baseline Scenario + the Project Scenario) were updated based on the results of the revised Levelton (2015) AQA. In addition, the EPCs for the COPCs in soil and vegetation were re-estimated using the results of the 2015 Levelton AQA. The EPCs for these media were updated for both the maximum North Delta residential receptor and the industrial receptor; the updated EPCs for air, soil and vegetation are presented in the tables included in Appendix II. While the EPC values themselves have changed based on the updated AQA results, the text associated with the Exposure Assessment sections in the 2014 HHRA remains unchanged. Baseline scenario EPCs, as well as those associated with the maximum rail corridor residential receptor, remain unchanged from the 2014 HHRA.

3.4. Toxicity Assessment

As part of the 2014 HHRA, a comprehensive Toxicity Assessment involving the identification of TRVs representing an acceptable dose or concentration of exposure for the COPCs being assessed was conducted. This HHRA addendum has relied on the Toxicity Assessment presented in the 2014 HHRA (SNC-Lavalin, 2014), with one exception, as outlined below. As the Toxicity Assessment presented in the 2014 HHRA was completed within the last year, this is considered appropriate.

The acute (1-hour) inhalation TRV selected for SO_2 in the 2014 HHRA was an air quality objective of 450 µg/m^3 recommended by Metro Vancouver (2011), CCME (1999) and the BC Ministry of Environment (MoE) (2013). In May 2015, Metro Vancouver adopted an interim 1-hour SO_2 AAQO of 200 µg/m^3. Metro Vancouver (2015) indicates that the interim AAQO is based recent clinical and epidemiological evidence and reference the US EPA (2010). The US EPA 1-hour SO_2 guideline of 75 ppb (200 µg/m^3) is based on an examination of both controlled exposure studies, confirming a causal relationship between SO_2 levels and decrements in lung function of exercising asthmatics, as well as epidemiological studies indicating adverse respiratory morbidity effects associated with SO_2 exposure (US EPA, 2010). Clinical studies have shown that even very short term (5 to 10 minute) exposures to SO_2, above approximately 200 ppb, can have detrimental effects on the lung function of exercising asthmatics (US EPA, 2010). The Metro Vancouver interim 1-hour SO_2 AAQO was selected as the acute (1 hour) inhalation TRV in this HHRA addendum.

It is noted that in October 2014 the BC MoE adopted interim 1-hour AAQOs of 100 ppb (200 µg/m^3) for NO_2 and 75 ppb (200 µg/m^3) for SO_2. The interim AAQOs are equivalent to the acute inhalation TRVs selected for NO_2 and SO_2.

3.5. Risk Characterization

While the introductory text and discussion of COPCs with additive effects in the Risk Characterization section remains unchanged from the 2014 HHRA, the risk estimates for the maximum North Delta residential receptor and the industrial receptor have been re-calculated based on the results of the Levelton (2015) AQA and are presented below for the Baseline Scenario, Project Scenario and Cumulative Scenario[2]; the risk estimates for these receptors are also presented in the tables included in Appendix III. Risk estimates for the maximum rail corridor residential receptor remain unchanged from those presented in the 2014 HHRA.

3.5.1. Maximum North Delta Residential Receptor

The acute and chronic inhalation risk estimates, as well as the cancer and non-cancer risk estimates for multi-media exposures, for the maximum North Delta residential receptor are summarized in the following tables.

Table 3-1 summarizes the acute inhalation risk estimates for each of the Baseline, Project and Cumulative Scenarios for COPCs with acute inhalation TRVs; the risk estimates are also presented in Tables III-1A (Baseline Scenario), III-1B (Project Scenario) and III-1E (Cumulative Scenario) in Appendix III. The estimated acute inhalation risks have been compared to a target risk level of a Hazard Quotient (HQ) $\leq$ 1.0.

Table 3-1: Risk Estimates for Acute Inhalation Exposures – Maximum North Delta Residential Receptor (Toddler and Adult)

COPC	Hazard Quotient: Baseline Scenario	Hazard Quotient: Project Scenario	Hazard Quotient: Cumulative Scenario
Metals			
Arsenic	3.6E-02	4.5E-03	4.1E-02
Boron	--	4.0E-09	NC
Cadmium	6.3E-01	2.3E-01	8.7E-01
Copper	1.1E-03	4.0E-05	1.1E-03
Manganese	1.9E-01	2.8E-04	1.9E-01
Mercury	ND	1.5E-04	NC
Nickel	6.9E-02	2.2E-05	6.9E-02
Vanadium	8.9E-04	1.7E-02	1.8E-02
Volatile Organic Compounds (VOC)			
Acetaldehyde	7.1E-03	2.6E-03	9.7E-03
Acrolein[a]	1.8E-02	1.4E-02	3.2E-02
Acrolein[b]	8.0E-02	6.0E-02	1.4E-01

[2] The Cumulative Scenario includes potential health risks associated with the Baseline Scenario plus the Project Scenario.

Table 3-1 (Cont'd): Risk Estimates for Acute Inhalation Exposures – Maximum North Delta Residential Receptor (Toddler and Adult)

COPC	Hazard Quotient: Baseline Scenario	Hazard Quotient: Project Scenario	Hazard Quotient: Cumulative Scenario
Volatile Organic Compounds (VOC) (Cont'd)			
Benzene	3.0E-02	4.4E-04	3.0E-02
1,3-Butadiene	1.6E-03	1.1E-04	1.7E-03
Ethylbenzene	2.2E-04	2.8E-06	2.2E-04
Formaldehyde	8.8E-02	3.0E-02	1.2E-01
Toluene	1.8E-03	1.9E-05	1.8E-03
Styrene	1.1E-03	8.4E-07	1.1E-03
Xylenes	2.1E-03	1.1E-05	2.1E-03
Dust Palliatives Chemical Constituents			
Epichlorohydrin	--	1.8E-08	NC
Others			
Sulfate	6.1E-02	1.1E-01	1.7E-01
Criteria Air Contaminants			
CO (1 hour)	4.3E-02	1.1E-02	5.4E-02
CO (8 hour)	1.0E-01	2.0E-02	1.2E-01
NO_2 (1 hour)	3.3E-01	1.9E-01	5.2E-01
SO_2 (1 hour)	6.2E-02	7.1E-02	1.3E-01
SO_2 (24 hour)	9.0E-01	8.3E-02	9.8E-01
$PM_{2.5}$ (24 hour)	4.8E-01	1.6E-01	6.4E-01
PM_{10} (24 hour)	5.4E-01	9.8E-02	6.4E-01
Nasal irritants (acrolein, *boron,* formaldehyde, toluene, styrene)**[a]	1.1E-01	4.4E-02	1.5E-01
Nasal irritants (acrolein, *boron,* formaldehyde, toluene, styrene)**[b]	1.7E-01	9.0E-02	2.6E-01
Ocular irritants (acrolein, epichlorohydrin, formaldehyde, toluene)** [a]	1.1E-01	4.4E-02	1.5E-01
Ocular irritants (acrolein, epichlorohydrin, formaldehyde, toluene)** [b]	1.7E-01	9.0E-02	2.6E-01
Respiratory irritants (acetaldehyde, cadmium, epichlorohydrin, formaldehyde, NO_2, SO_2, vanadium, xylenes, sulfate)**	**1.2E+00**	6.5E-01	**1.8E+00**

Notes:
[a] – based on the TCEQ 1 hour ReV for acrolein
[b] – based on the OEHHA 1 hour REL for acrolein
ND: no baseline air data were available for COPC (see discussion in Section 7)
NC: not calculated; cumulative risks could not be calculated based on a lack of baseline air data for COPC
** - no baseline air data were available for boron and epichlorohydrin; as discussed in previous sections of the report, due to a lack of sources, baseline air concentrations are not expected to appreciably contribute to exposures
BOLD: indicates risks in excess of the target risk level of 1E+00 for acute exposures

As presented in Table 3-1, the risk estimates for the maximum North Delta residential receptor's acute exposures to the individual COPCs, as well as for the COPCs identified as nasal and ocular irritants, for each of the Baseline, Project and Cumulative Scenarios, were below the target HQ of 1.0 for acute exposures. On this basis, unacceptable health risks are not predicted for acute exposures to these COPCs in Project emissions.

The maximum mixture HQ estimated for the COPCs identified as respiratory irritants exceeded the target risk level of 1.0 for the Baseline (HQ=1.2) and Cumulative (HQ=1.8) Scenarios, with an HQ for the Project Scenario of 0.65. The relative contribution of the Project HQ to the Cumulative HQ was 33%, with a Baseline HQ contribution of 67%.

The maximum mixture HQs for respiratory irritants are conservative and considered to be worst-case (i.e., the most conservative) estimates, resulting in the over-prediction of risks based on the following:

- In the estimation of the Project HQ, the acute exposures to the respiratory irritants were estimated using the maximum overall predicted acute (e.g., 1 hour) concentrations from Levelton (2015). These maximum concentrations would occur on an infrequent basis (i.e., 1 hour of the year). Additionally, the approach assumes that the maximum concentrations occur at the same location within the same hour; however, a review of Levelton (2015) indicates that the maximum concentrations occur at different receptors and, in some cases within different hours, thus, the approach overestimates actual risks.

- Although each of the COPCs in the mixture is a respiratory irritant, the mechanism of toxicity for the COPCs varies, and thus the assumption of additivity results in an overprediction of risks. Specifically:

    - The three COPCs that contributed the most to the overall Project HQ were cadmium (HQ=0.23), sulfate (HQ=0.11) and NO_2 (HQ=0.19). Although each of the COPCs are identified as respiratory irritants, the mechanism of toxicity for cadmium differs from sulfate and NO_2 (see endpoints that are the basis of the TRVs below), and thus the assumption of additivity is conservative. The Project and Cumulative HQs for each of the individual COPCs, and the Project and Cumulative HQs for sulfate and NO_2 (HQ=0.30 and HQ=0.69, respectively) are less than the target risk level for acute exposures of and HQ $\leq$ 1.0. Further information on the specific endpoints that the acute TRVs for cadmium, sulfate and NO_2 are based on is provided below:

        - The Agency for Toxic Substances and Disease Registry's (ATSDR) acute MRL for cadmium is based on alveolar histiocytic infiltration, focal inflammation and minimal fibrosis in alveolar septa observed in rats exposed to cadmium via inhalation for 5 days/week for 2 weeks (ATSDR, 2012a). Each of the other COPCs included in the respiratory irritants mixture had different mechanisms of toxicity, and thus, the assumption of additivity is highly conservative and results in an over-prediction of risks.

- The OEHHA acute (1 hour) inhalation REL for sulfate of 120 µg/m^3 is based on small changes in airway function tests for asthmatics exposed to sulfate via inhalation.
- The WHO (2000) AQO for NO_2 is based on small changes in lung function and changes in airway responsiveness following NO_2 exposure.

- The Cumulative HQ for formaldehyde (HQ=0.12) contributes significantly to the Cumulative HQ for the mixture of respiratory irritants (HQ=1.8). There is very little indication that formaldehyde would interact with the other substances as a respiratory irritant.

As discussed in Section 7.1 of the 2014 HHRA, where evidence was available to suggest that the critical effects of two or more COPCs occur at the same target site (i.e., tissue or organ system), it was assumed that there was the potential for additive effects at the target site. Using this approach in the 2014 HHRA, no unacceptable risks were predicted for the mixture of COPCs identified as respiratory irritants (i.e., COPCs with the same target site). This approach is conservative, as effects would typically only be considered additive if data suggests that two or more COPCs exert (or could potentially exert) their critical effects by similar mechanisms of action.

On this basis, the worst-case (i.e., the most conservative) mixture HQ predicted for the respiratory irritants is an overestimate of actual risks. When cadmium and formaldehyde are not included in the mixture of respiratory irritants based on their differing mechanisms of action, the mixture HQs for the acute inhalation of the respiratory irritants for the Baseline, Project and Cumulative Scenarios are 0.46, 0.39 and 0.85, respectively (see Table 3-2), and are below the target HQ of 1.0. These HQs remain conservative estimates of actual risks, because as indicated above, they assume that the maximum concentrations of the COPCs occur at the same location and within the same hour of the modeling period. On this basis, no unacceptable risks are predicted acute inhalation exposures for the maximum North Delta residential receptor.

Table 3-2: Risk Estimates for Acute Inhalation Exposures of Mixture of Respiratory Irritants, Not Including Cadmium and Formaldehyde – Maximum North Delta Residential Receptor (Toddler and Adult)

COPC	Hazard Quotient: Baseline Scenario	Hazard Quotient: Project Scenario	Hazard Quotient: Cumulative Scenario
Respiratory irritants (acetaldehyde, epichlorohydrin, NO_2, SO_2, vanadium, xylenes, sulfate)	4.6E-01	3.9E-01	8.5E-01

Chronic inhalation risk estimates for the maximum North Delta residential receptor's (toddler and adult) exposures to the non-carcinogenic gaseous COPCs are presented in Table 3-3; the risk estimates have been compared to the Health Canada negligible risk level of

0.2 for all COPCs with the exception of the CACs and the irritants (i.e., formaldehyde), which were compared to a target HQ of 1.0. The risk estimates for each of the scenarios are also presented in Table III-2A and III-2B in Appendix III. The risks associated with chronic inhalation exposures to the COPC mixtures (i.e., the COPCs identified as having the potential to have additive effects) are presented in Table 3-8.

Table 3-3: Non-Cancer Risk Estimates for Chronic Inhalation Exposures to Gaseous COPCs – Maximum North Delta Residential Receptor (Toddler and Adult)

Chemical	Baseline Hazard Quotient	Project Hazard Quotient	Cumulative Hazard Quotient
VOCs			
Acetaldehyde	8.6E-03	3.0E-05	8.6E-03
Acrolein[a]	7.4E-02	1.3E-04	7.4E-02
Acrolein[b]	**5.7E-01**	9.8E-04	**5.7E-01**
Benzene	1.9E-02	9.3E-05	1.9E-02
1,3-Butadiene	**3.2E-01**	1.5E-04	**3.2E-01**
Ethylbenzene	1.4E-03	2.8E-06	1.4E-03
Ethylene*	--	--	--
Formaldehyde	1.8E-01	4.9E-04	1.8E-01
Hexachlorobenzene	NA	--	--
n-Hexane	7.4E-04	1.2E-06	7.4E-04
Propionaldehyde	NA	2.7E-04	NC
Propylene (1-Propene)	1.4E-04	7.0E-08	1.4E-04
Toluene	1.0E-03	1.5E-06	1.0E-03
2,2,4-Trimethylpentane*	--	--	--
Styrene	1.5E-03	3.7E-06	1.5E-03
Xylenes	6.7E-03	6.8E-06	6.7E-03
Criteria Air Contaminants			
NO_2	6.8E-01	2.0E-01	8.7E-01
SO_2	1.6E-01	5.4E-03	1.7E-01
$PM_{2.5}$ (based on AAQO of 8 µg/m^3)	5.5E-01	3.4E-02	5.8E-01
$PM_{2.5}$ (based on planning AAQO of 6 µg/m^3)	7.3E-01	4.6E-02	7.8E-01
PM_{10}	6.0E-01	2.3E-02	6.2E-01
DPM	1.6E-01	2.3E-02	1.8E-01

Notes:
[a] – based on the TCEQ 1 hour ReV for acrolein
[b] – based on the OEHHA 1 hour REL for acrolein
ND: no baseline air data were available for COPC (see discussion in Section 7)
NC: not calculated; cumulative risks could not be calculated based on a lack of baseline air data for COPC
* - risks could not be predicted for ethylene and 2,2,4-trimethylpentane as no TRVs were identified for these COPCs
BOLD: indicates risks in excess of the Health Canada negligible risk level of 0.2

As presented in Table 3-3, the non-carcinogenic risks associated with chronic inhalation exposures to VOCs from Project emissions are less than the Health Canada negligible risk level of 0.2 for the Baseline, Project and Cumulative Scenarios (i.e., risks are acceptable), with the exception of the HQs for acrolein (when the OEHHA chronic REL is used) and 1,3-butadiene for the Baseline and the Cumulative Scenarios. The HQs for these COPCs for the Cumulative Scenario (Baseline + Project) are equivalent to the HQs for the Baseline Scenario, with negligible contribution from the Project emissions (0.17% and 0.05%, respectively). Therefore, no unacceptable risks are predicted for the chronic inhalation of these VOCs in Project emissions. It is noted that the HQ estimated for acrolein using the TCEQ chronic ReV (which is considered to be more robust) is less than the Health Canada negligible risk level of 0.2.

In addition, the HQs for the CACs were less than the target HQ of 1.0 for all three scenarios, and therefore, no unacceptable non-cancer risks are predicted for the chronic inhalation of the individual CACs.

Chronic inhalation risks for the maximum North Delta residential receptor's (adult) exposure to the carcinogenic gaseous COPCs are presented in Table 3-4 and in Table III-4B, in Appendix III. The estimated incremental lifetime cancer risk (ILCR) have been compared to the Health Canada negligible risk level of 1E-05. The risks associated with chronic inhalation exposures to the COPC mixtures (i.e., COPCs with additive effects) are presented in Table 3-8.

Table 3-4: Cancer Risk Estimates for Chronic Exposures to Gaseous COPCs – Maximum North Delta Residential Receptor (Adult)

Chemical	Project Scenario ILCR
VOCs	
Acetaldehyde	8.5E-10
Benzene	1.2E-09
1,3-Butadiene	2.3E-10
Hexachlorobenzene	2.0E-13
Criteria Air Contaminants	
DPM	6.8E-06

Notes:
ILCR – Incremental lifetime cancer risk

The ILCR estimates (cancer risks from air concentrations above background concentrations) associated with chronic inhalation exposures to the gaseous COPCs were less than the Health Canada negligible risk level of 1E-05. On this basis, no unacceptable cancer risks are predicted for the maximum North Delta residential receptor exposed to the above carcinogenic COPCs in Project emissions.

As described in the 2014 HHRA, the non-gaseous COPCs were retained for evaluation in the multi-media assessment. The non-cancer risk estimates for a toddler residential receptor (maximum North Delta residential receptor) for their multi-media exposure to the Project COPCs are presented in Table 3-5; the risk estimates for each of the Scenarios are also presented in Appendix III, Tables III-3A, III-3B and III-3C. The estimated HQs have been compared to the Health Canada negligible risk level of 0.2.

Table 3-5: Chronic Risks for Multi-Pathway Exposures, Maximum North Delta Residential Receptor (Toddler)

Chemical	Baseline Scenario			Project Scenario			Cumulative Scenario		
	HQ_{inh}	$HQ_{soil/veg}$	HQ_{all}	HQ_{inh}	$HQ_{soil/veg}$	HQ_{all}	HQ_{inh}	$HQ_{soil/veg}$	HQ_{all}
Carcinogenic Polycyclic Aromatic Hydrocarbons (PAH)									
Benzo(a)anthracene	1.3E-05	3.8E-04	4.0E-04	6.4E-06	4.3E-07	6.9E-06	2.0E-05	3.8E-04	4.0E-04
Benzo(a)pyrene	6.7E-06	3.0E-04	3.1E-04	2.0E-07	5.3E-07	7.3E-07	6.9E-06	3.0E-04	3.1E-04
Benzo(b)fluoranthene	1.2E-05	6.6E-04	6.7E-04	7.1E-07	1.7E-07	8.8E-07	1.2E-05	6.6E-04	6.7E-04
Benzo(g,h,i)perylene	NA	1.2E-04	1.2E-04	6.5E-08	1.1E-07	1.7E-07	NA	1.2E-04	1.2E-04
Benzo(k)fluoranthene	5.0E-06	1.9E-04	1.9E-04	1.6E-07	4.5E-07	6.1E-07	5.2E-06	1.9E-04	1.9E-04
Chrysene	NA	4.3E-04	4.3E-04	3.1E-07	8.5E-07	1.2E-06	NA	4.3E-04	4.3E-04
Dibenzo(a,h)anthracene	NA	2.6E-05	2.6E-05	4.0E-08	7.6E-08	1.2E-07	NA	2.6E-05	2.6E-05
Fluoranthene	8.6E-05	1.5E-03	1.6E-03	1.1E-06	4.3E-07	1.6E-06	8.7E-05	1.5E-03	1.6E-03
Indeno(1,2,3-cd)pyrene	3.2E-05	1.2E-04	1.5E-04	1.6E-07	2.6E-07	4.2E-07	3.2E-05	1.2E-04	1.5E-04
Phenanthrene	2.7E-04	2.9E-03	3.1E-03	1.8E-06	3.5E-08	1.8E-06	2.7E-04	2.9E-03	3.1E-03
Carcinogenic PAH Mixture	4.2E-04	6.6E-03	3.9E-03	1.1E-05	3.4E-06	1.3E-05	4.3E-04	6.6E-03	7.0E-03
Non-Carcinogenic PAHs									
Acenaphthene	1.8E-05	1.1E-04	1.3E-04	1.9E-07	5.3E-09	1.9E-07	1.9E-05	1.1E-04	1.3E-04
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	2.7E-06	4.5E-05	4.7E-05	6.2E-07	1.7E-09	6.2E-07	3.3E-06	4.5E-05	4.8E-05
Fluorene	6.4E-05	2.4E-04	3.0E-04	4.2E-07	7.0E-09	4.2E-07	6.5E-05	2.4E-04	3.0E-04
Fluoranthene	8.6E-05	1.5E-03	1.6E-03	1.1E-06	4.3E-07	1.6E-06	8.7E-05	1.5E-03	1.6E-03
Naphthalene	1.5E-02	7.5E-04	1.6E-02	2.2E-05	1.6E-07	2.2E-05	1.5E-02	7.6E-04	1.6E-02
2-Methylnaphthalene	NA	1.8E-03	1.8E-03	4.0E-07	7.4E-09	4.1E-07	NC	1.8E-03	1.8E-03
Pyrene	8.2E-05	2.3E-03	2.3E-03	1.9E-06	1.1E-06	3.0E-06	8.4E-05	2.3E-03	2.3E-03
Non-Carcinogenic PAH Mixture	1.5E-02	6.7E-03	2.2E-02	2.7E-05	1.7E-06	2.9E-05	1.5E-02	6.7E-03	2.2E-02
Metals & Metalloids									
Antimony	NA	5.4E-02	5.4E-02	9.3E-06	1.8E-04	1.9E-04	NC	5.4E-02	5.4E-02
Arsenic	4.9E-04	**1.4E+00**	**1.4E+00**	6.6E-05	4.7E-03	4.7E-03	5.6E-04	**1.4E+00**	**1.4E+00**
Barium	3.6E-03	8.0E-02	8.3E-02	1.7E-02	6.6E-03	2.3E-02	2.0E-02	8.6E-02	1.1E-01
Beryllium	4.3E-05	2.5E-03	2.6E-03	6.9E-04	3.5E-05	7.2E-04	7.3E-04	2.6E-03	3.3E-03
Cadmium	1.7E-02	**2.1E-01**	**2.3E-01**	2.8E-03	1.7E-03	4.5E-03	2.0E-02	**2.1E-01**	**2.3E-01**
Chromium III	1.3E-04	3.0E-04	4.2E-04	3.0E-05	1.8E-08	3.0E-05	1.6E-04	3.0E-04	4.5E-04
Chromium VI	6.3E-03	3.0E-03	9.3E-03	6.5E-05	8.9E-04	9.6E-04	6.4E-03	3.9E-03	1.0E-02
Cobalt	2.6E-04	2.7E-02	2.7E-02	7.0E-04	7.3E-05	7.7E-04	9.6E-04	2.7E-02	2.8E-02
Copper	3.4E-03	1.7E-01	1.7E-01	6.3E-04	1.4E-03	2.0E-03	4.0E-03	1.7E-01	1.8E-01
Lead	2.1E-02	**6.7E-01**	**6.9E-01**	8.6E-04	1.1E-03	1.9E-03	2.2E-02	**6.7E-01**	**6.9E-01**

Table 3-5 (Cont'd): Chronic Risks for Multi-Pathway Exposures, Maximum North Delta Residential Receptor (Toddler)

Chemical	Baseline Scenario			Project Scenario			Cumulative Scenario		
	HQ_{inh}	$HQ_{soil/veg}$	HQ_{all}	HQ_{inh}	$HQ_{soil/veg}$	HQ_{all}	HQ_{inh}	$HQ_{soil/veg}$	HQ_{all}
Metals & Metalloids (Cont'd)									
Manganese	5.4E-02	**1.0E+00**	**1.1E+00**	1.9E-02	8.8E-04	1.9E-02	7.3E-02	**1.0E+00**	**1.1E+00**
Mercury	1.2E-02	**2.4E-01**	**2.5E-01**	4.7E-07	7.5E-05	7.6E-05	1.2E-02	**2.4E-01**	**2.5E-01**
Molybdenum	1.9E-05	1.9E-02	1.9E-02	1.0E-02	2.9E-04	1.1E-02	1.0E-02	1.9E-02	2.9E-02
Nickel	**4.0E-01**	1.9E-01	**5.9E-01**	5.5E-02	5.8E-04	5.6E-02	**4.6E-01**	1.9E-01	**6.5E-01**
Selenium	9.0E-06	2.1E-03	2.1E-03	1.6E-06	7.2E-05	7.3E-05	1.1E-05	2.2E-03	2.2E-03
Strontium	5.5E-07	**4.4E-01**	**4.4E-01**	8.9E-06	2.3E-02	2.3E-02	9.5E-06	**4.6E-01**	**4.6E-01**
Tin	1.0E-07	5.4E-05	5.4E-05	1.0E-08	9.4E-08	1.0E-07	1.1E-07	5.4E-05	5.4E-05
Uranium	NA	2.3E-02	2.3E-02	4.2E-04	1.7E-04	5.9E-04	NC	2.3E-02	2.4E-02
Vanadium	2.6E-02	4.2E-02	6.8E-02	2.0E-02	1.6E-04	2.0E-02	4.6E-02	4.2E-02	8.8E-02
Zinc	1.2E-05	**2.6E-01**	**2.6E-01**	8.2E-07	6.6E-04	6.6E-04	1.3E-05	**2.6E-01**	**2.6E-01**
Aluminum	2.5E-07	**5.2E-01**	**5.2E-01**	1.8E-04	1.4E-03	1.5E-03	1.8E-04	**5.2E-01**	**5.2E-01**
Boron	NA	NA	NA	2.8E-06	9.8E-02	9.8E-02	NC	NC	NC
Iron	3.4E-05	**2.7E-01**	**2.7E-01**	4.8E-06	5.7E-04	5.8E-04	3.9E-05	**2.7E-01**	**2.7E-01**
Titanium	NA	3.4E-03	3.4E-03	1.3E-06	1.1E-05	1.3E-05	NC	3.5E-03	3.5E-03
Volatile Organic Compounds									
Hexachlorobenzene (total)	NA	NA	NA	6.6E-09	4.8E-10	7.1E-09	NC	NC	NC
Dust Palliatives Constituents									
Epichlorohydrin[a]	NA	NA	NA	1.3E-06	4.5E-08	1.3E-06	NC	NC	NC
Others									
Polychlorinated Biphenyls (PCB)	NA	NA	NA	9.7E-03	1.6E-04	1.1E-02	NC	NC	NC
Sulfate	ND	ND	ND	NA	NA	NA	NA	NA	NA

Notes:
NA – Not applicable; HQ could not be estimated based on a lack of TRVs for COPC
ND – no baseline data available for COPC
NC – not calculated based on a lack of baseline data for COPC
BOLD: indicates risks in excess of Health Canada negligible risk level of 0.2

Table 3-5 presents the non-cancer risk estimates for the residential toddler (maximum North Delta residential receptor) exposed to the Project non-gaseous COPCs via inhalation, the direct soil pathways and ingestion of produce. Hazard quotients for all COPCs for the Project Scenario were less than the than the Health Canada negligible risk level of 0.2, indicating that there are no unacceptable risks associated with exposures to the Project emissions alone. HQs greater than 0.2 were predicted for the Cumulative Scenario (i.e., Baseline + Project) for aluminum, arsenic, cadmium, iron, lead, manganese, mercury, nickel, strontium and zinc. With the exception of nickel and strontium, the Cumulative Scenario HQs are equivalent to the Baseline Scenario HQs, indicating negligible contribution from the Project. The HQs for nickel and strontium are further discussed below.

- For nickel, the Baseline Scenario HQ (all routes) is 0.59 and the Project Scenario HQ (all routes) is 0.056, resulting in a Cumulative Scenario HQ of 0.65. Of the exposure pathways considered, the inhalation route contributed the most significantly to the overall HQs (0.4 for the Baseline Scenario and 0.055 for the Project Scenario), resulting in a Cumulative Scenario HQ for the inhalation route of 0.46. If the inhalation route is not considered, the Cumulative Scenario HQ for the soil and vegetation pathways of 0.19 is equivalent to the Baseline Scenario HQ for the soil and vegetation pathways of 0.19 (i.e., negligible contribution from the Project), and is equivalent to the Health Canada negligible risk level.

- In the case of nickel inhalation, the relative contribution from the Project to the overall HQ is < 10%, with 90% of the estimate associated with background exposures. A target HQ of 1.0 for inhalation exposures to nickel is appropriate as the mechanism of toxicity is specific to the inhalation route of exposure (i.e., the mechanism of toxicity differs for oral exposures). Furthermore, a conservative approach was used in the characterization of risks associated with nickel. The toxicity of nickel is highly dependent on the form of the metal, and Health Canada recommends different TRVs for the various forms of nickel. Because the form of the nickel in the coal and in the combustion emissions was not known, the most conservative of the available inhalation TRVs, a Tolerable Concentration (TC) for nickel sulphate, was used in the HHRA. This approach has likely overestimated risks associated with Project emissions as although nickel sulphate has the potential to be present in combustion emissions, it is unlikely to be present in unburnt coal. The relative contributions of combustion emissions and coal dust to the air EPC for the maximum North Delta residential receptor are 4.9E-08 µg/m^3 and 1.9E-04 µg/m^3, respectively (i.e., exposures are largely from coal). Based on the above, and given that the HQ is well below 1.0, unacceptable risks associated with inhalation exposures to nickel are not anticipated.

- For strontium, the Baseline Scenario HQ is 0.44, while the Project Scenario HQ is 0.023, for a Cumulative Scenario HQ of 0.46. The relative contribution of the Project to the overall HQ is 4% (96% from background). On this basis, and considering the conservatism in the estimated exposure and associated risk, the contribution from the Project is considered to be negligible.

Based on the above, no unacceptable risks are predicted for the toddler maximum North Delta residential receptor exposed to the COPCs included in Table 3-5 in project emissions.

It is noted that no baseline data were available for select COPCs, including baseline air data for select PAHs (e.g., 2-methylnaphthalene) and metals (e.g., antimony, boron, uranium), hexachlorobenzene, PCBs and epichlorohydrin, and baseline soil data for select COPCs including select metals (boron), PCBs and epichlorohydrin. This applies to the results of the multi-media results for all receptors (residential and industrial), and the uncertainty associated with the lack of this data was discussed in Section 7 of the 2014 HHRA.

Table 3-6 presents the non-cancer risk estimates for an adult residential receptor (maximum North Delta residential receptor) for their multi-media exposure to the Project COPCs. The risk estimates for the various exposure pathways for each of the Baseline, Project and Cumulative Scenarios are presented in Appendix III, Tables III-4A, III-4B and III-4C, respectively. The risk estimates have been compared to the Health Canada negligible risk level of 0.2 for non-carcinogens.

Table 3-6: Chronic Risks for Multi-Pathway Exposures, Maximum North Delta Residential Receptor (Adult)

Chemical	Baseline Scenario			Project Scenario			Cumulative Scenario		
	HQ_{inh}	$HQ_{soil/veg}$	HQ_{all}	HQ_{inh}	$HQ_{soil/veg}$	HQ_{all}	HQ_{inh}	$HQ_{soil/veg}$	HQ_{all}
Carcinogenic PAHs									
Benzo(a)anthracene	6.3E-06	1.5E-04	1.6E-04	3.0E-06	1.7E-07	3.2E-06	9.3E-06	1.5E-04	1.6E-04
Benzo(a)pyrene	3.1E-06	1.1E-04	1.1E-04	9.5E-08	1.9E-07	2.9E-07	3.2E-06	1.1E-04	1.1E-04
Benzo(b)fluoranthene	5.5E-06	2.6E-04	2.6E-04	3.3E-07	6.8E-08	4.0E-07	5.8E-06	2.6E-04	2.6E-04
Benzo(g,h,i)perylene	NA	3.8E-05	3.8E-05	3.0E-08	3.5E-08	6.5E-08	NA	3.8E-05	3.8E-05
Benzo(k)fluoranthene	2.3E-06	6.8E-05	7.0E-05	7.5E-08	1.7E-07	2.4E-07	2.4E-06	6.8E-05	7.1E-05
Chrysene	NA	1.6E-04	1.6E-04	1.5E-07	3.3E-07	4.7E-07	NA	1.6E-04	1.6E-04
Dibenzo(a,h)anthracene	NA	8.0E-06	8.0E-06	1.9E-08	2.3E-08	4.2E-08	NA	8.0E-06	8.0E-06
Fluoranthene	4.0E-05	6.1E-04	6.5E-04	5.3E-07	1.8E-07	7.1E-07	4.0E-05	6.1E-04	6.5E-04
Indeno(1,2,3-cd)pyrene	1.5E-05	3.8E-05	5.2E-05	7.4E-08	8.2E-08	1.6E-07	1.5E-05	3.8E-05	5.3E-05
Phenanthrene	1.3E-04	1.2E-03	1.4E-03	8.3E-07	1.6E-08	8.5E-07	1.3E-04	1.2E-03	1.4E-03
Carcinogenic PAH Mixture	2.0E-04	2.7E-03	1.5E-03	5.1E-06	1.3E-06	5.5E-06	2.0E-04	2.7E-03	2.9E-03
Non-Carcinogenic PAHs									
Acenaphthene	8.6E-06	4.8E-05	5.7E-05	8.8E-08	2.4E-09	9.0E-08	8.7E-06	4.8E-05	5.7E-05
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	1.3E-06	1.9E-05	2.0E-05	2.9E-07	7.7E-10	2.9E-07	1.5E-06	1.9E-05	2.1E-05
Fluorene	3.0E-05	1.0E-04	1.3E-04	2.0E-07	3.2E-09	2.0E-07	3.0E-05	1.0E-04	1.3E-04
Fluoranthene	4.0E-05	6.1E-04	6.5E-04	5.3E-07	1.8E-07	7.1E-07	4.0E-05	6.1E-04	6.5E-04
Naphthalene	1.5E-02	3.3E-04	1.5E-02	2.2E-05	7.4E-08	2.2E-05	1.5E-02	3.3E-04	1.5E-02
2-Methylnaphthalene	NA	7.9E-04	7.9E-04	1.9E-07	3.5E-09	1.9E-07	NC	7.9E-04	7.9E-04
Pyrene	3.8E-05	9.6E-04	9.9E-04	9.0E-07	4.5E-07	1.4E-06	3.9E-05	9.6E-04	1.0E-03
Non-Carcinogenic PAH Mixture	1.5E-02	2.9E-03	1.8E-02	2.5E-05	7.2E-07	2.5E-05	1.5E-02	2.9E-03	1.8E-02
Metals & Metalloids									
Antimony	NA	2.4E-02	2.4E-02	4.3E-06	7.8E-05	8.2E-05	NC	2.4E-02	2.4E-02
Arsenic	4.9E-04	**5.7E-01**	**5.7E-01**	6.6E-05	1.9E-03	2.0E-03	5.6E-04	**5.7E-01**	**5.7E-01**
Barium	3.6E-03	3.5E-02	3.8E-02	1.7E-02	2.9E-03	2.0E-02	2.0E-02	3.7E-02	5.8E-02
Beryllium	4.3E-05	9.0E-04	9.4E-04	6.9E-04	1.3E-05	7.0E-04	7.3E-04	9.1E-04	1.6E-03
Cadmium	1.7E-02	9.1E-02	1.1E-01	2.8E-03	7.4E-04	3.5E-03	2.0E-02	9.2E-02	1.1E-01

Table 3-6 (Cont'd): Chronic Risks for Multi-Pathway Exposures, Maximum North Delta Residential Receptor (Adult)

Chemical	Baseline Scenario			Project Scenario			Cumulative Scenario		
	HQ_{inh}	$HQ_{soil/veg}$	HQ_{all}	HQ_{inh}	$HQ_{soil/veg}$	HQ_{all}	HQ_{inh}	$HQ_{soil/veg}$	HQ_{all}
Carcinogenic PAHs (Cont'd)									
Chromium III	1.3E-04	1.0E-04	2.3E-04	3.0E-05	6.3E-09	3.0E-05	1.6E-04	1.0E-04	2.6E-04
Chromium VI	6.3E-03	1.0E-03	7.3E-03	6.5E-05	3.0E-04	3.6E-04	6.4E-03	1.3E-03	7.7E-03
Cobalt	2.6E-04	1.1E-02	1.1E-02	7.0E-04	2.9E-05	7.3E-04	9.6E-04	1.1E-02	1.2E-02
Copper	3.4E-03	4.8E-02	5.2E-02	6.3E-04	4.0E-04	1.0E-03	4.0E-03	4.9E-02	5.3E-02
Lead	2.1E-02	8.5E-02	1.1E-01	8.6E-04	1.3E-04	9.9E-04	2.2E-02	8.5E-02	1.1E-01
Manganese	5.4E-02	**4.0E-01**	**4.5E-01**	1.9E-02	3.4E-04	1.9E-02	7.3E-02	**4.0E-01**	**4.7E-01**
Mercury	1.2E-02	1.0E-01	1.2E-01	1.9E-05	2.5E-03	2.6E-03	1.2E-02	1.1E-01	1.2E-01
Molybdenum	1.9E-05	6.7E-03	6.7E-03	3.0E-06	4.9E-05	5.2E-05	2.2E-05	6.7E-03	6.7E-03
Nickel	**4.0E-01**	8.4E-02	**4.8E-01**	5.5E-02	2.5E-04	5.5E-02	**4.6E-01**	8.4E-02	**5.4E-01**
Selenium	9.0E-06	9.2E-04	9.3E-04	1.6E-06	3.1E-05	3.3E-05	1.1E-05	9.5E-04	9.7E-04
Strontium	2.6E-07	1.9E-01	1.9E-01	4.2E-06	1.0E-02	1.0E-02	4.4E-06	2.0E-01	2.0E-01
Tin	4.7E-08	2.2E-05	2.2E-05	4.7E-09	3.8E-08	4.3E-08	5.2E-08	2.2E-05	2.2E-05
Uranium	NA	8.0E-03	8.0E-03	4.2E-04	5.9E-05	4.8E-04	NC	8.1E-03	8.5E-03
Vanadium	2.6E-02	1.3E-02	3.9E-02	2.0E-02	5.2E-05	2.0E-02	4.6E-02	1.3E-02	5.9E-02
Zinc	4.7E-06	9.5E-02	9.5E-02	3.2E-07	2.4E-04	2.4E-04	5.0E-06	9.5E-02	9.5E-02
Aluminum	1.2E-07	**1.5E-01**	**1.5E-01**	8.6E-05	3.9E-04	4.8E-04	8.6E-05	**1.5E-01**	**1.5E-01**
Boron	NA	NA	NA	2.8E-06	4.3E-02	4.3E-02	NC	NC	NC
Iron	1.6E-05	7.7E-02	7.7E-02	2.2E-06	1.6E-04	1.7E-04	1.8E-05	7.7E-02	7.7E-02
Titanium	NA	1.1E-03	1.1E-03	6.2E-07	3.6E-06	4.2E-06	NC	1.1E-03	1.1E-03
Volatile Organic Compounds									
Hexachlorobenzene	NA	NA	NA	3.1E-09	2.0E-10	7.1E-10	NC	NC	NC
Dust Palliatives Constituents									
Epichlorohydrin[a]	NA	NA	NA	1.3E-06	1.9E-08	1.3E-06	NC	NC	NC
Others									
PCBs	NA	NA	NA	4.5E-03	7.7E-04	1.5E-09	NC	NC	NC
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
NA – Not applicable; HQ could not be estimated based on a lack of TRVs for COPC
ND – no baseline data available for COPC
NC – not calculated based on a lack of baseline data for COPC
BOLD: indicates risks in excess of Health Canada negligible risk level of 0.2

Table 3-7 presents the cancer risks for an adult residential receptor (maximum North Delta residential receptor) for their multi-media exposure to the Project COPCs; the risk estimates are also presented in Appendix III, Table III-4B. The ILCR estimates have been compared to the Health Canada negligible risk level of 1E-05 for carcinogens.

Table 3-7: Cancer Risks for Multi-Pathway Exposures, Maximum North Delta Residential Receptor (Adult)

Chemical	Project Scenario ILCR
Carcinogenic PAHs	
Benzo(a)anthracene	1.3E-08
Benzo(a)pyrene	1.3E-09
Benzo(b)fluoranthene	4.8E-10
Benzo(g,h,i)perylene	2.4E-11
Benzo(k)fluoranthene	1.1E-09
Chrysene	2.3E-10
Dibenzo(a,h)anthracene	1.6E-09
Fluoranthene	1.7E-11
Indeno(1,2,3-cd)pyrene	5.7E-10
Phenanthrene	1.6E-12
Carcinogenic PAH Mixture	1.9E-08
Metals & Metalloids	
Arsenic	1.1E-06
Beryllium	4.1E-09
Cadmium	3.4E-08
Chromium VI	1.8E-07
Nickel	3.1E-08
Volatile Organic Compounds	
Hexachlorobenzene	2.8E-13
Dust Palliatives Constituents	
Epichlorohydrin	1.3E-12

As presented in Table 3-6 and 3-7, the non-cancer and cancer risk estimates for the adult maximum North Delta residential receptor were less than the Health Canada negligible risk levels of 0.2 and 1E-05, respectively, with the exception of the Baseline and Cumulative Scenario HQs for aluminum, arsenic, manganese and nickel. The HQs for these COPCs are discussed below.

- For arsenic and aluminum, the Cumulative Scenario HQ is equivalent to the Baseline Scenario HQ; therefore, the Project contribution for these COPCs is considered to be negligible.

- For manganese, the Baseline Scenario HQ (all routes) is 0.45 and the Project Scenario HQ (all routes) is 0.019, resulting in a Cumulative Scenario HQ of 0.47. The contribution from the Project is considered to be negligible.

- Similar to the above discussion for nickel for the toddler receptor, the inhalation route contributes the most significantly to the overall HQs for the various scenarios, and if the inhalation route is not considered, the Cumulative Scenario HQ for the soil and vegetation pathways of 0.084 is equivalent to the Baseline Scenario HQ (i.e., negligible contribution from the Project) and is less than the Health Canada negligible risk level of 0.2.

- The HQ of 0.46 for the inhalation of nickel for the Cumulative Scenario was greater than 0.2 (0.4 from background and 0.055 from Project emissions). As discussed above for the toddler, a target risk level of 1.0 (versus 0.2) is appropriate for the evaluation of risks associated with the inhalation of nickel based on the mechanism of toxicity specific to this exposure route (i.e., risks from non-inhalation routes would not be additive). In addition, an HQ greater than 0.2 was predicted based on background concentrations, with minimal contribution from the Project emissions. On this basis, unacceptable risks associated with inhalation exposures to nickel are not anticipated.

Based on the above, no unacceptable risks are predicted for the adult maximum North Delta residential receptor exposed to the COPCs in project emissions.

Table 3-8 presents the total hazard quotients and ILCRs estimated for the COPCs identified as being additive. The non-cancer and cancer risk estimates have been compared the Health Canada negligible risk levels of 0.2 and 1E-05, respectively.

Table 3-8: Risk Estimates for Chronic Exposures to COPC Mixtures, Maximum North Delta Residential Receptor (Toddler and Adult)

Exposure Route and Duration	Critical Effect	COPCs Considered Additive	Baseline Risk Estimate	Project Risk Estimate	Cumulative Risk Estimate
Chronic Inhalation	Nasal irritation/nasal lesions	Acetaldehyde, boron, acrolein, epichlorohydrin, formaldehyde, naphthalene, nickel, propionaldehyde	HQ[a,b]: **6.7E-01** HQ[a,c]: **1.2E+00**	HQ[b]: 5.6E-02 HQ[c]: 5.7E-02	HQ[b]: **7.3E-01** HQ[c]: **1.3E+00**
	Respiratory irritation	Chromium III, chromium VI, cobalt, copper, formaldehyde, NO_2, SO_2, propylene, vanadium	HQ: 1.0E+00	HQ: **2.2E-01**	HQ: **1.2E+00**
	Lung cancer	Arsenic, beryllium, cadmium, chromium VI, nickel, PAHs	NA	ILCR: 1.8E-07	NA
	Leukemia	Benzene, 1,3-butadiene	NA	ILCR: 1.4E-09	NA
	Developmental effects	Styrene, xylenes	HQ: 8.2E-03	HQ: 1.0E-05	HQ: 8.2E-03
	Renal toxicity	Cadmium, ethylbenzene, uranium	HQ[a]: 1.8E-02	HQ: 3.2E-03	HQ: 2.2E-02
	Neurotoxicity	n-Hexane, manganese, mercury, toluene	HQ: 6.8E-02	HQ: 2.9E-02	HQ: 9.6E-02

Table 3-8 (Cont'd): Risk Estimates for Chronic Exposures to COPC Mixtures, Maximum North Delta Residential Receptor (Toddler and Adult)

Exposure Route and Duration	Critical Effect	COPCs Considered Additive	Baseline Risk Estimate	Project Risk Estimate	Cumulative Risk Estimate
Chronic Oral	Renal toxicity	Barium, pyrene, mercury, uranium	HQ Adult: 1.5E-01	HQ Adult: 5.3E-03	HQ Adult: 1.5E-01
			HQ Toddler: **3.4E-01**	HQ Toddler: 1.7E-02	HQ Toddler: **3.6E-01**
	Hepatotoxicity	Acenaphthene, copper	HQ Adult: 4.8E-02	HQ Adult: 3.9E-04	HQ Adult: 4.8E-02
			HQ Toddler: 1.7E-01	HQ Toddler: 1.4E-03	HQ Toddler: 1.7E-01
	Reproductive Toxicity	Molybdenum, nickel	HQ Adult: 9.1E-02	HQ Adult: 3.1E-04	HQ Adult: 9.1E-02
			HQ Toddler: **2.1E-01**	HQ Toddler: 8.5E-04	HQ Toddler: **2.1E-01**

Notes:
[a] – no baseline air concentrations were available for boron, epichlorohydrin, propionaldehyde and uranium and therefore, HQs for the Baseline Scenario do not include these COPCs. It is noted that these COPCs are included in the estimation of the HQ for the Project Scenario
[b] – based on the TCEQ chronic ReV for acrolein
[c] – based on the OEHHA chronic REL ofr acrolein
HQ: Hazard Quotient
ILCR: Incremental Lifetime Cancer Risk
NA: not applicable; risk estimates were not predicted for the Baseline and Cumulative Scenario for carcinogens, as the cancer risks are estimates as cancer risks above background
BOLD: indicates risks in excess of Health Canada negligible risk level of 0.2

As presented in Table 3-8, HQs in excess of 0.2 were predicted for the Baseline and Cumulative Scenarios for the COPC mixtures identified as nasal and respiratory irritants for inhalation exposures, as well as the COPCs mixtures identified as renal and reproductive toxicants for oral exposures (toddler only). In the case of the nasal irritants (when the OEHHA chronic inhalation REL is used for acrolein vs. the TCEQ chronic inhalation ReV) and reproductive toxicants, the HQs for the Cumulative Scenario (Baseline + Project) are approximately equivalent to the Baseline Scenario, with negligible contribution from the Project emissions. Therefore, no unacceptable risks are predicted for the chronic inhalation of these COPC mixtures in Project emissions.

The Project emissions contribute very little to the Cumulative HQs estimated for the respiratory irritants (Baseline HQ = 1.0 and Project HQ = 0.2), for the renal toxicants (Baseline HQ = 0.35 and Project HQ = 0.017) as well as for the nasal irritants when the TCEQ chronic inhalation ReV for acrolein is used (Baseline HQ = 0.67 and Project HQ = 0.056). In addition, the exposures to the respiratory irritants, and all COPCs, were estimated using the maximum annual average concentrations for the numerous residential receptors modelled by Levelton (2015). Furthermore, the approach assumes that the maximum concentrations occur at the same location and within the same hour; however, a review of Levelton (2015) indicates that the maximum concentrations occur at different receptors, and thus, the approach overestimates actual risks. Finally, although the COPCs were identified as respiratory irritants, the mechanism of toxicity for the COPCs varies, and thus, the assumption of additivity is conservative. Given the above, no unacceptable risks are predicted for the chronic inhalation of these COPCs mixtures in Project emissions.

3.5.1.1. Maximum North Delta Residential Receptor Conclusions

As presented above, no unacceptable risks are predicted for the maximum North Delta residential receptor (toddler and adult). As described above and throughout the 2014 HHRA, the approach used to estimate exposures for this receptor, and all receptors, is highly conservative and will tend to overestimate exposures and therefore associated risks. In addition, as presented in the 2014 HHRA, the evaluation of the maximum North Delta residential receptor is protective of agricultural receptors, commercial receptors and urban park users in the area of the Project.

3.5.2. Industrial Receptor

The risk estimates for the industrial receptor are presented below for the Baseline Scenario, Project Scenario and Cumulative Scenario.

Table 3-9 summarizes the acute inhalation risk estimates for each of the Baseline, Project and Cumulative Scenarios for COPCs with acute inhalation TRVs; the risk estimates are also presented in Tables III-1A (Baseline Scenario), III-1D (Project Scenario) and III-1G (Cumulative Scenario) in Appendix III.

Table 3-9: Risk Estimates for Acute Inhalation Exposures – Industrial Receptor (Adult)

COPC	Hazard Quotient: Baseline Scenario	Hazard Quotient: Project Scenario	Hazard Quotient: Cumulative Scenario
Metals			
Arsenic	3.6E-02	1.4E-02	5.0E-02
Boron	--	1.2E-08	NC
Cadmium	6.3E-01	7.2E-01	**1.4E+00**
Copper	1.1E-03	1.3E-04	1.2E-03
Manganese	1.9E-01	7.3E-04	1.9E-01
Mercury	--	2.4E-04	NC
Nickel	6.9E-02	4.4E-05	6.9E-02
Vanadium	8.9E-04	5.4E-02	5.5E-02
VOCs			
Acetaldehyde	7.1E-03	7.3E-03	1.4E-02
Acrolein[a]	1.8E-02	1.1E-01	1.3E-01
Acrolein[b]	8.0E-02	4.8E-01	5.6E-01
Benzene	3.0E-02	7.7E-03	3.8E-02
1,3-Butadiene	1.6E-03	8.4E-04	2.4E-03
Ethylbenzene	2.2E-04	5.2E-06	2.3E-04
Formaldehyde	8.8E-02	8.3E-02	1.7E-01
Toluene	1.8E-03	3.6E-05	1.9E-03
Styrene	1.1E-03	1.0E-06	1.1E-03
Xylenes	2.1E-03	2.9E-05	2.1E-03

Table 3-9 (Cont'd): Risk Estimates for Acute Inhalation Exposures – Industrial Receptor (Adult)

COPC	Hazard Quotient: Baseline Scenario	Hazard Quotient: Project Scenario	Hazard Quotient: Cumulative Scenario
Dust Palliatives Chemical Constituents			
Epichlorohydrin	--	3.5E-08	NC
Others			
Sulfate	6.1E-02	3.3E-01	3.9E-01
Criteria Air Contaminants			
CO (1 hour)	4.3E-02	3.1E-02	7.4E-02
CO (8 hour)	1.0E-01	5.5E-02	1.6E-01
NO_2 (1 hour)	3.3E-01	2.5E-01	5.8E-01
SO_2 (1 hour)	6.2E-02	1.6E-01	2.2E-01
SO_2 (24 hour)	9.0E-01	1.4E-01	1.0E+00
$PM_{2.5}$ (24 hour)	4.8E-01	2.2E-01	7.0E-01
PM_{10} (24 hour)	5.4E-01	3.7E-01	9.1E-01
Nasal irritants (acrolein, *boron,* formaldehyde, toluene, styrene)**[a]	1.1E-01	1.9E-01	3.0E-01
Nasal irritants (acrolein, *boron,* formaldehyde, toluene, styrene)**[b]	1.7E-01	5.7E-01	7.4E-01
Ocular irritants (acrolein, epichlorohydrin, formaldehyde, toluene)** [a]	1.1E-01	1.9E-01	3.0E-01
Ocular irritants (acrolein, epichlorohydrin, formaldehyde, toluene)** [b]	1.7E-01	5.7E-01	7.4E-01
Respiratory irritants (acetaldehyde, cadmium, epichlorohydrin, formaldehyde, NO_2, SO_2, vanadium, xylenes, sulfate)**	**1.2E+00**	**1.6E+00**	**2.8E+00**

Notes:
[a] – based on the TCEQ 1 hour ReV for acrolein
[b] – based on the OEHHA 1 hour REL for acrolein
ND: no baseline air data were available for COPC (see discussion in Section 7)
NC: not calculated; cumulative risks could not be calculated based on a lack of baseline air data for COPC
** – no baseline air data were available for boron and epichlorohydrin; as discussed in previous sections of the report, due to a lack of sources, baseline air concentrations are not expected to appreciably contribute to exposures
BOLD: indicates risks in excess of the target risk level of 1E+00 for acute exposures

As presented in Table 3-9, the HQs for the industrial receptor's acute exposures to the individual COPCs for each of the Baseline, Project and Cumulative Scenarios were below or equal to the target hazard quotient of 1.0 for acute exposures, with the exception of the HQ for cadmium (HQ = 1.4). On this basis, unacceptable health risks are not predicted for acute exposures to the individual COPCs in the Project emissions, with the exception of cadmium.

As discussed in Section 3 of the 2014 HHRA, people involved in fishing activities were identified as receptors of concern with the potential to be exposed to Project emissions on an acute basis; the 2014 HHRA concluded that the characterization of acute inhalation exposures and risks for the industrial receptor was protective of people involved in fishing activities. As such, the HQs presented in Table 3-9 are also representative of potential risks for people involved in fishing activities.

The HQs for cadmium were estimated using the ATSDR acute MRL of 0.03 µg/m^3. The TRV is highly conservative as it is based on a sub-acute study (i.e., a 5 days a week for 2 weeks repeat exposure study) versus an acute study. By definition, ATSDR's acute MRL for cadmium is an estimate of the daily human exposure to cadmium that is likely to be without appreciable risk of adverse non-cancer health effects over a continuous exposure period of up to 14 days (ATSDR, 2012a). The TRV was conservatively selected for use in the 2014 HHRA based on a lack of other acute inhalation TRVs from the primary TRV sources considered; the use of the conservative TRV in the 2014 HHRA did not result in the prediction of unacceptable risks. Given the conservative nature of the acute inhalation TRV for cadmium, the estimated HQ is considered to over predict risks. The HQ has been calculated based on the maximum 1 hour concentration of cadmium predicted by Levelton (2015); however, given the sub-acute nature of the TRV, estimation of risks using the maximum 24-hour concentration is considered appropriate. When the maximum 24-hour concentration is used, the HQs for cadmium for the Project and Cumulative Scenarios are 2.9E-02 and 6.6E-01, respectively, and are below the target HQ of 1.0. On this basis, no unacceptable risks are predicted for the industrial receptor's (and people involved in fishing activities) acute inhalation exposures to cadmium.

The maximum mixture HQ estimated for the COPCs identified as respiratory irritants exceeded the target risk level of 1.0 for the Baseline (HQ=1.2), Project (HQ=1.6) and Cumulative (HQ=2.8) Scenarios.

As discussed in Section 3.5.1, the maximum mixture HQs for respiratory irritants were estimated in the 2014 HHRA using a conservative approach, and are considered to be worst-case (i.e., the most conservative) estimates. The mixture HQs for the respiratory irritants presented in Table 3-9 have been estimated using the same approach (i.e., assuming additivity based on the same target site, but without considering mechanism of action). When cadmium and formaldehyde are not included in the mixture of respiratory irritants based on their differing mechanisms of action, the mixture HQs for the acute inhalation of the respiratory irritants for the Baseline, Project and Cumulative Scenarios are 4.6E-01, 8.0E-01 and 1.3E+00, respectively, with both the Baseline and the Project HQs less than the target HQ of 1.0, and the Cumulative Scenario HQ exceeding the target HQ of 1.0. The risk estimates for acute inhalation exposures for the industrial receptor, not including cadmium and formaldehyde, are presented in Table 3-10.

Table 3-10: Risk Estimates for Acute Inhalation Exposures of Mixture of Respiratory Irritants, Not Including Cadmium and Formaldehyde – Industrial Receptor (Adult)

COPC	Hazard Quotient: Baseline Scenario	Hazard Quotient: Project Scenario	Hazard Quotient: Cumulative Scenario
Respiratory irritants (acetaldehyde, epichlorohydrin, NO_2, SO_2, vanadium, xylenes, sulfate)	4.6E-01	8.0E-01	1.3E+00

Further to the above, the mixture HQs were estimated using the maximum overall predicted acute (e.g., 1 hour) concentrations from Levelton (2015). These maximum concentrations would occur on an infrequent basis (i.e., 1 hour of the year). Additionally, the approach assumes that the maximum concentrations of each of the COPCs occur at the same location within the same hour; however, a review of Levelton (2015) indicates that the maximum concentrations occur at different receptors and in some cases, within different hours of the modeling period. On this basis, the approach overestimates actual risks.

Further assessment of potential acute inhalation risks was conducted for the industrial receptor to provide more reasonable estimates of potential risks. The receptor with the highest worst-case (i.e., the most conservative) Cumulative Scenario mixture HQ (of 1.3) was located on the FSD fenceline, over the Fraser River. Further analysis was conducted for this receptor; the results indicated the following:

- Cumulative Scenario HQs for the mixture of respiratory irritants were predicted for each hour of the modelling period (9336 hours), with HQs > 1.0 only predicted to occur 1% of the time, and HQs > 1.1 only predicted to occur 0.1% of the time.

- The 95% upper confidence limit of the mean for the Cumulative Scenario HQs for the mixture of respiratory irritants predicted over the modelling period (9336 hours) was 7.0E-01 and is below the target HQ of 1.0.

- The 90th and 95th percentile of the Cumulative Scenario HQs for the mixture of respiratory irritants predicted over the modelling period (9336 hours) were 8.7E-01 and 9.4E-01, respectively, are below the target HQ of 1.0.

Based on the above, no unacceptable risks are predicted for acute inhalation exposures for the industrial receptor. In addition, as noted in the 2014 HHRA, fishing boats would not be expected to frequent the area within or near the FSD fenceline/berth (i.e., within the breakwater) due to safety concerns. Based on the results of the AQA (Levelton, 2015), the predicted air concentrations from Project emissions will decrease with distance from the fenceline. On this basis, lower HQs are predicted for people involved in fishing activities and therefore, no unacceptable risks are predicted for their acute inhalation exposures to Project emissions.

Chronic inhalation risks associated with exposures to the non-carcinogenic gaseous COPCs, compared to the Health Canada negligible risk level of 0.2, with a target HQ of 1.0 used for the CACs, are presented in Table 3-11 and in Tables III-2A, III-2D and III-2G. The risks associated with chronic inhalation exposures to the COPC mixtures identified as having the potential to be additive are presented in Table 3-15. It is noted that no amortization has been assumed for the CACs; this approach is conservative, and will tend to overestimate risks.

Table 3-11: Non-Cancer Risk Estimates for Chronic Inhalation Exposures to Gaseous COPCs – Industrial Receptor (Adult)

Chemical	Baseline Hazard Quotient	Project Hazard Quotient	Cumulative Hazard Quotient
VOCs			
Acetaldehyde	2.2E-03	9.3E-05	2.3E-03
Acrolein[a]	2.0E-02	4.5E-04	2.0E-02
Acrolein[b]	1.5E-01	3.5E-03	1.6E-01
Benzene	4.9E-03	3.3E-04	5.2E-03
1,3-Butadiene	8.3E-02	3.1E-04	8.4E-02
Ethylbenzene	3.7E-04	4.0E-06	3.7E-04
Ethylene*	--	--	
Formaldehyde	1.8E-01	1.5E-03	1.8E-01
Hexachlorobenzene**	NA	--	--
n-Hexane	1.9E-04	4.2E-06	2.0E-04
Propionaldehyde	NA	3.8E-04	NC
Propylene (1-Propene)	3.6E-05	8.0E-07	3.7E-05
Toluene	2.7E-04	2.2E-06	2.7E-04
2,2,4-Trimethylpentane*	--	--	--
Styrene	4.0E-04	5.6E-06	4.0E-04
Xylenes	1.7E-03	1.4E-05	1.7E-03
Criteria Air Contaminants			
NO_2 (100%)	6.8E-01	4.7E-01	**1.1E+00**
SO_2	1.6E-01	1.7E-02	1.8E-01
$PM_{2.5}$ (based on AAQO of 8 µg/m^3)	5.5E-01	8.2E-02	6.3E-01
$PM_{2.5}$ (based on planning AAQO of 6 µg/m^3)	7.3E-01	1.1E-01	8.4E-01
PM_{10}	6.0E-01	9.0E-02	6.9E-01
DPM	4.2E-02	1.0E-01	1.4E-01

Notes:
[a] – based on the TCEQ 1 hour ReV for acrolein
[b] – based on the OEHHA 1 hour REL for acrolein
ND: no baseline air data were available for COPC (see discussion in Section 7)
NC: not calculated; cumulative risks could not be calculated based on a lack of baseline air data for COPC
* – risks could not be predicted for ethylene and 2,2,4-trimethylpentane as no TRVs were identified for these COPCs
** – evaluated as a carcinogen only

The non-carcinogenic risks associated with chronic inhalation exposures to VOCs from Project emissions are less than the Health Canada negligible risk level of 0.2 for the Baseline, Project and Cumulative Scenarios for all VOC COPCs.

In addition, the HQs for the CACs were less than the target HQ of 1.0 for all three scenarios, with the exception of the Cumulative Scenario HQ for NO_2. Exposures to the CACs, including NO_2, were conservatively estimated assuming no amortization (i.e., it has been assumed that industrial receptors would be exposed for 24 hours a day). As discussed in Section 3.2.2.1, Levelton (2015) predicted concentrations of NO_2 (maximum concentration of 46 µg/m^3) in excess of the AAQO at and adjacent to the FSD fenceline, in a region concentrated over the Fraser River. The exceedances were confined to maximum area of approximately 300 m^2 area over the river, and Levelton (2015) indicated that predicted annual average concentrations of NO_2 decrease with distance from the FSD fenceline, with concentrations below the AAQO of 40 µg/m^3 a maximum of approximately 80 m from the fenceline, in an area over the Fraser River. Given that the exceedances are located at the fenceline and over the river, the potential for exposures to the elevated NO_2 are limited to receptors that would spend time in this area. As noted, people involved in fishing activities were identified as receptors of concern; however, it was determined that people involved in fishing activities would only be exposed to Project emissions on an acute basis. As presented in Table 3-9, the HQ predicted for NO_2 based on acute inhalation risks (0.58) is less than the target HQ of 1.0 and therefore no unacceptable risks are predicted based on acute exposures to NO_2. Furthermore, SNC-Lavalin understands that monitoring for NO_2 will be conducted as part of the AQMP under development for the Project. Based on the above, no unacceptable non-cancer risks are predicted for the industrial receptor's (and for people involved in fishing activities) chronic inhalation of gaseous COPCs in Project emissions.

Chronic inhalation risks associated with exposures to the carcinogenic gaseous COPCs are presented in Table 3-12 and in Table III-2D. The ILCRs have been compared to the Health Canada negligible risk level of 1E-05.

Table 3-12: Cancer Risk Estimates for Chronic Exposures to Gaseous COPCs – Industrial Receptor (Adult)

Chemical	Project Scenario ILCR
VOCs	
Acetaldehyde	7.2E-10
Benzene	1.1E-09
1,3-Butadiene	1.3E-10
Hexachlorobenzene	3.1E-13
Criteria Air Contaminants	
DPM	5.1E-06

Notes:
ILCR – Incremental lifetime cancer risk

The ILCR estimates (cancer risks above background) associated with chronic inhalation exposures to the gaseous COPCs were less than the Health Canada negligible risk level of 1E-05, and therefore no unacceptable risks are predicted for the industrial receptor's chronic inhalation of the gaseous, carcinogenic COPCs in Project emissions.

The non-cancer risk estimates for the industrial receptor's (adult) multi-media exposure to the Project COPCs are presented in Table 3-13, and in Table III-7A, III-7B and III-7C. The estimated HQs have been compared to the Health Canada negligible risk level of 0.2 for non-carcinogens.

Table 3-13: Chronic Risks for Multi-Pathway Exposures, Industrial Receptor (Adult)

Chemical	Baseline Scenario			Project Scenario			Cumulative Scenario		
	HQ_{inh}	HQ_{soil}	HQ_{all}	HQ_{inh}	HQ_{soil}	HQ_{all}	HQ_{inh}	HQ_{soil}	HQ_{all}
Carcinogenic PAHs									
Benzo(a)anthracene	1.7E-06	4.8E-06	6.5E-06	9.5E-06	2.1E-08	9.5E-06	1.1E-05	4.8E-06	1.6E-05
Benzo(a)pyrene	8.6E-07	5.6E-06	6.5E-06	1.1E-07	3.9E-08	1.5E-07	9.7E-07	5.7E-06	6.6E-06
Benzo(b)fluoranthene	1.5E-06	8.5E-06	1.0E-05	3.8E-07	8.0E-09	3.8E-07	1.9E-06	8.5E-06	1.0E-05
Benzo(g,h,i)perylene	NA	3.5E-06	3.5E-06	3.4E-08	1.3E-08	4.6E-08	NC	3.5E-06	3.5E-06
Benzo(k)fluoranthene	6.5E-07	3.4E-06	4.0E-06	8.3E-08	3.3E-08	1.2E-07	7.3E-07	3.4E-06	4.1E-06
Chrysene	NA	5.6E-06	5.6E-06	1.6E-07	4.5E-08	2.0E-07	NC	5.7E-06	5.7E-06
Dibenzo(a,h)anthracene	NA	8.5E-07	8.5E-07	2.1E-08	9.8E-09	3.1E-08	NC	8.6E-07	8.6E-07
Fluoranthene	1.1E-05	9.1E-06	2.0E-05	5.5E-07	1.0E-08	5.6E-07	1.2E-05	9.1E-06	2.1E-05
Indeno(1,2,3-cd)pyrene	4.1E-06	3.8E-06	7.9E-06	8.6E-08	3.2E-08	1.2E-07	4.2E-06	3.8E-06	8.0E-06
Phenanthrene	3.4E-05	7.3E-06	4.2E-05	4.8E-07	2.4E-10	4.9E-07	3.5E-05	7.3E-06	4.2E-05
Carcinogenic PAH Mixture	5.4E-05	5.3E-05	6.5E-05	1.1E-05	2.1E-07	1.1E-05	6.6E-05	5.3E-05	1.2E-04
Non-Carcinogenic PAHs									
Acenaphthene	2.4E-06	1.4E-07	2.5E-06	9.1E-08	9.1E-12	9.1E-08	2.5E-06	1.4E-07	2.6E-06
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	3.4E-07	1.1E-07	4.6E-07	9.3E-07	1.2E-11	9.3E-07	1.3E-06	1.1E-07	1.4E-06
Fluorene	8.2E-06	4.2E-07	8.6E-06	1.4E-07	1.9E-11	1.4E-07	8.4E-06	4.2E-07	8.8E-06
Fluoranthene	1.1E-05	9.1E-06	2.0E-05	5.5E-07	1.0E-08	5.6E-07	1.2E-05	9.1E-06	2.1E-05
Naphthalene	4.1E-03	4.2E-07	4.1E-03	1.9E-05	4.1E-13	1.9E-05	4.1E-03	4.2E-07	4.1E-03
2-Methylnaphthalene	NA	2.1E-06	2.1E-06	2.1E-07	3.1E-12	2.1E-07	NC	2.1E-06	2.1E-06
Pyrene	1.1E-05	9.9E-06	2.0E-05	9.4E-07	1.8E-08	9.6E-07	1.1E-05	9.9E-06	2.1E-05
Non-Carcinogenic PAH Mixture	4.2E-03	2.2E-05	4.2E-03	2.2E-05	2.8E-08	2.2E-05	4.2E-03	2.2E-05	4.2E-03

Table 3-13 (Cont'd): Chronic Risks for Multi-Pathway Exposures, Industrial Receptor (Adult)

Chemical	Baseline Scenario			Project Scenario			Cumulative Scenario		
	HQ_{inh}	HQ_{soil}	HQ_{all}	HQ_{inh}	HQ_{soil}	HQ_{all}	HQ_{inh}	HQ_{soil}	HQ_{all}
Metals & Metalloids									
Antimony	NA	5.9E-05	5.9E-05	7.1E-06	8.1E-07	7.9E-06	NC	6.0E-05	6.7E-05
Arsenic	1.3E-04	4.7E-03	4.9E-03	7.7E-05	6.5E-05	1.4E-04	2.1E-04	4.8E-03	5.0E-03
Barium	9.9E-04	1.3E-04	1.1E-03	1.9E-02	4.3E-05	1.9E-02	2.0E-02	1.7E-04	2.0E-02
Beryllium	1.2E-05	4.4E-05	5.6E-05	2.3E-03	2.5E-06	2.3E-03	2.3E-03	4.7E-05	2.3E-03
Cadmium	4.7E-03	5.8E-05	4.7E-03	4.0E-03	1.9E-06	4.0E-03	8.7E-03	6.0E-05	8.7E-03
Chromium III	3.5E-05	7.0E-06	4.2E-05	3.4E-05	1.7E-09	3.4E-05	6.9E-05	7.0E-06	7.6E-05
Chromium VI	1.7E-03	6.2E-05	1.8E-03	8.0E-05	7.3E-05	1.5E-04	1.8E-03	1.4E-04	1.9E-03
Cobalt	7.1E-05	2.7E-04	3.4E-04	8.5E-04	2.9E-06	8.5E-04	9.2E-04	2.7E-04	1.2E-03
Copper	9.3E-04	5.4E-05	9.9E-04	7.3E-04	1.8E-06	7.3E-04	1.7E-03	5.6E-05	1.7E-03
Lead	5.9E-03	2.7E-03	8.6E-03	9.6E-04	1.7E-05	9.8E-04	6.8E-03	2.7E-03	9.6E-03
Manganese	1.5E-02	2.3E-03	1.7E-02	2.1E-02	7.8E-06	2.1E-02	3.6E-02	2.3E-03	3.8E-02
Mercury	3.9E-07	3.5E-08	4.3E-07	4.3E-07	3.6E-08	4.6E-07	8.2E-07	7.1E-08	8.9E-07
Molybdenum	1.0E-04	3.6E-05	1.4E-04	1.6E-04	3.7E-05	1.9E-04	2.6E-04	7.3E-05	3.3E-04
Nickel	1.1E-01	1.9E-03	1.1E-01	6.3E-02	2.3E-05	6.3E-02	1.7E-01	1.9E-03	1.7E-01
Selenium	2.5E-06	1.1E-05	1.3E-05	1.8E-06	1.4E-06	3.2E-06	4.2E-06	1.2E-05	1.6E-05
Strontium	7.1E-08	3.9E-05	3.9E-05	4.7E-06	8.0E-06	1.3E-05	4.8E-06	4.7E-05	5.2E-05
Tin	1.3E-08	3.6E-07	3.7E-07	7.2E-09	2.5E-09	9.8E-09	2.0E-08	3.6E-07	3.8E-07
Uranium	NA	4.4E-04	4.4E-04	4.8E-04	1.3E-05	5.0E-04	NC	4.5E-04	9.3E-04
Vanadium	7.1E-03	1.1E-03	8.3E-03	3.1E-02	1.7E-05	3.1E-02	3.8E-02	1.1E-03	3.9E-02
Zinc	1.3E-06	4.8E-05	4.9E-05	4.0E-07	4.9E-07	8.9E-07	1.7E-06	4.9E-05	5.0E-05
Aluminum	3.2E-08	1.6E-02	1.6E-02	9.8E-05	1.6E-04	2.6E-04	9.8E-05	1.6E-02	1.6E-02
Boron	NA	NA	NA	3.2E-06	1.3E-05	1.6E-05	NC	NC	NC
Iron	4.4E-06	8.1E-03	8.1E-03	4.1E-05	6.9E-05	1.1E-04	4.5E-05	8.2E-03	8.2E-03
Titanium	NA	8.6E-05	8.6E-05	6.8E-07	1.1E-06	1.8E-06	NC	8.7E-05	8.8E-05
VOCs									
Hexachlorobenzene	NA	NA	NA	5.1E-09	2.0E-11	5.1E-09	NC	NC	NC
Dust Palliatives Constituents									
Epichlorohydrin[a]	NA	NA	NA	1.8E-05	1.2E-13	1.8E-05	NC	NC	NC
Others									
PCBs	NA	NA	NA	7.5E-03	8.9E-05	7.6E-03	NC	NC	NC
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
NA – Not applicable; HQ could not be estimated based on a lack of TRVs for COPC
ND – no baseline data available for COPC
NC – not calculated based on a lack of baseline data for COPC
BG > Project – cumulative risks were not estimated as the background soil concentration of the COPC was greater than the concentration of the COPC in coal (see discussion in Section 4.1.2)
BOLD: indicates risks in excess of Health Canada negligible risk level of 0.2

Table 3-13 presents the non-cancer risk estimates for the industrial receptor exposed to the Project non-gaseous COPCs via inhalation and the direct soil pathways. The ingestion of produce pathway was not considered to be operable for the industrial receptor. The Cumulative Scenario HQs are less than the Health Canada negligible risk level of 0.2. On this basis, no unacceptable risks are predicted for the industrial receptor for the COPCs presented in Table 3-13.

Table 3-14 and Table III-7B present the cancer risks for an industrial receptor (adult) for their multi-media exposure to the Project COPCs. The estimated ILCRs have been compared to the Health Canada negligible risk level of 1E-05 for carcinogens.

Table 3-14: Cancer Risks for Multi-Pathway Exposures, Industrial Receptor (Adult)

Chemical	Project Scenario ILCR
Carcinogenic PAHs	
Benzo(a)pyrene	1.2E-09
Benzo(a)anthracene	5.3E-10
Benzo(b)fluoranthene	4.3E-11
Benzo(g,h,i)perylene	4.0E-12
Benzo(k)fluoranthene	1.0E-10
Chrysene	1.4E-11
Dibenzo(a,h)anthracene	3.1E-10
Fluoranthene	7.8E-13
Indeno(1,2,3-cd)pyrene	1.0E-10
Phenanthrene	2.5E-13
Carcinogenic PAH Mixture	2.3E-09
Metals & Metalloids	
Arsenic	7.7E-08
Beryllium	1.4E-08
Cadmium	4.9E-08
Chromium VI	8.9E-08
Nickel	3.6E-08
VOCs	
Hexachlorobenzene	3.4E-13
Dust Palliatives Constituents	
Epichlorohydrin	2.7E-12

As presented in Table 3-14, the cancer risk estimates for the industrial receptor (adult) were less than the Health Canada negligible risk level of 1E-05, and thus, no unacceptable cancer risks are predicted for the industrial receptor.

Table 3-15 presents the total HQs and ILCRs estimated for the COPCs identified as being additive. The non-cancer and cancer risk estimates have been compared the Health Canada negligible risk levels of 0.2 and 1E-05, respectively.

Table 3-15: Risk Estimates for Chronic Exposures to COPC Mixtures, Industrial Receptor (Adult)

Exposure Route and Duration	Critical Effect	COPCs Considered Additive	Baseline Risk Estimate	Project Risk Estimate	Cumulative Risk Estimate
Chronic Inhalation	Nasal irritation/nasal lesions	Acetaldehyde, boron, acrolein, epichlorohydrin, formaldehyde, naphthalene, nickel, propionaldehyde	HQ[a]: **3.1E-01** HQ[b]: **4.5E-01**	HQ[a]: 6.5E-02 HQ[b]: 6.8E-02	HQ[a]: **3.8E-01** HQ[b]: **5.1E-01**
	Respiratory irritation	Chromium III, chromium VI, cobalt, copper, formaldehyde, NO_2, SO_2, propylene, vanadium	HQ: **1.0E+00**	HQ[c]: **5.3E-01**	HQ[c]: **1.5E+00**
	Lung cancer	Arsenic, beryllium, cadmium, chromium VI, nickel, PAHs	NA	ILCR: 2.4E-07	NA
	Leukemia	Benzene, 1,3-butadiene	NA	ILCR: 1.2E-09	NA
	Developmental effects	Styrene, xylenes	HQ: 2.1E-03	HQ: 1.9E-05	HQ: 2.1E-03
	Renal toxicity	Cadmium, ethylbenzene, uranium	HQ: 5.0E-03	HQ: 4.5E-03	HQ: 9.5E-03
	Neurotoxicity	n-Hexane, manganese, mercury, toluene	HQ: 1.9E-02	HQ: 2.1E-02	HQ: 4.0E-02
Chronic Oral	Renal toxicity	Barium, pyrene, mercury, uranium	HQ: 1.4E-04	HQ: 5.6E-05	HQ: 1.9E-04
	Hepatotoxicity	Acenaphthene, copper	HQ: 5.5E-05	HQ: 1.8E-06	HQ: 5.6E-05
	Reproductive Toxicity	Molybdenum, nickel	HQ: 1.9E-03	HQ: 6.0E-05	HQ: 1.9E-03

Notes:
[a] – based on the TCEQ chronic ReV for acrolein
[b] – based on the OEHHA chronic REL ofr acrolein
HQ: Hazard Quotient
ILCR: Incremental Lifetime Cancer Risk
NA: not applicable; risk estimates were not predicted for the Baseline and Cumulative Scenario for carcinogens, as the cancer risks are estimates as cancer risks above background
BOLD: indicates risks in excess of Health Canada negligible risk level of 0.2

As presented in Table 3-15, HQs in excess of 0.2 were predicted for the Baseline and Cumulative Scenarios for the COPC mixtures identified as nasal irritants for inhalation exposures, and for the Baseline, Project and Cumulative Scenarios for the COPCs identified as respiratory irritants.

For the nasal irritants, the maximum Baseline HQ is 0.45 (based on the OEHHA chronic inhalation REL for acrolein) and the Project HQ is 0.068, resulting in a maximum Cumulative Scenario HQ of 0.51. The Project HQ is approximately equivalent to the inhalation HQ estimated for nickel (0.063). As discussed above, in the case of nickel, a target HQ of 1.0 for risks associated with inhalation exposures is appropriate as the mechanism of toxicity is specific to the inhalation route of exposure. The remaining COPCs in the mixture contribute negligibly to the Project HQ for the mixture and, therefore, no unacceptable risks are predicted for the COPC mixture of nasal irritants in Project emissions. When the HQ for nickel is not included in the estimation of the Baseline HQ (based on the use of a target risk level of 1.0), the estimated HQ ranges from of 0.3 (when the OEHHA REL for acrolein is used) to 0.2 (when the TCEQ ReV, which is considered to be more robust, for acrolein is used). It is noted that although the COPCs in the group are nasal irritants, the mechanism of toxicity varies, and thus the assumption of additivity is conservative. In addition, given the conservative approach used to estimate exposures, including the assumption that all predicted maximum concentrations occur at the same location, no unacceptable risks are predicted for cumulative (Baseline + Project) exposures to the nasal irritants.

For the respiratory irritants, NO_2 has the highest relative contribution to the HQ for the Project Scenario (HQ for NO_2 = 0.47 compared to the Project HQ = 0.53). The Project Scenario HQ for NO_2 is based on the maximum predicted annual average NO_2 concentration. As discussed above, the maximum NO_2 concentrations were predicted at the FSD fenceline and in areas over the Fraser River. Based on the locations of the maximum concentrations, it was determined that persons would be at these locations for only short durations and exposures to these concentrations would only be on an acute basis, and therefore, no unacceptable risks were predicted for NO_2. When NO_2 is not included in the COPC mixture, the Cumulative HQ for the respiratory irritants is essentially equivalent to the Baseline HQ, indicating negligible contribution from the Project. On this basis, no unacceptable risks are predicted for the COPCs identified as respiratory irritants in Project emissions.

3.5.2.1. Conclusions for the Industrial Receptor

Exposures and associated risks for the industrial receptor were predicted using conservative assumptions, including exposure to the maximum predicted concentrations at the fenceline. As presented above, no unacceptable risks are predicted for the industrial receptor. As indicated, the characterization of exposures and associated risks for the industrial receptor are protective of people involved in fishing activities. Therefore, no unacceptable risks are predicted for people involved in fishing activities.

4. CONCLUSIONS OF THE HHRA

As described in the 2014 HHRA, the HHRA was conducted using methods and guidance recommended by Health Canada, and using a series of conservative assumptions that are health protective, and will tend to overpredict exposures, and therefore risks, to receptors in the Study Area. Consideration of the Project Amendment does not change the conclusions as presented in the 2014 HHRA. Despite the conservative approach used, no unacceptable risks were predicted for the receptors in the Study Area (residents, commercial workers, urban park users, agricultural receptors), including the maximum North Delta residential receptor, industrial workers and people involved in fishing activities.

SNC-Lavalin also understands that the Air Quality Management Plan required for the Project includes air monitoring to validate the results of the air dispersion modelling.

5. NOTICE TO READER

This report has been prepared and the work referred to in this report have been undertaken by the Environment & Water business unit of SNC-Lavalin Inc. (SNC-Lavalin) for the exclusive use of Fraser Surrey Docks LP (FSD), who has been party to the development of the scope of work and understands its limitations. The methodology, findings, conclusions and recommendations in this report are based solely upon the scope of work and subject to the time and budgetary considerations described in the proposal and/or contract pursuant to which this report was issued. Any use, reliance on, or decision made by a third party based on this report is the sole responsibility of such third party. SNC-Lavalin accepts no liability or responsibility for any damages that may be suffered or incurred by any third party as a result of the use of, reliance on, or any decision made based on this report.

The findings, conclusions and recommendations in this report (i) have been developed in a manner consistent with the level of skill normally exercised by professionals currently practicing under similar conditions in the area, and (ii) reflect SNC-Lavalin's best judgment based on information available at the time of preparation of this report. No other warranties, either expressed or implied, are made as to the professional services provided under the terms of our original contract and included in this report. The findings and conclusions contained in this report are valid only as of the date of this report and may be based, in part, upon information provided by others. If any of the information is inaccurate, new information is discovered, site conditions change or applicable standards are amended, modifications to this report may be necessary. The results of this assessment should in no way be construed as a warranty that the subject site is free from any and all contamination.

Any soil and rock descriptions in this report and associated logs have been made with the intent of providing general information on the subsurface conditions of the site. This information should not be used as geotechnical data for any purpose unless specifically addressed in the text of this report. Groundwater conditions described in this report refer only to those observed at the location and time of observation noted in the report.

This report must be read as a whole, as sections taken out of context may be misleading. If discrepancies occur between the preliminary (draft) and final version of this report, it is the final version that takes precedence. Nothing in this report is intended to constitute or provide a legal opinion.

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We trust the presented information meets your needs. If you have any questions or concerns, please contact the undersigned at your convenience.

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APPENDICES
I: Summary of Levelton (2015) AQA Results
II: Exposure Point Concentrations and Exposure Model Details
III: Risk Estimates

APPENDIX I

Summary of Levelton (2015) AQA Results

Table I-1: Results of Levelton (2015) Revised AQA: Maximum Predicted Concentrations at the FSD Fenceline and at the Maximum North Delta Residential Receptor

CAC	Averaging Time	Metro Vancouver[a] (µg/m^3)	CCME[b]			British Columbia[d]			WHO (µg/m^3)	Back-ground (µg/m^3)	Maximum Concentration (µg/m^3)								Maximum Concentration + Background (µg/m^3)							
											Maximum Receptor				Nearest Residential Receptor				Maximum Receptor				Nearest Residential Receptor			
			Maximum Desirable (µg/m^3)	Maximum Acceptable (µg/m^3)	Maximum Tolerable (µg/m^3)	Level A (µg/m^3)	Level B (µg/m^3)	Level C (µg/m^3)			Coal	Agri	Combust -ion	Total	Coal	Agri	Combust -ion	Total	Coal	Agri	Combust -ion	Total	Coal	Agri	Combust -ion	Total
CO	1-hour	30,000	15,000	35,000	-	14,300	28,000	35,000	30,000[e]	617.5	-	-	446.9	446.9	-	-	161.3	161.3	-	-	1064.3	1064.3	-	-	778.8	778.8
	8-hour	10,000	6,000	15,000	20,000	5,500	11,000	14,300	10,000[e]	555	-	-	302	302	-	-	107	107	-	-	857	857	-	-	662	662
NO_2 (ARM*)	1-hour	200	-	400	1,000	-	-	-	200[f]	66*	-	-	117	117	-	-	104	104	-	-	117	117	-	-	104	104
NO_2 (100%**)	Annual	40	60	100	-	-	-	-	40[f]	27	-	-	19	19			8	8			46	46			35	35
SO_2	1-hour	200	450	900	-	450	900	900	-	27.7	-	-	31.6	31.6	-	-	14.1	14.1	-	-	59.3	59.3	-	-	41.8	41.8
	24-hour	125	150	300	800	160	260	360	20[f]	17.83	-	-	2.84	2.84	-	-	1.65	1.65	-	-	20.67	20.67	-	-	19.48	19.48
	Annual	30	30	60	-	25	50	80	-	3.78	-	-	0.436	0.436	-	-	0.136	0.136	-	-	4.213	4.213	-	-	3.913	3.913
PM_{10}	24-hour Rolling	50	-	-	-	50	-	-	50[f]	26.75	7.26	16.20	4.57	18.44	4.70	1.80	4.05	4.91	34.01	42.96	31.33	25.20	31.46	28.56	30.81	31.66
	Annual	20	-	-	-	-	-	-	20[f]	12.01	0.72	1.28	0.53	1.80	0.23	0.04	0.19	0.46	12.73	13.29	12.54	13.81	12.24	12.05	12.20	12.47
$PM_{2.5}$	24-hour Rolling	25	30[c] (2015: 28)[2] (2020: 27)[2]	-	-	25	-	-	25[f]	12.53	1.52	4.09	4.38	5.55	0.71	0.43	3.92	3.98	14.06	16.63	16.91	18.08	13.24	12.96	16.46	16.51
	Annual	8(6)	(2015: 10)[2] (2020: 8.8)[2]	-	-	8(6)	-	-	10[f]	4.45	0.18	0.32	0.50	0.66	0.08	0.01	0.18	0.27	4.62	4.77	4.95	5.11	4.53	4.46	4.63	4.72
TPM	24-hour	120	-	-	-	-	-	-	-	55.74	14.98	41.96	4.20	46.69	9.38	4.54	3.93	9.54	70.71	97.69	59.94	102.43	65.12	60.27	59.67	65.28
	Annual	60	-	-	-	-	-	-	-	25.12	1.85	3.51	0.55	4.51	0.48	0.12	0.19	0.80	26.97	28.63	25.67	29.63	25.60	25.24	25.31	25.92
Dustfall	Annual	1.7 (mg/dm^2/ day)	-	-	-	-	-	-	-	0.50	0.047	0.028	0.00074	0.052	0.013	0.00163	0.00029	0.013	0.55	0.53	0.50	0.55	0.51	0.50	0.50	0.51

Notes:

a. Metro Vancouver Ambient Air Quality Objectives (2011 and 2015 (1-hour SO_2 AAQO)); the annual $PM_{2.5}$ objective includes a planning goal (shown in brackets)
b. CCME National Ambient Air Quality Objectives (1999)
c. CCME Canada Wide Standards (2000)
d. B.C. Ambient Air Quality Objectives (2013); the annual $PM_{2.5}$ objective includes a planning goal (shown in brackets)
e. WHO Air Quality Guidelines for Europe (2000)
f. WHO Air Quality Guidelines (2006 and 2010)
[1] $PM_{2.5}$ from combustion sources is diesel particulate matter (DPM)
[2] CCME Proposed Air Quality Standards for $PM_{2.5}$ for 2015 and 2020
* - The Ambient Ratio Method (ARM) has been applied to the 1-hour NO_x results, which includes background in the calculation per the BC AQMG.
** NO_2 100% refers to 100% conversion of NOx to NO_2
Bold – maximum concentration exceeds the AAQO

APPENDIX II

Exposure Point Concentrations and Exposure Model Details

Table II-1A Summary of Multimedia Exposure Point Concentrations (EPCs) for the Baseline Scenario **Scenario: Baseline**

Parameter	C_s mg/kg	C_{dust} ug/m^3	$C_{plant\ (w/w)}$ mg/kg	$Pr_{root\ (w/w)}$ mg/kg	C_{air} ug/m^3
Polycyclic Aromatic Hydrocarbons					
Carcinogenic PAHs					
Benzo[a]anthracene	3.4E-01	2.6E-07	9.3E-04	9.3E-04	8.0E-04
Benzo[a]pyrene	4.0E-01	3.0E-07	6.7E-04	6.7E-04	4.0E-04
Benzo[b]fluoranthene	6.0E-01	4.6E-07	1.6E-03	1.6E-03	7.0E-04
Benzo[g,h,i]perylene	2.5E-01	1.9E-07	2.1E-04	2.1E-04	NA
Benzo[k]fluoranthene	2.4E-01	1.8E-07	4.1E-04	4.1E-04	3.0E-04
Chrysene	4.0E-01	3.0E-07	1.0E-03	1.0E-03	NA
Dibenzo[a,h]anthracene	6.0E-02	4.6E-08	4.4E-05	4.4E-05	NA
Fluoranthene	8.6E-01	6.5E-07	5.2E-03	5.2E-03	6.8E-03
Indeno[1,2,3-c,d]pyrene	2.7E-01	2.1E-07	2.1E-04	2.1E-04	1.9E-03
Phenanthrene	5.2E-01	4.0E-07	8.0E-03	8.0E-03	1.6E-02
Non-carcinogenic PAHs					
Acenaphthene	2.0E-02	1.5E-08	6.3E-04	6.3E-04	2.2E-03
Acenaphthylene	3.0E-02	2.3E-08	9.2E-04	9.2E-04	NA
Anthracene	8.0E-02	6.1E-08	1.2E-03	1.2E-03	1.6E-03
Fluorene	4.0E-02	3.0E-08	8.9E-04	8.9E-04	5.1E-03
Fluoranthene	8.6E-01	6.5E-07	5.2E-03	5.2E-03	6.8E-03
Naphthalene	2.0E-02	1.5E-08	1.4E-03	1.4E-03	1.5E-01
2-Methylnaphthalene	2.0E-02	1.5E-08	6.8E-04	6.8E-04	NA
Pyrene	7.0E-01	5.3E-07	6.1E-03	6.1E-03	4.9E-03
Metals and Metalliods					
Antimony	5.1E-01	3.9E-07	1.5E-02	1.5E-02	NA
Arsenic	6.1E+00	4.6E-06	3.6E-02	3.6E-02	4.9E-04
Barium	6.7E+01	5.1E-05	1.5E+00	1.5E+00	3.6E-03
Beryllium	2.4E-01	1.8E-07	3.6E-04	3.6E-04	8.6E-07
Cadmium	2.2E-01	1.7E-07	1.7E-02	1.7E-02	1.7E-04
Chromium (III)	2.6E+01	2.0E-05	2.9E-02	2.9E-02	*6.3E-04*
Chromium (VI)	1.6E-01	1.2E-07	1.8E-04	1.8E-04	*6.3E-04*
Cobalt	7.4E+00	5.6E-06	2.2E-02	2.2E-02	2.6E-05
Copper	2.5E+01	1.9E-05	1.5E+00	1.5E+00	3.4E-03
Lead	2.2E+01	1.7E-05	1.5E-01	1.5E-01	3.2E-03
Manganese	3.5E+02	2.7E-04	1.3E+01	1.3E+01	2.7E-03
Mercury	5.0E-02	3.8E-08	6.8E-03	6.8E-03	3.7E-03
Molybdenum	1.1E+00	8.2E-07	4.1E-02	4.1E-02	2.3E-04
Nickel	2.1E+01	1.6E-05	1.9E-01	1.9E-01	1.4E-03
Selenium	3.0E-01	2.3E-07	1.1E-03	1.1E-03	1.8E-04
Strontium	6.8E+01	5.1E-05	2.5E+01	2.5E+01	6.6E-04
Silver	1.0E-01	7.6E-08	6.0E-03	6.0E-03	NA
Tin	2.1E+00	1.6E-06	9.3E-03	9.3E-03	4.0E-04
Uranium	7.5E-01	5.7E-07	9.6E-04	9.6E-04	NA
Vanadium	4.5E+01	3.4E-05	3.7E-02	3.7E-02	2.6E-03
Zinc	8.3E+01	6.3E-05	1.2E+01	1.2E+01	1.2E-02
Aluminum	1.4E+04	1.0E-02	8.1E+00	8.1E+00	1.5E-04
Boron	NA	NA	NA	NA	NA
Iron	1.9E+04	1.4E-02	1.1E+01	1.1E+01	5.4E-02
Titanium	7.4E+02	5.7E-04	6.1E-01	6.1E-01	NA
Indium	NA	NA	NA	NA	NA
Lanthanum	NA	NA	NA	NA	NA
Others					
PCBs	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	9.0E-01
Hexachlorobenzene (gas phase)	NA	NA	NA	NA *	NA
Dust Pallatives					
Epichlorohydrin	NA	NA	NA	NA	NA

Notes:
- NA / Not applicable/available for this parameter
Italics Concentation for total chromium
* Root vegetables are assumed to be protected from air-to-plant transfer (US EPA OWS 2005).

Table II-2A Soil Concentrations for Baseline Scenario **Scenario:** **Baseline**

Parameter	D_{tot} mg/m^2/yr	Zs m	BD kg/m^3	Ds mg/kg/yr	kt yrs^{-1}	tD yrs	† C_s mg/kg
Polycyclic Aromatic Hydrocarbons							
Carcinogenic PAHs							
Benzo[a]anthracene	-	-	-	-	-	-	3.4E-01
Benzo[a]pyrene	-	-	-	-	-	-	4.0E-01
Benzo[b]fluoranthene	-	-	-	-	-	-	6.0E-01
Benzo[g,h,i]perylene	-	-	-	-	-	-	2.5E-01
Benzo[k]fluoranthene	-	-	-	-	-	-	2.4E-01
Chrysene	-	-	-	-	-	-	4.0E-01
Dibenzo[a,h]anthracene	-	-	-	-	-	-	6.0E-02
Fluoranthene	-	-	-	-	-	-	8.6E-01
Indeno[1,2,3-c,d]pyrene	-	-	-	-	-	-	2.7E-01
Phenanthrene	-	-	-	-	-	-	5.2E-01
Non-carcinogenic PAHs							
Acenaphthene	-	-	-	-	-	-	2.0E-02
Acenaphthylene	-	-	-	-	-	-	3.0E-02
Anthracene	-	-	-	-	-	-	8.0E-02
Fluorene	-	-	-	-	-	-	4.0E-02
Fluoranthene	-	-	-	-	-	-	8.6E-01
Naphthalene	-	-	-	-	-	-	2.0E-02
2-Methylnaphthalene	-	-	-	-	-	-	2.0E-02
Pyrene	-	-	-	-	-	-	7.0E-01
Metals and Metalloids							
Antimony	-	-	-	-	-	-	5.1E-01
Arsenic	-	-	-	-	-	-	6.1E+00
Barium	-	-	-	-	-	-	6.7E+01
Beryllium	-	-	-	-	-	-	2.4E-01
Cadmium	-	-	-	-	-	-	2.2E-01
Chromium (III)	-	-	-	-	-	-	2.6E+01
Chromium (VI)	-	-	-	-	-	-	1.6E-01
Cobalt	-	-	-	-	-	-	7.4E+00
Copper	-	-	-	-	-	-	2.5E+01
Lead	-	-	-	-	-	-	2.2E+01
Lithium	-	-	-	-	-	-	9.2E+00
Manganese	-	-	-	-	-	-	3.5E+02
Mercury	-	-	-	-	-	-	5.0E-02
Molybdenum	-	-	-	-	-	-	1.1E+00
Nickel	-	-	-	-	-	-	2.1E+01
Selenium	-	-	-	-	-	-	3.0E-01
Strontium	-	-	-	-	-	-	6.8E+01
Tin	-	-	-	-	-	-	2.1E+00
Uranium	-	-	-	-	-	-	7.5E-01
Vanadium	-	-	-	-	-	-	4.5E+01
Zinc	-	-	-	-	-	-	8.3E+01
Aluminum	-	-	-	-	-	-	1.4E+04
Boron	-	-	-	-	-	-	NA
Iron	-	-	-	-	-	-	1.9E+04
Titanium	-	-	-	-	-	-	7.4E+02
Indium	-	-	-	-	-	-	NA
Lanthanum	-	-	-	-	-	-	NA
Others							
PCBs	-	-	-	-	-	-	NA
Sulphate	-	-	-	-	-	-	NA
Hexachlorobenzene (gas phase)	-	-	-	-	-	-	NA
Dust Pallatives							
Epichlorohydrin	-	-	-	-	-	-	NA

Notes:
Equations based on US EPA OWS (2005)
[1] Based on Levelton (2014)
- Not applicable as baseline soil concentration based on measured data and not modelled
† Based on laboratory analysis conducted for study area
NA Data not available for this parameter

Table II-3A Kt Parameters for Baseline Scenario

Scenario: Baseline

Parameter	CAS	Organic Carbon Partition Coefficient (L/kg)	Water Solubility (mg/L)	Vapor Pressure (mm Hg)	t 1/2 days due to volatilzation	Kv yrs^{-1}	t 1/2 days due to degradation (abiotic and/or biotic)	Source t 1/2 due to degradation (abiotic and/or biotic)	Ks yrs^{-1}	Kt yrs^{-1}
Acenaphthene	000083-32-9	5.03E+03	3.90E+00	2.15E-03	1.4E-01	1.8E+03	103.5	CCME 2008 based on Loehr and Webster 1997	2.4E+00	1.8E+03
Acenaphthylene	000208-96-8	5.03E+03	1.61E+01	6.68E-03	1.9E-01	1.3E+03	103.5	CCME 2008 based on Loehr and Webster 1997	2.4E+00	1.3E+03
Aluminum	007429-90-5	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Anthracene	000120-12-7	1.64E+04	4.34E-02	6.53E-06	1.7E+00	1.5E+02	103.5	CCME 2008 based on Loehr and Webster 1997	2.4E+00	1.5E+02
Antimony (metallic)	007440-36-0	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Arsenic, Inorganic	007440-38-2	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Barium	007440-39-3	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Benz[a]anthracene	000056-55-3	1.77E+05	9.40E-03	2.10E-07	1.3E+02	2.0E+00	604.5	CCME 2008 based on Howard et al 1991	4.2E-01	2.4E+00
Benzo[a]pyrene	000050-32-8	5.87E+05	1.62E-03	5.49E-09	2.7E+03	9.2E-02	570	OEHHA 2000	4.4E-01	5.4E-01
Benzo[b]fluoranthene	000205-99-2	5.99E+05	1.50E-03	5.00E-07	2.8E+01	8.9E+00	570	OEHHA 2000	4.4E-01	9.4E+00
Benzo[g,h,i]perylene	000191-24-2	1.95E+06	2.60E-04	1.00E-10	8.0E+04	3.2E-03	570	OEHHA 2000	4.4E-01	4.5E-01
Benzo[k]fluoranthene	000207-08-9	5.87E+05	8.00E-04	9.65E-10	7.7E+03	3.3E-02	570	OEHHA 2000	4.4E-01	4.8E-01
Beryllium and compounds	007440-41-7	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Boron And Borates Only	007440-42-8	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Cadmium (Diet)	007440-43-9	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Chromium(III) (Soluble Particulates)	016065-83-1	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Chromium(III), Insoluble Salts	016065-83-1	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Chromium(VI)	018540-29-9	-	1.69E+06	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Chrysene	000218-01-9	1.81E+05	2.00E-03	6.23E-09	9.2E+02	2.8E-01	604.5	CCME 2008 based on Howard et al 1991	4.2E-01	6.9E-01
Cobalt	007440-48-4	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Copper	007440-50-8	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Dibenz[a,h]anthracene	000053-70-3	1.91E+06	2.49E-03	9.55E-10	7.9E+04	3.2E-03	570	OEHHA 2000	4.4E-01	4.5E-01
Epichlorohydrin	000106-89-8	9.91E+00	6.59E+04	1.64E+01	6.3E-04	4.0E+05	2.8E+01	Environment Canada 2000	9.0E+00	4.0E+05
Ethylbenzene	000100-41-4	4.46E+02	1.69E+02	9.60E+00	1.2E-04	2.0E+06	na	na	na	2.0E+06
Ethylene							1.0E+08	assumed	2.5E-06	2.5E-06
Fluoranthene	000206-44-0	5.55E+04	2.60E-01	9.22E-06	2.5E+01	1.0E+01	604.5	CCME 2008 based on Howard et al 1991	4.2E-01	1.1E+01
Fluorene	000086-73-7	9.16E+03	1.69E+00	6.00E-04	4.1E-01	6.2E+02	103.5	CCME 2008 based on Loehr and Webster 1997	2.4E+00	6.2E+02
Formaldehyde	000050-00-0	1.00E+00	4.00E+05	3.89E+03	1.6E-06	1.6E+08	na	na	na	1.6E+08
Hexane, N-	000110-54-3	1.32E+02	9.50E+00	1.51E+02	1.3E-07	1.9E+09	na	na	na	1.9E+09
Indeno[1,2,3-cd]pyrene	000193-39-5	3.47E+06	2.20E-05	1.25E-10	9.6E+03	2.6E-02	570	OEHHA 2000	4.4E-01	4.7E-01
Iron	007439-89-6	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Lead and Compounds	007439-92-1	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Lithium	007439-93-2	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Manganese (Diet)	007439-96-5	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Mercury (elemental)	007439-97-6	-	6.00E-02	1.96E-03		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Methylnaphthalene, 2-	000091-57-6	2.48E+03	2.46E+01	5.50E-02	1.8E-02	1.4E+04	32.5	CCME 2008 based on Loehr and Webster 1997	7.8E+00	1.4E+04
Molybdenum	007439-98-7	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Naphthalene	000091-20-3	1.54E+03	3.10E+01	8.50E-02	8.9E-03	2.9E+04	2.1	Enviornment Canada 1996	1.2E+02	2.9E+04
Nickel Oxide	001313-99-1	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Nickel Refinery Dust	000000-00-7	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Nickel Soluble Salts	007440-02-0	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Phenanthrene	000085-01-8	1.67E+04	1.15E+00	1.21E-04	2.5E+00	1.0E+02	5.7	CCME 2008 based on CEPA 1993	4.4E+01	1.5E+02
Pyrene	000129-00-0	5.43E+04	1.35E-01	4.50E-06	2.6E+01	9.8E+00	604.5	CCME 2008 based on Howard et al 1991	4.2E-01	1.0E+01
Selenium	007782-49-2	-	-	9.12E+03		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Silver	007440-22-4	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Strontium, Stable	007440-24-6	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Styrene	000100-42-5	4.46E+02	3.10E+02	6.40E+00	3.4E-04	7.4E+05	na	na	na	7.4E+05
Tin	007440-31-5	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Titanium	007440-32-6	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Toluene	000108-88-3	2.34E+02	5.26E+02	2.84E+01	6.8E-05	3.7E+06	na	na	na	3.7E+06
Uranium, Insoluble Compounds	007440-61-1	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Vanadium	000000-06-6	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Xylenes	001330-20-7	3.83E+02	1.06E+02	7.99E+00	8.0E-05	3.2E+06	na	na	na	3.2E+06
Zinc and Compounds	007440-66-6	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Indium	007440-74-6	-				na	1.0E+08	OEHHA 2001	2.5E-06	2.5E-06
Lanthanum	007439-91-0	-				na	1.0E+08	OEHHA 2002	2.5E-06	2.5E-06
Hexachlorobenzene	000118-74-1	6.20E+03	6.20E-03	1.80E-05	6.00E+02	4.2E-01	1.0E+09	OEHHA 2003	2.5E-07	4.2E-01
PCBs	001336-36-3	7.81E+04	7.00E-01	8.63E-05		na	3.23E+03	OEHHA 2004	7.8E-02	7.8E-02
Sulphate	014808-79-8	-	1.00E+06	5.93E-05		na	1.0E+08	OEHHA 2005	2.5E-06	2.5E-06

Notes:

Values from RAIS (2014) unless otherwise noted

CCME. 2008. Canadian Council of Ministers of the Enviroment. Canada-Wide Standard (CWS) for Petroleum Hydrocarbons (PHC) in Soil. Scientifc Rationale Supporting Technical Document. CCME. 2008

OEHHA 2000. Office of Environmental Health Hazard Assessment. California EPA. Technical Support Document for Exposure Assessment and Stochastic Analysis. Air Toxics Hot Spots Program Risk Assessment Guidelines. Oakland. California. 2000

Environment Canada. 2000. Screening Assessment: oxirane, (chloromethyl)-,epichlorohydrin. Chemical Abstracts Service Registry Number 106-89-8. Environment Canada. Health Canada. November 2008

	Calculated based on first order decay rate: k=0.693/(t1/2 / 365)
assumed	Based on lack of data from above sources, 10^6 t 1/2 based on professional judgement
na	Not availble from sources idenfied above

Table II-4A Soil Particulate/Dust Concentations for Baseline Scenario **Scenario: Baseline**

Parameter	DL kg/m^3	Cs mg/kg	CF ug/mg	C_{dust} ug/m^3
Polycyclic Aromatic Hydrocarbons				
Carcinogenic PAHs				
Benzo[a]anthracene	7.6E-10	0.34	1000	2.6E-07
Benzo[a]pyrene	7.6E-10	0.4	1000	3.0E-07
Benzo[b]fluoranthene	7.6E-10	0.6	1000	4.6E-07
Benzo[g,h,i]perylene	7.6E-10	0.25	1000	1.9E-07
Benzo[k]fluoranthene	7.6E-10	0.24	1000	1.8E-07
Chrysene	7.6E-10	0.4	1000	3.0E-07
Dibenzo[a,h]anthracene	7.6E-10	0.06	1000	4.6E-08
Fluoranthene	7.6E-10	0.86	1000	6.5E-07
Indeno[1,2,3-c,d]pyrene	7.6E-10	0.27	1000	2.1E-07
Phenanthrene	7.6E-10	0.52	1000	4.0E-07
Non-carcinogenic PAHs				
Acenaphthene	7.6E-10	0.02	1000	1.5E-08
Acenaphthylene	7.6E-10	0.03	1000	2.3E-08
Anthracene	7.6E-10	0.08	1000	6.1E-08
Fluorene	7.6E-10	0.04	1000	3.0E-08
Fluoranthene	7.6E-10	0.86	1000	6.5E-07
Naphthalene	7.6E-10	0.02	1000	1.5E-08
2-Methylnaphthalene	7.6E-10	0.02	1000	1.5E-08
Pyrene	7.6E-10	0.7	1000	5.3E-07
Metals and Metalloids				
Antimony	7.6E-10	0.51	1000	3.9E-07
Arsenic	7.6E-10	6.07	1000	4.6E-06
Barium	7.6E-10	66.52	1000	5.1E-05
Beryllium	7.6E-10	0.24	1000	1.8E-07
Cadmium	7.6E-10	0.22	1000	1.7E-07
Chromium (III)	7.6E-10	25.82	1000	2.0E-05
Chromium (VI)	7.6E-10	0.16	1000	1.2E-07
Cobalt	7.6E-10	7.41	1000	5.6E-06
Copper	7.6E-10	24.63	1000	1.9E-05
Lead	7.6E-10	21.94	1000	1.7E-05
Lithium	7.6E-10	9.2	1000	7.0E-06
Manganese	7.6E-10	354.67	1000	2.7E-04
Mercury	7.6E-10	0.05	1000	3.8E-08
Molybdenum	7.6E-10	1.08	1000	8.2E-07
Nickel	7.6E-10	20.93	1000	1.6E-05
Selenium	7.6E-10	0.3	1000	2.3E-07
Strontium	7.6E-10	67.76	1000	5.1E-05
Tin	7.6E-10	2.07	1000	1.6E-06
Uranium	7.6E-10	0.75	1000	5.7E-07
Vanadium	7.6E-10	44.7	1000	3.4E-05
Zinc	7.6E-10	83.36	1000	6.3E-05
Aluminum	7.6E-10	13549.79	1000	1.0E-02
Boron	7.6E-10	NA	1000	NA
Iron	7.6E-10	18715.42	1000	1.4E-02
Titanium	7.6E-10	744.44	1000	5.7E-04
Indium	7.6E-10	NA	1000	NA
Lanthanum	7.6E-10	NA	1000	NA
Others				
PCBs	7.6E-10	NA	1000	NA
Sulphate	7.6E-10	NA	1000	NA
Hexachlorobenzene (gas phase)	7.6E-10	NA	1000	NA
Dust Pallatives				
Epichlorohydrin	7.6E-10	NA	1000	NA

Notes:

Equations based on US EPA OWS (2005)

[1] Soil concentration from Equation 1.2

NA - not available for this parameter

Table II-5A: Above Ground Plant Concentations **Scenario: Baseline**

Parameter	Dd mg/m^2/yr	Dw mg/m^2/yr	Fv percentage	Rp unitless	kp yr^{-1}	Tp yr	Yp kg DW/m^2	Pd mg/kg DW	Log K_{ow} unitless	BCF kg soil/kg plant DW	Cs mg/kg	BCF kg soil/kg plant DW	Pr mg/kg DW	Pd mg/kg	Pr mg/kg	‡ $C_{plant\ ww}$ mg/kg
Polycyclic Aromatic Hydrocarbons																
Carcinogenic PAHs																
Benzo[a]anthracene	-	-	-	-	-	-	-	-	5.76	1.8E-02	3.4E-01	1.8E-02	6.2E-03	-	6.2E-03	9.3E-04
Benzo[a]pyrene	-	-	-	-	-	-	-	-	6.13	1.1E-02	4.0E-01	1.1E-02	4.4E-03	-	4.4E-03	6.7E-04
Benzo[b]fluoranthene	-	-	-	-	-	-	-	-	5.78	1.8E-02	6.0E-01	1.8E-02	1.1E-02	-	1.1E-02	1.6E-03
Benzo[g,h,i]perylene	-	-	-	-	-	-	-	-	6.63	5.7E-03	2.5E-01	5.7E-03	1.4E-03	-	1.4E-03	2.1E-04
Benzo[k]fluoranthene	-	-	-	-	-	-	-	-	6.11	1.1E-02	2.4E-01	1.1E-02	2.7E-03	-	2.7E-03	4.1E-04
Chrysene	-	-	-	-	-	-	-	-	5.81	1.7E-02	4.0E-01	1.7E-02	6.8E-03	-	6.8E-03	1.0E-03
Dibenzo[a,h]anthracene	-	-	-	-	-	-	-	-	6.75	4.9E-03	6.0E-02	4.9E-03	2.9E-04	-	2.9E-04	4.4E-05
Fluoranthene	-	-	-	-	-	-	-	-	5.16	4.0E-02	8.6E-01	4.0E-02	3.5E-02	-	3.5E-02	5.2E-03
Indeno[1,2,3-c,d]pyrene	-	-	-	-	-	-	-	-	6.71	5.1E-03	2.7E-01	5.1E-03	1.4E-03	-	1.4E-03	2.1E-04
Phenanthrene	-	-	-	-	-	-	-	-	4.46	1.0E-01	5.2E-01	1.0E-01	5.3E-02	-	5.3E-02	8.0E-03
Non-carcinogenic PAHs																
Acenaphthene	-	-	-	-	-	-	-	-	3.92	2.1E-01	2.0E-02	2.1E-01	4.2E-03	-	4.2E-03	6.3E-04
Acenaphthylene	-	-	-	-	-	-	-	-	3.94	2.0E-01	3.0E-02	2.0E-01	6.1E-03	-	6.1E-03	9.2E-04
Anthracene	-	-	-	-	-	-	-	-	4.45	1.0E-01	8.0E-02	1.0E-01	8.3E-03	-	8.3E-03	1.2E-03
Fluorene	-	-	-	-	-	-	-	-	4.18	1.5E-01	4.0E-02	1.5E-01	5.9E-03	-	5.9E-03	8.9E-04
Fluoranthene	-	-	-	-	-	-	-	-	5.16	4.0E-02	8.6E-01	4.0E-02	3.5E-02	-	3.5E-02	5.2E-03
Naphthalene	-	-	-	-	-	-	-	-	3.3	4.8E-01	2.0E-02	4.8E-01	9.6E-03	-	9.6E-03	1.4E-03
2-Methylnaphthalene	-	-	-	-	-	-	-	-	3.86	2.3E-01	2.0E-02	2.3E-01	4.5E-03	-	4.5E-03	6.8E-04
Pyrene	-	-	-	-	-	-	-	-	4.88	5.9E-02	7.0E-01	5.9E-02	4.1E-02	-	4.1E-02	6.1E-03
Metals and Metalliods																
Antimony	-	-	-	-	-	-	-	-	-	2.0E-01	5.1E-01	2.0E-01	1.0E-01	-	1.0E-01	1.5E-02
Arsenic	-	-	-	-	-	-	-	-	-	4.0E-02	6.1E+00	4.0E-02	2.4E-01	-	2.4E-01	3.6E-02
Barium	-	-	-	-	-	-	-	-	-	1.5E-01	6.7E+01	1.5E-01	1.0E+01	-	1.0E+01	1.5E+00
Beryllium	-	-	-	-	-	-	-	-	-	1.0E-02	2.4E-01	1.0E-02	2.4E-03	-	2.4E-03	3.6E-04
Cadmium	-	-	-	-	-	-	-	-	-	5.0E-01	2.2E-01	5.0E-01	1.1E-01	-	1.1E-01	1.7E-02
Chromium (III)	-	-	-	-	-	-	-	-	-	7.5E-03	2.6E+01	7.5E-03	1.9E-01	-	1.9E-01	2.9E-02
Chromium (VI)	-	-	-	-	-	-	-	-	-	7.5E-03	1.6E-01	7.5E-03	1.2E-03	-	1.2E-03	1.8E-04
Cobalt	-	-	-	-	-	-	-	-	-	2.0E-02	7.4E+00	2.0E-02	1.5E-01	-	1.5E-01	2.2E-02
Copper	-	-	-	-	-	-	-	-	-	4.0E-01	2.5E+01	4.0E-01	9.9E+00	-	9.9E+00	1.5E+00
Lead	-	-	-	-	-	-	-	-	-	4.5E-02	2.2E+01	4.5E-02	9.9E-01	-	9.9E-01	1.5E-01
Lithium	-	-	-	-	-	-	-	-	-	2.5E-02	9.2E+00	2.5E-02	2.3E-01	-	2.3E-01	3.5E-02
Manganese	-	-	-	-	-	-	-	-	-	2.5E-01	3.5E+02	2.5E-01	8.9E+01	-	8.9E+01	1.3E+01
Mercury	-	-	-	-	-	-	-	-	-	9.0E-01	5.0E-02	9.0E-01	4.5E-02	-	4.5E-02	6.8E-03
Molybdenum	-	-	-	-	-	-	-	-	-	2.5E-01	1.1E+00	2.5E-01	2.7E-01	-	2.7E-01	4.1E-02
Nickel	-	-	-	-	-	-	-	-	-	6.0E-02	2.1E+01	6.0E-02	1.3E+00	-	1.3E+00	1.9E-01
Selenium	-	-	-	-	-	-	-	-	-	2.5E-02	3.0E-01	2.5E-02	7.5E-03	-	7.5E-03	1.1E-03
Strontium	-	-	-	-	-	-	-	-	-	2.5E+00	6.8E+01	2.5E+00	1.7E+02	-	1.7E+02	2.5E+01
Tin	-	-	-	-	-	-	-	-	-	3.0E-02	2.1E+00	3.0E-02	6.2E-02	-	6.2E-02	9.3E-03
Uranium	-	-	-	-	-	-	-	-	-	8.5E-03	7.5E-01	8.5E-03	6.4E-03	-	6.4E-03	9.6E-04
Vanadium	-	-	-	-	-	-	-	-	-	5.5E-03	4.5E+01	5.5E-03	2.5E-01	-	2.5E-01	3.7E-02
Zinc	-	-	-	-	-	-	-	-	-	9.9E-01	8.3E+01	9.9E-01	8.3E+01	-	8.3E+01	1.2E+01
Aluminum	-	-	-	-	-	-	-	-	-	4.0E-03	1.4E+04	4.0E-03	5.4E+01	-	5.4E+01	8.1E+00
Boron	-	-	-	-	-	-	-	-	-	4.0E+00	NA	4.0E+00	NA	-	NA	NA
Iron	-	-	-	-	-	-	-	-	-	4.0E-03	1.9E+04	4.0E-03	7.5E+01	-	7.5E+01	1.1E+01
Titanium	-	-	-	-	-	-	-	-	-	5.5E-03	7.4E+02	5.5E-03	4.1E+00	-	4.1E+00	6.1E-01
Indium	-	-	-	-	-	-	-	-		*4.0E-01*	NA	4.0E-01	NA	-	NA	NA
Lanthanum	-	-	-	-	-	-	-	-		*4.0E-01*	NA	4.0E-01	NA	-	NA	NA
Others																
PCBs	-	-	-	-	-	-	-	-	7.1E+00	2.9E-03	NA	2.9E-03	NA	-	NA	NA
Sulphate	-	-	-	-	-	-	-	-		*4.0E-01*	NA	4.0E-01	NA	-	NA	NA
Hexachlorobenzene (gas phase)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NA
Dust Pallatives																
Epichlorohydrin	-	-	-	-	-	-	-	-	0.45	2.1E+01	NA	2.1E+01	NA	-	NA	NA

Notes:
Equations based on US EPA OWS (2005)
[1] Based on Levelton (2014)
[2] Log Kow based on US EPA (2004), RAIS (2014), HSDB (2014)
[3] Soil concentration from Equation 1.2
[4] For inorganics soil to dry plant uptake values from ORNL (2014)
- Not available for this parameter
‡ Background deposition data not available therefore, above ground plant concentation due to chemical root uptake. This is conservative as it assumes lower background vegetation concentrations.
Italics BCF not available BCF assumed to be equal to average of remaining metals

Table II-6A Below Ground Plant Concentrations Baseline Scenario **Scenario: Baseline**

Parameter	Cs mg/kg	BCF kg soil/kg plant DW	WPF unitless	WC percentage	Pr_{root} mg/kg ww
Polycyclic Aromatic Hydrocarbons					
Carcinogenic PAHs					
Benzo[a]anthracene	3.4E-01	1.8E-02	1	0.85	9.3E-04
Benzo[a]pyrene	4.0E-01	1.1E-02	1	0.85	6.7E-04
Benzo[b]fluoranthene	6.0E-01	1.8E-02	1	0.85	1.6E-03
Benzo[g,h,i]perylene	2.5E-01	5.7E-03	1	0.85	2.1E-04
Benzo[k]fluoranthene	2.4E-01	1.1E-02	1	0.85	4.1E-04
Chrysene	4.0E-01	1.7E-02	1	0.85	1.0E-03
Dibenzo[a,h]anthracene	6.0E-02	4.9E-03	1	0.85	4.4E-05
Fluoranthene	8.6E-01	4.0E-02	1	0.85	5.2E-03
Indeno[1,2,3-c,d]pyrene	2.7E-01	5.1E-03	1	0.85	2.1E-04
Phenanthrene	5.2E-01	1.0E-01	1	0.85	8.0E-03
Non-carcinogenic PAHs					
Acenaphthene	2.0E-02	2.1E-01	1	0.85	6.3E-04
Acenaphthylene	3.0E-02	2.0E-01	1	0.85	9.2E-04
Anthracene	8.0E-02	1.0E-01	1	0.85	1.2E-03
Fluorene	4.0E-02	1.5E-01	1	0.85	8.9E-04
Fluoranthene	8.6E-01	4.0E-02	1	0.85	5.2E-03
Naphthalene	2.0E-02	4.8E-01	1	0.85	1.4E-03
2-Methylnaphthalene	2.0E-02	2.3E-01	1	0.85	6.8E-04
Pyrene	7.0E-01	5.9E-02	1	0.85	6.1E-03
Metals and Metalliods					
Antimony	5.1E-01	2.0E-01	1	0.85	1.5E-02
Arsenic	6.1E+00	4.0E-02	1	0.85	3.6E-02
Barium	6.7E+01	1.5E-01	1	0.85	1.5E+00
Beryllium	2.4E-01	1.0E-02	1	0.85	3.6E-04
Cadmium	2.2E-01	5.0E-01	1	0.85	1.7E-02
Chromium (III)	2.6E+01	7.5E-03	1	0.85	2.9E-02
Chromium (VI)	1.6E-01	7.5E-03	1	0.85	1.8E-04
Cobalt	7.4E+00	2.0E-02	1	0.85	2.2E-02
Copper	2.5E+01	4.0E-01	1	0.85	1.5E+00
Lead	2.2E+01	4.5E-02	1	0.85	1.5E-01
Lithium	9.2E+00	2.5E-02	1	0.85	3.5E-02
Manganese	3.5E+02	2.5E-01	1	0.85	1.3E+01
Mercury	5.0E-02	9.0E-01	1	0.85	6.8E-03
Molybdenum	1.1E+00	2.5E-01	1	0.85	4.1E-02
Nickel	2.1E+01	6.0E-02	1	0.85	1.9E-01
Selenium	3.0E-01	2.5E-02	1	0.85	1.1E-03
Strontium	6.8E+01	2.5E+00	1	0.85	2.5E+01
Tin	2.1E+00	3.0E-02	1	0.85	9.3E-03
Uranium	7.5E-01	8.5E-03	1	0.85	9.6E-04
Vanadium	4.5E+01	5.5E-03	1	0.85	3.7E-02
Zinc	8.3E+01	9.9E-01	1	0.85	1.2E+01
Aluminum	1.4E+04	4.0E-03	1	0.85	8.1E+00
Boron	NA	4.0E+00	1	0.85	NA
Iron	1.9E+04	4.0E-03	1	0.85	1.1E+01
Titanium	7.4E+02	5.5E-03	1	0.85	6.1E-01
Crystalline Silica	NA	1.6E+00	1	0.85	NA
Indium	NA	4.0E-01	1	0.85	NA
Lanthanum	NA	4.0E-01	1	0.85	NA
Others					
PCBs	NA	2.9E-03	1	0.85	NA
Sulphate	NA	4.0E-01	1	0.85	NA
Hexachlorobenzene (gas phase)	-	-	-	-	-
Dust Pallatives					
Epichlorohydrin	NA	2.1E+01	1	0.85	NA

Notes:
Equations based on US EPA OWS (2005)
[1] Soil concentration from Equation 1.2
[2] BCF from Equation 3.2.1 for inorganics, for organics soil to dry plant uptake value from ORNL (2014)
NA Background data not available for this parameter
- Vapour to root vegetation uptake assumed to be zero (US EPA OSW 2005)

Table II-1B Summary of Project Multimedia Exposure Point Concentrations (EPCs) for Maximum North Delta Residential Receptor **Scenario: Project**

Parameter	C_s mg/kg	C_{dust} ug/m^3	$C_{plant\ (w/w)}$ mg/kg	$Pr_{root\ (w/w)}$ mg/kg	C_{air} ug/m^3
Polycyclic Aromatic Hydrocarbons					
Carcinogenic PAHs					
Benzo[a]anthracene	3.7E-04	2.8E-10	1.1E-06	1.0E-06	3.8E-04
Benzo[a]pyrene	6.9E-04	5.2E-10	1.2E-06	1.1E-06	1.2E-05
Benzo[b]fluoranthene	1.4E-04	1.1E-10	4.8E-07	3.8E-07	4.2E-05
Benzo[g,h,i]perylene	2.2E-04	1.7E-10	2.0E-07	1.9E-07	3.9E-06
Benzo[k]fluoranthene	5.8E-04	4.4E-10	1.0E-06	9.9E-07	9.5E-06
Chrysene	7.9E-04	6.0E-10	2.1E-06	2.0E-06	1.9E-05
Dibenzo[a,h]anthracene	1.7E-04	1.3E-10	1.3E-07	1.3E-07	2.4E-06
Fluoranthene	2.4E-04	1.8E-10	1.6E-06	1.5E-06	8.9E-05
Indeno[1,2,3-c,d]pyrene	5.7E-04	4.3E-10	4.8E-07	4.4E-07	9.5E-06
Phenanthrene	4.3E-06	3.3E-12	1.5E-07	6.6E-08	1.1E-04
Non-carcinogenic PAHs					
Acenaphthene	3.2E-07	2.4E-13	6.2E-08	1.0E-08	2.2E-05
Acenaphthylene	1.1E-07	8.7E-14	3.3E-08	3.5E-09	7.5E-05
Anthracene	2.1E-06	1.6E-12	7.4E-08	3.2E-08	3.7E-04
Fluorene	4.4E-07	3.3E-13	5.4E-08	9.7E-09	3.3E-05
Fluoranthene	2.4E-04	1.8E-10	1.6E-06	1.5E-06	8.9E-05
Naphthalene	4.4E-09	3.4E-15	7.7E-07	3.2E-10	2.2E-04
2-Methylnaphthalene	7.2E-09	5.5E-15	6.9E-09	2.5E-10	3.2E-06
Pyrene	3.2E-04	2.4E-10	3.0E-06	2.8E-06	1.2E-04
Metals and Metalliods					
Antimony	1.7E-03	1.3E-09	5.1E-05	5.0E-05	5.5E-05
Arsenic	2.1E-02	1.6E-08	1.2E-04	1.2E-04	6.6E-05
Barium	5.5E+00	4.2E-06	1.2E-01	1.2E-01	1.7E-02
Beryllium	3.3E-03	2.5E-09	5.0E-06	5.0E-06	1.4E-05
Cadmium	1.8E-03	1.3E-09	1.3E-04	1.3E-04	2.8E-05
Chromium (III)	1.6E-03	1.2E-09	1.8E-06	1.8E-06	1.5E-04
Chromium (VI)	4.7E-02	3.6E-08	5.3E-05	5.3E-05	6.5E-06
Cobalt	2.0E-02	1.5E-08	6.0E-05	5.9E-05	7.0E-05
Copper	2.0E-01	1.5E-07	1.2E-02	1.2E-02	6.3E-04
Lead	3.5E-02	2.6E-08	2.4E-04	2.3E-04	1.3E-04
Manganese	3.0E-01	2.3E-07	1.1E-02	1.1E-02	9.3E-04
Mercury	1.2E-03	9.3E-10	1.7E-04	1.7E-04	5.6E-06
Molybdenum	7.9E-03	6.0E-09	3.0E-04	3.0E-04	3.6E-05
Nickel	6.3E-02	4.8E-08	5.7E-04	5.7E-04	1.9E-04
Selenium	1.0E-02	7.7E-09	3.8E-05	3.8E-05	3.1E-05
Strontium	3.5E+00	2.6E-06	1.3E+00	1.3E+00	1.1E-02
Tin	3.6E-03	2.7E-09	1.6E-05	1.6E-05	4.0E-05
Uranium	5.5E-03	4.2E-09	7.1E-06	7.0E-06	1.7E-05
Vanadium	1.7E-01	1.3E-07	1.6E-04	1.4E-04	2.0E-03
Zinc	2.1E-01	1.6E-07	3.2E-02	3.2E-02	8.2E-04
Aluminum	3.5E+01	2.7E-05	2.2E-02	2.1E-02	1.1E-01
Boron	2.7E-01	2.1E-07	1.6E-01	1.6E-01	8.4E-04
Iron	4.0E+01	3.0E-05	2.4E-02	2.4E-02	7.6E-03
Titanium	2.5E+00	1.9E-06	2.0E-03	2.0E-03	7.9E-03
Others					
PCBs	3.0E-12	2.3E-18	9.1E-10	1.3E-15	4.4E-08
Sulfate	4.6E-07	3.5E-13	3.7E-04	2.8E-08	3.6E-02
Hexachlorobenzene	3.5E-09	2.6E-15	9.4E-12	9.4E-12	3.5E-09
Dust Pallatives					
Epichlorohydrin	3.8E-09	2.9E-15	4.7E-08	1.2E-08	1.3E-06

Notes:
- Not applicable for this parameter
[1] Parameter speciated into individual PAH and metal constituents above
[2] Operable exposure for this parameter limited to inhalation pathway

Table II-2B Project Soil Concentrations for Maximum North Delta Residential Receptor **Scenario: Project**

Parameter	D_{tot} mg/m^2/yr	Zs m	BD kg/m^3	Ds mg/kg/yr	kt yrs^{-1}	tD yrs	C_s mg/kg
Polycyclic Aromatic Hydrocarbons							
Carcinogenic PAHs							
Benzo[a]anthracene	2.7E-02	0.02	1500	9.1E-04	2.4E+00	10	3.7E-04
Benzo[a]pyrene	1.1E-02	0.02	1500	3.7E-04	5.4E-01	10	6.9E-04
Benzo[b]fluoranthene	4.0E-02	0.02	1500	1.3E-03	9.4E+00	10	1.4E-04
Benzo[g,h,i]perylene	3.0E-03	0.02	1500	1.0E-04	4.5E-01	10	2.2E-04
Benzo[k]fluoranthene	8.4E-03	0.02	1500	2.8E-04	4.8E-01	10	5.8E-04
Chrysene	1.7E-02	0.02	1500	5.5E-04	6.9E-01	10	7.9E-04
Dibenzo[a,h]anthracene	2.3E-03	0.02	1500	7.8E-05	4.5E-01	10	1.7E-04
Fluoranthene	7.7E-02	0.02	1500	2.6E-03	1.1E+01	10	2.4E-04
Indeno[1,2,3-c,d]pyrene	8.1E-03	0.02	1500	2.7E-04	4.7E-01	10	5.7E-04
Phenanthrene	1.9E-02	0.02	1500	6.3E-04	1.5E+02	10	4.3E-06
Non-carcinogenic PAHs							
Acenaphthene	1.7E-02	0.02	1500	5.6E-04	1.8E+03	10	3.2E-07
Acenaphthylene	4.5E-03	0.02	1500	1.5E-04	1.3E+03	10	1.1E-07
Anthracene	9.3E-03	0.02	1500	3.1E-04	1.5E+02	10	2.1E-06
Fluorene	8.2E-03	0.02	1500	2.7E-04	6.2E+02	10	4.4E-07
Fluoranthene	7.7E-02	0.02	1500	2.6E-03	1.1E+01	10	2.4E-04
Naphthalene	3.8E-03	0.02	1500	1.3E-04	2.9E+04	10	4.4E-09
2-Methylnaphthalene	3.1E-03	0.02	1500	1.0E-04	1.4E+04	10	7.2E-09
Pyrene	9.8E-02	0.02	1500	3.3E-03	1.0E+01	10	3.2E-04
Metals and Metalloids							
Antimony	5.0E-03	0.02	1500	1.7E-04	2.5E-06	10	1.7E-03
Arsenic	6.2E-02	0.02	1500	2.1E-03	2.5E-06	10	2.1E-02
Barium	1.6E+01	0.02	1500	5.5E-01	2.5E-06	10	5.5E+00
Beryllium	1.0E-02	0.02	1500	3.3E-04	2.5E-06	10	3.3E-03
Cadmium	5.3E-03	0.02	1500	1.8E-04	2.5E-06	10	1.8E-03
Chromium (III)	4.7E-03	0.02	1500	1.6E-04	2.5E-06	10	1.6E-03
Chromium (VI)	1.4E-01	0.02	1500	4.7E-03	2.5E-06	10	4.7E-02
Cobalt	5.9E-02	0.02	1500	2.0E-03	2.5E-06	10	2.0E-02
Copper	6.1E-01	0.02	1500	2.0E-02	2.5E-06	10	2.0E-01
Lead	1.0E-01	0.02	1500	3.5E-03	2.5E-06	10	3.5E-02
Lithium	2.3E-01	0.02	1500	7.8E-03	2.5E-06	10	7.8E-02
Manganese	9.1E-01	0.02	1500	3.0E-02	2.5E-06	10	3.0E-01
Mercury	3.7E-03	0.02	1500	1.2E-04	2.5E-06	10	1.2E-03
Molybdenum	2.4E-02	0.02	1500	7.9E-04	2.5E-06	10	7.9E-03
Nickel	1.9E-01	0.02	1500	6.3E-03	2.5E-06	10	6.3E-02
Selenium	3.0E-02	0.02	1500	1.0E-03	2.5E-06	10	1.0E-02
Strontium	1.0E+01	0.02	1500	3.5E-01	2.5E-06	10	3.5E+00
Tin	1.1E-02	0.02	1500	3.6E-04	2.5E-06	10	3.6E-03
Uranium	1.7E-02	0.02	1500	5.5E-04	2.5E-06	10	5.5E-03
Vanadium	5.0E-01	0.02	1500	1.7E-02	2.5E-06	10	1.7E-01
Zinc	6.4E-01	0.02	1500	2.1E-02	2.5E-06	10	2.1E-01
Aluminum	1.1E+02	0.02	1500	3.5E+00	2.5E-06	10	3.5E+01
Bismuth	4.7E-03	0.02	1500	1.6E-04	2.5E-06	10	1.6E-03
Boron	8.2E-01	0.02	1500	2.7E-02	2.5E-06	10	2.7E-01
Iron	1.2E+02	0.02	1500	4.0E+00	2.5E-06	10	4.0E+01
Titanium	7.4E+00	0.02	1500	2.5E-01	2.5E-06	10	2.5E+00
Others							
PCBs	1.3E-11	0.02	1500	4.4E-13	7.8E-02	10	3.0E-12
Sulphate	1.4E-06	0.02	1500	4.6E-08	2.5E-06	10	4.6E-07
Hexachlorobenzene	4.5E-08	0.02	1500	1.5E-09	4.2E-01	10	3.5E-09
Dust Pallatives							
Epichlorohydrin	*4.6E-02*	0.02	1500	1.5E-03	4.0E+05	10	3.8E-09

Notes:
Equations based on US EPA OWS (2005)
[1] Based on Levelton (2014)
Italics conservatively assuming 100% of dustfall, note this is clearly an overestimate

Table II-3B Kt Parameters for Maximum North Delta Residential Receptor **Scenario: Project**

Parameter	CAS	Organic Carbon Partition Coefficient (L/kg)	Water Solubility (mg/L)	Vapor Pressure (mm Hg)	t 1/2 days due to volatilzation	Kv yrs^{-1}	t 1/2 days due to degradation (abiotic and/or biotic)	Source t 1/2 due to degradation (abiotic and/or biotic)	Ks yrs^{-1}	Kt yrs^{-1}
Acenaphthene	000083-32-9	5.03E+03	3.90E+00	2.15E-03	1.4E-01	1.8E+03	103.5	CCME 2008 based on Loehr and Webster 1997	2.4E+00	1.8E+03
Acenaphthylene	000208-96-8	5.03E+03	1.61E+01	6.68E-03	1.9E-01	1.3E+03	103.5	CCME 2008 based on Loehr and Webster 1997	2.4E+00	1.3E+03
Aluminum	007429-90-5	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Anthracene	000120-12-7	1.64E+04	4.34E-02	6.53E-06	1.7E+00	1.5E+02	103.5	CCME 2008 based on Loehr and Webster 1997	2.4E+00	1.5E+02
Antimony (metallic)	007440-36-0	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Arsenic, Inorganic	007440-38-2	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Barium	007440-39-3	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Benz[a]anthracene	000056-55-3	1.77E+05	9.40E-03	2.10E-07	1.3E+02	2.0E+00	604.5	CCME 2008 based on Howard et al 1991	4.2E-01	2.4E+00
Benzene	000071-43-2	1.46E+02	1.79E+03	9.48E+01	4.4E-05	5.8E+06	68	CCME 2008 based on Baker and Mayfield 1980	3.7E+00	5.8E+06
Benzo[a]pyrene	000050-32-8	5.87E+05	1.62E-03	5.49E-09	2.7E+03	9.2E-02	570	OEHHA 2000	4.4E-01	5.4E-01
Benzo[b]fluoranthene	000205-99-2	5.99E+05	1.50E-03	5.00E-07	2.8E+01	8.9E+00	570	OEHHA 2000	4.4E-01	9.4E+00
Benzo[g,h,i]perylene	000191-24-2	1.95E+06	2.60E-04	1.00E-10	8.0E+04	3.2E-03	570	OEHHA 2000	4.4E-01	4.5E-01
Benzo[k]fluoranthene	000207-08-9	5.87E+05	8.00E-04	9.65E-10	7.7E+03	3.3E-02	570	OEHHA 2000	4.4E-01	4.8E-01
Beryllium and compounds	007440-41-7	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Boron And Borates Only	007440-42-8	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Cadmium (Diet)	007440-43-9	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Chromium(III) (Soluble Particulates)	016065-83-1	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Chromium(III), Insoluble Salts	016065-83-1	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Chromium(VI)	018540-29-9	-	1.69E+06	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Chrysene	000218-01-9	1.81E+05	2.00E-03	6.23E-09	9.2E+02	2.8E-01	604.5	CCME 2008 based on Howard et al 1991	4.2E-01	6.9E-01
Cobalt	007440-48-4	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Copper	007440-50-8	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Dibenz[a,h]anthracene	000053-70-3	1.91E+06	2.49E-03	9.55E-10	7.9E+04	3.2E-03	570	OEHHA 2000	4.4E-01	4.5E-01
Epichlorohydrin	000106-89-8	9.91E+00	6.59E+04	1.64E+01	6.3E-04	4.0E+05	2.8E+01	Environment Canada 2000	9.0E+00	4.0E+05
Fluoranthene	000206-44-0	5.55E+04	2.60E-01	9.22E-06	2.5E+01	1.0E+01	604.5	CCME 2008 based on Howard et al 1991	4.2E-01	1.1E+01
Fluorene	000086-73-7	9.16E+03	1.69E+00	6.00E-04	4.1E-01	6.2E+02	103.5	CCME 2008 based on Loehr and Webster 1997	2.4E+00	6.2E+02
Hexane, N-	000110-54-3	1.32E+02	9.50E+00	1.51E+02	1.3E-07	1.9E+09	na	na	na	1.9E+09
Indeno[1,2,3-cd]pyrene	000193-39-5	3.47E+06	2.20E-05	1.25E-10	9.6E+03	2.6E-02	570	OEHHA 2000	4.4E-01	4.7E-01
Iron	007439-89-6	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Lead and Compounds	007439-92-1	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Linear Alkyl Sulfonate							1.0E+08	assumed	2.5E-06	2.5E-06
Lithium	007439-93-2	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Manganese (Diet)	007439-96-5	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Mercury (elemental)	007439-97-6	-	6.00E-02	1.96E-03		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Methylnaphthalene, 2-	000091-57-6	2.48E+03	2.46E+01	5.50E-02	1.8E-02	1.4E+04	32.5	CCME 2008 based on Loehr and Webster 1997	7.8E+00	1.4E+04
Molybdenum	007439-98-7	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Naphthalene	000091-20-3	1.54E+03	3.10E+01	8.50E-02	8.9E-03	2.9E+04	2.1	Enviornment Canada 1996	1.2E+02	2.9E+04
Nickel Oxide	001313-99-1	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Nickel Refinery Dust	000000-00-7	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Nickel Soluble Salts	007440-02-0	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Phenanthrene	000085-01-8	1.67E+04	1.15E+00	1.21E-04	2.5E+00	1.0E+02	5.7	CCME 2008 based on CEPA 1993	4.4E+01	1.5E+02
Pyrene	000129-00-0	5.43E+04	1.35E-01	4.50E-06	2.6E+01	9.8E+00	604.5	CCME 2008 based on Howard et al 1991	4.2E-01	1.0E+01
Selenium	007782-49-2	-	-	9.12E+03		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Strontium, Stable	007440-24-6	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Styrene	000100-42-5	4.46E+02	3.10E+02	6.40E+00	3.4E-04	7.4E+05	na	na	na	7.4E+05
Tin	007440-31-5	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Titanium	007440-32-6	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Toluene	000108-88-3	2.34E+02	5.26E+02	2.84E+01	6.8E-05	3.7E+06	na	na	na	3.7E+06
Uranium, Insoluble Compounds	007440-61-1	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Vanadium	000000-06-6	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Xylenes	001330-20-7	3.83E+02	1.06E+02	7.99E+00	8.0E-05	3.2E+06	na	na	na	3.2E+06
Zinc and Compounds	007440-66-6	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Hexachlorobenzene	000118-74-1	6.20E+03	6.20E-03	1.80E-05	6.00E+02	4.2E-01	1.0E+09	OEHHA 2003	2.5E-07	4.2E-01
PCBs	001336-36-3	7.81E+04	7.00E-01	8.63E-05		na	3.23E+03	OEHHA 2004	7.8E-02	7.8E-02
Sulphate	014808-79-8	-	1.00E+06	5.93E-05		na	1.0E+08	OEHHA 2005	2.5E-06	2.5E-06

Notes:

Values from RAIS (2014) unless otherwise noted

CCME. 2008. Canadian Council of Ministers of the Enviroment. Canada-Wide Standard (CWS) for Petroleum Hydrocarbons (PHC) in Soil. Scientifc Rationale Supporting Technical Document. CCME. 2008

OEHHA 2000. Office of Environmental Health Hazard Assessment. California EPA. Technical Support Document for Exposure Assessment and Stochastic Analysis. Air Toxics Hot Spots Program Risk Assessment Guidelines. Oakland. California. 2000

Environment Canada. 2000. Screening Assessment: oxirane, (chloromethyl)-,epichlorohydrin. Chemical Abstracts Service Registry Number 106-89-8. Environment Canada. Health Canada. November 2008

	Calculated based on first order decay rate: k=0.693/(t1/2 / 365)
Assumed:	Based on lack of data from above sources, 10^8 t 1/2 based on professional judgement
na:	Not availble from sources idenfied above

Table II-4B Project Soil Particulate/Dust Concentations for Maximum North Delta Residential Receptor **Scenario: Project**

Parameter	DL kg/m^3	Cs mg/kg	CF ug/mg	C_{dust} ug/m^3
Polycyclic Aromatic Hydrocarbons				
Carcinogenic PAHs				
Benzo[a]anthracene	7.6E-10	3.7E-04	1000	2.8E-10
Benzo[a]pyrene	7.6E-10	6.9E-04	1000	5.2E-10
Benzo[b]fluoranthene	7.6E-10	1.4E-04	1000	1.1E-10
Benzo[g,h,i]perylene	7.6E-10	2.2E-04	1000	1.7E-10
Benzo[k]fluoranthene	7.6E-10	5.8E-04	1000	4.4E-10
Chrysene	7.6E-10	7.9E-04	1000	6.0E-10
Dibenzo[a,h]anthracene	7.6E-10	1.7E-04	1000	1.3E-10
Fluoranthene	7.6E-10	2.4E-04	1000	1.8E-10
Indeno[1,2,3-c,d]pyrene	7.6E-10	5.7E-04	1000	4.3E-10
Phenanthrene	7.6E-10	4.3E-06	1000	3.3E-12
Non-carcinogenic PAHs				
Acenaphthene	7.6E-10	3.2E-07	1000	2.4E-13
Acenaphthylene	7.6E-10	1.1E-07	1000	8.7E-14
Anthracene	7.6E-10	2.1E-06	1000	1.6E-12
Fluorene	7.6E-10	4.4E-07	1000	3.3E-13
Fluoranthene	7.6E-10	2.4E-04	1000	1.8E-10
Naphthalene	7.6E-10	4.4E-09	1000	3.4E-15
2-Methylnaphthalene	7.6E-10	7.2E-09	1000	5.5E-15
Pyrene	7.6E-10	3.2E-04	1000	2.4E-10
Metals and Metalloids				
Antimony	7.6E-10	1.7E-03	1000	1.3E-09
Arsenic	7.6E-10	2.1E-02	1000	1.6E-08
Barium	7.6E-10	5.5E+00	1000	4.2E-06
Beryllium	7.6E-10	3.3E-03	1000	2.5E-09
Cadmium	7.6E-10	1.8E-03	1000	1.3E-09
Chromium (III)	7.6E-10	1.6E-03	1000	1.2E-09
Chromium (VI)	7.6E-10	4.7E-02	1000	3.6E-08
Cobalt	7.6E-10	2.0E-02	1000	1.5E-08
Copper	7.6E-10	2.0E-01	1000	1.5E-07
Lead	7.6E-10	3.5E-02	1000	2.6E-08
Lithium	7.6E-10	7.8E-02	1000	5.9E-08
Manganese	7.6E-10	3.0E-01	1000	2.3E-07
Mercury	7.6E-10	1.2E-03	1000	9.3E-10
Molybdenum	7.6E-10	7.9E-03	1000	6.0E-09
Nickel	7.6E-10	6.3E-02	1000	4.8E-08
Selenium	7.6E-10	1.0E-02	1000	7.7E-09
Strontium	7.6E-10	3.5E+00	1000	2.6E-06
Tin	7.6E-10	3.6E-03	1000	2.7E-09
Uranium	7.6E-10	5.5E-03	1000	4.2E-09
Vanadium	7.6E-10	1.7E-01	1000	1.3E-07
Zinc	7.6E-10	2.1E-01	1000	1.6E-07
Aluminum	7.6E-10	3.5E+01	1000	2.7E-05
Boron	7.6E-10	2.7E-01	1000	2.1E-07
Iron	7.6E-10	4.0E+01	1000	3.0E-05
Titanium	7.6E-10	2.5E+00	1000	1.9E-06
Others				
PCBs	7.6E-10	3.0E-12	1000	2.3E-18
Sulphate	7.6E-10	4.6E-07	1000	3.5E-13
Hexachlorobenzene	7.6E-10	3.5E-09	1000	2.6E-15
Dust Pallatives				
Epichlorohydrin	7.6E-10	3.8E-09	1000	2.9E-15

Notes:
Equations based on US EPA OWS (2005)
[1] Soil concentration from Equation 1.2

Table II-5B: Project Above Ground Plant Concentations for Maximum North Delta Residential Receptor **Scenario: Project**

Parameter	Dd mg/m^2/yr	Dw mg/m^2/yr	Fv percentage	Rp unitless	kp yr^{-1}	Tp yr	Yp kg DW/m^2	Pd mg/kg DW	Log K_{ow} unitless	BCF kg soil/kg plant DW	Cs mg/kg	BCF kg soil/kg plant DW	Pr mg/kg DW	Pd mg/kg	Pr mg/kg	$C_{plant\ ww}$ mg/kg
Polycyclic Aromatic Hydrocarbons																
Carcinogenic PAHs																
Benzo[a]anthracene	1.5E-05	5.8E-05	1%	0.5	18	0.164	2.24	5.9E-07	5.8E+00	1.8E-02	3.7E-04	1.8E-02	6.8E-06	5.9E-07	6.8E-06	1.1E-06
Benzo[a]pyrene	5.7E-06	2.3E-05	1%	0.5	18	0.164	2.24	2.3E-07	6.1E+00	1.1E-02	6.9E-04	1.1E-02	7.6E-06	2.3E-07	7.6E-06	1.2E-06
Benzo[b]fluoranthene	1.2E-05	8.1E-05	1%	0.5	18	0.164	2.24	7.1E-07	5.8E+00	1.8E-02	1.4E-04	1.8E-02	2.5E-06	7.1E-07	2.5E-06	4.8E-07
Benzo[g,h,i]perylene	3.2E-06	6.9E-06	1%	0.5	18	0.164	2.24	8.6E-08	6.6E+00	5.7E-03	2.2E-04	5.7E-03	1.3E-06	8.6E-08	1.3E-06	2.0E-07
Benzo[k]fluoranthene	2.1E-07	1.6E-05	1%	0.5	18	0.164	2.24	1.2E-07	6.1E+00	1.1E-02	5.8E-04	1.1E-02	6.6E-06	1.2E-07	6.6E-06	1.0E-06
Chrysene	4.1E-07	3.3E-05	1%	0.5	18	0.164	2.24	2.4E-07	5.8E+00	1.7E-02	7.9E-04	1.7E-02	1.3E-05	2.4E-07	1.3E-05	2.1E-06
Dibenzo[a,h]anthracene	5.8E-08	4.6E-06	1%	0.5	18	0.164	2.24	3.3E-08	6.8E+00	4.9E-03	1.7E-04	4.9E-03	8.4E-07	3.3E-08	8.4E-07	1.3E-07
Fluoranthene	1.7E-05	1.5E-04	1%	0.5	18	0.164	2.24	1.3E-06	5.2E+00	4.0E-02	2.4E-04	4.0E-02	9.7E-06	1.3E-06	9.7E-06	1.6E-06
Indeno[1,2,3-c,d]pyrene	1.0E-05	1.8E-05	1%	0.5	18	0.164	2.24	2.5E-07	6.7E+00	5.1E-03	5.7E-04	5.1E-03	2.9E-06	2.5E-07	2.9E-06	4.8E-07
Phenanthrene	2.2E-05	4.3E-05	1%	0.5	18	0.164	2.24	5.7E-07	4.5E+00	1.0E-01	4.3E-06	1.0E-01	4.4E-07	5.7E-07	4.4E-07	1.5E-07
Non-carcinogenic PAHs																
Acenaphthene	8.0E-06	3.6E-05	1%	0.5	18	0.164	2.24	3.5E-07	3.9E+00	2.1E-01	3.2E-07	2.1E-01	6.7E-08	3.5E-07	6.7E-08	6.2E-08
Acenaphthylene	9.3E-06	1.2E-05	1%	0.5	18	0.164	2.24	2.0E-07	3.9E+00	2.0E-01	1.1E-07	2.0E-01	2.3E-08	2.0E-07	2.3E-08	3.3E-08
Anthracene	1.1E-05	2.2E-05	1%	0.5	18	0.164	2.24	2.8E-07	4.5E+00	1.0E-01	2.1E-06	1.0E-01	2.1E-07	2.8E-07	2.1E-07	7.4E-08
Fluorene	1.2E-05	2.1E-05	1%	0.5	18	0.164	2.24	2.9E-07	4.2E+00	1.5E-01	4.4E-07	1.5E-01	6.5E-08	2.9E-07	6.5E-08	5.4E-08
Fluoranthene	1.7E-05	1.5E-04	1%	0.5	18	0.164	2.24	1.3E-06	5.2E+00	4.0E-02	2.4E-04	4.0E-02	9.7E-06	1.3E-06	9.7E-06	1.6E-06
Naphthalene	3.5E-04	1.4E-04	1%	0.5	18	0.164	2.24	5.1E-06	3.3E+00	4.8E-01	4.4E-09	4.8E-01	2.1E-09	5.1E-06	2.1E-09	7.7E-07
2-Methylnaphthalene	7.8E-08	6.2E-06	1%	0.5	18	0.164	2.24	4.5E-08	3.9E+00	2.3E-01	7.2E-09	2.3E-01	1.6E-09	4.5E-08	1.6E-09	6.9E-09
Pyrene	2.8E-05	2.0E-04	1%	0.5	18	0.164	2.24	1.7E-06	4.9E+00	5.9E-02	3.2E-04	5.9E-02	1.9E-05	1.7E-06	1.9E-05	3.0E-06
Metals and Metalliods																
Antimony	2.4E-04	1.0E-04	0%	0.5	18	0.164	2.24	3.5E-06	-	2.0E-01	1.7E-03	2.0E-01	3.3E-04	3.5E-06	3.3E-04	5.1E-05
Arsenic	2.9E-05	1.3E-04	0%	0.5	18	0.164	2.24	1.2E-06	-	4.0E-02	2.1E-02	4.0E-02	8.3E-04	1.2E-06	8.3E-04	1.2E-04
Barium	6.1E-04	3.3E-02	0%	0.5	18	0.164	2.24	2.4E-04	-	1.5E-01	5.5E+00	1.5E-01	8.2E-01	2.4E-04	8.2E-01	1.2E-01
Beryllium	1.1E-05	2.1E-05	0%	0.5	18	0.164	2.24	2.8E-07	-	1.0E-02	3.3E-03	1.0E-02	3.3E-05	2.8E-07	3.3E-05	5.0E-06
Cadmium	1.0E-04	4.7E-05	0%	0.5	18	0.164	2.24	1.5E-06	-	5.0E-01	1.8E-03	5.0E-01	8.8E-04	1.5E-06	8.8E-04	1.3E-04
Chromium (III)	1.6E-05	1.3E-05	0%	0.5	18	0.164	2.24	2.8E-07	-	7.5E-03	1.6E-03	7.5E-03	1.2E-05	2.8E-07	1.2E-05	1.8E-06
Chromium (VI)	3.5E-05	2.9E-04	0%	0.5	18	0.164	2.24	2.4E-06	-	7.5E-03	4.7E-02	7.5E-03	3.5E-04	2.4E-06	3.5E-04	5.3E-05
Cobalt	4.7E-05	1.3E-04	0%	0.5	18	0.164	2.24	1.5E-06	-	2.0E-02	2.0E-02	2.0E-02	4.0E-04	1.5E-06	4.0E-04	6.0E-05
Copper	7.1E-05	1.2E-03	0%	0.5	18	0.164	2.24	9.4E-06	-	4.0E-01	2.0E-01	4.0E-01	8.1E-02	9.4E-06	8.1E-02	1.2E-02
Lead	1.7E-04	2.4E-04	0%	0.5	18	0.164	2.24	3.7E-06	-	4.5E-02	3.5E-02	4.5E-02	1.6E-03	3.7E-06	1.6E-03	2.4E-04
Lithium	5.8E-06	4.6E-04	0%	0.5	18	0.164	2.24	3.3E-06	-	2.5E-02	7.8E-02	2.5E-02	2.0E-03	3.3E-06	2.0E-03	2.9E-04
Manganese	2.4E-05	1.8E-03	0%	0.5	18	0.164	2.24	1.3E-05	-	2.5E-01	3.0E-01	2.5E-01	7.5E-02	1.3E-05	7.5E-02	1.1E-02
Mercury	1.8E-06	7.5E-06	1%	0.5	18	0.164	2.24	7.4E-08	-	9.0E-01	1.2E-03	9.0E-01	1.1E-03	7.4E-08	1.1E-03	1.7E-04
Molybdenum	5.6E-05	6.8E-05	0%	0.5	18	0.164	2.24	1.1E-06	-	2.5E-01	7.9E-03	2.5E-01	2.0E-03	1.1E-06	2.0E-03	3.0E-04
Nickel	4.7E-06	3.7E-04	0%	0.5	18	0.164	2.24	2.7E-06	-	6.0E-02	6.3E-02	6.0E-02	3.8E-03	2.7E-06	3.8E-03	5.7E-04
Selenium	8.0E-07	6.0E-05	0%	0.5	18	0.164	2.24	4.3E-07	-	2.5E-02	1.0E-02	2.5E-02	2.5E-04	4.3E-07	2.5E-04	3.8E-05
Strontium	2.6E-04	2.0E-02	0%	0.5	18	0.164	2.24	1.5E-04	-	2.5E+00	3.5E+00	2.5E+00	8.7E+00	1.5E-04	8.7E+00	1.3E+00
Tin	2.6E-07	2.1E-05	0%	0.5	18	0.164	2.24	1.5E-07	-	3.0E-02	3.6E-03	3.0E-02	1.1E-04	1.5E-07	1.1E-04	1.6E-05
Uranium	4.1E-07	3.3E-05	0%	0.5	18	0.164	2.24	2.4E-07	-	8.5E-03	5.5E-03	8.5E-03	4.7E-05	2.4E-07	4.7E-05	7.1E-06
Vanadium	7.2E-03	3.7E-03	0%	0.5	18	0.164	2.24	1.1E-04	-	5.5E-03	1.7E-01	5.5E-03	9.2E-04	1.1E-04	9.2E-04	1.6E-04
Zinc	-7.7E-04	1.6E-03	0%	0.5	18	0.164	2.24	1.9E-06	-	9.9E-01	2.1E-01	9.9E-01	2.1E-01	1.9E-06	2.1E-01	3.2E-02
Aluminum	2.6E-03	2.1E-01	0%	0.5	18	0.164	2.24	1.5E-03	-	4.0E-03	3.5E+01	4.0E-03	1.4E-01	1.5E-03	1.4E-01	2.2E-02
Bismuth	1.2E-07	9.3E-06	0%	0.5	18	0.164	2.24	6.7E-08	-		1.6E-03	0.0E+00	0.0E+00	6.7E-08	0.0E+00	1.0E-08
Boron	2.0E-05	1.6E-03	0%	0.5	18	0.164	2.24	1.2E-05	-	4.0E+00	2.7E-01	4.0E+00	1.1E+00	1.2E-05	1.1E+00	1.6E-01
Iron	5.2E-03	2.3E-01	0%	0.5	18	0.164	2.24	1.7E-03	-	4.0E-03	4.0E-01	4.0E-03	1.7E-03	1.7E-03	1.6E-01	2.4E-02
Titanium	1.3E-04	1.5E-02	0%	0.5	18	0.164	2.24	1.0E-04	-	5.5E-03	2.5E+00	5.5E-03	1.4E-02	1.0E-04	1.4E-02	2.0E-03
Others																
PCBs	4.5E-07	1.1E-07	1%	0.5	18	0.164	2.24	6.1E-09	7.1E+00	2.9E-03	3.0E-12	2.9E-03	8.9E-15	6.1E-09	8.9E-15	9.1E-10
Sulphate	1.7E-01	6.6E-02	1%	0.5	18	0.164	2.24	2.5E-03	-	*4.0E-01*	4.6E-07	4.0E-01	1.9E-07	2.5E-03	1.9E-07	3.7E-04
Hexachlorobenzene	0.0E+00	0.0E+00	1%	0.5	18	0.164	2.24	0.0E+00	3.8E+00	1.8E-02	3.5E-09	1.8E-02	6.3E-11	0.0E+00	6.3E-11	9.4E-12
Dust Pallatives																
Epichlorohydrin	1.2E-05	1.3E-05	1%	0.5	18	0.164	2.24	2.3E-07	4.5E-01	2.1E+01	3.8E-09	2.1E+01	8.1E-08	2.3E-07	8.1E-08	4.7E-08

Notes:
Equations based on US EPA OWS (2005)
[1] Based on Levelton (2014)
[2] Log Kow based on US EPA (2004), RAIS (2014), HSDB (2014)
[3] Soil concentration from Equation 1.2
[4] For inorganics soil to dry plant uptake values from ORNL (2014)
- Not available for this parameter
Italics BCF not available from RAIS (2014), BCF assumed to be equal to average of remaining metals

Table II-6B Project Below Ground Plant Concentrations for Maximum North Delta Residential Receptor **Scenario: Project**

Parameter	Cs mg/kg	BCF kg soil/kg plant DW	WPF unitless	WC percentage	Pr_{root} mg/kg ww
Polycyclic Aromatic Hydrocarbons					
Carcinogenic PAHs					
Benzo[a]anthracene	3.7E-04	1.8E-02	1	0.85	1.0E-06
Benzo[a]pyrene	6.9E-04	1.1E-02	1	0.85	1.1E-06
Benzo[b]fluoranthene	1.4E-04	1.8E-02	1	0.85	3.8E-07
Benzo[g,h,i]perylene	2.2E-04	5.7E-03	1	0.85	1.9E-07
Benzo[k]fluoranthene	5.8E-04	1.1E-02	1	0.85	9.9E-07
Chrysene	7.9E-04	1.7E-02	1	0.85	2.0E-06
Dibenzo[a,h]anthracene	1.7E-04	4.9E-03	1	0.85	1.3E-07
Fluoranthene	2.4E-04	4.0E-02	1	0.85	1.5E-06
Indeno[1,2,3-c,d]pyrene	5.7E-04	5.1E-03	1	0.85	4.4E-07
Phenanthrene	4.3E-06	1.0E-01	1	0.85	6.6E-08
Non-carcinogenic PAHs					
Acenaphthene	3.2E-07	2.1E-01	1	0.85	1.0E-08
Acenaphthylene	1.1E-07	2.0E-01	1	0.85	3.5E-09
Anthracene	2.1E-06	1.0E-01	1	0.85	3.2E-08
Fluorene	4.4E-07	1.5E-01	1	0.85	9.7E-09
Fluoranthene	2.4E-04	4.0E-02	1	0.85	1.5E-06
Naphthalene	4.4E-09	4.8E-01	1	0.85	3.2E-10
2-Methylnaphthalene	7.2E-09	2.3E-01	1	0.85	2.5E-10
Pyrene	3.2E-04	5.9E-02	1	0.85	2.8E-06
Metals and Metalliods					
Antimony	1.7E-03	2.0E-01	1	0.85	5.0E-05
Arsenic	2.1E-02	4.0E-02	1	0.85	1.2E-04
Barium	5.5E+00	1.5E-01	1	0.85	1.2E-01
Beryllium	3.3E-03	1.0E-02	1	0.85	5.0E-06
Cadmium	1.8E-03	5.0E-01	1	0.85	1.3E-04
Chromium (III)	1.6E-03	7.5E-03	1	0.85	1.8E-06
Chromium (VI)	4.7E-02	7.5E-03	1	0.85	5.3E-05
Cobalt	2.0E-02	2.0E-02	1	0.85	5.9E-05
Copper	2.0E-01	4.0E-01	1	0.85	1.2E-02
Lead	3.5E-02	4.5E-02	1	0.85	2.3E-04
Lithium	7.8E-02	2.5E-02	1	0.85	2.9E-04
Manganese	3.0E-01	2.5E-01	1	0.85	1.1E-02
Mercury	1.2E-03	9.0E-01	1	0.85	1.7E-04
Molybdenum	7.9E-03	2.5E-01	1	0.85	3.0E-04
Nickel	6.3E-02	6.0E-02	1	0.85	5.7E-04
Selenium	1.0E-02	2.5E-02	1	0.85	3.8E-05
Strontium	3.5E+00	2.5E+00	1	0.85	1.3E+00
Tin	3.6E-03	3.0E-02	1	0.85	1.6E-05
Uranium	5.5E-03	8.5E-03	1	0.85	7.0E-06
Vanadium	1.7E-01	5.5E-03	1	0.85	1.4E-04
Zinc	2.1E-01	9.9E-01	1	0.85	3.2E-02
Aluminum	3.5E+01	4.0E-03	1	0.85	2.1E-02
Boron	2.7E-01	4.0E+00	1	0.85	1.6E-01
Iron	4.0E+01	4.0E-03	1	0.85	2.4E-02
Titanium	2.5E+00	5.5E-03	1	0.85	2.0E-03
Others					
PCBs	3.0E-12	2.9E-03	1	0.85	1.3E-15
Sulphate	4.6E-07	4.0E-01	1	0.85	2.8E-08
Hexachlorobenzene	3.5E-09	1.8E-02	1	0.85	9.4E-12
Dust Pallatives					
Epichlorohydrin	3.8E-09	2.1E+01	1	0.85	1.2E-08

Notes:
Equations based on US EPA OWS (2005)
[1] Soil concentration from Equation 1.2
[2] BCF from Equation 3.2.1 for inorganics, for organics soil to dry plant uptake value from ORNL (2014)

Table II-1D Summary of Project Multimedia Exposure Point Concentrations (EPCs) for Industrial Receptor

Parameter	C_s mg/kg	C_{dust} ug/m^3	C_{air} ug/m^3
Polycyclic Aromatic Hydrocarbons			
Carcinogenic PAHs			
Benzo[a]anthracene	1.4E-03	1.1E-09	4.1E-03
Benzo[a]pyrene	2.6E-03	2.0E-09	4.7E-05
Benzo[b]fluoranthene	5.3E-04	4.0E-10	1.6E-04
Benzo[g,h,i]perylene	8.3E-04	6.3E-10	1.5E-05
Benzo[k]fluoranthene	2.2E-03	1.6E-09	3.6E-05
Chrysene	3.0E-03	2.3E-09	6.8E-05
Dibenzo[a,h]anthracene	6.5E-04	4.9E-10	9.3E-06
Fluoranthene	9.0E-04	6.8E-10	3.2E-04
Indeno[1,2,3-c,d]pyrene	2.1E-03	1.6E-09	3.7E-05
Phenanthrene	1.6E-05	1.2E-11	2.1E-04
Non-carcinogenic PAHs			
Acenaphthene	1.2E-06	9.1E-13	7.8E-05
Acenaphthylene	4.3E-07	3.3E-13	1.3E-04
Anthracene	7.7E-06	5.9E-12	4.0E-03
Fluorene	1.6E-06	1.2E-12	7.8E-05
Fluoranthene	9.0E-04	6.8E-10	3.2E-04
Naphthalene	1.8E-08	1.4E-14	6.5E-04
2-Methylnaphthalene	2.7E-08	2.1E-14	1.2E-05
Pyrene	1.2E-03	9.0E-10	4.1E-04
Metals and Metalliods			
Antimony	6.5E-03	4.9E-09	3.1E-04
Arsenic	7.7E-02	5.9E-08	2.6E-04
Barium	2.1E+01	1.6E-05	6.5E-02
Beryllium	1.2E-02	9.4E-09	1.5E-04
Cadmium	6.7E-03	5.1E-09	1.3E-04
Chromium (III)	5.9E-03	4.5E-09	5.7E-04
Chromium (VI)	1.8E-01	1.3E-07	2.7E-05
Cobalt	7.4E-02	5.6E-08	2.9E-04
Copper	7.5E-01	5.7E-07	2.5E-03
Lead	1.3E-01	9.9E-08	4.9E-04
Manganese	1.1E+00	8.6E-07	3.6E-03
Mercury	4.6E-03	3.5E-09	1.7E-05
Molybdenum	3.0E-02	2.2E-08	1.6E-04
Nickel	2.3E-01	1.8E-07	7.4E-04
Selenium	3.8E-02	2.9E-08	1.2E-04
Strontium	1.3E+01	9.8E-06	4.1E-02
Tin	1.4E-02	1.0E-08	2.1E-04
Uranium	2.1E-02	1.6E-08	6.5E-05
Vanadium	6.3E-01	4.8E-07	1.1E-02
Zinc	7.9E-01	6.0E-07	3.5E-03
Aluminum	1.3E+02	1.0E-04	4.2E-01
Boron	1.0E+00	7.8E-07	3.2E-03
Iron	1.5E+02	1.1E-04	4.7E-01
Titanium	9.2E+00	7.0E-06	2.9E-02
Others			
PCBs	5.5E-07	4.2E-13	2.5E-07
Sulfate	4.7E-01	3.6E-07	2.1E-01
Hexachlorobenzene	1.5E-08	1.1E-14	2.0E-08
Dust Pallatives			
Epichlorohydrin	3.6E-10	2.8E-16	6.0E-05

Notes:

- Not applicable for this parameter

[1] Parameter speciated into individual PAH and metal constituents above

[2] Operable exposure for this parameter limited to inhalation pathway

Table II-2D Project Soil Concentrations for Industrial Receptor **Scenario: Project**

Parameter	D_{tot} mg/m^2/yr	Zs m	BD kg/m^3	Ds mg/kg/yr	kt yrs^{-1}	tD yrs	C_s mg/kg
Polycyclic Aromatic Hydrocarbons							
Carcinogenic PAHs							
Benzo[a]anthracene	1.0E-01	0.02	1500	3.4E-03	2.4E+00	10	1.4E-03
Benzo[a]pyrene	4.2E-02	0.02	1500	1.4E-03	5.4E-01	10	2.6E-03
Benzo[b]fluoranthene	1.5E-01	0.02	1500	5.0E-03	9.4E+00	10	5.3E-04
Benzo[g,h,i]perylene	1.1E-02	0.02	1500	3.7E-04	4.5E-01	10	8.3E-04
Benzo[k]fluoranthene	3.1E-02	0.02	1500	1.0E-03	4.8E-01	10	2.2E-03
Chrysene	6.2E-02	0.02	1500	2.1E-03	6.9E-01	10	3.0E-03
Dibenzo[a,h]anthracene	8.8E-03	0.02	1500	2.9E-04	4.5E-01	10	6.5E-04
Fluoranthene	2.9E-01	0.02	1500	9.6E-03	1.1E+01	10	9.0E-04
Indeno[1,2,3-c,d]pyrene	3.0E-02	0.02	1500	1.0E-03	4.7E-01	10	2.1E-03
Phenanthrene	7.0E-02	0.02	1500	2.3E-03	1.5E+02	10	1.6E-05
Non-carcinogenic PAHs							
Acenaphthene	6.3E-02	0.02	1500	2.1E-03	1.8E+03	10	1.2E-06
Acenaphthylene	1.7E-02	0.02	1500	5.7E-04	1.3E+03	10	4.3E-07
Anthracene	3.5E-02	0.02	1500	1.2E-03	1.5E+02	10	7.7E-06
Fluorene	3.0E-02	0.02	1500	1.0E-03	6.2E+02	10	1.6E-06
Fluoranthene	2.9E-01	0.02	1500	9.6E-03	1.1E+01	10	9.0E-04
Naphthalene	1.5E-02	0.02	1500	5.1E-04	2.9E+04	10	1.8E-08
2-Methylnaphthalene	1.2E-02	0.02	1500	3.9E-04	1.4E+04	10	2.7E-08
Pyrene	3.6E-01	0.02	1500	1.2E-02	1.0E+01	10	1.2E-03
Metals and Metalloids							
Antimony	2.0E-02	0.02	1500	6.5E-04	2.5E-06	10	6.5E-03
Arsenic	2.3E-01	0.02	1500	7.7E-03	2.5E-06	10	7.7E-02
Barium	6.2E+01	0.02	1500	2.1E+00	2.5E-06	10	2.1E+01
Beryllium	3.7E-02	0.02	1500	1.2E-03	2.5E-06	10	1.2E-02
Cadmium	2.0E-02	0.02	1500	6.7E-04	2.5E-06	10	6.7E-03
Chromium (III)	1.8E-02	0.02	1500	5.9E-04	2.5E-06	10	5.9E-03
Chromium (VI)	5.3E-01	0.02	1500	1.8E-02	2.5E-06	10	1.8E-01
Cobalt	2.2E-01	0.02	1500	7.4E-03	2.5E-06	10	7.4E-02
Copper	2.3E+00	0.02	1500	7.5E-02	2.5E-06	10	7.5E-01
Lead	3.9E-01	0.02	1500	1.3E-02	2.5E-06	10	1.3E-01
Lithium	8.8E-01	0.02	1500	2.9E-02	2.5E-06	10	2.9E-01
Manganese	3.4E+00	0.02	1500	1.1E-01	2.5E-06	10	1.1E+00
Mercury	1.4E-02	0.02	1500	4.6E-04	2.5E-06	10	4.6E-03
Molybdenum	8.9E-02	0.02	1500	3.0E-03	2.5E-06	10	3.0E-02
Nickel	7.0E-01	0.02	1500	2.3E-02	2.5E-06	10	2.3E-01
Selenium	1.1E-01	0.02	1500	3.8E-03	2.5E-06	10	3.8E-02
Strontium	3.9E+01	0.02	1500	1.3E+00	2.5E-06	10	1.3E+01
Tin	4.1E-02	0.02	1500	1.4E-03	2.5E-06	10	1.4E-02
Uranium	6.2E-02	0.02	1500	2.1E-03	2.5E-06	10	2.1E-02
Vanadium	1.9E+00	0.02	1500	6.3E-02	2.5E-06	10	6.3E-01
Zinc	2.4E+00	0.02	1500	7.9E-02	2.5E-06	10	7.9E-01
Aluminum	4.0E+02	0.02	1500	1.3E+01	2.5E-06	10	1.3E+02
Boron	3.1E+00	0.02	1500	1.0E-01	2.5E-06	10	1.0E+00
Iron	4.4E+02	0.02	1500	1.5E+01	2.5E-06	10	1.5E+02
Titanium	2.8E+01	0.02	1500	9.2E-01	2.5E-06	10	9.2E+00
Indium	6.2E-04	0.02	1500	2.1E-05	2.5E-06	10	2.1E-04
Lanthanum	1.6E-03	0.02	1500	5.2E-05	2.5E-06	10	5.2E-04
Others							
PCBs	2.4E-06	0.02	1500	7.9E-08	7.8E-02	10	5.5E-07
Sulphate	1.4E+00	0.02	1500	4.7E-02	2.5E-06	10	4.7E-01
Hexachlorobenzene	1.9E-07	0.02	1500	6.3E-09	4.2E-01	10	1.5E-08
Dust Pallatives							
Epichlorohydrin	4.4E-03	0.02	1500	1.5E-04	4.0E+05	10	3.6E-10

Notes:
Equations based on US EPA OWS (2005)
[1] Based on Levelton (2014)

Table II-3D Kt Parameters for Industrial Receptor **Scenario: Project**

Parameter	CAS	Organic Carbon Partition Coefficient (L/kg)	Water Solubility (mg/L)	Vapor Pressure (mm Hg)	t 1/2 days due to volatilzation	Kv yrs^{-1}	t 1/2 days due to degradation (abiotic and/or biotic)	Source t 1/2 due to degradation (abiotic and/or biotic)	Ks yrs^{-1}	Kt yrs^{-1}
Acenaphthene	000083-32-9	5.03E+03	3.90E+00	2.15E-03	1.4E-01	1.8E+03	103.5	CCME 2008 based on Loehr and Webster 1997	2.4E+00	1.8E+03
Acenaphthylene	000208-96-8	5.03E+03	1.61E+01	6.68E-03	1.9E-01	1.3E+03	103.5	CCME 2008 based on Loehr and Webster 1997	2.4E+00	1.3E+03
Aluminum	007429-90-5	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Anthracene	000120-12-7	1.64E+04	4.34E-02	6.53E-06	1.7E+00	1.5E+02	103.5	CCME 2008 based on Loehr and Webster 1997	2.4E+00	1.5E+02
Antimony (metallic)	007440-36-0	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Arsenic, Inorganic	007440-38-2	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Barium	007440-39-3	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Benz[a]anthracene	000056-55-3	1.77E+05	9.40E-03	2.10E-07	1.3E+02	2.0E+00	604.5	CCME 2008 based on Howard et al 1991	4.2E-01	2.4E+00
Benzo[a]pyrene	000050-32-8	5.87E+05	1.62E-03	5.49E-09	2.7E+03	9.2E-02	570	OEHHA 2000	4.4E-01	5.4E-01
Benzo[b]fluoranthene	000205-99-2	5.99E+05	1.50E-03	5.00E-07	2.8E+01	8.9E+00	570	OEHHA 2000	4.4E-01	9.4E+00
Benzo[g,h,i]perylene	000191-24-2	1.95E+06	2.60E-04	1.00E-10	8.0E+04	3.2E-03	570	OEHHA 2000	4.4E-01	4.5E-01
Benzo[k]fluoranthene	000207-08-9	5.87E+05	8.00E-04	9.65E-10	7.7E+03	3.3E-02	570	OEHHA 2000	4.4E-01	4.8E-01
Beryllium and compounds	007440-41-7	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Boron And Borates Only	007440-42-8	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Butadiene, 1,3-	000106-99-0	3.96E+01	7.35E+02	2.11E+03	2.2E-07	1.2E+09	na	na	na	1.2E+09
Cadmium (Diet)	007440-43-9	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Chromium(III) (Soluble Particulates)	016065-83-1	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Chromium(III), Insoluble Salts	016065-83-1	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Chromium(VI)	018540-29-9	-	1.69E+06	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Chrysene	000218-01-9	1.81E+05	2.00E-03	6.23E-09	9.2E+02	2.8E-01	604.5	CCME 2008 based on Howard et al 1991	4.2E-01	6.9E-01
Cobalt	007440-48-4	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Copper	007440-50-8	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Dibenz[a,h]anthracene	000053-70-3	1.91E+06	2.49E-03	9.55E-10	7.9E+04	3.2E-03	570	OEHHA 2000	4.4E-01	4.5E-01
Epichlorohydrin	000106-89-8	9.91E+00	6.59E+04	1.64E+01	6.3E-04	4.0E+05	2.8E+01	Environment Canada 2000	9.0E+00	4.0E+05
Fluoranthene	000206-44-0	5.55E+04	2.60E-01	9.22E-06	2.5E+01	1.0E+01	604.5	CCME 2008 based on Howard et al 1991	4.2E-01	1.1E+01
Fluorene	000086-73-7	9.16E+03	1.69E+00	6.00E-04	4.1E-01	6.2E+02	103.5	CCME 2008 based on Loehr and Webster 1997	2.4E+00	6.2E+02
Hexane, N-	000110-54-3	1.32E+02	9.50E+00	1.51E+02	1.3E-07	1.9E+09	na	na	na	1.9E+09
Indeno[1,2,3-cd]pyrene	000193-39-5	3.47E+06	2.20E-05	1.25E-10	9.6E+03	2.6E-02	570	OEHHA 2000	4.4E-01	4.7E-01
Iron	007439-89-6	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Lead and Compounds	007439-92-1	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Lithium	007439-93-2	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Manganese (Diet)	007439-96-5	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Mercury (elemental)	007439-97-6	-	6.00E-02	1.96E-03		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Methylnaphthalene, 2-	000091-57-6	2.48E+03	2.46E+01	5.50E-02	1.8E-02	1.4E+04	32.5	CCME 2008 based on Loehr and Webster 1997	7.8E+00	1.4E+04
Molybdenum	007439-98-7	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Naphthalene	000091-20-3	1.54E+03	3.10E+01	8.50E-02	8.9E-03	2.9E+04	2.1	Enviornment Canada 1996	1.2E+02	2.9E+04
Nickel Oxide	001313-99-1	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Nickel Refinery Dust	000000-00-7	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Nickel Soluble Salts	007440-02-0	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Phenanthrene	000085-01-8	1.67E+04	1.15E+00	1.21E-04	2.5E+00	1.0E+02	5.7	CCME 2008 based on CEPA 1993	4.4E+01	1.5E+02
Pyrene	000129-00-0	5.43E+04	1.35E-01	4.50E-06	2.6E+01	9.8E+00	604.5	CCME 2008 based on Howard et al 1991	4.2E-01	1.0E+01
Selenium	007782-49-2	-	-	9.12E+03		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Succinic Acid							1.0E+08	assumed	2.5E-06	2.5E-06
Strontium, Stable	007440-24-6	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Styrene	000100-42-5	4.46E+02	3.10E+02	6.40E+00	3.4E-04	7.4E+05	na	na	na	7.4E+05
Tin	007440-31-5	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Titanium	007440-32-6	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Uranium, Insoluble Compounds	007440-61-1	-	-	0.00E+00		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Vanadium	000000-06-6	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Zinc and Compounds	007440-66-6	-	-	-		na	1.0E+08	OEHHA 2000	2.5E-06	2.5E-06
Indium	007440-74-6	-				na	1.0E+08	OEHHA 2001	2.5E-06	2.5E-06
Lanthanum	007439-91-0	-				na	1.0E+08	OEHHA 2002	2.5E-06	2.5E-06
Hexachlorobenzene	000118-74-1	6.20E+03	6.20E-03	1.80E-05	6.00E+02	4.2E-01	1.0E+09	OEHHA 2003	2.5E-07	4.2E-01
PCBs	001336-36-3	7.81E+04	7.00E-01	8.63E-05		na	3.23E+03	OEHHA 2004	7.8E-02	7.8E-02
Sulphate	014808-79-8	-	1.00E+06	5.93E-05		na	1.0E+08	OEHHA 2005	2.5E-06	2.5E-06

Notes:

Values from RAIS (2014) unless otherwise noted

CCME. 2008. Canadian Council of Ministers of the Enviroment. Canada-Wide Standard (CWS) for Petroleum Hydrocarbons (PHC) in Soil. Scientifc Rationale Supporting Technical Document. CCME. 2008

OEHHA 2000. Office of Environmental Health Hazard Assessment. California EPA. Technical Support Document for Exposure Assessment and Stochastic Analysis. Air Toxics Hot Spots Program Risk Assessment Guidelines. Oakland. California. 2000

Environment Canada. 2000. Screening Assessment: oxirane, (chloromethyl)-,epichlorohydrin. Chemical Abstracts Service Registry Number 106-89-8. Environment Canada. Health Canada. November 2008

	Calculated based on first order decay rate: k=0.693/(t1/2 / 365)
assumed	Based on lack of data from above sources, 10^8 t 1/2 based on professional judgement
na	Not availble from sources idenfied above

Table II-4D Project Soil Particulate/Dust Concentations for Industrial Receptor **Scenario: Project**

Parameter	DL kg/m^3	Cs mg/kg	CF ug/mg	C_{dust} ug/m^3
Polycyclic Aromatic Hydrocarbons				
Carcinogenic PAHs				
Benzo[a]anthracene	7.6E-10	1.4E-03	1000	1.1E-09
Benzo[a]pyrene	7.6E-10	2.6E-03	1000	2.0E-09
Benzo[b]fluoranthene	7.6E-10	5.3E-04	1000	4.0E-10
Benzo[g,h,i]perylene	7.6E-10	8.3E-04	1000	6.3E-10
Benzo[k]fluoranthene	7.6E-10	2.2E-03	1000	1.6E-09
Chrysene	7.6E-10	3.0E-03	1000	2.3E-09
Dibenzo[a,h]anthracene	7.6E-10	6.5E-04	1000	4.9E-10
Fluoranthene	7.6E-10	9.0E-04	1000	6.8E-10
Indeno[1,2,3-c,d]pyrene	7.6E-10	2.1E-03	1000	1.6E-09
Phenanthrene	7.6E-10	1.6E-05	1000	1.2E-11
Non-carcinogenic PAHs				
Acenaphthene	7.6E-10	1.2E-06	1000	9.1E-13
Acenaphthylene	7.6E-10	4.3E-07	1000	3.3E-13
Anthracene	7.6E-10	7.7E-06	1000	5.9E-12
Fluorene	7.6E-10	1.6E-06	1000	1.2E-12
Fluoranthene	7.6E-10	9.0E-04	1000	6.8E-10
Naphthalene	7.6E-10	1.8E-08	1000	1.4E-14
2-Methylnaphthalene	7.6E-10	2.7E-08	1000	2.1E-14
Pyrene	7.6E-10	1.2E-03	1000	9.0E-10
Metals and Metalloids				
Antimony	7.6E-10	6.5E-03	1000	4.9E-09
Arsenic	7.6E-10	7.7E-02	1000	5.9E-08
Barium	7.6E-10	2.1E+01	1000	1.6E-05
Beryllium	7.6E-10	1.2E-02	1000	9.4E-09
Cadmium	7.6E-10	6.7E-03	1000	5.1E-09
Chromium (III)	7.6E-10	5.9E-03	1000	4.5E-09
Chromium (VI)	7.6E-10	1.8E-01	1000	1.3E-07
Cobalt	7.6E-10	7.4E-02	1000	5.6E-08
Copper	7.6E-10	7.5E-01	1000	5.7E-07
Lead	7.6E-10	1.3E-01	1000	9.9E-08
Lithium	7.6E-10	2.9E-01	1000	2.2E-07
Manganese	7.6E-10	1.1E+00	1000	8.6E-07
Mercury	7.6E-10	4.6E-03	1000	3.5E-09
Molybdenum	7.6E-10	3.0E-02	1000	2.2E-08
Nickel	7.6E-10	2.3E-01	1000	1.8E-07
Selenium	7.6E-10	3.8E-02	1000	2.9E-08
Strontium	7.6E-10	1.3E+01	1000	9.8E-06
Tin	7.6E-10	1.4E-02	1000	1.0E-08
Uranium	7.6E-10	2.1E-02	1000	1.6E-08
Vanadium	7.6E-10	6.3E-01	1000	4.8E-07
Zinc	7.6E-10	7.9E-01	1000	6.0E-07
Aluminum	7.6E-10	1.3E+02	1000	1.0E-04
Boron	7.6E-10	1.0E+00	1000	7.8E-07
Iron	7.6E-10	1.5E+02	1000	1.1E-04
Titanium	7.6E-10	9.2E+00	1000	7.0E-06
Indium	7.6E-10	2.1E-04	1000	1.6E-10
Lanthanum	7.6E-10	5.2E-04	1000	4.0E-10
Others				
PCBs	7.6E-10	5.5E-07	1000	4.2E-13
Sulphate	7.6E-10	4.7E-01	1000	3.6E-07
Hexachlorobenzene (gas phase)	7.6E-10	1.5E-08	1000	1.1E-14
Dust Pallatives				
Epichlorohydrin	7.6E-10	3.6E-10	1000	2.8E-16

Notes:
Equations based on US EPA OWS (2005)
[1] Soil concentration from Equation 1.2

APPENDIX III

Risk Estimates

Table III-1A: Acute Inhalation Risk Estimates for All Receptors **Scenario: Baseline**

Chemical	Acute TRV ($\mu g/m^3$)	Exposure Concentration ($\mu g/m^3$)[a,b]	Averaging Time	Hazard Quotient
Carcinogenic PAHs				
Benzo(a)pyrene	--	--	--	--
Benzo(a)anthracene	--	--	--	--
Benzo(b)fluoranthene	--	--	--	--
Benzo(g,h,i)perylene	--	--	--	--
Benzo(k)fluoranthene	--	--	--	--
Chrysene	--	--	--	--
Dibenzo(a,h)anthracene	--	--	--	--
Fluoranthene	--	--	--	--
Indeno(1,2,3-cd)pyrene	--	--	--	--
Phenanthrene	--	--	--	--
Non-Carcinogenic PAHs[c]				
Acenaphthene	--	--	--	--
Acenaphthylene	--	--	--	--
Anthracene	--	--	--	--
Fluorene	--	--	--	--
Fluoranthene	--	--	--	--
Naphthalene	--	--	--	--
2-Methylnaphthalene	--	--	--	--
Pyrene	--	--	--	--
Metals & Metalloids[d]				
Aluminum	--	--	--	--
Antimony	--	--	--	--
Arsenic	1 hour REL: 0.2	7.3E-03	1 hour	3.6E-02
Barium	--	--	--	--
Beryllium	--	--	--	--
Boron	Acute MRL: 300	NA	--	--
Cadmium	Acute MRL: 0.03	1.9E-02	1 hour	6.3E-01
Total Chromium	--	--	--	--
Cobalt	--	--	--	--
Copper	1 hour REL: 100	1.1E-01	1 hour	1.1E-03
Indium	--	--	--	--
Iron	--	--	--	--
Lanthanum	--	--	--	--
Lead	--	--	--	--
Manganese	8 hour REL: 0.17	3.2E-02	1 hour	1.9E-01
Mercury	1 hour REL: 0.6	NA	--	--
Molybdenum	--	--	--	--
Nickel	1 hour REL: 0.2	1.4E-02	1 hour	6.9E-02
Selenium	--	--	--	--
Strontium	--	--	--	--
Tin	--	--	--	--
Titanium	--	--	--	--
Uranium	--	--	--	--
Vanadium	1 hour REL: 30	2.7E-02	1 hour	8.9E-04
Zinc	--	--	--	--
VOCs[c]				
Acetaldehyde	1 hour REL: 470	3.35	1 hour	7.1E-03
Acrolein	1 hour ReV 11	0.2	1 hour	1.8E-02
	1 hour REL 2.5	0.2	1 hour	8.0E-02
Benzene	Subchronic PPRTV: 80	2.4E+00	24 hour	3.0E-02
1,3-Butadiene	1 hour REL: 660	1.0E+00	1 hour	1.6E-03
Ethylbenzene	Acute MRL: 21700	4.8E+00	24 hour	2.2E-04
Ethylene	--	--	--	--
Formaldehyde	30 min exposure limit: 100	8.76	30 min	8.8E-02
Hexachlorobenzene	--	--	--	--
n-Hexane	--	--	--	--
Propionaldehyde	--	--	--	--
Propylene (1-Propene)	--	--	--	--
Toluene	8 hour exposure limit: 15000	2.7E+01	1 hour	1.8E-03
2,2,4-Trimethylpentane	--	--	--	--
Styrene	1 hour REL: 21000	2.4E+01	1 hour	1.1E-03
Xylenes	Acute (2 hour) MRL: 8700	1.8E+01	1 hour	2.1E-03
Dust Palliatives Chemical Constituents				
Epichlorohydrin[a]	Acute REL: 1300	NA	--	--
Others[c]				
Polychlorinated Biphenyls (PCB)	--	--	--	--
Sulfate	1 hour REL 120	7.3E+00	1 hour	6.1E-02
Criteria Air Contaminants				
CO	1 hour AQO: 14300	6.2E+02	1 hour	4.3E-02
	8 hour AQO: 5500	5.6E+02	8 hour	1.0E-01
NO_2	1 hour AQO: 200	6.6E+01	1 hour	3.3E-01
SO_2	1 hour AQO: 200	2.8E+01	1 hour	1.4E-01
	24 hour AQO: 20	1.8E+01	24 hour	9.0E-01
$PM_{2.5}$	24 hour AQO: 25	1.2E+01	24 hour	4.8E-01
PM_{10}	24 hour AQO: 50	2.7E+01	24 hour	5.4E-01
DPM	--	2.3E+00	24 hour	--
TPM	--	5.6E+01	24 hour	--
Nasal irritants (acrolein, *boron,* formaldehyde, toluene, styrene)** (presented as a range using based on the use of both the TCEQ acute ReV and the OEHHA acute REL for acolein)				1.1E-01 – 1.7E-01
Ocular irritants (acrolein, *epichlorohydrin,* formaldehyde, toluene)** (presented as a range using based on the use of both the TCEQ acute ReV and the OEHHA acute REL for acolein)				1.1E-01 – 1.7E-01
Respiratory irritants (acetaldehyde, cadmium, *epichlorohydrin,* formaldehyde, NO_2, SO_2, vanadium, xylenes, sulfate)**				**1.2E+00**

[a] Baseline concentrations based on data from Metro Vancouver's Burnaby South NAPs Super Site.

[b] 1 hour maximum baseline concentrations calculated from 24 hour maximum concentrations using a 2.4 conversion recommended by the Ontario MoE; available at http://allianceforrisk.org/Workshop/CaseStudies/24-hour_sampling/MOE_24_hour_case_study.pdf.

[c] Baseline concentrations calcuated based on data collected over 5 years (2008-2012) (n=294 for VOCs and Naphthalene, n=563 for Sulfate)

[d] Baseline concentrations calculated based on data collected over 2 years (2008-2009 [only data available]) (n=171)

--' not evaluated; no acute TRVs available for parameter

NA - no baseline data available for parameter

** - no baseline data available for italicized COPCs

BOLD: indicates acute inhalation risks > 1.0

Table III-1B: Acute Inhalation Risk Estimates for the Maximum North Delta Residential Receptor **Scenario: Project**

Chemical	Acute TRV ($\mu g/m^3$)		Exposure Concentration ($\mu g/m^3$)	Averaging Time	Hazard Quotient
Carcinogenic PAHs					
Benzo(a)pyrene	--		--	--	--
Benzo(a)anthracene	--		--	--	--
Benzo(b)fluoranthene	--		--	--	--
Benzo(g,h,i)perylene	--		--	--	--
Benzo(k)fluoranthene	--		--	--	--
Chrysene	--		--	--	--
Dibenzo(a,h)anthracene	--		--	--	--
Fluoranthene	--		--	--	--
Indeno(1,2,3-cd)pyrene	--		--	--	--
Phenanthrene	--		--	--	--
Non-Carcinogenic PAHs[b]					
Acenaphthene	--		--	--	--
Acenaphthylene	--		--	--	--
Anthracene	--		--	--	--
Fluorene	--		--	--	--
Fluoranthene	--		--	--	--
Naphthalene	--		--	--	--
2-Methylnaphthalene	--		--	--	--
Pyrene	--		--	--	--
Metals & Metalloids[c]					
Aluminum	--		--	--	--
Antimony	--		--	--	--
Arsenic	1 hour REL:	0.2	9.0E-04	1 hour	4.5E-03
Barium	--		--	--	--
Beryllium	--		--	--	--
Boron	Acute MRL:	300	1.2E-06	24 hour	4.0E-09
Cadmium	Acute MRL:	0.03	7.0E-03	1 hour	2.3E-01
Total Chromium	--		--	--	--
Cobalt	--		--	--	--
Copper	1 hour REL:	100	4.0E-03	1 hour	4.0E-05
Iron	--		--	--	--
Lead	--		--	--	--
Manganese	8 hour REL:	0.17	4.7E-05	1 hour	2.8E-04
Mercury	1 hour REL:	0.6	9.2E-05	1 hour	1.5E-04
Molybdenum	--		--	--	--
Nickel	1 hour REL:	0.2	4.5E-06	1 hour	2.2E-05
Selenium	--		--	--	--
Strontium	--		--	--	--
Tin	--		--	--	--
Titanium	--		--	--	--
Uranium	--		--	--	--
Vanadium	1 hour REL:	30	5.2E-01	1 hour	1.7E-02
Zinc	--		--	--	--
VOCs[b]					
Acetaldehyde	1 hour REL:	470	1.2E+00	1 hour	2.6E-03
Acrolein	1 hour ReV:	11	1.5E-01	1 hour	1.4E-02
	1 hour REL	2.5	1.5E-01	1 hour	6.0E-02
Benzene	Subchronic PPRTV	80	3.5E-02	24 hour	4.4E-04
1,3-Butadiene	1 hour REL:	660	7.3E-02	1 hour	1.1E-04
Ethylbenzene	Acute MRL:	21700	6.0E-02	1 hour	2.8E-06
Ethylene	--		--	--	--
Formaldehyde	30 min exposure limit:	100	3.0E+00	30 min	3.0E-02
Hexachlorobenzene	--		--	--	--
n-Hexane	--		--	--	--
Propionaldehyde	--		--	--	--
Propylene (1-Propene)	--		--	--	--
Toluene	8 hour exposure limit:	15000	2.9E-01	1 hour	1.9E-05
2,2,4-Trimethylpentane	--		--	--	--
Styrene	1 hour REL:	21000	1.8E-02	1 hour	8.4E-07
Xylenes	Acute (2 hour) MRL:	8700	9.2E-02	1 hour	1.1E-05
Dust Palliatives Chemical Constituents					
Epichlorohydrin	Acute REL:	1300	2.3E-05	1 hour	1.8E-08
Others[b]					
Polychlorinated Biphenyls (PCB)	--		--	--	--
Sulfate	1 hour REL	120	1.3E+01	1 hour	1.1E-01
Criteria Air Contaminants					
CO	1 hour AQO:	14300	1.6E+02	1 hour	1.1E-02
	8 hour AQO:	5500	1.1E+02	8 hour	2.0E-02
NO_2	1 hour AQO:	200	3.7E+01	1 hour	1.9E-01
SO_2	1 hour AQO:	200	1.4E+01	1 hour	7.1E-02
	24 hour AQO:	20	1.7E+00	24 hour	8.3E-02
$PM_{2.5}$	24 hour AQO:	25	4.0E+00	24 hour	1.6E-01
PM_{10}	24 hour AQO:	50	4.9E+00	24 hour	9.8E-02
DPM	--		3.9E+00	24 hour	--
TPM	--		9.5E+00	24 hour	--
Nasal irritants (acrolein, *boron,* formaldehyde, toluene, styrene)** (presented as a range using based on the use of both the TCEQ acute ReV and the OEHHA acute REL for acolein)					4.4E-02 9.0E-02
Ocular irritants (acrolein, *epichlorohydrin,* formaldehyde, toluene)** (presented as a range using based on the use of both the TCEQ acute ReV and the OEHHA acute REL for acolein)					4.4E-02 9.0E-02
Respiratory irritants (acetaldehyde, cadmium, epichlorohydrin, formaldehyde, NO_2, SO_2, vanadium, xylenes, sulfate)					6.5E-01

--' Not evaluated; no acute TRVs available for parameter

Table I-1D: Acute Inhalation Risk Estimates for the Industrial Receptor **Scenario: Project**

Chemical	Acute TRV ($\mu g/m^3$)		Exposure Concentration ($\mu g/m^3$)	Averaging Time	Hazard Quotient
Carcinogenic PAHs					
Benzo(a)pyrene	--		--	--	--
Benzo(a)anthracene	--		--	--	--
Benzo(b)fluoranthene	--		--	--	--
Benzo(g,h,i)perylene	--		--	--	--
Benzo(k)fluoranthene	--		--	--	--
Chrysene	--		--	--	--
Dibenzo(a,h)anthracene	--		--	--	--
Fluoranthene	--		--	--	--
Indeno(1,2,3-cd)pyrene	--		--	--	--
Phenanthrene	--		--	--	--
Non-Carcinogenic PAHs[b]					
Acenaphthene	--		--	--	--
Acenaphthylene	--		--	--	--
Acridine	--		--	--	--
Anthracene	--		--	--	--
Fluorene	--		--	--	--
Fluoranthene	--		--	--	--
Naphthalene	--		--	--	--
2-Methylnaphthalene	--		--	--	--
Pyrene	--		--	--	--
Quinoline	--		--	--	--
Metals & Metalloids[c]					
Aluminum	--		--	--	--
Antimony	--		--	--	--
Arsenic	1 hour REL:	0.2	2.8E-03	1 hour	1.4E-02
Barium	--		--	--	--
Beryllium	--		--	--	--
Boron	Acute MRL:	300	3.6E-06	24 hour	1.2E-08
Cadmium	Acute MRL:	0.03	2.2E-02	1 hour	7.2E-01
Total Chromium	--		--	--	--
Cobalt	--		--	--	--
Copper	1 hour REL:	100	1.3E-02	1 hour	1.3E-04
Indium	--		--	--	--
Iron	--		--	--	--
Lanthanum	--		--	--	--
Lead	--		--	--	--
Manganese	8 hour REL:	0.17	1.2E-04	1 hour	7.3E-04
Mercury	1 hour REL:	0.6	1.5E-04	1 hour	2.4E-04
Molybdenum	--		--	--	--
Nickel	1 hour REL:	0.2	8.7E-06	1 hour	4.4E-05
Selenium	--		--	--	--
Strontium	--		--	--	--
Tin	--		--	--	--
Titanium	--		--	--	--
Uranium	--		--	--	--
Vanadium	1 hour REL:	30	1.6E+00	1 hour	5.4E-02
Zinc	--		--	--	--
VOCs[b]					
Acetaldehyde	1 hour REL:	470	3.4E+00	1 hour	7.3E-03
Acrolein	1 hour ReV:	11	1.2E+00	1 hour	1.1E-01
	1 hour REL:	2.5	1.2E+00	1 hour	4.8E-01
Benzene	Subchronic PPRTV:	80	6.2E-01	24 hour	7.7E-03
1,3-Butadiene	1 hour REL:	660	5.5E-01	1 hour	8.4E-04
Ethylbenzene	Acute MRL:	21700	1.1E-01	1 hour	5.2E-06
Ethylene	--		--	--	--
Formaldehyde	30 min exposure limit:	100	8.3E+00	30 min	8.3E-02
Hexachlorobenzene	--		--	--	--
n-Hexane	--		--	--	--
Propionaldehyde	--		--	--	--
Propylene (1-Propene)	--		--	--	--
Toluene	8 hour exposure limit:	15000	5.5E-01	1 hour	3.6E-05
2,2,4-Trimethylpentane	--		--	--	--
Styrene	1 hour REL:	21000	2.2E-02	1 hour	1.0E-06
Xylenes	Acute (2 hour) MRL:	8700	2.5E-01	1 hour	2.9E-05
Dust Palliatives Chemical Constituents					
Epichlorohydrin[a]	Acute REL:	1300	4.6E-05	1 hour	3.5E-08
Others[b]					
Polychlorinated Biphenyls (PCB)	--		--	--	--
Sulfate	1 hour REL	120	3.9E+01	1 hour	3.3E-01
Criteria Air Contaminants					
CO	1 hour AQO:	14300	4.5E+02	1 hour	3.1E-02
	8 hour AQO:	5500	3.0E+02	8 hour	5.5E-02
NO_2	1 hour AQO:	200	5.1E+01	1 hour	2.5E-01
SO_2	1 hour AQO:	200	3.2E+01	1 hour	1.6E-01
	24 hour AQO:	20	2.8E+00	24 hour	1.4E-01
$PM_{2.5}$	24 hour AQO:	25	5.5E+00	24 hour	2.2E-01
PM_{10}	24 hour AQO:	50	1.8E+01	24 hour	3.7E-01
DPM	--		4.4E+00	24 hour	--
TPM	--		4.7E+01	24 hour	--
Nasal irritants (acrolein, *boron,* formaldehyde, toluene, styrene)** (presented as a range using based on the use of both the TCEQ acute ReV and the OEHHA acute REL for acolein)					1.9E-01 5.7E-01
Ocular irritants (acrolein, *epichlorohydrin,* formaldehyde, toluene)** (presented as a range using based on the use of both the TCEQ acute ReV and the OEHHA acute REL for acolein)					1.9E-01 5.7E-01
Respiratory irritants (acetaldehyde, cadmium, epichlorohydrin, formaldehyde, NO_2, SO_2, vanadium, xylenes, sulfate)					1.6E+00

--' Not evaluated; no acute TRVs available for parameter

Table III-1E: Cumulative Acute Inhalation Risk Estimates for the Maximum North Delta Residential Receptor **Scenario: Cumulative**

Chemical	Baseline Hazard Quotient[a]	Project Hazard Quotient	Cumulative Hazard Quotient[b]
Carcinogenic PAHs			
Benzo(a)pyrene	--	--	--
Benzo(a)anthracene	--	--	--
Benzo(b)fluoranthene	--	--	--
Benzo(g,h,i)perylene	--	--	--
Benzo(k)fluoranthene	--	--	--
Chrysene	--	--	--
Dibenzo(a,h)anthracene	--	--	--
Fluoranthene	--	--	--
Indeno(1,2,3-cd)pyrene	--	--	--
Phenanthrene	--	--	--
Non-Carcinogenic PAHs			
Acenaphthene	--	--	--
Acenaphthylene	--	--	--
Anthracene	--	--	--
Fluorene	--	--	--
Fluoranthene	--	--	--
Naphthalene	--	--	--
2-Methylnaphthalene	--	--	--
Pyrene	--	--	--
Metals & Metalloids			
Aluminum	--	--	--
Antimony	--	--	--
Arsenic	3.6E-02	4.5E-03	4.1E-02
Barium	--	--	--
Beryllium	--	--	--
Boron	--	4.0E-09	NC
Cadmium	6.3E-01	2.3E-01	8.7E-01
Total Chromium	--	--	--
Cobalt	--	--	--
Copper	1.1E-03	4.0E-05	1.1E-03
Indium	--	--	--
Iron	--	--	--
Lanthanum	--	--	--
Lead	--	--	--
Manganese	1.9E-01	2.8E-04	1.9E-01
Mercury	ND	1.5E-04	NC
Molybdenum	--	--	--
Nickel	6.9E-02	2.2E-05	6.9E-02
Selenium	--	--	--
Strontium	--	--	--
Tin	--	--	--
Titanium	--	--	--
Uranium	--	--	--
Vanadium	8.9E-04	1.7E-02	1.8E-02
Zinc	--	--	--
VOCs			
Acetaldehyde	7.1E-03	2.6E-03	9.7E-03
Acrolein[c]	1.8E-02	1.4E-02	3.2E-02
Acrolein[d]	8.0E-02	6.0E-02	1.4E-01
Benzene	3.0E-02	4.4E-04	3.0E-02
1,3-Butadiene	1.6E-03	1.1E-04	1.7E-03
Ethylbenzene	2.2E-04	2.8E-06	2.2E-04
Ethylene	--	--	--
Formaldehyde	8.8E-02	3.0E-02	1.2E-01
Hexachlorobenzene	--	--	--
n-Hexane	--	--	--
Propionaldehyde	--	--	--
Propylene (1-Propene)	--	--	--
Toluene	1.8E-03	1.9E-05	1.8E-03
2,2,4-Trimethylpentane	--	--	--
Styrene	1.1E-03	8.4E-07	1.1E-03
Xylenes	2.1E-03	1.1E-05	2.1E-03
Dust Palliatives Chemical Constituents			
Epichlorohydrin[a]	--	1.8E-08	NC
Others			
Polychlorinated Biphenyls (PCB)	--	--	--
Sulfate	6.1E-02	1.1E-01	1.7E-01
Criteria Air Contaminants			
CO (1 hour)	4.3E-02	1.1E-02	5.4E-02
(8 hour)	1.0E-01	2.0E-02	1.2E-01
NO_2	3.3E-01	1.9E-01	5.2E-01
SO_2 (1 hour)	6.2E-02	7.1E-02	1.3E-01
(24 hour)	9.0E-01	8.3E-02	9.8E-01
$PM_{2.5}$	4.8E-01	1.6E-01	6.4E-01
PM_{10}	5.4E-01	9.8E-02	6.4E-01
DPM	--	--	--
TPM	--	--	--
Nasal irritants (acrolein, *boron*, formaldehyde, toluene, styrene)**[c]	1.1E-01	4.4E-02	1.5E-01
Nasal irritants (acrolein, *boron*, formaldehyde, toluene, styrene)**[d]	1.7E-01	9.0E-02	2.6E-01
Ocular irritants (acrolein, *epichlorohydrin*, formaldehyde, toluene)**[c]	1.1E-01	4.4E-02	1.5E-01
Ocular irritants (acrolein, *epichlorohydrin*, formaldehyde, toluene)**[d]	1.7E-01	9.0E-02	2.6E-01
Respiratory irritants *(acetaldehyde,* cadmium, *epichlorohydrin,* formaldehyde, NO_2, SO_2, vanadium, xylenes, sulfate)**	**1.2E+00**	6.5E-01	**1.8E+00**

[a] Based on baseline air data from Metro Vancouver's Burnaby South NAPs Super Site.

[b] Cumulative Hazard Quotient (HQ) calculated as Baseline HQ + Project HQ

[c] Based on TCEQ acute ReV (1 hour) for acrolein of 11 ug/m3

[d] Based on OEHHA acute REL (1 hour) for acrolein of 2.5 ug/m3

--' not evaluated; no acute TRVs available for parameter

NC - not calculated; cumulative risks could not be calculated as baseline data was not available for the COPC

** - no baseline data available for italicized COPCs

Table III-1G: Cumulative Acute Inhalation Risk Estimates for the Industrial Receptor **Scenario: Cumulative**

Chemical	Baseline	Project	Cumulative
	Hazard Quotient[a]	Hazard Quotient	Hazard Quotient[b]
Carcinogenic PAHs			
Benzo(a)pyrene	--	--	--
Benzo(a)anthracene	--	--	--
Benzo(b)fluoranthene	--	--	--
Benzo(g,h,i)perylene	--	--	--
Benzo(k)fluoranthene	--	--	--
Chrysene	--	--	--
Dibenzo(a,h)anthracene	--	--	--
Fluoranthene	--	--	--
Indeno(1,2,3-cd)pyrene	--	--	--
Phenanthrene	--	--	--
Non-Carcinogenic PAHs			
Acenaphthene	--	--	--
Acenaphthylene	--	--	--
Anthracene	--	--	--
Fluorene	--	--	--
Fluoranthene	--	--	--
Naphthalene	--	--	--
2-Methylnaphthalene	--	--	--
Pyrene	--	--	--
Metals & Metalloids			
Aluminum	--	--	--
Antimony	--	--	--
Arsenic	3.6E-02	1.4E-02	5.0E-02
Barium	--	--	--
Beryllium	--	--	--
Boron	--	1.2E-08	NC
Cadmium	6.3E-01	7.2E-01	**1.4E+00**
Total Chromium	--	--	--
Cobalt	--	--	--
Copper	1.1E-03	1.3E-04	1.2E-03
Indium	--	--	--
Iron	--	--	--
Lanthanum	--	--	--
Lead	--	--	--
Manganese	1.9E-01	7.3E-04	1.9E-01
Mercury	--	2.4E-04	NC
Molybdenum	--	--	--
Nickel	6.9E-02	4.4E-05	6.9E-02
Selenium	--	--	--
Strontium	--	--	--
Tin	--	--	--
Titanium	--	--	--
Uranium	--	--	--
Vanadium	8.9E-04	5.4E-02	5.5E-02
Zinc	--	--	--
VOCs			
Acetaldehyde	7.1E-03	7.3E-03	1.4E-02
Acrolein[c]	1.8E-02	1.1E-01	1.3E-01
Acrolein[d]	8.0E-02	4.8E-01	5.6E-01
Benzene	3.0E-02	7.7E-03	3.8E-02
1,3-Butadiene	1.6E-03	8.4E-04	2.4E-03
Ethylbenzene	2.2E-04	5.2E-06	2.3E-04
Ethylene	--	--	--
Formaldehyde	8.8E-02	8.3E-02	1.7E-01
Hexachlorobenzene	--	--	--
n-Hexane	--	--	--
Propionaldehyde	--	--	--
Propylene (1-Propene)	--	--	--
Toluene	1.8E-03	3.6E-05	1.9E-03
2,2,4-Trimethylpentane	--	--	--
Styrene	1.1E-03	1.0E-06	1.1E-03
Xylenes	2.1E-03	2.9E-05	2.1E-03
Dust Palliatives Chemical Constituents			
Epichlorohydrin[a]	--	3.5E-08	NC
Others			
Polychlorinated Biphenyls (PCB)	--	--	--
Sulfate	6.1E-02	3.3E-01	3.9E-01
Criteria Air Contaminants			
CO (1 hour)	4.3E-02	3.1E-02	7.4E-02
(8 hour)	1.0E-01	5.5E-02	1.6E-01
NO_2	3.3E-01	2.5E-01	5.8E-01
SO_2 (1 hour)	6.2E-02	1.6E-01	2.2E-01
(24 hour)	9.0E-01	1.4E-01	1.0E+00
$PM_{2.5}$	4.8E-01	2.2E-01	7.0E-01
PM_{10}	5.4E-01	3.7E-01	9.1E-01
DPM	--	--	--
TPM	--	--	--
Nasal irritants (acrolein, *boron,* formaldehyde, toluene, styrene)**[c]	1.1E-01	1.9E-01	3.0E-01
Nasal irritants (acrolein, *boron,* formaldehyde, toluene, styrene)**[d]	1.7E-01	5.7E-01	7.4E-01
Ocular irritants (acrolein, *epichlorohydrin,* formaldehyde, toluene)**[c]	1.1E-01	1.9E-01	3.0E-01
Ocular irritants (acrolein, *epichlorohydrin,* formaldehyde, toluene)**[d]	1.7E-01	5.7E-01	7.4E-01
Respiratory irritants *(acetaldehyde,* cadmium, *epichlorohydrin,* formaldehyde, NO_2, SO_2, vanadium, xylenes, sulfate)**	**1.2E+00**	**1.6E+00**	**2.8E+00**

[a] Based on baseline air data from Metro Vancouver's Burnaby South NAPs Super Site.

[b] Cumulative Hazard Quotient (HQ) calculated as Baseline HQ + Project HQ

[c] Based on TCEQ acute ReV (1 hour) for acrolein of 11 ug/m3

[d] Based on OEHHA acute REL (1 hour) for acrolein of 2.5 ug/m3

--' not evaluated; no acute TRVs available for parameter

NC - not calculated; cumulative risks could not be calculated as baseline data was not available for the COPC

** - no baseline data available for italicized COPCs

Table III-2A: Chronic Baseline Inhalation Risk Estimates for All Receptors, Gaseous COPCs **Scenario: Baseline**

Chemical	Chronic Inhalation TRV		Baseline Concentration	Baseline	Non-Cancer Baseline Concentration	Baseline
	RfC/TC	Unit Risk	($\mu g/m^3$)[a,b,c]	Hazard Quotient	($\mu g/m^3$)[a,b,d]	Hazard Quotient
	($\mu g/m^3$)	($\mu g/m^3$)$^{-1}$	(Residential)	(Residential)	(Amortized: Industrial)	(Industrial)
VOCs[d]						
Acetaldehyde	390	5.80E-07	3.35	8.6E-03	0.9045	2.3E-03
Acrolein	2.7	--	0.2	7.4E-02	0.054	2.0E-02
	0.35	--	0.2	5.7E-01	0.054	1.5E-01
Benzene	30	3.30E-06	0.56	1.9E-02	0.1512	5.0E-03
1,3-Butadiene	2	5.90E-06	0.64	3.2E-01	0.1728	8.6E-02
Ethylbenzene	260	--	0.37	1.4E-03	0.0999	3.8E-04
Ethylene	--	--	1.23	--	0.3321	--
Formaldehyde	50	--	8.76	1.8E-01	8.76	1.8E-01
Hexachlorobenzene	--	4.60E-04	NA	NA	NA	NA
n-Hexane	700	--	0.52	7.4E-04	0.1404	2.0E-04
Propionaldehyde	8	--	NA	NA	NA	NA
Propylene (1-Propene)	3000	--	0.42	1.4E-04	0.1134	3.8E-05
Toluene	2300	--	2.4	1.0E-03	0.648	2.8E-04
2,2,4-Trimethylpentane	--	--	0.75	--	0.2025	--
Styrene	92	--	0.14	1.5E-03	0.0378	4.1E-04
Xylenes	180	--	1.2	6.7E-03	0.324	1.8E-03
Criteria Air Contaminants						
CAC	**AAQO (Annual Average) ($\mu g/m^3$)**		**Baseline Concentration ($\mu g/m^3$)[a,b,c]**	**Baseline Hazard Quotient (Residential)**	**Non-Cancer Baseline Concentration ($\mu g/m^3$)[a,b,c (d - for DPM only)]**	**Baseline Hazard Quotient (Industrial)**
CO	--		--	--	--	--
NO_2	40		27	6.8E-01	27	6.8E-01
SO_2	25		3.8	1.5E-01	3.8	1.5E-01
$PM_{2.5}$	8	[e]	4.4	5.5E-01	4.4	5.5E-01
	6	[e]	4.4	7.3E-01	4.4	7.3E-01
PM_{10}	20		12	6.0E-01	12	6.0E-01
DPM	5	[f]	0.8	1.6E-01	0.216	4.3E-02

[a] Baseline concentrations based on data from Metro Vancouver's Burnaby South NAPs Super Site.

[b] Annual average baseline concentrations

[c] No amortization conducted for baseline exposures; receptors assumed to be exposed for 24 hours a day, 7 days a week, 52 weeks a year for 80 years

[d] Amortization conducted for exposures for industrial receptor; receptors assumed to be exposed for 10 hours a day, 5 days a week for 48 weeks a year (ET = 2.7)

[e] Hazard quotients estimates using Metro Vancouver's AAQO of 8 ug/m^3, as well as their planning goal of 6 ug/m^3

[f] AAQO are not available for diesel particulate matter (DPM); the US EPA RfC of 5 ug/m^3 was used to estimate non-cancer risks

[g] AAQO are not available for DPM; the California OEHHA (2009) UR of 3E-04 was used to estimate carcinogenic risks

--' no TRV available/risks could not be estimated

NA - no baseline data available for parameter

AAQO - ambient air quality objective

Table III-2B: Chronic Inhalation Risk Estimates for the Maximum North Delta Residential Receptor, Gaseous COPCs **Scenario: Project**

Chemical	Chronic Inhalation TRV		Exposure Concentration	Amortized Exposure Concentration	Project	Project
	RfC/TC	Unit Risk	Non-Cancer	Cancer	Hazard Quotient	ILCR
	($\mu g/m^3$)	$(\mu g/m^3)^{-1}$	$(\mu g/m^3)^{a,b,c}$	$(\mu g/m^3)^{a,b,d}$		
VOCs						
Acetaldehyde	390	5.80E-07	1.2E-02	1.5E-03	3.0E-05	8.5E-10
Acrolein	2.7	--	3.4E-04	--	1.3E-04	--
	0.35	--	3.4E-04	--	9.8E-04	--
Benzene	30	3.30E-06	2.8E-03	3.5E-04	9.3E-05	1.2E-09
1,3-Butadiene	2	5.90E-06	3.1E-04	3.8E-05	1.5E-04	2.3E-10
Ethylbenzene	260	--	7.4E-04	--	2.8E-06	--
Ethylene	--	--	3.5E-04	--	--	--
Formaldehyde	50	--	2.5E-02	--	4.9E-04	--
Hexachlorobenzene	--	4.60E-04	3.5E-09	4.4E-10	--	2.0E-13
n-Hexane	700	--	8.7E-04	--	1.2E-06	--
Propionaldehyde	8	--	2.1E-03	--	2.7E-04	--
Propylene (1-Propene)	3000	--	2.1E-04	--	7.0E-08	--
Toluene	2300	--	3.5E-03	--	1.5E-06	--
2,2,4-Trimethylpentane	--	--	4.9E-04	--	--	--
Styrene	92	--	3.4E-04	--	3.7E-06	--
Xylenes	180	--	1.2E-03	--	6.8E-06	--
Criteria Air Contaminants						
CAC	**AAQO (Annual Average) ($\mu g/m^3$)**		**Exposure Concentration $(\mu g/m^3)^{a,b,c}$**	**Amortized Exposure Concentration Cancer $(\mu g/m^3)^{d}$**	**Project Hazard Quotient**	**Project ILCR**
CO	--		--	--	--	--
NO_2 (100%)**	40		7.8E+00	--	2.0E-01	--
SO_2	25		1.4E-01	--	5.4E-03	--
$PM_{2.5}$	8 [e]		2.7E-01	--	3.4E-02	--
	6 [e]		2.7E-01	--	4.6E-02	--
PM_{10}	20		4.6E-01	--	2.3E-02	--
DPM	5 [f]		1.8E-01	--	3.6E-02	--
	3.0E-04 [g]		--	2.3E-02	--	6.8E-06

[a] Exposure concentrations based on the results of the Levelton (2015) AQA; predicted concentrations from the Project from all sources (coal, agricultural emissions and combustion emissions from transporation equipment, as applicable)

[b] Predicted annual average concentrations (Levelton, 2015)

[c] No amortization conducted for exposures to non-carcinogenic COPCs for a residential receptor; receptors assumed to be exposed for 24 hours a day, 7 days a week for 52 weeks a year

[d] Amortization conducted for exposures to carcinogenic COPCs from Project emissions for a residential receptor based on the lifetime of the Project (10 years) (i.e., amortization for 10 years/80 years) (ET = 0.125)

[e] Hazard quotients estimates using Metro Vancouver's AAQO of 8 ug/m^3, as well as their planning goal of 6 ug/m^3

[f] AAQO are not available for diesel particulate matter (DPM); the US EPA RfC of 5 ug/m^3 was used to estimate non-cancer risks

[g] AAQO are not available for DPM; the California OEHHA (2009) UR of 3E-04 was used to estimate carcinogenic risks

--' no TRV available/risks could not be estimated

AAQO - ambient air quality objective

** NO_2 100% refers to 100% conversion of NOx to NO_2

Table III-2D: Chronic Inhalation Risk Estimates for the Industrial Receptor, Gaseous COPCs **Scenario: Project**

Chemical	Chronic Inhalation TRV		Amortized Exposure Concentration	Amortized Exposure Concentration	Project	Project
	RfC/TC	Unit Risk	Non-Cancer	Cancer	Hazard Quotient	ILCR
	($\mu g/m^3$)	$(\mu g/m^3)^{-1}$	$(\mu g/m^3)^{a,b,c}$	$(\mu g/m^3)^{a,b,c}$		
VOCs						
Acetaldehyde	390	5.80E-07	3.6E-02	1.2E-03	9.3E-05	7.2E-10
Acrolein	2.7	--	1.2E-03	--	4.5E-04	--
	0.35	--	1.2E-03	--	3.5E-03	--
Benzene	30	3.30E-06	9.9E-03	3.4E-04	3.3E-04	1.1E-09
1,3-Butadiene	2	5.90E-06	6.2E-04	2.1E-05	3.1E-04	1.3E-10
Ethylbenzene	260	--	1.1E-03	--	4.0E-06	--
Ethylene	--	--	4.0E-03	--	--	--
Formaldehyde	50	--	7.3E-02	--	1.5E-03	--
Hexachlorobenzene	--	4.60E-04	2.0E-08	6.8E-10	--	3.1E-13
n-Hexane	700	--	2.9E-03	--	4.2E-06	--
Propionaldehyde	8	--	3.0E-03	--	3.8E-04	--
Propylene (1-Propene)	3000	--	2.4E-03	--	8.0E-07	--
Toluene	2300	--	5.0E-03	--	2.2E-06	--
2,2,4-Trimethylpentane	--	--	6.4E-04	--	--	--
Styrene	92	--	5.1E-04	--	5.6E-06	--
Xylenes	180	--	2.5E-03	--	1.4E-05	--
Criteria Air Contaminants						
CAC	**AAQO (Annual Average) ($\mu g/m^3$)**		**Exposure Concentration Non-Cancer ($\mu g/m^3$)^{a,b,d}**	**Amortized Exposure Concentration Cancer ($\mu g/m^3$)^{c}**	**Project Hazard Quotient**	**Project ILCR**
CO	--		--	--	--	--
NO_2 (100%)**	40		1.9E+01	--	4.7E-01	--
SO_2	25		4.4E-01	--	1.7E-02	--
$PM_{2.5}$	8	[d]	6.6E-01	--	8.2E-02	--
	6	[d]	6.6E-01	--	1.1E-01	--
PM_{10}	20		1.8E+00	--	9.0E-02	--
DPM	5	[e]	5.0E-01	--	1.0E-01	--
	3.0E-04	[f]	--	1.7E-02	--	5.1E-06

[a] Exposure concentrations based on the results of the Levelton (2015) AQA; predicted concentrations from the Project from all sources (coal, agricultural emissions and combustion emissions from transporation equipment, as applicable)

[b] Predicted annual average concentrations (Levelton, 2015)

[c] Amortization conducted for exposures for industrial receptor; receptors assumed to be exposed for 10 hours a day, 5 days a week for 48 weeks a year for the lifetime of the Project (10 years)

[d] Hazard quotients estimates using Metro Vancouver's AAQO of 8 ug/m^3, as well as their planning goal of 6 ug/m^3

[e] AAQO are not available for diesel particulate matter (DPM); the US EPA RfC of 5 ug/m^3 was used to estimate non-cancer risks

[f] AAQO are not available for DPM; the California OEHHA (2009) UR of 3E-04 was used to estimate carcinogenic risks

--' no TRV available/risks could not be estimated

AAQO - ambient air quality objective

** NO_2 100% refers to 100% conversion of NOx to NO_2

Table III-2E: Cumulative Chronic Inhalation Risk Estimates for the Maximum North Delta Residential Receptor, Gaseous COPCs **Scenario: Cumulative**

Chemical	Baseline	Project	Cumulative
	Hazard Quotient	Hazard Quotient	Hazard Quotient
VOCs			
Acetaldehyde	8.6E-03	3.0E-05	8.6E-03
Acrolein[a]	7.4E-02	1.3E-04	7.4E-02
Acrolein[b]	**5.7E-01**	9.8E-04	**5.7E-01**
Benzene	1.9E-02	9.3E-05	**1.9E-02**
1,3-Butadiene	**3.2E-01**	1.5E-04	**3.2E-01**
Ethylbenzene	1.4E-03	2.8E-06	1.4E-03
Ethylene	--	--	--
Formaldehyde	1.8E-01	4.9E-04	1.8E-01
Hexachlorobenzene	NA	--	--
n-Hexane	7.4E-04	1.2E-06	7.4E-04
Propionaldehyde	NA	2.7E-04	NC
Propylene (1-Propene)	1.4E-04	7.0E-08	1.4E-04
Toluene	1.0E-03	1.5E-06	1.0E-03
2,2,4-Trimethylpentane	--	--	--
Styrene	1.5E-03	3.7E-06	1.5E-03
Xylenes	6.7E-03	6.8E-06	6.7E-03
Criteria Air Contaminants			
CAC	**Baseline Hazard Quotient**	**Project Hazard Quotient**	**Cumulative Hazard Quotient**
CO	--	--	--
NO_2 (100%)**	6.8E-01	2.0E-01	8.7E-01
SO_2	1.6E-01	5.4E-03	1.7E-01
$PM_{2.5}$	5.5E-01	3.4E-02	5.8E-01
	7.3E-01	4.6E-02	7.8E-01
PM_{10}	6.0E-01	2.3E-02	6.2E-01
DPM	1.6E-01	2.3E-02	1.8E-01

--' no TRV available/risks could not be estimated

NA - no baseline data available for parameter

NC - not calculated; cumulative risks could not be calculated as baseline data was not available for the COPC

[a] Based on TCEQ chronic ReV for acrolein of 2.7 ug/m3

[b] Based on OEHHA chronic REL for acrolein of 0.35 ug/m3

** NO_2 100% refers to 100% conversion of NOx to NO_2

Table III-2G: Cumulative Chronic Inhalation Risk Estimates for the Industrial Receptor, Gaseous COPCs **Scenario: Cumulative**

Chemical	Baseline Hazard Quotient	Project Hazard Quotient	Cumulative Hazard Quotient
VOCs			
Acetaldehyde	2.2E-03	9.3E-05	2.3E-03
Acrolein[a]	2.0E-02	4.5E-04	2.0E-02
Acrolein[b]	1.5E-01	3.5E-03	1.6E-01
Benzene	4.9E-03	3.3E-04	5.2E-03
1,3-Butadiene	8.3E-02	3.1E-04	8.4E-02
Ethylbenzene	3.7E-04	4.0E-06	3.7E-04
Ethylene	--	--	--
Formaldehyde	1.8E-01	1.5E-03	1.8E-01
Hexachlorobenzene	--	--	--
n-Hexane	1.9E-04	4.2E-06	2.0E-04
Propionaldehyde	NA	3.8E-04	NC
Propylene (1-Propene)	3.6E-05	8.0E-07	3.7E-05
Toluene	2.7E-04	2.2E-06	2.7E-04
2,2,4-Trimethylpentane	--	--	--
Styrene	4.0E-04	5.6E-06	4.0E-04
Xylenes	1.7E-03	1.4E-05	1.7E-03
Criteria Air Contaminants			
CAC	**Baseline Hazard Quotient**	**Project Hazard Quotient**	**Cumulative Hazard Quotient**
CO	--	--	
NO_2 (100%)**	6.8E-01	4.7E-01	**1.1E+00**
SO_2	1.6E-01	1.7E-02	1.8E-01
$PM_{2.5}$	5.5E-01	8.2E-02	6.3E-01
	7.3E-01	1.1E-01	8.4E-01
PM_{10}	6.0E-01	9.0E-02	6.9E-01
DPM	4.2E-02	1.0E-01	1.4E-01

--' no TRV available/risks could not be estimated

NA - no baseline data available for parameter

NC - not calculated; cumulative risks could not be calculated as baseline data was not available for the COPC

BOLD: Indicates HQ > target HQ of 1.0 for CACs

[a] Based on TCEQ chronic ReV for acrolein of 2.7 ug/m3

[b] Based on OEHHA chronic REL for acrolein of 0.35 ug/m3

** NO_2 100% refers to 100% conversion of NOx to NO_2

TABLE III-3A Baseline Scenario Risk Estimates for Maximum North Delta Residential Receptor (Toddler)
(Based on Background Multi-Media Concentrations)

Scenario: Baseline

	Soil Concentration µg/g	Soil Dust Concentration µg/m^3	Plant Concentration (Aboveground) µg/g	Plant Concentration (Belowground) µg/g	Air Concentration µg/m^3	HQ Soil Ingestion	HQ Soil Dermal	HQ Soil Dust Inhalation	HQ Plant (Aboveground)	HQ Plant (Belowground)	HQ Air Inhalation	HQ Soil / Vegetation	HQ All Routes
Polycyclic Aromatic Hydrocarbons													
Carcinogenic PAHs													
Benzo[a]anthracene	3.4E-01	2.6E-07	9.3E-04	9.3E-04	8.0E-04	5.5E-05	7.0E-06	4.33E-09	1.25E-04	1.96E-04	1.34E-05	3.83E-04	4.0E-04
Benzo[a]pyrene	4.0E-01	3.0E-07	6.7E-04	6.7E-04	4.0E-04	6.5E-05	8.2E-06	5.10E-09	9.00E-05	1.41E-04	6.71E-06	3.04E-04	3.1E-04
Benzo[b]fluoranthene	6.0E-01	4.6E-07	1.6E-03	1.6E-03	7.0E-04	9.7E-05	1.2E-05	7.65E-09	2.15E-04	3.37E-04	1.17E-05	6.62E-04	6.7E-04
Benzo[g,h,i]perylene	2.5E-01	1.9E-07	2.1E-04	2.1E-04	NA	4.0E-05	5.1E-06	3.19E-09	2.89E-05	4.53E-05	NA	1.20E-04	1.2E-04
Benzo[k]fluoranthene	2.4E-01	1.8E-07	4.1E-04	4.1E-04	3.0E-04	3.9E-05	4.9E-06	3.06E-09	5.55E-05	8.70E-05	5.03E-06	1.86E-04	1.9E-04
Chrysene	4.0E-01	3.0E-07	1.0E-03	1.0E-03	NA	6.5E-05	8.2E-06	5.10E-09	1.38E-04	2.16E-04	NA	4.27E-04	4.3E-04
Dibenzo[a,h]anthracene	6.0E-02	4.6E-08	4.4E-05	4.4E-05	NA	9.7E-06	1.2E-06	7.65E-10	5.92E-06	9.28E-06	NA	2.61E-05	2.6E-05
Fluoranthene	8.6E-01	6.5E-07	5.2E-03	5.2E-03	6.8E-03	1.0E-04	1.3E-05	8.22E-09	5.28E-04	8.27E-04	8.55E-05	1.47E-03	1.6E-03
Indeno[1,2,3-c,d]pyrene	2.7E-01	2.1E-07	2.1E-04	2.1E-04	1.9E-03	4.4E-05	5.6E-06	3.44E-09	2.81E-05	4.40E-05	3.19E-05	1.21E-04	1.5E-04
Phenanthrene	5.2E-01	4.0E-07	8.0E-03	8.0E-03	1.6E-02	8.4E-05	1.1E-05	6.63E-09	1.08E-03	1.69E-03	2.68E-04	2.87E-03	3.1E-03
Carcinogenic PAH Mixture											4.23E-04	6.57E-03	3.9E-03
Non-carcinogenic PAHs													
Acenaphthene	2.0E-02	1.5E-08	6.3E-04	6.3E-04	2.2E-03	1.6E-06	2.1E-07	1.27E-10	4.26E-05	6.68E-05	1.84E-05	1.11E-04	1.3E-04
Acenaphthylene	3.0E-02	2.3E-08	9.2E-04	9.2E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	8.0E-02	6.1E-08	1.2E-03	1.2E-03	1.6E-03	1.3E-06	1.6E-07	1.02E-10	1.68E-05	2.64E-05	2.68E-06	4.47E-05	4.7E-05
Fluorene	4.0E-02	3.0E-08	8.9E-04	8.9E-04	5.1E-03	4.8E-06	6.2E-07	3.82E-10	9.05E-05	1.42E-04	6.41E-05	2.38E-04	3.0E-04
Fluoranthene	8.6E-01	6.5E-07	5.2E-03	5.2E-03	6.8E-03	1.0E-04	1.3E-05	8.22E-09	5.28E-04	8.27E-04	8.55E-05	1.47E-03	1.6E-03
Naphthalene	2.0E-02	1.5E-08	1.4E-03	1.4E-03	1.5E-01	4.8E-06	6.2E-07	1.52E-09	2.92E-04	4.58E-04	1.50E-02	7.55E-04	1.6E-02
2-Methylnaphthalene	2.0E-02	1.5E-08	6.8E-04	6.8E-04	NA	2.4E-05	3.1E-06	1.91E-09	6.93E-04	1.09E-03	NA	1.81E-03	1.8E-03
Pyrene	7.0E-01	5.3E-07	6.1E-03	6.1E-03	4.9E-03	1.1E-04	1.4E-05	8.92E-09	8.32E-04	1.30E-03	8.22E-05	2.26E-03	2.3E-03
Non-carcinogenic PAH Mixture											1.53E-02	6.69E-03	2.2E-02
Metals and Metalloids													
Antimony	5.1E-01	3.9E-07	1.5E-02	1.5E-02	NA	8.2E-04	7.1E-05	6.50E-08	2.07E-02	3.25E-02	NA	5.41E-02	5.4E-02
Arsenic	6.1E+00	4.6E-06	3.6E-02	3.6E-02	4.9E-04	9.8E-02	2.5E-03	4.61E-06	**4.93E-01**	**7.73E-01**	4.90E-04	1.37E+00	1.4E+00
Barium	6.7E+01	5.1E-05	1.5E+00	1.5E+00	3.6E-03	1.6E-03	1.4E-04	5.06E-05	3.04E-02	4.76E-02	3.60E-03	7.98E-02	8.3E-02
Beryllium	2.4E-01	1.8E-07	3.6E-04	3.6E-04	8.6E-07	5.8E-04	5.0E-05	9.12E-06	7.31E-04	1.15E-03	4.30E-05	2.52E-03	2.6E-03
Cadmium	2.2E-01	1.7E-07	1.7E-02	1.7E-02	1.7E-04	1.3E-03	1.1E-05	1.67E-05	8.07E-02	1.27E-01	1.70E-02	2.09E-01	2.3E-01
Chromium(III)	2.6E+01	2.0E-05	2.9E-02	2.9E-02	6.3E-04	8.3E-05	7.2E-06	3.92E-06	7.86E-05	1.23E-04	1.26E-04	2.96E-04	4.2E-04
Chromium(VI)	1.6E-01	1.2E-07	1.8E-04	1.8E-04	6.3E-04	8.6E-04	7.4E-05	1.22E-06	8.12E-04	1.27E-03	6.30E-03	3.02E-03	9.3E-03
Cobalt	7.4E+00	5.6E-06	2.2E-02	2.2E-02	2.6E-05	3.6E-03	3.1E-04	5.63E-05	9.03E-03	1.41E-02	2.60E-04	2.71E-02	2.7E-02
Copper	2.5E+01	1.9E-05	1.5E+00	1.5E+00	3.4E-03	1.3E-03	6.8E-05	1.87E-05	6.59E-02	1.03E-01	3.40E-03	1.71E-01	1.7E-01
Lead	2.2E+01	1.7E-05	1.5E-01	1.5E-01	3.2E-03	1.8E-01	9.1E-04	1.11E-04	1.90E-01	**2.98E-01**	2.13E-02	6.67E-01	6.9E-01
Manganese	3.5E+02	2.7E-04	1.3E+01	1.3E+01	2.7E-03	1.3E-02	1.1E-03	5.39E-03	**3.97E-01**	**6.22E-01**	5.40E-02	1.04E+00	1.1E+00
Mercury	5.0E-02	3.8E-08	6.8E-03	6.8E-03	3.7E-03	8.1E-04	6.9E-06	1.27E-07	9.14E-02	1.43E-01	1.23E-02	2.35E-01	2.5E-01
Molybdenum	1.1E+00	8.2E-07	4.1E-02	4.1E-02	2.3E-04	2.3E-04	2.0E-05	6.84E-08	7.15E-03	1.12E-02	1.92E-05	1.86E-02	1.9E-02
Nickel	2.1E+01	1.6E-05	1.9E-01	1.9E-01	1.4E-03	9.2E-03	7.2E-04	4.54E-03	6.95E-02	1.09E-01	4.00E-01	1.93E-01	5.9E-01
Selenium	3.0E-01	2.3E-07	1.1E-03	1.1E-03	1.8E-04	2.3E-04	2.0E-06	1.14E-08	7.37E-04	1.15E-03	9.00E-06	2.13E-03	2.1E-03
Strontium	6.8E+01	5.1E-05	2.5E+01	2.5E+01	6.6E-04	5.5E-04	4.7E-05	4.32E-08	1.72E-01	**2.70E-01**	5.53E-07	4.42E-01	4.4E-01
Tin	2.1E+00	1.6E-06	9.3E-03	9.3E-03	4.0E-04	5.0E-06	4.3E-07	3.96E-10	1.89E-05	2.96E-05	1.01E-07	5.40E-05	5.4E-05
Uranium	7.5E-01	5.7E-07	9.6E-04	9.6E-04	NA	6.1E-03	5.2E-04	1.43E-05	6.47E-03	1.01E-02	NA	2.32E-02	2.3E-02
Vanadium	4.5E+01	3.4E-05	3.7E-02	3.7E-02	2.6E-03	1.4E-02	1.2E-03	3.40E-04	9.98E-03	1.56E-02	2.60E-02	4.17E-02	6.8E-02
Zinc	8.3E+01	6.3E-05	1.2E+01	1.2E+01	1.2E-02	8.1E-04	7.0E-05	6.37E-08	1.01E-01	1.58E-01	1.21E-05	2.59E-01	2.6E-01
Aluminum	1.4E+04	1.0E-02	8.1E+00	8.1E+00	1.5E-04	**2.2E-01**	1.9E-02	1.73E-05	1.10E-01	1.72E-01	2.52E-07	5.20E-01	5.2E-01
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	1.9E+04	1.4E-02	1.1E+01	1.1E+01	5.4E-02	1.1E-01	9.8E-03	8.94E-06	5.70E-02	8.93E-02	3.40E-05	2.70E-01	2.7E-01
Titanium	7.4E+02	5.7E-04	6.1E-01	6.1E-01	NA	1.2E-03	1.0E-04	9.49E-08	8.31E-04	1.30E-03	NA	3.44E-03	3.4E-03
Indium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lanthanum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Others													
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulphate	NA	NA	NA	NA	9.0E-01	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene (gas phase)	NA	NA	NA	NA *	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene (gas phase)	NA	NA	NA	NA *	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene (gas phase)	NA	NA	NA	NA *	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dust Pallatives													
Epichlorohydrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

HQ = Hazard Quotient

NA = not applicable, no COPC identified for the media/pathway, or suitable TRV not identified, see report text for details

Bold HQ > 0.2

[1] maximum outdoor air concentration assumed equal to the analytical detection limit

TABLE III-3B Project Scneario Risk Estimates for the Maximum North Delta Residential Receptor (Toddler)
(Based on Maximum Multi-Media Concentrations)

Scenario: Project

	Soil Concentration µg/g	Soil Dust Concentration µg/m^3	Plant Concentration (Aboveground) µg/g	Plant Concentration (Belowground) µg/g	Air Concentration µg/m^3	HQ Soil Ingestion	HQ Soil Dermal	HQ Soil Dust Inhalation	HQ Plant (Aboveground)	HQ Plant (Belowground)	HQ Air Inhalation	HQ Soil / Vegetation	HQ All Routes
Polycyclic Aromatic Hydrocarbons													
Carcinogenic PAHs													
Benzo[a]anthracene	3.7E-04	2.8E-10	1.1E-06	1.0E-06	3.8E-04	6.0E-08	7.7E-09	4.76E-12	1.5E-07	2.2E-07	6.4E-06	4.3E-07	6.9E-06
Benzo[a]pyrene	6.9E-04	5.2E-10	1.2E-06	1.1E-06	1.2E-05	1.1E-07	1.4E-08	8.79E-12	1.6E-07	2.4E-07	2.0E-07	5.3E-07	7.3E-07
Benzo[b]fluoranthene	1.4E-04	1.1E-10	4.8E-07	3.8E-07	4.2E-05	2.3E-08	2.9E-09	1.81E-12	6.5E-08	8.0E-08	7.1E-07	1.7E-07	8.8E-07
Benzo[g,h,i]perylene	2.2E-04	1.7E-10	2.0E-07	1.9E-07	3.9E-06	3.6E-08	4.6E-09	2.82E-12	2.7E-08	4.0E-08	6.5E-08	1.1E-07	1.7E-07
Benzo[k]fluoranthene	5.8E-04	4.4E-10	1.0E-06	9.9E-07	9.5E-06	9.4E-08	1.2E-08	7.38E-12	1.4E-07	2.1E-07	1.6E-07	4.5E-07	6.1E-07
Chrysene	7.9E-04	6.0E-10	2.1E-06	2.0E-06	1.9E-05	1.3E-07	1.6E-08	1.01E-11	2.8E-07	4.3E-07	3.1E-07	8.5E-07	1.2E-06
Dibenzo[a,h]anthracene	1.7E-04	1.3E-10	1.3E-07	1.3E-07	2.4E-06	2.8E-08	3.6E-09	2.20E-12	1.8E-08	2.7E-08	4.0E-08	7.6E-08	1.2E-07
Fluoranthene	2.4E-04	1.8E-10	1.6E-06	1.5E-06	8.9E-05	2.9E-08	3.7E-09	2.30E-12	1.7E-07	2.3E-07	1.1E-06	4.3E-07	1.6E-06
Indeno[1,2,3-c,d]pyrene	5.7E-04	4.3E-10	4.8E-07	4.4E-07	9.5E-06	9.2E-08	1.2E-08	7.29E-12	6.5E-08	9.3E-08	1.6E-07	2.6E-07	4.2E-07
Phenanthrene	4.3E-06	3.3E-12	1.5E-07	6.6E-08	1.1E-04	7.0E-10	8.9E-11	5.50E-14	2.1E-08	1.4E-08	1.8E-06	3.5E-08	1.8E-06
Carcinogenic PAH Mixture											1.1E-05	3.4E-06	1.3E-05
Non-carcinogenic PAHs													
Acenaphthene	3.2E-07	2.4E-13	6.2E-08	1.0E-08	2.2E-05	2.6E-11	3.3E-12	2.04E-15	4.2E-09	1.1E-09	1.9E-07	5.3E-09	1.9E-07
Acenaphthylene	1.1E-07	8.7E-14	3.3E-08	3.5E-09	7.5E-05	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	2.1E-06	1.6E-12	7.4E-08	3.2E-08	3.7E-04	3.3E-11	4.3E-12	2.64E-15	1.0E-09	6.8E-10	6.2E-07	1.7E-09	6.2E-07
Fluorene	4.4E-07	3.3E-13	5.4E-08	9.7E-09	3.3E-05	5.3E-11	6.7E-12	4.17E-15	5.4E-09	1.5E-09	4.2E-07	7.0E-09	4.2E-07
Fluoranthene	2.4E-04	1.8E-10	1.6E-06	1.5E-06	8.9E-05	2.9E-08	3.7E-09	2.30E-12	1.7E-07	2.3E-07	1.1E-06	4.3E-07	1.6E-06
Naphthalene	4.4E-09	3.4E-15	7.7E-07	3.2E-10	2.2E-04	1.1E-12	1.4E-13	3.38E-16	1.6E-07	1.0E-10	2.2E-05	1.6E-07	2.2E-05
2-Methylnaphthalene	7.2E-09	5.5E-15	6.9E-09	2.5E-10	3.2E-06	8.8E-12	1.1E-12	6.92E-16	7.0E-09	3.9E-10	4.0E-07	7.4E-09	4.1E-07
Pyrene	3.2E-04	2.4E-10	3.0E-06	2.8E-06	1.2E-04	5.1E-08	6.5E-09	4.04E-12	4.1E-07	5.9E-07	1.9E-06	1.1E-06	3.0E-06
Non-carcinogenic PAH Mixture											2.7E-05	1.7E-06	2.9E-05
Metals and Metalloids													
Antimony	1.7E-03	1.3E-09	5.1E-05	5.0E-05	5.5E-05	2.7E-06	2.3E-07	2.13E-10	6.9E-05	1.1E-04	9.3E-06	1.8E-04	1.9E-04
Arsenic	2.1E-02	1.6E-08	1.2E-04	1.2E-04	6.6E-05	3.3E-04	8.6E-06	1.57E-08	1.7E-03	2.6E-03	6.6E-05	4.7E-03	4.7E-03
Barium	5.5E+00	4.2E-06	1.2E-01	1.2E-01	1.7E-02	1.3E-04	1.1E-05	4.17E-06	2.5E-03	3.9E-03	1.7E-02	6.6E-03	2.3E-02
Beryllium	3.3E-03	2.5E-09	5.0E-06	5.0E-06	1.4E-05	8.1E-06	6.9E-07	1.26E-07	1.0E-05	1.6E-05	6.9E-04	3.5E-05	7.2E-04
Cadmium	1.8E-03	1.3E-09	1.3E-04	1.3E-04	2.8E-05	1.0E-05	8.9E-08	1.34E-07	6.5E-04	1.0E-03	2.8E-03	1.7E-03	4.5E-03
Chromium(III)	1.6E-03	1.2E-09	1.8E-06	1.8E-06	1.5E-04	5.1E-09	4.4E-10	2.39E-10	4.9E-09	7.5E-09	3.0E-05	1.8E-08	3.0E-05
Chromium(VI)	4.7E-02	3.6E-08	5.3E-05	5.3E-05	6.5E-06	2.5E-04	2.2E-05	3.58E-07	2.4E-04	3.7E-04	6.5E-05	8.9E-04	9.6E-04
Cobalt	2.0E-02	1.5E-08	6.0E-05	5.9E-05	7.0E-05	9.6E-06	8.2E-07	1.50E-07	2.4E-05	3.8E-05	7.0E-04	7.3E-05	7.7E-04
Copper	2.0E-01	1.5E-07	1.2E-02	1.2E-02	6.3E-04	1.1E-05	5.5E-07	1.53E-07	5.4E-04	8.5E-04	6.3E-04	1.4E-03	2.0E-03
Lead	3.5E-02	2.6E-08	2.4E-04	2.3E-04	1.3E-04	2.8E-04	1.4E-06	1.76E-07	3.0E-04	4.7E-04	8.6E-04	1.1E-03	1.9E-03
Manganese	3.0E-01	2.3E-07	1.1E-02	1.1E-02	9.3E-04	1.1E-05	9.3E-07	4.59E-06	3.4E-04	5.3E-04	1.9E-02	8.8E-04	1.9E-02
Mercury	1.2E-03	9.3E-10	1.7E-04	1.7E-04	5.6E-06	2.6E-07	2.2E-09	7.76E-11	2.9E-05	4.6E-05	4.7E-07	7.5E-05	7.6E-05
Molybdenum	7.9E-03	6.0E-09	3.0E-04	3.0E-04	3.6E-05	3.5E-06	3.0E-07	1.72E-06	1.1E-04	1.7E-04	1.0E-02	2.9E-04	1.1E-02
Nickel	6.3E-02	4.8E-08	5.7E-04	5.7E-04	1.9E-04	2.8E-05	2.2E-06	1.37E-05	2.1E-04	3.3E-04	5.5E-02	5.8E-04	5.6E-02
Selenium	1.0E-02	7.7E-09	3.8E-05	3.8E-05	3.1E-05	7.9E-06	6.8E-08	3.85E-10	2.5E-05	3.9E-05	1.6E-06	7.2E-05	7.3E-05
Strontium	3.5E+00	2.6E-06	1.3E+00	1.3E+00	1.1E-02	2.8E-05	2.4E-06	2.21E-09	8.8E-03	1.4E-02	8.9E-06	2.3E-02	2.3E-02
Tin	3.6E-03	2.7E-09	1.6E-05	1.6E-05	4.0E-05	8.7E-09	7.5E-10	6.90E-13	3.3E-08	5.2E-08	1.0E-08	9.4E-08	1.0E-07
Uranium	5.5E-03	4.2E-09	7.1E-06	7.0E-06	1.7E-05	4.5E-05	3.8E-06	1.05E-07	4.8E-05	7.5E-05	4.2E-04	1.7E-04	5.9E-04
Vanadium	1.7E-01	1.3E-07	1.6E-04	1.4E-04	2.0E-03	5.4E-05	4.7E-06	1.28E-06	4.2E-05	5.9E-05	2.0E-02	1.6E-04	2.0E-02
Zinc	2.1E-01	1.6E-07	3.2E-02	3.2E-02	8.2E-04	2.1E-06	1.8E-07	1.63E-10	2.6E-04	4.0E-04	8.2E-07	6.6E-04	6.6E-04
Aluminum	3.5E+01	2.7E-05	2.2E-02	2.1E-02	1.1E-01	5.7E-04	4.9E-05	4.52E-08	2.9E-04	4.5E-04	1.8E-04	1.4E-03	1.5E-03
Boron	2.7E-01	2.1E-07	1.6E-01	1.6E-01	8.4E-04	7.6E-05	6.5E-07	6.93E-10	3.8E-02	6.0E-02	2.8E-06	9.8E-02	9.8E-02
Iron	4.0E+01	3.0E-05	2.4E-02	2.4E-02	7.6E-03	2.4E-04	2.1E-05	1.89E-08	1.2E-04	1.9E-04	4.8E-06	5.7E-04	5.8E-04
Titanium	2.5E+00	1.9E-06	2.0E-03	2.0E-03	7.9E-03	4.0E-06	3.4E-07	3.14E-10	2.8E-06	4.3E-06	1.3E-06	1.1E-05	1.3E-05
Others													
PCBs	3.0E-12	2.3E-18	9.1E-10	1.3E-15	4.4E-08	6.4E-09	5.5E-10	5.04E-13	1.6E-03	3.7E-09	9.7E-03	1.6E-03	1.1E-02
Sulphate	4.6E-07	3.5E-13	3.7E-04	2.8E-08	3.6E-02	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	3.5E-09	2.6E-15	9.4E-12	9.4E-12	3.5E-09	6.3E-11	5.4E-11	4.94E-15	1.4E-10	2.2E-10	6.6E-09	4.8E-10	7.1E-09
Dust Pallatives													
Epichlorohydrin	3.8E-09	2.9E-15	4.7E-08	1.2E-08	1.3E-06	3.1E-12	2.6E-12	2.89E-15	3.2E-08	1.3E-08	1.3E-06	4.5E-08	1.3E-06

HQ = Hazard Quotient

NA = not applicable, no COPC identified for the media/pathway, or suitable TRV not identified, see report text for details

Bold HQ > 0.2

[1] maximum outdoor air concentration assumed equal to the analytical detection limit

TABLE III-3C: Cumulative (Background+Project) Scenario Risk Estimates for a Maximum North Delta Residential Receptor, Toddler
(Based on Maximum Multi-Media Concentrations)

Scenario: Cumulative

	BASELINE HQ Air Inhalation	BASELINE HQ Soil/Vegetation	BASELINE HQ All Routes	PROJECT HQ Air Inhalation	PROJECT HQ Soil/Vegetation	PROJECT HQ All Routes	CUMULATIVE HQ Air Inhalation	CUMULATIVE HQ Soil/Vegetation	CUMULATIVE HQ All Routes
Polycyclic Aromatic Hydrocarbons									
Carcinogenic PAHs									
Benzo[a]anthracene	1.3E-05	3.8E-04	4.0E-04	6.4E-06	4.3E-07	6.9E-06	2.0E-05	3.8E-04	4.0E-04
Benzo[a]pyrene	6.7E-06	3.0E-04	3.1E-04	2.0E-07	5.3E-07	7.3E-07	6.9E-06	3.0E-04	3.1E-04
Benzo[b]fluoranthene	1.2E-05	6.6E-04	6.7E-04	7.1E-07	1.7E-07	8.8E-07	1.2E-05	6.6E-04	6.7E-04
Benzo[g,h,i]perylene	NA	1.2E-04	1.2E-04	6.5E-08	1.1E-07	1.7E-07	NA	1.2E-04	1.2E-04
Benzo[k]fluoranthene	5.0E-06	1.9E-04	1.9E-04	1.6E-07	4.5E-07	6.1E-07	5.2E-06	1.9E-04	1.9E-04
Chrysene	NA	4.3E-04	4.3E-04	3.1E-07	8.5E-07	1.2E-06	NA	4.3E-04	4.3E-04
Dibenzo[a,h]anthracene	NA	2.6E-05	2.6E-05	4.0E-08	7.6E-08	1.2E-07	NA	2.6E-05	2.6E-05
Fluoranthene	8.6E-05	1.5E-03	1.6E-03	1.1E-06	4.3E-07	1.6E-06	8.7E-05	1.5E-03	1.6E-03
Indeno[1,2,3-c,d]pyrene	3.2E-05	1.2E-04	1.5E-04	1.6E-07	2.6E-07	4.2E-07	3.2E-05	1.2E-04	1.5E-04
Phenanthrene	2.7E-04	2.9E-03	3.1E-03	1.8E-06	3.5E-08	1.8E-06	2.7E-04	2.9E-03	3.1E-03
Carcinogenic PAH Mixture	4.2E-04	6.6E-03	3.9E-03	1.1E-05	3.4E-06	1.3E-05	4.3E-04	6.6E-03	7.0E-03
Non-carcinogenic PAHs									
Acenaphthene	1.8E-05	1.1E-04	1.3E-04	1.9E-07	5.3E-09	1.9E-07	1.9E-05	1.1E-04	1.3E-04
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	2.7E-06	4.5E-05	4.7E-05	6.2E-07	1.7E-09	6.2E-07	3.3E-06	4.5E-05	4.8E-05
Fluorene	6.4E-05	2.4E-04	3.0E-04	4.2E-07	7.0E-09	4.2E-07	6.5E-05	2.4E-04	3.0E-04
Fluoranthene	8.6E-05	1.5E-03	1.6E-03	1.1E-06	4.3E-07	1.6E-06	8.7E-05	1.5E-03	1.6E-03
Naphthalene	1.5E-02	7.5E-04	1.6E-02	2.2E-05	1.6E-07	2.2E-05	1.5E-02	7.6E-04	1.6E-02
2-Methylnaphthalene	NA	1.8E-03	1.8E-03	4.0E-07	7.4E-09	4.1E-07	NC	1.8E-03	1.8E-03
Pyrene	8.2E-05	2.3E-03	2.3E-03	1.9E-06	1.1E-06	3.0E-06	8.4E-05	2.3E-03	2.3E-03
Non-carcinogenic PAH Mixture	1.5E-02	6.7E-03	2.2E-02	2.7E-05	1.7E-06	2.9E-05	1.5E-02	6.7E-03	2.2E-02
Metals and Metalloids									
Antimony	NA	5.4E-02	5.4E-02	9.3E-06	1.8E-04	1.9E-04	NC	5.4E-02	5.4E-02
Arsenic	4.9E-04	**1.4E+00**	**1.4E+00**	6.6E-05	4.7E-03	4.7E-03	5.6E-04	**1.4E+00**	**1.4E+00**
Barium	3.6E-03	8.0E-02	8.3E-02	1.7E-02	6.6E-03	2.3E-02	2.0E-02	8.6E-02	1.1E-01
Beryllium	4.3E-05	2.5E-03	2.6E-03	6.9E-04	3.5E-05	7.2E-04	7.3E-04	2.6E-03	3.3E-03
Cadmium	1.7E-02	**2.1E-01**	**2.3E-01**	2.8E-03	1.7E-03	4.5E-03	2.0E-02	**2.1E-01**	**2.3E-01**
Chromium(III)	1.3E-04	3.0E-04	4.2E-04	3.0E-05	1.8E-08	3.0E-05	1.6E-04	3.0E-04	4.5E-04
Chromium(VI)	6.3E-03	3.0E-03	9.3E-03	6.5E-05	8.9E-04	9.6E-04	6.4E-03	3.9E-03	1.0E-02
Cobalt	2.6E-04	2.7E-02	2.7E-02	7.0E-04	7.3E-05	7.7E-04	9.6E-04	2.7E-02	2.8E-02
Copper	3.4E-03	1.7E-01	1.7E-01	6.3E-04	1.4E-03	2.0E-03	4.0E-03	1.7E-01	1.8E-01
Lead	2.1E-02	**6.7E-01**	**6.9E-01**	8.6E-04	1.1E-03	1.9E-03	2.2E-02	**6.7E-01**	**6.9E-01**
Manganese	5.4E-02	**1.0E+00**	**1.1E+00**	1.9E-02	8.8E-04	1.9E-02	7.3E-02	**1.0E+00**	**1.1E+00**
Mercury	1.2E-02	**2.4E-01**	**2.5E-01**	4.7E-07	7.5E-05	7.6E-05	1.2E-02	**2.4E-01**	**2.5E-01**
Molybdenum	1.9E-05	1.9E-02	1.9E-02	1.0E-02	2.9E-04	1.1E-02	1.0E-02	1.9E-02	2.9E-02
Nickel	**4.0E-01**	1.9E-01	**5.9E-01**	5.5E-02	5.8E-04	5.6E-02	**4.6E-01**	1.9E-01	**6.5E-01**
Selenium	9.0E-06	2.1E-03	2.1E-03	1.6E-06	7.2E-05	7.3E-05	1.1E-05	2.2E-03	2.2E-03
Strontium	5.5E-07	**4.4E-01**	**4.4E-01**	8.9E-06	2.3E-02	2.3E-02	9.5E-06	**4.6E-01**	**4.6E-01**
Tin	1.0E-07	5.4E-05	5.4E-05	1.0E-08	9.4E-08	1.0E-07	1.1E-07	5.4E-05	5.4E-05
Uranium	NA	2.3E-02	2.3E-02	4.2E-04	1.7E-04	5.9E-04	NC	2.3E-02	2.4E-02
Vanadium	2.6E-02	4.2E-02	6.8E-02	2.0E-02	1.6E-04	2.0E-02	4.6E-02	4.2E-02	8.8E-02
Zinc	1.2E-05	**2.6E-01**	**2.6E-01**	8.2E-07	6.6E-04	6.6E-04	1.3E-05	**2.6E-01**	**2.6E-01**
Aluminum	2.5E-07	**5.2E-01**	**5.2E-01**	1.8E-04	1.4E-03	1.5E-03	1.8E-04	**5.2E-01**	**5.2E-01**
Boron	NA	NA	NA	2.8E-06	9.8E-02	9.8E-02	NC	NC	NC
Iron	3.4E-05	**2.7E-01**	**2.7E-01**	4.8E-06	5.7E-04	5.8E-04	3.9E-05	**2.7E-01**	**2.7E-01**
Titanium	NA	3.4E-03	3.4E-03	1.3E-06	1.1E-05	1.3E-05	NC	3.5E-03	3.5E-03
Others									
PCBs	NA	NA	NA	9.7E-03	1.6E-03	1.1E-02	NC	NC	NC
Sulphate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene (total)	NA	NA	NA	6.6E-09	4.8E-10	7.1E-09	NC	NC	NC
Dust Pallatives									
Epichlorohydrin	NA	NA	NA	1.3E-06	4.5E-08	1.3E-06	NC	NC	NC

HQ = Hazard Quotient

NA = not applicable, no COPC identified for the media/pathway, or suitable TRV not identified, see report text for details; NC = not calculated

Bold HQ > 0.2

TABLE III-4A Baseline Scenario Risk Estimates for the Maximum North Delta Residential Receptor (Adult)
(Based on Background Multi-Media Concentrations)

Scenario: Baseline

	Soil Concentration µg/g	Soil Dust Concentration µg/m^3	Plant Concentration (Aboveground) µg/g	Plant Concentration (Belowground) µg/g	Air Concentration µg/m^3	HQ Soil Ingestion	HQ Soil Dermal	HQ Soil Dust Inhalation	HQ Plant (Aboveground)	HQ Plant (Belowground)	HQ Air Inhalation	HQ Soil / Vegetation	HQ All Routes
Polycyclic Aromatic Hydrocarbons													
Carcinogenic PAHs													
Benzo[a]anthracene	3.4E-01	2.6E-07	9.3E-04	9.3E-04	8.0E-04	3.2E-06	4.1E-06	2.02E-09	5.98E-05	8.20E-05	6.26E-06	1.49E-04	1.6E-04
Benzo[a]pyrene	4.0E-01	3.0E-07	6.7E-04	6.7E-04	4.0E-04	3.8E-06	4.8E-06	2.38E-09	4.30E-05	5.90E-05	3.13E-06	1.10E-04	1.1E-04
Benzo[b]fluoranthene	6.0E-01	4.6E-07	1.6E-03	1.6E-03	7.0E-04	5.7E-06	7.2E-06	3.57E-09	1.03E-04	1.41E-04	5.48E-06	2.56E-04	2.6E-04
Benzo[g,h,i]perylene	2.5E-01	1.9E-07	2.1E-04	2.1E-04	NA	2.4E-06	3.0E-06	1.49E-09	1.38E-05	1.89E-05	NA	3.81E-05	3.8E-05
Benzo[k]fluoranthene	2.4E-01	1.8E-07	4.1E-04	4.1E-04	3.0E-04	2.3E-06	2.9E-06	1.43E-09	2.65E-05	3.63E-05	2.35E-06	6.79E-05	7.0E-05
Chrysene	4.0E-01	3.0E-07	1.0E-03	1.0E-03	NA	3.8E-06	4.8E-06	2.38E-09	6.58E-05	9.03E-05	NA	1.65E-04	1.6E-04
Dibenzo[a,h]anthracene	6.0E-02	4.6E-08	4.4E-05	4.4E-05	NA	5.7E-07	7.2E-07	3.57E-10	2.82E-06	3.88E-06	NA	7.98E-06	8.0E-06
Fluoranthene	8.6E-01	6.5E-07	5.2E-03	5.2E-03	6.8E-03	6.1E-06	7.7E-06	3.84E-09	2.52E-04	3.46E-04	3.99E-05	6.12E-04	6.5E-04
Indeno[1,2,3-c,d]pyrene	2.7E-01	2.1E-07	2.1E-04	2.1E-04	1.9E-03	2.5E-06	3.2E-06	1.61E-09	1.34E-05	1.84E-05	1.49E-05	3.76E-05	5.2E-05
Phenanthrene	5.2E-01	4.0E-07	8.0E-03	8.0E-03	1.6E-02	4.9E-06	6.2E-06	3.09E-09	5.16E-04	7.08E-04	1.25E-04	1.23E-03	1.4E-03
Carcinogenic PAH Mixture											1.97E-04	2.68E-03	1.5E-03
Non-carcinogenic PAHs													
Acenaphthene	2.0E-02	1.5E-08	6.3E-04	6.3E-04	2.2E-03	9.4E-08	1.2E-07	5.95E-11	2.03E-05	2.79E-05	8.61E-06	4.85E-05	5.7E-05
Acenaphthylene	3.0E-02	2.3E-08	9.2E-04	9.2E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	8.0E-02	6.1E-08	1.2E-03	1.2E-03	1.6E-03	7.5E-08	9.6E-08	4.76E-11	8.04E-06	1.10E-05	1.25E-06	1.92E-05	2.0E-05
Fluorene	4.0E-02	3.0E-08	8.9E-04	8.9E-04	5.1E-03	2.8E-07	3.6E-07	1.78E-10	4.32E-05	5.93E-05	2.99E-05	1.03E-04	1.3E-04
Fluoranthene	8.6E-01	6.5E-07	5.2E-03	5.2E-03	6.8E-03	6.1E-06	7.7E-06	3.84E-09	2.52E-04	3.46E-04	3.99E-05	6.12E-04	6.5E-04
Naphthalene	2.0E-02	1.5E-08	1.4E-03	1.4E-03	1.5E-01	2.8E-07	3.6E-07	1.52E-09	1.39E-04	1.91E-04	1.50E-02	3.31E-04	1.5E-02
2-Methylnaphthalene	2.0E-02	1.5E-08	6.8E-04	6.8E-04	NA	1.4E-06	1.8E-06	8.92E-10	3.31E-04	4.54E-04	NA	7.87E-04	7.9E-04
Pyrene	7.0E-01	5.3E-07	6.1E-03	6.1E-03	4.9E-03	6.6E-06	8.4E-06	4.16E-09	3.97E-04	5.45E-04	3.83E-05	9.57E-04	9.9E-04
Non-carcinogenic PAH Mixture											1.51E-02	2.86E-03	1.8E-02
Metals and Metalloids													
Antimony	5.1E-01	3.9E-07	1.5E-02	1.5E-02	NA	4.8E-05	4.1E-05	3.03E-08	9.88E-03	1.36E-02	NA	2.35E-02	2.4E-02
Arsenic	6.1E+00	4.6E-06	3.6E-02	3.6E-02	4.9E-04	5.7E-03	1.5E-03	4.61E-06	2.35E-01	3.23E-01	4.90E-04	**5.65E-01**	**5.7E-01**
Barium	6.7E+01	5.1E-05	1.5E+00	1.5E+00	3.6E-03	9.4E-05	8.1E-05	5.06E-05	1.45E-02	1.99E-02	3.60E-03	3.46E-02	3.8E-02
Beryllium	2.4E-01	1.8E-07	3.6E-04	3.6E-04	8.6E-07	3.4E-05	2.9E-05	9.12E-06	3.49E-04	4.79E-04	4.30E-05	9.00E-04	9.4E-04
Cadmium	2.2E-01	1.7E-07	1.7E-02	1.7E-02	1.7E-04	7.5E-05	6.4E-06	1.67E-05	3.85E-02	5.29E-02	1.70E-02	9.15E-02	1.1E-01
Chromium(III)	2.6E+01	2.0E-05	2.9E-02	2.9E-02	6.3E-04	4.9E-06	4.2E-06	3.92E-06	3.75E-05	5.15E-05	1.26E-04	1.02E-04	2.3E-04
Chromium(VI)	1.6E-01	1.2E-07	1.8E-04	1.8E-04	6.3E-04	5.0E-05	4.3E-05	1.22E-06	3.88E-04	5.32E-04	6.30E-03	1.01E-03	7.3E-03
Cobalt	7.4E+00	5.6E-06	2.2E-02	2.2E-02	2.6E-05	2.1E-04	1.8E-04	5.63E-05	4.31E-03	5.91E-03	2.60E-04	1.07E-02	1.1E-02
Copper	2.5E+01	1.9E-05	1.5E+00	1.5E+00	3.4E-03	4.9E-05	2.5E-05	1.87E-05	2.03E-02	2.79E-02	3.40E-03	4.83E-02	5.2E-02
Lead	2.2E+01	1.7E-05	1.5E-01	1.5E-01	3.2E-03	3.9E-03	2.0E-04	1.11E-04	3.41E-02	4.68E-02	2.13E-02	8.50E-02	1.1E-01
Manganese	3.5E+02	2.7E-04	1.3E+01	1.3E+01	2.7E-03	6.4E-04	5.5E-04	5.39E-03	1.65E-01	2.27E-01	5.40E-02	**3.99E-01**	**4.5E-01**
Mercury	5.0E-02	3.8E-08	6.8E-03	6.8E-03	3.7E-03	4.7E-05	4.0E-06	1.27E-07	4.36E-02	5.98E-02	1.23E-02	1.03E-01	1.2E-01
Molybdenum	1.1E+00	8.2E-07	4.1E-02	4.1E-02	2.3E-04	1.1E-05	9.3E-06	6.84E-08	2.80E-03	3.85E-03	1.92E-05	6.67E-03	6.7E-03
Nickel	2.1E+01	1.6E-05	1.9E-01	1.9E-01	1.4E-03	5.4E-04	4.2E-04	4.54E-03	3.32E-02	4.55E-02	4.00E-01	8.42E-02	**4.8E-01**
Selenium	3.0E-01	2.3E-07	1.1E-03	1.1E-03	1.8E-04	1.5E-05	1.3E-06	1.14E-08	3.82E-04	5.25E-04	9.00E-06	9.23E-04	9.3E-04
Strontium	6.8E+01	5.1E-05	2.5E+01	2.5E+01	6.6E-04	3.2E-05	2.7E-05	2.02E-08	8.21E-02	1.13E-01	2.58E-07	1.95E-01	1.9E-01
Tin	2.1E+00	1.6E-06	9.3E-03	9.3E-03	4.0E-04	2.9E-07	2.5E-07	1.85E-10	9.03E-06	1.24E-05	4.70E-08	2.20E-05	2.2E-05
Uranium	7.5E-01	5.7E-07	9.6E-04	9.6E-04	NA	3.5E-04	3.0E-04	1.43E-05	3.09E-03	4.24E-03	NA	8.00E-03	8.0E-03
Vanadium	4.5E+01	3.4E-05	3.7E-02	3.7E-02	2.6E-03	8.4E-04	7.2E-04	3.40E-04	4.76E-03	6.54E-03	2.60E-02	1.32E-02	3.9E-02
Zinc	8.3E+01	6.3E-05	1.2E+01	1.2E+01	1.2E-02	3.9E-05	3.4E-05	2.48E-08	4.00E-02	5.49E-02	4.70E-06	9.49E-02	9.5E-02
Aluminum	1.4E+04	1.0E-02	8.1E+00	8.1E+00	1.5E-04	1.3E-02	1.1E-02	8.06E-06	5.25E-02	7.21E-02	1.17E-07	1.48E-01	1.5E-01
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00E+00	NA
Iron	1.9E+04	1.4E-02	1.1E+01	1.1E+01	5.4E-02	6.6E-03	5.7E-03	4.17E-06	2.72E-02	3.73E-02	1.58E-05	7.68E-02	7.7E-02
Titanium	7.4E+02	5.7E-04	6.1E-01	6.1E-01	NA	7.0E-05	6.0E-05	4.43E-08	3.97E-04	5.44E-04	NA	1.07E-03	1.1E-03
Others													
PCBs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulphate	NA	NA	NA	NA	9.0E-01	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA *	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dust Pallatives													
Epichlorohydrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

HQ = Hazard Quotient

NA = not applicable, no COPC identified for the media/pathway, or suitable TRV not identified, see report text for details

Bold HQ > 0.2 ILCR >1E-05

[1] maximum outdoor air concentration assumed equal to the analytical detection limit

TABLE III-4B: Project Scenario Risk Estimates for the Maximum North Delta Residential Receptor (Adult)
(Based on Maximum Multi-Media Concentrations)

Scenario: Project

	Soil Concentration µg/g	Soil Dust Concentration µg/m^3	Plant Concentration (Aboveground) µg/g	Plant Concentration (Belowground) µg/g	Air Concentration µg/m^3	HQ Soil Ingestion	HQ Soil Dermal	HQ Soil Dust Inhalation	HQ Plant (Aboveground)	HQ Plant (Belowground)	HQ Air Inhalation	HQ Soil / Vegetation	HQ All Routes	ILCR Soil Ingestion	ILCR Soil Dermal	ILCR Soil Dust Inhalation	ILCR Plant (Aboveground)	ILCR Plant (Belowground)	ILCR Air Inhalation	ILCR All Routes
Polycyclic Aromatic Hydrocarbons																				
Carcinogenic PAHs																				
Benzo[a]anthracene	3.7E-04	2.8E-10	1.1E-06	1.0E-06	3.8E-04	3.5E-09	4.5E-09	2.22E-12	7.1E-08	9.0E-08	3.00E-06	1.70E-07	3.2E-06	2.4E-11	3.1E-11	8.8E-16	4.9E-10	6.2E-10	1.5E-10	1.3E-09
Benzo[a]pyrene	6.9E-04	5.2E-10	1.2E-06	1.1E-06	1.2E-05	6.5E-09	8.2E-09	4.10E-12	7.6E-08	1.0E-07	9.50E-08	1.93E-07	2.9E-07	4.5E-10	5.7E-10	1.6E-14	5.3E-09	7.0E-09	4.7E-11	1.3E-08
Benzo[b]fluoranthene	1.4E-04	1.1E-10	4.8E-07	3.8E-07	4.2E-05	1.3E-09	1.7E-09	8.44E-13	3.1E-08	3.3E-08	3.31E-07	6.76E-08	4.0E-07	9.2E-12	1.2E-11	3.3E-16	2.2E-10	2.3E-10	1.6E-11	4.8E-10
Benzo[g,h,i]perylene	2.2E-04	1.7E-10	2.0E-07	1.9E-07	3.9E-06	2.1E-09	2.6E-09	1.32E-12	1.3E-08	1.7E-08	3.05E-08	3.45E-08	6.5E-08	1.4E-12	1.8E-12	5.2E-17	9.0E-12	1.2E-11	1.5E-13	2.4E-11
Benzo[k]fluoranthene	5.8E-04	4.4E-10	1.0E-06	9.9E-07	9.5E-06	5.5E-09	6.9E-09	3.44E-12	6.5E-08	8.8E-08	7.47E-08	1.65E-07	2.4E-07	3.8E-11	4.8E-11	1.4E-15	4.5E-10	6.0E-10	3.7E-12	1.1E-09
Chrysene	7.9E-04	6.0E-10	2.1E-06	2.0E-06	1.9E-05	7.5E-09	9.5E-09	4.73E-12	1.3E-07	1.8E-07	1.45E-07	3.29E-07	4.7E-07	5.2E-12	6.6E-12	1.9E-16	9.2E-11	1.2E-10	7.2E-13	2.3E-10
Dibenzo[a,h]anthracene	1.7E-04	1.3E-10	1.3E-07	1.3E-07	2.4E-06	1.6E-09	2.1E-09	1.03E-12	8.5E-09	1.1E-08	1.88E-08	2.33E-08	4.2E-08	1.1E-10	1.4E-10	4.1E-15	5.8E-10	7.7E-10	9.3E-12	1.6E-09
Fluoranthene	2.4E-04	1.8E-10	1.6E-06	1.5E-06	8.9E-05	1.7E-09	2.2E-09	1.07E-12	8.0E-08	9.7E-08	5.25E-07	1.80E-07	7.1E-07	1.6E-13	2.0E-13	5.7E-18	7.3E-12	8.9E-12	3.5E-13	1.7E-11
Indeno[1,2,3-cd]pyrene	5.7E-04	4.3E-10	4.8E-07	4.4E-07	9.5E-06	5.4E-09	6.8E-09	3.40E-12	3.1E-08	3.9E-08	7.41E-08	8.20E-08	1.6E-07	3.7E-11	4.7E-11	1.3E-15	2.1E-10	2.7E-10	3.7E-12	5.7E-10
Phenanthrene	4.3E-06	3.3E-12	1.5E-07	6.6E-08	1.1E-04	4.1E-11	5.2E-11	2.57E-14	9.8E-09	5.9E-09	8.34E-07	1.57E-08	8.5E-07	2.8E-15	3.6E-15	1.0E-19	6.8E-13	4.0E-13	4.1E-13	1.5E-12
Carcinogenic PAH Mixture											5.12E-06	1.26E-06	5.5E-06						2.3E-10	1.9E-08
Non-carcinogenic PAHs																				
Acenaphthene	3.2E-07	2.4E-13	6.2E-08	1.0E-08	2.2E-05	1.5E-12	1.9E-12	9.50E-16	2.0E-09	4.5E-10	8.76E-08	2.45E-09	9.0E-08	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	1.1E-07	8.7E-14	3.3E-08	3.5E-09	7.5E-05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	2.1E-06	1.6E-12	7.4E-08	3.2E-08	3.7E-04	2.0E-12	2.5E-12	1.23E-15	4.8E-10	2.9E-10	2.89E-07	7.69E-10	2.9E-07	NA	NA	NA	NA	NA	NA	NA
Fluorene	4.4E-07	3.3E-13	5.4E-08	9.7E-09	3.3E-05	3.1E-12	3.9E-12	1.95E-15	2.6E-09	6.5E-10	1.95E-07	3.25E-09	2.0E-07	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	2.4E-04	1.8E-10	1.6E-06	1.5E-06	8.9E-05	1.7E-09	2.2E-09	1.07E-12	8.0E-08	9.7E-08	5.25E-07	1.80E-07	7.1E-07	1.6E-13	2.0E-13	5.7E-18	7.3E-12	8.9E-12	3.5E-13	1.7E-11
Naphthalene	4.4E-09	3.4E-15	7.7E-07	3.2E-10	2.2E-04	6.3E-14	8.0E-14	3.38E-16	7.4E-08	4.2E-11	2.23E-05	7.44E-08	2.2E-05	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	7.2E-09	5.5E-15	6.9E-09	2.5E-10	3.2E-06	5.1E-13	6.5E-13	3.23E-16	3.4E-09	1.6E-10	1.88E-07	3.52E-09	1.9E-07	NA	NA	NA	NA	NA	NA	NA
Pyrene	3.2E-04	2.4E-10	3.0E-06	2.8E-06	1.2E-04	3.0E-09	3.8E-09	1.89E-12	2.0E-07	2.5E-07	9.01E-07	4.50E-07	1.4E-06	NA	NA	NA	NA	NA	NA	NA
Non-carcinogenic PAH Mixture											2.45E-05	7.15E-07	2.5E-05							
Metals and Metalloids																				
Antimony	1.7E-03	1.3E-09	5.1E-05	5.0E-05	5.5E-05	1.6E-07	1.3E-07	9.95E-11	3.3E-05	4.4E-05	4.33E-06	7.75E-05	8.2E-05	NA	NA	NA	NA	NA	NA	NA
Arsenic	2.1E-02	1.6E-08	1.2E-04	1.2E-04	6.6E-05	2.0E-05	5.0E-06	1.57E-08	8.0E-04	1.1E-03	6.62E-05	1.93E-03	2.0E-03	1.1E-08	2.7E-09	1.0E-10	4.3E-07	5.9E-07	5.3E-08	1.1E-06
Barium	5.5E+00	4.2E-06	1.2E-01	1.2E-01	1.7E-02	7.8E-06	6.6E-06	4.17E-06	1.2E-03	1.6E-03	1.69E-02	2.86E-03	2.0E-02	NA	NA	NA	NA	NA	NA	NA
Beryllium	3.3E-03	2.5E-09	5.0E-06	5.0E-06	1.4E-05	4.7E-07	4.0E-07	1.26E-07	4.9E-06	6.6E-06	6.90E-04	1.25E-05	7.0E-04	NA	NA	6.1E-12	NA	NA	4.1E-09	4.1E-09
Cadmium	1.8E-03	1.3E-09	1.3E-04	1.3E-04	2.8E-05	6.0E-07	5.2E-08	1.34E-07	3.1E-04	4.3E-04	2.80E-03	7.36E-04	3.5E-03	NA	NA	1.3E-11	NA	NA	3.4E-08	3.4E-08
Chromium(III)	1.6E-03	1.2E-09	1.8E-06	1.8E-06	1.5E-04	3.0E-10	2.5E-10	2.39E-10	2.3E-09	3.1E-09	2.96E-05	6.26E-09	3.0E-05	NA	NA	NA	NA	NA	NA	NA
Chromium(VI)	4.7E-02	3.6E-08	5.3E-05	5.3E-05	6.5E-06	1.5E-05	1.3E-05	3.58E-07	1.1E-04	1.6E-04	6.52E-05	2.99E-04	3.6E-04	5.6E-09	4.8E-09	2.7E-09	4.3E-08	5.9E-08	6.2E-08	1.8E-07
Cobalt	2.0E-02	1.5E-08	6.0E-05	5.9E-05	7.0E-05	5.6E-07	4.8E-07	1.50E-07	1.2E-05	1.6E-05	7.01E-04	2.85E-05	7.3E-04	NA	NA	NA	NA	NA	NA	NA
Copper	2.0E-01	1.5E-07	1.2E-02	1.2E-02	6.3E-04	4.0E-07	2.1E-07	1.53E-07	1.7E-04	2.3E-04	6.31E-04	3.96E-04	1.0E-03	NA	NA	NA	NA	NA	NA	NA
Lead	3.5E-02	2.6E-08	2.4E-04	2.3E-04	1.3E-04	6.1E-06	3.2E-07	1.76E-07	5.4E-05	7.4E-05	8.55E-04	1.35E-04	9.9E-04	NA	NA	NA	NA	NA	NA	NA
Manganese	3.0E-01	2.3E-07	1.1E-02	1.1E-02	9.3E-04	5.5E-07	4.7E-07	4.59E-06	1.4E-04	1.9E-04	1.85E-02	3.39E-04	1.9E-02	NA	NA	NA	NA	NA	NA	NA
Mercury	1.2E-03	9.3E-10	1.7E-04	1.7E-04	5.6E-06	1.2E-06	9.9E-08	3.10E-09	1.1E-03	1.5E-03	1.88E-05	2.54E-03	2.6E-03	NA	NA	NA	NA	NA	NA	NA
Molybdenum	7.9E-03	6.0E-09	3.0E-04	3.0E-04	3.6E-05	8.0E-08	6.8E-08	5.01E-10	2.1E-05	2.8E-05	2.99E-06	4.89E-05	5.2E-05	NA	NA	NA	NA	NA	NA	NA
Nickel	6.3E-02	4.8E-08	5.7E-04	5.7E-04	1.9E-04	1.6E-06	1.3E-06	1.37E-05	1.0E-04	1.4E-04	5.51E-02	2.53E-04	5.5E-02	NA	NA	6.2E-11	NA	NA	3.1E-08	3.1E-08
Selenium	1.0E-02	7.7E-09	3.8E-05	3.8E-05	3.1E-05	5.0E-07	4.3E-08	3.85E-10	1.3E-05	1.8E-05	1.55E-06	3.12E-05	3.3E-05	NA	NA	NA	NA	NA	NA	NA
Strontium	3.5E+00	2.6E-06	1.3E+00	1.3E+00	1.1E-02	1.6E-06	1.4E-06	1.03E-09	4.2E-03	5.8E-03	4.16E-06	9.95E-03	1.0E-02	NA	NA	NA	NA	NA	NA	NA
Tin	3.6E-03	2.7E-09	1.6E-05	1.6E-05	4.0E-05	5.1E-10	4.4E-10	3.22E-13	1.6E-08	2.2E-08	4.70E-09	3.83E-08	4.3E-08	NA	NA	NA	NA	NA	NA	NA
Uranium	5.5E-03	4.2E-09	7.1E-06	7.0E-06	1.7E-05	2.6E-06	2.2E-06	1.05E-07	2.3E-05	3.1E-05	4.24E-04	5.90E-05	4.8E-04	NA	NA	NA	NA	NA	NA	NA
Vanadium	1.7E-01	1.3E-07	1.6E-04	1.4E-04	2.0E-03	3.2E-06	2.7E-06	1.28E-06	2.0E-05	2.5E-05	2.01E-02	5.17E-05	2.0E-02	NA	NA	NA	NA	NA	NA	NA
Zinc	2.1E-01	1.6E-07	3.2E-02	3.2E-02	8.2E-04	1.0E-07	8.6E-08	6.32E-11	1.0E-04	1.4E-04	3.19E-07	2.42E-04	2.4E-04	NA	NA	NA	NA	NA	NA	NA
Aluminum	3.5E+01	2.7E-05	2.2E-02	2.1E-02	1.1E-01	3.3E-05	2.9E-05	2.11E-08	1.4E-04	1.9E-04	8.58E-05	3.90E-04	4.8E-04	NA	NA	NA	NA	NA	NA	NA
Boron	2.7E-01	2.1E-07	1.6E-01	1.6E-01	8.4E-04	4.4E-06	3.8E-07	6.93E-10	1.8E-02	2.5E-02	2.80E-06	4.31E-02	4.3E-02	NA	NA	NA	NA	NA	NA	NA
Iron	4.0E+01	3.0E-05	2.4E-02	2.4E-02	7.6E-03	1.4E-05	1.2E-05	8.82E-09	5.8E-05	7.9E-05	2.22E-06	1.63E-04	1.7E-04	NA	NA	NA	NA	NA	NA	NA
Titanium	2.5E+00	1.9E-06	2.0E-03	2.0E-03	7.9E-03	2.3E-07	2.0E-07	1.46E-10	1.3E-06	1.8E-06	6.16E-07	3.55E-06	4.2E-06	NA	NA	NA	NA	NA	NA	NA
Others																				
PCBs	3.0E-12	2.3E-18	9.1E-10	1.3E-15	4.4E-08	3.7E-10	3.2E-10	2.35E-13	7.7E-04	1.5E-09	4.52E-03	7.66E-04	5.3E-03	NA	NA	NA	NA	NA	NA	NA
Sulphate	4.6E-07	3.5E-13	3.7E-04	2.8E-08	3.6E-02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	3.5E-09	2.6E-15	9.4E-12	9.4E-12	3.5E-09	3.7E-12	3.1E-11	2.30E-15	6.8E-11	9.3E-11	3.08E-09	1.95E-10	3.3E-09	1.6E-15	1.4E-15	1.2E-18	2.9E-14	4.0E-14	2.0E-13	2.8E-13
Dust Pallatives																				
Epichlorohydrin	3.8E-09	2.9E-15	4.1E-08	1.2E-08	1.3E-06	1.8E-13	1.5E-12	2.89E-15	1.3E-08	5.4E-09	1.25E-06	1.87E-08	1.3E-06	1.1E-17	9.1E-17	3.5E-21	7.9E-13	3.2E-13	1.9E-13	1.3E-12

HQ = Hazard Quotient

ILCR = Incremental Lifetime Cancer Risk

NA = not applicable, not a carcinogen, no COPC identified for the media/pathway, or suitable TRV not identified, see report text for details

Bold HQ > 0.2 ILCR >1E-05

[1] maximum outdoor air concentration assumed equal to the analytical detection limit

TABLE III-4C: Cumulative (Background+Project) Scenario Risk Estimates for a Maximum North Delta Residential Receptor, Adult
(Based on Maximum Multi-Media Concentrations)

Scenario: Cumulative

	BASELINE HQ Air Inhalation	BASELINE HQ Soil/Vegetation	BASELINE HQ All Routes	PROJECT HQ Air Inhalation	PROJECT HQ Soil/Vegetation	PROJECT HQ All Routes	CUMULATIVE HQ Air Inhalation	CUMULATIVE HQ Soil/Vegetation	CUMULATIVE HQ All Routes
Polycyclic Aromatic Hydrocarbons									
Carcinogenic PAHs									
Benzo[a]anthracene	6.3E-06	1.5E-04	1.6E-04	3.0E-06	1.7E-07	3.2E-06	9.3E-06	1.5E-04	1.6E-04
Benzo[a]pyrene	3.1E-06	1.1E-04	1.1E-04	9.5E-08	1.9E-07	2.9E-07	3.2E-06	1.1E-04	1.1E-04
Benzo[b]fluoranthene	5.5E-06	2.6E-04	2.6E-04	3.3E-07	6.8E-08	4.0E-07	5.8E-06	2.6E-04	2.6E-04
Benzo[g,h,i]perylene	NA	3.8E-05	3.8E-05	3.0E-08	3.5E-08	6.5E-08	NA	3.8E-05	3.8E-05
Benzo[k]fluoranthene	2.3E-06	6.8E-05	7.0E-05	7.5E-08	1.7E-07	2.4E-07	2.4E-06	6.8E-05	7.1E-05
Chrysene	NA	1.6E-04	1.6E-04	1.5E-07	3.3E-07	4.7E-07	NA	1.6E-04	1.6E-04
Dibenzo[a,h]anthracene	NA	8.0E-06	8.0E-06	1.9E-08	2.3E-08	4.2E-08	NA	8.0E-06	8.0E-06
Fluoranthene	4.0E-05	6.1E-04	6.5E-04	5.3E-07	1.8E-07	7.1E-07	4.0E-05	6.1E-04	6.5E-04
Indeno[1,2,3-c,d]pyrene	1.5E-05	3.8E-05	5.2E-05	7.4E-08	8.2E-08	1.6E-07	1.5E-05	3.8E-05	5.3E-05
Phenanthrene	1.3E-04	1.2E-03	1.4E-03	8.3E-07	1.6E-08	8.5E-07	1.3E-04	1.2E-03	1.4E-03
Carcinogenic PAH Mixture	2.0E-04	2.7E-03	1.5E-03	5.1E-06	1.3E-06	5.5E-06	2.0E-04	2.7E-03	2.9E-03
Non-carcinogenic PAHs									
Acenaphthene	8.6E-06	4.8E-05	5.7E-05	8.8E-08	2.4E-09	9.0E-08	8.7E-06	4.8E-05	5.7E-05
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	1.3E-06	1.9E-05	2.0E-05	2.9E-07	7.7E-10	2.9E-07	1.5E-06	1.9E-05	2.1E-05
Fluorene	3.0E-05	1.0E-04	1.3E-04	2.0E-07	3.2E-09	2.0E-07	3.0E-05	1.0E-04	1.3E-04
Fluoranthene	4.0E-05	6.1E-04	6.5E-04	5.3E-07	1.8E-07	7.1E-07	4.0E-05	6.1E-04	6.5E-04
Naphthalene	1.5E-02	3.3E-04	1.5E-02	2.2E-05	7.4E-08	2.2E-05	1.5E-02	3.3E-04	1.5E-02
2-Methylnaphthalene	NA	7.9E-04	7.9E-04	1.9E-07	3.5E-09	1.9E-07	NC	7.9E-04	7.9E-04
Pyrene	3.8E-05	9.6E-04	9.9E-04	9.0E-07	4.5E-07	1.4E-06	3.9E-05	9.6E-04	1.0E-03
Non-carcinogenic PAH Mixture	1.5E-02	2.9E-03	1.8E-02	2.5E-05	7.2E-07	2.5E-05	1.5E-02	2.9E-03	1.8E-02
Metals and Metalloids									
Antimony	NA	2.4E-02	2.4E-02	4.3E-06	7.8E-05	8.2E-05	NC	2.4E-02	2.4E-02
Arsenic	4.9E-04	**5.7E-01**	**5.7E-01**	6.6E-05	1.9E-03	2.0E-03	5.6E-04	**5.7E-01**	**5.7E-01**
Barium	3.6E-03	3.5E-02	3.8E-02	1.7E-02	2.9E-03	2.0E-02	2.0E-02	3.7E-02	5.8E-02
Beryllium	4.3E-05	9.0E-04	9.4E-04	6.9E-04	1.3E-05	7.0E-04	7.3E-04	9.1E-04	1.6E-03
Cadmium	1.7E-02	9.1E-02	1.1E-01	2.8E-03	7.4E-04	3.5E-03	2.0E-02	9.2E-02	1.1E-01
Chromium(III)	1.3E-04	1.0E-04	2.3E-04	3.0E-05	6.3E-09	3.0E-05	1.6E-04	1.0E-04	2.6E-04
Chromium(VI)	6.3E-03	1.0E-03	7.3E-03	6.5E-05	3.0E-04	3.6E-04	6.4E-03	1.3E-03	7.7E-03
Cobalt	2.6E-04	1.1E-02	1.1E-02	7.0E-04	2.9E-05	7.3E-04	9.6E-04	1.1E-02	1.2E-02
Copper	3.4E-03	4.8E-02	5.2E-02	6.3E-04	4.0E-04	1.0E-03	4.0E-03	4.9E-02	5.3E-02
Lead	2.1E-02	8.5E-02	1.1E-01	8.6E-04	1.3E-04	9.9E-04	2.2E-02	8.5E-02	1.1E-01
Manganese	5.4E-02	**4.0E-01**	**4.5E-01**	1.9E-02	3.4E-04	1.9E-02	7.3E-02	**4.0E-01**	**4.7E-01**
Mercury	1.2E-02	1.0E-01	1.2E-01	1.9E-05	2.5E-03	2.6E-03	1.2E-02	1.1E-01	1.2E-01
Molybdenum	1.9E-05	6.7E-03	6.7E-03	3.0E-06	4.9E-05	5.2E-05	2.2E-05	6.7E-03	6.7E-03
Nickel	**4.0E-01**	8.4E-02	**4.8E-01**	5.5E-02	2.5E-04	5.5E-02	**4.6E-01**	8.4E-02	**5.4E-01**
Selenium	9.0E-06	9.2E-04	9.3E-04	1.6E-06	3.1E-05	3.3E-05	1.1E-05	9.5E-04	9.7E-04
Strontium	2.6E-07	1.9E-01	1.9E-01	4.2E-06	1.0E-02	1.0E-02	4.4E-06	2.0E-01	2.0E-01
Tin	4.7E-08	2.2E-05	2.2E-05	4.7E-09	3.8E-08	4.3E-08	5.2E-08	2.2E-05	2.2E-05
Uranium	NA	8.0E-03	8.0E-03	4.2E-04	5.9E-05	4.8E-04	NC	8.1E-03	8.5E-03
Vanadium	2.6E-02	1.3E-02	3.9E-02	2.0E-02	5.2E-05	2.0E-02	4.6E-02	1.3E-02	5.9E-02
Zinc	4.7E-06	9.5E-02	9.5E-02	3.2E-07	2.4E-04	2.4E-04	5.0E-06	9.5E-02	9.5E-02
Aluminum	1.2E-07	**1.5E-01**	**1.5E-01**	8.6E-05	3.9E-04	4.8E-04	8.6E-05	**1.5E-01**	**1.5E-01**
Boron	NA	NA	NA	2.8E-06	4.3E-02	4.3E-02	NC	NC	NC
Iron	1.6E-05	7.7E-02	7.7E-02	2.2E-06	1.6E-04	1.7E-04	1.8E-05	7.7E-02	7.7E-02
Titanium	NA	1.1E-03	1.1E-03	6.2E-07	3.6E-06	4.2E-06	NC	1.1E-03	1.1E-03
Others									
PCBs	NA	NA	NA	4.5E-03	7.7E-04	1.5E-09	NC	NC	NC
Sulphate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	3.1E-09	2.0E-10	7.1E-10	NC	NC	NC
Dust Pallatives									
Epichlorohydrin	NA	NA	NA	1.25E-06	1.87E-08	1.3E-06	NC	NC	NC

HQ = Hazard Quotient

NA = not applicable, no COPC identified for the media/pathway, or suitable TRV not identified, see report text for details; NC = not calculated

Bold HQ > 0.2

TABLE III-7A: Baseline Scenario Risk Estimates for a Industrial Receptor (Adult)
(Based on Background Multi-Media Concentrations)

	Soil Concentration µg/g	Soil Dust Concentration µg/m^3	Plant Concentration (Aboveground) µg/g	Plant Concentration (Belowground) µg/g	Air Concentration µg/m^3	HQ Soil Ingestion	HQ Soil Dermal	HQ Soil Dust Inhalation	HQ Air Inhalation	HQ Soil Pathways	HQ All Routes
Polycyclic Aromatic Hydrocarbons											
Carcinogenic PAHs											
Benzo[a]anthracene	3.4E-01	2.6E-07	9.3E-04	9.3E-04	8.0E-04	2.1E-06	2.7E-06	5.56E-10	1.72E-06	4.79E-06	6.5E-06
Benzo[a]pyrene	4.0E-01	3.0E-07	6.7E-04	6.7E-04	4.0E-04	2.5E-06	3.2E-06	6.54E-10	8.60E-07	5.64E-06	6.5E-06
Benzo[b]fluoranthene	6.0E-01	4.6E-07	1.6E-03	1.6E-03	7.0E-04	3.7E-06	4.7E-06	9.80E-10	1.51E-06	8.46E-06	1.0E-05
Benzo[g,h,i]perylene	2.5E-01	1.9E-07	2.1E-04	2.1E-04	NA	1.6E-06	2.0E-06	4.09E-10	NA	3.52E-06	3.5E-06
Benzo[k]fluoranthene	2.4E-01	1.8E-07	4.1E-04	4.1E-04	3.0E-04	1.5E-06	1.9E-06	3.92E-10	6.45E-07	3.38E-06	4.0E-06
Chrysene	4.0E-01	3.0E-07	1.0E-03	1.0E-03	NA	2.5E-06	3.2E-06	6.54E-10	NA	5.64E-06	5.6E-06
Dibenzo[a,h]anthracene	6.0E-02	4.6E-08	4.4E-05	4.4E-05	NA	3.7E-07	4.7E-07	9.80E-11	NA	8.46E-07	8.5E-07
Fluoranthene	8.6E-01	6.5E-07	5.2E-03	5.2E-03	6.8E-03	4.0E-06	5.1E-06	1.05E-09	1.10E-05	9.09E-06	2.0E-05
Indeno[1,2,3-c,d]pyrene	2.7E-01	2.1E-07	2.1E-04	2.1E-04	1.9E-03	1.7E-06	2.1E-06	4.41E-10	4.09E-06	3.81E-06	7.9E-06
Phenanthrene	5.2E-01	4.0E-07	8.0E-03	8.0E-03	1.6E-02	3.2E-06	4.1E-06	8.50E-10	3.44E-05	7.33E-06	4.2E-05
Carcinogenic PAH Mixture									5.42E-05	5.25E-05	6.5E-05
Non-carcinogenic PAHs											
Acenaphthene	2.0E-02	1.5E-08	6.3E-04	6.3E-04	2.2E-03	6.2E-08	7.9E-08	1.63E-11	2.37E-06	1.41E-07	2.5E-06
Acenaphthylene	3.0E-02	2.3E-08	9.2E-04	9.2E-04	NA	NA	NA	NA	NA	NA	NA
Anthracene	8.0E-02	6.1E-08	1.2E-03	1.2E-03	1.6E-03	5.0E-08	6.3E-08	1.31E-11	3.44E-07	1.13E-07	4.6E-07
Fluorene	4.0E-02	3.0E-08	8.9E-04	8.9E-04	5.1E-03	1.9E-07	2.4E-07	4.90E-11	8.22E-06	4.23E-07	8.6E-06
Fluoranthene	8.6E-01	6.5E-07	5.2E-03	5.2E-03	6.8E-03	4.0E-06	5.1E-06	1.05E-09	1.10E-05	9.09E-06	2.0E-05
Naphthalene	2.0E-02	1.5E-08	1.4E-03	1.4E-03	1.5E-01	1.9E-07	2.4E-07	4.18E-10	4.12E-03	4.23E-07	4.1E-03
2-Methylnaphthalene	2.0E-02	1.5E-08	6.8E-04	6.8E-04	NA	9.3E-07	1.2E-06	2.45E-10	NA	2.11E-06	2.1E-06
Pyrene	7.0E-01	5.3E-07	6.1E-03	6.1E-03	4.9E-03	4.4E-06	5.5E-06	1.14E-09	1.05E-05	9.87E-06	2.0E-05
Non-carcinogenic PAH Mixture									4.15E-03	2.22E-05	4.2E-03
Metals and Metalloids											
Antimony	5.1E-01	3.9E-07	1.5E-02	1.5E-02	NA	3.2E-05	2.7E-05	8.33E-09	NA	5.89E-05	5.9E-05
Arsenic	6.1E+00	4.6E-06	3.6E-02	3.6E-02	4.9E-04	3.8E-03	9.7E-04	1.27E-06	1.35E-04	4.74E-03	4.9E-03
Barium	6.7E+01	5.1E-05	1.5E+00	1.5E+00	3.6E-03	6.2E-05	5.3E-05	1.39E-05	9.89E-04	1.29E-04	1.1E-03
Beryllium	2.4E-01	1.8E-07	3.6E-04	3.6E-04	8.6E-07	2.2E-05	1.9E-05	2.51E-06	1.18E-05	4.40E-05	5.6E-05
Cadmium	2.2E-01	1.7E-07	1.7E-02	1.7E-02	1.7E-04	4.9E-05	4.2E-06	4.59E-06	4.67E-03	5.83E-05	4.7E-03
Chromium(III)	2.6E+01	2.0E-05	2.9E-02	2.9E-02	6.3E-04	3.2E-06	2.7E-06	1.08E-06	3.46E-05	7.04E-06	4.2E-05
Chromium(VI)	1.6E-01	1.2E-07	1.8E-04	1.8E-04	6.3E-04	3.3E-05	2.8E-05	3.34E-07	1.73E-03	6.19E-05	1.8E-03
Cobalt	7.4E+00	5.6E-06	2.2E-02	2.2E-02	2.6E-05	1.4E-04	1.2E-04	1.55E-05	7.14E-05	2.72E-04	3.4E-04
Copper	2.5E+01	1.9E-05	1.5E+00	1.5E+00	3.4E-03	3.3E-05	1.7E-05	5.14E-06	9.34E-04	5.45E-05	9.9E-04
Lead	2.2E+01	1.7E-05	1.5E-01	1.5E-01	3.2E-03	2.6E-03	1.3E-04	3.05E-05	5.86E-03	2.72E-03	8.6E-03
Manganese	3.5E+02	2.7E-04	1.3E+01	1.3E+01	2.7E-03	4.2E-04	3.6E-04	1.48E-03	1.48E-02	2.27E-03	1.7E-02
Mercury	3.4E-03	3.4E-05	3.4E-03	6.8E-03	3.7E-03	2.1E-06	1.8E-07	3.09E-05	3.39E-03	3.32E-05	3.4E-03
Molybdenum	5.3E-06	1.3E-05	1.9E-05	4.1E-02	2.3E-04	3.5E-11	3.0E-11	3.06E-07	5.27E-06	3.06E-07	5.6E-06
Nickel	2.1E+01	1.6E-05	1.9E-01	1.9E-01	1.4E-03	3.5E-04	2.8E-04	1.25E-03	1.10E-01	1.88E-03	1.1E-01
Selenium	3.0E-01	2.3E-07	1.1E-03	1.1E-03	1.8E-04	9.8E-06	8.4E-07	3.13E-09	2.47E-06	1.07E-05	1.3E-05
Strontium	6.8E+01	5.1E-05	2.5E+01	2.5E+01	6.6E-04	2.1E-05	1.8E-05	5.54E-09	7.10E-08	3.91E-05	3.9E-05
Tin	2.1E+00	1.6E-06	9.3E-03	9.3E-03	4.0E-04	1.9E-07	1.7E-07	5.07E-11	1.29E-08	3.58E-07	3.7E-07
Uranium	7.5E-01	5.7E-07	9.6E-04	9.6E-04	NA	2.3E-04	2.0E-04	3.91E-06	NA	4.37E-04	4.4E-04
Vanadium	4.5E+01	3.4E-05	3.7E-02	3.7E-02	2.6E-03	5.6E-04	4.8E-04	9.33E-05	7.14E-03	1.12E-03	8.3E-03
Zinc	8.3E+01	6.3E-05	1.2E+01	1.2E+01	1.2E-02	2.6E-05	2.2E-05	6.81E-09	1.29E-06	4.81E-05	4.9E-05
Aluminum	1.4E+04	1.0E-02	8.1E+00	8.1E+00	1.5E-04	8.4E-03	7.2E-03	2.21E-06	3.23E-08	1.56E-02	1.6E-02
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	1.9E+04	1.4E-02	1.1E+01	1.1E+01	5.4E-02	4.4E-03	3.7E-03	1.15E-06	4.35E-06	8.10E-03	8.1E-03
Titanium	7.4E+02	5.7E-04	6.1E-01	6.1E-01	NA	4.6E-05	4.0E-05	1.22E-08	NA	8.59E-05	8.6E-05
Others											
PCBs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulphate	NA	NA	NA	NA	9.0E-01	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA *	NA	NA	NA	NA	NA	NA	NA
Dust Pallatives											
Epichlorohydrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

HQ = Hazard Quotient

ILCR = Incremental Lifetime Cancer Risk

NA = not applicable, not a carcinogen, no COPC identified for the media/pathway, or suitable TRV not identified, see report text for details

Bold HQ > 0.2 ILCR >1E-05

[1] maximum outdoor air concentration assumed equal to the analytical detection limit

TABLE III-7B: Project Scenario Risk Estimates for a Industrial Receptor (Adult)
(Based on Maximum Multi-Media Concentrations)

Scenario: Project

	Soil Concentration µg/g	Soil Dust Concentration µg/m^3	Air Concentration µg/m^3	HQ Soil Ingestion	HQ Soil Dermal	HQ Soil Dust Inhalation	HQ Air Inhalation	HQ Soil	HQ All Routes	ILCR Soil Ingestion	ILCR Soil Dermal	ILCR Soil Dust Inhalation	ILCR Air Inhalation	ILCR All Routes
Polycyclic Aromatic Hydrocarbons														
Carcinogenic PAHs														
Benzo[a]anthracene	1.4E-03	1.1E-09	4.1E-03	9.3E-09	1.2E-08	2.46E-12	9.47E-06	2.12E-08	9.5E-06	2.8E-11	3.6E-11	4.3E-16	4.7E-10	5.3E-10
Benzo[a]pyrene	2.6E-03	2.0E-09	4.7E-05	1.7E-08	2.2E-08	4.53E-12	1.08E-07	3.91E-08	1.5E-07	5.2E-10	6.6E-10	7.9E-15	5.3E-11	1.2E-09
Benzo[b]fluoranthene	5.3E-04	4.0E-10	1.6E-04	3.5E-09	4.5E-09	9.33E-13	3.76E-07	8.04E-09	3.8E-07	1.1E-11	1.4E-11	1.6E-16	1.9E-11	4.3E-11
Benzo[g,h,i]perylene	8.3E-04	6.3E-10	1.5E-05	5.5E-09	7.0E-09	1.45E-12	3.38E-08	1.25E-08	4.6E-08	1.7E-12	2.1E-12	2.5E-17	1.7E-13	4.0E-12
Benzo[k]fluoranthene	2.2E-03	1.6E-09	3.6E-05	1.4E-08	1.8E-08	3.80E-12	8.25E-08	3.28E-08	1.2E-07	4.4E-11	5.5E-11	6.6E-16	4.1E-12	1.0E-10
Chrysene	3.0E-03	2.3E-09	6.8E-05	2.0E-08	2.5E-08	5.22E-12	1.57E-07	4.50E-08	2.0E-07	6.0E-12	7.6E-12	9.0E-17	7.8E-13	1.4E-11
Dibenzo[a,h]anthracene	6.5E-04	4.9E-10	9.3E-06	4.3E-09	5.5E-09	1.14E-12	2.14E-08	9.80E-09	3.1E-08	1.3E-10	1.7E-10	2.0E-15	1.1E-11	3.1E-10
Fluoranthene	9.0E-04	6.8E-10	3.2E-04	4.5E-09	5.7E-09	1.18E-12	5.53E-07	1.02E-08	5.6E-07	1.8E-13	2.3E-13	2.7E-18	3.7E-13	7.8E-13
Indeno[1,2,3-c,d]pyrene	2.1E-03	1.6E-09	3.7E-05	1.4E-08	1.8E-08	3.76E-12	8.61E-08	3.24E-08	1.2E-07	4.3E-11	5.5E-11	6.5E-16	4.3E-12	1.0E-10
Phenanthrene	1.6E-05	1.2E-11	2.1E-04	1.1E-10	1.4E-10	2.83E-14	4.85E-07	2.44E-10	4.9E-07	3.3E-15	4.1E-15	4.9E-20	2.4E-13	2.5E-13
Carcinogenic PAH Mixture							1.14E-05	2.11E-07	1.1E-05				5.3E-11	2.3E-09
Non-carcinogenic PAHs														
Acenaphthene	1.2E-06	9.1E-13	7.8E-05	4.0E-12	5.1E-12	1.05E-15	9.07E-08	9.05E-12	9.1E-08	NA	NA	NA	NA	NA
Acenaphthylene	4.3E-07	3.3E-13	1.3E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	7.7E-06	5.9E-12	4.0E-03	5.2E-12	6.6E-12	1.36E-15	9.31E-07	1.17E-11	9.3E-07	NA	NA	NA	NA	NA
Fluorene	1.6E-06	1.2E-12	7.8E-05	8.2E-12	1.0E-11	2.15E-15	1.36E-07	1.86E-11	1.4E-07	NA	NA	NA	NA	NA
Fluoranthene	9.0E-04	6.8E-10	3.2E-04	4.5E-09	5.7E-09	1.18E-12	5.53E-07	1.02E-08	5.6E-07	1.8E-13	2.3E-13	2.7E-18	3.7E-13	7.8E-13
Naphthalene	1.8E-08	1.4E-14	6.5E-04	1.8E-13	2.3E-13	4.00E-16	1.93E-05	4.06E-13	1.9E-05	NA	NA	NA	NA	NA
2-Methylnaphthalene	2.7E-08	2.1E-14	1.2E-05	1.4E-12	1.7E-12	3.57E-16	2.15E-07	3.08E-12	2.1E-07	NA	NA	NA	NA	NA
Pyrene	1.2E-03	9.0E-10	4.1E-04	7.9E-09	1.0E-08	2.08E-12	9.43E-07	1.80E-08	9.6E-07	NA	NA	NA	NA	NA
Non-carcinogenic PAH Mixture							2.22E-05	2.82E-08	2.2E-05					
Metals and Metalloids														
Antimony	6.5E-03	4.9E-09	3.1E-04	4.4E-07	3.7E-07	1.14E-10	7.08E-06	8.08E-07	7.9E-06	NA	NA	NA	NA	NA
Arsenic	7.7E-02	5.9E-08	2.6E-04	5.2E-05	1.3E-05	1.74E-08	7.68E-05	6.50E-05	1.4E-04	1.2E-08	3.1E-09	4.9E-11	6.1E-08	7.7E-08
Barium	2.1E+01	1.6E-05	6.5E-02	2.1E-05	1.8E-05	4.61E-06	1.93E-02	4.28E-05	1.9E-02	NA	NA	NA	NA	NA
Beryllium	1.2E-02	9.4E-09	1.5E-04	1.2E-06	1.1E-06	1.40E-07	2.27E-03	2.45E-06	2.3E-03	NA	NA	2.9E-12	1.4E-08	1.4E-08
Cadmium	6.7E-03	5.1E-09	1.3E-04	1.6E-06	1.4E-07	1.50E-07	3.98E-03	1.91E-06	4.0E-03	NA	NA	6.4E-12	4.9E-08	4.9E-08
Chromium(III)	5.9E-03	4.5E-09	5.7E-04	7.9E-10	6.7E-10	2.64E-10	3.39E-05	1.72E-09	3.4E-05	NA	NA	NA	NA	NA
Chromium(VI)	1.8E-01	1.3E-07	2.7E-05	3.9E-05	3.4E-05	3.95E-07	8.00E-05	7.32E-05	1.5E-04	6.5E-09	5.6E-09	1.3E-09	7.6E-08	8.9E-08
Cobalt	7.4E-02	5.6E-08	2.9E-04	1.5E-06	1.3E-06	1.66E-07	8.51E-04	2.92E-06	8.5E-04	NA	NA	NA	NA	NA
Copper	7.5E-01	5.7E-07	2.5E-03	1.1E-06	5.5E-07	1.69E-07	7.26E-04	1.79E-06	7.3E-04	NA	NA	NA	NA	NA
Lead	1.3E-01	9.9E-08	4.9E-04	1.6E-05	8.4E-07	1.94E-07	9.62E-04	1.73E-05	9.8E-04	NA	NA	NA	NA	NA
Manganese	1.1E+00	8.6E-07	3.6E-03	1.5E-06	1.2E-06	5.07E-06	2.11E-02	7.76E-06	2.1E-02	NA	NA	NA	NA	NA
Mercury	4.6E-03	3.5E-09	1.7E-05	3.3E-08	2.8E-09	8.57E-11	4.29E-07	3.57E-08	4.6E-07	NA	NA	NA	NA	NA
Molybdenum	3.0E-02	2.2E-08	1.6E-04	2.0E-05	1.7E-05	2.22E-08	1.57E-04	3.68E-05	1.9E-04	NA	NA	NA	NA	NA
Nickel	2.3E-01	1.8E-07	7.4E-04	4.3E-06	3.3E-06	1.51E-05	6.29E-02	2.27E-05	6.3E-02	NA	NA	3.0E-11	3.6E-08	3.6E-08
Selenium	3.8E-02	2.9E-08	1.2E-04	1.3E-06	1.1E-07	4.25E-10	1.77E-06	1.45E-06	3.2E-06	NA	NA	NA	NA	NA
Strontium	1.3E+01	9.8E-06	4.1E-02	4.3E-06	3.7E-06	1.14E-09	4.74E-06	8.03E-06	1.3E-05	NA	NA	NA	NA	NA
Tin	1.4E-02	1.0E-08	2.1E-04	1.4E-09	1.2E-09	3.59E-13	7.22E-09	2.54E-09	9.8E-09	NA	NA	NA	NA	NA
Uranium	2.1E-02	1.6E-08	6.5E-05	6.9E-06	5.9E-06	1.16E-07	4.83E-04	1.29E-05	5.0E-04	NA	NA	NA	NA	NA
Vanadium	6.3E-01	4.8E-07	1.1E-02	8.5E-06	7.3E-06	1.43E-06	3.11E-02	1.72E-05	3.1E-02	NA	NA	NA	NA	NA
Zinc	7.9E-01	6.0E-07	3.5E-03	2.7E-07	2.3E-07	6.99E-11	4.00E-07	4.94E-07	8.9E-07	NA	NA	NA	NA	NA
Aluminum	1.3E+02	1.0E-04	4.2E-01	8.9E-05	7.6E-05	2.33E-08	9.81E-05	1.65E-04	2.6E-04	NA	NA	NA	NA	NA
Boron	1.0E+00	7.8E-07	3.2E-03	1.2E-05	1.0E-06	7.66E-10	3.19E-06	1.27E-05	1.6E-05	NA	NA	NA	NA	NA
Iron	1.5E+02	1.1E-04	4.7E-01	3.7E-05	3.2E-05	9.74E-09	4.09E-05	6.88E-05	1.1E-04	NA	NA	NA	NA	NA
Titanium	9.2E+00	7.0E-06	2.9E-02	6.2E-07	5.3E-07	1.62E-10	6.75E-07	1.14E-06	1.8E-06	NA	NA	NA	NA	NA
Others														
Hexachlorobenzene	1.5E-08	1.1E-14	2.0E-08	1.1E-11	9.4E-12	2.90E-15	5.12E-09	2.05E-11	5.1E-09	2.1E-15	1.8E-15	6.7E-19	3.4E-13	3.4E-13
PCBs	5.5E-07	4.2E-13	2.5E-07	4.8E-05	4.1E-05	1.26E-08	7.52E-03	8.90E-05	7.6E-03	NA	NA	NA	NA	NA
Sulphate	4.7E-01	3.6E-07	2.1E-01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dust Pallatives														
Epichlorohydrin	3.6E-10	2.8E-16	6.0E-05	1.2E-14	1.0E-13	8.16E-17	1.78E-05	1.16E-13	1.8E-05	3.2E-19	2.7E-18	4.3E-23	2.7E-12	2.7E-12

HQ = Hazard Quotient

ILCR = Incremental Lifetime Cancer Risk

NA = not applicable, not a carcinogen, no COPC identified for the media/pathway, or suitable TRV not identified, see report text for details

Bold HQ > 0.2 ILCR >1E-05

[1] maximum outdoor air concentration assumed equal to the analytical detection limit

TABLE III-7C: Cumulative (Background+Project) Scenario Risk Estimates for an Industrial Receptor, Adult
(Based on Maximum Multi-Media Concentrations)

Scenario: Cumulative

	BASELINE HQ Air Inhalation	BASELINE HQ Soil	BASELINE HQ All Routes	PROJECT HQ Air Inhalation	PROJECT HQ Soil	PROJECT HQ All Routes	CUMULATIVE HQ Air Inhalation	CUMULATIVE HQ Soil/Vegetation	CUMULATIVE HQ All Routes
Polycyclic Aromatic Hydrocarbons									
Carcinogenic PAHs									
Benzo[a]anthracene	1.7E-06	4.8E-06	6.5E-06	9.5E-06	2.1E-08	9.5E-06	1.1E-05	4.8E-06	1.6E-05
Benzo[a]pyrene	8.6E-07	5.6E-06	6.5E-06	1.1E-07	3.9E-08	1.5E-07	9.7E-07	5.7E-06	6.6E-06
Benzo[b]fluoranthene	1.5E-06	8.5E-06	1.0E-05	3.8E-07	8.0E-09	3.8E-07	1.9E-06	8.5E-06	1.0E-05
Benzo[g,h,i]perylene	NA	3.5E-06	3.5E-06	3.4E-08	1.3E-08	4.6E-08	NC	3.5E-06	3.5E-06
Benzo[k]fluoranthene	6.5E-07	3.4E-06	4.0E-06	8.3E-08	3.3E-08	1.2E-07	7.3E-07	3.4E-06	4.1E-06
Chrysene	NA	5.6E-06	5.6E-06	1.6E-07	4.5E-08	2.0E-07	NC	5.7E-06	5.7E-06
Dibenzo[a,h]anthracene	NA	8.5E-07	8.5E-07	2.1E-08	9.8E-09	3.1E-08	NC	8.6E-07	8.6E-07
Fluoranthene	1.1E-05	9.1E-06	2.0E-05	5.5E-07	1.0E-08	5.6E-07	1.2E-05	9.1E-06	2.1E-05
Indeno[1,2,3-c,d]pyrene	4.1E-06	3.8E-06	7.9E-06	8.6E-08	3.2E-08	1.2E-07	4.2E-06	3.8E-06	8.0E-06
Phenanthrene	3.4E-05	7.3E-06	4.2E-05	4.8E-07	2.4E-10	4.9E-07	3.5E-05	7.3E-06	4.2E-05
Carcinogenic PAH Mixture	5.4E-05	5.3E-05	6.5E-05	1.1E-05	2.1E-07	1.1E-05	6.6E-05	5.3E-05	1.2E-04
Non-carcinogenic PAHs									
Acenaphthene	2.4E-06	1.4E-07	2.5E-06	9.1E-08	9.1E-12	9.1E-08	2.5E-06	1.4E-07	2.6E-06
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	3.4E-07	1.1E-07	4.6E-07	9.3E-07	1.2E-11	9.3E-07	1.3E-06	1.1E-07	1.4E-06
Fluorene	8.2E-06	4.2E-07	8.6E-06	1.4E-07	1.9E-11	1.4E-07	8.4E-06	4.2E-07	8.8E-06
Fluoranthene	1.1E-05	9.1E-06	2.0E-05	5.5E-07	1.0E-08	5.6E-07	1.2E-05	9.1E-06	2.1E-05
Naphthalene	4.1E-03	4.2E-07	4.1E-03	1.9E-05	4.1E-13	1.9E-05	4.1E-03	4.2E-07	4.1E-03
2-Methylnaphthalene	NA	2.1E-06	2.1E-06	2.1E-07	3.1E-12	2.1E-07	NC	2.1E-06	2.1E-06
Pyrene	1.1E-05	9.9E-06	2.0E-05	9.4E-07	1.8E-08	9.6E-07	1.1E-05	9.9E-06	2.1E-05
Non-carcinogenic PAH Mixture	4.2E-03	2.2E-05	4.2E-03	2.2E-05	2.8E-08	2.2E-05	4.2E-03	2.2E-05	4.2E-03
Metals and Metalloids									
Antimony	NA	5.9E-05	5.9E-05	7.1E-06	8.1E-07	7.9E-06	NC	6.0E-05	6.7E-05
Arsenic	1.3E-04	4.7E-03	4.9E-03	7.7E-05	6.5E-05	1.4E-04	2.1E-04	4.8E-03	5.0E-03
Barium	9.9E-04	1.3E-04	1.1E-03	1.9E-02	4.3E-05	1.9E-02	2.0E-02	1.7E-04	2.0E-02
Beryllium	1.2E-05	4.4E-05	5.6E-05	2.3E-03	2.5E-06	2.3E-03	2.3E-03	4.7E-05	2.3E-03
Cadmium	4.7E-03	5.8E-05	4.7E-03	4.0E-03	1.9E-06	4.0E-03	8.7E-03	6.0E-05	8.7E-03
Chromium(III)	3.5E-05	7.0E-06	4.2E-05	3.4E-05	1.7E-09	3.4E-05	6.9E-05	7.0E-06	7.6E-05
Chromium(VI)	1.7E-03	6.2E-05	1.8E-03	8.0E-05	7.3E-05	1.5E-04	1.8E-03	1.4E-04	1.9E-03
Cobalt	7.1E-05	2.7E-04	3.4E-04	8.5E-04	2.9E-06	8.5E-04	9.2E-04	2.7E-04	1.2E-03
Copper	9.3E-04	5.4E-05	9.9E-04	7.3E-04	1.8E-06	7.3E-04	1.7E-03	5.6E-05	1.7E-03
Lead	5.9E-03	2.7E-03	8.6E-03	9.6E-04	1.7E-05	9.8E-04	6.8E-03	2.7E-03	9.6E-03
Manganese	1.5E-02	2.3E-03	1.7E-02	2.1E-02	7.8E-06	2.1E-02	3.6E-02	2.3E-03	3.8E-02
Mercury	3.9E-07	3.5E-08	4.3E-07	4.3E-07	3.6E-08	4.6E-07	8.2E-07	7.1E-08	8.9E-07
Molybdenum	1.0E-04	3.6E-05	1.4E-04	1.6E-04	3.7E-05	1.9E-04	2.6E-04	7.3E-05	3.3E-04
Nickel	1.1E-01	1.9E-03	1.1E-01	6.3E-02	2.3E-05	6.3E-02	**1.7E-01**	1.9E-03	**1.7E-01**
Selenium	2.5E-06	1.1E-05	1.3E-05	1.8E-06	1.4E-06	3.2E-06	4.2E-06	1.2E-05	1.6E-05
Strontium	7.1E-08	3.9E-05	3.9E-05	4.7E-06	8.0E-06	1.3E-05	4.8E-06	4.7E-05	5.2E-05
Tin	1.3E-08	3.6E-07	3.7E-07	7.2E-09	2.5E-09	9.8E-09	2.0E-08	3.6E-07	3.8E-07
Uranium	NA	4.4E-04	4.4E-04	4.8E-04	1.3E-05	5.0E-04	NC	4.5E-04	9.3E-04
Vanadium	7.1E-03	1.1E-03	8.3E-03	3.1E-02	1.7E-05	3.1E-02	3.8E-02	1.1E-03	3.9E-02
Zinc	1.3E-06	4.8E-05	4.9E-05	4.0E-07	4.9E-07	8.9E-07	1.7E-06	4.9E-05	5.0E-05
Aluminum	3.2E-08	1.6E-02	1.6E-02	9.8E-05	1.6E-04	2.6E-04	9.8E-05	1.6E-02	1.6E-02
Boron	NA	NA	NA	3.2E-06	1.3E-05	1.6E-05	NC	NC	NC
Iron	4.4E-06	8.1E-03	8.1E-03	4.1E-05	6.9E-05	1.1E-04	4.5E-05	8.2E-03	8.2E-03
Titanium	NA	8.6E-05	8.6E-05	6.8E-07	1.1E-06	1.8E-06	NC	8.7E-05	8.8E-05
Others									
Hexachlorobenzene	NA	NA	NA	5.1E-09	2.0E-11	5.1E-09	NC	NC	NC
PCBs	NA	NA	NA	7.5E-03	8.9E-05	7.6E-03	NC	NC	NC
Sulphate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dust Pallatives									
Epichlorohydrin	NA	NA	NA	1.8E-05	1.2E-13	1.8E-05	NC	NC	NC

HQ = Hazard Quotient

NA = no COPC identified for the media/pathway, or suitable TRV not identified, see report text for details; NC = not calculated

Bold HQ > 0.2