May 16, 2018

Steve Gill, Brownfields and VCP Specialist
Idaho Department of Environmental Quality
Coeur d'Alene Regional Office
2110 Ironwood Parkway
Coeur d'Alene, ID 83814

Subject: BNSF Huetter to Riverstone ROW Risk Evaluation Results

Dear Mr. Gill:

Alta Science and Engineering, Inc. completed a human health risk evaluation for the area in Coeur d'Alene, Idaho referred to as the Burlington Northern Santa Fe Railway Right-of-way, Huetter to Riverstone section. This letter briefly summarizes the results of the risk evaluation.

Based on previous assessment activities conducted at the site, historical use has impacted surface soils (0-12 inches bgs) resulting in residual constituents of concern (COCs). By using the measured concentrations of the COCs observed in site soils, the human health risk evaluation (using the current USEPA model) indicates that the residual COCs do not pose an unacceptable risk to humans under the residential, non-residential worker, and construction worker scenarios. Measured arsenic concentrations at the site are considered similar to background levels and were not included in the risk evaluation.

In conclusion, the areas of the site that were sampled and evaluated for risk are considered suitable for future use.

If you have any questions or need further information, please do not hesitate to call.

Sincerely,

Susan M. Spalinger

Susan Spalinger
Principal Scientist

Letter Health Consultation

BNSF Railway Corridor Site: Soil Arsenic

Coeur d'Alene, Idaho

October 11, 2017

Prepared By:

Environmental Health Program
Bureau of Community and Environmental Health
Division of Public Health
Idaho Department of Health and Welfare
Under a Cooperative Agreement with the Agency for Toxic Substances and Disease Registry

IDAHO DEPARTMENT OF HEALTH & WELFARE
DIVISION OF PUBLIC HEALTH

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IDAHO DEPARTMENT OF
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October 11, 2017

Eric Traynor
Brownfields Program Manager
Waste Management and Remediation Division
State of Idaho Department of Environmental Quality
1410 North Hilton
Boise, Idaho 83706

Dear Mr. Traynor:

Per a request of the Idaho Department of Environmental Quality (DEQ), the Idaho Department of Health and Welfare, Division of Public Health, Bureau of Community and Environmental Health (BCEH) assessed possible health risks from exposure to arsenic in soils at the Burlington Northern Santa Fe (BNSF) railway corridor site in Coeur d'Alene, Idaho. The BCEH evaluates the public health risk of contaminated sites through a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). The results of the health risk assessment did not indicate any significant noncancerous or cancerous adverse health effects expected for potential residents at the site. Further description of the assessment and results are included below.

Background and Statement of Issues

The BNSF railway company corridor of right of way at the Riverstone to Huetter Site located in Coeur d'Alene, Idaho was historically used as a railway corridor where mining and industrial products were frequently transported. Because of transport of these materials, the site was identified as likely having heavy metal and polycyclic aromatic hydrocarbon (PAH) contamination in soils. The BNSF site is approximately 20−60 feet wide and 11,950 feet long, is surrounded by residential and commercial property, and is adjacent to the Spokane River. Presently, the site is vacant but is proposed to be redeveloped for residential use and/or public greenspace and a pedestrian trail with riverfront access.

Before redevelopment, DEQ requested TerraGraphics Environmental Engineering complete a site risk evaluation to determine potential human health risks associated with exposure to heavy metals and PAH compounds at the site. Results of the site risk assessment indicated that for a

residential exposure scenario soil arsenic concentrations exceeded the target risk level for acceptable lifetime cancer risk (10^{-5}) [1].

Based on the results of the TerraGraphics risk evaluation, BCEH was requested to conduct a health risk assessment for exposure to arsenic in soils and evaluate possible site-specific health effects. Results of this risk assessment can help determine if there is a likely health risk to populations that may occupy or use this site under future residential and use scenarios. Residents occupying the site would have the highest likely exposure compared to any recreational site users.

Soil Sampling and Results

The BNSF site was subdivided into seven separate decision units based on historical grade elevations. Surface soil sampling (0−12 inches below ground surface) and analysis were completed by TerraGraphics in 2016 for each decision unit [1]. Arsenic values in soil ranged from 13.1 to 25.6 milligrams per kilogram (mg/kg) with the highest concentration located in decision unit 1.1 (Table 1). The arsenic soil concentration values were compared to health effects based screening comparison values to determine potential for risk based on the highest likely exposure scenario. Arsenic concentrations in two decision units (1.1 and 1.2) were greater than the ATSDR Environmental Media Evaluation Guide (EMEG) comparison value of 17 mg/kg in soil based on chronic exposure to arsenic for a child (Table 1). The EMEG comparison value screens for potential chronic non-cancerous health effects. However, all decision units exceeded the Cancer Risk Evaluation Guide (CREG) value. Exceedance of comparison values does not indicate adverse health effects, but does warrant need for further investigation to determine risks.

According to the TerraGraphics risk assessment using the U.S. Geological Survey soil database, mean soil arsenic concentrations for Kootenai County are 7.88 mg/kg with a standard deviation of 2.42 mg/kg, and a maximum value of 21.0 mg/kg [1]. This indicates that arsenic concentrations measured at the BNSF site may not greatly exceed background concentrations. Although these soil sampling data are limited, exposure to soil at the BNSF site may not cause increased health risks considering background exposure levels to arsenic in the area.

Table 1: Arsenic soil concentrations within each decision unit at the BNSF site and health screening comparison values.

Decision Units	Soil Arsenic concentrations (mg/kg)	Comparison Values (mg/kg)
1.1	25.6	17[a] 0.25[b]
1.2	20.7	
1.3	13.1	
2.1	14.8	
2.2	15.7	
3.1	14.4	
3.2	15.4	

[a]ATSDR child's chronic Environmental Media Evaluation Guide (EMEG)
[b]ATSDR Cancer Risk Evaluation Guide (CREG)

Health Risk Assessment

Soil arsenic concentrations in several decision units exceeded the health effects screening values (EMEG and CREG). Based on these comparisons, BCEH evaluated chronic non-cancer risk and cancer risk using ATSDR's Public Health Assessment Tool (Appendix A) [2]. Risk was assessed based on ingestion of contaminated soils. Metals are poorly absorbed through the skin, and soil concentrations were not high enough to contribute significantly to dermal or inhalation risk when compared to the ingestion pathway [3]. Risk was evaluated using the maximum soil arsenic concentration (25.6 mg/kg) for both a central tendency exposure (CTE; an "average" ingestion rate) and the reasonable maximum exposure (RME; likely maximum ingestion rates). Seven age-based exposure groups (ranging from infant to adult) were assessed (Appendix B). A residential exposure scenario was chosen and the tool used default ATSDR exposure duration values and assumed daily exposure via soil for each exposure group (Appendix B) [3]. This scenario is the most conservative due to the length of potential exposure to arsenic in the soil and would be considered protective of recreational site users.

Non-cancer residential scenario

Children have the greatest potential exposure to arsenic from soils due to behaviors that can increase their likelihood of ingesting contaminated soils [4]. For all exposure groups, the expected chronic daily dose did not exceed ATSDR's Minimal Risk Level (MRL) of 0.0003 mg/kg-day, indicating that there is no reasonable risk of non-cancerous health effects (Table 2). The highest dose for children age 1 to <2 years (0.00027 mg/kg-day) was at the chronic MRL. Additionally, for children 1 to 6 years old who may consume large quantities of soil (up to 5,000 mg/day; pica scenario[1]), the highest acute dose was 0.0029 mg/kg-day, which is 1.7 times lower than the acute MRL of 0.005 mg/kg-day [4]. Therefore, there are no expected non-cancerous health effects for children or adults due to arsenic in soil.

Cancer risk residential scenario

Arsenic is classified as a "Group A" human carcinogen by the U.S. Environmental Protection Agency (EPA), meaning there is sufficient evidence to link arsenic exposure with cancerous health effects [5]. Because the concentration of arsenic in soils exceeded the ATSDR CREG comparison value of 0.25 mg/kg (Table 1), further assessment of effects of exposure to soils was completed [3]. Cumulative combined cancer risk for children from birth to age 21 was 4.1×10^{-5} using the reasonable maximum exposure scenario (Table 2). This indicates that for the highest expected exposure to arsenic, there may be 4 additional excess cancer cases per 100,000 children. For the central tendency exposure, cancer risk for children was 1.6×10^{-5}, indicating that at an average expected soil ingestion rate, less than 2 excess cancer cases are expected in 100,000 children. These excess cancer risk levels are considered a low increased risk of excess cancer and are within the EPA's acceptable excess cancer risk guidance levels of 10^{-4} to 10^{-6} (Table 2) [3]. For potential adult residents at the site (Exposure Duration = 33 years), cancer risk was 1.2×10^{-5}, which was a lower risk than for children and is also within the range of acceptable cancer risk (Table 2).

[1]ATSDR considers pica for children ages 1—6 years old who may consume 5,000 mg/day of soil 3 times a week [3].

Table 2: Results of ingestion dose calculations and cancer risk by age group for a residential exposure scenario.

Exposure Group (Age)	Chronic Dose (mg/kg-day)		Cancer Risk	
	CTE[a]	RME[b]	CTE[a]	RME[b]
6 weeks to < 1 year	0.00011	0.00019	1.6E-5	4.1E-5
1 to < 2 years	0.00013	0.00027		
2 to < 6 years	8.8E-5	0.00018		
6 to < 11 years	4.8E-5	9.7E-5		
11 to < 16 years	2.7E-5	5.4E-5		
16 to < 21 years	2.1E-5	4.3E-5		
Adult	9.6E-6	1.9E-5	2.2E-6	1.2E-5
Health Effects Guidelines	MRL[c] 0.0003 mg/kg-day		Acceptable cancer risk level[d] 10^{-4} to 10^{-6}	

[a]CTE: Central Tendency Exposure (Appendix B) [2,3]
[b]RME: Reasonable Maximum Exposure (Appendix B) [2,3]
[c]MRL: ATSDR Minimal Risk Level [4]
[d]EPA acceptable excess cancer risk levels [3]

Conclusions

Based on the potential exposure to arsenic in the soil for future child or adult residents at the BNSF site, there was no likely risk of chronic non-cancerous health effects. Additional risks of excess cancer cases for children were within EPA acceptable cancer risk levels. Notably, as described above, arsenic concentrations measured at the BNSF site may not greatly exceed background concentrations for the county. Therefore, BCEH does not expect exposure to arsenic in soil to increase risk of cancer beyond typical population-level cancer incidence rates.

This assessment used a conservative evaluation approach by comparing the highest measured arsenic concentration and assessing risks using reasonable maximum exposures. Arsenic concentrations in other decision units were lower than the maximum value, indicating that overall risk is also likely to be less. If areas of the site will primarily be used for recreation, it is unlikely that chronic exposure for the residential scenario would be a concern. Therefore, health risks would also be reduced. Additionally, if portions of the site are planned to be paved and likely redeveloped with vegetation, this would also limit direct exposure to soils.

Recommendations

- BCEH recommends following the guidance in the TerraGraphics risk evaluation regarding exposure of workers at this site during redevelopment activities. Wearing appropriate personal protective equipment and following best management practices can reduce exposure to arsenic from soils and dust.
- Though significant health risks are not expected, if portions of the BNSF site are redeveloped as private residences, educating homeowners on possible health effects of

arsenic in the soil and appropriate hygiene practices (e.g., hand washing after outdoor activities) could further reduce potential health risks, especially for children.

Please contact me if you have any questions,

Sincerely,

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References

[1] TerraGraphics. 2017. Risk Evaluation of the Burlington Northern Santa Fe Railway Company Corridor Right of Way Riverstone to Huetter Site in Coeur d'Alene, Idaho. Prepared for Idaho Department of Environmental Quality.

[2] Agency for Toxic Substances and Disease Registry (ATSDR). 2017. Public Health Assessment Tool. Available online at: https://csams.cdc.gov/PHAST/Home/Index.

[3] Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Public Health Assessment Guidance Manual.

[4] Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Arsenic Toxicological Profile. Available on line at: https://www.atsdr.cdc.gov/toxprofiles/tp2.pdf

[5] US Environmental Protection Agency Integrated Risk Information System and Chemical-Specific Factors Data Base. Arsenic. Available on line at: https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0278_summary.pdf

[6] US Environmental Protection Agency. 2012. Recommendations for Default Value for Relative Bioavailability of Arsenic in Soil. Available online at: https://semspub.epa.gov/work/HQ/175338.pdf

Appendix A

Equations

A1. Non-cancer Dose Equation for Ingestion:

$$D = \frac{(C \times IR \times BF \times CF \times EF)}{BW}$$

Where:

D = Dose in milligram per kilogram of body weight per day (mg/kg-day)
C = Contaminant concentration in milligrams per kilogram (mg/kg)
IR[1]= Ingestion rate in mg/kg
BF[2] = Bioavailability Factor
CF = Conversion Factor $1x10^{-6}$
EF[3]= Exposure Factor
BW[4] = Body Weight in kilograms

Sources:
[1]ATSDR default age-specific exposure ingestion rates (Appendix B). [2]
[2]BF: US EPA 60% bioavailability default value [6]
[3]EF: Chronic residential exposure default (365 days/365 days) = 1 [2]
[4]BW: ATSDR default age-specific values (Appendix B) [2,3]

A2. Cancer Risk Equation for Ingestion:

$$Cancer\ Risk = [D \times CSF \times \frac{Exposure\ years}{78\ years}]$$

D = Dose mg/kg-day
CSF = Cancer Slope Factor 1.5 mg/kg-day from EPA IRIS [5]
Exposure years = Default exposure duration for each age group (Appendix B)

Appendix B

Table B1: Exposure calculation inputs for ATSDR default residential exposure scenario [2,3].

Exposure Group	Body Weight (kg)	CTE[a]		RME[b]	
		Ingestion Rate (mg/day)	Exposure Duration (yrs)	Ingestion Rate (mg/day)	Exposure Duration (yrs)
6 weeks to < 1 year	8.2	60	0.88	100	0.88
1 to < 2 years	11.4	100	1	200	1
2 to < 6 years	17.4	100	4	200	4
6 to < 11 years	31.8	100	5	200	5
11 to < 16 years	56.8	100	1	200	5
16 to < 21 years	71.6	100	0	200	5
Adult	80	50	12	100	33

[a]CTE: Central Tendency Exposure [2,3]
[b]RME: Reasonable Maximum Exposure [2,3]

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M E M O R A N D U M

To: Eric Traynor, IDEQ, Boise
Steve Gill, IDEQ, Coeur d'Alene

From: Jon Munkers, Alta, Boise
Rachel Gibeault, Alta, Boise

Date: June 13, 2018

Job Code: Contract No. K157, Task Order No. 27, Alta Job No. 18035

Subject: Coeur d'Alene, Idaho, BNSF Huetter to Riverstone ROW DU1 and DU2 Risk Evaluation Update – Final

Section 1 Introduction

1.1 Background

The memorandum entitled *Coeur d'Alene, Idaho, BNSF Huetter to Riverstone ROW DU3 Risk Evaluation Update* (Alta 2018) provides a brief history of the Burlington Northern Santa Fe (BNSF) Railway Company corridor in Coeur d'Alene, Idaho (the Site), describes key documents pertaining to the sampling activities that occurred at the Site, and summarizes results of the Site Risk Evaluation (RE) conducted in 2017 (Alta 2017). The lifetime cancer and non-cancer risks estimated in the 2017 RE are summarized in Attachment A, Table A1. Tables A2 and A3 display the Site soil data. An RE Update was completed earlier this year for Decision Unit 3 (DU3) using new information about arsenic concentrations and toxicological information for benzo(a)pyrene (Alta 2018).

1.2 Purpose

The purpose of this memorandum is to update the 2017 RE for the other DUs at the Site; DU1 and DU2. Proposed redevelopment in these DUs includes public access with potential residential and commercial use. This update will assist the Idaho Department of Environmental Quality (IDEQ) and stakeholders in redevelopment decisions.

Arsenic was included as a constituent of concern (COC) in the 2017 RE and was a main risk driver (Alta 2017); however, the measured arsenic concentrations at the Site are considered to be similar to background levels[1]. Additionally, the other main risk driver, benzo(a)pyrene, has

[1] A representative of the Idaho Department of Health and Welfare (IDHW) evaluated arsenic concentrations measured at the Site relative to background concentrations. The IDHW representative concluded that Site arsenic concentrations are similar to background concentrations for Kootenai County (IDHW 2017).

new toxicological information that could change the estimated lifetime cancer risk[2]. This RE Update removes arsenic as a COC and uses the USEPA Regional Screening Level (RSL) calculator that uses the current benzo(a)pyrene toxicity data to evaluate cancer and non-cancer risk in DU1 and DU2.

Section 2 Exposure Assessment

Five exposure areas are evaluated in this RE Update: DUs 1.1, 1.2, 1.3, 2.1, and 2.2 (described in detail in Alta [2017]).

This RE Update uses the following same elements as the 2017 RE:

- site conceptual model,
- receptors (non-residential/composite worker, construction worker, and future resident),
- routes of exposure (direct contact with surficial soils [0-12 inches, or 0.30 meters below ground surface [bgs] via ingestion, dermal, and inhalation pathways),
- COCs (except arsenic, explained in Section 1; presented in Attachment A, Table A4)
- exposure point concentrations (EPCs; Attachment A, Table A4), and
- type of construction activities[3].

The default exposure factor values in the USEPA RSL calculator (USEPA 2017b) are used in this RE Update and are shown in Attachment B[4]. Site-specific exposure area information was used, including acreage and percent vegetative cover. Boise, Idaho, was selected as the Climate Zone for the particulate emission factor equations. Other site-specific inputs are highlighted in orange in Attachment B.

[2] In June 2017, U.S. Environmental Protection Agency (USEPA) updated its RSL tables to reflect changes in chemical-specific toxicity data on benzo(a)pyrene (USEPA 2017a). This update recommends a reference dose (RfD) of $3x10^{-04}$ milligrams per kilogram per day (mg/kg/day), an inhalation reference concentration (RfC) of $2x10^{-06}$ milligrams per cubic meter (mg/m^3), and a slope factor of 1 per mg/kg/day. Because the Petro REM software has not been updated with these values, IDEQ approved the use of the USEPA RSL software to estimate human health risk in this DU1 and DU2 RE Update.

[3] Evaluation of the construction scenario is challenging based on the considerable uncertainty surrounding the details of future construction activities (USEPA 2002). The 2017 RE and this RE Update assume that: 1) The entirety of DUs 1 and 2 will be graded once to level the unpaved ROW; 2) after the ROWs are level, dump trucks will lay down a 6-inch deep road bed cover equal to the length and width of the exposure area (0.1524 meters) in preparation for an asphalt cover to complete the planned public pedestrian and/or bike trail; and 3) the road bed and asphalt cover placed on the ROW will cap the contaminated soil.

[4] Default exposure factor values for the USEPA RSL calculator differ from those for the Petro REM, which was used to estimate risk from PAHs in the 2017 RE (Alta 2017).

Section 3 Risk Evaluation

The following subsections summarize the RE Update results. Attachment B contains the USEPA RSL Calculator input and output values.

3.1 Comparison of Estimated Risk with Target Risk Criteria for DU1 and DU2 of the Site

An RE involves estimating the magnitude of the potential adverse health effects of Site COCs, and identifying the COCs and routes of exposure that contribute the most risk to the defined receptor population. Table 1 presents the estimated cancer and non-cancer risks for DU1.1, DU1.2, DU1.3, DU2.1, and DU2.2.

3.1.1 Carcinogenic Health Effects

The potential for carcinogenic effects is evaluated by estimating the probability of developing cancer over a lifetime based on exposure assumptions and chemical-specific toxicity criteria. The risks resulting from exposure to multiple carcinogens are assumed to be additive.

In accordance with IDAPA 58.01.24, a target Site risk of 10^{-5} was used to determine acceptable cancer risk at the Site. As shown in Table 1, in all assessed DUs, total lifetime cancer risks for the future residential, non-residential/composite worker, and the construction worker scenarios are all below the target cancer risk of 10^{-5} and are acceptable.

3.1.2 Non-Cancer Health Effects

The reference dose is a level of intake below which it is unlikely that sensitive individuals will experience adverse health effects during a lifetime. If the Hazard Quotient (HQ) exceeds 1, there may be cause for concern regarding non-cancer effects (USEPA 1989). Risk assessment guidelines consider the additive effects associated with simultaneous exposure to several chemicals by specifying that all HQs be summed across exposure routes and chemicals to estimate a total Hazard Index (HI; USEPA 1989).

In all the DUs, the HIs for the future residential receptor, non-residential/composite worker, and the construction worker scenarios were below 1 and are acceptable (Table 1).

Table 1. 2018 DU1 and DU2 Risk Evaluation Summary of Lifetime Cancer and Non-Cancer Risks at BNSF Huetter to Riverstone ROW

DU1.1	Residential			Non-Residential		Construction Worker[a]	
Route of Exposure - Direct Contact Soil	Cancer Risk[b]	Hazard Index		Cancer Risk[b]	Hazard Index	Cancer Risk[b]	Hazard Index
		Child	Adult				
Total Risk or Hazard Index for Receptor	-	2E-02	8E-03	-	2E-03	-	9E-02
DU1.2	**Residential**			**Non-Residential**		**Construction Worker[a]**	
Route of Exposure - Direct Contact Soil	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child	Adult				
Total Risk or Hazard Index for Receptor	2E-06	6E-02	5E-02	8E-08	1E-02	3E-08	6E-01
DU1.3	**Residential**			**Non-Residential**		**Construction Worker[a]**	
Route of Exposure - Direct Contact Soil	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child	Adult				
Total Risk or Hazard Index for Receptor	5E-06	4E-02	6E-03	3E-07	3E-03	1E-07	4E-02
DU2.1	**Residential**			**Non-Residential**		**Construction Worker[a]**	
Route of Exposure - Direct Contact Soil	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child	Adult				
Total Risk or Hazard Index for Receptor	6E-06	5E-02	1E-02	3E-07	5E-03	1E-07	1E-01
DU2.2	**Residential**			**Non-Residential**		**Construction Worker[a]**	
Route of Exposure - Direct Contact Soil	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child	Adult				
Total Risk or Hazard Index for Receptor	7E-06	7E-02	1E-02	4E-07	7E-03	1E-07	1E-01

Notes:

a The Construction Worker scenario in the USEPA RSL Calculator (USEPA 2017b) is a combination of "Unpaved Road Traffic" and "Other Construction Activities."

b Toxicity data is not available for the following COCs: mercury, selenium, and total chromium. Therefore, the cancer risk for DU1.1 could not be calculated.

Section 4 Conclusions and Recommendations

Based on previous assessment activities conducted at the Site, historical use has impacted surface soils (0-12 inches bgs) resulting in residual COCs. Estimated risks in DU1.1, DU1.2, DU1.3, DU2.1, and DU2.2 are considered suitable for the future residential use and for non-residential/composite worker use based on this RE Update. In addition, construction workers (performing grading activities) do not exceed the cancer and non-cancer risk of 10^{-5} and 1, respectively, due to residual COCs at the Site.

Alta has the following recommendation for the Coeur d'Alene BNSF Huetter to Riverstone ROW in DU1 and DU2 based on the information available to-date:

- Use caution and best management practices during construction activities to prevent the ingestion of soil and the inhalation of dust if construction activities other than grading are to occur. Alternatively, if site-specific construction activities are known, consider further risk evaluation for those specific construction worker scenarios using the current USEPA RSL calculator with updated information.

Section 5 Clean and Green Reporting

In accordance with the Green Remediation Objectives outlined in USEPA Region 10 Clean and Green Policy, Alta implemented several sustainable technologies and practices to minimize the overall environmental footprint on this project including the following:

- Project correspondence, plans, and reports were conveyed via electronic transmittal to reduce the use of paper products.

Section 6 References

Alta Science and Engineering, Inc. (Alta), 2017. Risk Evaluation of the Burlington Northern Santa Fe Railway Company Corridor Right of Way Riverstone to Huetter Site in Coeur d'Alene, Idaho. Prepared for Idaho Department of Environmental Quality: Waste and Remediation Division, Brownfields Program. Revision #2, November 17, 2017.

Alta, 2018. Coeur d'Alene, Idaho, BNSF Huetter to Riverstone ROW DU3 Risk Evaluation Update. Memorandum prepared for E. Traynor (IDEQ, Boise) and S. Gill (IDEQ, Coeur d'Alene) by J. Munkers and R. Gibeault. Final April 19, 2018.

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USEPA, 2017b. Regional Screening Level Calculator. Accessed in February 2017 at https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search.

Attachment A

Table A1. 2017 Risk Evaulation Overall Summary of Lifetime Cancer and Non-cancer Risks at BNSF Huetter to Riverstone ROW

DU1.1	Residential			Non-Residential		Construction Worker[b]	
Route of Exposure - Direct Contact Soil	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child[a]	Adult				
USEPA RSL Calculator	-	1.71E-02	7.86E-03	-	2.33E-03	2.16E-06	4.79E-02
IDEQ Petro REM (v 1.1.3)	-	-	-	-	-	-	-
Total Risk or Hazard Index for Receptor	**-**	**2E-02**	**8E-03**	**-**	**2E-03**	**2E-06**	**5E-02**
DU1.2	**Residential**			**Non-Residential**		**Construction Worker[b]**	
Route of Exposure - Direct Contact Soil	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child[a]	Adult				
USEPA RSL Calculator	-	5.64E-02	4.71E-02	-	1.17E-02	-	2.95E-01
IDEQ Petro REM (v 1.1.3)	8.58E-06	2.10E-04		5.61E-07	2.04E-05	9.30E-09	8.40E-06
Total Risk or Hazard Index for Receptor	**9E-06**	**6E-02**	**5E-02**	**6E-07**	**1E-02**	**9E-09**	**3E-01**
DU1.3	**Residential**			**Non-Residential**		**Construction Worker[b]**	
Route of Exposure - Direct Contact Soil	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child[a]	Adult				
USEPA RSL Calculator	-	1.20E-02	2.77E-03	-	1.12E-03	-	1.62E-02
IDEQ Petro REM (v 1.1.3)	3.08E-05	8.55E-04		2.02E-06	8.32E-05	3.34E-08	3.42E-05
Total Risk or Hazard Index for Receptor	**3E-05**	**1E-02**	**3E-03**	**2E-06**	**1E-03**	**3E-08**	**2E-02**
DU2.1	**Residential**			**Non-Residential**		**Construction Worker[b]**	
Route of Exposure - Direct Contact Soil	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child[a]	Adult				
USEPA RSL Calculator	-	1.89E-02	9.68E-03	-	2.76E-03	-	0.00E+00
IDEQ Petro REM (v 1.1.3)	3.40E-05	9.11E-04		2.22E-06	8.86E-05	3.68E-08	3.65E-05
Total Risk or Hazard Index for Receptor	**3E-05**	**2E-02**	**1E-02**	**2E-06**	**3E-03**	**4E-08**	**4E-05**
DU2.2	**Residential**			**Non-Residential**		**Construction Worker[b]**	
Route of Exposure - Direct Contact Soil	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child[a]	Adult				
USEPA RSL Calculator	1.39E-10	3.81E-02	9.89E-03	3.19E-11	3.81E-03	0.00E+00	0.00E+00
IDEQ Petro REM (v 1.1.3)	3.95E-05	7.84E-04		2.59E-06	7.63E-05	4.29E-08	3.14E-05
Total Risk or Hazard Index for Receptor	**4E-05**	**4E-02**	**1E-02**	**3E-06**	**4E-03**	**4E-08**	**3E-05**
DU3.1	**Residential**			**Non-Residential**		**Construction Worker[b]**	
Route of Exposure - Direct Contact Soil	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child[a]	Adult				
USEPA RSL Calculator	-	4.02E-02	1.37E-02	-	4.56E-03	-	0.00E+00
IDEQ Petro REM (v 1.1.3)	7.84E-06	1.61E-04		5.13E-07	1.57E-05	8.50E-09	6.45E-06
Total Risk or Hazard Index for Receptor	**8E-06**	**4E-02**	**1E-02**	**5E-07**	**5E-03**	**9E-09**	**6E-06**
DU3.2	**Residential**			**Non-Residential**		**Construction Worker[b]**	
Route of Exposure - Direct Contact Soil	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child[a]	Adult				
USEPA RSL Calculator	-	2.01E-02	1.09E-02	-	3.04E-03	-	0.00E+00
IDEQ Petro REM (v 1.1.3)	1.57E-05	4.92E-04		1.03E-06	1.62E-04	1.72E-08	1.91E-04
Total Risk or Hazard Index for Receptor	**2E-05**	**2E-02**	**1E-02**	**1E-06**	**3E-03**	**2E-08**	**2E-04**

Notes:

a Noncarcinogenic chemical exposure is conservatively assessed using only the child receptor under Petro REM (IDEQ 2012).

b The Construction Worker scenario in the USEPA RSL Calculator (USEPA 2016a) is a combination of "Unpaved Road Traffic" and "Other Construction Activities."

Grey shaded cells denote an exceedence for a receptor.

Table A2. Metals Data Summary for Coeur d'Alene BNSF Huetter to Riverstone ROW

Sample ID	Sample Depth (in. bgs)	Date	Unit	Arsenic	Barium	Cadmium	Total Chromium	Lead	Selenium	Silver	Mercury
DU1.1	12	10/7/2016	mg/kg	25.6	171	0.410	**24.6**	63.9	**<4.0**	<0.50	**0.268**
DU1.2*	12	10/7/2016	mg/kg	20.7	187	0.340	**26.9**	59.0	**<4.0**	<0.50	**1.54†**
DU1.3A	12	10/4/2016	mg/kg	13.1	224	0.370	**18.8**	24.2	**<4.0**	<0.50	**0.035**
DU1.3B	12	10/4/2016	mg/kg	12.2	140	0.510	**21.4**	31.6	**<4.0**	<0.50	**<0.033**
DU1.3C	12	10/5/2016	mg/kg	11.6	173	0.520	**18.4**	34.0	**<4.0**	<0.50	**0.058**
DU2.1A	12	10/4/2016	mg/kg	14.8	227	0.420	**20.9**	35.6	**<4.0**	<0.50	**0.285**
DU2.1B	12	10/3/2016	mg/kg	10.3	174	0.400	**21.4**	42.2	**<4.0**	<0.50	**0.160**
DU2.1C	12	10/4/2016	mg/kg	10.7	218	0.380	**20.7**	48.2	**<4.0**	<0.50	**0.115**
DU2.2A	12	10/3/2016	mg/kg	15.7	173	0.440	**22.5**	35.6	**<4.0**	<0.50	**0.132**
DU2.2B*	12	10/3/2016	mg/kg	14.5	190	0.400	**20.5**	36.4	**<4.0**	<0.50	**0.193**
DU2.2B	~ 24–36	8/28/2017	mg/kg	14.4	NS	NS	NS	NS	NS	NS	NS
DU2.2C	12	10/3/2016	mg/kg	13.7	187	0.750	**23.7**	35.5	**<4.0**	<0.50	**0.038**
DU3.1A*	12	10/7/2016	mg/kg	14.4	297	0.610	**19.6**	60.5	**<4.0**	<0.50	**0.272†**
DU3.1B	12	10/6/2016	mg/kg	13.4	201	<0.200	**19.0**	23.6	**<4.0**	<0.50	**0.310**
DU3.1C	12	10/5/2016	mg/kg	12.3	147	0.400	**16.6**	37.1	**<4.0**	<0.50	**0.098**
DU3.2A	12	10/6/2016	mg/kg	15.4	209	0.490	**25.3**	49.4	**<4.0**	<0.50	**0.042**
DU3.2B	12	10/5/2016	mg/kg	12.5	209	0.420	**17.5**	40.4	**<4.0**	<0.50	**0.342**
DU3.2C	12	10/5/2016	mg/kg	11.7	99.3	0.250	**14.9**	18.6	**<4.0**	<0.50	**<0.0330**
USEPA SSL											
Risk-based protection of groundwater			mg/kg	0.002	155	0.693	-	-	0.519	0.799	0.0327
MCL-based protection of groundwater			mg/kg	0.292	82.4	0.376	180,000	13.5	0.260	-	0.104
USEPA RSL											
			mg/kg	0.68	15,000	71.0	0.30**	400	390	390	23.0
USEPA RSL Critical Receptor				*Residential Direct Contact; Carcinogenic*	*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Carcinogenic*	*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Ingestion-Child*	*Residential Direct Contact; Ingestion-Child*	*Residential Direct Contact; Ingestion-Child*
Kootenai County ID Background (USGS 2017)											
No. of samples = 12											
Minimum			mg/kg	1.67	-	-	-	16.2	0.101	-	0.011
Maximum			mg/kg	21.0	-	-	-	61.1	0.738	-	0.115
Standard Deviation			mg/kg	2.42	-	-	-	7.93	0.087	-	0.018
Mean			mg/kg	7.88	-	-	-	30.7	0.208	-	0.053

Notes:

Analytical tests for RCRA 8 Metals used USEPA Method 6010C. Mercury by USEPA Method 7471B.

< denotes that the result was not detected above reporting limit.

USEPA RSL = U.S. Environmental Protection Agency Regional Screening Level; Resident Soil Table (USEPA 2016).

USEPA SSL = U.S. Environmental Protection Agency Soil Screening Level; Protection of Groundwater Table (USEPA 2016).

U.S. Geological Survey online National Geochemical Survey by County database (USGS 2017).

mg/kg = milligram per kilogram

NS = not sampled

† = The maximum concentration of the replicate ISM [Incremental Sampling Methodology] results is presented.

* = Sample is a duplicate. The highest concentration is shown.

** = RSL (USEPA 2016) is for chromium(VI), as there is no RSL for total chromium. Chromium(VI) yields the most conservative screening level for carcinogenic risk in resident soil.

Table A3. PAH Data Summary for Coeur d'Alene BNSF Huetter to Riverstone ROW

Sample ID	Sample Depth (in. bgs)	Date	Unit	Anthracene	Acenaphthene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Chrysene	Fluoranthene	Fluorene	Naphthalene	Pyrene
DU1.1	12	10/7/2016	mg/kg	<0.120	<0.120	<0.120	<0.120	<0.120	<0.120	<0.120	<0.120	<0.120	<0.400	<0.120
DU1.2*	12	10/5-6/2016	mg/kg	0.0211	<0.012	**0.135**	**0.128**	**0.217**	0.0687	0.192	0.254	<0.0120	<0.0400	0.275
DU1.3A	12	10/4/2016	mg/kg	0.0466	<0.0060	0.0302	**0.0317**	0.0673	0.0205	0.0461	0.0584	<0.0060	<0.0200	0.0558
DU1.3B	12	10/4/2016	mg/kg	0.361	<0.030	**0.456**	**0.440**	**1.00**	0.317	0.839	1.08	<0.0300	<0.100	1.06
DU1.3C	12	10/5/2016	mg/kg	<0.012	<0.012	<0.0120	<0.0120	<0.0120	<0.0120	<0.0120	<0.0120	<0.0120	<0.0400	<0.0120
DU2.1A	12	10/4/2016	mg/kg	0.0575	<0.0120	0.0382	0.0452	0.132	0.035	0.0547	0.0911	<0.0120	<0.0400	0.0834
DU2.1B	12	10/3/2016	mg/kg	0.340	<0.030	**0.468**	**0.505**	**0.942**	0.282	0.815	1.17	<0.0300	<0.100	1.12
DU2.1C	12	10/4/2016	mg/kg	0.0571	<0.030	0.0673	0.066	0.150	0.0436	0.133	0.135	<0.0300	<0.100	0.117
DU2.2A	12	10/3/2016	mg/kg	<0.060	<0.060	<0.0600	<0.0600	<0.0600	<0.0600	<0.0600	<0.0600	<0.0600	<0.200	<0.0600
DU2.2B*	12	10/3/2016	mg/kg	0.349	<0.060	**0.520**	0.606	**0.942**	0.288	0.679	0.938	<0.0600	<0.200	1.01
DU2.2B*	~ 24–36	8/28/2017	mg/kg	0.130	0.0778	**0.052**	0.0309	**0.0573**	0.0211	0.0656	0.351	0.0618	0.0498	0.237
DU2.2C	12	10/3/2016	mg/kg	<0.030	<0.030	<0.0300	<0.0300	<0.0300	<0.0300	<0.0300	0.0343	<0.0300	<0.100	0.0367
DU3.1A*	12	10/7/2016	mg/kg	0.0125	<0.030	0.0164	0.0195	0.0417	<0.0300	0.043	0.0439	<0.0300	<0.100	0.0372
DU3.1B	12	10/6/2016	mg/kg	0.0571	<0.0060	0.0856	**0.121**	0.196	0.0634	0.125	0.142	<0.00600	<0.0200	0.175
DU3.1C	12	10/4/2016	mg/kg	<0.060	<0.060	0.0849	**0.0993**	0.126	<0.0600	0.0975	0.138	<0.0600	<0.200	0.247
DU3.2A	12	10/6/2016	mg/kg	0.0348	0.015	0.0249	0.0263	0.0528	0.0130	0.0481	0.0940	<0.0120	0.0693	0.0711
DU3.2B	12	10/5/2016	mg/kg	0.138	<0.060	**0.224**	**0.234**	**0.416**	0.117	0.301	0.373	<0.0600	<0.200	0.402
DU3.2C	12	10/5/2016	mg/kg	<0.060	<0.060	<0.0600	**0.160**	0.0782	<0.0600	<0.0600	<0.0600	<0.0600	<0.200	0.128
IDEQ SLC														
SLC Critical Pathway			mg/kg	3,200 *GWP*	200 *GWP*	0.0900 *GWP*	0.0200 *Direct Contact*	0.200 *Direct Contact*	1.90 *Direct Contact*	9.50 *GWP*	1,400 *GWP*	240 *GWP*	0.120 *Vapor Intrusion*	1,000 *GWP*
USEPA SSL														
Risk-based protection of groundwater			mg/kg	58.1	5.49	0.00425	0.00403	0.0411	0.403	1.24	89.1	5.45	0.000543	13.2
MCL-based protection of groundwater			mg/kg	-	-	-	0.235	-	-	-	-	-	-	-
USEPA RSL														
USEPA RSL Direct Contact Critical Receptor			mg/kg	18,000 *Non-Carcinogenic Child*	3,600 *Non-Carcinogenic Child*	0.160 *Carcinogenic*	0.0160 *Carcinogenic*	0.160 *Carcinogenic*	1.60 *Carcinogenic*	16.0 *Carcinogenic*	2,400 *Non-Carcinogenic Child*	2,400 *Non-Carcinogenic Child*	3.80 *Carcinogenic*	1,800 *Non-Carcinogenic Child*

Notes:

Analytical test for PAHs (polycyclic aromatic hydrocarbons) used USEPA Method 8270D-SIM.

< denotes that the result was not detected above the reporting limit

SLC = Screening Level Concentration for petroleum related constituents from Idaho Risk Evaluation for Petroleum Releases (IDEQ 2012).

USEPA RSL = U.S. Environmental Protection Agency Regional Screening Level; Resident Soil Table (USEPA 2016)

USEPA SSL = U.S. Environmental Protection Agency Soil Screening Level; Protection of Groundwater Table (USEPA 2016).

GWP = ground water protection

mg/kg = milligram per kilogram

- = not established

Table A4. Exposure Point Concentrations for Direct Contact Soils in DU1 and DU2

Zone	Decision Unit	Surface Soil (mg/kg)	
		Metals	PAHs
1	1.1	total chromium = 24.6	
		mercury = 0.268	
		selenium [b] = 4.00	
	1.2	total chromium = 26.9	anthracene = 0.0211
		mercury = 1.54	benzo(a)anthracene [a] = 0.135
		selenium [b] = 4.00	benzo(a)pyrene [a] = 0.128
			benzo(b)fluoranthene [a] = 0.217
			benzo(k)fluoranthene [a] = 0.0687
			chrysene [a] = 0.192
			fluoranthene = 0.254
			pyrene [a] = 0.275
	1.3	total chromium = 21.4	anthracene = 0.361
		mercury = 0.0580	benzo(a)anthracene = 0.456
		selenium [b] = 4.00	benzo(a)pyrene = 0.440
			benzo(b)fluoranthene = 1.00
			benzo(k)fluoranthene = 0.317
			chrysene = 0.839
			fluoranthene = 1.08
			pyrene = 1.06
2	2.1	total chromium = 21.4	anthracene = 0.340
		mercury = 0.285	benzo(a)anthracene = 0.468
		selenium [b] = 4.00	benzo(a)pyrene = 0.505
			benzo(b)fluoranthene = 0.942
			benzo(k)fluoranthene = 0.282
			chrysene = 0.815
			fluoranthene = 1.17
			pyrene = 1.12
	2.2	cadmium = 0.75	anthracene = 0.349
		total chromium = 23.7	benzo(a)anthracene = 0.520
		mercury = 0.193	benzo(a)pyrene = 0.606
		selenium [b] = 4.00	benzo(b)fluoranthene = 0.942
			benzo(k)fluoranthene = 0.288
			chrysene = 0.679
			fluoranthene = 0.938
			pyrene = 1.01

Notes:

[a] The maximum concentration of the ISM sample collected in triplicate is presented.

[b] The concentration was not detected above the reporting limit. Therefore, the reporting limit is used as the EPC.

mg/kg = milligram per kilogram

Attachment B

B1. Construction Worker Decision Unit USEPA RSL Calculator Assumptions

DU	Acres	Vegetative Cover (%)	DU Length (ft)	DU Width (ft)	DU ft^2 (length * width)	DU m^2 (ft^2 * 0.092903)	DU ft^3 (ft^2 * 0.5 feet)	DU yd^3 (ft^3 * 0.037037)	18 yd^3 Dump Truck Loads (DU yd^3 / 18)
1.1	0.64	0	1,400	20	28,000	2,601.28	14,000	519	29
1.2	1.52	0	1,100	60	66,000	6,131.60	33,000	1,222	68
1.3	1.93	33	1,400	60	84,000	7,803.85	42,000	1,556	86
2.1	1.72	33	1,250	60	75,000	6,967.73	37,500	1,389	77
2.2	4.06	33	2,950	60	177,000	16,443.83	88,500	3,278	182

Notes:

DU = Decision Unit m = meter

ft = feet yd = yard

B2. Construction Worker Construction Activity USEPA RSL Calculator Assumptions

Vehicle	Type	Max Weight (lb)	Max Weight (ton)	Blade Length (ft)	Blade Length (m)
Truck	F150	5,238	2.6	NA	NA
Dump Truck	Volvo A25C 4X4	88,780	44.4	NA	NA
Grader	Cat 120G Motor Grader	25,320	12.7	8.2	2.5
Dozer	Komatsu WD420-3 Wheel Dozer	44,093	22.0	12.3	3.7

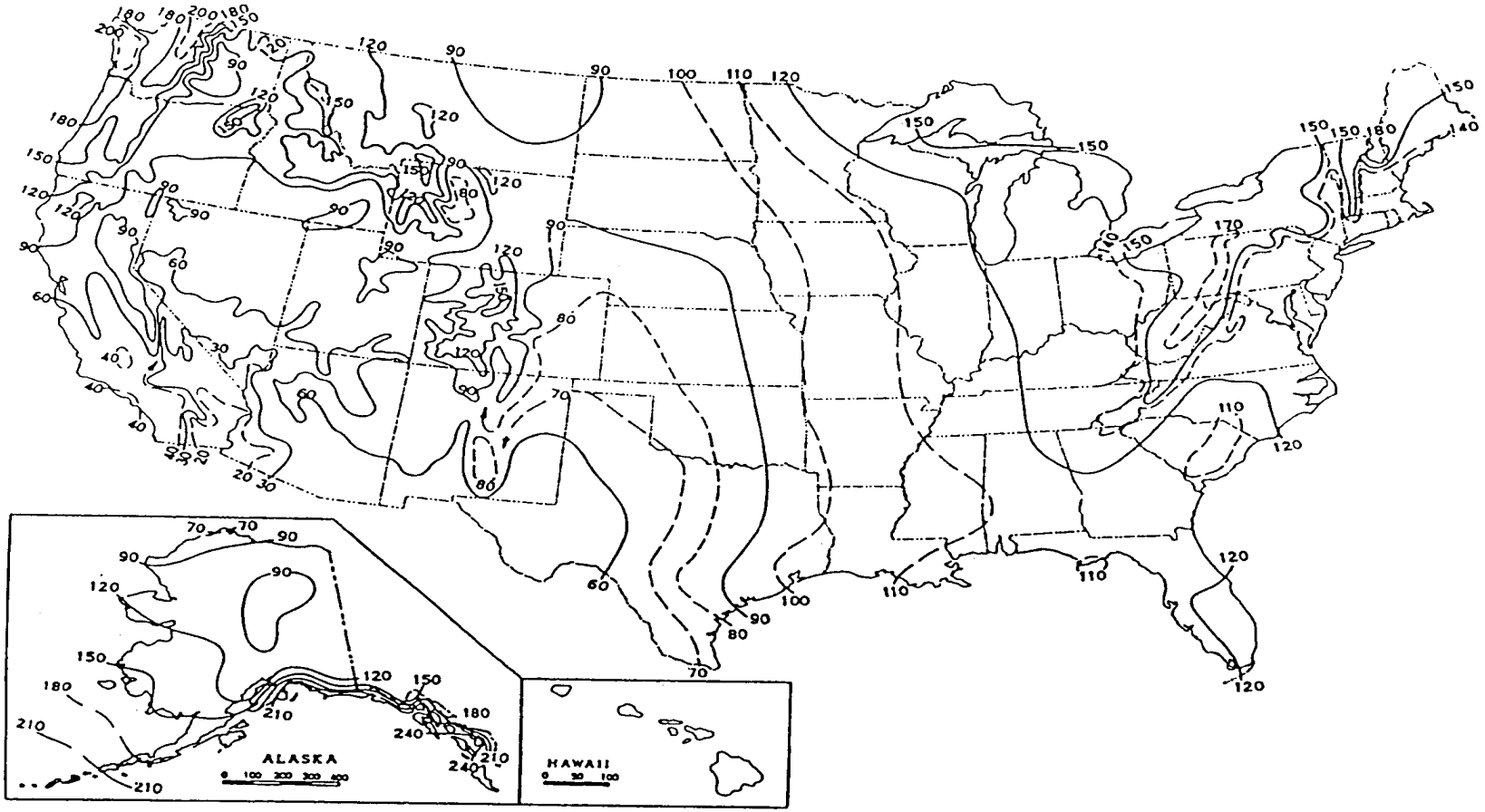
Notes:

ft = feet m = meter

lb = pound

Exhibit 5-2

MEAN NUMBER OF DAYS WITH 0.01 INCH OR MORE OF ANNUAL PRECIPITATION



VOLVO A25C 4X4 ARTICULATED DUMP TRUCK

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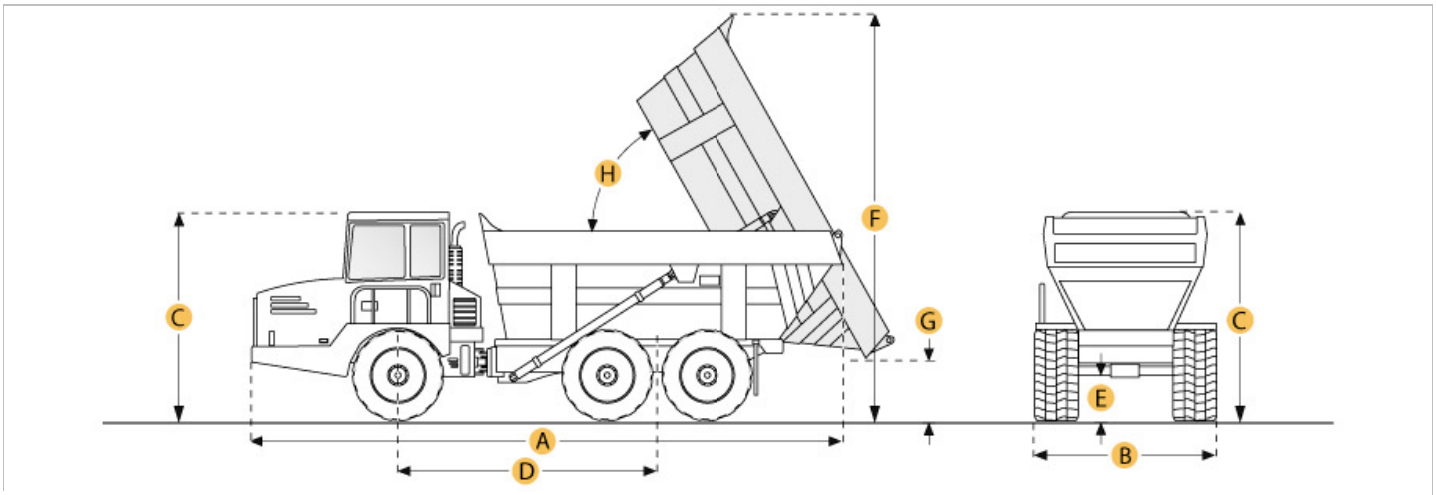

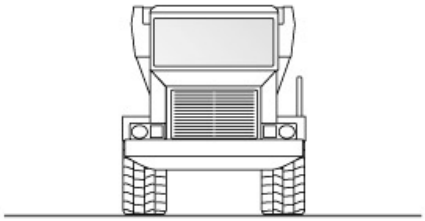

Selected Dimensions

Dimensions		
A. OVERALL LENGTH	31.7 ft in	9675 mm
B. OVERALL WIDTH	8.2 ft in	2500 mm
C. OVERALL HEIGHT	10.8 ft in	3285 mm
D. WHEELBASE	13.7 ft in	4165 mm
E. GROUND CLEARANCE	1.7 ft in	520 mm
F. DUMP HEIGHT	21 ft in	6400 mm
G. DUMP GROUND CLEARANCE	2.1 ft in	640 mm
Dump		
H. DUMP ANGLE	70 degrees	

Specification

Engine		
MAKE	Volvo	
MODEL	TD 73 KCE	
GROSS POWER	255 hp	190.2 kw
NET POWER	251 hp	187.2 kw
POWER MEASURED @	2400 rpm	
DISPLACEMENT	410.7 cu in	6.7 L
TORQUE MEASURED @	1200 rpm	
MAX TORQUE	796.6 lb ft	1080 Nm
ASPIRATION	Turbocharged	
NUMBER OF CYLINDERS	6	
Operational		
FUEL CAPACITY	74 gal	280 L
HYDRAULIC SYSTEM FLUID CAPACITY	47.6 gal	180 L
COOLING SYSTEM FLUID CAPACITY	9.8 gal	37 L
ENGINE OIL CAPACITY	6.3 gal	24 L
TRANSMISSION FLUID CAPACITY	4.2 gal	16 L
OPERATING VOLTAGE	24 V	
ALTERNATOR SUPPLIED AMPERAGE	60 amps	
TIRE SIZE	front 23.5R25 / rear 29.5R25	
Transmission		
TYPE	Fully automatic planetary transmission	

NUMBER OF FORWARD GEARS	10	
NUMBER OF REVERSE GEARS	2	
MAX SPEED	32.3 mph	52 km/h

Weights

FRONT AXLE - EMPTY	19929.8 lb	9040 kg
REAR AXLE - EMPTY	19246.4 lb	8730 kg
FRONT AXLE - LOADED	25353.2 lb	11500 kg
REAR AXLE - LOADED	63427 lb	28770 kg
TOTAL EMPTY	39176.1 lb	17770 kg
TOTAL LOADED	88780.1 lb	40270 kg

Dump

RATED PAYLOAD	49604 lb	22500 kg
CAPACITY - STRUCK	14.4 yd3	11 m3
CAPACITY - HEAPED	18 yd3	13.8 m3
DUMP ANGLE	70 degrees	
RAISE TIME	12 sec	
LOWER TIME	10 sec	

Dimensions

OVERALL LENGTH	31.7 ft in	9675 mm
OVERALL WIDTH	8.2 ft in	2500 mm
OVERALL HEIGHT	10.8 ft in	3285 mm
WHEELBASE	13.7 ft in	4165 mm
GROUND CLEARANCE	1.7 ft in	520 mm
DUMP HEIGHT	21 ft in	6400 mm
DUMP GROUND CLEARANCE	2.1 ft in	640 mm

CATERPILLAR 120G MOTOR GRADER

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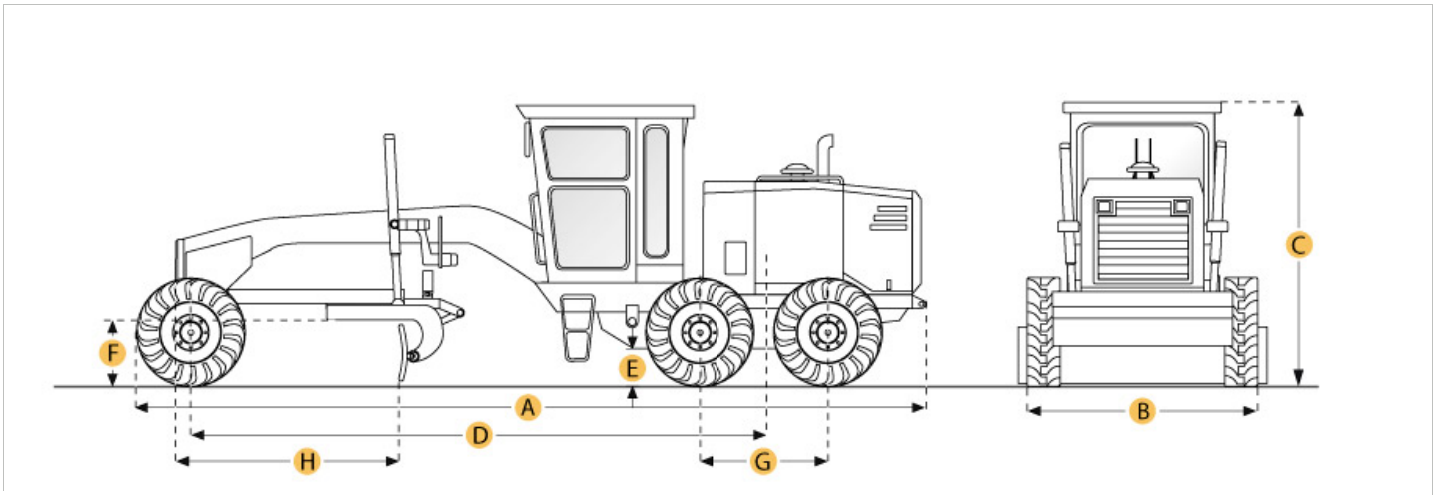
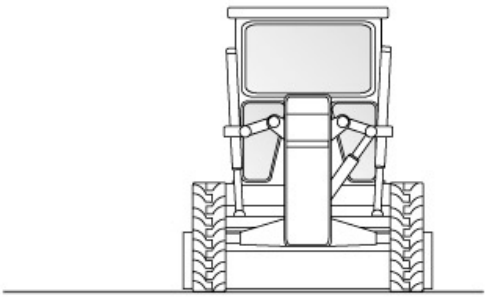


Selected Dimensions

Dimensions		
A. OVERALL LENGTH	26 ft in	7930 mm
B. WIDTH OVER TIRES	7.9 ft in	2410 mm
C. HEIGHT TO TOP OF CAB	10.9 ft in	3330 mm
D. WHEELBASE	18.7 ft in	5690 mm
H. BLADE BASE	8.2 ft in	2490 mm



Specification

Engine		
MAKE	Caterpillar	
MODEL	3304	
NET POWER GEAR 5-6	125 hp	93.2 kw
MAX POWER	125 hp	93.2 kw
DISPLACEMENT	427.2 cu in	7 L
Operational		
STD OPERATION WEIGHT - TOTAL	25320.1 lb	11485 kg
FUEL CAPACITY	60 gal	227 L
TIRE SIZE	13x24 8 PR	
Transmission		
NUMBER OF GEARS - FORWARD	6	
NUMBER OF GEARS - REVERSE	6	
MAX SPEED - FORWARD	25.4 mph	40.9 km/h
MAX SPEED - REVERSE	25.4 mph	40.9 km/h
Steering		
TURNING RADIUS	22 ft in	6.7 m
Circle		
MAX LIFT ABOVE GROUND	16.1 in	410 mm
Dimensions		
HEIGHT TO TOP OF CAB	10.9 ft in	3330 mm
OVERALL LENGTH	26 ft in	7930 mm
WIDTH OVER TIRES	7.9 ft in	2410 mm
WHEELBASE	18.7 ft in	5690 mm
BLADE BASE	8.2 ft in	2490 mm

KOMATSU WD420-3 WHEEL DOZER

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Print specification

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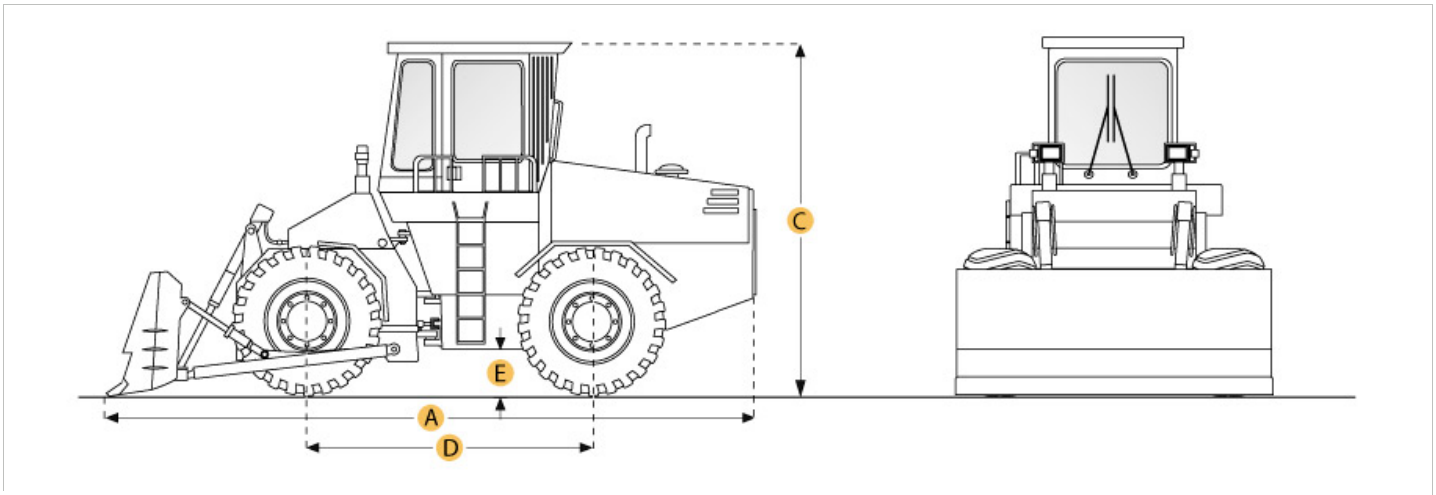
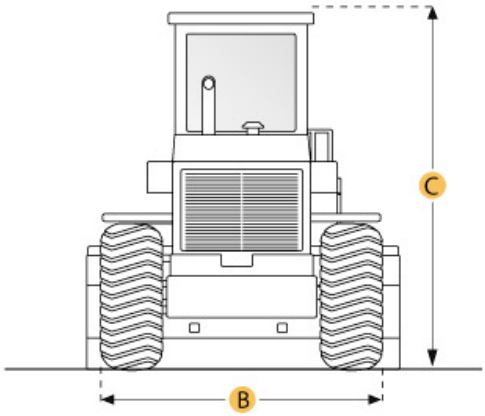


Selected Dimensions

Dimensions		
A. LENGTH WITH BLADE ON GROUND	23.5 ft in	7160 mm
B. WIDTH OVER TIRES	9.3 ft in	2820 mm
C. HEIGHT TO TOP OF CAB	11.1 ft in	3370 mm
D. WHEELBASE	10.8 ft in	3300 mm



Specification

Engine		
MAKE	Komatsu	
MODEL	SA6D108	
GROSS POWER	224 hp	167 kw
NUMBER OF CYLINDERS	6	
DISPLACEMENT	436.3 cu in	7.2 L
Operational		
OPERATING WEIGHT	44092.5 lb	20000 kg
FUEL CAPACITY	89.8 gal	340 L
TIRE SIZE	23.5-25-12PR	
Transmission		
NUMBER OF FORWARD GEARS	4	
NUMBER OF REVERSE GEARS	4	
MAX SPEED - FORWARD	20.4 mph	32.8 km/h
MAX SPEED - REVERSE	21.1 mph	33.9 km/h
Blade		
BLADE CAPACITY	4.1 yd3	3.1 m3
BLADE WIDTH	12.3 ft in	3745 mm
Dimensions		
LENGTH WITH BLADE ON GROUND	23.5 ft in	7160 mm
WIDTH OVER TIRES	9.3 ft in	2820 mm
HEIGHT TO TOP OF CAB	11.1 ft in	3370 mm
WHEELBASE	10.8 ft in	3300 mm

Site-specific
Resident Equation Inputs for DU1.1 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
A (PEF Dispersion Constant)	16.2302	11.3161
A (VF Dispersion Constant)	11.911	11.3161
A (VF Dispersion Constant - Mass Limit)	11.911	11.3161
B (PEF Dispersion Constant)	18.7762	19.6437
B (VF Dispersion Constant)	18.4385	19.6437
B (VF Dispersion Constant - Mass Limit)	18.4385	19.6437
C (PEF Dispersion Constant)	216.108	224.8172
C (VF Dispersion Constant)	209.7845	224.8172
C (VF Dispersion Constant - Mass Limit)	209.7845	224.8172
d_s (depth of source) m	.	0.3
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.0495
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
PEF (particulate emission factor) m^3/kg	1359344438	3167068891
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	68.13537413
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	68.13537413
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	68.13537413
A_s (PEF acres)	0.5	0.64
A_s (VF acres)	0.5	0.64
A_s (VF mass-limit acres)	0.5	0.64
$AF_{0\text{-}2}$ (mutagenic skin adherence factor) mg/cm^2	0.2	0.2
$AF_{2\text{-}6}$ (mutagenic skin adherence factor) mg/cm^2	0.2	0.2
$AF_{6\text{-}16}$ (mutagenic skin adherence factor) mg/cm^2	0.07	0.07
$AF_{16\text{-}26}$ (mutagenic skin adherence factor) mg/cm^2	0.07	0.07
$AF_{res\text{-}a}$ (skin adherence factor - adult) mg/cm^2	0.07	0.07
$AF_{res\text{-}c}$ (skin adherence factor - child) mg/cm^2	0.2	0.2
AT_{res} (averaging time - resident carcinogenic)	365	365
$BW_{0\text{-}2}$ (mutagenic body weight) kg	15	15
$BW_{2\text{-}6}$ (mutagenic body weight) kg	15	15
$BW_{6\text{-}16}$ (mutagenic body weight) kg	80	80
$BW_{16\text{-}26}$ (mutagenic body weight) kg	80	80
$BW_{res\text{-}a}$ (body weight - adult) kg	80	80
$BW_{res\text{-}c}$ (body weight - child) kg	15	15
$DFS_{res\text{-}adj}$ (age-adjusted soil dermal factor) mg/kg	103390	103390

Site-specific
Resident Equation Inputs for DU1.1 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
$DFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	428260	428260
ED_{res} (exposure duration) years	26	26
$ED_{0\text{-}2}$ (mutagenic exposure duration) years	2	2
$ED_{2\text{-}6}$ (mutagenic exposure duration) years	4	4
$ED_{6\text{-}16}$ (mutagenic exposure duration) years	10	10
$ED_{16\text{-}26}$ (mutagenic exposure duration) years	10	10
$ED_{res\text{-}a}$ (exposure duration - adult) years	20	20
$ED_{res\text{-}c}$ (exposure duration - child) years	6	6
EF_{res} (exposure frequency) days/year	350	350
$EF_{0\text{-}2}$ (mutagenic exposure frequency) days/year	350	350
$EF_{2\text{-}6}$ (mutagenic exposure frequency) days/year	350	350
$EF_{6\text{-}16}$ (mutagenic exposure frequency) days/year	350	350
$EF_{16\text{-}26}$ (mutagenic exposure frequency) days/year	350	350
$EF_{res\text{-}a}$ (exposure frequency - adult) days/year	350	350
$EF_{res\text{-}c}$ (exposure frequency - child) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
$ET_{0\text{-}2}$ (mutagenic exposure time) hours/day	24	24
$ET_{2\text{-}6}$ (mutagenic exposure time) hours/day	24	24
$ET_{6\text{-}16}$ (mutagenic exposure time) hours/day	24	24
$ET_{16\text{-}26}$ (mutagenic exposure time) hours/day	24	24
$ET_{res\text{-}a}$ (adult exposure time) hours/day	24	24
$ET_{res\text{-}c}$ (child exposure time) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	1
$IFS_{res\text{-}adj}$ (age-adjusted soil ingestion factor) mg/kg	36750	36750
$IFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	166833.3	166833.3
$IRS_{0\text{-}2}$ (mutagenic soil intake rate) mg/day	200	200
$IRS_{2\text{-}6}$ (mutagenic soil intake rate) mg/day	200	200
$IRS_{6\text{-}16}$ (mutagenic soil intake rate) mg/day	100	100
$IRS_{16\text{-}26}$ (mutagenic soil intake rate) mg/day	100	100
$IRS_{res\text{-}a}$ (soil intake rate - adult) mg/day	100	100
$IRS_{res\text{-}c}$ (soil intake rate - child) mg/day	200	200
LT (lifetime) years	70	70
$SA_{0\text{-}2}$ (mutagenic skin surface area) cm^2/day	2373	2373
$SA_{2\text{-}6}$ (mutagenic skin surface area) cm^2/day	2373	2373
$SA_{6\text{-}16}$ (mutagenic skin surface area) cm^2/day	6032	6032

Site-specific
Resident Equation Inputs for DU1.1 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
$SA_{16\text{-}26}$ (mutagenic skin surface area) cm^2/day	6032	6032
$SA_{res\text{-}a}$ (skin surface area - adult) cm^2/day	6032	6032
$SA_{res\text{-}c}$ (skin surface area - child) cm^2/day	2373	2373
TR (target risk) unitless	0.000001	0.00001
T_w (groundwater temperature) Celsius	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0
VF_{ml} (volitization factor - mass-limit) m^3/kg	.	124148.1025

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Site-specific
Resident Risk for DU1.1 Soil

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
*Total Risk/HI	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	3170000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	3170000000	124000
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	3170000000	-
*Total Risk/HI	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion Child HQ	Dermal Child HQ	Inhalation Child HQ	Noncarcinogenic Child HI	Ingestion Adult HQ	Dermal Adult HQ	Inhalation Adult HQ	Noncarcinogenic Adult HI
Chromium, Total	24.6	-	-	-	-	-	-	-	-	-	-	-	-
Mercury (elemental)	0.268	-	-	-	-	-	-	0.0069	0.0069	-	-	0.0069	0.0069
Selenium	4	-	-	-	-	0.0102	-	6.06E-08	0.0102	0.000959	-	6.06E-08	0.000959
*Total Risk/HI	-	-	-	-	-	0.0102	-	0.0069	0.0171	0.000959	-	0.0069	0.00786

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Site-specific
Composite Worker Equation Inputs for DU1.1 Soil

* Inputted values different from Composite Worker defaults are highlighted.

Variable	Composite Worker Soil Default	Form-input Value
A (PEF Dispersion Constant)	16.2302	11.3161
A (VF Dispersion Constant)	11.911	11.3161
A (VF Dispersion Constant - Mass Limit)	11.911	11.3161
B (PEF Dispersion Constant)	18.7762	19.6437
B (VF Dispersion Constant)	18.4385	19.6437
B (VF Dispersion Constant - Mass Limit)	18.4385	19.6437
C (PEF Dispersion Constant)	216.108	224.8172
C (VF Dispersion Constant)	209.7845	224.8172
C (VF Dispersion Constant - Mass Limit)	209.7845	224.8172
d_s (depth of source) m	.	0.3
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.0495
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
PEF (particulate emission factor) m^3/kg	1359344438	3167068891
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	68.13537413
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	68.13537413
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	68.13537413
A_s (PEF acres)	0.5	0.64
A_s (VF acres)	0.5	0.64
A_s (VF mass-limit acres)	0.5	0.64
AF_w (skin adherence factor - composite worker) mg/cm^2	0.12	0.12
AT_w (averaging time - composite worker)	365	365
BW_w (body weight - composite worker)	80	80
ED_w (exposure duration - composite worker) yr	25	25
EF_w (exposure frequency - composite worker) day/yr	250	250
ET_w (exposure time - composite worker) hr	8	8
THQ (target hazard quotient) unitless	0.1	1
IR_w (soil ingestion rate - composite worker) mg/day	100	100
LT (lifetime) yr	70	70
SA_w (surface area - composite worker) cm^2/day	3527	3527
TR (target risk) unitless	0.000001	0.00001
T_w (groundwater temperature) Celsius	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396

Site-specific
Composite Worker Equation Inputs for DU1.1 Soil

* Inputted values different from Composite Worker defaults are highlighted.

Variable	Composite Worker Soil Default	Form-input Value
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0
VF_{ml} (volitization factor - mass-limit) m^3/kg	.	124148.1025

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Site-specific
Composite Worker Risk for DU1.1 Soil

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
*Total Risk/HI	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	3170000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	3170000000	124000
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	3170000000	-
*Total Risk/HI	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Chromium, Total	24.6	-	-	-	-	-	-	-	-
Mercury (elemental)	0.268	-	-	-	-	-	-	0.00164	0.00164
Selenium	4	-	-	-	-	0.000685	-	1.44E-08	0.000685
*Total Risk/HI	-	-	-	-	-	0.000685	-	0.00164	0.00233

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Site-specific Construction Worker Equation Inputs for DU1.1 Soil - Unpaved Road Traffic

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Unpaved Default	Form-input Value
L_R (length of road segment) ft	147.58077	166.9685863
A (PEF Dispersion Constant)	12.9351	12.9351
A_R (surface area of contaminated road segment) m^2	274.21393	310.2376514
A (VF Dispersion Constant)	2.4538	2.4538
W_R (width of road segment) ft	20	20
B (PEF Dispersion Constant)	5.7383	5.7383
B (VF Dispersion Constant)	17.566	17.566
C (PEF Dispersion Constant)	71.7711	71.7711
C (VF Dispersion Constant)	189.0426	189.0426
distance (road length) km/day	0.04498	0.050891948
d_s (average source depth) m	.	0.3
F_D Unitless Dispersion Correction Factor	0.185837208	0.185837208
foc (fraction organic carbon in soil) g/g	0.006	0.006
uncontrolled conditions) %	0.2	0.2
Number of cars	.	0
Number of trucks	.	29
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p (days per year with at least .01" of precipitation) days/year	.	90
p_b ($VF_{ulim-sc}$ dry soil bulk density) g/cm^3	1.5	1.5
p_b ($VF_{mlim-sc}$ dry soil bulk density) g/cm^3	1.5	1.5
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{sr} (g/m^2-s per kg/m^3)	23.01785	22.04038762
Q/C_{vol} (g/m^2-s per kg/m^3)	14.31407	13.65188929
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	13.65188929
s (road surface silt content) %	8.5	8.5
A_s (PEF_{sc} - acres)	0.5	0.64
A_s ($VF_{mlim-sc}$ acres)	0.5	0.64
A_s ($VF_{ulim-sc}$ acres)	0.5	0.64
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3	0.3
AT_{cw} (averaging time - construction worker) days	365	365
BW_{cw} (body weight - construction worker) kg	80	80
ED_{cw} (exposure duration - construction worker) yr	1	1
EF_{cw} (exposure frequency - construction worker) day/yr	250	250
ET_{cw} (exposure time - construction worker) hr/day	8	8
THQ (target hazard quotient) unitless	0.1	1

Site-specific
Construction Worker Equation Inputs for DU1.1 Soil - Unpaved Road Traffic

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Unpaved Default	Form-input Value
IR_{cw} (soil ingestion rate - construction worker) mg/day	330	330
LT (lifetime) yr	70	70
SA_{cw} (surface area - construction worker) cm^2/day	3527	3527
TR (target cancer risk) unitless	0.000001	0.00001
t_c (overall duration of construction) hours	8400	8400
T_c (overall duration of construction) s	30240000	30240000
T_w (groundwater temperature) C	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T_t (overall duration of traffic) s	7200000	7200000
$VF_{mlim-sc}$ (volitization factor) m^3_{air}/kg_{soil}	.	4936.616141
Tons per car	.	2.6
Tons per truck	.	44.4

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Site-specific
Construction Worker Risk for DU1.1 Soil - Unpaved Road Traffic

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	0	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	0	4940
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	0	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Chromium, Total	24.6	-	-	-	-	-	-	-	-
Mercury (elemental)	0.268	-	-	-	-	-	-	0.0431	0.0431
Selenium	4	-	-	-	-	0.00236	-	-	0.00236
**Total Risk/HI*	-	-	-	-	-	*0.00236*	-	*0.0431*	*0.0454*

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Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); U = User-provided

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Site-specific Construction Worker Equation Inputs for DU1.1 Soil - Other Construction Activities

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Other Default	Form-input Value
$A_{c\text{-}doz}$ (areal extent of dozing) acres	.	0.64
A_{excav} (area of excavation site) m^2	.	2601.28
$A_{c\text{-}grade}$ (areal extent of grading) acres	.	0.64
A (PEF Dispersion Constant)	2.4538	2.4538
A_{surf} (areal extent of site) m^2	2023.43	2589.9904
A_{till} (areal extent of tilling) acres	.	0.64
A (VF Dispersion Constant)	2.4538	2.4538
B_l (dozing blade length) m	.	3.7
B_l (grading blade length) m	.	2.5
B (PEF Dispersion Constant)	17.566	17.566
B (VF Dispersion Constant)	17.566	17.566
C (PEF Dispersion Constant)	189.0426	189.0426
C (VF Dispersion Constant)	189.0426	189.0426
d_{excav} (average depth of excavation site) m	.	0.1524
d_s (average source depth) m	.	0.3
F_D Unitless Dispersion Correction Factor	0.185837208	0.185837208
foc (fraction organic carbon in soil) g/g	0.006	0.006
(1985))	0.194	0.0495
$M_{m\text{-}doz}$ (Gravimetric soil moisture content) %	7.9	7.9
$M_{m\text{-}excav}$ (Gravimetric soil moisture content) %	12	12
M_{wind} (dust emitted by wind erosion) g	51288.84717	1757.194745
$N_{A\text{-}doz}$ (number of times site was dozed)	.	0
$N_{A\text{-}dump}$ (number of times soil is dumped)	2	1
$N_{A\text{-}grade}$ (number of times site was graded)	.	1
$N_{A\text{-}till}$ (number of times soil is tilled)	2	0
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	13.65188929
Q/C_{vol} (g/m^2-s per kg/m^3)	14.31407	13.65188929
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	13.65188929
p_{soil} (density) g/cm^3 - chemical-specific	1.68	1.68
A_c (acres)	0.5	0.64
A_s ($VF_{mlim\text{-}sc}$ acres)	0.5	0.64

Site-specific Construction Worker Equation Inputs for DU1.1 Soil - Other Construction Activities

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Other Default	Form-input Value
A_s ($VF_{ulim-sc}$ acres)	0.5	0.64
s_{doz} (soil silt content) %	6.9	6.9
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3	0.3
AT_{cw} (averaging time - construction worker) days	365	365
BW_{cw} (body weight - construction worker) kg	80	80
ED_{cw} (exposure duration - construction worker) yr	1	1
EF_{cw} (exposure frequency - construction worker) day/yr	250	250
ET_{cw} (exposure time - construction worker) hr/day	8	8
THQ (target hazard quotient) unitless	0.1	1
IR_{cw} (soil ingestion rate - construction worker) mg/day	330	330
LT (lifetime) yr	70	70
SA_{cw} (surface area - construction worker) cm^2/day	3527	3527
TR (target cancer risk) unitless	0.000001	0.00001
S_{doz} (dozing speed) kph	11.4	11.4
S_{grade} (dozing speed) kph	11.4	11.4
s_{till} (soil silt content) %	18	18
t_c (overall duration of construction) hours	8400	8400
T_c (overall duration of construction) s	30240000	30240000
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (time over which traffic occurs) s	7200000	7200000
T_t (overall duration of traffic) s	7200000	7200000
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value) m/s	11.32	11.32
$VF_{mlim-sc}$ (volitization factor) m^3_{air}/kg_{soil}	.	4936.616141
V (fraction of vegetative cover)	0	0

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Site-specific
Construction Worker Risk for DU1.1 Soil - Other Construction Activities

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
*Total Risk/HI	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	602000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	602000000	4940
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	602000000	-
*Total Risk/HI	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Chromium, Total	24.6	-	-	-	-	-	-	-	-
Mercury (elemental)	0.268	-	-	-	-	-	-	0.0431	0.0431
Selenium	4	-	-	-	-	0.00236	-	7.91E-08	0.00236
*Total Risk/HI	-	-	-	-	-	*0.00236*	-	*0.0431*	*0.0454*

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Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); U = User-provided

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Site-specific
Resident Equation Inputs for DU1.2 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
A (PEF Dispersion Constant)	16.2302	11.3161
A (VF Dispersion Constant)	11.911	11.3161
A (VF Dispersion Constant - Mass Limit)	11.911	11.3161
B (PEF Dispersion Constant)	18.7762	19.6437
B (VF Dispersion Constant)	18.4385	19.6437
B (VF Dispersion Constant - Mass Limit)	18.4385	19.6437
C (PEF Dispersion Constant)	216.108	224.8172
C (VF Dispersion Constant)	209.7845	224.8172
C (VF Dispersion Constant - Mass Limit)	209.7845	224.8172
d_s (depth of source) m	.	0.3
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.0495
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
PEF (particulate emission factor) m^3/kg	1359344438	2722470739
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	58.57042229
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	58.57042229
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	58.57042229
A_s (PEF acres)	0.5	1.52
A_s (VF acres)	0.5	1.52
A_s (VF mass-limit acres)	0.5	1.52
$AF_{0\text{-}2}$ (mutagenic skin adherence factor) mg/cm^2	0.2	0.2
$AF_{2\text{-}6}$ (mutagenic skin adherence factor) mg/cm^2	0.2	0.2
$AF_{6\text{-}16}$ (mutagenic skin adherence factor) mg/cm^2	0.07	0.07
$AF_{16\text{-}26}$ (mutagenic skin adherence factor) mg/cm^2	0.07	0.07
$AF_{res\text{-}a}$ (skin adherence factor - adult) mg/cm^2	0.07	0.07
$AF_{res\text{-}c}$ (skin adherence factor - child) mg/cm^2	0.2	0.2
AT_{res} (averaging time - resident carcinogenic)	365	365
$BW_{0\text{-}2}$ (mutagenic body weight) kg	15	15
$BW_{2\text{-}6}$ (mutagenic body weight) kg	15	15
$BW_{6\text{-}16}$ (mutagenic body weight) kg	80	80
$BW_{16\text{-}26}$ (mutagenic body weight) kg	80	80
$BW_{res\text{-}a}$ (body weight - adult) kg	80	80
$BW_{res\text{-}c}$ (body weight - child) kg	15	15
$DFS_{res\text{-}adj}$ (age-adjusted soil dermal factor) mg/kg	103390	103390

Site-specific
Resident Equation Inputs for DU1.2 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
$DFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	428260	428260
ED_{res} (exposure duration) years	26	26
$ED_{0\text{-}2}$ (mutagenic exposure duration) years	2	2
$ED_{2\text{-}6}$ (mutagenic exposure duration) years	4	4
$ED_{6\text{-}16}$ (mutagenic exposure duration) years	10	10
$ED_{16\text{-}26}$ (mutagenic exposure duration) years	10	10
$ED_{res\text{-}a}$ (exposure duration - adult) years	20	20
$ED_{res\text{-}c}$ (exposure duration - child) years	6	6
EF_{res} (exposure frequency) days/year	350	350
$EF_{0\text{-}2}$ (mutagenic exposure frequency) days/year	350	350
$EF_{2\text{-}6}$ (mutagenic exposure frequency) days/year	350	350
$EF_{6\text{-}16}$ (mutagenic exposure frequency) days/year	350	350
$EF_{16\text{-}26}$ (mutagenic exposure frequency) days/year	350	350
$EF_{res\text{-}a}$ (exposure frequency - adult) days/year	350	350
$EF_{res\text{-}c}$ (exposure frequency - child) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
$ET_{0\text{-}2}$ (mutagenic exposure time) hours/day	24	24
$ET_{2\text{-}6}$ (mutagenic exposure time) hours/day	24	24
$ET_{6\text{-}16}$ (mutagenic exposure time) hours/day	24	24
$ET_{16\text{-}26}$ (mutagenic exposure time) hours/day	24	24
$ET_{res\text{-}a}$ (adult exposure time) hours/day	24	24
$ET_{res\text{-}c}$ (child exposure time) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	1
$IFS_{res\text{-}adj}$ (age-adjusted soil ingestion factor) mg/kg	36750	36750
$IFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	166833.3	166833.3
$IRS_{0\text{-}2}$ (mutagenic soil intake rate) mg/day	200	200
$IRS_{2\text{-}6}$ (mutagenic soil intake rate) mg/day	200	200
$IRS_{6\text{-}16}$ (mutagenic soil intake rate) mg/day	100	100
$IRS_{16\text{-}26}$ (mutagenic soil intake rate) mg/day	100	100
$IRS_{res\text{-}a}$ (soil intake rate - adult) mg/day	100	100
$IRS_{res\text{-}c}$ (soil intake rate - child) mg/day	200	200
LT (lifetime) years	70	70
$SA_{0\text{-}2}$ (mutagenic skin surface area) cm^2/day	2373	2373
$SA_{2\text{-}6}$ (mutagenic skin surface area) cm^2/day	2373	2373
$SA_{6\text{-}16}$ (mutagenic skin surface area) cm^2/day	6032	6032

Site-specific
Resident Equation Inputs for DU1.2 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
$SA_{16\text{-}26}$ (mutagenic skin surface area) cm^2/day	6032	6032
$SA_{res\text{-}a}$ (skin surface area - adult) cm^2/day	6032	6032
$SA_{res\text{-}c}$ (skin surface area - child) cm^2/day	2373	2373
TR (target risk) unitless	0.000001	0.00001
T_w (groundwater temperature) Celsius	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0
VF_{ml} (volitization factor - mass-limit) m^3/kg	.	106719.9951

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Site-specific
Resident Risk for DU1.2 Soil

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	0.0000006	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	0.0000556	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	2720000000	107000
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	2720000000	107000
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	2720000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	2720000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	2720000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	2720000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	2720000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	2720000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	2720000000	107000
Pyrene	54300	326	0.0000119	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	2720000000	107000
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	2720000000	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion Child HQ	Dermal Child HQ	Inhalation Child HQ	Noncarcinogenic Child HI	Ingestion Adult HQ	Dermal Adult HQ	Inhalation Adult HQ	Noncarcinogenic Adult HI
Anthracene	0.0211	-	-	-	-	0.00000027	8.32E-08	-	0.000000353	2.53E-08	1.39E-08	-	3.92E-08
Benz[a]anthracene	0.135	8.82E-08	2.94E-08	7.49E-08	0.000000192	-	-	-	-	-	-	-	-
Benzo[a]pyrene	0.128	8.36E-07	2.79E-07	2.78E-11	0.00000111	0.00546	0.00168	0.0000225	0.00716	0.000511	0.000281	0.0000225	0.000815
Benzo[b]fluoranthene	0.217	1.42E-07	4.73E-08	4.72E-12	0.000000189	-	-	-	-	-	-	-	-
Benzo[k]fluoranthene	0.0687	4.49E-09	1.5E-09	1.49E-13	5.98E-09	-	-	-	-	-	-	-	-
Chromium, Total	26.9	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	0.192	1.25E-09	4.18E-10	4.17E-14	1.67E-09	-	-	-	-	-	-	-	-
Fluoranthene	0.254	-	-	-	-	0.0000325	0.00001	-	0.0000425	3.04E-06	0.00000167	-	0.00000472
Mercury (elemental)	1.54	-	-	-	-	-	-	0.0461	0.0461	-	-	0.0461	0.0461
Pyrene	0.275	-	-	-	-	0.0000117	0.00000362	-	0.0000153	0.0000011	0.000000603	-	0.0000017
Selenium	4	-	-	-	-	0.0102	-	7.04E-08	0.0102	0.000959	-	7.04E-08	0.000959
**Total Risk/HI*	-	*0.00000107*	*3.58E-07*	*7.49E-08*	*0.0000015*	*0.0157*	*0.0017*	*0.0461*	*0.0636*	*0.00147*	*0.000283*	*0.0461*	*0.0479*

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Site-specific
Composite Worker Equation Inputs for DU1.2 Soil

* Inputted values different from Composite Worker defaults are highlighted.

Variable	Composite Worker Soil Default	Form-input Value
A (PEF Dispersion Constant)	16.2302	11.3161
A (VF Dispersion Constant)	11.911	11.3161
A (VF Dispersion Constant - Mass Limit)	11.911	11.3161
B (PEF Dispersion Constant)	18.7762	19.6437
B (VF Dispersion Constant)	18.4385	19.6437
B (VF Dispersion Constant - Mass Limit)	18.4385	19.6437
C (PEF Dispersion Constant)	216.108	224.8172
C (VF Dispersion Constant)	209.7845	224.8172
C (VF Dispersion Constant - Mass Limit)	209.7845	224.8172
d_s (depth of source) m	.	0.3
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.0495
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
PEF (particulate emission factor) m^3/kg	1359344438	2722470739
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	58.57042229
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	58.57042229
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	58.57042229
A_s (PEF acres)	0.5	1.52
A_s (VF acres)	0.5	1.52
A_s (VF mass-limit acres)	0.5	1.52
AF_w (skin adherence factor - composite worker) mg/cm^2	0.12	0.12
AT_w (averaging time - composite worker)	365	365
BW_w (body weight - composite worker)	80	80
ED_w (exposure duration - composite worker) yr	25	25
EF_w (exposure frequency - composite worker) day/yr	250	250
ET_w (exposure time - composite worker) hr	8	8
THQ (target hazard quotient) unitless	0.1	1
IR_w (soil ingestion rate - composite worker) mg/day	100	100
LT (lifetime) yr	70	70
SA_w (surface area - composite worker) cm^2/day	3527	3527
TR (target risk) unitless	0.000001	0.00001
T_w (groundwater temperature) Celsius	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396

Site-specific
Composite Worker Equation Inputs for DU1.2 Soil

* Inputted values different from Composite Worker defaults are highlighted.

Variable	Composite Worker Soil Default	Form-input Value
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0
VF_{ml} (volitization factor - mass-limit) m^3/kg	.	106719.9951

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Site-specific
Composite Worker Risk for DU1.2 Soil

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	0.0000006	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	0.0000556	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	2720000000	107000
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	2720000000	107000
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	2720000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	2720000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	2720000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	2720000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	2720000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	2720000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	2720000000	107000
Pyrene	54300	326	0.0000119	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	2720000000	107000
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	2720000000	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Anthracene	0.0211	-	-	-	-	1.81E-08	9.94E-09	-	0.000000028
Benz[a]anthracene	0.135	4.13E-09	2.27E-09	6.19E-09	1.26E-08	-	-	-	-
Benzo[a]pyrene	0.128	3.91E-08	2.15E-08	2.3E-12	6.07E-08	0.000365	0.000201	0.00000537	0.000572
Benzo[b]fluoranthene	0.217	6.64E-09	3.65E-09	3.9E-13	1.03E-08	-	-	-	-
Benzo[k]fluoranthene	0.0687	2.1E-10	1.16E-10	1.23E-14	3.26E-10	-	-	-	-
Chromium, Total	26.9	-	-	-	-	-	-	-	-
Chrysene	0.192	5.87E-11	3.23E-11	3.45E-15	9.1E-11	-	-	-	-
Fluoranthene	0.254	-	-	-	-	0.00000217	0.0000012	-	0.00000337
Mercury (elemental)	1.54	-	-	-	-	-	-	0.011	0.011
Pyrene	0.275	-	-	-	-	0.000000785	0.000000432	-	0.00000122
Selenium	4	-	-	-	-	0.000685	-	1.68E-08	0.000685
**Total Risk/HI*	-	*5.02E-08*	*2.76E-08*	*6.19E-09*	*0.000000084*	*0.00105*	*0.000203*	*0.011*	*0.0122*

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Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); U = User-provided

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Site-specific Construction Worker Equation Inputs for DU1.2 Soil - Unpaved Road Traffic

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Unpaved Default	Form-input Value
L_R (length of road segment) ft	147.58077	257.3158728
A (PEF Dispersion Constant)	12.9351	12.9351
A_R (surface area of contaminated road segment) m^2	274.21393	1434.324992
A (VF Dispersion Constant)	2.4538	2.4538
W_R (width of road segment) ft	20	60
B (PEF Dispersion Constant)	5.7383	5.7383
B (VF Dispersion Constant)	17.566	17.566
C (PEF Dispersion Constant)	71.7711	71.7711
C (VF Dispersion Constant)	189.0426	189.0426
distance (road length) km/day	0.04498	0.07842976
d_s (average source depth) m	.	0.3
F_D Unitless Dispersion Correction Factor	0.185837208	0.185837208
foc (fraction organic carbon in soil) g/g	0.006	0.006
M_{dry} (road surface material moisture content under dry, uncontrolled conditions) %	0.2	0.2
Number of cars	.	0
Number of trucks	.	68
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p (days per year with at least .01" of precipitation) days/year	.	90
p_b ($VF_{ulim-sc}$ dry soil bulk density) g/cm^3	1.5	1.5
p_b ($VF_{mlim-sc}$ dry soil bulk density) g/cm^3	1.5	1.5
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{sr} (g/m^2-s per kg/m^3)	23.01785	19.18687184
Q/C_{vol} (g/m^2-s per kg/m^3)	14.31407	11.62315393
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	11.62315393
s (road surface silt content) %	8.5	8.5
A_s (PEF_{sc} - acres)	0.5	1.52
A_s ($VF_{mlim-sc}$ acres)	0.5	1.52
A_s ($VF_{ulim-sc}$ acres)	0.5	1.52
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3	0.3
AT_{cw} (averaging time - construction worker) days	365	365
BW_{cw} (body weight - construction worker) kg	80	80
ED_{cw} (exposure duration - construction worker) yr	1	1
EF_{cw} (exposure frequency - construction worker) day/yr	250	250
ET_{cw} (exposure time - construction worker) hr/day	8	8
THQ (target hazard quotient) unitless	0.1	1

Site-specific
Construction Worker Equation Inputs for DU1.2 Soil - Unpaved Road Traffic

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Unpaved Default	Form-input Value
IR_{cw} (soil ingestion rate - construction worker) mg/day	330	330
LT (lifetime) yr	70	70
SA_{cw} (surface area - construction worker) cm^2/day	3527	3527
TR (target cancer risk) unitless	0.000001	0.00001
t_c (overall duration of construction) hours	8400	8400
T_c (overall duration of construction) s	30240000	30240000
T_w (groundwater temperature) C	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T_t (overall duration of traffic) s	7200000	7200000
$VF_{mlim-sc}$ (volitization factor) m^3_{air}/kg_{soil}	.	4203.011616
Tons per car	.	2.6
Tons per truck	.	44.4

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Site-specific
Construction Worker Risk for DU1.2 Soil - Unpaved Road Traffic

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	0.0000006	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	0.0000556	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	0	4200
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	0	4200
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	0	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	0	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	0	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	0	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	0	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	0	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	0	4200
Pyrene	54300	326	0.0000119	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	0	4200
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	0	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Anthracene	0.0211	-	-	-	-	6.22E-08	2.59E-08	-	8.81E-08
Benz[a]anthracene	0.135	5.45E-10	2.27E-10	6.29E-09	7.06E-09	-	-	-	-
Benzo[a]pyrene	0.128	5.17E-09	2.15E-09	-	7.32E-09	0.00126	0.000524	-	0.00178
Benzo[b]fluoranthene	0.217	8.76E-10	3.65E-10	-	1.24E-09	-	-	-	-
Benzo[k]fluoranthene	0.0687	2.77E-11	1.16E-11	-	3.93E-11	-	-	-	-
Chromium, Total	26.9	-	-	-	-	-	-	-	-
Chrysene	0.192	7.75E-12	3.23E-12	-	1.1E-11	-	-	-	-
Fluoranthene	0.254	-	-	-	-	0.00000748	0.00000312	-	0.0000106
Mercury (elemental)	1.54	-	-	-	-	-	-	0.291	0.291
Pyrene	0.275	-	-	-	-	0.0000027	0.00000113	-	0.00000383
Selenium	4	-	-	-	-	0.00236	-	-	0.00236
**Total Risk/HI*	-	*6.62E-09*	*2.76E-09*	*6.29E-09*	*1.57E-08*	*0.00362*	*0.000528*	*0.291*	*0.295*

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Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); U = User-provided

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Site-specific

Construction Worker Equation Inputs for DU1.2 Soil - Other Construction Activities

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Other Default	Form-input Value
$A_{c\text{-}doz}$ (areal extent of dozing) acres	.	1.52
A_{excav} (area of excavation site) m^2	.	6131.6
$A_{c\text{-}grade}$ (areal extent of grading) acres	.	1.52
A (PEF Dispersion Constant)	2.4538	2.4538
A_{surf} (areal extent of site) m^2	2023.43	6151.2272
A_{till} (areal extent of tilling) acres	.	1.52
A (VF Dispersion Constant)	2.4538	2.4538
B_l (dozing blade length) m	.	3.7
B_l (grading blade length) m	.	2.5
B (PEF Dispersion Constant)	17.566	17.566
B (VF Dispersion Constant)	17.566	17.566
C (PEF Dispersion Constant)	189.0426	189.0426
C (VF Dispersion Constant)	189.0426	189.0426
d_{excav} (average depth of excavation site) m	.	0.1524
d_s (average source depth) m	.	0.3
F_D Unitless Dispersion Correction Factor	0.185837208	0.185837208
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependant on U_m/U_t derived using Cowherd et al. (1985))	0.194	0.0495
$M_{m\text{-}doz}$ (Gravimetric soil moisture content) %	7.9	7.9
$M_{m\text{-}excav}$ (Gravimetric soil moisture content) %	12	12
M_{wind} (dust emitted by wind erosion) g	51288.84717	4173.33752
$N_{A\text{-}doz}$ (number of times site was dozed)	.	0
$N_{A\text{-}dump}$ (number of times soil is dumped)	2	1
$N_{A\text{-}grade}$ (number of times site was graded)	.	1
$N_{A\text{-}till}$ (number of times soil is tilled)	2	0
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	11.62315393
Q/C_{vol} (g/m^2-s per kg/m^3)	14.31407	11.62315393
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	11.62315393
p_{soil} (density) g/cm^3 - chemical-specific	1.68	1.68
A_c (acres)	0.5	1.52

Site-specific

Construction Worker Equation Inputs for DU1.2 Soil - Other Construction Activities

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Other Default	Form-input Value
A_s ($VF_{mlim\text{-}sc}$ acres)	0.5	1.52
A_s ($VF_{ulim\text{-}sc}$ acres)	0.5	1.52
s_{doz} (soil silt content) %	6.9	6.9
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3	0.3
AT_{cw} (averaging time - construction worker) days	365	365
BW_{cw} (body weight - construction worker) kg	80	80
ED_{cw} (exposure duration - construction worker) yr	1	1
EF_{cw} (exposure frequency - construction worker) day/yr	250	250
ET_{cw} (exposure time - construction worker) hr/day	8	8
THQ (target hazard quotient) unitless	0.1	1
IR_{cw} (soil ingestion rate - construction worker) mg/day	330	330
LT (lifetime) yr	70	70
SA_{cw} (surface area - construction worker) cm^2/day	3527	3527
TR (target cancer risk) unitless	0.000001	0.00001
S_{doz} (dozing speed) kph	11.4	11.4
S_{grade} (dozing speed) kph	11.4	11.4
s_{till} (soil silt content) %	18	18
t_c (overall duration of construction) hours	8400	8400
T_c (overall duration of construction) s	30240000	30240000
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (time over which traffic occurs) s	7200000	7200000
T_t (overall duration of traffic) s	7200000	7200000
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value) m/s	11.32	11.32
$VF_{mlim\text{-}sc}$ (volitization factor) m^3_{air}/kg_{soil}	.	4203.011616
V (fraction of vegetative cover)	0	0

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Site-specific
Construction Worker Risk for DU1.2 Soil - Other Construction Activities

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	6E-07	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	5.56E-05	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	513000000	4200
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	513000000	4200
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	513000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	513000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	513000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	513000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	513000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	513000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	513000000	4200
Pyrene	54300	326	1.19E-05	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	513000000	4200
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	513000000	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Anthracene	0.0211	-	-	-	-	6.22E-08	2.59E-08	-	8.81E-08
Benz[a]anthracene	0.135	5.45E-10	2.27E-10	6.29E-09	7.06E-09	-	-	-	-
Benzo[a]pyrene	0.128	5.17E-09	2.15E-09	4.89E-13	7.32E-09	0.00126	0.000524	0.0000297	0.00181
Benzo[b]fluoranthene	0.217	8.76E-10	3.65E-10	8.28E-14	1.24E-09	-	-	-	-
Benzo[k]fluoranthene	0.0687	2.77E-11	1.16E-11	2.62E-15	3.93E-11	-	-	-	-
Chromium, Total	26.9	-	-	-	-	-	-	-	-
Chrysene	0.192	7.75E-12	3.23E-12	7.33E-16	1.1E-11	-	-	-	-
Fluoranthene	0.254	-	-	-	-	0.00000748	0.00000312	-	0.0000106
Mercury (elemental)	1.54	-	-	-	-	-	-	0.291	0.291
Pyrene	0.275	-	-	-	-	0.0000027	0.00000113	-	0.00000383
Selenium	4	-	-	-	-	0.00236	-	9.29E-08	0.00236
**Total Risk/HI*	-	*6.62E-09*	*2.76E-09*	*6.29E-09*	*1.57E-08*	*0.00362*	*0.000528*	*0.291*	*0.295*

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Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); U = User-provided

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Site-specific
Resident Equation Inputs for DU1.3 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
A (PEF Dispersion Constant)	16.2302	11.3161
A (VF Dispersion Constant)	11.911	11.3161
A (VF Dispersion Constant - Mass Limit)	11.911	11.3161
B (PEF Dispersion Constant)	18.7762	19.6437
B (VF Dispersion Constant)	18.4385	19.6437
B (VF Dispersion Constant - Mass Limit)	18.4385	19.6437
C (PEF Dispersion Constant)	216.108	224.8172
C (VF Dispersion Constant)	209.7845	224.8172
C (VF Dispersion Constant - Mass Limit)	209.7845	224.8172
d_s (depth of source) m	.	0.3
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.0495
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
PEF (particulate emission factor) m^3/kg	1359344438	3901760993
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	56.24068479
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	56.24068479
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	56.24068479
A_s (PEF acres)	0.5	1.93
A_s (VF acres)	0.5	1.93
A_s (VF mass-limit acres)	0.5	1.93
$AF_{0\text{-}2}$ (mutagenic skin adherence factor) mg/cm^2	0.2	0.2
$AF_{2\text{-}6}$ (mutagenic skin adherence factor) mg/cm^2	0.2	0.2
$AF_{6\text{-}16}$ (mutagenic skin adherence factor) mg/cm^2	0.07	0.07
$AF_{16\text{-}26}$ (mutagenic skin adherence factor) mg/cm^2	0.07	0.07
$AF_{res\text{-}a}$ (skin adherence factor - adult) mg/cm^2	0.07	0.07
$AF_{res\text{-}c}$ (skin adherence factor - child) mg/cm^2	0.2	0.2
AT_{res} (averaging time - resident carcinogenic)	365	365
$BW_{0\text{-}2}$ (mutagenic body weight) kg	15	15
$BW_{2\text{-}6}$ (mutagenic body weight) kg	15	15
$BW_{6\text{-}16}$ (mutagenic body weight) kg	80	80
$BW_{16\text{-}26}$ (mutagenic body weight) kg	80	80
$BW_{res\text{-}a}$ (body weight - adult) kg	80	80
$BW_{res\text{-}c}$ (body weight - child) kg	15	15
$DFS_{res\text{-}adj}$ (age-adjusted soil dermal factor) mg/kg	103390	103390

Site-specific
Resident Equation Inputs for DU1.3 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
$DFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	428260	428260
ED_{res} (exposure duration) years	26	26
$ED_{0\text{-}2}$ (mutagenic exposure duration) years	2	2
$ED_{2\text{-}6}$ (mutagenic exposure duration) years	4	4
$ED_{6\text{-}16}$ (mutagenic exposure duration) years	10	10
$ED_{16\text{-}26}$ (mutagenic exposure duration) years	10	10
$ED_{res\text{-}a}$ (exposure duration - adult) years	20	20
$ED_{res\text{-}c}$ (exposure duration - child) years	6	6
EF_{res} (exposure frequency) days/year	350	350
$EF_{0\text{-}2}$ (mutagenic exposure frequency) days/year	350	350
$EF_{2\text{-}6}$ (mutagenic exposure frequency) days/year	350	350
$EF_{6\text{-}16}$ (mutagenic exposure frequency) days/year	350	350
$EF_{16\text{-}26}$ (mutagenic exposure frequency) days/year	350	350
$EF_{res\text{-}a}$ (exposure frequency - adult) days/year	350	350
$EF_{res\text{-}c}$ (exposure frequency - child) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
$ET_{0\text{-}2}$ (mutagenic exposure time) hours/day	24	24
$ET_{2\text{-}6}$ (mutagenic exposure time) hours/day	24	24
$ET_{6\text{-}16}$ (mutagenic exposure time) hours/day	24	24
$ET_{16\text{-}26}$ (mutagenic exposure time) hours/day	24	24
$ET_{res\text{-}a}$ (adult exposure time) hours/day	24	24
$ET_{res\text{-}c}$ (child exposure time) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	1
$IFS_{res\text{-}adj}$ (age-adjusted soil ingestion factor) mg/kg	36750	36750
$IFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	166833.3	166833.3
$IRS_{0\text{-}2}$ (mutagenic soil intake rate) mg/day	200	200
$IRS_{2\text{-}6}$ (mutagenic soil intake rate) mg/day	200	200
$IRS_{6\text{-}16}$ (mutagenic soil intake rate) mg/day	100	100
$IRS_{16\text{-}26}$ (mutagenic soil intake rate) mg/day	100	100
$IRS_{res\text{-}a}$ (soil intake rate - adult) mg/day	100	100
$IRS_{res\text{-}c}$ (soil intake rate - child) mg/day	200	200
LT (lifetime) years	70	70
$SA_{0\text{-}2}$ (mutagenic skin surface area) cm^2/day	2373	2373
$SA_{2\text{-}6}$ (mutagenic skin surface area) cm^2/day	2373	2373
$SA_{6\text{-}16}$ (mutagenic skin surface area) cm^2/day	6032	6032

Site-specific
Resident Equation Inputs for DU1.3 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
$SA_{16\text{-}26}$ (mutagenic skin surface area) cm^2/day	6032	6032
$SA_{res\text{-}a}$ (skin surface area - adult) cm^2/day	6032	6032
$SA_{res\text{-}c}$ (skin surface area - child) cm^2/day	2373	2373
TR (target risk) unitless	0.000001	0.00001
T_w (groundwater temperature) Celsius	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.33
VF_{ml} (volitization factor - mass-limit) m^3/kg	.	102475.0269

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Site-specific
Resident Risk for DU1.3 Soil

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	0.0000006	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
*Total Risk/HI	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	0.0000556	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	3900000000	102000
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	3900000000	102000
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	3900000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	3900000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	3900000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	3900000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	3900000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	3900000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	3900000000	102000
Pyrene	54300	326	0.0000119	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	3900000000	102000
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	3900000000	-
*Total Risk/HI	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion Child HQ	Dermal Child HQ	Inhalation Child HQ	Noncarcinogenic Child HI	Ingestion Adult HQ	Dermal Adult HQ	Inhalation Adult HQ	Noncarcinogenic Adult HI
Anthracene	0.361	-	-	-	-	0.00000462	0.00000142	-	0.00000604	4.33E-07	0.000000238	-	0.00000067
Benz[a]anthracene	0.456	2.98E-07	9.94E-08	0.000000263	0.00000066	-	-	-	-	-	-	-	-
Benzo[a]pyrene	0.44	0.00000287	9.59E-07	6.67E-11	0.00000383	0.0188	0.00578	0.0000541	0.0246	0.00176	0.000965	0.0000541	0.00278
Benzo[b]fluoranthene	1	6.53E-07	2.18E-07	1.52E-11	0.000000871	-	-	-	-	-	-	-	-
Benzo[k]fluoranthene	0.317	2.07E-08	6.91E-09	4.81E-13	2.76E-08	-	-	-	-	-	-	-	-
Chromium, Total	21.4	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	0.839	5.48E-09	1.83E-09	1.27E-13	7.31E-09	-	-	-	-	-	-	-	-
Fluoranthene	1.08	-	-	-	-	0.000138	0.0000426	-	0.000181	1.29E-05	0.00000711	-	0.0000201
Mercury (elemental)	0.058	-	-	-	-	-	-	0.00181	0.00181	-	-	0.00181	0.00181
Pyrene	1.06	-	-	-	-	0.0000452	0.0000139	-	0.0000591	4.24E-06	0.00000232	-	0.00000656
Selenium	4	-	-	-	-	0.0102	-	4.92E-08	0.0102	0.000959	-	4.92E-08	0.000959
*Total Risk/HI	-	3.85E-06	1.28E-06	0.000000263	0.0000054	0.0292	0.00584	0.00186	0.0369	0.00273	0.000975	0.00186	0.00557

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Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); U = User-provided

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Site-specific
Composite Worker Equation Inputs for DU1.3 Soil

* Inputted values different from Composite Worker defaults are highlighted.

Variable	Composite Worker Soil Default	Form-input Value
A (PEF Dispersion Constant)	16.2302	11.3161
A (VF Dispersion Constant)	11.911	11.3161
A (VF Dispersion Constant - Mass Limit)	11.911	11.3161
B (PEF Dispersion Constant)	18.7762	19.6437
B (VF Dispersion Constant)	18.4385	19.6437
B (VF Dispersion Constant - Mass Limit)	18.4385	19.6437
C (PEF Dispersion Constant)	216.108	224.8172
C (VF Dispersion Constant)	209.7845	224.8172
C (VF Dispersion Constant - Mass Limit)	209.7845	224.8172
d_s (depth of source) m	.	0.3
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.0495
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
PEF (particulate emission factor) m^3/kg	1359344438	3901760993
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	56.24068479
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	56.24068479
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	56.24068479
A_s (PEF acres)	0.5	1.93
A_s (VF acres)	0.5	1.93
A_s (VF mass-limit acres)	0.5	1.93
AF_w (skin adherence factor - composite worker) mg/cm^2	0.12	0.12
AT_w (averaging time - composite worker)	365	365
BW_w (body weight - composite worker)	80	80
ED_w (exposure duration - composite worker) yr	25	25
EF_w (exposure frequency - composite worker) day/yr	250	250
ET_w (exposure time - composite worker) hr	8	8
THQ (target hazard quotient) unitless	0.1	1
IR_w (soil ingestion rate - composite worker) mg/day	100	100
LT (lifetime) yr	70	70
SA_w (surface area - composite worker) cm^2/day	3527	3527
TR (target risk) unitless	0.000001	0.00001
T_w (groundwater temperature) Celsius	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396

Site-specific
Composite Worker Equation Inputs for DU1.3 Soil

* Inputted values different from Composite Worker defaults are highlighted.

Variable	Composite Worker Soil Default	Form-input Value
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.33
VF_{ml} (volitization factor - mass-limit) m^3/kg	.	102475.0269

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Site-specific
Composite Worker Risk for DU1.3 Soil

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	0.0000006	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	0.0000556	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	3900000000	102000
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	3900000000	102000
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	3900000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	3900000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	3900000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	3900000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	3900000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	3900000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	3900000000	102000
Pyrene	54300	326	0.0000119	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	3900000000	102000
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	3900000000	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Anthracene	0.361	-	-	-	-	0.000000309	0.00000017	-	0.000000479
Benz[a]anthracene	0.456	1.39E-08	7.67E-09	2.18E-08	4.34E-08	-	-	-	-
Benzo[a]pyrene	0.44	1.35E-07	7.4E-08	5.52E-12	0.000000209	0.00126	0.000691	0.0000129	0.00196
Benzo[b]fluoranthene	1	3.06E-08	1.68E-08	1.25E-12	4.74E-08	-	-	-	-
Benzo[k]fluoranthene	0.317	9.69E-10	5.33E-10	3.97E-14	1.5E-09	-	-	-	-
Chromium, Total	21.4	-	-	-	-	-	-	-	-
Chrysene	0.839	2.57E-10	1.41E-10	1.05E-14	3.98E-10	-	-	-	-
Fluoranthene	1.08	-	-	-	-	0.00000925	0.00000509	-	0.0000143
Mercury (elemental)	0.058	-	-	-	-	-	-	0.000431	0.000431
Pyrene	1.06	-	-	-	-	0.00000303	0.00000166	-	0.00000469
Selenium	4	-	-	-	-	0.000685	-	1.17E-08	0.000685
**Total Risk/HI*	-	*0.00000018*	*9.92E-08*	*2.18E-08*	*0.000000301*	*0.00195*	*0.000698*	*0.000444*	*0.00309*

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Site-specific

Construction Worker Equation Inputs for DU1.3 Soil - Unpaved Road Traffic

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Unpaved Default	Form-input Value
L_R (length of road segment) ft	147.58077	289.9502166
A (PEF Dispersion Constant)	12.9351	12.9351
A_R (surface area of contaminated road segment) m^2	274.21393	1616.234698
A (VF Dispersion Constant)	2.4538	2.4538
W_R (width of road segment) ft	20	60
B (PEF Dispersion Constant)	5.7383	5.7383
B (VF Dispersion Constant)	17.566	17.566
C (PEF Dispersion Constant)	71.7711	71.7711
C (VF Dispersion Constant)	189.0426	189.0426
distance (road length) km/day	0.04498	0.088376693
d_s (average source depth) m	.	0.3
F_D Unitless Dispersion Correction Factor	0.185837208	0.185837208
foc (fraction organic carbon in soil) g/g	0.006	0.006
uncontrolled conditions) %	0.2	0.2
Number of cars	.	0
Number of trucks	.	86
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p (days per year with at least .01" of precipitation) days/year	.	90
p_b ($VF_{ulim-sc}$ dry soil bulk density) g/cm^3	1.5	1.5
p_b ($VF_{mlim-sc}$ dry soil bulk density) g/cm^3	1.5	1.5
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{sr} (g/m^2-s per kg/m^3)	23.01785	18.5342489
Q/C_{vol} (g/m^2-s per kg/m^3)	14.31407	11.13371505
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	11.13371505
s (road surface silt content) %	8.5	8.5
A_s (PEF_{sc} - acres)	0.5	1.93
A_s ($VF_{mlim-sc}$ acres)	0.5	1.93
A_s ($VF_{ulim-sc}$ acres)	0.5	1.93
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3	0.3
AT_{cw} (averaging time - construction worker) days	365	365
BW_{cw} (body weight - construction worker) kg	80	80
ED_{cw} (exposure duration - construction worker) yr	1	1
EF_{cw} (exposure frequency - construction worker) day/yr	250	250
ET_{cw} (exposure time - construction worker) hr/day	8	8
THQ (target hazard quotient) unitless	0.1	1

Site-specific

Construction Worker Equation Inputs for DU1.3 Soil - Unpaved Road Traffic

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Unpaved Default	Form-input Value
IR_{cw} (soil ingestion rate - construction worker) mg/day	330	330
LT (lifetime) yr	70	70
SA_{cw} (surface area - construction worker) cm^2/day	3527	3527
TR (target cancer risk) unitless	0.000001	0.00001
t_c (overall duration of construction) hours	8400	8400
T_c (overall duration of construction) s	30240000	30240000
T_w (groundwater temperature) C	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T_t (overall duration of traffic) s	7200000	7200000
$VF_{mlim-sc}$ (volitization factor) m^3_{air}/kg_{soil}	.	4026.027186
Tons per car	.	2.6
Tons per truck	.	44.4

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Site-specific
Construction Worker Risk for DU1.3 Soil - Unpaved Road Traffic

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	6E-07	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	5.56E-05	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	0	4030
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	0	4030
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	0	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	0	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	0	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	0	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	0	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	0	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	0	4030
Pyrene	54300	326	1.19E-05	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	0	4030
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	0	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Anthracene	0.361	-	-	-	-	0.00000106	0.000000443	-	0.00000151
Benz[a]anthracene	0.456	1.84E-09	7.67E-10	2.22E-08	2.48E-08	-	-	-	-
Benzo[a]pyrene	0.44	1.78E-08	7.4E-09	-	2.52E-08	0.00432	0.0018	-	0.00612
Benzo[b]fluoranthene	1	4.04E-09	1.68E-09	-	5.72E-09	-	-	-	-
Benzo[k]fluoranthene	0.317	1.28E-10	5.33E-11	-	1.81E-10	-	-	-	-
Chromium, Total	21.4	-	-	-	-	-	-	-	-
Chrysene	0.839	3.39E-11	1.41E-11	-	4.8E-11	-	-	-	-
Fluoranthene	1.08	-	-	-	-	0.0000318	0.0000133	-	0.0000451
Mercury (elemental)	0.058	-	-	-	-	-	-	0.0114	0.0114
Pyrene	1.06	-	-	-	-	0.0000104	0.00000434	-	0.0000148
Selenium	4	-	-	-	-	0.00236	-	-	0.00236
**Total Risk/HI*	-	*2.38E-08*	*9.92E-09*	*2.22E-08*	*5.59E-08*	*0.00672*	*0.00182*	*0.0114*	*0.02*

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Site-specific Construction Worker Equation Inputs for DU1.3 Soil - Other Construction Activities

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Other Default	Form-input Value
$A_{c\text{-}doz}$ (areal extent of dozing) acres	.	1.93
A_{excav} (area of excavation site) m^2	.	7803.85
$A_{c\text{-}grade}$ (areal extent of grading) acres	.	1.93
A (PEF Dispersion Constant)	2.4538	2.4538
A_{surf} (areal extent of site) m^2	2023.43	7810.4398
A_{till} (areal extent of tilling) acres	.	1.93
A (VF Dispersion Constant)	2.4538	2.4538
B_l (dozing blade length) m	.	3.7
B_l (grading blade length) m	.	2.5
B (PEF Dispersion Constant)	17.566	17.566
B (VF Dispersion Constant)	17.566	17.566
C (PEF Dispersion Constant)	189.0426	189.0426
C (VF Dispersion Constant)	189.0426	189.0426
d_{excav} (average depth of excavation site) m	.	0.1524
d_s (average source depth) m	.	0.3
F_D Unitless Dispersion Correction Factor	0.185837208	0.185837208
foc (fraction organic carbon in soil) g/g	0.006	0.006
(1985))	0.194	0.0495
$M_{m\text{-}doz}$ (Gravimetric soil moisture content) %	7.9	7.9
$M_{m\text{-}excav}$ (Gravimetric soil moisture content) %	12	12
M_{wind} (dust emitted by wind erosion) g	51288.84717	3550.35707
$N_{A\text{-}doz}$ (number of times site was dozed)	.	0
$N_{A\text{-}dump}$ (number of times soil is dumped)	2	1
$N_{A\text{-}grade}$ (number of times site was graded)	.	1
$N_{A\text{-}till}$ (number of times soil is tilled)	2	0
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	11.13371505
Q/C_{vol} (g/m^2-s per kg/m^3)	14.31407	11.13371505
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	11.13371505
p_{soil} (density) g/cm^3 - chemical-specific	1.68	1.68
A_c (acres)	0.5	1.93
A_s ($VF_{mlim\text{-}sc}$ acres)	0.5	1.93

Site-specific
Construction Worker Equation Inputs for DU1.3 Soil - Other Construction Activities

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Other Default	Form-input Value
A_s ($VF_{ulim-sc}$ acres)	0.5	1.93
s_{doz} (soil silt content) %	6.9	6.9
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3	0.3
AT_{cw} (averaging time - construction worker) days	365	365
BW_{cw} (body weight - construction worker) kg	80	80
ED_{cw} (exposure duration - construction worker) yr	1	1
EF_{cw} (exposure frequency - construction worker) day/yr	250	250
ET_{cw} (exposure time - construction worker) hr/day	8	8
THQ (target hazard quotient) unitless	0.1	1
IR_{cw} (soil ingestion rate - construction worker) mg/day	330	330
LT (lifetime) yr	70	70
SA_{cw} (surface area - construction worker) cm^2/day	3527	3527
TR (target cancer risk) unitless	0.000001	0.00001
S_{doz} (dozing speed) kph	11.4	11.4
S_{grade} (dozing speed) kph	11.4	11.4
s_{till} (soil silt content) %	18	18
t_c (overall duration of construction) hours	8400	8400
T_c (overall duration of construction) s	30240000	30240000
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (time over which traffic occurs) s	7200000	7200000
T_t (overall duration of traffic) s	7200000	7200000
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value) m/s	11.32	11.32
$VF_{mlim-sc}$ (volitization factor) m^3_{air}/kg_{soil}	.	4026.027186
V (fraction of vegetative cover)	0	0.33

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Site-specific
Construction Worker Risk for DU1.3 Soil - Other Construction Activities

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	0.0000006	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	0.0000556	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	659000000	4030
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	659000000	4030
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	659000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	659000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	659000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	659000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	659000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	659000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	659000000	4030
Pyrene	54300	326	0.0000119	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	659000000	4030
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	659000000	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Anthracene	0.361	-	-	-	-	0.00000106	0.000000443	-	0.00000151
Benz[a]anthracene	0.456	1.84E-09	7.67E-10	2.22E-08	2.48E-08	-	-	-	-
Benzo[a]pyrene	0.44	1.78E-08	7.4E-09	1.31E-12	2.52E-08	0.00432	0.0018	0.0000795	0.0062
Benzo[b]fluoranthene	1	4.04E-09	1.68E-09	2.97E-13	5.72E-09	-	-	-	-
Benzo[k]fluoranthene	0.317	1.28E-10	5.33E-11	9.41E-15	1.81E-10	-	-	-	-
Chromium, Total	21.4	-	-	-	-	-	-	-	-
Chrysene	0.839	3.39E-11	1.41E-11	2.49E-15	4.8E-11	-	-	-	-
Fluoranthene	1.08	-	-	-	-	0.0000318	0.0000133	-	0.0000451
Mercury (elemental)	0.058	-	-	-	-	-	-	0.0114	0.0114
Pyrene	1.06	-	-	-	-	0.0000104	0.00000434	-	0.0000148
Selenium	4	-	-	-	-	0.00236	-	7.22E-08	0.00236
**Total Risk/HI*	-	*2.38E-08*	*9.92E-09*	*2.22E-08*	*5.59E-08*	*0.00672*	*0.00182*	*0.0115*	*0.0201*

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Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); U = User-provided

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Site-specific
Resident Equation Inputs for DU2.1 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
A (PEF Dispersion Constant)	16.2302	11.3161
A (VF Dispersion Constant)	11.911	11.3161
A (VF Dispersion Constant - Mass Limit)	11.911	11.3161
B (PEF Dispersion Constant)	18.7762	19.6437
B (VF Dispersion Constant)	18.4385	19.6437
B (VF Dispersion Constant - Mass Limit)	18.4385	19.6437
C (PEF Dispersion Constant)	216.108	224.8172
C (VF Dispersion Constant)	209.7845	224.8172
C (VF Dispersion Constant - Mass Limit)	209.7845	224.8172
d_s (depth of source) m	.	0.3
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.0495
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
PEF (particulate emission factor) m^3/kg	1359344438	3978655493
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	57.34905593
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	57.34905593
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	57.34905593
A_s (PEF acres)	0.5	1.72
A_s (VF acres)	0.5	1.72
A_s (VF mass-limit acres)	0.5	1.72
$AF_{0\text{-}2}$ (mutagenic skin adherence factor) mg/cm^2	0.2	0.2
$AF_{2\text{-}6}$ (mutagenic skin adherence factor) mg/cm^2	0.2	0.2
$AF_{6\text{-}16}$ (mutagenic skin adherence factor) mg/cm^2	0.07	0.07
$AF_{16\text{-}26}$ (mutagenic skin adherence factor) mg/cm^2	0.07	0.07
$AF_{res\text{-}a}$ (skin adherence factor - adult) mg/cm^2	0.07	0.07
$AF_{res\text{-}c}$ (skin adherence factor - child) mg/cm^2	0.2	0.2
AT_{res} (averaging time - resident carcinogenic)	365	365
$BW_{0\text{-}2}$ (mutagenic body weight) kg	15	15
$BW_{2\text{-}6}$ (mutagenic body weight) kg	15	15
$BW_{6\text{-}16}$ (mutagenic body weight) kg	80	80
$BW_{16\text{-}26}$ (mutagenic body weight) kg	80	80
$BW_{res\text{-}a}$ (body weight - adult) kg	80	80
$BW_{res\text{-}c}$ (body weight - child) kg	15	15
$DFS_{res\text{-}adj}$ (age-adjusted soil dermal factor) mg/kg	103390	103390

Site-specific
Resident Equation Inputs for DU2.1 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
$DFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	428260	428260
ED_{res} (exposure duration) years	26	26
$ED_{0\text{-}2}$ (mutagenic exposure duration) years	2	2
$ED_{2\text{-}6}$ (mutagenic exposure duration) years	4	4
$ED_{6\text{-}16}$ (mutagenic exposure duration) years	10	10
$ED_{16\text{-}26}$ (mutagenic exposure duration) years	10	10
$ED_{res\text{-}a}$ (exposure duration - adult) years	20	20
$ED_{res\text{-}c}$ (exposure duration - child) years	6	6
EF_{res} (exposure frequency) days/year	350	350
$EF_{0\text{-}2}$ (mutagenic exposure frequency) days/year	350	350
$EF_{2\text{-}6}$ (mutagenic exposure frequency) days/year	350	350
$EF_{6\text{-}16}$ (mutagenic exposure frequency) days/year	350	350
$EF_{16\text{-}26}$ (mutagenic exposure frequency) days/year	350	350
$EF_{res\text{-}a}$ (exposure frequency - adult) days/year	350	350
$EF_{res\text{-}c}$ (exposure frequency - child) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
$ET_{0\text{-}2}$ (mutagenic exposure time) hours/day	24	24
$ET_{2\text{-}6}$ (mutagenic exposure time) hours/day	24	24
$ET_{6\text{-}16}$ (mutagenic exposure time) hours/day	24	24
$ET_{16\text{-}26}$ (mutagenic exposure time) hours/day	24	24
$ET_{res\text{-}a}$ (adult exposure time) hours/day	24	24
$ET_{res\text{-}c}$ (child exposure time) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	1
$IFS_{res\text{-}adj}$ (age-adjusted soil ingestion factor) mg/kg	36750	36750
$IFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	166833.3	166833.3
$IRS_{0\text{-}2}$ (mutagenic soil intake rate) mg/day	200	200
$IRS_{2\text{-}6}$ (mutagenic soil intake rate) mg/day	200	200
$IRS_{6\text{-}16}$ (mutagenic soil intake rate) mg/day	100	100
$IRS_{16\text{-}26}$ (mutagenic soil intake rate) mg/day	100	100
$IRS_{res\text{-}a}$ (soil intake rate - adult) mg/day	100	100
$IRS_{res\text{-}c}$ (soil intake rate - child) mg/day	200	200
LT (lifetime) years	70	70
$SA_{0\text{-}2}$ (mutagenic skin surface area) cm^2/day	2373	2373
$SA_{2\text{-}6}$ (mutagenic skin surface area) cm^2/day	2373	2373
$SA_{6\text{-}16}$ (mutagenic skin surface area) cm^2/day	6032	6032

Site-specific
Resident Equation Inputs for DU2.1 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
$SA_{16\text{-}26}$ (mutagenic skin surface area) cm^2/day	6032	6032
$SA_{res\text{-}a}$ (skin surface area - adult) cm^2/day	6032	6032
$SA_{res\text{-}c}$ (skin surface area - child) cm^2/day	2373	2373
TR (target risk) unitless	0.000001	0.00001
T_w (groundwater temperature) Celsius	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.33
VF_{ml} (volitization factor - mass-limit) m^3/kg	.	104494.5678

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Site-specific
Resident Risk for DU2.1 Soil

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	0.0000006	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	0.0000556	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	3980000000	104000
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	3980000000	104000
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	3980000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	3980000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	3980000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	3980000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	3980000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	3980000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	3980000000	104000
Pyrene	54300	326	0.0000119	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	3980000000	104000
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	3980000000	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion Child HQ	Dermal Child HQ	Inhalation Child HQ	Noncarcinogenic Child HI	Ingestion Adult HQ	Dermal Adult HQ	Inhalation Adult HQ	Noncarcinogenic Adult HI
Anthracene	0.34	-	-	-	-	0.00000435	0.00000134	-	0.00000569	4.08E-07	0.000000224	-	0.000000631
Benz[a]anthracene	0.468	3.06E-07	1.02E-07	0.000000265	0.000000673	-	-	-	-	-	-	-	-
Benzo[a]pyrene	0.505	0.0000033	0.0000011	7.51E-11	0.0000044	0.0215	0.00664	0.0000609	0.0282	0.00202	0.00111	0.0000609	0.00319
Benzo[b]fluoranthene	0.942	6.15E-07	2.05E-07	1.4E-11	0.00000082	-	-	-	-	-	-	-	-
Benzo[k]fluoranthene	0.282	1.84E-08	6.14E-09	4.19E-13	2.46E-08	-	-	-	-	-	-	-	-
Chromium, Total	21.4	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	0.815	5.32E-09	1.78E-09	1.21E-13	7.1E-09	-	-	-	-	-	-	-	-
Fluoranthene	1.17	-	-	-	-	0.00015	0.0000461	-	0.000196	0.000014	0.0000077	-	0.0000217
Mercury (elemental)	0.285	-	-	-	-	-	-	0.00872	0.00872	-	-	0.00872	0.00872
Pyrene	1.12	-	-	-	-	0.0000477	0.0000147	-	0.0000625	4.47E-06	0.00000246	-	0.00000693
Selenium	4	-	-	-	-	0.0102	-	4.82E-08	0.0102	0.000959	-	4.82E-08	0.000959
**Total Risk/HI*	-	*4.24E-06*	*1.42E-06*	*0.000000265*	*0.00000592*	*0.032*	*0.0067*	*0.00878*	*0.0474*	*0.003*	*0.00112*	*0.00878*	*0.0129*

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Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); U = User-provided

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Site-specific
Composite Worker Equation Inputs for DU2.1 Soil

* Inputted values different from Composite Worker defaults are highlighted.

Variable	Composite Worker Soil Default	Form-input Value
A (PEF Dispersion Constant)	16.2302	11.3161
A (VF Dispersion Constant)	11.911	11.3161
A (VF Dispersion Constant - Mass Limit)	11.911	11.3161
B (PEF Dispersion Constant)	18.7762	19.6437
B (VF Dispersion Constant)	18.4385	19.6437
B (VF Dispersion Constant - Mass Limit)	18.4385	19.6437
C (PEF Dispersion Constant)	216.108	224.8172
C (VF Dispersion Constant)	209.7845	224.8172
C (VF Dispersion Constant - Mass Limit)	209.7845	224.8172
d_s (depth of source) m	.	0.3
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.0495
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
PEF (particulate emission factor) m^3/kg	1359344438	3978655493
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	57.34905593
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	57.34905593
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	57.34905593
A_s (PEF acres)	0.5	1.72
A_s (VF acres)	0.5	1.72
A_s (VF mass-limit acres)	0.5	1.72
AF_w (skin adherence factor - composite worker) mg/cm^2	0.12	0.12
AT_w (averaging time - composite worker)	365	365
BW_w (body weight - composite worker)	80	80
ED_w (exposure duration - composite worker) yr	25	25
EF_w (exposure frequency - composite worker) day/yr	250	250
ET_w (exposure time - composite worker) hr	8	8
THQ (target hazard quotient) unitless	0.1	1
IR_w (soil ingestion rate - composite worker) mg/day	100	100
LT (lifetime) yr	70	70
SA_w (surface area - composite worker) cm^2/day	3527	3527
TR (target risk) unitless	0.000001	0.00001
T_w (groundwater temperature) Celsius	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396

Site-specific
Composite Worker Equation Inputs for DU2.1 Soil

* Inputted values different from Composite Worker defaults are highlighted.

Variable	Composite Worker Soil Default	Form-input Value
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.33
VF_{ml} (volitization factor - mass-limit) m^3/kg	.	104494.5678

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Site-specific
Composite Worker Risk for DU2.1 Soil

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	0.0000006	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	0.0000556	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	3980000000	104000
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	3980000000	104000
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	3980000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	3980000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	3980000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	3980000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	3980000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	3980000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	3980000000	104000
Pyrene	54300	326	0.0000119	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	3980000000	104000
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	3980000000	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Anthracene	0.34	-	-	-	-	0.000000291	0.00000016	-	0.000000451
Benz[a]anthracene	0.468	1.43E-08	7.87E-09	2.19E-08	4.41E-08	-	-	-	-
Benzo[a]pyrene	0.505	1.54E-07	8.5E-08	6.21E-12	0.000000239	0.00144	0.000793	0.0000145	0.00225
Benzo[b]fluoranthene	0.942	2.88E-08	1.58E-08	1.16E-12	4.47E-08	-	-	-	-
Benzo[k]fluoranthene	0.282	8.62E-10	4.74E-10	3.47E-14	1.34E-09	-	-	-	-
Chromium, Total	21.4	-	-	-	-	-	-	-	-
Chrysene	0.815	2.49E-10	1.37E-10	1E-14	3.86E-10	-	-	-	-
Fluoranthene	1.17	-	-	-	-	0.00001	0.00000551	-	0.0000155
Mercury (elemental)	0.285	-	-	-	-	-	-	0.00208	0.00208
Pyrene	1.12	-	-	-	-	0.0000032	0.00000176	-	0.00000496
Selenium	4	-	-	-	-	0.000685	-	1.15E-08	0.000685
**Total Risk/HI*	-	*1.99E-07*	*1.09E-07*	*2.19E-08*	*0.00000033*	*0.00214*	*0.0008*	*0.00209*	*0.00503*

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Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); U = User-provided

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Site-specific Construction Worker Equation Inputs for DU2.1 Soil - Unpaved Road Traffic

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Unpaved Default	Form-input Value
L_R (length of road segment) ft	147.58077	273.72156
A (PEF Dispersion Constant)	12.9351	12.9351
A_R (surface area of contaminated road segment) m^2	274.21393	1525.773245
A (VF Dispersion Constant)	2.4538	2.4538
W_R (width of road segment) ft	20	60
B (PEF Dispersion Constant)	5.7383	5.7383
B (VF Dispersion Constant)	17.566	17.566
C (PEF Dispersion Constant)	71.7711	71.7711
C (VF Dispersion Constant)	189.0426	189.0426
distance (road length) km/day	0.04498	0.083430206
d_s (average source depth) m	.	0.3
F_D Unitless Dispersion Correction Factor	0.185837208	0.185837208
foc (fraction organic carbon in soil) g/g	0.006	0.006
uncontrolled conditions) %	0.2	0.2
Number of cars	.	0
Number of trucks	.	77
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p (days per year with at least .01" of precipitation) days/year	.	90
p_b ($VF_{ulim-sc}$ dry soil bulk density) g/cm^3	1.5	1.5
p_b ($VF_{mlim-sc}$ dry soil bulk density) g/cm^3	1.5	1.5
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{sr} (g/m^2-s per kg/m^3)	23.01785	18.84249985
Q/C_{vol} (g/m^2-s per kg/m^3)	14.31407	11.36632371
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	11.36632371
s (road surface silt content) %	8.5	8.5
A_s (PEF_{sc} - acres)	0.5	1.72
A_s ($VF_{mlim-sc}$ acres)	0.5	1.72
A_s ($VF_{ulim-sc}$ acres)	0.5	1.72
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3	0.3
AT_{cw} (averaging time - construction worker) days	365	365
BW_{cw} (body weight - construction worker) kg	80	80
ED_{cw} (exposure duration - construction worker) yr	1	1
EF_{cw} (exposure frequency - construction worker) day/yr	250	250
ET_{cw} (exposure time - construction worker) hr/day	8	8
THQ (target hazard quotient) unitless	0.1	1
IR_{cw} (soil ingestion rate - construction worker) mg/day	330	330

Site-specific
Construction Worker Equation Inputs for DU2.1 Soil - Unpaved Road Traffic

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Unpaved Default	Form-input Value
LT (lifetime) yr	70	70
SA_{cw} (surface area - construction worker) cm^2/day	3527	3527
TR (target cancer risk) unitless	0.000001	0.00001
t_c (overall duration of construction) hours	8400	8400
T_c (overall duration of construction) s	30240000	30240000
T_w (groundwater temperature) C	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T_t (overall duration of traffic) s	7200000	7200000
$VF_{mlim-sc}$ (volitization factor) m^3_{air}/kg_{soil}	.	4110.140062
Tons per car	.	2.6
Tons per truck	.	44.4

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Site-specific
Construction Worker Risk for DU2.1 Soil - Unpaved Road Traffic

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	6E-07	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	5.56E-05	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	0	4110
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	0	4110
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	0	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	0	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	0	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	0	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	0	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	0	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	0	4110
Pyrene	54300	326	1.19E-05	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	0	4110
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	0	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Anthracene	0.34	-	-	-	-	0.000001	0.000000418	-	0.00000142
Benz[a]anthracene	0.468	1.89E-09	7.87E-10	2.23E-08	0.000000025	-	-	-	-
Benzo[a]pyrene	0.505	2.04E-08	8.5E-09	-	2.89E-08	0.00496	0.00207	-	0.00703
Benzo[b]fluoranthene	0.942	3.8E-09	1.58E-09	-	5.39E-09	-	-	-	-
Benzo[k]fluoranthene	0.282	1.14E-10	4.74E-11	-	1.61E-10	-	-	-	-
Chromium, Total	21.4	-	-	-	-	-	-	-	-
Chrysene	0.815	3.29E-11	1.37E-11	-	4.66E-11	-	-	-	-
Fluoranthene	1.17	-	-	-	-	0.0000345	0.0000144	-	0.0000488
Mercury (elemental)	0.285	-	-	-	-	-	-	0.055	0.055
Pyrene	1.12	-	-	-	-	0.000011	0.00000459	-	0.0000156
Selenium	4	-	-	-	-	0.00236	-	-	0.00236
**Total Risk/HI*	-	*2.62E-08*	*1.09E-08*	*2.23E-08*	*5.94E-08*	*0.00736*	*0.00209*	*0.055*	*0.0645*

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Site-specific Construction Worker Equation Inputs for DU2.1 Soil - Other Construction Activities

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Other Default	Form-input Value
$A_{c\text{-}doz}$ (areal extent of dozing) acres	.	1.72
A_{excav} (area of excavation site) m^2	.	6967.73
$A_{c\text{-}grade}$ (areal extent of grading) acres	.	1.72
A (PEF Dispersion Constant)	2.4538	2.4538
A_{surf} (areal extent of site) m^2	2023.43	6960.5992
A_{till} (areal extent of tilling) acres	.	1.72
A (VF Dispersion Constant)	2.4538	2.4538
B_l (dozing blade length) m	.	3.7
B_l (grading blade length) m	.	2.5
B (PEF Dispersion Constant)	17.566	17.566
B (VF Dispersion Constant)	17.566	17.566
C (PEF Dispersion Constant)	189.0426	189.0426
C (VF Dispersion Constant)	189.0426	189.0426
d_{excav} (average depth of excavation site) m	.	0.1524
d_s (average source depth) m	.	0.3
F_D Unitless Dispersion Correction Factor	0.185837208	0.185837208
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependant on U_m/U_t derived using Cowherd et al. (1985))	0.194	0.0495
$M_{m\text{-}doz}$ (Gravimetric soil moisture content) %	7.9	7.9
$M_{m\text{-}excav}$ (Gravimetric soil moisture content) %	12	12
M_{wind} (dust emitted by wind erosion) g	51288.84717	3164.048788
$N_{A\text{-}doz}$ (number of times site was dozed)	.	0
$N_{A\text{-}dump}$ (number of times soil is dumped)	2	1
$N_{A\text{-}grade}$ (number of times site was graded)	.	1
$N_{A\text{-}till}$ (number of times soil is tilled)	2	0
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	11.36632371
Q/C_{vol} (g/m^2-s per kg/m^3)	14.31407	11.36632371
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	11.36632371
p_{soil} (density) g/cm^3 - chemical-specific	1.68	1.68
A_c (acres)	0.5	1.72

Site-specific Construction Worker Equation Inputs for DU2.1 Soil - Other Construction Activities

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Other Default	Form-input Value
A_s ($VF_{mlim\text{-}sc}$ acres)	0.5	1.72
A_s ($VF_{ulim\text{-}sc}$ acres)	0.5	1.72
s_{doz} (soil silt content) %	6.9	6.9
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3	0.3
AT_{cw} (averaging time - construction worker) days	365	365
BW_{cw} (body weight - construction worker) kg	80	80
ED_{cw} (exposure duration - construction worker) yr	1	1
EF_{cw} (exposure frequency - construction worker) day/yr	250	250
ET_{cw} (exposure time - construction worker) hr/day	8	8
THQ (target hazard quotient) unitless	0.1	1
IR_{cw} (soil ingestion rate - construction worker) mg/day	330	330
LT (lifetime) yr	70	70
SA_{cw} (surface area - construction worker) cm^2/day	3527	3527
TR (target cancer risk) unitless	0.000001	0.00001
S_{doz} (dozing speed) kph	11.4	11.4
S_{grade} (dozing speed) kph	11.4	11.4
s_{till} (soil silt content) %	18	18
t_c (overall duration of construction) hours	8400	8400
T_c (overall duration of construction) s	30240000	30240000
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (time over which traffic occurs) s	7200000	7200000
T_t (overall duration of traffic) s	7200000	7200000
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value) m/s	11.32	11.32
$VF_{mlim\text{-}sc}$ (volitization factor) m^3_{air}/kg_{soil}	.	4110.140062
V (fraction of vegetative cover)	0	0.33

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Site-specific
Construction Worker Risk for DU2.1 Soil - Other Construction Activities

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	6E-07	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	5.56E-05	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	673000000	4110
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	673000000	4110
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	673000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	673000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	673000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	673000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	673000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	673000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	673000000	4110
Pyrene	54300	326	1.19E-05	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	673000000	4110
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	673000000	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Anthracene	0.34	-	-	-	-	0.000001	0.000000418	-	0.00000142
Benz[a]anthracene	0.468	1.89E-09	7.87E-10	2.23E-08	0.000000025	-	-	-	-
Benzo[a]pyrene	0.505	2.04E-08	8.5E-09	1.47E-12	2.89E-08	0.00496	0.00207	0.0000893	0.00712
Benzo[b]fluoranthene	0.942	3.8E-09	1.58E-09	2.74E-13	5.39E-09	-	-	-	-
Benzo[k]fluoranthene	0.282	1.14E-10	4.74E-11	8.2E-15	1.61E-10	-	-	-	-
Chromium, Total	21.4	-	-	-	-	-	-	-	-
Chrysene	0.815	3.29E-11	1.37E-11	2.37E-15	4.66E-11	-	-	-	-
Fluoranthene	1.17	-	-	-	-	0.0000345	0.0000144	-	0.0000488
Mercury (elemental)	0.285	-	-	-	-	-	-	0.055	0.055
Pyrene	1.12	-	-	-	-	0.000011	0.00000459	-	0.0000156
Selenium	4	-	-	-	-	0.00236	-	7.08E-08	0.00236
**Total Risk/HI*	-	*2.62E-08*	*1.09E-08*	*2.23E-08*	*5.94E-08*	*0.00736*	*0.00209*	*0.0551*	*0.0646*

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Site-specific
Resident Equation Inputs for DU2.2 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
A (PEF Dispersion Constant)	16.2302	11.3161
A (VF Dispersion Constant)	11.911	11.3161
A (VF Dispersion Constant - Mass Limit)	11.911	11.3161
B (PEF Dispersion Constant)	18.7762	19.6437
B (VF Dispersion Constant)	18.4385	19.6437
B (VF Dispersion Constant - Mass Limit)	18.4385	19.6437
C (PEF Dispersion Constant)	216.108	224.8172
C (VF Dispersion Constant)	209.7845	224.8172
C (VF Dispersion Constant - Mass Limit)	209.7845	224.8172
d_s (depth of source) m	.	0.3
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.0495
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
PEF (particulate emission factor) m^3/kg	1359344438	3449677717
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	49.72427513
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	49.72427513
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	49.72427513
A_s (PEF acres)	0.5	4.06
A_s (VF acres)	0.5	4.06
A_s (VF mass-limit acres)	0.5	4.06
$AF_{0\text{-}2}$ (mutagenic skin adherence factor) mg/cm^2	0.2	0.2
$AF_{2\text{-}6}$ (mutagenic skin adherence factor) mg/cm^2	0.2	0.2
$AF_{6\text{-}16}$ (mutagenic skin adherence factor) mg/cm^2	0.07	0.07
$AF_{16\text{-}26}$ (mutagenic skin adherence factor) mg/cm^2	0.07	0.07
$AF_{res\text{-}a}$ (skin adherence factor - adult) mg/cm^2	0.07	0.07
$AF_{res\text{-}c}$ (skin adherence factor - child) mg/cm^2	0.2	0.2
AT_{res} (averaging time - resident carcinogenic)	365	365
$BW_{0\text{-}2}$ (mutagenic body weight) kg	15	15
$BW_{2\text{-}6}$ (mutagenic body weight) kg	15	15
$BW_{6\text{-}16}$ (mutagenic body weight) kg	80	80
$BW_{16\text{-}26}$ (mutagenic body weight) kg	80	80
$BW_{res\text{-}a}$ (body weight - adult) kg	80	80
$BW_{res\text{-}c}$ (body weight - child) kg	15	15
$DFS_{res\text{-}adj}$ (age-adjusted soil dermal factor) mg/kg	103390	103390

Site-specific
Resident Equation Inputs for DU2.2 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
$DFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	428260	428260
ED_{res} (exposure duration) years	26	26
$ED_{0\text{-}2}$ (mutagenic exposure duration) years	2	2
$ED_{2\text{-}6}$ (mutagenic exposure duration) years	4	4
$ED_{6\text{-}16}$ (mutagenic exposure duration) years	10	10
$ED_{16\text{-}26}$ (mutagenic exposure duration) years	10	10
$ED_{res\text{-}a}$ (exposure duration - adult) years	20	20
$ED_{res\text{-}c}$ (exposure duration - child) years	6	6
EF_{res} (exposure frequency) days/year	350	350
$EF_{0\text{-}2}$ (mutagenic exposure frequency) days/year	350	350
$EF_{2\text{-}6}$ (mutagenic exposure frequency) days/year	350	350
$EF_{6\text{-}16}$ (mutagenic exposure frequency) days/year	350	350
$EF_{16\text{-}26}$ (mutagenic exposure frequency) days/year	350	350
$EF_{res\text{-}a}$ (exposure frequency - adult) days/year	350	350
$EF_{res\text{-}c}$ (exposure frequency - child) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
$ET_{0\text{-}2}$ (mutagenic exposure time) hours/day	24	24
$ET_{2\text{-}6}$ (mutagenic exposure time) hours/day	24	24
$ET_{6\text{-}16}$ (mutagenic exposure time) hours/day	24	24
$ET_{16\text{-}26}$ (mutagenic exposure time) hours/day	24	24
$ET_{res\text{-}a}$ (adult exposure time) hours/day	24	24
$ET_{res\text{-}c}$ (child exposure time) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	1
$IFS_{res\text{-}adj}$ (age-adjusted soil ingestion factor) mg/kg	36750	36750
$IFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	166833.3	166833.3
$IRS_{0\text{-}2}$ (mutagenic soil intake rate) mg/day	200	200
$IRS_{2\text{-}6}$ (mutagenic soil intake rate) mg/day	200	200
$IRS_{6\text{-}16}$ (mutagenic soil intake rate) mg/day	100	100
$IRS_{16\text{-}26}$ (mutagenic soil intake rate) mg/day	100	100
$IRS_{res\text{-}a}$ (soil intake rate - adult) mg/day	100	100
$IRS_{res\text{-}c}$ (soil intake rate - child) mg/day	200	200
LT (lifetime) years	70	70
$SA_{0\text{-}2}$ (mutagenic skin surface area) cm^2/day	2373	2373
$SA_{2\text{-}6}$ (mutagenic skin surface area) cm^2/day	2373	2373
$SA_{6\text{-}16}$ (mutagenic skin surface area) cm^2/day	6032	6032

Site-specific
Resident Equation Inputs for DU2.2 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
$SA_{16\text{-}26}$ (mutagenic skin surface area) cm^2/day	6032	6032
$SA_{res\text{-}a}$ (skin surface area - adult) cm^2/day	6032	6032
$SA_{res\text{-}c}$ (skin surface area - child) cm^2/day	2373	2373
TR (target risk) unitless	0.000001	0.00001
T_w (groundwater temperature) Celsius	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.33
VF_{ml} (volitization factor - mass-limit) m^3/kg	.	90601.60722

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Site-specific
Resident Risk for DU2.2 Soil

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Cadmium (Diet)	-		0.0018	I	0.0005	A /Subchronic	0.00001	A /Chronic	0.025	0.001	1	-	-
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	0.0000006	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
*Total Risk/HI	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	0.0000556	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	3450000000	90600
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	3450000000	90600
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	3450000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	3450000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	3450000000	-
Cadmium (Diet)	-	75	-	-		1038.15	PHYSPROP	2291	YAWS	-	-	-	3450000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	3450000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	3450000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	3450000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	3450000000	90600
Pyrene	54300	326	0.0000119	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	3450000000	90600
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	3450000000	-
*Total Risk/HI	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion Child HQ	Dermal Child HQ	Inhalation Child HQ	Noncarcinogenic Child HI	Ingestion Adult HQ	Dermal Adult HQ	Inhalation Adult HQ	Noncarcinogenic Adult HI
Anthracene	0.349	-	-	-	-	0.00000446	0.00000138	-	0.00000584	4.18E-07	0.00000023	-	0.000000648
Benz[a]anthracene	0.52	3.4E-07	1.13E-07	0.00000034	0.000000793	-	-	-	-	-	-	-	-
Benzo[a]pyrene	0.606	3.96E-06	1.32E-06	1.04E-10	0.00000528	0.0258	0.00797	0.0000842	0.0339	0.00242	0.00133	0.0000842	0.00383
Benzo[b]fluoranthene	0.942	6.15E-07	2.05E-07	1.62E-11	0.00000082	-	-	-	-	-	-	-	-
Benzo[k]fluoranthene	0.288	1.88E-08	6.28E-09	4.94E-13	2.51E-08	-	-	-	-	-	-	-	-
Cadmium (Diet)	0.75	-	-	1.39E-10	1.39E-10	0.0192	0.00182	0.0000208	0.021	0.0018	0.000304	0.0000208	0.00212
Chromium, Total	23.7	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	0.679	4.43E-09	1.48E-09	1.16E-13	5.91E-09	-	-	-	-	-	-	-	-
Fluoranthene	0.938	-	-	-	-	0.00012	0.000037	-	0.000157	0.0000112	0.00000617	-	0.0000174
Mercury (elemental)	0.193	-	-	-	-	-	-	0.00681	0.00681	-	-	0.00681	0.00681
Pyrene	1.01	-	-	-	-	0.000043	0.0000133	-	0.0000563	4.04E-06	0.00000222	-	0.00000625
Selenium	4	-	-	-	-	0.0102	-	5.56E-08	0.0102	0.000959	-	5.56E-08	0.000959
*Total Risk/HI	-	4.93E-06	1.65E-06	0.00000034	0.00000692	0.0554	0.00984	0.00691	0.0722	0.00519	0.00164	0.00691	0.0137

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Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); U = User-provided

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Site-specific
Composite Worker Equation Inputs for DU2.2 Soil

* Inputted values different from Composite Worker defaults are highlighted.

Variable	Composite Worker Soil Default	Form-input Value
A (PEF Dispersion Constant)	16.2302	11.3161
A (VF Dispersion Constant)	11.911	11.3161
A (VF Dispersion Constant - Mass Limit)	11.911	11.3161
B (PEF Dispersion Constant)	18.7762	19.6437
B (VF Dispersion Constant)	18.4385	19.6437
B (VF Dispersion Constant - Mass Limit)	18.4385	19.6437
C (PEF Dispersion Constant)	216.108	224.8172
C (VF Dispersion Constant)	209.7845	224.8172
C (VF Dispersion Constant - Mass Limit)	209.7845	224.8172
d_s (depth of source) m	.	0.3
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.0495
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
PEF (particulate emission factor) m^3/kg	1359344438	3449677717
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	49.72427513
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	49.72427513
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	49.72427513
A_s (PEF acres)	0.5	4.06
A_s (VF acres)	0.5	4.06
A_s (VF mass-limit acres)	0.5	4.06
AF_w (skin adherence factor - composite worker) mg/cm^2	0.12	0.12
AT_w (averaging time - composite worker)	365	365
BW_w (body weight - composite worker)	80	80
ED_w (exposure duration - composite worker) yr	25	25
EF_w (exposure frequency - composite worker) day/yr	250	250
ET_w (exposure time - composite worker) hr	8	8
THQ (target hazard quotient) unitless	0.1	1
IR_w (soil ingestion rate - composite worker) mg/day	100	100
LT (lifetime) yr	70	70
SA_w (surface area - composite worker) cm^2/day	3527	3527
TR (target risk) unitless	0.000001	0.00001
T_w (groundwater temperature) Celsius	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15

Site-specific
Composite Worker Equation Inputs for DU2.2 Soil

* Inputted values different from Composite Worker defaults are highlighted.

Variable	Composite Worker Soil Default	Form-input Value
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.33
VF_{ml} (volitization factor - mass-limit) m^3/kg	.	90601.60722

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Site-specific
Composite Worker Risk for DU2.2 Soil

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Cadmium (Diet)	-		0.0018	I	0.0005	A /Subchronic	0.00001	A /Chronic	0.025	0.001	1	-	-
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	0.0000006	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	0.0000556	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	3450000000	90600
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	3450000000	90600
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	3450000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	3450000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	3450000000	-
Cadmium (Diet)	-	75	-	-		1038.15	PHYSPROP	2291	YAWS	-	-	-	3450000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	3450000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	3450000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	3450000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	3450000000	90600
Pyrene	54300	326	0.0000119	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	3450000000	90600
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	3450000000	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Anthracene	0.349	-	-	-	-	0.000000299	0.000000164	-	0.000000463
Benz[a]anthracene	0.52	1.59E-08	8.75E-09	2.81E-08	5.27E-08	-	-	-	-
Benzo[a]pyrene	0.606	1.85E-07	1.02E-07	8.59E-12	0.000000287	0.00173	0.000952	0.0000201	0.0027
Benzo[b]fluoranthene	0.942	2.88E-08	1.58E-08	1.34E-12	4.47E-08	-	-	-	-
Benzo[k]fluoranthene	0.288	8.81E-10	4.85E-10	4.08E-14	1.37E-09	-	-	-	-
Cadmium (Diet)	0.75	-	-	3.19E-11	3.19E-11	0.00128	0.000217	0.00000496	0.00151
Chromium, Total	23.7	-	-	-	-	-	-	-	-
Chrysene	0.679	2.08E-10	1.14E-10	9.63E-15	3.22E-10	-	-	-	-
Fluoranthene	0.938	-	-	-	-	0.00000803	0.00000442	-	0.0000124
Mercury (elemental)	0.193	-	-	-	-	-	-	0.00162	0.00162
Pyrene	1.01	-	-	-	-	0.00000288	0.00000159	-	0.00000447
Selenium	4	-	-	-	-	0.000685	-	1.32E-08	0.000685
**Total Risk/HI*	-	*2.31E-07*	*1.27E-07*	*2.81E-08*	*0.000000386*	*0.00371*	*0.00118*	*0.00165*	*0.00653*

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Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); U = User-provided

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Site-specific

Construction Worker Equation Inputs for DU2.2 Soil - Unpaved Road Traffic

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Unpaved Default Value	Form-input Value
L_R (length of road segment) ft	147.58077	420.5404739
A (PEF Dispersion Constant)	12.9351	12.9351
A_R (surface area of contaminated road segment) m^2	274.21393	2344.168299
A (VF Dispersion Constant)	2.4538	2.4538
W_R (width of road segment) ft	20	60
B (PEF Dispersion Constant)	5.7383	5.7383
B (VF Dispersion Constant)	17.566	17.566
C (PEF Dispersion Constant)	71.7711	71.7711
C (VF Dispersion Constant)	189.0426	189.0426
distance (road length) km/day	0.04498	0.128180543
d_s (average source depth) m	.	0.3
F_D Unitless Dispersion Correction Factor	0.185837208	0.185837208
foc (fraction organic carbon in soil) g/g	0.006	0.006
M_{dry} (road surface material moisture content under dry, uncontrolled conditions) %	0.2	0.2
Number of cars	.	0
Number of trucks	.	182
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p (days per year with at least .01" of precipitation) days/year	.	90
p_b ($VF_{ulim-sc}$ dry soil bulk density) g/cm^3	1.5	1.5
p_b ($VF_{mlim-sc}$ dry soil bulk density) g/cm^3	1.5	1.5
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{sr} (g/m^2-s per kg/m^3)	23.01785	16.81104131
Q/C_{vol} (g/m^2-s per kg/m^3)	14.31407	9.775437902
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	9.775437902
s (road surface silt content) %	8.5	8.5
A_s (PEF_{sc} - acres)	0.5	4.06
A_s ($VF_{mlim-sc}$ acres)	0.5	4.06
A_s ($VF_{ulim-sc}$ acres)	0.5	4.06
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3	0.3
AT_{cw} (averaging time - construction worker) days	365	365
BW_{cw} (body weight - construction worker) kg	80	80
ED_{cw} (exposure duration - construction worker) yr	1	1
EF_{cw} (exposure frequency - construction worker) day/yr	250	250

Site-specific

Construction Worker Equation Inputs for DU2.2 Soil - Unpaved Road Traffic

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Unpaved Default Value	Form-input Value
ET_{cw} (exposure time - construction worker) hr/day	8	8
THQ (target hazard quotient) unitless	0.1	1
IR_{cw} (soil ingestion rate - construction worker) mg/day	330	330
LT (lifetime) yr	70	70
SA_{cw} (surface area - construction worker) cm^2/day	3527	3527
TR (target cancer risk) unitless	0.000001	0.00001
t_c (overall duration of construction) hours	8400	8400
T_c (overall duration of construction) s	30240000	30240000
T_w (groundwater temperature) C	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T_t (overall duration of traffic) s	7200000	7200000
$VF_{mlim\text{-}sc}$ (volitization factor) m^3_{air}/kg_{soil}	.	3534.864918
Tons per car	.	2.6
Tons per truck	.	44.4

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Site-specific
Construction Worker Risk for DU2.2 Soil - Unpaved Road Traffic

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Cadmium (Diet)	-		0.0018	I	0.0005	A /Subchronic	0.00001	A /Chronic	0.025	0.001	1	-	-
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	0.0000006	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	0.0000556	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	0	3530
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	0	3530
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	0	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	0	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	0	-
Cadmium (Diet)	-	75	-	-		1038.15	PHYSPROP	2291	YAWS	-	-	-	0	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	0	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	0	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	0	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	0	3530
Pyrene	54300	326	0.0000119	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	0	3530
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	0	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Anthracene	0.349	-	-	-	-	0.00000103	0.000000429	-	0.00000146
Benz[a]anthracene	0.52	2.1E-09	8.75E-10	2.88E-08	3.18E-08	-	-	-	-
Benzo[a]pyrene	0.606	2.45E-08	1.02E-08	-	3.47E-08	0.00595	0.00248	-	0.00843
Benzo[b]fluoranthene	0.942	3.8E-09	1.58E-09	-	5.39E-09	-	-	-	-
Benzo[k]fluoranthene	0.288	1.16E-10	4.85E-11	-	1.65E-10	-	-	-	-
Cadmium (Diet)	0.75	-	-	-	-	0.00442	0.000567	-	0.00499
Chromium, Total	23.7	-	-	-	-	-	-	-	-
Chrysene	0.679	2.74E-11	1.14E-11	-	3.88E-11	-	-	-	-
Fluoranthene	0.938	-	-	-	-	0.0000276	0.0000115	-	0.0000392
Mercury (elemental)	0.193	-	-	-	-	-	-	0.0433	0.0433
Pyrene	1.01	-	-	-	-	0.00000992	0.00000413	-	0.0000141
Selenium	4	-	-	-	-	0.00236	-	-	0.00236
**Total Risk/HI*	-	*3.05E-08*	*1.27E-08*	*2.88E-08*	*0.000000072*	*0.0128*	*0.00306*	*0.0433*	*0.0592*

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Site-specific Construction Worker Equation Inputs for DU2.2 Soil - Other Construction Activities

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Other Default	Form-input Value
$A_{c\text{-}doz}$ (areal extent of dozing) acres	.	4.06
A_{excav} (area of excavation site) m^2	.	16443.83
$A_{c\text{-}grade}$ (areal extent of grading) acres	.	4.06
A (PEF Dispersion Constant)	2.4538	2.4538
A_{surf} (areal extent of site) m^2	2023.43	16430.2516
A_{till} (areal extent of tilling) acres	.	4.06
A (VF Dispersion Constant)	2.4538	2.4538
B_l (dozing blade length) m	.	3.7
B_l (grading blade length) m	.	2.5
B (PEF Dispersion Constant)	17.566	17.566
B (VF Dispersion Constant)	17.566	17.566
C (PEF Dispersion Constant)	189.0426	189.0426
C (VF Dispersion Constant)	189.0426	189.0426
d_{excav} (average depth of excavation site) m	.	0.1524
d_s (average source depth) m	.	0.3
F_D Unitless Dispersion Correction Factor	0.185837208	0.185837208
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependant on U_m/U_t derived using Cowherd et al. (1985))	0.194	0.0495
$M_{m\text{-}doz}$ (Gravimetric soil moisture content) %	7.9	7.9
$M_{m\text{-}excav}$ (Gravimetric soil moisture content) %	12	12
M_{wind} (dust emitted by wind erosion) g	51288.84717	7468.626791
$N_{A\text{-}doz}$ (number of times site was dozed)	.	0
$N_{A\text{-}dump}$ (number of times soil is dumped)	2	1
$N_{A\text{-}grade}$ (number of times site was graded)	.	1
$N_{A\text{-}till}$ (number of times soil is tilled)	2	0
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	9.775437902
Q/C_{vol} (g/m^2-s per kg/m^3)	14.31407	9.775437902
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	9.775437902
p_{soil} (density) g/cm^3 - chemical-specific	1.68	1.68
A_c (acres)	0.5	4.06
A_s ($VF_{mlim\text{-}sc}$ acres)	0.5	4.06

Site-specific Construction Worker Equation Inputs for DU2.2 Soil - Other Construction Activities

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Other Default	Form-input Value
A_s ($VF_{ulim-sc}$ acres)	0.5	4.06
s_{doz} (soil silt content) %	6.9	6.9
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3	0.3
AT_{cw} (averaging time - construction worker) days	365	365
BW_{cw} (body weight - construction worker) kg	80	80
ED_{cw} (exposure duration - construction worker) yr	1	1
EF_{cw} (exposure frequency - construction worker) day/yr	250	250
ET_{cw} (exposure time - construction worker) hr/day	8	8
THQ (target hazard quotient) unitless	0.1	1
IR_{cw} (soil ingestion rate - construction worker) mg/day	330	330
LT (lifetime) yr	70	70
SA_{cw} (surface area - construction worker) cm^2/day	3527	3527
TR (target cancer risk) unitless	0.000001	0.00001
S_{doz} (dozing speed) kph	11.4	11.4
S_{grade} (dozing speed) kph	11.4	11.4
s_{till} (soil silt content) %	18	18
t_c (overall duration of construction) hours	8400	8400
T_c (overall duration of construction) s	30240000	30240000
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (time over which traffic occurs) s	7200000	7200000
T_t (overall duration of traffic) s	7200000	7200000
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value) m/s	11.32	11.32
$VF_{mlim-sc}$ (volitization factor) m^3_{air}/kg_{soil}	.	3534.864918
V (fraction of vegetative cover)	0	0.33

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Site-specific
Construction Worker Risk for Soil - Other Construction Activities

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Cadmium (Diet)	-		0.0018	I	0.0005	A /Subchronic	0.00001	A /Chronic	0.025	0.001	1	-	-
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	6E-07	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
*Total Risk/HI	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	5.56E-05	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	579000000	3530
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	579000000	3530
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	579000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	579000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	579000000	-
Cadmium (Diet)	-	75	-	-		1038.15	PHYSPROP	2291	YAWS	-	-	-	579000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	579000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	579000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	579000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	579000000	3530
Pyrene	54300	326	1.19E-05	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	579000000	3530
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	579000000	-
*Total Risk/HI	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Anthracene	0.349	-	-	-	-	0.00000103	0.000000429	-	0.00000146
Benz[a]anthracene	0.52	2.1E-09	8.75E-10	2.88E-08	3.18E-08	-	-	-	-
Benzo[a]pyrene	0.606	2.45E-08	1.02E-08	2.05E-12	3.47E-08	0.00595	0.00248	0.000125	0.00856
Benzo[b]fluoranthene	0.942	3.8E-09	1.58E-09	3.19E-13	5.39E-09	-	-	-	-
Benzo[k]fluoranthene	0.288	1.16E-10	4.85E-11	9.74E-15	1.65E-10	-	-	-	-
Cadmium (Diet)	0.75	-	-	7.61E-12	7.61E-12	0.00442	0.000567	0.0000309	0.00502
Chromium, Total	23.7	-	-	-	-	-	-	-	-
Chrysene	0.679	2.74E-11	1.14E-11	2.3E-15	3.88E-11	-	-	-	-
Fluoranthene	0.938	-	-	-	-	0.0000276	0.0000115	-	0.0000392
Mercury (elemental)	0.193	-	-	-	-	-	-	0.0433	0.0433
Pyrene	1.01	-	-	-	-	0.00000992	0.00000413	-	0.0000141
Selenium	4	-	-	-	-	0.00236	-	8.23E-08	0.00236
*Total Risk/HI	-	*3.05E-08*	*1.27E-08*	*2.88E-08*	*0.000000072*	*0.0128*	*0.00306*	*0.0435*	*0.0593*

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M E M O R A N D U M

To: Eric Traynor, IDEQ, Boise
Steve Gill, IDEQ, Coeur d'Alene

From: Jon Munkers, Alta, Boise
Rachel Gibeault, Alta, Boise

Date: June 12, 2018

Job Code: Contract No. K157, Task Order No. 27, Alta Job No. 18035

Subject: Coeur d'Alene, Idaho, BNSF Huetter to Riverstone ROW DU3 Risk Evaluation Update - Final

Section 1 Introduction

1.1 Background

The Huetter to Riverstone right-of-way (ROW) of the Burlington Northern Santa Fe (BNSF) Railway Company corridor in Coeur d'Alene, Idaho (the Site), has a 100-year history of railroad use. In the early 1900s, the rail line included hourly electric train services linking Spokane, Washington, to Coeur d'Alene, Idaho. The region includes a long history of heavy metal mining and rail distribution (TerraGraphics 2015). In 2017, based on the historical use of the Site and on the conclusions from the Phase I Environmental Site Assessment (ESA; TerraGraphics 2015), Alta Science and Engineering, Inc. (Alta) collected soil samples from the top 0 to12 inches under the Idaho Department of Environmental Quality (IDEQ)-approved Quality Assurance Project Plan (TerraGraphics 2016). Conclusions in the Phase II ESA (TerraGraphics 2017) posited that metals and petroleum-based constituents remained at the Site at concentrations greater than risk-based screening levels.

Alta completed a Risk Evaluation (RE) using version 1.1.3 of the IDEQ Risk Evaluation Manual for Petroleum Release Sites (Petro REM) (IDEQ 2015) and the 2016 version of the U.S. Environmental Protection Agency (USEPA) Regional Screening Level (RSL) Calculator, based upon the direction from IDEQ. The RE conclusions are that all decision units (DUs) within the Site have acceptable cancer risk (below the Idaho target cancer risk of 10^{-5} [Idaho Administrative Procedures Act (IDAPA) 58.01.24]) and target non-cancer risk (below the Idaho target Hazard Index (HI) of 1 [IDAPA 58.01.24]) for non-residential/composite worker use and construction worker use (those performing grading activities as described in the RE [Alta 2017]). Additionally, the future residential receptor has an acceptable non-cancer risk in all DUs. However, the future residential receptor in the following DUs exceeded the acceptable cancer risk (10^{-5}), with arsenic and benzo(a)pyrene, a polycyclic aromatic hydrocarbon (PAH), being the risk drivers: DU1.3, DU2.1, DU2.2, and DU3.2. See Table A1 in Attachment A for a summary of the lifetime cancer and non-cancer risks identified in the 2017 RE. Alta recommended these DUs be restricted for non-residential use and to use caution and best management practices during construction activities (Alta 2017).

1.2 Purpose

The purpose of this memorandum is to use USEPA's relevant semi-annual changes to their RSL information and update the 2017 RE for DU3. Redevelopment in DU3 is imminent and a proposed use includes residential. This update will assist IDEQ and stakeholders in redevelopment decisions. Arsenic was included as a constituent of concern (COC) in the 2017 RE; however, the measured arsenic concentrations at the Site are considered to be similar to background levels[1]. Additionally, the other main risk driver (Alta 2017), benzo(a)pyrene, has new toxicological information that could change the estimated lifetime cancer risk. This RE Update removes arsenic as a COC and utilizes the current benzo(a)pyrene toxicity data by applying the USEPA RSL calculator to evaluate risk in DU3[2]. Similar updates for DU1 and DU2 are forthcoming in a separate memorandum.

Section 2 Exposure Assessment

This RE Update uses the same Site Conceptual Model, receptors (non-residential/composite worker, construction worker, and future residential scenarios), routes of exposure (direct contact exposure [ingestion, dermal, particle inhalation] of soil from 0-12 inches [0.30 meters] below ground surface [bgs]), and exposure point concentrations (EPCs; see Table A4 in Attachment A) as described in the 2017 RE (Alta 2017).

The exposure factor values[3], assumptions, and COCs used for receptors for each exposure area, except for arsenic, for this RE Update are the same as those used in the 2017 RE (Alta 2017), and are located in Attachment B. Two exposure areas are evaluated in this RE Update (DU3.1 and DU3.2, as described in Alta [2017]), and the COCs included for each area are presented in Table A4 (Attachment A).

Evaluation of the construction scenario is challenging based on the considerable uncertainty surrounding the details of future construction activities (USEPA 2002). This RE Update assumes the following (which were also assumed in the 2017 RE [Alta 2017]):

- All exposure areas will be graded once, to level the unpaved ROW (the entirety of DU3).
- After the ROW is level, dump trucks will lay down a road bed cover equal to the length and width of the exposure area and 6 inches deep (0.1524 meters) in preparation for an asphalt cover to complete the planned public pedestrian and/or bike trail.
- The road bed and asphalt cover placed on the ROW will cap the contaminated soil.

[1] A representative of the Idaho Department of Health and Welfare (IDHW) evaluated arsenic concentrations measured at the Site relative to background concentrations. The IDHW representative concluded that Site arsenic concentrations are similar to background concentrations for Kootenai County (IDHW 2017). As a result of this evaluation completed for IDEQ, Alta removed arsenic as a COC in this DU3 RE Update. See Table A2 in Attachment A for Site metals concentrations.

[2] In June 2017, USEPA released an updated toxicological review of benzo(a)pyrene (USEPA 2017a). This update recommends a reference dose (RfD) of $3x10^{-04}$ milligrams per kilogram per day (mg/kg-day), an inhalation reference concentration (RfC) of $2x10^{-06}$ milligrams per cubic meter (mg/m^3), and a slope factor of 1 mg/kg-day. Because the Petro REM software has not been updated with these values, IDEQ approved the use of the USEPA RSL software to estimate human health risk in this DU3 RE Update.

[3] Exposure factor values used by the USEPA RSL Calculator are different than those used by the Petro REM. These differences can be viewed in the outputs of the 2017 RE (Alta 2017) and this DU3 RE Update, which are located in Attachment B.

Section 3 Risk Evaluation

The following subsections summarize the RE Update model inputs and results.

3.1 USEPA RSL Calculator Model

To calculate cancer and non-cancer risks, Alta used the current online USEPA RSL Calculator with its default exposure factor values (USEPA 2017b). Alta changed the acceptable target risk level to 10^{-5} and target Hazard Quotient (HQ) to 1, as set forth in IDAPA 58.01.24. Additionally, Alta entered exposure area specifics into the model, such as acreage and vegetative cover, and used Boise, Idaho, as the Climate Zone selection for the particulate emission factor equations. As described in Section 2, the same assumptions were used for the construction worker scenario as in the 2017 RE, given that DU3 is an unpaved ROW. If future construction differs from this scenario, then the updated construction activities should be input to the USEPA RSL Calculator to evaluate whether those construction activities might pose significant risks to construction workers and other receptors in the absence of mitigating measures.

Attachment B contains the model input values from the current USEPA RSL Calculator used in this RE Update.

3.2 Comparison of Calculated Risk with Target Risk Criteria for DU3 of the Site

An RE involves estimating the magnitude of the potential adverse health effects of Site COCs, and identifying the COCs and routes of exposure that contribute the most risk to the defined receptor population. Table 1 presents the quantified cancer and non-cancer risks using the current USEPA RSL Calculator (USEPA RSL Calculator outputs are presented in Attachment B).

3.2.1 Carcinogenic Health Effects

The potential for carcinogenic effects is evaluated by estimating the probability of developing cancer over a lifetime based on exposure assumptions and chemical-specific toxicity criteria. The risks resulting from exposure to multiple carcinogens are assumed to be additive.

In accordance with IDAPA 58.01.24, a target Site risk of 10^{-5} was used to determine acceptable cancer risk at the Site. In both DU3.1 and DU3.2, total lifetime cancer risks for the future residential receptor, non-residential/composite worker, and the construction worker scenarios are all below the target cancer risk of 10^{-5}.

3.2.2 Non-cancer Health Effects

The reference dose is a level of intake below which it is unlikely that sensitive individuals will experience adverse health effects during a lifetime. If the HQ exceeds 1, there may be cause for concern regarding non-cancer effects (USEPA 1989). Risk assessment guidelines consider the additive effects associated with simultaneous exposure to several chemicals by specifying that all HQs be summed across exposure routes and chemicals to estimate a total HI (USEPA 1989).

The HIs presented in Table 1 sum total non-cancer risk from the USEPA RSL Calculator (outputs are presented in Attachment B). In both DU3.1 and DU3.2, the HIs for the future residential receptor, non-residential/composite worker, and the construction worker scenarios were below 1 and are acceptable.

Table 1. 2018 DU3 Risk Evaluation Summary of Lifetime Cancer and Non-cancer Risks at BNSF Huetter to Riverstone ROW

DU3.1	Residential			Non-Residential		Construction Worker[a]	
Route of Exposure - Direct Contact Soil	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child	Adult				
Total Risk or Hazard Index for Receptor	1E-06	5E-02	1E-02	8E-08	5E-03	3E-08	2E-01
DU3.2	**Residential**			**Non-Residential**		**Construction Worker[a]**	
Route of Exposure - Direct Contact Soil	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child	Adult				
Total Risk or Hazard Index for Receptor	3E-06	3E-02	1E-02	2E-07	4E-03	6E-08	1E-01

Notes:
a The Construction Worker scenario in the USEPA RSL Calculator (USEPA 2017b) is a combination of "Unpaved Road Traffic" and "Other Construction Activities."

Section 4 Conclusions and Recommendations

Based on the assessment activities conducted at the Site, historical use has impacted surface soils (0-12 inches bgs) resulting in residual COCs. Based on the current USEPA RSL Calculator, estimated risks in DU3.1 and DU3.2 are considered suitable for the future residential use, and for non-residential/composite worker use. Construction workers (performing grading activities) do not exceed the cancer and non-cancer risk of 10^{-5} and 1, respectively, due to residual COCs at the Site.

Alta has the following recommendation for the Coeur d'Alene BNSF Huetter to Riverstone ROW in DU3.1 and DU3.2 based on the information available to-date:

- Use caution and best management practices during construction activities to prevent the ingestion of soil and the inhalation of dust if construction activities other than grading are to occur. Alternatively, if site-specific construction activities are known, consider further risk evaluation for those specific construction worker scenarios using the current USEPA RSL Calculator with updated information.

Section 5 Clean and Green Reporting

In accordance with the Green Remediation Objectives outlined in USEPA Region 10 Clean and Green Policy, Alta implemented several sustainable technologies and practices to minimize the overall environmental footprint on this project including the following:

- Project correspondence, plans, and reports were conveyed via electronic transmittal to reduce the use of paper products.

Section 6 References

Alta Science and Engineering, Inc. (Alta), 2017. Risk Evaluation of the Burlington Northern Santa Fe Railway Company Corridor Right of Way Riverstone to Huetter Site in Coeur d'Alene, Idaho. Prepared for Idaho Department of Environmental Quality: Waste and Remediation Division, Brownfields Program. Revision #2, November 17, 2017.

Idaho Administrative Procedures Act (IDAPA) 58.01.24: Standards and Procedures for Application of Risk Based Corrective Action at Petroleum Release Sites.

Idaho Department of Environmental Quality (IDEQ), 2015. IDEQ Risk Evaluation Application, Version 1.1.3. Boise, Idaho 83706.

Idaho Department of Health and Welfare (IDHW), 2017. "Letter Health Consultation, BNSF Railway Corridor Site: Soil Arsenic Coeur d'Alene, Idaho." Prepared for E. Traynor (Brownfields Program Manager, Idaho Department of Environmental Quality) prepared by M. Willming (PhD Toxicologist/Health Assessor, Idaho Department of Health and Welfare). October 11, 2017.

TerraGraphics Environmental Engineering, Inc. (TerraGraphics), 2015. Phase I Environmental Site Assessment Report Coeur d'Alene BNSF Railroad Corridor, Coeur d'Alene, ID 83814. Prepared for the Idaho Department of Environmental Quality. May 4.

TerraGraphics, 2016. Final Quality Assurance Project Plan for BNSF ROW R2R, Coeur d'Alene, Idaho. Prepared for Idaho Department of Environmental Quality Waste and Remediation Division. September 23; Revision No. 1.

TerraGraphics, 2017. Phase II Environmental Assessment Report for BNSF ROW R2R, Coeur d'Alene, Idaho – Final. Prepared for Idaho Department of Environmental Quality Waste and Remediation Division. March 8; Revision No. 3.

U.S. Environmental Protection Agency (USEPA), 1989. Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual, USEPA/540/1-89/002; December. Available at https://www.epa.gov/sites/production/files/2015-09/documents/rags_a.pdf.

USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December.

USEPA, 2017a. IRIS Toxicological Review of Benzo[a]pyrene [CASRN 50-32-8]. USEPA/635/R-17/003Fa. Accessed in April 2018 at https://cfpub.epa.gov/ncea/iris/iris_documents/documents/toxreviews/0136tr.pdf.

USEPA, 2017b. Regional Screening Level Calculator. Accessed in February 2017 at https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search.

Attachment A

Table A1. 2017 Risk Evaulation Overall Summary of Lifetime Cancer and Non-cancer Risks at BNSF Huetter to Riverstone ROW

DU1.1	Residential			Non-Residential		Construction Worker[b]	
Route of Exposure - Direct Contact Soil	**Cancer Risk**	**Hazard Index**		**Cancer Risk**	**Hazard Index**	**Cancer Risk**	**Hazard Index**
		Child[a]	**Adult**				
USEPA RSL Calculator	-	1.71E-02	7.86E-03	-	2.33E-03	2.16E-06	4.79E-02
IDEQ Petro REM (v 1.1.3)	-	-	-	-	-	-	-
Total Risk or Hazard Index for Receptor	**-**	**2E-02**	**8E-03**	**-**	**2E-03**	**2E-06**	**5E-02**
DU1.2	**Residential**			**Non-Residential**		**Construction Worker[b]**	
Route of Exposure - Direct Contact Soil	**Cancer Risk**	**Hazard Index**		**Cancer Risk**	**Hazard Index**	**Cancer Risk**	**Hazard Index**
		Child[a]	**Adult**				
USEPA RSL Calculator	-	5.64E-02	4.71E-02	-	1.17E-02	-	2.95E-01
IDEQ Petro REM (v 1.1.3)	8.58E-06	2.10E-04		5.61E-07	2.04E-05	9.30E-09	8.40E-06
Total Risk or Hazard Index for Receptor	**9E-06**	**6E-02**	**5E-02**	**6E-07**	**1E-02**	**9E-09**	**3E-01**
DU1.3	**Residential**			**Non-Residential**		**Construction Worker[b]**	
Route of Exposure - Direct Contact Soil	**Cancer Risk**	**Hazard Index**		**Cancer Risk**	**Hazard Index**	**Cancer Risk**	**Hazard Index**
		Child[a]	**Adult**				
USEPA RSL Calculator	-	1.20E-02	2.77E-03	-	1.12E-03	-	1.62E-02
IDEQ Petro REM (v 1.1.3)	3.08E-05	8.55E-04		2.02E-06	8.32E-05	3.34E-08	3.42E-05
Total Risk or Hazard Index for Receptor	**3E-05**	**1E-02**	**3E-03**	**2E-06**	**1E-03**	**3E-08**	**2E-02**
DU2.1	**Residential**			**Non-Residential**		**Construction Worker[b]**	
Route of Exposure - Direct Contact Soil	**Cancer Risk**	**Hazard Index**		**Cancer Risk**	**Hazard Index**	**Cancer Risk**	**Hazard Index**
		Child[a]	**Adult**				
USEPA RSL Calculator	-	1.89E-02	9.68E-03	-	2.76E-03	-	0.00E+00
IDEQ Petro REM (v 1.1.3)	3.40E-05	9.11E-04		2.22E-06	8.86E-05	3.68E-08	3.65E-05
Total Risk or Hazard Index for Receptor	**3E-05**	**2E-02**	**1E-02**	**2E-06**	**3E-03**	**4E-08**	**4E-05**
DU2.2	**Residential**			**Non-Residential**		**Construction Worker[b]**	
Route of Exposure - Direct Contact Soil	**Cancer Risk**	**Hazard Index**		**Cancer Risk**	**Hazard Index**	**Cancer Risk**	**Hazard Index**
		Child[a]	**Adult**				
USEPA RSL Calculator	1.39E-10	3.81E-02	9.89E-03	3.19E-11	3.81E-03	0.00E+00	0.00E+00
IDEQ Petro REM (v 1.1.3)	3.95E-05	7.84E-04		2.59E-06	7.63E-05	4.29E-08	3.14E-05
Total Risk or Hazard Index for Receptor	**4E-05**	**4E-02**	**1E-02**	**3E-06**	**4E-03**	**4E-08**	**3E-05**
DU3.1	**Residential**			**Non-Residential**		**Construction Worker[b]**	
Route of Exposure - Direct Contact Soil	**Cancer Risk**	**Hazard Index**		**Cancer Risk**	**Hazard Index**	**Cancer Risk**	**Hazard Index**
		Child[a]	**Adult**				
USEPA RSL Calculator	-	4.02E-02	1.37E-02	-	4.56E-03	-	0.00E+00
IDEQ Petro REM (v 1.1.3)	7.84E-06	1.61E-04		5.13E-07	1.57E-05	8.50E-09	6.45E-06
Total Risk or Hazard Index for Receptor	**8E-06**	**4E-02**	**1E-02**	**5E-07**	**5E-03**	**9E-09**	**6E-06**
DU3.2	**Residential**			**Non-Residential**		**Construction Worker[b]**	
Route of Exposure - Direct Contact Soil	**Cancer Risk**	**Hazard Index**		**Cancer Risk**	**Hazard Index**	**Cancer Risk**	**Hazard Index**
		Child[a]	**Adult**				
USEPA RSL Calculator	-	2.01E-02	1.09E-02	-	3.04E-03	-	0.00E+00
IDEQ Petro REM (v 1.1.3)	1.57E-05	4.92E-04		1.03E-06	1.62E-04	1.72E-08	1.91E-04
Total Risk or Hazard Index for Receptor	**2E-05**	**2E-02**	**1E-02**	**1E-06**	**3E-03**	**2E-08**	**2E-04**

Notes:

a Noncarcinogenic chemical exposure is conservatively assessed using only the child receptor under Petro REM (IDEQ 2012).

b The Construction Worker scenario in the USEPA RSL Calculator (USEPA 2016a) is a combination of "Unpaved Road Traffic" and "Other Construction Activities."

Grey shaded cells denote an exceedence for a receptor.

Table A2. Metals Data Summary for Coeur d'Alene BNSF Huetter to Riverstone ROW

Sample ID	Sample Depth (in. bgs)	Date	Unit	Arsenic	Barium	Cadmium	Total Chromium	Lead	Selenium	Silver	Mercury
DU1.1	12	10/7/2016	mg/kg	25.6	171	0.410	**24.6**	63.9	**<4.0**	<0.50	**0.268**
DU1.2*	12	10/7/2016	mg/kg	20.7	187	0.340	**26.9**	59.0	**<4.0**	<0.50	**1.54†**
DU1.3A	12	10/4/2016	mg/kg	13.1	224	0.370	**18.8**	24.2	**<4.0**	<0.50	**0.035**
DU1.3B	12	10/4/2016	mg/kg	12.2	140	0.510	**21.4**	31.6	**<4.0**	<0.50	**<0.033**
DU1.3C	12	10/5/2016	mg/kg	11.6	173	0.520	**18.4**	34.0	**<4.0**	<0.50	**0.058**
DU2.1A	12	10/4/2016	mg/kg	14.8	227	0.420	**20.9**	35.6	**<4.0**	<0.50	**0.285**
DU2.1B	12	10/3/2016	mg/kg	10.3	174	0.400	**21.4**	42.2	**<4.0**	<0.50	**0.160**
DU2.1C	12	10/4/2016	mg/kg	10.7	218	0.380	**20.7**	48.2	**<4.0**	<0.50	**0.115**
DU2.2A	12	10/3/2016	mg/kg	15.7	173	0.440	**22.5**	35.6	**<4.0**	<0.50	**0.132**
DU2.2B*	12	10/3/2016	mg/kg	14.5	190	0.400	**20.5**	36.4	**<4.0**	<0.50	**0.193**
DU2.2B	~ 24–36	8/28/2017	mg/kg	14.4	NS	NS	NS	NS	NS	NS	NS
DU2.2C	12	10/3/2016	mg/kg	13.7	187	0.750	**23.7**	35.5	**<4.0**	<0.50	**0.038**
DU3.1A*	12	10/7/2016	mg/kg	14.4	297	0.610	**19.6**	60.5	**<4.0**	<0.50	**0.272†**
DU3.1B	12	10/6/2016	mg/kg	13.4	201	<0.200	**19.0**	23.6	**<4.0**	<0.50	**0.310**
DU3.1C	12	10/5/2016	mg/kg	12.3	147	0.400	**16.6**	37.1	**<4.0**	<0.50	**0.098**
DU3.2A	12	10/6/2016	mg/kg	15.4	209	0.490	**25.3**	49.4	**<4.0**	<0.50	**0.042**
DU3.2B	12	10/5/2016	mg/kg	12.5	209	0.420	**17.5**	40.4	**<4.0**	<0.50	**0.342**
DU3.2C	12	10/5/2016	mg/kg	11.7	99.3	0.250	**14.9**	18.6	**<4.0**	<0.50	**<0.0330**
USEPA SSL											
Risk-based protection of groundwater			mg/kg	0.002	155	0.693	-	-	0.519	0.799	0.0327
MCL-based protection of groundwater			mg/kg	0.292	82.4	0.376	180,000	13.5	0.260	-	0.104
USEPA RSL											
USEPA RSL Critical Receptor			mg/kg	0.68 *Residential Direct Contact; Carcinogenic*	15,000 *Residential Direct Contact; Noncarcinogenic - Child*	71.0 *Residential Direct Contact; Noncarcinogenic - Child*	0.30** *Residential Direct Contact; Carcinogenic*	400 *Residential Direct Contact; Noncarcinogenic - Child*	390 *Residential Direct Contact; Ingestion-Child*	390 *Residential Direct Contact; Ingestion-Child*	23.0 *Residential Direct Contact; Ingestion-Child*
Kootenai County ID Background (USGS 2017)											
No. of samples = 12											
Minimum			mg/kg	1.67	-	-	-	16.2	0.101	-	0.011
Maximum			mg/kg	21.0	-	-	-	61.1	0.738	-	0.115
Standard Deviation			mg/kg	2.42	-	-	-	7.93	0.087	-	0.018
Mean			mg/kg	7.88	-	-	-	30.7	0.208	-	0.053

Notes:

Analytical tests for RCRA 8 Metals used USEPA Method 6010C. Mercury by USEPA Method 7471B.

< denotes that the result was not detected above reporting limit.

USEPA RSL = U.S. Environmental Protection Agency Regional Screening Level; Resident Soil Table (USEPA 2016).

USEPA SSL = U.S. Environmental Protection Agency Soil Screening Level; Protection of Groundwater Table (USEPA 2016).

U.S. Geological Survey online National Geochemical Survey by County database (USGS 2017).

mg/kg = milligram per kilogram

NS = not sampled

† = The maximum concentration of the replicate ISM [Incremental Sampling Methodology] results is presented.

* = Sample is a duplicate. The highest concentration is shown.

** = RSL (USEPA 2016) is for chromium(VI), as there is no RSL for total chromium. Chromium(VI) yields the most conservative screening level for carcinogenic risk in resident soil.

Table A3. PAH Data Summary for Coeur d'Alene BNSF Huetter to Riverstone ROW

Sample ID	Sample Depth (in. bgs)	Date	Unit	Anthracene	Acenaphthene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Chrysene	Fluoranthene	Fluorene	Naphthalene	Pyrene
DU1.1	12	10/7/2016	mg/kg	<0.120	<0.120	<0.120	<0.120	<0.120	<0.120	<0.120	<0.120	<0.120	<0.400	<0.120
DU1.2*	12	10/5-6/2016	mg/kg	0.0211	<0.012	**0.135**	**0.128**	**0.217**	0.0687	0.192	0.254	<0.0120	<0.0400	0.275
DU1.3A	12	10/4/2016	mg/kg	0.0466	<0.0060	0.0302	**0.0317**	0.0673	0.0205	0.0461	0.0584	<0.0060	<0.0200	0.0558
DU1.3B	12	10/4/2016	mg/kg	0.361	<0.030	**0.456**	**0.440**	**1.00**	0.317	0.839	1.08	<0.0300	<0.100	1.06
DU1.3C	12	10/5/2016	mg/kg	<0.012	<0.012	<0.0120	<0.0120	<0.0120	<0.0120	<0.0120	<0.0120	<0.0120	<0.0400	<0.0120
DU2.1A	12	10/4/2016	mg/kg	0.0575	<0.0120	0.0382	0.0452	0.132	0.035	0.0547	0.0911	<0.0120	<0.0400	0.0834
DU2.1B	12	10/3/2016	mg/kg	0.340	<0.030	**0.468**	**0.505**	**0.942**	0.282	0.815	1.17	<0.0300	<0.100	1.12
DU2.1C	12	10/4/2016	mg/kg	0.0571	<0.030	0.0673	0.066	0.150	0.0436	0.133	0.135	<0.0300	<0.100	0.117
DU2.2A	12	10/3/2016	mg/kg	<0.060	<0.060	<0.0600	<0.0600	<0.0600	<0.0600	<0.0600	<0.0600	<0.0600	<0.200	<0.0600
DU2.2B*	12	10/3/2016	mg/kg	0.349	<0.060	**0.520**	0.606	**0.942**	0.288	0.679	0.938	<0.0600	<0.200	1.01
DU2.2B*	~ 24–36	8/28/2017	mg/kg	0.130	0.0778	**0.052**	0.0309	**0.0573**	0.0211	0.0656	0.351	0.0618	0.0498	0.237
DU2.2C	12	10/3/2016	mg/kg	<0.030	<0.030	<0.0300	<0.0300	<0.0300	<0.0300	<0.0300	0.0343	<0.0300	<0.100	0.0367
DU3.1A*	12	10/7/2016	mg/kg	0.0125	<0.030	0.0164	0.0195	0.0417	<0.0300	0.043	0.0439	<0.0300	<0.100	0.0372
DU3.1B	12	10/6/2016	mg/kg	0.0571	<0.0060	0.0856	**0.121**	0.196	0.0634	0.125	0.142	<0.00600	<0.0200	0.175
DU3.1C	12	10/4/2016	mg/kg	<0.060	<0.060	0.0849	**0.0993**	0.126	<0.0600	0.0975	0.138	<0.0600	<0.200	0.247
DU3.2A	12	10/6/2016	mg/kg	0.0348	0.015	0.0249	0.0263	0.0528	0.0130	0.0481	0.0940	<0.0120	0.0693	0.0711
DU3.2B	12	10/5/2016	mg/kg	0.138	<0.060	**0.224**	**0.234**	**0.416**	0.117	0.301	0.373	<0.0600	<0.200	0.402
DU3.2C	12	10/5/2016	mg/kg	<0.060	<0.060	<0.0600	**0.160**	0.0782	<0.0600	<0.0600	<0.0600	<0.0600	<0.200	0.128
IDEQ SLC														
SLC Critical Pathway			mg/kg	3,200 *GWP*	200 *GWP*	0.0900 *GWP*	0.0200 *Direct Contact*	0.200 *Direct Contact*	1.90 *Direct Contact*	9.50 *GWP*	1,400 *GWP*	240 *GWP*	0.120 *Vapor Intrusion*	1,000 *GWP*
USEPA SSL														
Risk-based protection of groundwater			mg/kg	58.1	5.49	0.00425	0.00403	0.0411	0.403	1.24	89.1	5.45	0.000543	13.2
MCL-based protection of groundwater			mg/kg	-	-	-	0.235	-	-	-	-	-	-	-
USEPA RSL														
USEPA RSL Direct Contact Critical Receptor			mg/kg	18,000 *Non-Carcinogenic Child*	3,600 *Non-Carcinogenic Child*	0.160 *Carcinogenic*	0.0160 *Carcinogenic*	0.160 *Carcinogenic*	1.60 *Carcinogenic*	16.0 *Carcinogenic*	2,400 *Non-Carcinogenic Child*	2,400 *Non-Carcinogenic Child*	3.80 *Carcinogenic*	1,800 *Non-Carcinogenic Child*

Notes:

Analytical test for PAHs (polycyclic aromatic hydrocarbons) used USEPA Method 8270D-SIM.

< denotes that the result was not detected above the reporting limit

SLC = Screening Level Concentration for petroleum related constituents from Idaho Risk Evaluation for Petroleum Releases (IDEQ 2012).

USEPA RSL = U.S. Environmental Protection Agency Regional Screening Level; Resident Soil Table (USEPA 2016)

USEPA SSL = U.S. Environmental Protection Agency Soil Screening Level; Protection of Groundwater Table (USEPA 2016).

GWP = ground water protection

mg/kg = milligram per kilogram

- = not established

Table A4. Exposure Point Concentrations for Direct Contact Soils in DU3

Zone	Decision Unit	Surface Soil (mg/kg)	
		Metals	PAHs
3	3.1	barium = 297	anthracene = 0.0571
		total chromium = 19.6	benzo(a)anthracene = 0.0856
		mercury = 0.310	benzo(a)pyrene = 0.121
		selenium [b] = 4.00	benzo(b)fluoranthene = 0.196
			benzo(k)fluoranthene = 0.0634
			chrysene [a] = 0.125
			fluoranthene = 0.142
			pyrene = 0.247
	3.2	total chromium = 25.3	anthracene = 0.138
		mercury = 0.342	acenaphthene = 0.015
		selenium [b] = 4.00	benzo(a)anthracene = 0.224
			benzo(a)pyrene = 0.234
			benzo(b)fluoranthene = 0.416
			benzo(k)fluoranthene = 0.117
			chrysene = 0.301
			fluoranthene = 0.373
			naphthalene = 0.0693
			pyrene = 0.402

Notes:

[a] The maximum concentration of the ISM sample collected in triplicate is presented.

[b] The concentration was not detected above the reporting limit. Therefore, the reporting limit is used as the EPC.

mg/kg = milligram per kilogram

Attachment B

Table B1. Construction Worker Decision Unit USEPA RSL Calculator Assumptions

DU	Acres	Vegetative Cover (%)	DU Length (ft)	DU Width (ft)	DU ft^2 (length * width)	DU m^2 (ft^2 * 0.092903)	DU ft^3 (ft^2 * 0.5 feet)	DU yd^3 (ft^3 * 0.037037)	18 yd^3 Dump Truck Loads (DU yd^3 / 18)
3.1	4.06	33	2,950	60	177,000	16,443.83	88,500	3,278	182
3.2	1.24	33	900	60	54,000	5,016.76	27,000	1,000	56

Notes:

DU = Decision Unit m = meter

ft = feet yd = yard

Table B2. Construction Worker Construction Activity USEPA RSL Calculator Assumptions

Vehicle	Type	Max Weight (lb)	Max Weight (ton)	Blade Length (ft)	Blade Length (m)
Truck	F150	5,238	2.6	NA	NA
Dump Truck	Volvo A25C 4X4	88,780	44.4	NA	NA
Grader	Cat 120G Motor Grader	25,320	12.7	8.2	2.5
Dozer	Komatsu WD420-3 Wheel Dozer	44,093	22.0	12.3	3.7

Notes:

ft = feet m = meter

lb = pound

VOLVO A25C 4X4 ARTICULATED DUMP TRUCK

VIEW ARTICLES ON THIS ITEM

Print specification

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Find a Volvo A25C 4X4 Articulated Dump Truck being sold at Ritchie Bros. auctions.

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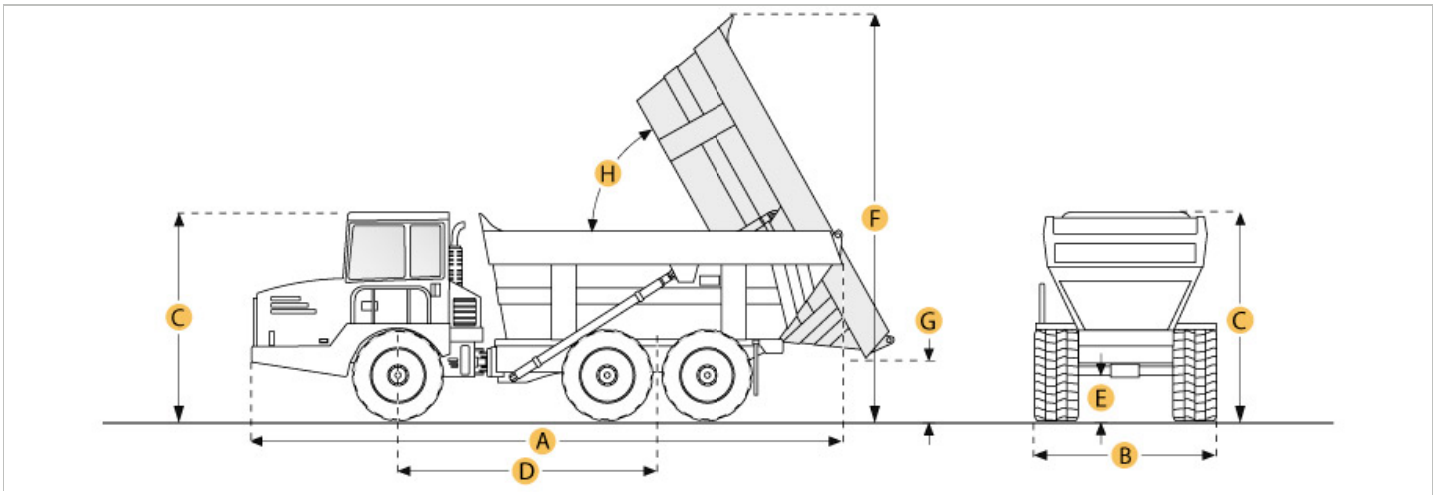

Selected Dimensions

Dimensions		
A. OVERALL LENGTH	31.7 ft in	9675 mm
B. OVERALL WIDTH	8.2 ft in	2500 mm
C. OVERALL HEIGHT	10.8 ft in	3285 mm
D. WHEELBASE	13.7 ft in	4165 mm
E. GROUND CLEARANCE	1.7 ft in	520 mm
F. DUMP HEIGHT	21 ft in	6400 mm
G. DUMP GROUND CLEARANCE	2.1 ft in	640 mm
Dump		
H. DUMP ANGLE	70 degrees	

Specification

Engine		
MAKE	Volvo	
MODEL	TD 73 KCE	
GROSS POWER	255 hp	190.2 kw
NET POWER	251 hp	187.2 kw
POWER MEASURED @	2400 rpm	
DISPLACEMENT	410.7 cu in	6.7 L
TORQUE MEASURED @	1200 rpm	
MAX TORQUE	796.6 lb ft	1080 Nm
ASPIRATION	Turbocharged	
NUMBER OF CYLINDERS	6	
Operational		
FUEL CAPACITY	74 gal	280 L
HYDRAULIC SYSTEM FLUID CAPACITY	47.6 gal	180 L
COOLING SYSTEM FLUID CAPACITY	9.8 gal	37 L
ENGINE OIL CAPACITY	6.3 gal	24 L
TRANSMISSION FLUID CAPACITY	4.2 gal	16 L
OPERATING VOLTAGE	24 V	
ALTERNATOR SUPPLIED AMPERAGE	60 amps	
TIRE SIZE	front 23.5R25 / rear 29.5R25	
Transmission		
TYPE	Fully automatic planetary transmission	

NUMBER OF FORWARD GEARS	10	
NUMBER OF REVERSE GEARS	2	
MAX SPEED	32.3 mph	52 km/h

Weights

FRONT AXLE - EMPTY	19929.8 lb	9040 kg
REAR AXLE - EMPTY	19246.4 lb	8730 kg
FRONT AXLE - LOADED	25353.2 lb	11500 kg
REAR AXLE - LOADED	63427 lb	28770 kg
TOTAL EMPTY	39176.1 lb	17770 kg
TOTAL LOADED	88780.1 lb	40270 kg

Dump

RATED PAYLOAD	49604 lb	22500 kg
CAPACITY - STRUCK	14.4 yd3	11 m3
CAPACITY - HEAPED	18 yd3	13.8 m3
DUMP ANGLE	70 degrees	
RAISE TIME	12 sec	
LOWER TIME	10 sec	

Dimensions

OVERALL LENGTH	31.7 ft in	9675 mm
OVERALL WIDTH	8.2 ft in	2500 mm
OVERALL HEIGHT	10.8 ft in	3285 mm
WHEELBASE	13.7 ft in	4165 mm
GROUND CLEARANCE	1.7 ft in	520 mm
DUMP HEIGHT	21 ft in	6400 mm
DUMP GROUND CLEARANCE	2.1 ft in	640 mm

CATERPILLAR 120G MOTOR GRADER

VIEW ARTICLES ON THIS ITEM

Print specification

Looking to purchase this item?

Find a Caterpillar 120G Motor Grader being sold at Ritchie Bros. auctions.

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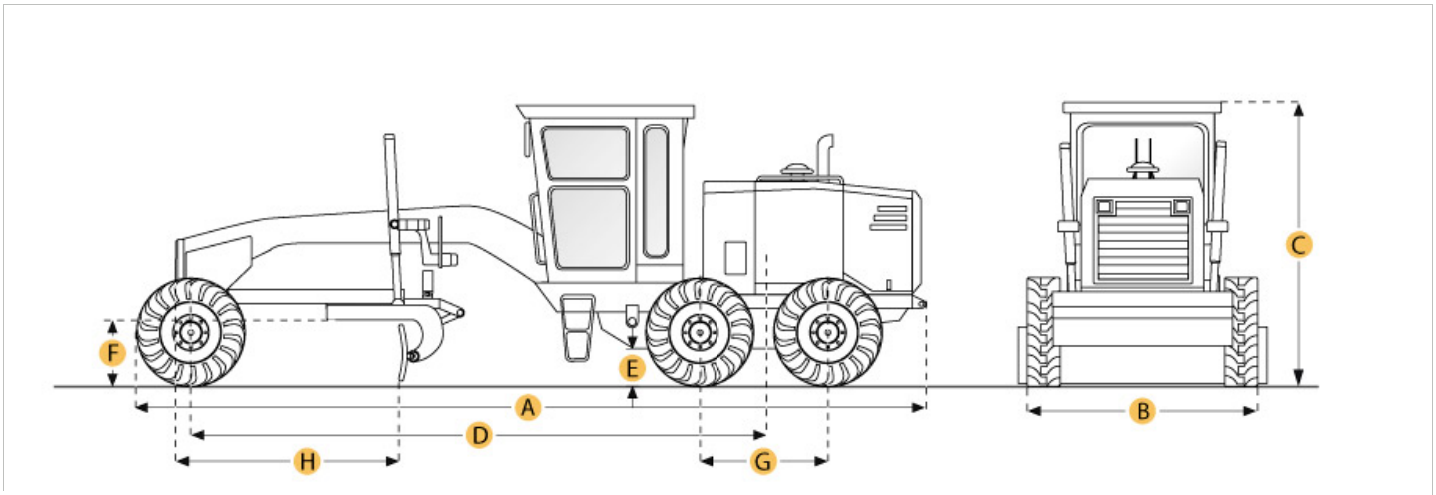
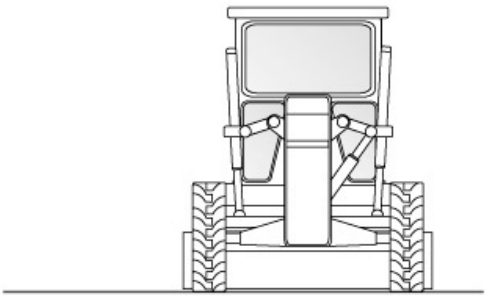


Selected Dimensions

Dimensions		
A. OVERALL LENGTH	26 ft in	7930 mm
B. WIDTH OVER TIRES	7.9 ft in	2410 mm
C. HEIGHT TO TOP OF CAB	10.9 ft in	3330 mm
D. WHEELBASE	18.7 ft in	5690 mm
H. BLADE BASE	8.2 ft in	2490 mm



Specification

Engine		
MAKE	Caterpillar	
MODEL	3304	
NET POWER GEAR 5-6	125 hp	93.2 kw
MAX POWER	125 hp	93.2 kw
DISPLACEMENT	427.2 cu in	7 L
Operational		
STD OPERATION WEIGHT - TOTAL	25320.1 lb	11485 kg
FUEL CAPACITY	60 gal	227 L
TIRE SIZE	13x24 8 PR	
Transmission		
NUMBER OF GEARS - FORWARD	6	
NUMBER OF GEARS - REVERSE	6	
MAX SPEED - FORWARD	25.4 mph	40.9 km/h
MAX SPEED - REVERSE	25.4 mph	40.9 km/h
Steering		
TURNING RADIUS	22 ft in	6.7 m
Circle		
MAX LIFT ABOVE GROUND	16.1 in	410 mm
Dimensions		
HEIGHT TO TOP OF CAB	10.9 ft in	3330 mm
OVERALL LENGTH	26 ft in	7930 mm
WIDTH OVER TIRES	7.9 ft in	2410 mm
WHEELBASE	18.7 ft in	5690 mm
BLADE BASE	8.2 ft in	2490 mm

KOMATSU WD420-3 WHEEL DOZER

VIEW ARTICLES ON THIS ITEM

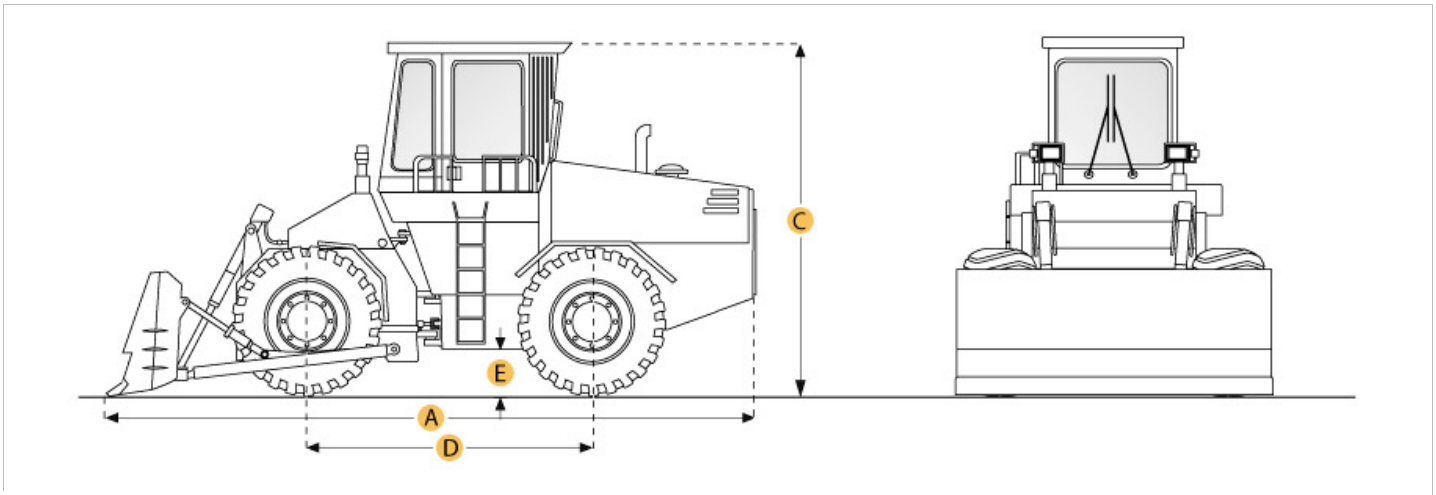
Print specification

Looking to purchase this item?

Find a Komatsu WD420-3 Wheel Dozer being sold at Ritchie Bros. auctions.

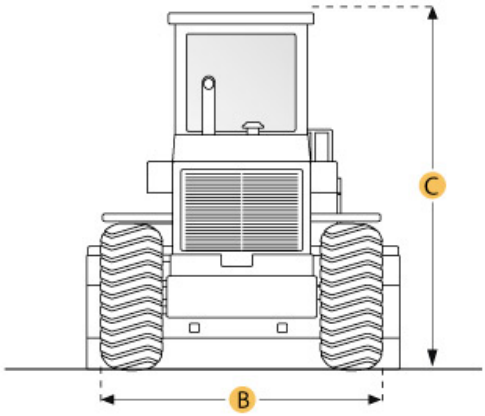
Need to sell equipment?

Complete this form and a Ritchie Bros. representative will contact you.



Selected Dimensions

Dimensions		
A. LENGTH WITH BLADE ON GROUND	23.5 ft in	7160 mm
B. WIDTH OVER TIRES	9.3 ft in	2820 mm
C. HEIGHT TO TOP OF CAB	11.1 ft in	3370 mm
D. WHEELBASE	10.8 ft in	3300 mm

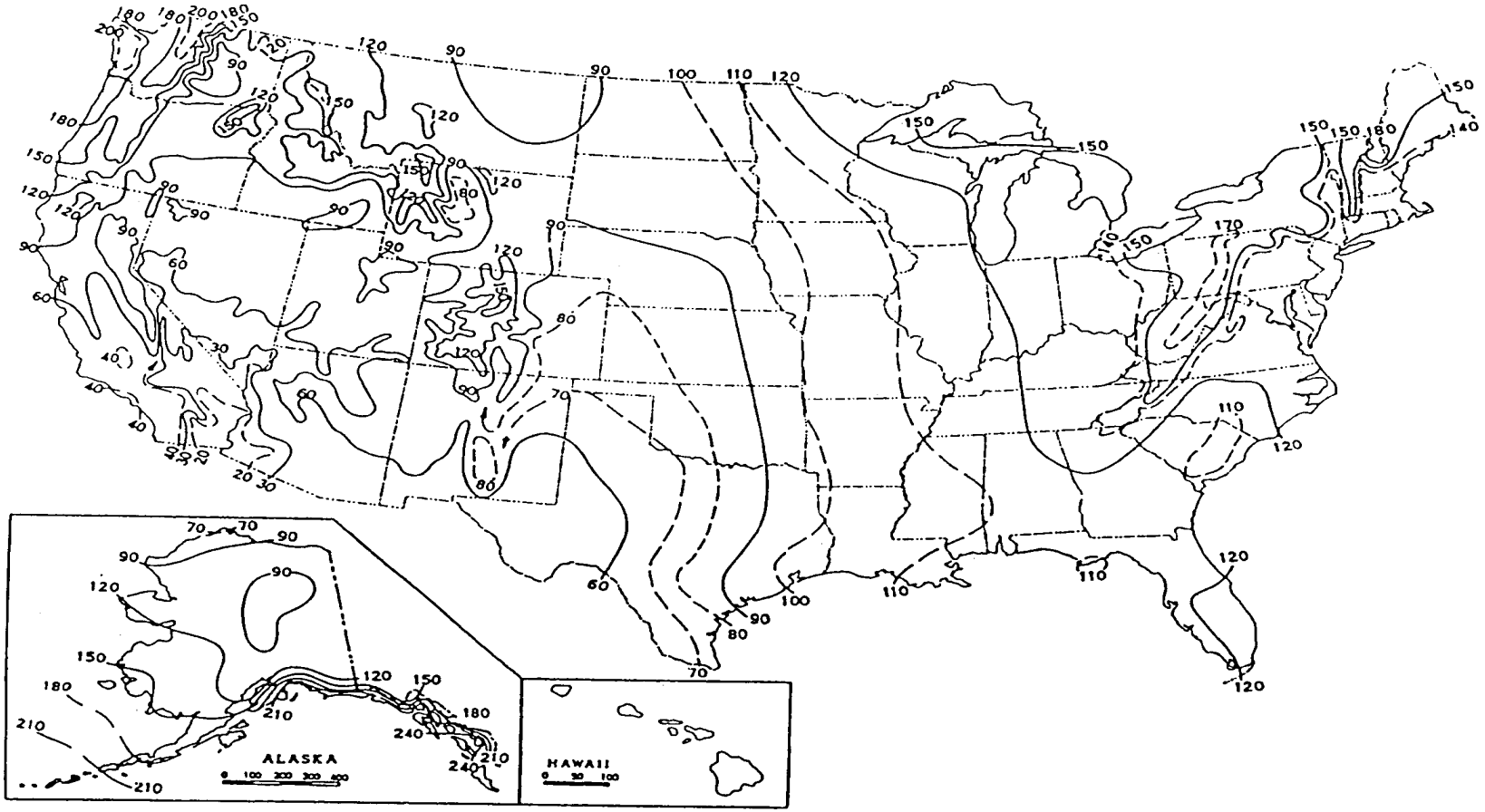


Specification

Engine		
MAKE	Komatsu	
MODEL	SA6D108	
GROSS POWER	224 hp	167 kw
NUMBER OF CYLINDERS	6	
DISPLACEMENT	436.3 cu in	7.2 L
Operational		
OPERATING WEIGHT	44092.5 lb	20000 kg
FUEL CAPACITY	89.8 gal	340 L
TIRE SIZE	23.5-25-12PR	
Transmission		
NUMBER OF FORWARD GEARS	4	
NUMBER OF REVERSE GEARS	4	
MAX SPEED - FORWARD	20.4 mph	32.8 km/h
MAX SPEED - REVERSE	21.1 mph	33.9 km/h
Blade		
BLADE CAPACITY	4.1 yd3	3.1 m3
BLADE WIDTH	12.3 ft in	3745 mm
Dimensions		
LENGTH WITH BLADE ON GROUND	23.5 ft in	7160 mm
WIDTH OVER TIRES	9.3 ft in	2820 mm
HEIGHT TO TOP OF CAB	11.1 ft in	3370 mm
WHEELBASE	10.8 ft in	3300 mm

Exhibit 5-2

MEAN NUMBER OF DAYS WITH 0.01 INCH OR MORE OF ANNUAL PRECIPITATION



Site-specific
Resident Equation Inputs for DU3.1 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
A (PEF Dispersion Constant)	16.2302	11.3161
A (VF Dispersion Constant)	11.911	11.3161
A (VF Dispersion Constant - Mass Limit)	11.911	11.3161
B (PEF Dispersion Constant)	18.7762	19.6437
B (VF Dispersion Constant)	18.4385	19.6437
B (VF Dispersion Constant - Mass Limit)	18.4385	19.6437
C (PEF Dispersion Constant)	216.108	224.8172
C (VF Dispersion Constant)	209.7845	224.8172
C (VF Dispersion Constant - Mass Limit)	209.7845	224.8172
d_s (depth of source) m	.	0.3
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.0495
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
PEF (particulate emission factor) m^3/kg	1359344438	3449677717
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	49.72427513
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	49.72427513
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	49.72427513
A_s (PEF acres)	0.5	4.06
A_s (VF acres)	0.5	4.06
A_s (VF mass-limit acres)	0.5	4.06
$AF_{0\text{-}2}$ (mutagenic skin adherence factor) mg/cm^2	0.2	0.2
$AF_{2\text{-}6}$ (mutagenic skin adherence factor) mg/cm^2	0.2	0.2
$AF_{6\text{-}16}$ (mutagenic skin adherence factor) mg/cm^2	0.07	0.07
$AF_{16\text{-}26}$ (mutagenic skin adherence factor) mg/cm^2	0.07	0.07
$AF_{res\text{-}a}$ (skin adherence factor - adult) mg/cm^2	0.07	0.07
$AF_{res\text{-}c}$ (skin adherence factor - child) mg/cm^2	0.2	0.2
AT_{res} (averaging time - resident carcinogenic)	365	365
$BW_{0\text{-}2}$ (mutagenic body weight) kg	15	15
$BW_{2\text{-}6}$ (mutagenic body weight) kg	15	15
$BW_{6\text{-}16}$ (mutagenic body weight) kg	80	80
$BW_{16\text{-}26}$ (mutagenic body weight) kg	80	80
$BW_{res\text{-}a}$ (body weight - adult) kg	80	80
$BW_{res\text{-}c}$ (body weight - child) kg	15	15
$DFS_{res\text{-}adj}$ (age-adjusted soil dermal factor) mg/kg	103390	103390

Site-specific
Resident Equation Inputs for DU3.1 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
$DFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	428260	428260
ED_{res} (exposure duration) years	26	26
$ED_{0\text{-}2}$ (mutagenic exposure duration) years	2	2
$ED_{2\text{-}6}$ (mutagenic exposure duration) years	4	4
$ED_{6\text{-}16}$ (mutagenic exposure duration) years	10	10
$ED_{16\text{-}26}$ (mutagenic exposure duration) years	10	10
$ED_{res\text{-}a}$ (exposure duration - adult) years	20	20
$ED_{res\text{-}c}$ (exposure duration - child) years	6	6
EF_{res} (exposure frequency) days/year	350	350
$EF_{0\text{-}2}$ (mutagenic exposure frequency) days/year	350	350
$EF_{2\text{-}6}$ (mutagenic exposure frequency) days/year	350	350
$EF_{6\text{-}16}$ (mutagenic exposure frequency) days/year	350	350
$EF_{16\text{-}26}$ (mutagenic exposure frequency) days/year	350	350
$EF_{res\text{-}a}$ (exposure frequency - adult) days/year	350	350
$EF_{res\text{-}c}$ (exposure frequency - child) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
$ET_{0\text{-}2}$ (mutagenic exposure time) hours/day	24	24
$ET_{2\text{-}6}$ (mutagenic exposure time) hours/day	24	24
$ET_{6\text{-}16}$ (mutagenic exposure time) hours/day	24	24
$ET_{16\text{-}26}$ (mutagenic exposure time) hours/day	24	24
$ET_{res\text{-}a}$ (adult exposure time) hours/day	24	24
$ET_{res\text{-}c}$ (child exposure time) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	1
$IFS_{res\text{-}adj}$ (age-adjusted soil ingestion factor) mg/kg	36750	36750
$IFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	166833.3	166833.3
$IRS_{0\text{-}2}$ (mutagenic soil intake rate) mg/day	200	200
$IRS_{2\text{-}6}$ (mutagenic soil intake rate) mg/day	200	200
$IRS_{6\text{-}16}$ (mutagenic soil intake rate) mg/day	100	100
$IRS_{16\text{-}26}$ (mutagenic soil intake rate) mg/day	100	100
$IRS_{res\text{-}a}$ (soil intake rate - adult) mg/day	100	100
$IRS_{res\text{-}c}$ (soil intake rate - child) mg/day	200	200
LT (lifetime) years	70	70
$SA_{0\text{-}2}$ (mutagenic skin surface area) cm^2/day	2373	2373
$SA_{2\text{-}6}$ (mutagenic skin surface area) cm^2/day	2373	2373
$SA_{6\text{-}16}$ (mutagenic skin surface area) cm^2/day	6032	6032

Site-specific
Resident Equation Inputs for DU3.1 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
$SA_{16\text{-}26}$ (mutagenic skin surface area) cm^2/day	6032	6032
$SA_{res\text{-}a}$ (skin surface area - adult) cm^2/day	6032	6032
$SA_{res\text{-}c}$ (skin surface area - child) cm^2/day	2373	2373
TR (target risk) unitless	0.000001	0.00001
T_w (groundwater temperature) Celsius	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.33
VF_{ml} (volitization factor - mass-limit) m^3/kg	.	90601.60722

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Site-specific
Resident Risk for DU3.1 Soil

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Barium	-		-		0.2	A /Subchronic	0.005	H /Subchronic	0.07	-	1	-	-
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	6E-07	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	5.56E-05	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	3450000000	90600
Barium	-	41	-	-		1873.15	PHYSPROP	3572.13	YAWS	-	-	-	3450000000	-
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	3450000000	90600
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	3450000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	3450000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	3450000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	3450000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	3450000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	3450000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	3450000000	90600
Pyrene	54300	326	1.19E-05	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	3450000000	90600
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	3450000000	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion Child HQ	Dermal Child HQ	Inhalation Child HQ	Noncarcinogenic Child HI	Ingestion Adult HQ	Dermal Adult HQ	Inhalation Adult HQ	Noncarcinogenic Adult HI
Anthracene	0.0571	-	-	-	-	0.00000073	0.000000225	-	0.000000955	6.84E-08	3.76E-08	-	0.000000106
Barium	297	-	-	-	-	0.019	-	0.0000165	0.019	0.00178	-	0.0000165	0.0018
Benz[a]anthracene	0.0856	5.59E-08	1.87E-08	5.59E-08	1.30E-07	-	-	-	-	-	-	-	-
Benzo[a]pyrene	0.121	0.00000079	2.64E-07	2.08E-11	1.05E-06	0.00516	0.00159	0.0000168	0.00676	0.000483	0.000265	0.0000168	0.000766
Benzo[b]fluoranthene	0.196	1.28E-07	4.27E-08	3.36E-12	1.71E-07	-	-	-	-	-	-	-	-
Benzo[k]fluoranthene	0.0634	4.14E-09	1.38E-09	1.09E-13	5.52E-09	-	-	-	-	-	-	-	-
Chromium, Total	19.6	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	0.125	8.16E-10	2.72E-10	2.14E-14	1.09E-09	-	-	-	-	-	-	-	-
Fluoranthene	0.142	-	-	-	-	0.0000182	0.0000056	-	0.0000238	1.7E-06	0.000000934	-	0.00000264
Mercury (elemental)	0.31	-	-	-	-	-	-	0.0109	0.0109	-	-	0.0109	0.0109
Pyrene	0.247	-	-	-	-	0.0000105	0.00000325	-	0.0000138	9.87E-07	0.000000542	-	0.00000153
Selenium	4	-	-	-	-	0.0102	-	5.56E-08	0.0102	0.000959	-	5.56E-08	0.000959
**Total Risk/HI*	-	*9.79E-07*	*3.27E-07*	*5.59E-08*	*1.36E-06*	*0.0344*	*0.0016*	*0.011*	*0.047*	*0.00323*	*0.000267*	*0.011*	*0.0145*

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Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); U = User-provided

Site-specific
Resident Risk for DU3.1 Soil

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Barium	-		-		0.2	A /Subchronic	0.005	H /Subchronic	0.07	-	1	-	-
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	6E-07	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	5.56E-05	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	3450000000	90600
Barium	-	41	-	-		1873.15	PHYSPROP	3572.13	YAWS	-	-	-	3450000000	-
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	3450000000	90600
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	3450000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	3450000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	3450000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	3450000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	3450000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	3450000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	3450000000	90600
Pyrene	54300	326	1.19E-05	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	3450000000	90600
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	3450000000	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion Child HQ	Dermal Child HQ	Inhalation Child HQ	Noncarcinogenic Child HI	Ingestion Adult HQ	Dermal Adult HQ	Inhalation Adult HQ	Noncarcinogenic Adult HI
Anthracene	0.0571	-	-	-	-	0.00000073	0.000000225	-	0.000000955	6.84E-08	3.76E-08	-	0.000000106
Barium	297	-	-	-	-	0.019	-	0.0000165	0.019	0.00178	-	0.0000165	0.0018
Benz[a]anthracene	0.0856	5.59E-08	1.87E-08	5.59E-08	1.30E-07	-	-	-	-	-	-	-	-
Benzo[a]pyrene	0.121	0.00000079	2.64E-07	2.08E-11	1.05E-06	0.00516	0.00159	0.0000168	0.00676	0.000483	0.000265	0.0000168	0.000766
Benzo[b]fluoranthene	0.196	1.28E-07	4.27E-08	3.36E-12	1.71E-07	-	-	-	-	-	-	-	-
Benzo[k]fluoranthene	0.0634	4.14E-09	1.38E-09	1.09E-13	5.52E-09	-	-	-	-	-	-	-	-
Chromium, Total	19.6	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	0.125	8.16E-10	2.72E-10	2.14E-14	1.09E-09	-	-	-	-	-	-	-	-
Fluoranthene	0.142	-	-	-	-	0.0000182	0.0000056	-	0.0000238	1.7E-06	0.000000934	-	0.00000264
Mercury (elemental)	0.31	-	-	-	-	-	-	0.0109	0.0109	-	-	0.0109	0.0109
Pyrene	0.247	-	-	-	-	0.0000105	0.00000325	-	0.0000138	9.87E-07	0.000000542	-	0.00000153
Selenium	4	-	-	-	-	0.0102	-	5.56E-08	0.0102	0.000959	-	5.56E-08	0.000959
**Total Risk/HI*	-	*9.79E-07*	*3.27E-07*	*5.59E-08*	*1.36E-06*	*0.0344*	*0.0016*	*0.011*	*0.047*	*0.00323*	*0.000267*	*0.011*	*0.0145*

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Site-specific
Composite Worker Equation Inputs for DU3.1 Soil

* Inputted values different from Composite Worker defaults are highlighted.

Variable	Composite Worker Soil Default	Form-input Value
A (PEF Dispersion Constant)	16.2302	11.3161
A (VF Dispersion Constant)	11.911	11.3161
A (VF Dispersion Constant - Mass Limit)	11.911	11.3161
B (PEF Dispersion Constant)	18.7762	19.6437
B (VF Dispersion Constant)	18.4385	19.6437
B (VF Dispersion Constant - Mass Limit)	18.4385	19.6437
C (PEF Dispersion Constant)	216.108	224.8172
C (VF Dispersion Constant)	209.7845	224.8172
C (VF Dispersion Constant - Mass Limit)	209.7845	224.8172
d_s (depth of source) m	.	0.3
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.0495
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
PEF (particulate emission factor) m^3/kg	1359344438	3449677717
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	49.72427513
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	49.72427513
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	49.72427513
A_s (PEF acres)	0.5	4.06
A_s (VF acres)	0.5	4.06
A_s (VF mass-limit acres)	0.5	4.06
AF_w (skin adherence factor - composite worker) mg/cm^2	0.12	0.12
AT_w (averaging time - composite worker)	365	365
BW_w (body weight - composite worker)	80	80
ED_w (exposure duration - composite worker) yr	25	25
EF_w (exposure frequency - composite worker) day/yr	250	250
ET_w (exposure time - composite worker) hr	8	8
THQ (target hazard quotient) unitless	0.1	1
IR_w (soil ingestion rate - composite worker) mg/day	100	100
LT (lifetime) yr	70	70
SA_w (surface area - composite worker) cm^2/day	3527	3527
TR (target risk) unitless	0.000001	0.00001
T_w (groundwater temperature) Celsius	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396

Site-specific
Composite Worker Equation Inputs for DU3.1 Soil

* Inputted values different from Composite Worker defaults are highlighted.

Variable	Composite Worker Soil Default	Form-input Value
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.33
VF_{ml} (volitization factor - mass-limit) m^3/kg	.	90601.60722

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Site-specific
Composite Worker Risk for DU3.1 Soil

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Barium	-		-		0.2	A /Subchronic	0.005	H /Subchronic	0.07	-	1	-	-
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	0.0000006	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	0.0000556	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	3450000000	90600
Barium	-	41	-	-		1873.15	PHYSPROP	3572.13	YAWS	-	-	-	3450000000	-
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	3450000000	90600
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	3450000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	3450000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	3450000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	3450000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	3450000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	3450000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	3450000000	90600
Pyrene	54300	326	0.0000119	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	3450000000	90600
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	3450000000	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Anthracene	0.0571	-	-	-	-	4.89E-08	2.69E-08	-	7.58E-08
Barium	297	-	-	-	-	0.00127	-	0.00000393	0.00128
Benz[a]anthracene	0.0856	2.62E-09	1.44E-09	4.62E-09	8.68E-09	-	-	-	-
Benzo[a]pyrene	0.121	3.7E-08	2.04E-08	1.72E-12	5.74E-08	0.000345	0.00019	0.000004	0.000539
Benzo[b]fluoranthene	0.196	5.99E-09	3.3E-09	2.78E-13	9.29E-09	-	-	-	-
Benzo[k]fluoranthene	0.0634	1.94E-10	1.07E-10	8.99E-15	3.01E-10	-	-	-	-
Chromium, Total	19.6	-	-	-	-	-	-	-	-
Chrysene	0.125	3.82E-11	2.1E-11	1.77E-15	5.93E-11	-	-	-	-
Fluoranthene	0.142	-	-	-	-	0.00000122	0.000000669	-	0.00000188
Mercury (elemental)	0.31	-	-	-	-	-	-	0.0026	0.0026
Pyrene	0.247	-	-	-	-	0.000000705	0.000000388	-	0.00000109
Selenium	4	-	-	-	-	0.000685	-	1.32E-08	0.000685
**Total Risk/HI*	-	*4.58E-08*	*2.52E-08*	*4.62E-09*	*7.57E-08*	*0.0023*	*0.000191*	*0.00261*	*0.00511*

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Site-specific

Construction Worker Equation Inputs for DU3.1 Soil - Unpaved Road Traffic

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Unpaved Default Value	Form-input Value
L_R (length of road segment) ft	147.58077	420.5404739
A (PEF Dispersion Constant)	12.9351	12.9351
A_R (surface area of contaminated road segment) m^2	274.21393	2344.168299
A (VF Dispersion Constant)	2.4538	2.4538
W_R (width of road segment) ft	20	60
B (PEF Dispersion Constant)	5.7383	5.7383
B (VF Dispersion Constant)	17.566	17.566
C (PEF Dispersion Constant)	71.7711	71.7711
C (VF Dispersion Constant)	189.0426	189.0426
distance (road length) km/day	0.04498	0.128180543
d_s (average source depth) m	.	0.3
F_D Unitless Dispersion Correction Factor	0.185837208	0.185837208
foc (fraction organic carbon in soil) g/g	0.006	0.006
uncontrolled conditions) %	0.2	0.2
Number of cars	.	0
Number of trucks	.	182
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p (days per year with at least .01" of precipitation) days/year	.	90
p_b ($VF_{ulim-sc}$ dry soil bulk density) g/cm^3	1.5	1.5
p_b ($VF_{mlim-sc}$ dry soil bulk density) g/cm^3	1.5	1.5
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{sr} (g/m^2-s per kg/m^3)	23.01785	16.81104131
Q/C_{vol} (g/m^2-s per kg/m^3)	14.31407	9.775437902
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	9.775437902
s (road surface silt content) %	8.5	8.5
A_s (PEF_{sc} - acres)	0.5	4.06
A_s ($VF_{mlim-sc}$ acres)	0.5	4.06
A_s ($VF_{ulim-sc}$ acres)	0.5	4.06
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3	0.3
AT_{cw} (averaging time - construction worker) days	365	365
BW_{cw} (body weight - construction worker) kg	80	80
ED_{cw} (exposure duration - construction worker) yr	1	1
EF_{cw} (exposure frequency - construction worker) day/yr	250	250

Site-specific

Construction Worker Equation Inputs for DU3.1 Soil - Unpaved Road Traffic

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Unpaved Default Value	Form-input Value
ET_{cw} (exposure time - construction worker) hr/day	8	8
THQ (target hazard quotient) unitless	0.1	1
IR_{cw} (soil ingestion rate - construction worker) mg/day	330	330
LT (lifetime) yr	70	70
SA_{cw} (surface area - construction worker) cm^2/day	3527	3527
TR (target cancer risk) unitless	0.000001	0.00001
t_c (overall duration of construction) hours	8400	8400
T_c (overall duration of construction) s	30240000	30240000
T_w (groundwater temperature) C	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T_t (overall duration of traffic) s	7200000	7200000
$VF_{mlim-sc}$ (volitization factor) m^3_{air}/kg_{soil}	.	3534.864918
Tons per car	.	2.6
Tons per truck	.	44.4

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Site-specific
Construction Worker Risk for DU3.1 Soil - Unpaved Road Traffic

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Barium	-		-		0.2	A /Subchronic	0.005	H /Subchronic	0.07	-	1	-	-
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	6E-07	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	5.56E-05	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	0	3530
Barium	-	41	-	-		1873.15	PHYSPROP	3572.13	YAWS	-	-	-	0	-
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	0	3530
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	0	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	0	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	0	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	0	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	0	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	0	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	0	3530
Pyrene	54300	326	1.19E-05	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	0	3530
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	0	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Anthracene	0.0571	-	-	-	-	0.000000168	7.01E-08	-	0.000000238
Barium	297	-	-	-	-	0.00438	-	-	0.00438
Benz[a]anthracene	0.0856	3.45E-10	1.44E-10	4.74E-09	5.23E-09	-	-	-	-
Benzo[a]pyrene	0.121	4.88E-09	2.04E-09	-	6.92E-09	0.00119	0.000495	-	0.00168
Benzo[b]fluoranthene	0.196	7.91E-10	3.3E-10	-	1.12E-09	-	-	-	-
Benzo[k]fluoranthene	0.0634	2.56E-11	1.07E-11	-	3.63E-11	-	-	-	-
Chromium, Total	19.6	-	-	-	-	-	-	-	-
Chrysene	0.125	5.05E-12	2.1E-12	-	7.15E-12	-	-	-	-
Fluoranthene	0.142	-	-	-	-	0.00000418	0.00000174	-	0.00000593
Mercury (elemental)	0.31	-	-	-	-	-	-	0.0696	0.0696
Pyrene	0.247	-	-	-	-	0.00000243	0.00000101	-	0.00000344
Selenium	4	-	-	-	-	0.00236	-	-	0.00236
**Total Risk/HI*	-	*6.05E-09*	*2.52E-09*	*4.74E-09*	*1.33E-08*	*0.00793*	*0.000498*	*0.0696*	*0.078*

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Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); U = User-provided

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Site-specific

Construction Worker Equation Inputs for DU3.1 Soil - Other Construction Activities

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Other Default Value	Form-input Value
$A_{c\text{-}doz}$ (areal extent of dozing) acres	.	4.06
A_{excav} (area of excavation site) m^2	.	16443.83
$A_{c\text{-}grade}$ (areal extent of grading) acres	.	4.06
A (PEF Dispersion Constant)	2.4538	2.4538
A_{surf} (areal extent of site) m^2	2023.43	16430.2516
A_{till} (areal extent of tilling) acres	.	4.06
A (VF Dispersion Constant)	2.4538	2.4538
B_l (dozing blade length) m	.	3.7
B_l (grading blade length) m	.	2.5
B (PEF Dispersion Constant)	17.566	17.566
B (VF Dispersion Constant)	17.566	17.566
C (PEF Dispersion Constant)	189.0426	189.0426
C (VF Dispersion Constant)	189.0426	189.0426
d_{excav} (average depth of excavation site) m	.	0.1524
d_s (average source depth) m	.	0.3
F_D Unitless Dispersion Correction Factor	0.185837208	0.185837208
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependant on U_m/U_t derived using Cowherd et al. (1985))	0.194	0.0495
$M_{m\text{-}doz}$ (Gravimetric soil moisture content) %	7.9	7.9
$M_{m\text{-}excav}$ (Gravimetric soil moisture content) %	12	12
M_{wind} (dust emitted by wind erosion) g	51288.84717	7468.626791
$N_{A\text{-}doz}$ (number of times site was dozed)	.	0
$N_{A\text{-}dump}$ (number of times soil is dumped)	2	1
$N_{A\text{-}grade}$ (number of times site was graded)	.	1
$N_{A\text{-}till}$ (number of times soil is tilled)	2	0
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	9.775437902
Q/C_{vol} (g/m^2-s per kg/m^3)	14.31407	9.775437902
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	9.775437902
p_{soil} (density) g/cm^3 - chemical-specific	1.68	1.68
A_c (acres)	0.5	4.06

Site-specific

Construction Worker Equation Inputs for DU3.1 Soil - Other Construction Activities

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Other Default Value	Form-input Value
A_s ($VF_{mlim\text{-}sc}$ acres)	0.5	4.06
A_s ($VF_{ulim\text{-}sc}$ acres)	0.5	4.06
s_{doz} (soil silt content) %	6.9	6.9
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3	0.3
AT_{cw} (averaging time - construction worker) days	365	365
BW_{cw} (body weight - construction worker) kg	80	80
ED_{cw} (exposure duration - construction worker) yr	1	1
EF_{cw} (exposure frequency - construction worker) day/yr	250	250
ET_{cw} (exposure time - construction worker) hr/day	8	8
THQ (target hazard quotient) unitless	0.1	1
IR_{cw} (soil ingestion rate - construction worker) mg/day	330	330
LT (lifetime) yr	70	70
SA_{cw} (surface area - construction worker) cm^2/day	3527	3527
TR (target cancer risk) unitless	0.000001	0.00001
S_{doz} (dozing speed) kph	11.4	11.4
S_{grade} (dozing speed) kph	11.4	11.4
s_{till} (soil silt content) %	18	18
t_c (overall duration of construction) hours	8400	8400
T_c (overall duration of construction) s	30240000	30240000
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (time over which traffic occurs) s	7200000	7200000
T_t (overall duration of traffic) s	7200000	7200000
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value) m/s	11.32	11.32
$VF_{mlim\text{-}sc}$ (volitization factor) m^3_{air}/kg_{soil}	.	3534.864918
V (fraction of vegetative cover)	0	0.33

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Site-specific
Construction Worker Risk for DU3.1 Soil - Other Construction Activities

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Barium	-		-		0.2	A /Subchronic	0.005	H /Subchronic	0.07	-	1	-	-
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	6E-07	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Anthracene	16400	98.2	5.56E-05	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	8E-06	4.85E-08	579000000	3530
Barium	-	41	-	-		1873.15	PHYSPROP	3572.13	YAWS	-	-	-	579000000	-
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	7E-06	6.83E-10	579000000	3530
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	6E-06	-	579000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	6E-06	-	579000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	6E-06	-	579000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	579000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	7E-06	-	579000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	7E-06	-	579000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	6E-06	0.000011	579000000	3530
Pyrene	54300	326	1.19E-05	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	7E-06	2.35E-09	579000000	3530
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	579000000	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Anthracene	0.0571	-	-	-	-	0.000000168	7.01E-08	-	0.000000238
Barium	297	-	-	-	-	0.00438	-	0.0000244	0.0044
Benz[a]anthracene	0.0856	3.45E-10	1.44E-10	4.74E-09	5.23E-09	-	-	-	-
Benzo[a]pyrene	0.121	4.88E-09	2.04E-09	4.09E-13	6.92E-09	0.00119	0.000495	0.0000249	0.00171
Benzo[b]fluoranthene	0.196	7.91E-10	3.3E-10	6.63E-14	1.12E-09	-	-	-	-
Benzo[k]fluoranthene	0.0634	2.56E-11	1.07E-11	2.14E-15	3.63E-11	-	-	-	-
Chromium, Total	19.6	-	-	-	-	-	-	-	-
Chrysene	0.125	5.05E-12	2.1E-12	4.23E-16	7.15E-12	-	-	-	-
Fluoranthene	0.142	-	-	-	-	0.00000418	0.00000174	-	0.00000593
Mercury (elemental)	0.31	-	-	-	-	-	-	0.0696	0.0696
Pyrene	0.247	-	-	-	-	0.00000243	0.00000101	-	0.00000344
Selenium	4	-	-	-	-	0.00236	-	8.23E-08	0.00236
**Total Risk/HI*	-	*6.05E-09*	*2.52E-09*	*4.74E-09*	*1.33E-08*	*0.00793*	*0.000498*	*0.0697*	*0.0781*

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Site-specific
Resident Equation Inputs for DU3.2 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
A (PEF Dispersion Constant)	16.2302	11.3161
A (VF Dispersion Constant)	11.911	11.3161
A (VF Dispersion Constant - Mass Limit)	11.911	11.3161
B (PEF Dispersion Constant)	18.7762	19.6437
B (VF Dispersion Constant)	18.4385	19.6437
B (VF Dispersion Constant - Mass Limit)	18.4385	19.6437
C (PEF Dispersion Constant)	216.108	224.8172
C (VF Dispersion Constant)	209.7845	224.8172
C (VF Dispersion Constant - Mass Limit)	209.7845	224.8172
d_s (depth of source) m	.	0.3
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.0495
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
PEF (particulate emission factor) m^3/kg	1359344438	4208148853
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	60.6570145
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	60.6570145
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	60.6570145
A_s (PEF acres)	0.5	1.24
A_s (VF acres)	0.5	1.24
A_s (VF mass-limit acres)	0.5	1.24
$AF_{0\text{-}2}$ (mutagenic skin adherence factor) mg/cm^2	0.2	0.2
$AF_{2\text{-}6}$ (mutagenic skin adherence factor) mg/cm^2	0.2	0.2
$AF_{6\text{-}16}$ (mutagenic skin adherence factor) mg/cm^2	0.07	0.07
$AF_{16\text{-}26}$ (mutagenic skin adherence factor) mg/cm^2	0.07	0.07
$AF_{res\text{-}a}$ (skin adherence factor - adult) mg/cm^2	0.07	0.07
$AF_{res\text{-}c}$ (skin adherence factor - child) mg/cm^2	0.2	0.2
AT_{res} (averaging time - resident carcinogenic)	365	365
$BW_{0\text{-}2}$ (mutagenic body weight) kg	15	15
$BW_{2\text{-}6}$ (mutagenic body weight) kg	15	15
$BW_{6\text{-}16}$ (mutagenic body weight) kg	80	80
$BW_{16\text{-}26}$ (mutagenic body weight) kg	80	80
$BW_{res\text{-}a}$ (body weight - adult) kg	80	80
$BW_{res\text{-}c}$ (body weight - child) kg	15	15
$DFS_{res\text{-}adj}$ (age-adjusted soil dermal factor) mg/kg	103390	103390

Site-specific
Resident Equation Inputs for DU3.2 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
$DFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	428260	428260
ED_{res} (exposure duration) years	26	26
$ED_{0\text{-}2}$ (mutagenic exposure duration) years	2	2
$ED_{2\text{-}6}$ (mutagenic exposure duration) years	4	4
$ED_{6\text{-}16}$ (mutagenic exposure duration) years	10	10
$ED_{16\text{-}26}$ (mutagenic exposure duration) years	10	10
$ED_{res\text{-}a}$ (exposure duration - adult) years	20	20
$ED_{res\text{-}c}$ (exposure duration - child) years	6	6
EF_{res} (exposure frequency) days/year	350	350
$EF_{0\text{-}2}$ (mutagenic exposure frequency) days/year	350	350
$EF_{2\text{-}6}$ (mutagenic exposure frequency) days/year	350	350
$EF_{6\text{-}16}$ (mutagenic exposure frequency) days/year	350	350
$EF_{16\text{-}26}$ (mutagenic exposure frequency) days/year	350	350
$EF_{res\text{-}a}$ (exposure frequency - adult) days/year	350	350
$EF_{res\text{-}c}$ (exposure frequency - child) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
$ET_{0\text{-}2}$ (mutagenic exposure time) hours/day	24	24
$ET_{2\text{-}6}$ (mutagenic exposure time) hours/day	24	24
$ET_{6\text{-}16}$ (mutagenic exposure time) hours/day	24	24
$ET_{16\text{-}26}$ (mutagenic exposure time) hours/day	24	24
$ET_{res\text{-}a}$ (adult exposure time) hours/day	24	24
$ET_{res\text{-}c}$ (child exposure time) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	1
$IFS_{res\text{-}adj}$ (age-adjusted soil ingestion factor) mg/kg	36750	36750
$IFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	166833.3	166833.3
$IRS_{0\text{-}2}$ (mutagenic soil intake rate) mg/day	200	200
$IRS_{2\text{-}6}$ (mutagenic soil intake rate) mg/day	200	200
$IRS_{6\text{-}16}$ (mutagenic soil intake rate) mg/day	100	100
$IRS_{16\text{-}26}$ (mutagenic soil intake rate) mg/day	100	100
$IRS_{res\text{-}a}$ (soil intake rate - adult) mg/day	100	100
$IRS_{res\text{-}c}$ (soil intake rate - child) mg/day	200	200
LT (lifetime) years	70	70
$SA_{0\text{-}2}$ (mutagenic skin surface area) cm^2/day	2373	2373
$SA_{2\text{-}6}$ (mutagenic skin surface area) cm^2/day	2373	2373
$SA_{6\text{-}16}$ (mutagenic skin surface area) cm^2/day	6032	6032

Site-specific
Resident Equation Inputs for DU3.2 Soil

* Inputted values different from Resident defaults are highlighted.

Variable	Resident Soil Default Value	Form-input Value
$SA_{16\text{-}26}$ (mutagenic skin surface area) cm^2/day	6032	6032
$SA_{res\text{-}a}$ (skin surface area - adult) cm^2/day	6032	6032
$SA_{res\text{-}c}$ (skin surface area - child) cm^2/day	2373	2373
TR (target risk) unitless	0.000001	0.00001
T_w (groundwater temperature) Celsius	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.33
VF_{ml} (volitization factor - mass-limit) m^3/kg	.	110521.933

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Site-specific
Resident Risk for DU3.2 Soil

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Acenaphthene	-		-		0.2	P /Subchronic	-		1	0.13	1	-	3.9
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	0.0000006	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Naphthalene	-		0.000034	C	0.6	A /Subchronic	0.003	I /Chronic	1	0.13	1	-	31
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Acenaphthene	5030	30.2	0.000184	0.00752	PHYSPROP	552.15	PHYSPROP	803.15	YAWS	0.0506	0.00000833	0.000000672	4210000000	111000
Anthracene	16400	98.2	0.0000556	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	4210000000	111000
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	4210000000	111000
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	4210000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	4210000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	4210000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	4210000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	4210000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	4210000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	4210000000	111000
Naphthalene	1540	9.26	0.00044	0.018	PHYSPROP	491.05	PHYSPROP	748.3	CRC89	0.0605	0.00000838	0.0000062	4210000000	111000
Pyrene	54300	326	0.0000119	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	4210000000	111000
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	4210000000	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion Child HQ	Dermal Child HQ	Inhalation Child HQ	Noncarcinogenic Child HI	Ingestion Adult HQ	Dermal Adult HQ	Inhalation Adult HQ	Noncarcinogenic Adult HI
Acenaphthene	0.015	-	-	-	-	0.000000959	0.000000296	-	0.00000125	8.99E-08	4.93E-08	-	0.000000139
Anthracene	0.138	-	-	-	-	0.00000176	0.000000544	-	0.00000231	1.65E-07	9.08E-08	-	0.000000256
Benz[a]anthracene	0.224	1.46E-07	4.88E-08	1.20E-07	3.15E-07	-	-	-	-	-	-	-	-
Benzo[a]pyrene	0.234	1.53E-06	5.1E-07	3.29E-11	2.04E-06	0.00997	0.00308	0.0000267	0.0131	0.000935	0.000513	0.0000267	0.00147
Benzo[b]fluoranthene	0.416	2.72E-07	9.06E-08	5.85E-12	3.62E-07	-	-	-	-	-	-	-	-
Benzo[k]fluoranthene	0.117	7.64E-09	2.55E-09	1.65E-13	1.02E-08	-	-	-	-	-	-	-	-
Chromium, Total	25.3	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	0.301	1.97E-09	6.56E-10	4.23E-14	2.62E-09	-	-	-	-	-	-	-	-
Fluoranthene	0.373	-	-	-	-	0.0000477	0.0000147	-	0.0000624	4.47E-06	0.00000245	-	0.00000693
Mercury (elemental)	0.342	-	-	-	-	-	-	0.00989	0.00989	-	-	0.00989	0.00989
Naphthalene	0.0693	-	-	7.59E-09	7.59E-09	0.00000148	0.000000456	0.0002	0.000202	1.38E-07	0.000000076	0.0002	0.000201
Pyrene	0.402	-	-	-	-	0.0000171	0.00000529	-	0.0000224	1.61E-06	0.000000882	-	0.00000249
Selenium	4	-	-	-	-	0.0102	-	4.56E-08	0.0102	0.000959	-	4.56E-08	0.000959
**Total Risk/HI*	-	*1.96E-06*	*6.53E-07*	*1.28E-07*	*2.74E-06*	*0.0203*	*0.0031*	*0.0101*	*0.0335*	*0.0019*	*0.000517*	*0.0101*	*0.0125*

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Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); U = User-provided

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Site-specific
Composite Worker Equation Inputs for DU3.2 Soil

* Inputted values different from Composite Worker defaults are highlighted.

Variable	Composite Worker Soil Default Value	Form-input Value
A (PEF Dispersion Constant)	16.2302	11.3161
A (VF Dispersion Constant)	11.911	11.3161
A (VF Dispersion Constant - Mass Limit)	11.911	11.3161
B (PEF Dispersion Constant)	18.7762	19.6437
B (VF Dispersion Constant)	18.4385	19.6437
B (VF Dispersion Constant - Mass Limit)	18.4385	19.6437
C (PEF Dispersion Constant)	216.108	224.8172
C (VF Dispersion Constant)	209.7845	224.8172
C (VF Dispersion Constant - Mass Limit)	209.7845	224.8172
d_s (depth of source) m	.	0.3
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.0495
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
PEF (particulate emission factor) m^3/kg	1359344438	4208148853
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	60.6570145
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	60.6570145
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	60.6570145
A_s (PEF acres)	0.5	1.24
A_s (VF acres)	0.5	1.24
A_s (VF mass-limit acres)	0.5	1.24
AF_w (skin adherence factor - composite worker) mg/cm^2	0.12	0.12
AT_w (averaging time - composite worker)	365	365
BW_w (body weight - composite worker)	80	80
ED_w (exposure duration - composite worker) yr	25	25
EF_w (exposure frequency - composite worker) day/yr	250	250
ET_w (exposure time - composite worker) hr	8	8
THQ (target hazard quotient) unitless	0.1	1
IR_w (soil ingestion rate - composite worker) mg/day	100	100
LT (lifetime) yr	70	70
SA_w (surface area - composite worker) cm^2/day	3527	3527
TR (target risk) unitless	0.000001	0.00001
T_w (groundwater temperature) Celsius	25	25

Site-specific
Composite Worker Equation Inputs for DU3.2 Soil

* Inputted values different from Composite Worker defaults are highlighted.

Variable	Composite Worker Soil Default Value	Form-input Value
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.33
VF_{ml} (volitization factor - mass-limit) m^3/kg	.	110521.933

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Site-specific
Composite Worker Risk for DU3.2 Soil

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Acenaphthene	-		-		0.2	P /Subchronic	-		1	0.13	1	-	3.9
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	6E-07	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Naphthalene	-		0.000034	C	0.6	A /Subchronic	0.003	I /Chronic	1	0.13	1	-	31
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Acenaphthene	5030	30.2	0.000184	0.00752	PHYSPROP	552.15	PHYSPROP	803.15	YAWS	0.0506	0.00000833	0.000000672	4210000000	111000
Anthracene	16400	98.2	5.56E-05	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	4210000000	111000
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	4210000000	111000
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	4210000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	4210000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	4210000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	4210000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	4210000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	4210000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	4210000000	111000
Naphthalene	1540	9.26	0.00044	0.018	PHYSPROP	491.05	PHYSPROP	748.3	CRC89	0.0605	0.00000838	0.0000062	4210000000	111000
Pyrene	54300	326	1.19E-05	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	4210000000	111000
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	4210000000	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Acenaphthene	0.015	-	-	-	-	6.42E-08	3.53E-08	-	9.95E-08
Anthracene	0.138	-	-	-	-	0.000000118	0.000000065	-	0.000000183
Benz[a]anthracene	0.224	6.85E-09	3.77E-09	9.92E-09	2.05E-08	-	-	-	-
Benzo[a]pyrene	0.234	7.16E-08	3.94E-08	2.72E-12	0.000000111	0.000668	0.000367	0.00000635	0.00104
Benzo[b]fluoranthene	0.416	1.27E-08	7E-09	4.84E-13	1.97E-08	-	-	-	-
Benzo[k]fluoranthene	0.117	3.58E-10	1.97E-10	1.36E-14	5.55E-10	-	-	-	-
Chromium, Total	25.3	-	-	-	-	-	-	-	-
Chrysene	0.301	9.2E-11	5.06E-11	3.5E-15	1.43E-10	-	-	-	-
Fluoranthene	0.373	-	-	-	-	0.00000319	0.00000176	-	0.00000495
Mercury (elemental)	0.342	-	-	-	-	-	-	0.00236	0.00236
Naphthalene	0.0693	-	-	1.74E-09	1.74E-09	9.89E-08	5.44E-08	0.0000477	0.0000479
Pyrene	0.402	-	-	-	-	0.00000115	0.000000631	-	0.00000178
Selenium	4	-	-	-	-	0.000685	-	1.09E-08	0.000685
**Total Risk/HI*	-	*9.16E-08*	*5.04E-08*	*1.17E-08*	*1.54E-07*	*0.00136*	*0.00037*	*0.00241*	*0.00414*

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Site-specific

Construction Worker Equation Inputs for DU3.2 Soil - Unpaved Road Traffic

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Unpaved Default Value	Form-input Value
L_R (length of road segment) ft	147.58077	232.4104361
A (PEF Dispersion Constant)	12.9351	12.9351
A_R (surface area of contaminated road segment) m^2	274.21393	1295.497605
A (VF Dispersion Constant)	2.4538	2.4538
W_R (width of road segment) ft	20	60
B (PEF Dispersion Constant)	5.7383	5.7383
B (VF Dispersion Constant)	17.566	17.566
C (PEF Dispersion Constant)	71.7711	71.7711
C (VF Dispersion Constant)	189.0426	189.0426
distance (road length) km/day	0.04498	0.070838594
d_s (average source depth) m	.	0.3
F_D Unitless Dispersion Correction Factor	0.185837208	0.185837208
foc (fraction organic carbon in soil) g/g	0.006	0.006
M_{dry} (road surface material moisture content under dry, uncontrolled conditions) %	0.2	0.2
Number of cars	.	0
Number of trucks	.	56
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p (days per year with at least .01" of precipitation) days/year	.	90
p_b ($VF_{ulim-sc}$ dry soil bulk density) g/cm^3	1.5	1.5
p_b ($VF_{mlim-sc}$ dry soil bulk density) g/cm^3	1.5	1.5
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{sr} (g/m^2-s per kg/m^3)	23.01785	19.78620314
Q/C_{vol} (g/m^2-s per kg/m^3)	14.31407	12.06312994
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	12.06312994
s (road surface silt content) %	8.5	8.5
A_s (PEF_{sc} - acres)	0.5	1.24
A_s ($VF_{mlim-sc}$ acres)	0.5	1.24
A_s ($VF_{ulim-sc}$ acres)	0.5	1.24
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3	0.3
AT_{cw} (averaging time - construction worker) days	365	365
BW_{cw} (body weight - construction worker) kg	80	80
ED_{cw} (exposure duration - construction worker) yr	1	1
EF_{cw} (exposure frequency - construction worker) day/yr	250	250

Site-specific

Construction Worker Equation Inputs for DU3.2 Soil - Unpaved Road Traffic

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Unpaved Default Value	Form-input Value
ET_{cw} (exposure time - construction worker) hr/day	8	8
THQ (target hazard quotient) unitless	0.1	1
IR_{cw} (soil ingestion rate - construction worker) mg/day	330	330
LT (lifetime) yr	70	70
SA_{cw} (surface area - construction worker) cm^2/day	3527	3527
TR (target cancer risk) unitless	0.000001	0.00001
t_c (overall duration of construction) hours	8400	8400
T_c (overall duration of construction) s	30240000	30240000
T_w (groundwater temperature) C	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T_t (overall duration of traffic) s	7200000	7200000
$VF_{mlim-sc}$ (volitization factor) m^3_{air}/kg_{soil}	.	4362.10994
Tons per car	.	2.6
Tons per truck	.	44.4

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Site-specific
Construction Worker Risk for DU3.2 Soil - Unpaved Road Traffic

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Acenaphthene	-		-		0.2	P /Subchronic	-		1	0.13	1	-	3.9
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	6E-07	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Naphthalene	-		0.000034	C	0.6	A /Subchronic	0.003	I /Chronic	1	0.13	1	-	31
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Acenaphthene	5030	30.2	0.000184	0.00752	PHYSPROP	552.15	PHYSPROP	803.15	YAWS	0.0506	0.00000833	0.000000672	0	4360
Anthracene	16400	98.2	5.56E-05	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	0.00000785	4.85E-08	0	4360
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	0.00000675	6.83E-10	0	4360
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	0.00000556	-	0	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	0.00000556	-	0	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	0.00000556	-	0	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	0	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	0.00000675	-	0	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	0.00000718	-	0	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	0.0000063	0.000011	0	4360
Naphthalene	1540	9.26	0.00044	0.018	PHYSPROP	491.05	PHYSPROP	748.3	CRC89	0.0605	0.00000838	0.0000062	0	4360
Pyrene	54300	326	1.19E-05	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	0.00000725	2.35E-09	0	4360
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	0	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Acenaphthene	0.015	-	-	-	-	0.000000221	9.21E-08	-	0.000000313
Anthracene	0.138	-	-	-	-	0.000000407	0.000000169	-	0.000000576
Benz[a]anthracene	0.224	9.04E-10	3.77E-10	0.00000001	1.13E-08	-	-	-	-
Benzo[a]pyrene	0.234	9.44E-09	3.94E-09	-	1.34E-08	0.0023	0.000958	-	0.00326
Benzo[b]fluoranthene	0.416	1.68E-09	7E-10	-	2.38E-09	-	-	-	-
Benzo[k]fluoranthene	0.117	4.72E-11	1.97E-11	-	6.69E-11	-	-	-	-
Chromium, Total	25.3	-	-	-	-	-	-	-	-
Chrysene	0.301	1.21E-11	5.06E-12	-	1.72E-11	-	-	-	-
Fluoranthene	0.373	-	-	-	-	0.000011	0.00000458	-	0.0000156
Mercury (elemental)	0.342	-	-	-	-	-	-	0.0622	0.0622
Naphthalene	0.0693	-	-	1.76E-09	1.76E-09	0.00000034	0.000000142	0.00126	0.00126
Pyrene	0.402	-	-	-	-	0.00000395	0.00000165	-	0.00000559
Selenium	4	-	-	-	-	0.00236	-	-	0.00236
**Total Risk/HI*	-	*1.21E-08*	*5.04E-09*	*1.18E-08*	*2.89E-08*	*0.00467*	*0.000965*	*0.0635*	*0.0691*

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Site-specific Construction Worker Equation Inputs for DU3.2 Soil - Other Construction Activities

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Other Default Value	Form-input Value
$A_{c\text{-}doz}$ (areal extent of dozing) acres	.	1.24
A_{excav} (area of excavation site) m^2	.	5016.76
$A_{c\text{-}grade}$ (areal extent of grading) acres	.	1.24
A (PEF Dispersion Constant)	2.4538	2.4538
A_{surf} (areal extent of site) m^2	2023.43	5018.1064
A_{till} (areal extent of tilling) acres	.	1.24
A (VF Dispersion Constant)	2.4538	2.4538
B_l (dozing blade length) m	.	3.7
B_l (grading blade length) m	.	2.5
B (PEF Dispersion Constant)	17.566	17.566
B (VF Dispersion Constant)	17.566	17.566
C (PEF Dispersion Constant)	189.0426	189.0426
C (VF Dispersion Constant)	189.0426	189.0426
d_{excav} (average depth of excavation site) m	.	0.1524
d_s (average source depth) m	.	0.3
F_D Unitless Dispersion Correction Factor	0.185837208	0.185837208
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependant on U_m/U_t derived using Cowherd et al. (1985))	0.194	0.0495
$M_{m\text{-}doz}$ (Gravimetric soil moisture content) %	7.9	7.9
$M_{m\text{-}excav}$ (Gravimetric soil moisture content) %	12	12
M_{wind} (dust emitted by wind erosion) g	51288.84717	2281.058429
$N_{A\text{-}doz}$ (number of times site was dozed)	.	1
$N_{A\text{-}dump}$ (number of times soil is dumped)	2	1
$N_{A\text{-}grade}$ (number of times site was graded)	.	1
$N_{A\text{-}till}$ (number of times soil is tilled)	2	0
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	12.06312994
Q/C_{vol} (g/m^2-s per kg/m^3)	14.31407	12.06312994
Q/C_{sa} (g/m^2-s per kg/m^3)	14.31407	12.06312994
p_{soil} (density) g/cm^3 - chemical-specific	1.68	1.68
A_c (acres)	0.5	1.24

Site-specific
Construction Worker Equation Inputs for DU3.2 Soil - Other Construction Activities

* Inputted values different from Construction Worker defaults are highlighted.

Variable	Construction Worker Soil - Other Default Value	Form-input Value
A_s ($VF_{mlim\text{-}sc}$ acres)	0.5	1.24
A_s ($VF_{ulim\text{-}sc}$ acres)	0.5	1.24
s_{doz} (soil silt content) %	6.9	6.9
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3	0.3
AT_{cw} (averaging time - construction worker) days	365	365
BW_{cw} (body weight - construction worker) kg	80	80
ED_{cw} (exposure duration - construction worker) yr	1	1
EF_{cw} (exposure frequency - construction worker) day/yr	250	250
ET_{cw} (exposure time - construction worker) hr/day	8	8
THQ (target hazard quotient) unitless	0.1	1
IR_{cw} (soil ingestion rate - construction worker) mg/day	330	330
LT (lifetime) yr	70	70
SA_{cw} (surface area - construction worker) cm^2/day	3527	3527
TR (target cancer risk) unitless	0.000001	0.00001
S_{doz} (dozing speed) kph	11.4	11.4
S_{grade} (dozing speed) kph	11.4	11.4
s_{till} (soil silt content) %	18	18
t_c (overall duration of construction) hours	8400	8400
T_c (overall duration of construction) s	30240000	30240000
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (time over which traffic occurs) s	7200000	7200000
T_t (overall duration of traffic) s	7200000	7200000
U_m (mean annual wind speed) m/s	4.69	3.98
U_t (equivalent threshold value) m/s	11.32	11.32
$VF_{mlim\text{-}sc}$ (volitization factor) m^3_{air}/kg_{soil}	.	4362.10994
V (fraction of vegetative cover)	0	0.33

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Site-specific
Construction Worker Risk for DU3.2 Soil - Other Construction Activities

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)
Acenaphthene	-		-		0.2	P /Subchronic	-		1	0.13	1	-	3.9
Anthracene	-		-		1	P /Subchronic	-		1	0.13	1	-	0.0434
Benz[a]anthracene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0094
Benzo[a]pyrene	1	I	0.0006	I	0.0003	I /Chronic	0.000002	I /Chronic	1	0.13	1	-	0.00162
Benzo[b]fluoranthene	0.1	E	0.00006	E	-		-		1	0.13	1	-	0.0015
Benzo[k]fluoranthene	0.01	E	0.000006	E	-		-		1	0.13	1	-	0.0008
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Chrysene	0.001	E	6E-07	E	-		-		1	0.13	1	-	0.002
Fluoranthene	-		-		0.1	P /Subchronic	-		1	0.13	1	-	0.26
Mercury (elemental)	-		-		-		0.0003	H /Subchronic	1	-	1	3.13	0.06
Naphthalene	-		0.000034	C	0.6	A /Subchronic	0.003	I /Chronic	1	0.13	1	-	31
Pyrene	-		-		0.3	P /Subchronic	-		1	0.13	1	-	0.135
Selenium	-		-		0.005	H /Subchronic	0.02	C /Chronic	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

Chemical	K_{oc} (cm3/g)	K_d (cm3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
Acenaphthene	5030	30.2	0.000184	0.00752	PHYSPROP	552.15	PHYSPROP	803.15	YAWS	0.0506	8E-06	0.000000672	705000000	4360
Anthracene	16400	98.2	5.56E-05	0.00227	PHYSPROP	613.05	PHYSPROP	873	YAWS	0.039	8E-06	4.85E-08	705000000	4360
Benz[a]anthracene	177000	1060	0.000012	0.000491	PHYSPROP	710.75	PHYSPROP	979	YAWS	0.0261	7E-06	6.83E-10	705000000	4360
Benzo[a]pyrene	587000	-	4.57E-07	0.0000187	PHYSPROP	768.15	PHYSPROP	-		0.0476	6E-06	-	705000000	-
Benzo[b]fluoranthene	599000	-	6.57E-07	0.0000269	PHYSPROP	715.9	EPI	-		0.0476	6E-06	-	705000000	-
Benzo[k]fluoranthene	587000	-	5.84E-07	0.0000239	PHYSPROP	753.15	PHYSPROP	-		0.0476	6E-06	-	705000000	-
Chromium, Total	-	1800000	-	-		2915.15	PHYSPROP	8560.93	YAWS	-	-	-	705000000	-
Chrysene	181000	-	5.23E-06	0.000214	PHYSPROP	721.15	PHYSPROP	979	YAWS	0.0261	7E-06	-	705000000	-
Fluoranthene	55500	-	8.86E-06	0.000362	PHYSPROP	657.15	PHYSPROP	905	YAWS	0.0276	7E-06	-	705000000	-
Mercury (elemental)	-	52	0.00862	0.352	PHYSPROP VP/S	629.75	PHYSPROP	1764	CRC89	0.0307	6E-06	0.000011	705000000	4360
Naphthalene	1540	9.26	0.00044	0.018	PHYSPROP	491.05	PHYSPROP	748.3	CRC89	0.0605	8E-06	0.0000062	705000000	4360
Pyrene	54300	326	1.19E-05	0.000487	PHYSPROP	677.15	PHYSPROP	936	YAWS	0.0278	7E-06	2.35E-09	705000000	4360
Selenium	-	5	-	-		958.15	PHYSPROP	1766	CRC89	-	-	-	705000000	-
**Total Risk/HI*	-	-	-	-		-		-		-	-	-	-	-

Chemical	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
Acenaphthene	0.015	-	-	-	-	0.000000221	9.21E-08	-	0.000000313
Anthracene	0.138	-	-	-	-	0.000000407	0.000000169	-	0.000000576
Benz[a]anthracene	0.224	9.04E-10	3.77E-10	0.00000001	1.13E-08	-	-	-	-
Benzo[a]pyrene	0.234	9.44E-09	3.94E-09	6.49E-13	1.34E-08	0.0023	0.000958	0.0000395	0.0033
Benzo[b]fluoranthene	0.416	1.68E-09	7E-10	1.15E-13	2.38E-09	-	-	-	-
Benzo[k]fluoranthene	0.117	4.72E-11	1.97E-11	3.25E-15	6.69E-11	-	-	-	-
Chromium, Total	25.3	-	-	-	-	-	-	-	-
Chrysene	0.301	1.21E-11	5.06E-12	8.35E-16	1.72E-11	-	-	-	-
Fluoranthene	0.373	-	-	-	-	0.000011	0.00000458	-	0.0000156
Mercury (elemental)	0.342	-	-	-	-	-	-	0.0622	0.0622
Naphthalene	0.0693	-	-	1.76E-09	1.76E-09	0.00000034	0.000000142	0.00126	0.00126
Pyrene	0.402	-	-	-	-	0.00000395	0.00000165	-	0.00000559
Selenium	4	-	-	-	-	0.00236	-	6.75E-08	0.00236
**Total Risk/HI*	-	*1.21E-08*	*5.04E-09*	*1.18E-08*	*2.89E-08*	*0.00467*	*0.000965*	*0.0635*	*0.0692*

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Alta Science & Engineering, Inc.

Risk Evaluation of the Burlington Northern Santa Fe Railway Company Corridor Right of Way Riverstone to Huetter Site in Coeur d'Alene, Idaho

Revision #2
IDEQ Contract No. C975 Task Order No. 27C

Prepared for: Idaho Department of Environmental Quality
Waste and Remediation Division, Brownfields Program,
State Office: 1410 N. Hilton, Boise, ID 83706
Coeur d'Alene Regional Office: 2110 Ironwood Parkway, Coeur d'Alene, ID 83814

November 17, 2017

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Acronyms and Abbreviations

Alta	Alta Science & Engineering, Inc.
bgs	below ground surface
BNSF	Burlington Northern Santa Fe
CDA	Coeur d'Alene
COPC	chemical of potential concern
DU	decision unit
EPC	exposure point concentration
ESA	Environmental Site Assessment
GWP	ground water protection pathway
HI	Hazard Index
HQ	Hazard Quotient
IDAPA	Idaho Administrative Procedures Act
IDEQ	Idaho Department of Environmental Quality
ISM	Incremental Sampling Method
PAH	polycyclic aromatic hydrocarbon
Petro REM	Risk Evaluation Manual for Petroleum Releases
QAPP	Quality Assurance Project Plan
R2R	Riverstone to Huetter
RCRA	Resource Conservation and Recovery Act
RE	Risk Evaluation
REC	recognized environmental condition
ROW	right of way
RSL	Regional Screening Level
SCM	Site Conceptual Model
SSL	Soil Screening Level
SVOC	semi-volatile organic compound
TerraGraphics	TerraGraphics Environmental Engineering, Inc.
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey

Units

ft	feet
lb	pound
m	meter
mg/kg	milligram per kilogram
yd	yard

Executive Summary

TerraGraphics Environmental Engineering, Inc. (TerraGraphics) and later Alta Science & Engineering, Inc. (Alta) completed a Risk Evaluation (RE) for the chemicals of potential concern (COPCs) exceeding screening levels at the Riverstone to Huetter (R2R) Burlington Northern Santa Fe (BNSF) Railway Company corridor in Coeur d'Alene (CDA), Idaho. TerraGraphics completed a Phase II Environmental Site Assessment (ESA) report in October 2016 and concluded that concentrations of metals and petroleum-related COPCs in soil were above their respective screening levels. To evaluate both cancer and non-cancer risks to humans associated with the concentrations of the detected COPCs, and in consideration of planned future land use, the Idaho Department of Environmental Quality (IDEQ) requested that TerraGraphics perform a RE of seven areas sampled in 2016.

The purposes of this RE are to 1) evaluate potential cancer and non-cancer risk to human receptors at the Site and determine the primary cause(s) of those risks, and 2) help determine whether remediation actions are necessary. IDEQ and the developer will use the results of this RE for risk management decision-making.

TerraGraphics and Alta evaluated risk for the non-residential/composite worker, construction worker, and future residential scenarios. The only exceedance of total lifetime cancer risk and total non-cancer risk was for the future residential receptor. Both the non-residential/composite worker and construction worker receptors were below the acceptable target lifetime cancer risk of 10^{-5} and non-cancer risk of 1 for all exposure pathways across all COPCs (based on the U.S. Environmental Protection Agency [USEPA] Regional Screening Level [RSL] Calculator [USEPA 2016a] and the Idaho Risk Evaluation Manual for Petroleum Releases [Petro REM] [IDEQ 2012]).

Conclusions and Recommendations

Based on the assessment activities conducted at the Site, historical use has impacted surface soils (0-12 inches below ground surface [bgs]) resulting in residual metals and petroleum-based chemicals (Petro REM polycyclic aromatic hydrocarbons [PAHs]). Additional soil sampling in DU2.2B shows that PAH concentrations decrease within the first couple feet. However, benzo(a)pyrene slightly exceeds the Idaho Petro REM Screening Level in the deeper soil (approximately 36 inches bgs). Based upon the Site's historic use, a similar decreasing trend from the surface soil to depth could be expected in other DUs that have PAH impacts. However, additional sampling in each DU would be necessary to confirm this trend.

Based on the acceptable cancer and non-cancer results of this site-specific RE, all exposure areas at the Site are suitable for non-residential/composite worker use. Construction workers (performing grading activities) are also not at significant cancer and non-cancer risk due to residual metals and petroleum-related COPCs at the Site. Future residential receptors, however, are at a risk for cancer in DU1.3, DU2.1, DU2.2, and DU3.2.

TerraGraphics and Alta have the following recommendations for the CDA BNSF right of way (ROW) R2R based on the information gathered to-date:

- Restrict the Site use for DU1.3, DU2.1, DU2.2, and DU3.2 exposure areas to non-residential/composite worker scenarios.
- Evaluate potential PAH exposure scenarios for soils at depth at each DU in conjunction with the proposed redevelopment and/or future land use. Risk from PAH soils could

likely be mitigated with land use restrictions, onsite soil barriers, and/or shallow soil removals.

- Use caution and best management practices during construction activities to prevent the ingestion of soil and the inhalation of dust if construction activities other than grading are to occur. Alternatively, if site-specific construction activities are known, evaluate risk using the USEPA RSL Calculator with updated information.

1 Site Background

TerraGraphics completed a Phase I ESA in 2015, which concluded there are several recognized environmental conditions (RECs) within the BNSF ROW R2R area (TerraGraphics 2015). The Phase I ESA divided the ROW into three zones based upon historical industrial uses (Figures 1 through 3). All zones have a 100-year history of railroad use. In the early 1900s, the rail line included hourly electric train services linking Spokane, Washington, to CDA, Idaho. The region includes a long history of heavy metal mining and rail distribution.

In Zones 1, 2, and 3, the Phase I ESA identified RECs for heavy metals and PAHs from historical rail activity and nearby industrial businesses. As a result of the past railroad transportation and loading/unloading operations, conclusions in the Phase I ESA identified surface soils within the zones as having potential for containing PAHs, semi-volatile organic compounds (SVOCs), and heavy metals. Recommendations from the Phase I ESA included additional characterization of surface soils for Resource Conservation and Recovery Act (RCRA) 8 metals, PAHs, and SVOCs to evaluate the extent of the identified RECs.

On May 28, 2015, the City of CDA and Ignite CDA, the City's urban renewal agency, purchased the BNSF ROW R2R property. TerraGraphics performed additional characterization activities in October 2016 on the ROW Site at the request of IDEQ. TerraGraphics sub-divided the zones into 17 separate decision units (DUs) based on historical grade elevations, and surface soil samples (ground surface to 12 inches bgs) were collected and analyzed for RCRA 8 metals and PAH concentrations.

Analytical results from the October 2016 sampling event indicate that COPCs remain on Site within each Zone at concentrations greater than risk-based screening levels (TerraGraphics 2017); therefore, IDEQ requested that TerraGraphics and Alta complete this site-specific RE. The purposes of this RE are to 1) evaluate potential cancer and non-cancer risks to human receptors at the Site and determine the primary cause(s) of the risks, and 2) help determine whether remediation actions are necessary. The results of this RE will be used by IDEQ, the City, and the developer for risk management decision-making. Appendix A includes data tables and Appendices B and C include supporting documentation for the RE.

2 Current and Future Land Use

Currently, the Site is vacant and is zoned for commercial use. The Site is approximately 20 feet to 60 feet wide and approximately 11,950 feet long. It is surrounded by residential and commercial property, as well as vacant lots (Figures 1 through 3). The City of CDA has strong interest in, and public support for, redeveloping this Site as a public pedestrian and/or bike trail through green space for public waterfront access. The corridor contains some of the last remaining opportunities for public access to the Spokane River in CDA.

3 Data and Chemicals of Potential Concern Included in the Risk Evaluation

Data used in this RE are from the *Phase II Environmental Assessment Report for BNSF ROW R2R, Coeur d'Alene, Idaho Final* (TerraGraphics 2017). TerraGraphics collected all data and the laboratory analyzed the samples according to the IDEQ approved Quality Assurance Project

Plan (QAPP; TerraGraphics 2016). TerraGraphics reviewed the results using the data quality indicators established in the QAPP (TerraGraphics 2016) and concluded that the 2016 data are complete and representative of the Site (see Appendix C of TerraGraphics 2017). All of the data are surface soil data from October 2016; no groundwater data were collected at this Site.

TerraGraphics screened metal data against USEPA Resident Soil RSLs (USEPA 2016b) and the USEPA Resident Soil to Groundwater Soil Screening Levels (SSLs) (USEPA 2016c) to identify the COPCs that exceed risk-based screening levels (Appendix A, Tables A1 through A7). A chemical that exceeded the lowest screening level was considered a COPC for this RE. TerraGraphics also used background metal information from Kootenai County, Idaho (USGS 2017), and background metal information from the Spokane Basin in Washington (Ecology 1994) for further reference. If a metal concentration was below background values, it was not included in this RE. Alta Science & Engineering, Inc. (Alta) reviewed a letter prepared by a representative of the Idaho Department of Health and Welfare regarding the arsenic in soil at the Site (IDHW 2017). Conclusions from this letter indicate that arsenic concentrations measured at the Site are similar to background concentrations; therefore, arsenic is not included in this RE. A copy of this letter is presented in Appendix C.

For PAHs, TerraGraphics screened the October 2016 data against the Idaho Petro REM Screening Levels (Table 2; IDEQ 2012). All PAHs exceeding these screening levels, as well as any petroleum-related chemical with a detected concentration, were carried forward into the RE. Tables A8 through A14 (Appendix A) also present USEPA RSLs and SSLs for informational purposes only. All PAH results in DU1.1 were below detection limits, so no PAH COPCs were included in the RE for that exposure area.

The COPCs in soil include: total chromium, mercury, cadmium, barium, selenium, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, naphthalene, and pyrene.

4 Exposure Assessment

4.1 Site Conceptual Model

A Site Conceptual Model (SCM) describes potential chemical sources, release mechanisms, environmental transport processes, exposure routes, and receptors at the Site. The purpose of this SCM is to describe the routes or pathways by which humans may be exposed to contaminants at the Site.

Exposure can occur when contaminants migrate from the source to an exposure point, where a receptor comes into direct contact with contaminated media. A complete exposure pathway consists of four necessary elements:

1) a source and mechanism of chemical release to the environment,
2) an environmental transport medium for a released chemical,
3) a point of potential human contact with the impacted medium (referred to as the exposure point), and
4) an exposure route (soil ingestion, inhalation, dermal absorption) at the exposure point.

No exposure (and therefore no risk) exists unless the exposure pathway is complete or potentially complete. An SCM figure from the IDEQ Petro REM Risk Evaluation Application

version 1.1.3 (IDEQ 2015) depicts the impacted media, the transport mechanisms, exposure routes, and potential receptors and is shown in Appendix B. Receptors and exposure routes included as part of this RE are summarized in the following subsections.

4.2 Receptors

The potential human receptors evaluated in this RE are based on current and planned Site use. As further described in Section 4.3, the following receptors are evaluated in order to determine if activity and use limitations are necessary.

- *future residential* receptors – children and adults
- *non-residential/composite worker* receptors – adults ("non-residential" is the term used in the Petro REM and "composite worker" is the term used in the USEPA RSL Calculator, which is a combination of an indoor and outdoor worker)
- *construction worker* receptors – adults, which is a combination of unpaved road traffic work and other construction activity work

4.3 Exposure Areas

The primary source of the Site contamination comes from the historical Site use of the railroad. Residual soil contamination appears to be slightly elevated Site-wide compared to screening levels, most likely distributed during demolition of the facilities/buildings and/or backfilling and ground leveling. Based on this conceptual understanding and the purposes of performing a Site investigation/characterization, the sampling process design divided the Site into three Zones, which were further broken down into a total of 17 DUs. Figures 1 through 3 depict each of the three zones and the DUs. Reasoning for subdividing specific DUs for sampling (1.3[A, B, C], 2.1[A, B, C], 2.2[A, B, C], 3.1[A, B, C], and 3.2[A, B, C]) was based on differing elevation topography and past uses. The southern 20 feet of each of these DUs (labeled with a "C") was a historical vehicle spur road and possible rail bed; the middle 20 feet (labeled with a "B") was a former rail bed track elevated with ballast; and the northern 20 feet (labeled with an "A") currently consists of possible former rail bed that is now vegetated. For this RE, TerraGraphics assumes that DUs that do not specifically have "A" labels have zero vegetation cover based on the heavy erosion and distressed vegetation from historical use. Additionally, each DU that was subdivided for sampling purposes is evaluated as one exposure area in this RE.

4.3.1 Zone 1

Zone 1 has street ROWs nearby and trends east to west from Huetter Avenue to the western boundary of Government Lot 4. The City plans to use this Zone for public access.

- DU1.1 runs from Huetter Avenue to W. Shoreview Lane. It is 1,400 feet long by 20 feet wide and creates a 0.64-acre DU with no vegetation cover. DU1.1 was evaluated as one exposure area for non-residential/composite worker and construction worker scenarios with RCRA 8 metals as the COPCs. The residential receptor was evaluated for information purposes and the understanding of potential future land use restrictions.
- DU1.2 runs parallel to Johnson Mill Park. It is 1,100 feet long by 60 feet wide and creates a 1.52-acre DU with zero vegetation cover. DU1.2 was evaluated as one exposure area for non-residential/composite worker and construction worker scenarios with RCRA 8 metals and PAHs as the COPCs. The residential receptor was evaluated for information purposes and the understanding of potential future land use restrictions.

- DUs 1.3A, 1.3B, and 1.3C are each 1,400 feet long and 20 feet wide, which creates a 1.93-acre area with 33% vegetation cover. DU1.3A, DU1.3B, and DU1.3C were evaluated as one exposure area for non-residential/composite worker and construction worker scenarios with RCRA 8 metals and PAHs as the COPCs. The residential receptor was evaluated for information purposes and the understanding of potential future land use restrictions.

4.3.2 Zone 2

Zone 2 has residential areas surrounding it and trends east to west from the western boundary of Government Lot 4 to the eastern boundary of Government Lot 2. The City plans to use it for public access.

- DUs 2.1A, 2.1B, and 2.1C are each 1,250 feet long and 20 feet wide, which creates a 1.72-acre area with 33% vegetation cover. DU2.1A, DU2.1B, and DU2.1C were evaluated as one exposure area for residential, non-residential/composite worker, and construction worker scenarios with RCRA 8 metals and PAHs as the COPCs.
- DUs 2.2A, 2.2B, and 2.2C are each 2,950 feet long and 20 feet wide, which creates a 4.06-acre area with 33% vegetation cover. DU2.2A, DU2.2B, and DU2.2C were evaluated as one exposure area for residential, non-residential/composite worker, and construction worker scenarios with RCRA 8 metals and PAHs as the COPCs.

4.3.3 Zone 3

Zone 3 has non-residential areas surrounding it and trends east to west from the eastern boundary of Government Lot 2 to the Bureau of Land Management property. The City plans to use this area for public access.

- DUs 3.1A, 3.1B, and 3.1C are each 2,950 feet long and 20 feet wide, which creates a 4.06-acre area with 33% vegetation cover. DUs 3.1A, 3.1B, and 3.1C were evaluated as one exposure area for non-residential/composite worker and construction worker scenarios with RCRA 8 metals and PAHs as the COPCs. The residential receptor was evaluated for information purposes and the understanding of potential future land use restrictions.
- DUs 3.2A, 3.2B, and 3.2C are each 900 feet long and 20 feet wide, which creates a 1.24-acre area with 33% vegetation cover. DUs 3.2A, 3.2B, and 3.2C were evaluated as one exposure area for non-residential/composite worker and construction worker scenarios with RCRA 8 metals and PAHs as the COPCs. The residential receptor was evaluated for information purposes and the understanding of potential future land use restrictions.

4.4 Routes of Exposure

For this RE, the direct contact exposure pathway (ingestion, dermal, particle inhalation) was considered complete and was quantified as part of this RE using soil data from 0-12 inches (0.30 meters) bgs (shown in Appendix B). No groundwater data were collected at the Site; however, the potential migration of contaminants through soil to groundwater is discussed separately in Section 5.2.3.

4.5 Representative Exposure Concentrations

All surface soil data from the October 2016 sampling event were used to estimate an exposure point concentration (EPC) for each exposure area and receptor. Soil data were collected from 0-12 inches (0.30 meters) bgs using a multi-incremental sampling approach, consistent with the Interstate Technology and Regulatory Council's Incremental Sampling Method (ISM) guidance document (ITRC 2012). The ISM strategy is a method to collect soil samples that are representative of the area sampled, referred to as a DU (all data are shown in Appendix A). The details of this sampling event and the results are described in further detail in the *Phase II Environmental Assessment Report for BNSF ROW R2R, Coeur d'Alene, Idaho Final* report (TerraGraphics 2017). The 0-12 inch (0.30 meter) soil depth interval is assumed to represent the surface soil in this RE and subsequent exposures to each receptor: residential, non-residential/composite worker, and construction worker. The Idaho Petro REM defines surface soil as the soil zone from the ground surface to 1 foot bgs (IDEQ 2012; pg 33).

In instances where a sampling location had a duplicate sample collected for quality control purposes, TerraGraphics used the higher of the two concentrations as the representative sample location concentration. Likewise, for exposure areas that had multiple DUs, TerraGraphics used the highest chemical concentrations from the sub-DUs as the EPC for the exposure area. When the reporting limit for detect results is greater than screening levels, the reporting limit was used as the EPC in the RE. This instance occurred for selenium in all exposure areas. Additionally, petroleum-based chemicals are considered to have a cumulative effect; therefore, any chemical that had at least one detected concentration was carried forward in the RE regardless of a screening level exceedance.

EPCs for the non-residential/composite worker, construction worker, and future residential scenarios are presented in Table 1.

Table 1. Estimated Exposure Point Concentrations (EPCs) for Direct Contact Soil

Zone	Decision Unit and Exposure Area	Surface Soil (mg/kg)	
		Metals	PAHs
1	1.1	total chromium = 24.6	
		mercury = 0.268	
		selenium [c] = 4.0	
	1.2	total chromium = 26.9	anthracene = 0.0211
		mercury = 1.54	benzo(a)anthracene [a] = 0.135
		selenium [c] = 4.0	benzo(a)pyrene [a] = 0.128
			benzo(b)fluoranthene [a] = 0.217
			benzo(k)fluoranthene [a] = 0.0687
			chrysene [a] = 0.192
			fluoranthene = 0.254
			pyrene [a] = 0.275

Table 1. Estimated Exposure Point Concentrations (EPCs) for Direct Contact Soil

Zone	Decision Unit and Exposure Area	Surface Soil (mg/kg)	
		Metals	**PAHs**
	1.3	total chromium = 21.4	anthracene = 0.361
		mercury = 0.0580	benzo(a)anthracene = 0.456
		selenium [c] = 4.0	benzo(a)pyrene = 0.440
			benzo(b)fluoranthene = 1.00
			benzo(k)fluoranthene = 0.317
			chrysene = 0.839
			fluoranthene = 1.08
			pyrene = 1.06
2	2.1	total chromium = 21.4	anthracene = 0.340
		mercury = 0.285	benzo(a)anthracene = 0.468
		selenium [c] = 4.0	benzo(a)pyrene = 0.505
			benzo(b)fluoranthene = 0.942
			benzo(k)fluoranthene = 0.282
			chrysene = 0.815
			fluoranthene = 1.17
			pyrene = 1.12

Table 1. Estimated Exposure Point Concentrations (EPCs) for Direct Contact Soil

Zone	Decision Unit and Exposure Area	Surface Soil (mg/kg)	
		Metals	PAHs
2	2.2	cadmium = 0.750	anthracene = 0.349
		total chromium = 23.7	benzo(a)anthracene = 0.520
		mercury = 0.193	benzo(a)pyrene = 0.606
		selenium [c] = 4.0	benzo(b)fluoranthene = 0.942
			benzo(k)fluoranthene = 0.288
			chrysene = 0.679
			fluoranthene = 0.938
			pyrene = 1.01
3	3.1	barium = 297	anthracene = 0.0571
		total chromium = 19.6	benzo(a)anthracene = 0.0856
		mercury = 0.310	benzo(a)pyrene = 0.121
		selenium [c] = 4.0	benzo(b)fluoranthene = 0.196
			benzo(k)fluoranthene = 0.0634
			chrysene [a] = 0.125
			fluoranthene = 0.142
			pyrene = 0.247
	3.2	total chromium = 25.3	anthracene = 0.138
		mercury = 0.342	acenaphthene = 0.0150
		selenium [c] = 4.0	benzo(a)anthracene = 0.224
			benzo(a)pyrene = 0.234
			benzo(b)fluoranthene = 0.416
			benzo(k)fluoranthene = 0.117
			chrysene = 0.301
			fluoranthene = 0.373
			naphthalene = 0.0693
			pyrene = 0.402

Notes:

[a] The maximum concentration of the ISM sample collected in triplicate is presented.
[b] The higher result was used when a duplicate/original sample pair was collected.
[c] The concentration was not detected above the reporting limit. Therefore, the reporting limit is used as the EPC.
mg/kg = milligram per kilogram

5 Risk Evaluation

The following sections summarize the RE models and results.

5.1 Justification of Models and Equations

TerraGraphics used the IDEQ Petro REM Risk Evaluation Application version 1.1.3 (IDEQ 2015) to calculate cancer and non-cancer risk from acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, naphthalene, and pyrene. TerraGraphics used the default exposure factor values in the IDEQ Petro REM according to the Idaho Administrative Procedures Act (IDAPA) 58.01.24 "Standards and Procedures for Application of Risk Based Corrective Action at Petroleum Release Sites," along with exposure area specifics in the model such as acreage and vegetative cover. Appendix B contains the model input values from the IDEQ Petro REM Risk Evaluation Application version 1.1.3 used in this RE.

To calculate cancer and non-cancer risks from total chromium, mercury, cadmium, barium, and selenium, Alta used the online USEPA RSL Calculator with its default exposure factor values (USEPA 2016). TerraGraphics changed the acceptable target risk level to 10^{-5} as set forth in IDAPA 58.01.24. Additionally, Alta entered exposure area specifics into the model, such as acreage and vegetative cover, and used Boise, Idaho, as the Climate Zone selection for the particulate emission factor equations. Appendix B contains the model input values from the USEPA RSL Calculator used in this RE.

Evaluating the construction scenario is difficult based on the considerable uncertainty surrounding the details of future construction activities (USEPA 2002). Therefore, the following assumptions and risk outcomes should be used for information purposes. TerraGraphics and Alta assume for this site-specific RE, since the entire Site consists of an unpaved ROW, that all exposure areas will be graded once to level the ROW. After the ROW is level, dump trucks will lay down a road bed cover equal to the length and width of the exposure area and 6 inches deep in preparation for an asphalt cover to complete the planned public pedestrian and/or bike trail. Once the road bed and asphalt cover are placed on the ROW, the contaminated soil will be capped. If specific construction differs from this scenario, then the new information should be input to the USEPA RSL Calculator to evaluate whether those construction activities might pose significant risks to construction workers and other receptors in the absence of mitigating measures. The exposure factor values and assumptions used for the construction worker scenario for each exposure area are located in Appendix B.

5.2 Comparison of Calculated Risk with Target Risk Criteria for the Site

Two general types of health effects are evaluated: cancer effects and adverse non-cancer health effects. This distinction is made because it is generally assumed that a dose threshold exists for non-carcinogens, and that compensatory processes prevent the expression of adverse effects if humans are exposed to chemical doses below the threshold. No such threshold is assumed for carcinogens. Instead, it is generally assumed that there is a finite probability of developing cancer associated with any exposure to a carcinogen. As a result, carcinogens and non-carcinogens have separate toxicity criteria.

A RE involves estimating the magnitude of the potential adverse health effects of Site COPCs and identifying the COPCs and routes of exposure that contribute the most risk to the defined receptor population. TerraGraphics and Alta quantified the exposure routes listed in Section 4.4 in the Petro REM model and the USEPA RSL Calculator.

5.2.1 Carcinogenic Effects

The potential for carcinogenic effects is evaluated by estimating the probability of developing cancer over a lifetime based on exposure assumptions and chemical-specific toxicity criteria. The risks resulting from exposure to multiple carcinogens are also assumed to be additive.

In accordance with IDAPA 58.01.24 and the Idaho Petro REM (IDEQ 2012), TerraGraphics and Alta used a target Site risk of 10^{-5} to determine acceptable cancer risk at the Site. TerraGraphics and Alta selected this target risk level because it is protective based on the overall conservative nature of exposure scenarios used in the Petro REM and USEPA RSL Calculator and the underlying health criteria. Tables 2 through 8, displayed at the end of the report, show the estimated cancer risks (and non-cancer risks further discussed in Section 5.3.2) associated with the future residential, non-residential/composite worker, and construction worker scenarios. The total cancer risk presented in these tables sums total cancer risk from the USEPA RSL Calculator and the Petro REM model (USEPA RSL Calculator and Petro REM outputs are presented in Appendix B).

In all seven exposure areas, total lifetime cancer risks for the non-residential/composite worker and the construction worker scenarios are all below the target cancer risk of 10^{-5}. However, the target cancer risk of 10^{-5} is exceeded in four of the seven exposure areas for a future residential receptor. Benzo(a)pyrene was the risk driver in these exposure areas.

5.2.1.1 Zone 1

- For DU1.1, the total lifetime cancer risk for the construction worker scenario is below the target cancer risk of 10^{-5}, with a cancer risk of 2x10-6 and $2x10^{-6}$ (Table 2).
- For DU1.2, the total lifetime cancer risks for the future residential receptor, the non-residential/composite worker, and the construction worker scenarios are all below the target cancer risk of 10^{-5}, with cancer risks of $9x10^{-6}$, $6x10^{-7}$ and $9x10^{-9}$, respectively (Table 3).
- For DU1.3, the total lifetime cancer risks for the non-residential/composite worker and the construction worker scenarios are both below the target cancer risk of 10^{-5}, with cancer risks of $2x10^{-6}$ and $3x10^{-8}$, respectively (Table 4). The future residential receptor scenario exceeds the total lifetime cancer risk with a cancer risk of $3x10^{-5}$. Benzo(a)pyrene is the risk driver in this exposure area.

5.2.1.2 Zone 2

- For DU2.1, the total lifetime cancer risks for the non-residential/composite worker and the construction worker scenarios are both below the target cancer risk of 10^{-5}, with cancer risks of $2x10^{-6}$ and $4x10^{-8}$, respectively.. The future residential receptor scenario exceeds the total lifetime cancer risk, with a cancer risk of $3x10^{-5}$ (Table 5). Benzo(a)pyrene is the risk driver in this exposure area.
- For DU2.2, the total lifetime cancer risks for the non-residential/composite worker and the construction worker scenarios are both below the target cancer risk of 10^{-5}, with cancer risks of $3x10^{-6}$ and $4x10^{-8}$, respectively. The future residential receptor scenario

exceeds the total lifetime cancer risk, with a cancer risk of $4x10^{-5}$. Benzo(a)pyrene is the risk driver.

5.2.1.3 Zone 3

- For DU3.1, the total lifetime cancer risks for the future residential receptor, the non-residential/composite worker, and the construction worker scenarios are all below the target cancer risk of 10^{-5}, with cancer risks of $8x10^{-6}$, $5x10^{-7}$, and $9x10^{-9}$, respectively.
- For DU3.2, the total lifetime cancer risks for the non-residential/composite worker and the construction worker scenarios are both below the target cancer risk of 10^{-5}, with cancer risks of $1x10^{-6}$ and $2x10^{-8}$, respectively. The future residential receptor scenario exceeds the total lifetime cancer risk, with a cancer risk of $2x10^{-5}$. Benzo(a)pyrene is the risk driver in this exposure area.

5.2.2 Non-cancer Health Effects

The reference dose is a level of intake below which it is unlikely that sensitive individuals will experience adverse health effects during a lifetime. If the Hazard Quotient (HQ) exceeds 1, there may be cause for concern regarding non-cancer effects (USEPA 1989, IDEQ 2012). Risk assessment guidelines consider the additive effects associated with simultaneous exposure to several chemicals by specifying that all HQs be summed across exposure routes and chemicals to estimate a total Hazard Index (HI) (USEPA 1989). Tables 2 through 8, displayed at the end of the report, show estimated HIs for the future residential, non-residential/composite worker, and construction worker scenarios. The HIs presented in these tables sums total non-cancer risk from the USEPA RSL Calculator and the Petro REM models (HQs and HIs from the Petro REM and USEPA RSL Calculator outputs are presented in Appendix B). All HIs from all exposure areas for all receptor scenarios were below 1 and are acceptable.

5.2.3 Groundwater Pathway

Groundwater is not currently used as drinking water at the Site; however, future use is not currently restricted according to the Idaho Department of Water Resources “Regulated Water Activity” interactive web map (https://idwr.maps.arcgis.com/home/webmap/viewer.html). Site data were compared to maximum contaminant level-based and risk-based values in lieu of quantifying risk from this pathway. These screening levels are conservative to protect human health. Appendix A contains tables that present all available ground water protection pathway (GWP) screening levels. However, other nearby site investigations and well logs show that depth to groundwater in this area (an approximate 1-mile radius) ranges from 170 to 330 feet bgs (Weston 2006). Consequently, the likelihood of groundwater impacts is low.

6 Uncertainty Summary

Uncertainty in a RE produces the potential for two kinds of possible errors. A Type I error is the identification of a specific chemical, area, or activity as a health concern when, in fact, it is not a concern (false positive conclusion). A Type II error is the elimination of a chemical, area, or activity from further consideration when, in fact, there should be a concern (false negative conclusion). This RE is generally conservative in order to protect human health and reduce Type II error.

Uncertainty in this RE can be attributed to the available data and estimated EPCs. Data used in REs will typically be pooled for an exposure area and either a 95 percent upper confidence limit of the mean or a maximum value will be used to estimate an EPC. In this RE, for those exposure areas where three DU results were available, the maximum concentration was used as the EPC. For the exposure areas with only one DU result, that result was applied as the EPC. The use of individual DU results may or may not underestimate risk. Although upper confidence limits could not be calculated with the available data, the ISM approach is intended to significantly reduce variability in soil sample results and represent the true mean of a DU. When the reporting limit for detect results is greater than screening levels, the reporting limit was used as the EPC in the RE. In cases where the reporting limit is greater than the screening level (and greater than background levels), it is unknown if the use of reporting limits as EPCs contributes to an under- or over-estimation of risk because the true value is something less than the reporting limit.

The inclusion of all detected petroleum-based chemicals, regardless of whether or not they exceeded screening levels, further reduces Type II error in the risk outcomes. In the case of the exposure area DU1.1, all PAH results were below detection limits and no PAHs were carried into the RE. This may slightly underestimate risk in DU1.1; however, the Petro REM HI and cancer risk values from the other exposure areas were minor contributors to overall HI and cancer risk outcomes.

The lack of site-specific background data for metals may also contribute to the uncertainty in this RE. The USGS soil database was the main resource for Kootenai County background metals (USGS 2017), with supplemental background data from the Spokane Basin (Ecology 1994). A lack of site-specific background data may result in considering a metal above or below background. For example, arsenic was generally detected at concentrations between 10 mg/kg and 16.0 mg/kg (in all DUs but 1.1 and 1.2). The USGS soil database only contains 12.0 sample results for Kootenai County, and the maximum value was 21.0 mg/kg with a mean of 7.88 mg/kg. It is unknown if the soil arsenic results are at or near true background levels for the Site.

Additionally, the lack of site-specific groundwater data lends to uncertainty in the GWP pathway and whether Site contaminants have migrated or will migrate to the groundwater.

Exposure factors can also contribute to uncertainty in risk outcomes, such as assumptions about exposure frequencies, daily soil ingestion rates, and time spent indoors and outdoors. Exposure factors are intended to represent typical (or average) exposures or might be conservative in order to be health protective of sensitive subpopulations. It is unknown if the overall risk is over- or under-estimated in this RE due to the use of default exposure and toxicity factors in both the Idaho Petro REM and the USEPA RSL Calculator. Some default exposure factors differ between the two models (e.g., adult body weight). The scope of this RE did not include completing a detailed comparison of the two models and assessment of their default values. Regardless, if the USEPA RSL Calculator default values had been modified to reflect those in the Idaho Petro REM (or vice versa), the impact to the risk outcomes is unknown.

The construction scenario in the USEPA RSL Calculator contains inputs for various types of construction work (dozing, excavation, tilling). This RE considered that construction at this Site would only include grading. When there are more specifics regarding Site construction, there can be less uncertainty in the construction worker risk outcome if the assumptions are revised to reflect those construction plans.

7 Additional Site Sampling

On August 28, 2017, Alta completed additional ISM sampling within the 2.2.-mile section of DU2.2B in the BNSF Railroad ROW to delineate the extent of arsenic and PAHs at a lower depth after a removal of the railroad lines and the excavation of approximately the top 24 inches of soil. The arsenic results, detected at 14.4 mg/kg within an approximate depth interval of 24 to 36 inches bgs, support the IDHW conclusions (IDHW 2017) that arsenic levels in this DU are similar to area background concentrations. The PAH results decrease at an approximate depth interval of 24 to 36 inches bgs; however, benzo(a)pyrene (0.0309 mg/kg) remains above the RUSL (0.0200 mg/kg). A summary of the work and findings is provided in a memorandum in Appendix D.

8 Summary of Actions and Findings

TerraGraphics and Alta evaluated risk using a combination of Idaho's Petro REM (IDEQ 2012) and USEPA's RSL Calculator (USEPA 2016a) for future residential, non-residential/composite worker, and construction worker scenarios using soil data from October 2016. Total cancer risk was exceeded for the future residential receptor scenario in DU1.3, DU2.1, DU2.2, and DU3.2 due to benzo(a)pyrene levels in these exposure areas but was below the acceptable cancer risk of 10^{-5} for both non-residential/composite worker and construction worker receptors in all exposure areas. It is possible that the exposure areas in Zone 2 could become part of residential development.

The HIs for all receptors were below the acceptable non-cancer risk of 1 in all zones.

Additional arsenic and PAH ISM sampling at an approximate depth interval of 24 to 36 inches bgs in DU2.2B due to the removal of railroad lines shows that arsenic concentrations remain consistent and overall PAH concentrations decrease; however, benzo(a)pyrene remains above the RUSL.

9 Conclusions and Recommendations

Based on the assessment activities conducted at the Site, historical use has impacted surface soils (0-12 inches bgs) resulting in residual metals and petroleum-based chemicals (Petro REM PAHs). Additional soil sampling in DU2.2B shows that PAH concentrations decrease within the first couple feet. However, benzo(a)pyrene slightly exceeds the Idaho Petro REM Screening Level in the deeper soil (approximately 36 inches bgs). Based upon the Site's historic use, a similar decreasing trend from the surface soil to depth could be expected in other DUs that have PAH impacts. However, additional sampling in each DU would be necessary to confirm this trend.

Based on the acceptable cancer and non-cancer results of the site-specific RE presented in this report, all exposure areas at the Site are suitable for non-residential/composite worker use. Construction workers (performing grading activities) are also not at significant cancer and non-cancer risk due to residual metals and Petro REM PAHs at the Site. Future residential receptors, however, are at a risk for cancer in DU1.3, DU2.1, DU2.2, and DU3.2.

TerraGraphics and Alta have the following recommendations for the CDA BNSF ROW R2R based on the information gathered to-date:

- Restrict the Site use for DU1.3, DU2.1, DU2.2, and DU3.2 exposure areas to non-residential/composite worker scenarios.
- Evaluate potential PAH exposure scenarios for soils at depth at each DU in conjunction with the proposed redevelopment and/or future land use. Risk from PAH soils could likely be mitigated with land use restrictions, onsite soil barriers, and/or shallow soil removals.
- Use caution and best management practices during construction activities to prevent the ingestion of soil and the inhalation of dust if construction activities other than grading are to occur. Alternatively, if site-specific construction activities are known, evaluate risk using the USEPA RSL Calculator with updated information.

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Figure 1. Zone 1 Decision Units

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TerraGraphics Environmental Engineering, Inc.
www.terragraphics.com

Print Date	March 8, 2017
Project Number	15029-01
Requestor	M. Studer
Project Manager	M. Studer
Cartographer	B. Bailey
Project Name	**BNSF ROW R2R Coeur d'Alene, Idaho**

This map was produced using information obtained from several different sources that have not been independently verified. These sources have also not provided information on the precision and accuracy of the data. Information on this map is not a substitute for survey data.

1:4,000
1 inch = 333 feet
0 200 400 Feet

N

Figure 1

Decision Units 1.1, 1.2, and 1.3

Figure 2. Zone 2 Decision Units

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TerraGraphics Environmental Engineering, Inc.
www.terragraphics.com

Print Date	March 8, 2017
Project Number	15029-01
Requestor	M. Studer
Project Manager	M. Studer
Cartographer	B. Bailey
Project Name	**ROW R2R Coeur d'Alene, Idaho**

This map was produced using information obtained from several different sources that have not been independently verified. These sources have also not provided information on the precision and accuracy of the data. Information on this map is not a substitute for survey data.

1:4,000
1 inch = 333 feet
0 200 400 Feet

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Figure 2

Decision Units 2.1 and 2.2

Figure 3. Zone 3 Decision Units

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TerraGraphics Environmental Engineering, Inc.
www.terragraphics.com

Print Date	March 8, 2017
Project Number	15029-01
Requestor	M. Studer
Project Manager	M. Studer
Cartographer	B. Bailey
Project Name	**ROW R2R Coeur d'Alene, Idaho**

This map was produced using information obtained from several different sources that have not been independently verified. These sources have also not provided information on the precision and accuracy of the data. Information on this map is not a substitute for survey data.

1:4,000
1 inch = 333 feet
0 200 400 Feet

N

Figure 3

Decision Units 3.1 and 3.2

Table 2. Overall Summary of Lifetime Cancer and Non-cancer Risks at DU1.1 for all Receptors

Route of Exposure - Direct Contact Soil	Residential			Non-Residential		Construction Worker[b]	
	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child[a]	Adult				
USEPA RSL Calculator	-	1.71E-02	7.86E-03	-	2.33E-03	2.16E-06	4.79E-02
IDEQ Petro REM (v 1.1.3)	-	-	-	-	-	-	-
Total Risk or Hazard Index for Receptor	**-**	**2E-02**	**8E-03**	**-**	**2E-03**	**2E-06**	**5E-02**

Notes:

a Noncarcinogenic chemical exposure is conservatively assessed using only the child receptor under Petro REM (IDEQ 2012).

b The Construction Worker scenario in the USEPA RSL Calculator (USEPA 2016a) is a combination of "Unpaved Road Traffic" and "Other Construction Activities."

Grey shaded cells denote an exceedence for a receptor.

- = Petroleum-related chemicals were not detected above the reporting limit in this exposure area.

Table 3. Overall Summary of Lifetime Cancer and Non-cancer Risks at DU1.2 for all Receptors

Route of Exposure - Direct Contact Soil	Residential			Non-Residential		Construction Worker[b]	
	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child[a]	Adult				
USEPA RSL Calculator	-	5.64E-02	4.71E-02	-	1.17E-02	-	2.95E-01
IDEQ Petro REM (v 1.1.3)	8.58E-06	2.10E-04		5.61E-07	2.04E-05	9.30E-09	8.40E-06
Total Risk or Hazard Index for Receptor	**9E-06**	**6E-02**	**5E-02**	**6E-07**	**1E-02**	**9E-09**	**3E-01**

Notes:

a Noncarcinogenic chemical exposure is conservatively assessed using only the child receptor under Petro REM (IDEQ 2012).

b The Construction Worker scenario in the USEPA RSL Calculator (USEPA 2016a) is a combination of "Unpaved Road Traffic" and "Other Construction Activities."

Grey shaded cells denote an exceedence for a receptor.

Table 4. Overall Summary of Lifetime Cancer and Non-cancer Risks at DU1.3 for all Receptors

Route of Exposure - Direct Contact Soil	Residential			Non-Residential		Construction Worker[b]	
	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child[a]	Adult				
USEPA RSL Calculator	-	1.20E-02	2.77E-03	-	1.12E-03	-	1.62E-02
IDEQ Petro REM (v 1.1.3)	3.08E-05	8.55E-04		2.02E-06	8.32E-05	3.34E-08	3.42E-05
Total Risk or Hazard Index for Receptor	**3E-05**	**1E-02**	**3E-03**	**2E-06**	**1E-03**	**3E-08**	**2E-02**

Notes:

a Noncarcinogenic chemical exposure is conservatively assessed using only the child receptor under Petro REM (IDEQ 2012).

b The Construction Worker scenario in the USEPA RSL Calculator (USEPA 2016a) is a combination of "Unpaved Road Traffic" and "Other Construction Activities."

Grey shaded cells denote an exceedence for a receptor.

Table 5. Overall Summary of Lifetime Cancer and Non-cancer Risks at DU2.1 for all Receptors

Route of Exposure - Direct Contact Soil	Residential			Non-Residential		Construction Worker[b]	
	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child[a]	Adult				
USEPA RSL Calculator	-	1.89E-02	9.68E-03	-	2.76E-03	-	5.98E-02
IDEQ Petro REM (v 1.1.3)	3.40E-05	9.11E-04		2.22E-06	8.86E-05	3.68E-08	3.65E-05
Total Risk or Hazard Index for Receptor	**3E-05**	**2E-02**	**1E-02**	**2E-06**	**3E-03**	**4E-08**	**6E-02**

Notes:

a Noncarcinogenic chemical exposure is conservatively assessed using only the child receptor under Petro REM (IDEQ 2012).

b The Construction Worker scenario in the USEPA RSL Calculator (USEPA 2016a) is a combination of "Unpaved Road Traffic" and "Other Construction Activities."

Grey shaded cells denote an exceedence for a receptor.

Table 6. Overall Summary of Lifetime Cancer and Non-cancer Risks at DU2.2 for all Receptors

Route of Exposure - Direct Contact Soil	Residential			Non-Residential		Construction Worker[b]	
	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child[a]	Adult				
USEPA RSL Calculator	1.39E-10	3.81E-02	9.89E-03	3.19E-11	3.81E-03	4.40E-10	5.98E-02
IDEQ Petro REM (v 1.1.3)	3.95E-05	7.84E-04		2.59E-06	7.63E-05	4.29E-08	3.14E-05
Total Risk or Hazard Index for Receptor	**4E-05**	**4E-02**	**1E-02**	**3E-06**	**4E-03**	**4E-08**	**6E-02**

Notes:

a Noncarcinogenic chemical exposure is conservatively assessed using only the child receptor under Petro REM (IDEQ 2012).

b The Construction Worker scenario in the USEPA RSL Calculator (USEPA 2016a) is a combination of "Unpaved Road Traffic" and "Other Construction Activities."

Grey shaded cells denote an exceedence for a receptor.

Table 7. Overall Summary of Lifetime Cancer and Non-cancer Risks at DU3.1 for all Receptors

Route of Exposure - Direct Contact Soil	Residential			Non-Residential		Construction Worker[b]	
	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child[a]	Adult				
USEPA RSL Calculator	-	4.02E-02	1.37E-02	-	4.56E-03	-	8.45E-02
IDEQ Petro REM (v 1.1.3)	7.84E-06	1.61E-04		5.13E-07	1.57E-05	8.50E-09	6.45E-06
Total Risk or Hazard Index for Receptor	**8E-06**	**4E-02**	**1E-02**	**5E-07**	**5E-03**	**9E-09**	**8E-02**

Notes:

a Noncarcinogenic chemical exposure is conservatively assessed using only the child receptor under Petro REM (IDEQ 2012).

b The Construction Worker scenario in the USEPA RSL Calculator (USEPA 2016a) is a combination of "Unpaved Road Traffic" and "Other Construction Activities."

Grey shaded cells denote an exceedence for a receptor.

Table 8. Overall Summary of Lifetime Cancer and Non-cancer Risks at DU3.2 for all Receptors

Route of Exposure - Direct Contact Soil	Residential			Non-Residential		Construction Worker[b]	
	Cancer Risk	Hazard Index		Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
		Child[a]	Adult				
USEPA RSL Calculator	-	2.01E-02	1.09E-02	-	3.04E-03	-	6.70E-02
IDEQ Petro REM (v 1.1.3)	1.57E-05	4.92E-04		1.03E-06	1.62E-04	1.72E-08	1.91E-04
Total Risk or Hazard Index for Receptor	**2E-05**	**2E-02**	**1E-02**	**1E-06**	**3E-03**	**2E-08**	**7E-02**

Notes:

a Noncarcinogenic chemical exposure is conservatively assessed using only the child receptor under Petro REM (IDEQ 2012).

b The Construction Worker scenario in the USEPA RSL Calculator (USEPA 2016a) is a combination of "Unpaved Road Traffic" and "Other Construction Activities."

Grey shaded cells denote an exceedence for a receptor.

Appendix A.

Data Summary Tables

Table A1. Data Summary for DU1.1

Sample ID	Date	Unit	Barium	Cadmium	Total Chromium	Lead	Selenium	Silver	Mercury
DU1.1	10/7/2016	mg/kg	171	0.410	**24.6**	63.9	**<4.0**	<0.50	**0.268**
USEPA RSL									
		mg/kg	15,000	71.0	0.30**	400	390	390	23.0
USEPA RSL Critical Receptor			*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Carcinogenic*	*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Ingestion-Child*	*Residential Direct Contact; Ingestion-Child*	*Residential Direct Contact; Ingestion-Child*
USEPA SSL									
Risk-based protection of groundwater		mg/kg	155	0.693	-	-	0.519	0.799	0.0327
MCL-based protection of groundwater		mg/kg	82.4	0.376	180,000	13.5	0.260	-	0.104
Kootenai County ID Background (USGS 2017) *No. of samples = 12*									
Minimum		mg/kg	-	-	-	16.2	0.101	-	0.011
Maximum		mg/kg	-	-	-	61.1	0.738	-	0.115
Standard Deviation		mg/kg	-	-	-	7.93	0.087	-	0.018
Mean		mg/kg	-	-	-	30.7	0.208	-	0.053
Spokane Basin WA Background (Ecology 1994) *No. of samples = 79*									
Minimum		mg/kg	-	0.125	4.50	2.17	-	-	0.00425
Maximum		mg/kg	-	0.685	20.3	16.0	-	-	0.131
Mean		mg/kg	-	0.40	12.0	7.00	-	-	0.020
90th Percentile		mg/kg	255	0.72	17.8	14.9	0.78	0.61	0.02

Notes:

Analytical tests for RCRA 8 Metals used USEPA Method 6010C. Mercury by USEPA Method 7471B.

< denotes that the result was not detected above reporting limit.

Natural Background Soil Metals Concentrations in Washington State: Table 7, Figure 47 (Ecology 1994).

USEPA RSL = U.S. Environmental Protection Agency Regional Screening Level; Resident Soil Table (USEPA 2016).

USEPA SSL = U.S. Environmental Protection Agency Soil Screening Level; Protection of Groundwater Table (USEPA 2016).

U.S. Geological Survey online National Geochemical Survey by County database (USGS 2017).

mg/kg = milligram per kilogram

** = RSL is for chromium(VI), as there is no RSL for total chromium. Chromium(VI) yields the most conservative screening level for carcinogenic risk in resident soil.

Table A2. Data Summary for DU1.2

Sample ID	Date	Unit	Barium	Cadmium	Total Chromium	Lead	Selenium	Silver	Mercury
DU1.2*	10/7/2016	mg/kg	187	0.340	**26.9**	59.0	**<4.0**	<0.50	**1.54†**
USEPA RSL									
		mg/kg	15,000	71.0	0.30**	400	390	390	23.0
USEPA RSL Critical Receptor			*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Carcinogenic*	*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Ingestion-Child*	*Residential Direct Contact; Ingestion-Child*	*Residential Direct Contact; Ingestion-Child*
USEPA SSL									
Risk-based protection of groundwater		mg/kg	155	0.693	-	-	0.519	0.799	0.0327
MCL-based protection of groundwater		mg/kg	82.4	0.376	180,000	13.5	0.260	-	0.104
Kootenai County ID Background (USGS 2017)									
No. of samples = 12									
Minimum		mg/kg	-	-	-	16.2	0.101	-	0.011
Maximum		mg/kg	-	-	-	61.1	0.738	-	0.115
Standard Deviation		mg/kg	-	-	-	7.93	0.087	-	0.018
Mean		mg/kg	-	-	-	30.7	0.208	-	0.053
Spokane Basin WA Background (Ecology 1994)									
No. of samples = 79									
Minimum		mg/kg	-	0.125	4.50	2.17	-	-	0.00425
Maximum		mg/kg	-	0.685	20.3	16.0	-	-	0.131
Mean		mg/kg	-	0.40	12.0	7.00	-	-	0.020
90th Percentile		mg/kg	255	0.72	17.8	14.9	0.78	0.61	0.02

Notes:

Analytical tests for RCRA 8 Metals used USEPA Method 6010C. Mercury by USEPA Method 7471B.

< denotes that the result was not detected above reporting limit.

Natural Background Soil Metals Concentrations in Washington State: Table 7, Figure 47 (Ecology 1994).

USEPA RSL = U.S. Environmental Protection Agency Regional Screening Level; Resident Soil Table (USEPA 2016).

USEPA SSL = U.S. Environmental Protection Agency Soil Screening Level; Protection of Groundwater Table (USEPA 2016).

U.S. Geological Survey online National Geochemical Survey by County database (USGS 2017).

mg/kg = milligram per kilogram

* = Sample is a duplicate. The highest concentration is shown.

** = RSL is for chromium(VI), as there is no RSL for total chromium. Chromium(VI) yields the most conservative screening level for carcinogenic risk in resident soil.

† = The maximum concentration of the replicate ISM results is presented.

Table A3. Data Summary for DU1.3

Sample ID	Date	Unit	Barium	Cadmium	Total Chromium	Lead	Selenium	Silver	Mercury
DU1.3A	10/4/2016	mg/kg	224	0.370	**18.8**	24.2	**<4.0**	<0.50	0.0350
DU1.3B	10/4/2016	mg/kg	140	0.510	**21.4**	31.6	**<4.0**	<0.50	<0.0330
DU1.3C	10/5/2016	mg/kg	173	0.520	**18.4**	34.0	**<4.0**	<0.50	**0.0580**
USEPA RSL									
		mg/kg	15,000	71.0	0.30**	400	390	390	23.0
USEPA RSL Critical Receptor			*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Carcinogenic*	*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Ingestion-Child*	*Residential Direct Contact; Ingestion-Child*	*Residential Direct Contact; Ingestion-Child*
USEPA SSL									
Risk-based protection of groundwater		mg/kg	155	0.693	-	-	0.519	0.799	0.0327
MCL-based protection of groundwater		mg/kg	82.4	0.376	180,000	13.5	0.260	-	0.104
Kootenai County ID Background (USGS 2017)									
No. of samples = 12									
Minimum		mg/kg	-	-	-	16.2	0.101	-	0.011
Maximum		mg/kg	-	-	-	61.1	0.738	-	0.115
Standard Deviation		mg/kg	-	-	-	7.93	0.087	-	0.018
Mean		mg/kg	-	-	-	30.7	0.208	-	0.053
Spokane Basin WA Background (Ecology 1994)									
No. of samples = 79									
Minimum		mg/kg	-	0.125	4.50	2.17	-	-	0.00425
Maximum		mg/kg	-	0.685	20.3	16.0	-	-	0.131
Mean		mg/kg	-	0.40	12.0	7.00	-	-	0.020
90th Percentile		mg/kg	255	0.72	17.8	14.9	0.78	0.61	0.02

Notes:

Analytical tests for RCRA 8 Metals used USEPA Method 6010C. Mercury by USEPA Method 7471B.

< denotes that the result was not detected above reporting limit.

Natural Background Soil Metals Concentrations in Washington State: Table 7, Figure 47 (Ecology 1994).

USEPA RSL = U.S. Environmental Protection Agency Regional Screening Level; Resident Soil Table (USEPA 2016).

USEPA SSL = U.S. Environmental Protection Agency Soil Screening Level; Protection of Groundwater Table (USEPA 2016).

U.S. Geological Survey online National Geochemical Survey by County database (USGS 2017).

mg/kg = milligram per kilogram

** = RSL is for chromium(VI), as there is no RSL for total chromium. Chromium(VI) yields the most conservative screening level for carcinogenic risk in resident soil.

Table A4. Data Summary for DU2.1

Sample ID	Date	Unit	Barium	Cadmium	Total Chromium	Lead	Selenium	Silver	Mercury
DU2.1A	10/4/2016	mg/kg	227	0.420	**20.9**	35.6	**<4.0**	<0.50	**0.285**
DU2.1B	10/3/2016	mg/kg	174	0.400	**21.4**	42.2	**<4.0**	<0.50	**0.160**
DU2.1C	10/4/2016	mg/kg	218	0.380	**20.7**	48.2	**<4.0**	<0.50	**0.115**
USEPA RSL									
		mg/kg	15,000	71.0	0.30**	400	390	390	23.0
USEPA RSL Critical Receptor			*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Carcinogenic*	*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Ingestion-Child*	*Residential Direct Contact; Ingestion-Child*	*Residential Direct Contact; Ingestion-Child*
USEPA SSL									
Risk-based protection of groundwater		mg/kg	155	0.693	-	-	0.519	0.799	0.0327
MCL-based protection of groundwater		mg/kg	82.4	0.376	180,000	13.5	0.260	-	0.104
Kootenai County ID Background (USGS 2016)									
No. of samples = 12									
Minimum		mg/kg	-	-	-	16.2	0.101	-	0.011
Maximum		mg/kg	-	-	-	61.1	0.738	-	0.115
Standard Deviation		mg/kg	-	-	-	7.93	0.087	-	0.018
Mean		mg/kg	-	-	-	30.7	0.208	-	0.053
Spokane Basin WA Background (Ecology 1994)									
No. of samples = 79									
Minimum		mg/kg	-	0.125	4.50	2.17	-	-	0.00425
Maximum		mg/kg	-	0.685	20.3	16.0	-	-	0.131
Mean		mg/kg	-	0.40	12.0	7.00	-	-	0.020
90th Percentile		mg/kg	255	0.72	17.8	14.9	0.78	0.61	0.02

Notes:

Analytical tests for RCRA 8 Metals used USEPA Method 6010C. Mercury by USEPA Method 7471B.

< denotes that the result was not detected above reporting limit.

Natural Background Soil Metals Concentrations in Washington State: Table 7, Figure 47 (Ecology 1994).

USEPA RSL = U.S. Environmental Protection Agency Regional Screening Level; Resident Soil Table (USEPA 2016).

USEPA SSL = U.S. Environmental Protection Agency Soil Screening Level; Protection of Groundwater Table (USEPA 2016).

U.S. Geological Survey online National Geochemical Survey by County database (USGS 2017).

mg/kg = milligram per kilogram

** = RSL is for chromium(VI), as there is no RSL for total chromium. Chromium(VI) yields the most conservative screening level for carcinogenic risk in resident soil.

Table A5. Data Summary for DU2.2

Sample ID	Date	Unit	Barium	Cadmium	Total Chromium	Lead	Selenium	Silver	Mercury
DU2.2A	10/3/2016	mg/kg	173	0.440	**22.5**	35.6	**<4.0**	<0.50	**0.132**
DU2.2B*	10/3/2016	mg/kg	190	0.400	**20.5**	36.4	**<4.0**	<0.50	**0.193**
DU2.2C	10/3/2016	mg/kg	187	**0.750**	**23.7**	35.5	**<4.0**	<0.50	0.0380
USEPA RSL									
		mg/kg	15,000	71.0	0.30**	400	390	390	23.0
USEPA RSL Critical Receptor			*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Carcinogenic*	*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Ingestion-Child*	*Residential Direct Contact; Ingestion-Child*	*Residential Direct Contact; Ingestion-Child*
USEPA SSL									
Risk-based protection of groundwater		mg/kg	155	0.693	-	-	0.519	0.799	0.0327
MCL-based protection of groundwater		mg/kg	82.4	0.376	180,000	13.5	0.260	-	0.104
Kootenai County ID Background (USGS 2017)									
No. of samples = 12									
Minimum		mg/kg	-	-	-	16.2	0.101	-	0.011
Maximum		mg/kg	-	-	-	61.1	0.738	-	0.115
Standard Deviation		mg/kg	-	-	-	7.93	0.087	-	0.018
Mean		mg/kg	-	-	-	30.7	0.208	-	0.053
Spokane Basin WA Background (Ecology 1994)									
No. of samples = 79									
Minimum		mg/kg	-	0.125	4.50	2.17	-	-	0.00425
Maximum		mg/kg	-	0.685	20.3	16.0	-	-	0.131
Mean		mg/kg	-	0.40	12.0	7.00	-	-	0.020
90th Percentile		mg/kg	255	0.72	17.8	14.9	0.78	0.61	0.02

Notes:

Analytical tests for RCRA 8 Metals used USEPA Method 6010C. Mercury by USEPA Method 7471B.

< denotes that the result was not detected above reporting limit.

Natural Background Soil Metals Concentrations in Washington State: Table 7, Figure 47 (Ecology 1994).

USEPA RSL = U.S. Environmental Protection Agency Regional Screening Level; Resident Soil Table (USEPA 2016).

USEPA SSL = U.S. Environmental Protection Agency Soil Screening Level; Protection of Groundwater Table (USEPA 2016).

U.S. Geological Survey online National Geochemical Survey by County database (USGS 2017).

mg/kg = milligram per kilogram

* = Sample is a duplicate. The highest concentration is shown.

** = RSL is for chromium(VI), as there is no RSL for total chromium. Chromium(VI) yields the most conservative screening level for carcinogenic risk in resident soil.

Table A6. Data Summary for DU3.1

Sample ID	Date	Unit	Barium	Cadmium	Total Chromium	Lead	Selenium	Silver	Mercury
DU3.1A*	10/7/2016	mg/kg	**297**	0.610	**19.6**	60.5	**<4.0**	<0.50	**0.272†**
DU3.1B	10/6/2016	mg/kg	201	<0.200	**19.0**	23.6	**<4.0**	<0.50	**0.310**
DU3.1C	10/5/2016	mg/kg	147	0.400	16.6	37.1	**<4.0**	<0.50	**0.0980**
USEPA RSL									
		mg/kg	15,000	71.0	0.30**	400	390	390	23.0
USEPA RSL Critical Receptor			*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Carcinogenic*	*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Ingestion-Child*	*Residential Direct Contact; Ingestion-Child*	*Residential Direct Contact; Ingestion-Child*
USEPA SSL									
Risk-based protection of groundwater		mg/kg	155	0.693	-	-	0.519	0.799	0.0327
MCL-based protection of groundwater		mg/kg	82.4	0.376	180,000	13.5	0.260	-	0.104
Kootenai County ID Background (USGS 2017)									
No. of samples = 12									
Minimum		mg/kg	-	-	-	16.2	0.101	-	0.011
Maximum		mg/kg	-	-	-	61.1	0.738	-	0.115
Standard Deviation		mg/kg	-	-	-	7.93	0.087	-	0.018
Mean		mg/kg	-	-	-	30.7	0.208	-	0.053
Spokane Basin WA Background (Ecology 1994)									
No. of samples = 79									
Minimum		mg/kg	-	0.125	4.50	2.17	-	-	0.00425
Maximum		mg/kg	-	0.685	20.3	16.0	-	-	0.131
Mean		mg/kg	-	0.40	12.0	7.00	-	-	0.020
90th Percentile		mg/kg	255	0.72	17.8	14.9	0.78	0.61	0.02

Notes:

Analytical tests for RCRA 8 Metals used USEPA Method 6010C. Mercury by USEPA Method 7471B.

< denotes that the result was not detected above reporting limit.

Natural Background Soil Metals Concentrations in Washington State: Table 7, Figure 47 (Ecology 1994).

USEPA RSL = U.S. Environmental Protection Agency Regional Screening Level; Resident Soil Table (USEPA 2016).

USEPA SSL = U.S. Environmental Protection Agency Soil Screening Level; Protection of Groundwater Table (USEPA 2016).

U.S. Geological Survey online National Geochemical Survey by County database (USGS 2017).

mg/kg = milligram per kilogram

* = Sample is a duplicate. The highest concentration is shown.

** = RSL is for chromium(VI), as there is no RSL for total chromium. Chromium(VI) yields the most conservative screening level for carcinogenic risk in resident soil.

† = The maximum concentration of the replicate ISM results is presented.

Table A7. Data Summary for DU3.2

Sample ID	Date	Unit	Barium	Cadmium	Total Chromium	Lead	Selenium	Silver	Mercury
DU3.2A	10/6/2016	mg/kg	209	0.490	**25.3**	49.4	**<4.0**	<0.50	0.0420
DU3.2B	10/5/2016	mg/kg	209	0.420	17.5	40.4	**<4.0**	<0.50	**0.342**
DU3.2C	10/5/2016	mg/kg	99.3	0.250	14.9	18.6	**<4.0**	<0.50	<0.0330
USEPA RSL									
		mg/kg	15,000	71.0	0.30**	400	390	390	23.0
USEPA RSL Critical Receptor			*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Carcinogenic*	*Residential Direct Contact; Noncarcinogenic - Child*	*Residential Direct Contact; Ingestion-Child*	*Residential Direct Contact; Ingestion-Child*	*Residential Direct Contact; Ingestion-Child*
USEPA SSL									
Risk-based protection of groundwater		mg/kg	155	0.693	-	-	0.519	0.799	0.0327
MCL-based protection of groundwater		mg/kg	82.4	0.376	180,000	13.5	0.260	-	0.104
Kootenai County ID Background (USGS 2017)									
No. of samples = 12									
Minimum		mg/kg	-	-	-	16.2	0.101	-	0.011
Maximum		mg/kg	-	-	-	61.1	0.738	-	0.115
Standard Deviation		mg/kg	-	-	-	7.93	0.087	-	0.018
Mean		mg/kg	-	-	-	30.7	0.208	-	0.053
Spokane Basin WA Background (Ecology 1994)									
No. of samples = 79									
Minimum		mg/kg	-	0.125	4.50	2.17	-	-	0.00425
Maximum		mg/kg	-	0.685	20.3	16.0	-	-	0.131
Mean		mg/kg	-	0.40	12.0	7.00	-	-	0.020
90th Percentile		mg/kg	255	0.72	17.8	14.9	0.78	0.61	0.02

Notes:

Analytical tests for RCRA 8 Metals used USEPA Method 6010C. Mercury by USEPA Method 7471B.

< denotes that the result was not detected above reporting limit.

Natural Background Soil Metals Concentrations in Washington State: Table 7, Figure 47 (Ecology 1994).

USEPA RSL = U.S. Environmental Protection Agency Regional Screening Level; Resident Soil Table (USEPA 2016).

USEPA SSL = U.S. Environmental Protection Agency Soil Screening Level; Protection of Groundwater Table (USEPA 2016).

U.S. Geological Survey online National Geochemical Survey by County database (USGS 2017).

mg/kg = milligram per kilogram

** = RSL is for chromium(VI), as there is no RSL for total chromium. Chromium(VI) yields the most conservative screening level for carcinogenic risk in resident soil.

Table A8. Data Summary for DU1.1

Sample ID	Date	Unit	Anthracene	Acenaphthene	Benzo(a)anthracene	Benzo(a) pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Chrysene	Fluoranthene	Fluorene	Naphthalene	Pyrene
DU1.1	10/7/2016	mg/kg	<0.120	<0.120	<0.120	<0.120	<0.120	<0.120	<0.120	<0.120	<0.120	<0.400	<0.120
SLC		mg/kg	3,200	200	0.0900	0.0200	0.200	1.90	9.50	1,400	240	0.120	1,000
SLC Critical Pathway			*GWP*	*GWP*	*GWP*	*Direct Contact*	*Direct Contact*	*Direct Contact*	*GWP*	*GWP*	*GWP*	*Vapor Intrusion*	*GWP*
RSL		mg/kg	18,000	3,600	0.160	0.0160	0.160	1.60	16.0	2,400	2,400	3.80	1,800
USEPA RSL Direct Contact Critical Receptor			*Non-Carcinogenic Child*	*Non-Carcinogenic Child*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Non-Carcinogenic Child*	*Non-Carcinogenic Child*	*Carcinogenic*	*Non-Carcinogenic Child*
USEPA SSL													
Risk-based protection of groundwater		mg/kg	58.1	5.49	0.00425	0.00403	0.0411	0.403	1.24	89.1	5.45	0.000543	13.2
MCL-based protection of groundwater		mg/kg	-	-	-	0.235	-	-	-	-	-	-	-

Notes:

Analytical test for PAHs (polycyclic aromatic hydrocarbons) used USEPA Method 8270D-SIM.

< denotes that the result was not detected above the reporting limit

SLC = Screening Level Concentration for petroleum related constituents from Idaho Risk Evaluation for Petroleum Releases (IDEQ 2012).

USEPA RSL = U.S. Environmental Protection Agency Regional Screening Level; Resident Soil Table (USEPA 2016)

USEPA SSL = U.S. Environmental Protection Agency Soil Screening Level; Protection of Groundwater Table (USEPA 2016).

GWP = ground water protection

mg/kg = milligram per kilogram

- = not established

Table A9. Data Summary for DU1.2

Sample ID	Date	Unit	Anthracene	Acenaphthene	Benzo(a)anthracene†	Benzo(a) pyrene†	Benzo(b)fluoranthene†	Benzo(k)fluoranthene†	Chrysene†	Fluoranthene†	Fluorene	Naphthalene	Pyrene†
DU1.2*	10/5-6/2016	mg/kg	0.0211	<0.012	**0.135**	0.128	**0.217**	0.0687	0.192	0.254	<0.0120	<0.0400	0.275
SLC		mg/kg	3,200	200	0.0900	0.0200	0.200	1.90	9.50	1,400	240	0.120	1,000
SLC Critical Pathway			*GWP*	*GWP*	*GWP*	*Direct Contact*	*Direct Contact*	*Direct Contact*	*GWP*	*GWP*	*GWP*	*Vapor Intrusion*	*GWP*
RSL		mg/kg	18,000	3,600	0.160	0.0160	0.160	1.60	16.0	2,400	2,400	3.80	1,800
USEPA RSL Direct Contact Critical Receptor			*Non-Carcinogenic Child*	*Non-Carcinogenic Child*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Non-Carcinogenic Child*	*Non-Carcinogenic Child*	*Carcinogenic*	*Non-Carcinogenic Child*
USEPA SSL													
Risk-based protection of groundwater		mg/kg	58.1	5.49	0.00425	0.00403	0.0411	0.403	1.24	89.1	5.45	0.000543	13.2
MCL-based protection of groundwater		mg/kg	-	-	-	0.235	-	-	-	-	-	-	-

Notes:

Analytical test for PAHs (polycyclic aromatic hydrocarbons) used USEPA Method 8270D-SIM.

< denotes that the result was not detected above the reporting limit

SLC = Screening Level Concentration for petroleum related constituents from Idaho Risk Evaluation for Petroleum Releases (IDEQ 2012).

USEPA RSL = U.S. Environmental Protection Agency Regional Screening Level; Resident Soil Table (USEPA 2016)

USEPA SSL = U.S. Environmental Protection Agency Soil Screening Level; Protection of Groundwater Table (USEPA 2016).

GWP = ground water protection

mg/kg = milligram per kilogram

- = not established

* = Sample is a replicate/duplicate. The highest concentration is shown.

† = The maximum concentration of the replicate ISM results is presented.

Table A10. Data Summary for DU1.3

Sample ID	Date	Unit	Anthracene	Acenaphthene	Benzo(a)anthracene	Benzo(a) pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Chrysene	Fluoranthene	Fluorene	Naphthalene	Pyrene
DU1.3A	10/4/2016	mg/kg	0.0466	<0.0060	0.0302	**0.0317**	0.0673	0.0205	0.0461	0.0584	<0.0060	<0.0200	0.0558
DU1.3B	10/4/2016	mg/kg	0.361	<0.030	**0.456**	**0.440**	**1.00**	0.317	0.839	1.08	<0.0300	<0.100	1.06
DU1.3C	10/5/2016	mg/kg	<0.012	<0.012	<0.0120	<0.0120	<0.0120	<0.0120	<0.0120	<0.0120	<0.0120	<0.0400	<0.0120
	SLC	mg/kg	3,200	200	0.0900	0.0200	0.200	1.90	9.50	1,400	240	0.120	1,000
SLC Critical Pathway			*GWP*	*GWP*	*GWP*	*Direct Contact*	*Direct Contact*	*Direct Contact*	*GWP*	*GWP*	*GWP*	*Vapor Intrusion*	*GWP*
	RSL	mg/kg	18,000	3,600	0.160	0.0160	0.160	1.60	16.0	2,400	2,400	3.80	1,800
USEPA RSL Direct Contact Critical Receptor			*Non-Carcinogenic Child*	*Non-Carcinogenic Child*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Non-Carcinogenic Child*	*Non-Carcinogenic Child*	*Carcinogenic*	*Non-Carcinogenic Child*
USEPA SSL													
Risk-based protection of groundwater		mg/kg	58.1	5.49	0.00425	0.00403	0.0411	0.403	1.24	89.1	5.45	0.000543	13.2
MCL-based protection of groundwater		mg/kg	-	-	-	0.235	-	-	-	-	-	-	-

Notes:

Analytical test for PAHs (polycyclic aromatic hydrocarbons) used USEPA Method 8270D-SIM.

< denotes that the result was not detected above the reporting limit

SLC = Screening Level Concentration for petroleum related constituents from Idaho Risk Evaluation for Petroleum Releases (IDEQ 2012).

USEPA RSL = U.S. Environmental Protection Agency Regional Screening Level; Resident Soil Table (USEPA 2016)

USEPA SSL = U.S. Environmental Protection Agency Soil Screening Level; Protection of Groundwater Table (USEPA 2016).

GWP = ground water protection

mg/kg = milligram per kilogram

- = not used for comparison

Table A11. Data Summary for DU2.1

Sample ID	Date	Unit	Anthracene	Acenaphthene	Benzo(a)anthracene	Benzo(a) pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Chrysene	Fluoranthene	Fluorene	Naphthalene	Pyrene
DU2.1A	10/4/2016	mg/kg	0.0575	<0.0120	0.0382	0.0452	0.132	0.035	0.0547	0.0911	<0.0120	<0.0400	0.0834
DU2.1B	10/3/2016	mg/kg	0.340	<0.030	**0.468**	**0.505**	**0.942**	0.282	0.815	1.17	<0.0300	<0.100	1.12
DU2.1C	10/4/2016	mg/kg	0.0571	<0.030	0.0673	0.066	0.150	0.0436	0.133	0.135	<0.0300	<0.100	0.117
	SLC	mg/kg	3,200	200	0.0900	0.0200	0.200	1.90	9.50	1,400	240	0.120	1,000
SLC Critical Pathway			*GWP*	*GWP*	*GWP*	*Direct Contact*	*Direct Contact*	*Direct Contact*	*GWP*	*GWP*	*GWP*	*Vapor Intrusion*	*GWP*
	RSL	mg/kg	18,000	3,600	0.160	0.0160	0.160	1.60	16.0	2,400	2,400	3.80	1,800
USEPA RSL Direct Contact Critical Receptor			*Non-Carcinogenic Child*	*Non-Carcinogenic Child*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Non-Carcinogenic Child*	*Non-Carcinogenic Child*	*Carcinogenic*	*Non-Carcinogenic Child*
USEPA SSL													
Risk-based protection of groundwater		mg/kg	58.1	5.49	0.00425	0.00403	0.0411	0.403	1.24	89.1	5.45	0.000543	13.2
MCL-based protection of groundwater		mg/kg	-	-	-	0.235	-	-	-	-	-	-	-

Notes:

Analytical test for PAHs (polycyclic aromatic hydrocarbons) used USEPA Method 8270D-SIM.

< denotes that the result was not detected above the reporting limit

SLC = Screening Level Concentration for petroleum related constituents from Idaho Risk Evaluation for Petroleum Releases (IDEQ 2012).

USEPA RSL = U.S. Environmental Protection Agency Regional Screening Level; Resident Soil Table (USEPA 2016)

USEPA SSL = U.S. Environmental Protection Agency Soil Screening Level; Protection of Groundwater Table (USEPA 2016).

GWP = ground water protection

mg/kg = milligram per kilogram

- = not used for comparison

Table A12. Data Summary for DU2.2

Sample ID	Date	Unit	Anthracene	Acenaphthene	Benzo(a)anthracene	Benzo(a) pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Chrysene	Fluoranthene	Fluorene	Naphthalene	Pyrene
DU2.2A	10/3/2016	mg/kg	<0.060	<0.060	<0.0600	<0.0600	<0.0600	<0.0600	<0.0600	<0.0600	<0.0600	<0.200	<0.0600
DU2.2B*	10/3/2016	mg/kg	0.349	<0.060	**0.520**	0.606	**0.942**	0.288	0.679	0.938	<0.0600	<0.200	1.01
DU2.2C	10/3/2016	mg/kg	<0.030	<0.030	<0.0300	<0.0300	<0.0300	<0.0300	<0.0300	0.0343	<0.0300	<0.100	0.0367
	SLC	mg/kg	3,200	200	0.0900	0.0200	0.200	1.90	9.50	1,400	240	0.120	1,000
SLC Critical Pathway			*GWP*	*GWP*	*GWP*	*Direct Contact*	*Direct Contact*	*Direct Contact*	*GWP*	*GWP*	*GWP*	*Vapor Intrusion*	*GWP*
	RSL	mg/kg	18,000	3,600	0.160	0.0160	0.160	1.60	16.0	2,400	2,400	3.80	1,800
USEPA RSL Direct Contact Critical Receptor			*Non-Carcinogenic Child*	*Non-Carcinogenic Child*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Non-Carcinogenic Child*	*Non-Carcinogenic Child*	*Carcinogenic*	*Non-Carcinogenic Child*
USEPA SSL													
Risk-based protection of groundwater		mg/kg	58.1	5.49	0.00425	0.00403	0.0411	0.403	1.24	89.1	5.45	0.000543	13.2
MCL-based protection of groundwater		mg/kg	-	-	-	0.235	-	-	-	-	-	-	-

Notes:

Analytical test for PAHs (polycyclic aromatic hydrocarbons) used USEPA Method 8270D-SIM.

< denotes that the result was not detected above the reporting limit

SLC = Screening Level Concentration for petroleum related constituents from Idaho Risk Evaluation for Petroleum Releases (IDEQ 2012).

USEPA RSL = U.S. Environmental Protection Agency Regional Screening Level; Resident Soil Table (USEPA 2016)

USEPA SSL = U.S. Environmental Protection Agency Soil Screening Level; Protection of Groundwater Table (USEPA 2016).

GWP = ground water protection

mg/kg = milligram per kilogram

- = not used for comparison

* = Sample is a replicate/duplicate. The highest concentration is shown.

Table A13. Data Summary for DU3.1

Sample ID	Date	Unit	Anthracene	Acenaphthene	Benzo(a)anthracene	Benzo(a) pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Chrysene†	Fluoranthene	Fluorene	Naphthalene	Pyrene
DU3.1A*	10/7/2016	mg/kg	0.0125	<0.030	0.0164	0.0195	0.0417	<0.0300	0.043	0.0439	<0.0300	<0.100	0.0372
DU3.1B	10/6/2016	mg/kg	0.0571	<0.0060	0.0856	**0.121**	0.196	0.0634	0.125	0.142	<0.00600	<0.0200	0.175
DU3.1C	10/4/2016	mg/kg	<0.060	<0.060	0.0849	**0.0993**	0.126	<0.0600	0.0975	0.138	<0.0600	<0.200	0.247
	SLC	mg/kg	3,200	200	0.0900	0.0200	0.200	1.90	9.50	1,400	240	0.120	1,000
SLC Critical Pathway			*GWP*	*GWP*	*GWP*	*Direct Contact*	*Direct Contact*	*Direct Contact*	*GWP*	*GWP*	*GWP*	*Vapor Intrusion*	*GWP*
	RSL	mg/kg	18,000	3,600	0.160	0.0160	0.160	1.60	16.0	2,400	2,400	3.80	1,800
USEPA RSL Direct Contact Critical Receptor			*Non-Carcinogenic Child*	*Non-Carcinogenic Child*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Non-Carcinogenic Child*	*Non-Carcinogenic Child*	*Carcinogenic*	*Non-Carcinogenic Child*
USEPA SSL													
Risk-based protection of groundwater		mg/kg	58.1	5.49	0.00425	0.00403	0.0411	0.403	1.24	89.1	5.45	0.000543	13.2
MCL-based protection of groundwater		mg/kg	-	-	-	0.235	-	-	-	-	-	-	-

Notes:

Analytical test for PAHs (polycyclic aromatic hydrocarbons) used USEPA Method 8270D-SIM.

< denotes that the result was not detected above the reporting limit

SLC = Screening Level Concentration for petroleum related constituents from Idaho Risk Evaluation for Petroleum Releases (IDEQ 2012).

USEPA RSL = U.S. Environmental Protection Agency Regional Screening Level; Resident Soil Table (USEPA 2016)

USEPA SSL = U.S. Environmental Protection Agency Soil Screening Level; Protection of Groundwater Table (USEPA 2016).

GWP = ground water protection

mg/kg = milligram per kilogram

- = not used for comparison

* = Sample is a replicate/duplicate. The highest concentration is shown.

† = The maximum concentration of the replicate ISM results is presented.

Table A14. Data Summary for DU3.2

Sample ID	Date	Unit	Anthracene	Acenaphthene	Benzo(a)anthracene	Benzo(a) pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Chrysene	Fluoranthene	Fluorene	Naphthalene	Pyrene
DU3.2A	10/6/2016	mg/kg	0.0348	0.015	0.0249	0.0263	0.0528	0.0130	0.0481	0.0940	<0.0120	0.0693	0.0711
DU3.2B	10/5/2016	mg/kg	0.138	<0.060	**0.224**	**0.234**	**0.416**	0.117	0.301	0.373	<0.0600	<0.200	0.402
DU3.2C	10/5/2016	mg/kg	<0.060	<0.060	<0.0600	**0.160**	0.0782	<0.0600	<0.0600	<0.0600	<0.0600	<0.200	0.128
	SLC	mg/kg	3,200	200	0.0900	0.0200	0.200	1.90	9.50	1,400	240	0.120	1,000
SLC Critical Pathway			*GWP*	*GWP*	*GWP*	*Direct Contact*	*Direct Contact*	*Direct Contact*	*GWP*	*GWP*	*GWP*	*Vapor Intrusion*	*GWP*
	RSL	mg/kg	18,000	3,600	0.160	0.0160	0.160	1.60	16.0	2,400	2,400	3.80	1,800
USEPA RSL Direct Contact Critical Receptor			*Non-Carcinogenic Child*	*Non-Carcinogenic Child*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Carcinogenic*	*Non-Carcinogenic Child*	*Non-Carcinogenic Child*	*Carcinogenic*	*Non-Carcinogenic Child*
USEPA SSL													
Risk-based protection of groundwater		mg/kg	58.1	5.49	0.00425	0.00403	0.0411	0.403	1.24	89.1	5.45	0.000543	13.2
MCL-based protection of groundwater		mg/kg	-	-	-	0.235	-	-	-	-	-	-	-

Notes:

Analytical test for PAHs (polycyclic aromatic hydrocarbons) used USEPA Method 8270D-SIM.

< denotes that the result was not detected above the reporting limit

SLC = Screening Level Concentration for petroleum related constituents from Idaho Risk Evaluation for Petroleum Releases (IDEQ 2012).

USEPA RSL = U.S. Environmental Protection Agency Regional Screening Level; Resident Soil Table (USEPA 2016)

USEPA SSL = U.S. Environmental Protection Agency Soil Screening Level; Protection of Groundwater Table (USEPA 2016).

GWP = ground water protection

mg/kg = milligram per kilogram

- = not used for comparison

Appendix B.

Site-specific Risk Evaluation Supporting Documentation

SITE CONCEPTUAL MODEL (SCM)

The development of a site conceptual model is crucial to the completion of an accurate risk evaluation. By identifying impacted media, transport mechanisms, exposure routes, and receptors, the most appropriate data can be collected and applied to the evaluation of risk. This page is provided for the benefit of the user to aid in completing this step and is not connected to any input screens within the application. A detailed discussion of the site conceptual model is provided in Section 4.1 of the Guidance document.

DETAILED RISK EVALUATION

IMPACTED MEDIA	TRANSPORT MECHANISMS	EXPOSURE ROUTES	POTENTIAL RECEPTORS: Current Land Use – On Site: Residential	Current Land Use – On Site: Non-Residential	Current Land Use – On Site: Construction Worker	Current Land Use – Off Site: Residential	Current Land Use – Off Site: Non-Residential	Current Land Use – Off Site: Construction Worker	Future Land Use – On Site: Residential	Future Land Use – On Site: Non-Residential	Future Land Use – On Site: Construction Worker	Future Land Use – Off Site: Residential	Future Land Use – Off Site: Non-Residential	Future Land Use – Off Site: Construction Worker
Surficial Soil	Wind Erosion Dispersion Volaltilization	Direct Contact: Vapors/Particulate Inhalation Dermal Contact-Ingestion	☐	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
		Leaching to Ground Water	☐	☑		☑	☑		☑	☑		☑	☑	
Subsurface Soil	Volatilization	Indoor Inhalation	☐	☐		☐	☐		☐	☐		☐	☐	
	Construction Activity Wind Erosion Dispersion Volatilization	Direct Contact: Vapors/Particulate Inhalation Dermal Contact-Ingestion	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Leaching to Ground Water	☐	☐		☐	☐		☐	☐		☐	☐	
Groundwater	Volatilization	Indoor Inhalation	☐	☐		☐	☐		☐	☐		☐	☐	
		Ingestion	☐	☐		☐	☐		☐	☐		☐	☐	
		Surface Water Impacts	☐	☐		☐	☐		☐	☐		☐	☐	

RECEPTORS AND ROUTES OF EXPOSURE

DETAILED RISK EVALUATION

ROUTES OF EXPOSURE BY MEDIA	Residential	Non-Residential	Construction Worker
Direct Contact Soil Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil	☑	☑	☑
Subsurface Soil Indoor Inhalation of Vapor Emissions	☐	☐	
Groundwater Indoor Inhalation of Vapor Emissions	☐	☐	
Soil-Vapor Indoor Inhalation of Vapor Emissions	☐	☐	

Construction worker direct contact exposure is for expected depth of construction.
Depending on the data available for evaluation of indoor inhalation risk, check either A) subsurface soil and/or groundwater data, or B) soil vapor, but not all three.

Groundwater Protection

The Maximum Contaminant Levels (MCLs) are used as the target concentrations at the POE. For chemicals without MCLs, risk-based ingestion standards are calculated.

Surface Water Protection

If a surface water body is impacted or threatened, complete the following. Refer to the Idaho Water Quality Standards (IDAPA 58.01.02) sections 109 through 160 for designated beneficial uses of specific Idaho surface water bodies.

Designated for use as domestic water supply?	☐
Designated for aquatic life or recreation use?	☐

PHYSICAL AND CHEMICAL PROPERTIES

CHEMICAL PROPERTIES

	Molecular Weight	Water Solubility	Henry's Law Constant	Organic Carbon Adsorption Coefficient	Soil-Water Sorption Coefficient	Soil-Water Sorption	Diffusion Coefficients	
	[--]	[--]	[--]	[--]	[--]	[mL-water/g-soil]	Diffusion Coefficient in Air [cm^2/s]	Diffusion Coefficient in Water [cm^2/s]
Benzene	7.81E+01	1.79E+03	2.30E-01	1.46E+02	1.00E+00	1.46E-01	9.00E-02	1.00E-05
Toluene	9.21E+01	5.26E+02	2.70E-01	2.34E+02	*NPCP*	2.34E-01	7.80E-02	9.20E-06
Ethylbenzene	1.06E+02	1.69E+02	3.20E-01	4.46E+02	1.00E+00	4.46E-01	6.80E-02	8.50E-06
Xylenes	1.06E+02	1.06E+02	2.10E-01	3.83E+02	*NPCP*	3.83E-01	8.50E-02	9.90E-06
Naphthalene	1.28E+02	3.10E+01	1.80E-02	1.54E+03	1.00E+00	1.54E+00	6.00E-02	8.40E-06
MTBE	8.82E+01	5.10E+04	2.40E-02	1.20E+01	1.00E+00	1.20E-02	7.50E-02	8.60E-06
1,2-Dichloroethane	9.90E+01	8.60E+03	4.80E-02	4.00E+01	1.00E+00	4.00E-02	8.60E-02	1.00E-05
Ethylene Dibromide	1.88E+02	3.91E+03	2.70E-02	4.00E+01	1.00E+00	4.00E-02	4.30E-02	1.00E-05
Acenaphthene	1.54E+02	3.90E+00	7.50E-03	5.03E+03	*NPCP*	5.03E+00	5.10E-02	8.30E-06
Anthracene	1.78E+02	4.34E-02	2.30E-03	1.64E+04	*NPCP*	1.64E+01	3.90E-02	7.90E-06
Benz(a)anthracene	2.28E+02	9.40E-03	4.90E-04	1.77E+05	1.00E+01	1.77E+02	5.10E-02	5.90E-06
Benzo(a)pyrene	2.52E+02	1.60E-03	1.90E-05	5.87E+05	1.00E+01	5.87E+02	4.80E-02	5.60E-06
Benzo(b)fluoranthene	2.52E+02	1.50E-03	2.70E-05	5.99E+05	1.00E+01	5.99E+02	4.80E-02	5.60E-06
Benzo(k)fluoranthene	2.52E+02	8.00E-04	2.40E-05	5.87E+05	1.00E+01	5.87E+02	4.80E-02	5.60E-06
Chrysene	2.28E+02	2.00E-03	2.10E-04	1.81E+05	1.00E+01	1.81E+02	2.60E-02	6.70E-06
Fluoranthene	2.02E+02	2.60E-01	3.60E-04	5.55E+04	*NPCP*	5.55E+01	2.80E-02	7.20E-06
Fluorene	1.66E+02	1.69E+00	3.90E-03	9.16E+03	*NPCP*	9.16E+00	4.40E-02	7.90E-06
Pyrene	2.02E+02	1.35E-01	4.90E-04	5.43E+04	*NPCP*	5.43E+01	2.80E-02	7.20E-06

NOTES:

NPCP: A physical-chemical parameter, required in the calculation of the value, is not available.

TOXICITY VALUES

CHEMICAL PROPERTIES

	Carcinogenic Effects		Non-Carcinogenic Effects		Oral Relative Absorption Factor	Dermal Relative Absorption Factor	Maximum Contaminant Level	Aquatic Life Criterion		Human Health Risk from Consumption of:		Early Childhood Mutagen?
	Oral Slope Factor [--]	Inhalation Unit Risk [--]	Oral Reference Dose [--]	Inhalation Reference Concentration [--]	[--]	[--]	[--]	Acute Criteria [--]	Chronic Criteria [--]	Water & Organisms [--]	Organisms Only [--]	[1=Yes, 0=No]
Benzene	5.50E-02	7.80E-06	4.00E-03	3.00E-02	1.00E+00	0.00E+00	5.00E-03	*NTOX*	*NTOX*	2.20E+00	5.10E+01	0.00E+00
Toluene	*NTOX*	*NTOX*	8.00E-02	5.00E+00	1.00E+00	0.00E+00	1.00E+00	*NTOX*	*NTOX*	1.30E+03	1.50E+04	0.00E+00
Ethylbenzene	1.10E-02	2.50E-06	1.00E-01	1.00E+00	1.00E+00	0.00E+00	7.00E-01	*NTOX*	*NTOX*	5.30E+02	2.10E+03	0.00E+00
Xylenes	*NTOX*	*NTOX*	2.00E-01	1.00E-01	1.00E+00	0.00E+00	1.00E+01	*NTOX*	*NTOX*	*NTOX*	*NTOX*	0.00E+00
Naphthalene	*NTOX*	3.40E-05	2.00E-02	3.00E-03	1.00E+00	1.30E-01	*NTOX*	*NTOX*	*NTOX*	*NTOX*	*NTOX*	0.00E+00
MTBE	1.80E-03	2.60E-07	*NTOX*	3.00E+00	1.00E+00	0.00E+00	*NTOX*	*NTOX*	*NTOX*	*NTOX*	*NTOX*	0.00E+00
1,2-Dichloroethane	9.10E-02	2.60E-05	6.00E-03	7.00E-03	1.00E+00	0.00E+00	5.00E-03	*NTOX*	*NTOX*	3.80E-01	3.70E+01	0.00E+00
Ethylene Dibromide	2.00E+00	6.00E-04	9.00E-03	9.00E-03	1.00E+00	0.00E+00	5.00E-05	*NTOX*	*NTOX*	*NTOX*	*NTOX*	0.00E+00
Acenaphthene	*NTOX*	*NTOX*	6.00E-02	*NTOX*	1.00E+00	1.30E-01	*NTOX*	*NTOX*	*NTOX*	6.70E+02	9.90E+02	0.00E+00
Anthracene	*NTOX*	*NTOX*	3.00E-01	*NTOX*	1.00E+00	1.30E-01	*NTOX*	*NTOX*	*NTOX*	8.30E+03	4.00E+04	0.00E+00
Benz(a)anthracene	7.30E-01	1.10E-04	*NTOX*	*NTOX*	1.00E+00	1.30E-01	*NTOX*	*NTOX*	*NTOX*	3.80E-03	1.80E-02	1.00E+00
Benzo(a)pyrene	7.30E+00	1.10E-03	*NTOX*	*NTOX*	1.00E+00	1.30E-01	2.00E-04	*NTOX*	*NTOX*	3.80E-03	1.80E-02	1.00E+00
Benzo(b)fluoranthene	7.30E-01	1.10E-04	*NTOX*	*NTOX*	1.00E+00	1.30E-01	*NTOX*	*NTOX*	*NTOX*	3.80E-03	1.80E-02	1.00E+00
Benzo(k)fluoranthene	7.30E-02	1.10E-04	*NTOX*	*NTOX*	1.00E+00	1.30E-01	*NTOX*	*NTOX*	*NTOX*	3.80E-03	1.80E-02	1.00E+00
Chrysene	7.30E-03	1.10E-05	*NTOX*	*NTOX*	1.00E+00	1.30E-01	*NTOX*	*NTOX*	*NTOX*	3.80E-03	1.80E-02	1.00E+00
Fluoranthene	*NTOX*	*NTOX*	4.00E-02	*NTOX*	1.00E+00	1.30E-01	*NTOX*	*NTOX*	*NTOX*	1.30E+02	1.40E+02	0.00E+00
Fluorene	*NTOX*	*NTOX*	4.00E-02	*NTOX*	1.00E+00	1.30E-01	*NTOX*	*NTOX*	*NTOX*	1.10E+03	5.30E+03	0.00E+00
Pyrene	*NTOX*	*NTOX*	3.00E-02	*NTOX*	1.00E+00	1.30E-01	*NTOX*	*NTOX*	*NTOX*	8.30E+02	4.00E+03	0.00E+00

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

Construction Worker Exposure Area USEPA RSL Calculator Assumptions

Zone	EA	EA Length (ft)	EA Width (ft)	EA ft^2 (length * width)	EA m^2 (ft^2 * 0.092903)	EA ft^3 (ft^2 * 0.5 feet)	EA yd^3 (ft^3 * 0.037037)	18 yd^3 Truck Loads (EA yd^3 / 18)
1	1.1	1,400	20	28,000	2,601.28	14,000	519	29
	1.2	1,100	60	66,000	6,131.60	33,000	1,222	68
	1.3	1,400	60	84,000	7,803.85	42,000	1,556	86
2	2.1	1,250	60	75,000	6,967.73	37,500	1,389	77
	2.2	2,950	60	177,000	16,443.83	88,500	3,278	182
3	3.1	2,950	60	177,000	16,443.83	88,500	3,278	182
	3.2	900	60	54,000	5,016.76	27,000	1,000	56

Notes:

EA = Exposure Area m = meter

ft = feet yd = yard

Construction Worker Construction Activity USEPA RSL Calculator Assumptions

Vehicle	Type	Max Weight (lb)	Max Weight (ton)	Blade Length (ft)	Blade Length (m)
Truck	F150	5,238	2.6	NA	NA
Dump Truck	Volvo A25C 4X4	88,780	44.4	NA	NA
Grader	Cat 120G Motor Grader	25,320	12.7	8.2	2.5
Dozer	Komatsu WD420-3 Wheel Dozer	44,093	22.0	12.3	3.7

Notes:

ft = feet m = meter

lb = pound

VOLVO A25C 4X4 ARTICULATED DUMP TRUCK

VIEW ARTICLES ON THIS ITEM

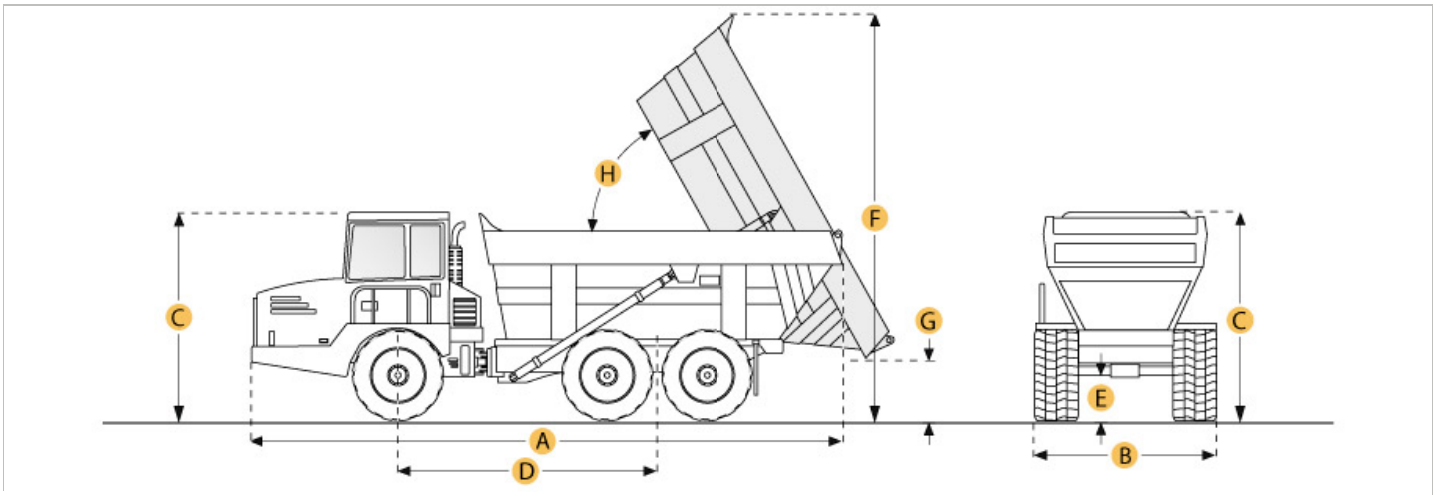
Print specification

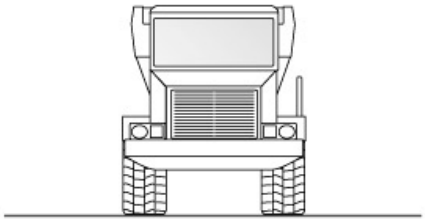
Looking to purchase this item?

Find a Volvo A25C 4X4 Articulated Dump Truck being sold at Ritchie Bros. auctions.

Need to sell equipment?

Complete this form and a Ritchie Bros. representative will contact you.





Selected Dimensions

Dimensions		
A. OVERALL LENGTH	31.7 ft in	9675 mm
B. OVERALL WIDTH	8.2 ft in	2500 mm
C. OVERALL HEIGHT	10.8 ft in	3285 mm
D. WHEELBASE	13.7 ft in	4165 mm
E. GROUND CLEARANCE	1.7 ft in	520 mm
F. DUMP HEIGHT	21 ft in	6400 mm
G. DUMP GROUND CLEARANCE	2.1 ft in	640 mm
Dump		
H. DUMP ANGLE	70 degrees	

Specification

Engine		
MAKE	Volvo	
MODEL	TD 73 KCE	
GROSS POWER	255 hp	190.2 kw
NET POWER	251 hp	187.2 kw
POWER MEASURED @	2400 rpm	
DISPLACEMENT	410.7 cu in	6.7 L
TORQUE MEASURED @	1200 rpm	
MAX TORQUE	796.6 lb ft	1080 Nm
ASPIRATION	Turbocharged	
NUMBER OF CYLINDERS	6	
Operational		
FUEL CAPACITY	74 gal	280 L
HYDRAULIC SYSTEM FLUID CAPACITY	47.6 gal	180 L
COOLING SYSTEM FLUID CAPACITY	9.8 gal	37 L
ENGINE OIL CAPACITY	6.3 gal	24 L
TRANSMISSION FLUID CAPACITY	4.2 gal	16 L
OPERATING VOLTAGE	24 V	
ALTERNATOR SUPPLIED AMPERAGE	60 amps	
TIRE SIZE	front 23.5R25 / rear 29.5R25	
Transmission		
TYPE	Fully automatic planetary transmission	

NUMBER OF FORWARD GEARS	10	
NUMBER OF REVERSE GEARS	2	
MAX SPEED	32.3 mph	52 km/h

Weights

FRONT AXLE - EMPTY	19929.8 lb	9040 kg
REAR AXLE - EMPTY	19246.4 lb	8730 kg
FRONT AXLE - LOADED	25353.2 lb	11500 kg
REAR AXLE - LOADED	63427 lb	28770 kg
TOTAL EMPTY	39176.1 lb	17770 kg
TOTAL LOADED	88780.1 lb	40270 kg

Dump

RATED PAYLOAD	49604 lb	22500 kg
CAPACITY - STRUCK	14.4 yd3	11 m3
CAPACITY - HEAPED	18 yd3	13.8 m3
DUMP ANGLE	70 degrees	
RAISE TIME	12 sec	
LOWER TIME	10 sec	

Dimensions

OVERALL LENGTH	31.7 ft in	9675 mm
OVERALL WIDTH	8.2 ft in	2500 mm
OVERALL HEIGHT	10.8 ft in	3285 mm
WHEELBASE	13.7 ft in	4165 mm
GROUND CLEARANCE	1.7 ft in	520 mm
DUMP HEIGHT	21 ft in	6400 mm
DUMP GROUND CLEARANCE	2.1 ft in	640 mm

CATERPILLAR 120G MOTOR GRADER

VIEW ARTICLES ON THIS ITEM

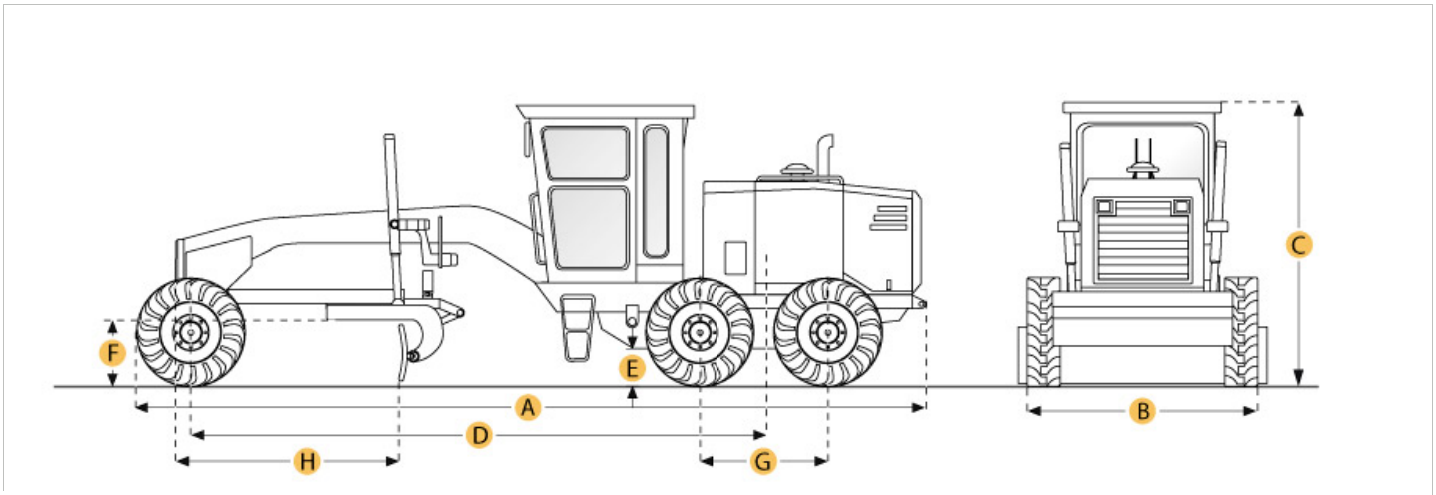
Print specification

Looking to purchase this item?

Find a Caterpillar 120G Motor Grader being sold at Ritchie Bros. auctions.

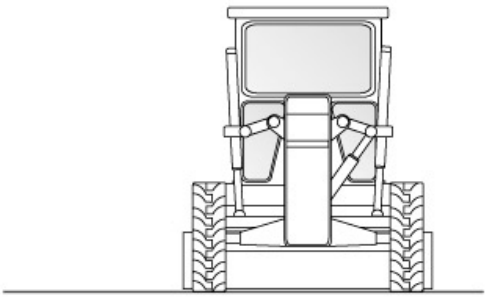
Need to sell equipment?

Complete this form and a Ritchie Bros. representative will contact you.



Selected Dimensions

Dimensions		
A. OVERALL LENGTH	26 ft in	7930 mm
B. WIDTH OVER TIRES	7.9 ft in	2410 mm
C. HEIGHT TO TOP OF CAB	10.9 ft in	3330 mm
D. WHEELBASE	18.7 ft in	5690 mm
H. BLADE BASE	8.2 ft in	2490 mm



Specification

Engine		
MAKE	Caterpillar	
MODEL	3304	
NET POWER GEAR 5-6	125 hp	93.2 kw
MAX POWER	125 hp	93.2 kw
DISPLACEMENT	427.2 cu in	7 L
Operational		
STD OPERATION WEIGHT - TOTAL	25320.1 lb	11485 kg
FUEL CAPACITY	60 gal	227 L
TIRE SIZE	13x24 8 PR	
Transmission		
NUMBER OF GEARS - FORWARD	6	
NUMBER OF GEARS - REVERSE	6	
MAX SPEED - FORWARD	25.4 mph	40.9 km/h
MAX SPEED - REVERSE	25.4 mph	40.9 km/h
Steering		
TURNING RADIUS	22 ft in	6.7 m
Circle		
MAX LIFT ABOVE GROUND	16.1 in	410 mm
Dimensions		
HEIGHT TO TOP OF CAB	10.9 ft in	3330 mm
OVERALL LENGTH	26 ft in	7930 mm
WIDTH OVER TIRES	7.9 ft in	2410 mm
WHEELBASE	18.7 ft in	5690 mm
BLADE BASE	8.2 ft in	2490 mm

KOMATSU WD420-3 WHEEL DOZER

VIEW ARTICLES ON THIS ITEM

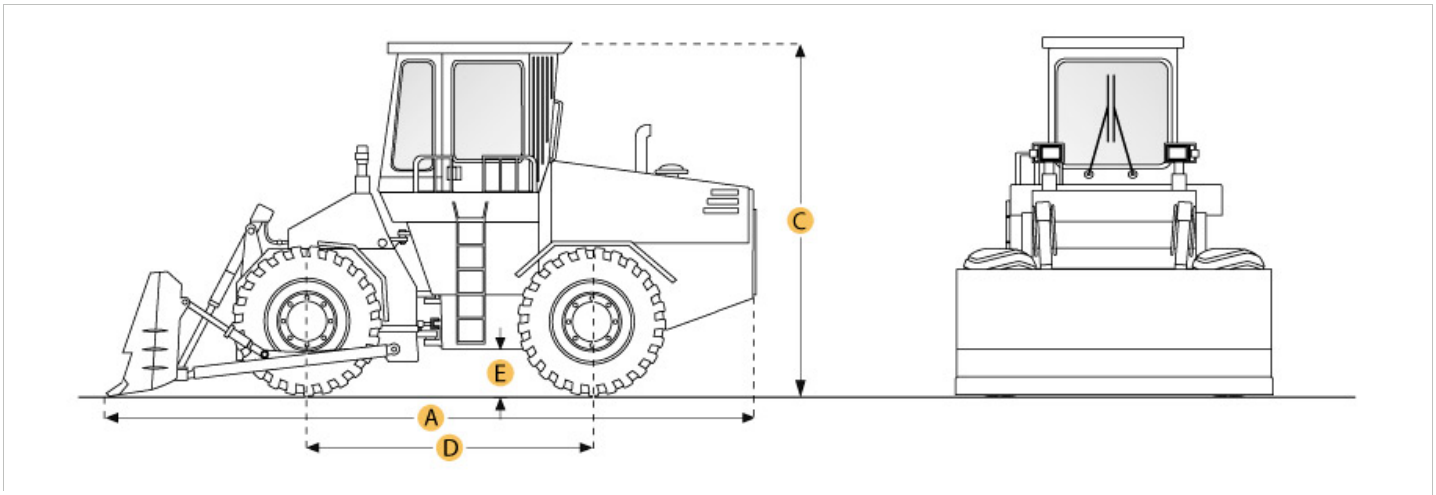
Print specification

Looking to purchase this item?

Find a Komatsu WD420-3 Wheel Dozer being sold at Ritchie Bros. auctions.

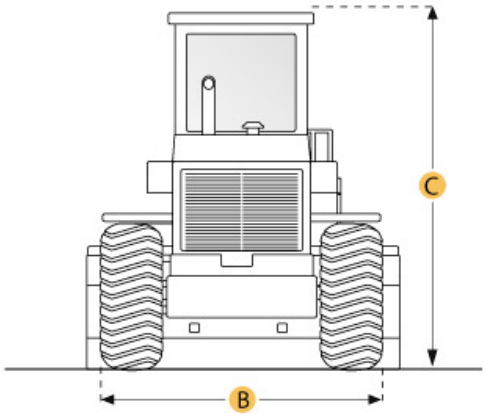
Need to sell equipment?

Complete this form and a Ritchie Bros. representative will contact you.



Selected Dimensions

Dimensions		
A. LENGTH WITH BLADE ON GROUND	23.5 ft in	7160 mm
B. WIDTH OVER TIRES	9.3 ft in	2820 mm
C. HEIGHT TO TOP OF CAB	11.1 ft in	3370 mm
D. WHEELBASE	10.8 ft in	3300 mm

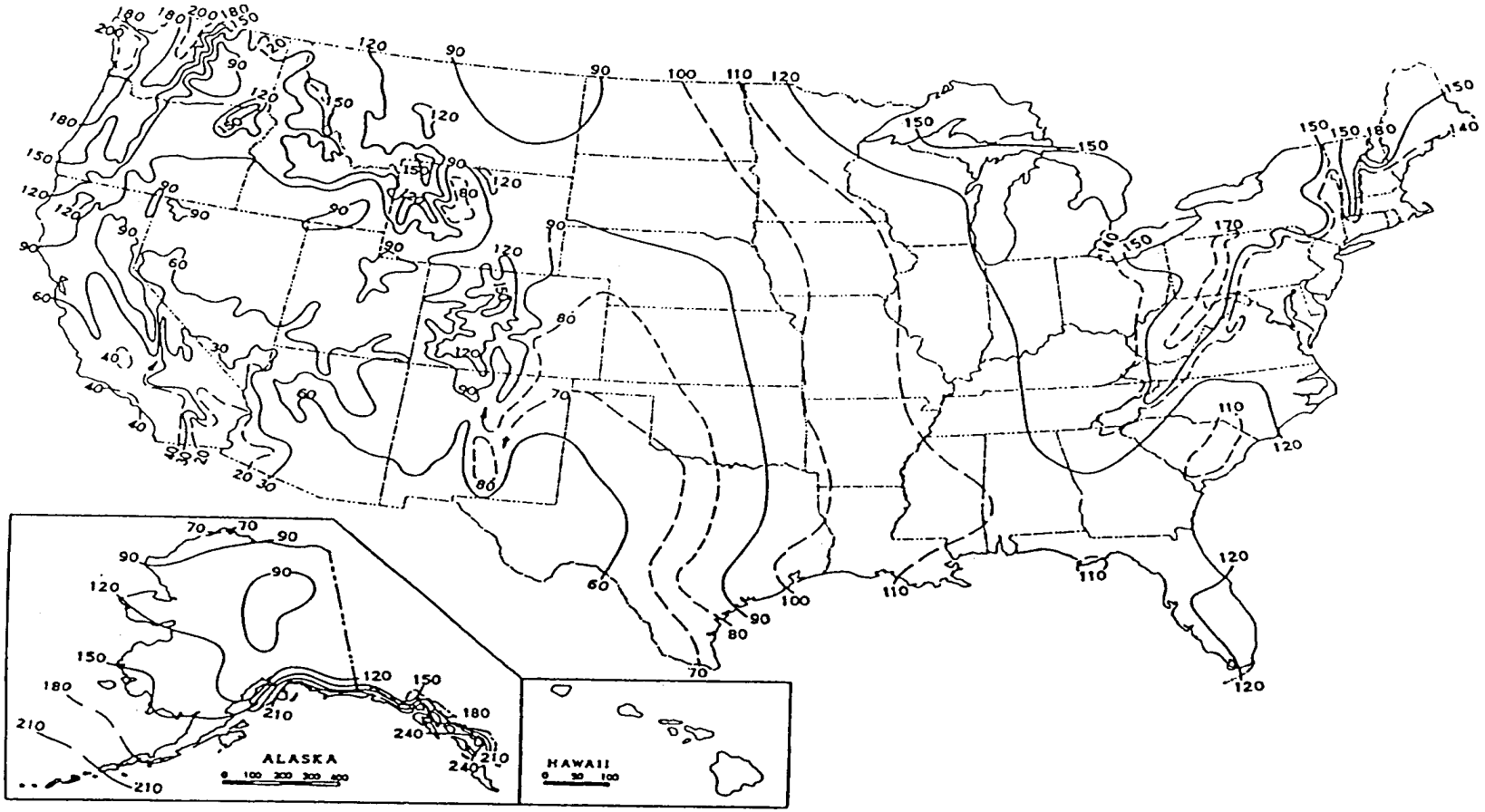


Specification

Engine		
MAKE	Komatsu	
MODEL	SA6D108	
GROSS POWER	224 hp	167 kw
NUMBER OF CYLINDERS	6	
DISPLACEMENT	436.3 cu in	7.2 L
Operational		
OPERATING WEIGHT	44092.5 lb	20000 kg
FUEL CAPACITY	89.8 gal	340 L
TIRE SIZE	23.5-25-12PR	
Transmission		
NUMBER OF FORWARD GEARS	4	
NUMBER OF REVERSE GEARS	4	
MAX SPEED - FORWARD	20.4 mph	32.8 km/h
MAX SPEED - REVERSE	21.1 mph	33.9 km/h
Blade		
BLADE CAPACITY	4.1 yd3	3.1 m3
BLADE WIDTH	12.3 ft in	3745 mm
Dimensions		
LENGTH WITH BLADE ON GROUND	23.5 ft in	7160 mm
WIDTH OVER TIRES	9.3 ft in	2820 mm
HEIGHT TO TOP OF CAB	11.1 ft in	3370 mm
WHEELBASE	10.8 ft in	3300 mm

Exhibit 5-2

MEAN NUMBER OF DAYS WITH 0.01 INCH OR MORE OF ANNUAL PRECIPITATION



Exposure Area DU1.1

Site-specific
Resident Equation Inputs for Soil

Variable	Value
THQ (target hazard quotient) unitless	1
TR (target risk) unitless	0.00001
LT (lifetime) years	70
ET_{res} (exposure time) hours/day	24
$ET_{res\text{-}c}$ (child exposure time) hours/day	24
$ET_{res\text{-}a}$ (adult exposure time) hours/day	24
$ET_{0\text{-}2}$ (mutagenic exposure time) hours/day	24
$ET_{2\text{-}6}$ (mutagenic exposure time) hours/day	24
$ET_{6\text{-}16}$ (mutagenic exposure time) hours/day	24
$ET_{16\text{-}26}$ (mutagenic exposure time) hours/day	24
ED_{res} (exposure duration) years	26
$ED_{res\text{-}c}$ (exposure duration - child) years	6
$ED_{res\text{-}a}$ (exposure duration - adult) years	20
$ED_{0\text{-}2}$ (mutagenic exposure duration) years	2
$ED_{2\text{-}6}$ (mutagenic exposure duration) years	4
$ED_{6\text{-}16}$ (mutagenic exposure duration) years	10
$ED_{16\text{-}26}$ (mutagenic exposure duration) years	10
$BW_{res\text{-}c}$ (body weight - child) kg	15
$BW_{res\text{-}a}$ (body weight - adult) kg	80
$BW_{0\text{-}2}$ (mutagenic body weight) kg	15
$BW_{2\text{-}6}$ (mutagenic body weight) kg	15
$BW_{6\text{-}16}$ (mutagenic body weight) kg	80
$BW_{16\text{-}26}$ (mutagenic body weight) kg	80
$SA_{res\text{-}c}$ (skin surface area - child) cm^2/day	2373
$SA_{res\text{-}a}$ (skin surface area - adult) cm^2/day	6032
$SA_{0\text{-}2}$ (mutagenic skin surface area) cm^2/day	2373
$SA_{2\text{-}6}$ (mutagenic skin surface area) cm^2/day	2373
$SA_{6\text{-}16}$ (mutagenic skin surface area) cm^2/day	6032
$SA_{16\text{-}26}$ (mutagenic skin surface area) cm^2/day	6032
EF_{res} (exposure frequency) days/year	350
$EF_{res\text{-}c}$ (exposure frequency - child) days/year	350
$EF_{res\text{-}a}$ (exposure frequency - adult) days/year	350
$EF_{0\text{-}2}$ (mutagenic exposure frequency) days/year	350
$EF_{2\text{-}6}$ (mutagenic exposure frequency) days/year	350
$EF_{6\text{-}16}$ (mutagenic exposure frequency) days/year	350
$EF_{16\text{-}26}$ (mutagenic exposure frequency) days/year	350
$IFS_{res\text{-}adj}$ (age-adjusted soil ingestion factor) mg/kg	36750
$IFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	166833.33
$IRS_{res\text{-}c}$ (soil intake rate - child) mg/day	200
$IRS_{res\text{-}a}$ (soil intake rate - adult) mg/day	100
$IRS_{0\text{-}2}$ (mutagenic soil intake rate) mg/day	200

Site-specific
Resident Equation Inputs for Soil

Variable	Value
IRS_{2-6} (mutagenic soil intake rate) mg/day	200
IRS_{6-16} (mutagenic soil intake rate) mg/day	100
IRS_{16-26} (mutagenic soil intake rate) mg/day	100
AF_{res-a} (skin adherence factor - adult) mg/cm^2	0.07
AF_{res-c} (skin adherence factor - child) mg/cm^2	0.2
AF_{0-2} (mutagenic skin adherence factor) mg/cm^2	0.2
AF_{2-6} (mutagenic skin adherence factor) mg/cm^2	0.2
AF_{6-16} (mutagenic skin adherence factor) mg/cm^2	0.07
AF_{16-26} (mutagenic skin adherence factor) mg/cm^2	0.07
$DFS_{res-adj}$ (age-adjusted soil dermal factor) mg/kg	103390
$DFSM_{res-adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	428260
$City_{PEF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	0.64
Q/C_{wp} (inverse of the ratio of the geometric mean air concentration to the emission flu	68.13537413
PEF (particulate emission factor) m^3/kg	3167068891
A (PEF Dispersion Constant)	11.3161
B (PEF Dispersion Constant)	19.6437
C (PEF Dispersion Constant)	224.8172
V (fraction of vegetative cover) unitless	
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.0495
$City_{VF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	0.64
Q/C_{vol}(inverse of the ratio of the geometric mean air concentration to the emission flu	68.13537413
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	11.3161
B (VF Dispersion Constant)	19.6437
C (VF Dispersion Constant)	224.8172
$City_{VF\ mass\text{-}loading}$ (Climate Zone) Selection	Boise, ID (4)
VF_{ml} (volitization factor - mass-limit) m^3/kg	124148.1025
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	68.13537413
A_s (acres)	0.64
T (exposure interval) yr	26
d_s (depth of source) m	0.3

Site-specific
Resident Equation Inputs for Soil

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
A (VF Dispersion Constant - Mass Limit)	11.3161
B (VF Dispersion Constant - Mass Limit)	19.6437
C (VF Dispersion Constant - Mass Limit)	224.8172

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Site-specific
Resident Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1

	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)	S (mg/L)	K_{oc} (cm3/g)	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)
Chromium, Total	-	1	-	-	-	-	-	3170000000	-	-	-	-
Mercury (elemental)	-	1	124000	0.352	0.06	-	3.13	3170000000	-	-	-	-
Selenium	-	1	-	-	-	-	-	3170000000	-	-	-	-

	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)	Ingestion SL Adult THQ=1 (mg/kg)	Dermal SL Adult THQ=1 (mg/kg)	Inhalation SL Adult THQ=1 (mg/kg)	Noncarcinogenic SL Adult THI=1 (mg/kg)	Screening Level (mg/kg)
Chromium, Total	-	-	-	-	-	-	-	-	
Mercury (elemental)	-	-	38.8	38.8	-	-	38.8	38.8	3.88E+01 sat
Selenium	391	-	66100000	391	4170	-	66100000	4170	3.91E+02 nc

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Site-specific
Resident Risk for Soil

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)	S (mg/L)	K_{oc} (cm3/g)
Chromium, Total	-		-		-		-		0.013	-	1	-	-	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	124000	0.352	0.06	-
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion Child HQ	Dermal Child HQ	Inhalation Child HQ	Noncarcinogenic Child HI	Ingestion Adult HQ	Dermal Adult HQ	Inhalation Adult HQ	Noncarcinogenic Adult HI
	-	3170000000	0.64	-	-	-	-	-	-	-	-	-	-	-	-
	3.13	3170000000	0.268	-	-	-	-	-	-	0.0069	0.0069	-	-	0.0069	0.0069
	-	3170000000	4	-	-	-	-	0.0102	-	6.06E-08	0.0102	0.000959	-	6.06E-08	0.000959
**Total Risk/HI*	-	-	-	-	-	-	-	*0.0102*	-	*0.0069*	*0.0171*	*0.000959*	-	*0.0069*	*0.00786*

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Site-specific
Composite Worker Equation Inputs for Soil

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
AT_w (averaging time)	365
EF_w (exposure frequency) d/yr	250
ED_w (exposure duration) yr	25
ET_w (exposure time) hr	8
LT (lifetime) yr	70
BW_w (body weight)	80
IR_w (soil ingestion rate) mg/day	100
SA_w (surface area) cm^2/day	3527
AF_w (skin adherence factor) mg/cm^2	0.12
$City_{PEF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	0.64
Q/C_{wp} (inverse of the ratio of the geometric mean air concentration to the emission flu	68.13537413
PEF (particulate emission factor) m^3/kg	3167068891
A (PEF Dispersion Constant)	11.3161
B (PEF Dispersion Constant)	19.6437
C (PEF Dispersion Constant)	224.8172
V (fraction of vegetative cover) unitless	0
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.0495
$City_{VF}$ (Climate Zone) Selection	Default
A_s (acres)	0.64
Q/C_{vol}(inverse of the ratio of the geometric mean air concentration to the emission flu	65.20066412
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	11.911
B (VF Dispersion Constant)	18.4385
C (VF Dispersion Constant)	209.7845
$City_{VF\ mass\text{-}loading}$ (Climate Zone) Selection	Boise, ID (4)
VF_{ml} (volitization factor - mass-limit) m^3/kg	124148.1025
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	68.13537413
A_s (acres)	0.64
T (exposure interval) yr	26
d_s (depth of source) m	0.3

Site-specific
Composite Worker Equation Inputs for Soil

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
A (VF Dispersion Constant - Mass Limit)	11.3161
B (VF Dispersion Constant - Mass Limit)	19.6437
C (VF Dispersion Constant - Mass Limit)	224.8172

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Site-specific
Composite Worker Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	124000	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	3170000000	-	-	-	-	-	-	-	-	
3.13	0.06	-	3170000000	-	-	-	-	-	-	163	163	1.63E+02 sat
-	-	-	3170000000	-	-	-	-	5840	-	277000000	5840	5.84E+03 nc

Output generated 27OCT2017:14:07:16

Site-specific
Composite Worker Risk for Soil

Chemical	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	124000	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
*Total Risk/HI	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	3170000000	24.6	-	-	-	-	-	-	-	-
	3.13	0.06	-	3170000000	0.268	-	-	-	-	-	-	0.00164	0.00164
	-	-	-	3170000000	4	-	-	-	-	0.000685	-	1.44E-08	0.000685
*Total Risk/HI	-	-	-	-	-	-	-	-	-	*0.000685*	-	*0.00164*	*0.00233*

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Site-specific
Construction Worker Equation Inputs for Soil - Unpaved Road Traffic

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
EF_{cw} (exposure frequency - construction worker) day/yr	250
ED_{cw} (exposure duration - construction worker) yr	1
ET_{cw} (exposure time - construction worker) hr/day	8
LT (lifetime) yr	70
BW_{cw} (body weight - construction worker) kg	80
IR_{cw} (soil ingestion rate - construction worker) mg/day	330
SA_{cw} (surface area - construction worker) cm^2/day	3527
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3
AT_{cw} (averaging time - construction worker carcinogenic)	365
AT_{cw-a} (averaging time - construction worker non-carcinogenic)	350
EW_{cw} (overall duration of construction) weeks/year	50
DW_{cw} (days worked - construction worker) days/week	5
A_s (PEF_{sc} - acres)	0.64
s (road surface silt content) %	8.5
M_{dry} (road surface material moisture content under dry, uncontrolled conditions) %	0.2
p (days per year with at least .01" of precipitation) days/year	90
L_R (length of road segment) ft	166.9685863
W_R (width of road segment) ft	20
number of cars	0
number of trucks	29
tons/car	2.6
tons/truck	44.4
F_D Unitless Dispersion Correction Factor	0.185837208
t_c (overall duration of construction) hours	8400
distance (road length) km/day	0.050891948
T_t (overall duration of traffic) s	7200000
total number of vehicles	0
A_R (surface area of contaminated road segment) m^2	310.2376514
W (mean vehicle weight) tons	0
SigmaVKT (sum of fleet vehicle km traveled) km	0
Q/C_{sr} (inverse of the ratio of the 1-h. geometric mean air concentration to the emission	22.04038762
PEF_{sc} (particulate emission factor) m^3/kg	0
A (Dispersion Constant)	12.9351
B (Dispersion Constant)	5.7383
C (Dispersion Constant)	71.7711
A_{surf} (areal extent of site) m^2	2589.9904
A_s ($VF_{ulim-sc}$ acres)	0.64
T (temperature) C	25
foc (fraction organic carbon in soil) g/g	0.006

Site-specific
Construction Worker Equation Inputs for Soil - Unpaved Road Traffic

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
A (VF Dispersion Constant)	2.4538
B (VF Dispersion Constant)	17.566
C (VF Dispersion Constant)	189.0426
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	13.65188929
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
A_s ($VF_{mlim\text{-}sc}$ acres)	0.64
p_b (dry soil bulk density) g/cm^3	1.5
d_s (average source depth) m	0.3
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	13.65188929
$VF_{mlim\text{-}sc}$ (volitization factor) m^3_{air}/kg_{soil}	4936.616141

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Site-specific
Construction Worker Screening Levels (RSL) for Soil - Unpaved Road Traffic

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	4940	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	0	-	-	-	-	-	-	-	-	
3.13	0.06	-	0	-	-	-	-	-	-	-	-	
-	-	-	0	-	-	-	-	1700	-	-	1700	1.70E+03 nc

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Site-specific
Construction Worker Risk for Soil - Unpaved Road Traffic

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	4940	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	0	24.6	-	-	-	-	-	-	-	-
	3.13	0.06	-	0	0.268	-	-	-	-	-	-	-	-
	-	-	-	0	4	-	-	-	-	0.00236	-	-	0.00236
**Total Risk/HI*	-	-	-	-	-	-	-	-	-	*0.00236*	-	-	*0.00236*

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Site-specific
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
EF_{cw} (exposure frequency - construction worker) day/yr	250
ED_{cw} (exposure duration - construction worker) yr	1
ET_{cw} (exposure time - construction worker) hr/day	8
LT (lifetime) yr	70
BW_{cw} (body weight - construction worker) kg	80
IR_{cw} (soil ingestion rate - construction worker) mg/day	330
SA_{cw} (surface area - construction worker) cm^2/day	3527
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3
AT_{cw} (averaging time - construction worker carcinogenic)	365
AT_{cw-a} (averaging time - construction worker non-carcinogenic)	350
EW_{cw} (overall duration of construction) weeks/year	50
DW_{cw} (days worked - construction worker) days/week	5
A_c (acres)	0.64
A_{till} (areal extent of tilling) acres	0.64
A_{excav} (area of excavation site) m^2	2601.28
$A_{c\text{-}grade}$ (areal extent of grading) acres	0.64
$A_{c\text{-}doz}$ (areal extent of dozing) acres	0.64
$M_{m\text{-}doz}$ (Gravimetric soil moisture content) %	7.9
$M_{m\text{-}excav}$ (Gravimetric soil moisture content) %	12
p_{soil} (density) g/cm^3 - chemical-specific	1.68
$N_{A\text{-}dump}$ (number of times soil is dumped)	2
$N_{A\text{-}till}$ (number of times soil is tilled)	2
s_{till} (soil silt content) %	18
s_{doz} (soil silt content) %	6.9
B_l (dozing blade length) m	3.7
B_l (grading blade length) m	2.5
$N_{A\text{-}doz}$ (number of times site was dozed)	0
$N_{A\text{-}grade}$ (number of times site was graded)	1
S_{doz} (dozing speed) kph	11.4
S_{grade} (dozing speed) kph	11.4
d_{excav} (average depth of excavation site) m	0.3
V (fraction of vegetative cover)	0
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value) m/s	11.32
t_c (overall duration of construction) hours	8400
F_D Unitless Dispersion Correction Factor	0.185837208
T (time over which traffic occurs) s	7200000
$J`_T$ (g/m^2s)	3.79504E-06
F(x) (function dependant on U_m/U_t derived using Cowherd et al. (1985))	0.0495

Site-specific
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value
M_{wind} (dust emitted by wind erosion) g	51288.84717
M_{doz} (dust emitted from dozing operations) g	
M_{till} (dust emitted from tilling operations) g	3227.746079
M_{grade} (dust emitted from grading operations) g	452.3995349
M_{excav} (dust emitted from excavation soil dumping) g	319.7415831
$SigmaVKT_{doz}$ (sum of fleet vehicle km traveled) km	
$SigmaVKT_{grade}$ (sum of fleet vehicle km traveled) km	1.036032
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	13.65188929
$PEF`_{sc}$ (particulate emission factor) m^3/kg	19357270.48
A (PEF Dispersion Constant)	2.4538
B (PEF Dispersion Constant)	17.566
C (PEF Dispersion Constant)	189.0426
A_{surf} (areal extent of site) m^2	2589.9904
A_s ($VF_{ulim-sc}$ acres)	0.64
T (temperature) C	25
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
A (VF Dispersion Constant)	2.4538
B (VF Dispersion Constant)	17.566
C (VF Dispersion Constant)	189.0426
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	13.65188929
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
A_s ($VF_{mlim-sc}$ acres)	0.64
p_b (dry soil bulk density) g/cm^3	1.5
d_s (average source depth) m	0.3
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	13.65188929
$VF_{mlim-sc}$ (volitization factor) m^3_{air}/kg_{soil}	4936.616141
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Site-specific
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	4940	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	19400000	-	-	-	-	-	-	-	-	
3.13	0.06	-	19400000	-	-	-	-	-	-	6.22	6.22	6.22E+00 sat
-	-	-	19400000	-	-	-	-	1700	-	1630000	1700	1.70E+03 nc

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Site-specific
Construction Worker Risk for Soil - Other Construction Activities

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	4940	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	19400000	24.6	-	-	-	-	-	-	-	-
	3.13	0.06	-	19400000	0.268	-	-	-	-	-	-	0.0431	0.0431
	-	-	-	19400000	4	-	-	-	-	0.00236	-	0.00000246	0.00236
**Total Risk/HI*	-	-	-	-	-	-	-	-	-	*0.00236*	-	*0.0431*	*0.0455*

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Exposure Area DU1.2

Site-specific
Resident Equation Inputs for Soil

Variable	Value
THQ (target hazard quotient) unitless	1
TR (target risk) unitless	0.00001
LT (lifetime) years	70
ET_{res} (exposure time) hours/day	24
$ET_{res\text{-}c}$ (child exposure time) hours/day	24
$ET_{res\text{-}a}$ (adult exposure time) hours/day	24
$ET_{0\text{-}2}$ (mutagenic exposure time) hours/day	24
$ET_{2\text{-}6}$ (mutagenic exposure time) hours/day	24
$ET_{6\text{-}16}$ (mutagenic exposure time) hours/day	24
$ET_{16\text{-}26}$ (mutagenic exposure time) hours/day	24
ED_{res} (exposure duration) years	26
$ED_{res\text{-}c}$ (exposure duration - child) years	6
$ED_{res\text{-}a}$ (exposure duration - adult) years	20
$ED_{0\text{-}2}$ (mutagenic exposure duration) years	2
$ED_{2\text{-}6}$ (mutagenic exposure duration) years	4
$ED_{6\text{-}16}$ (mutagenic exposure duration) years	10
$ED_{16\text{-}26}$ (mutagenic exposure duration) years	10
$BW_{res\text{-}c}$ (body weight - child) kg	15
$BW_{res\text{-}a}$ (body weight - adult) kg	80
$BW_{0\text{-}2}$ (mutagenic body weight) kg	15
$BW_{2\text{-}6}$ (mutagenic body weight) kg	15
$BW_{6\text{-}16}$ (mutagenic body weight) kg	80
$BW_{16\text{-}26}$ (mutagenic body weight) kg	80
$SA_{res\text{-}c}$ (skin surface area - child) cm^2/day	2373
$SA_{res\text{-}a}$ (skin surface area - adult) cm^2/day	6032
$SA_{0\text{-}2}$ (mutagenic skin surface area) cm^2/day	2373
$SA_{2\text{-}6}$ (mutagenic skin surface area) cm^2/day	2373
$SA_{6\text{-}16}$ (mutagenic skin surface area) cm^2/day	6032
$SA_{16\text{-}26}$ (mutagenic skin surface area) cm^2/day	6032
EF_{res} (exposure frequency) days/year	350
$EF_{res\text{-}c}$ (exposure frequency - child) days/year	350
$EF_{res\text{-}a}$ (exposure frequency - adult) days/year	350
$EF_{0\text{-}2}$ (mutagenic exposure frequency) days/year	350
$EF_{2\text{-}6}$ (mutagenic exposure frequency) days/year	350
$EF_{6\text{-}16}$ (mutagenic exposure frequency) days/year	350
$EF_{16\text{-}26}$ (mutagenic exposure frequency) days/year	350
$IFS_{res\text{-}adj}$ (age-adjusted soil ingestion factor) mg/kg	36750
$IFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	166833.33
$IRS_{res\text{-}c}$ (soil intake rate - child) mg/day	200
$IRS_{res\text{-}a}$ (soil intake rate - adult) mg/day	100
$IRS_{0\text{-}2}$ (mutagenic soil intake rate) mg/day	200

Site-specific
Resident Equation Inputs for Soil

Variable	Value
IRS_{2-6} (mutagenic soil intake rate) mg/day	200
IRS_{6-16} (mutagenic soil intake rate) mg/day	100
IRS_{16-26} (mutagenic soil intake rate) mg/day	100
AF_{res-a} (skin adherence factor - adult) mg/cm^2	0.07
AF_{res-c} (skin adherence factor - child) mg/cm^2	0.2
AF_{0-2} (mutagenic skin adherence factor) mg/cm^2	0.2
AF_{2-6} (mutagenic skin adherence factor) mg/cm^2	0.2
AF_{6-16} (mutagenic skin adherence factor) mg/cm^2	0.07
AF_{16-26} (mutagenic skin adherence factor) mg/cm^2	0.07
$DFS_{res-adj}$ (age-adjusted soil dermal factor) mg/kg	103390
$DFSM_{res-adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	428260
$City_{PEF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	1.52
Q/C_{wp} (inverse of the ratio of the geometric mean air concentration to the emission flu	58.57042229
PEF (particulate emission factor) m^3/kg	2722470739
A (PEF Dispersion Constant)	11.3161
B (PEF Dispersion Constant)	19.6437
C (PEF Dispersion Constant)	224.8172
V (fraction of vegetative cover) unitless	0
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.0495
$City_{VF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	1.52
Q/C_{vol}(inverse of the ratio of the geometric mean air concentration to the emission flu	58.57042229
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	11.3161
B (VF Dispersion Constant)	19.6437
C (VF Dispersion Constant)	224.8172
$City_{VF\ mass\text{-}loading}$ (Climate Zone) Selection	Boise, ID (4)
VF_{ml} (volitization factor - mass-limit) m^3/kg	106719.9951
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	58.57042229
A_s (acres)	1.52
T (exposure interval) yr	26
d_s (depth of source) m	0.3

Site-specific
Resident Equation Inputs for Soil

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
A (VF Dispersion Constant - Mass Limit)	11.3161
B (VF Dispersion Constant - Mass Limit)	19.6437
C (VF Dispersion Constant - Mass Limit)	224.8172

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Site-specific
Resident Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1

Chemical	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)	S (mg/L)	K_{oc} (cm3/g)	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)
Chromium, Total	-	1	-	-	-	-	-	2720000000	-	-	-	-
Mercury (elemental)	-	1	107000	0.352	0.06	-	3.13	2720000000	-	-	-	-
Selenium	-	1	-	-	-	-	-	2720000000	-	-	-	-

Chemical	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)	Ingestion SL Adult THQ=1 (mg/kg)	Dermal SL Adult THQ=1 (mg/kg)	Inhalation SL Adult THQ=1 (mg/kg)	Noncarcinogenic SL Adult THI=1 (mg/kg)	Screening Level (mg/kg)
Chromium, Total	-	-	-	-	-	-	-	-	
Mercury (elemental)	-	-	33.4	33.4	-	-	33.4	33.4	3.34E+01 sat
Selenium	391	-	56800000	391	4170	-	56800000	4170	3.91E+02 nc

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Site-specific
Resident Risk for Soil

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)	S (mg/L)	K_{oc} (cm3/g)
Chromium, Total	-		-		-		-		0.013	-	1	-	-	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	107000	0.352	0.06	-
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-	-	-
*Total Risk/HI	-		-		-		-		-	-	-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion Child HQ	Dermal Child HQ	Inhalation Child HQ	Noncarcinogenic Child HI	Ingestion Adult HQ	Dermal Adult HQ	Inhalation Adult HQ	Noncarcinogenic Adult HI
	-	2720000000	26.9	-	-	-	-	-	-	-	-	-	-	-	-
	3.13	2720000000	1.54	-	-	-	-	-	-	0.0461	0.0461	-	-	0.0461	0.0461
	-	2720000000	4	-	-	-	-	0.0102	-	7.04E-08	0.0102	0.000959	-	7.04E-08	0.000959
*Total Risk/HI	-	-	-	-	-	-	-	*0.0102*	-	*0.0461*	*0.0564*	*0.000959*	-	*0.0461*	*0.0471*

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Site-specific
Composite Worker Equation Inputs for Soil

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
AT_w (averaging time)	365
EF_w (exposure frequency) d/yr	250
ED_w (exposure duration) yr	25
ET_w (exposure time) hr	8
LT (lifetime) yr	70
BW_w (body weight)	80
IR_w (soil ingestion rate) mg/day	100
SA_w (surface area) cm^2/day	3527
AF_w (skin adherence factor) mg/cm^2	0.12
$City_{PEF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	1.52
Q/C_{wp} (inverse of the ratio of the geometric mean air concentration to the emission flu	58.57042229
PEF (particulate emission factor) m^3/kg	2722470739
A (PEF Dispersion Constant)	11.3161
B (PEF Dispersion Constant)	19.6437
C (PEF Dispersion Constant)	224.8172
V (fraction of vegetative cover) unitless	0
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.0495
$City_{VF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	1.52
Q/C_{vol}(inverse of the ratio of the geometric mean air concentration to the emission flu	58.57042229
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	11.3161
B (VF Dispersion Constant)	19.6437
C (VF Dispersion Constant)	224.8172
$City_{VF\ mass\text{-}loading}$ (Climate Zone) Selection	Boise, ID (4)
VF_{ml} (volitization factor - mass-limit) m^3/kg	106719.9951
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	58.57042229
A_s (acres)	1.52
T (exposure interval) yr	26
d_s (depth of source) m	0.3

Site-specific
Composite Worker Equation Inputs for Soil

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
A (VF Dispersion Constant - Mass Limit)	11.3161
B (VF Dispersion Constant - Mass Limit)	19.6437
C (VF Dispersion Constant - Mass Limit)	224.8172

Output generated 27OCT2017:14:09:55

Site-specific
Composite Worker Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RE

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	107000	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	2720000000	-	-	-	-	-	-	-	-	
3.13	0.06	-	2720000000	-	-	-	-	-	-	140	140	1.40E+02 sat
-	-	-	2720000000	-	-	-	-	5840	-	238000000	5840	5.84E+03 nc

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Site-specific
Composite Worker Risk for Soil

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	107000	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
*Total Risk/HI	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	2720000000	26.9	-	-	-	-	-	-	-	-
	3.13	0.06	-	2720000000	1.54	-	-	-	-	-	-	0.011	0.011
	-	-	-	2720000000	4	-	-	-	-	0.000685	-	1.68E-08	0.000685
*Total Risk/HI	-	-	-	-	-	-	-	-	-	*0.000685*	-	*0.011*	*0.0117*

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Site-specific
Construction Worker Equation Inputs for Soil - Unpaved Road Traffic

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
EF_{cw} (exposure frequency - construction worker) day/yr	250
ED_{cw} (exposure duration - construction worker) yr	1
ET_{cw} (exposure time - construction worker) hr/day	8
LT (lifetime) yr	70
BW_{cw} (body weight - construction worker) kg	80
IR_{cw} (soil ingestion rate - construction worker) mg/day	330
SA_{cw} (surface area - construction worker) cm^2/day	3527
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3
AT_{cw} (averaging time - construction worker carcinogenic)	365
AT_{cw-a} (averaging time - construction worker non-carcinogenic)	350
EW_{cw} (overall duration of construction) weeks/year	50
DW_{cw} (days worked - construction worker) days/week	5
A_s (PEF_{sc} - acres)	1.52
s (road surface silt content) %	8.5
M_{dry} (road surface material moisture content under dry, uncontrolled conditions) %	0.2
p (days per year with at least .01" of precipitation) days/year	90
L_R (length of road segment) ft	257.3158728
W_R (width of road segment) ft	60
number of cars	0
number of trucks	68
tons/car	2.6
tons/truck	44.4
F_D Unitless Dispersion Correction Factor	0.185837208
t_c (overall duration of construction) hours	8400
distance (road length) km/day	0.07842976
T_t (overall duration of traffic) s	7200000
total number of vehicles	0
A_R (surface area of contaminated road segment) m^2	1434.324992
W (mean vehicle weight) tons	0
SigmaVKT (sum of fleet vehicle km traveled) km	0
Q/C_{sr} (inverse of the ratio of the 1-h. geometric mean air concentration to the emission	19.18687184
PEF_{sc} (particulate emission factor) m^3/kg	0
A (Dispersion Constant)	12.9351
B (Dispersion Constant)	5.7383
C (Dispersion Constant)	71.7711
A_{surf} (areal extent of site) m^2	6151.2272
A_s ($VF_{ulim-sc}$ acres)	1.52
T (temperature) C	25
foc (fraction organic carbon in soil) g/g	0.006

Site-specific
Construction Worker Equation Inputs for Soil - Unpaved Road Traffic

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
A (VF Dispersion Constant)	2.4538
B (VF Dispersion Constant)	17.566
C (VF Dispersion Constant)	189.0426
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	11.62315393
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
A_s ($VF_{mlim\text{-}sc}$ acres)	1.52
p_b (dry soil bulk density) g/cm^3	1.5
d_s (average source depth) m	0.3
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	11.62315393
$VF_{mlim\text{-}sc}$ (volitization factor) m^3_{air}/kg_{soil}	4203.011616

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Site-specific
Construction Worker Screening Levels (RSL) for Soil - Unpaved Road Traffic

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	4200	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	0	-	-	-	-	-	-	-	-	
3.13	0.06	-	0	-	-	-	-	-	-	-	-	
-	-	-	0	-	-	-	-	1700	-	-	1700	1.70E+03 nc

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Site-specific
Construction Worker Risk for Soil - Unpaved Road Traffic

Chemical	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	4200	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	0	26.9	-	-	-	-	-	-	-	-
	3.13	0.06	-	0	1.54	-	-	-	-	-	-	-	-
	-	-	-	0	4	-	-	-	-	0.00236	-	-	0.00236
	-	-	-	-	-	-	-	-	-	*0.00236*	-	-	*0.00236*

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Site-specific
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
EF_{cw} (exposure frequency - construction worker) day/yr	250
ED_{cw} (exposure duration - construction worker) yr	1
ET_{cw} (exposure time - construction worker) hr/day	8
LT (lifetime) yr	70
BW_{cw} (body weight - construction worker) kg	80
IR_{cw} (soil ingestion rate - construction worker) mg/day	330
SA_{cw} (surface area - construction worker) cm^2/day	3527
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3
AT_{cw} (averaging time - construction worker carcinogenic)	365
AT_{cw-a} (averaging time - construction worker non-carcinogenic)	350
EW_{cw} (overall duration of construction) weeks/year	50
DW_{cw} (days worked - construction worker) days/week	5
A_c (acres)	1.52
A_{till} (areal extent of tilling) acres	1.52
A_{excav} (area of excavation site) m^2	6131.6
$A_{c\text{-}grade}$ (areal extent of grading) acres	1.52
$A_{c\text{-}doz}$ (areal extent of dozing) acres	1.52
$M_{m\text{-}doz}$ (Gravimetric soil moisture content) %	7.9
$M_{m\text{-}excav}$ (Gravimetric soil moisture content) %	12
p_{soil} (density) g/cm^3 - chemical-specific	1.68
$N_{A\text{-}dump}$ (number of times soil is dumped)	2
$N_{A\text{-}till}$ (number of times soil is tilled)	2
s_{till} (soil silt content) %	18
s_{doz} (soil silt content) %	6.9
B_l (dozing blade length) m	3.7
B_l (grading blade length) m	2.5
$N_{A\text{-}doz}$ (number of times site was dozed)	0
$N_{A\text{-}grade}$ (number of times site was graded)	1
S_{doz} (dozing speed) kph	11.4
S_{grade} (dozing speed) kph	11.4
d_{excav} (average depth of excavation site) m	0.3
V (fraction of vegetative cover)	0
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value) m/s	11.32
t_c (overall duration of construction) hours	8400
F_D Unitless Dispersion Correction Factor	0.185837208
T (time over which traffic occurs) s	7200000
$J`_T$ (g/m^2s)	4.17216E-06
F(x) (function dependant on U_m/U_t derived using Cowherd et al. (1985))	0.0495

Site-specific
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value
M_{wind} (dust emitted by wind erosion) g	51288.84717
M_{doz} (dust emitted from dozing operations) g	
M_{till} (dust emitted from tilling operations) g	7665.896938
M_{grade} (dust emitted from grading operations) g	1074.448895
M_{excav} (dust emitted from excavation soil dumping) g	753.6779935
$SigmaVKT_{doz}$ (sum of fleet vehicle km traveled) km	
$SigmaVKT_{grade}$ (sum of fleet vehicle km traveled) km	2.460576
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	11.62315393
$PEF`_{sc}$ (particulate emission factor) m^3/kg	14991006.37
A (PEF Dispersion Constant)	2.4538
B (PEF Dispersion Constant)	17.566
C (PEF Dispersion Constant)	189.0426
A_{surf} (areal extent of site) m^2	6151.2272
A_s ($VF_{ulim-sc}$ acres)	1.52
T (temperature) C	25
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
A (VF Dispersion Constant)	2.4538
B (VF Dispersion Constant)	17.566
C (VF Dispersion Constant)	189.0426
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	11.62315393
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
A_s ($VF_{mlim-sc}$ acres)	1.52
p_b (dry soil bulk density) g/cm^3	1.5
d_s (average source depth) m	0.3
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	11.62315393
$VF_{mlim-sc}$ (volitization factor) m^3_{air}/kg_{soil}	4203.011616
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Site-specific
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	4200	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	15000000	-	-	-	-	-	-	-	-	
3.13	0.06	-	15000000	-	-	-	-	-	-	5.29	5.29	5.29E+00 sat
-	-	-	15000000	-	-	-	-	1700	-	1260000	1690	1.69E+03 nc

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Site-specific
Construction Worker Risk for Soil - Other Construction Activities

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	4200	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	15000000	26.9	-	-	-	-	-	-	-	-
	3.13	0.06	-	15000000	1.54	-	-	-	-	-	-	0.291	0.291
	-	-	-	15000000	4	-	-	-	-	0.00236	-	0.00000318	0.00236
**Total Risk/HI*	-	-	-	-	-	-	-	-	-	*0.00236*	-	*0.291*	*0.293*

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SITE INFORMATION

Facility ID	
Site Name	CDA BNSF R2R ROW
Date	Apr 21, 2017
Name of Preparer	Rachel Gibeault
Address	DU1.2
Latitude	
Longitude	

EXPOSURE POINT CONCENTRATIONS: RESIDENTIAL

Chemical	Direct Contact Soil
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil
	Representative Concentration [mg/kg]
Anthracene	0.0211
Benz(a)anthracene	0.135
Benzo(a)pyrene	0.128
Benzo(b)fluoranthene	0.217
Benzo(k)fluoranthene	0.0687
Chrysene	0.192
Fluoranthene	0.254
Pyrene	0.275

EXPOSURE POINT CONCENTRATIONS: NON-RESIDENTIAL

Chemical	Direct Contact Soil
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil
	Representative Concentration [mg/kg]
Anthracene	0.0211
Benz(a)anthracene	0.135
Benzo(a)pyrene	0.128
Benzo(b)fluoranthene	0.217
Benzo(k)fluoranthene	0.0687
Chrysene	0.192
Fluoranthene	0.254
Pyrene	0.275

EXPOSURE POINT CONCENTRATIONS: CONSTRUCTION WORKER

Chemical	Direct Contact Soil
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil
	Representative Concentration [mg/kg]
Anthracene	0.0211
Benz(a)anthracene	0.135
Benzo(a)pyrene	0.128
Benzo(b)fluoranthene	0.217
Benzo(k)fluoranthene	0.0687
Chrysene	0.192
Fluoranthene	0.254
Pyrene	0.275

EXPOSURE POINT CONCENTRATIONS: GROUNDWATER / SURFACE WATER PROTECTION

Chemical	Groundwater and/or Surface Water Protection		
	Representative Groundwater Concentration at the Source [mg/L]	Representative Soil Concentration at the Source [mg/kg] NOT USED IN CALCULATIONS	Representative Groundwater Concentration at the POC [mg/L]
Anthracene			
Benz(a)anthracene			
Benzo(a)pyrene			
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Chrysene			
Fluoranthene			
Pyrene			
	Paste Values...	Paste Values...	Paste Values...

Direct Contact

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Cowherd Particulate Emission Model					
Parameters					
Site size for calculation of Q/C parameter		acres	~~0.5~~	1.52	Calculated
Inverse of Mean Concentration in the Middle of a Square Source	Q/C			60.9	Calculated
Fraction of Vegetative Cover	V	m^2/m^2	~~0.5~~	0	Calculated
Mean Annual Wind Speed	U_m	m/s	3.98		Default
Equivalent Threshold Value of Windspeed at 7m	U_t	m/s	11.3		Default
Windspeed Distribution Function from Cowherd et. al, 1985	$F_{(x)}$		0.0495		Default
Soil Properties					
Immediately Below the Building					
Soil Bulk Density	ρ_{sA}	cm^3	1.64		Default
Total Porosity	Θ_{TA}	cm^3/cm^3-soil	0.39		Default
Fractional Organic Carbon Content	foc_A	g-C/g-soil	0.001		Default
Volumetric Water Content	Θ_{wsA}	cm^3/cm^3	0.17		Default
Volumetric Air Content	Θ_{asA}	cm^3/cm^3		0.22	Calculated

Groundwater / Surface Water Protection

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Common Water Inputs					
Source Zone Soil Properties					
Dry Soil Bulk Density of the source zone soil	ρ_s	g/cm³	1.64		Default
Fractional Organic Carbon Content in the source zone soil	foc	g-C/g-soil	0.001		Default
Total Soil Porosity of the source zone soil	Θ_T	cm³/cm³-soil	0.39		Default
Volumetric Water Content in the source zone soil	Θ_{ws}	cm³/cm³	0.17		Default
Volumetric Air Content in the source zone soil	Θ_{as}	cm³/cm³		0.22	Calculated
Saturated Zone Soil Properties					
Dry Soil Bulk Density of the saturated zone soil	ρ_{ss}	g/cm³	1.64		Default
Fractional Organic Carbon Content in the saturated zone soil	focs	g-C/g-soil	0.001		Default
Total Soil Porosity in the saturated zone soil	Θ_{ts}	cm³/cm³-soil	0.39		Default
Source Area Parameters					
Groundwater Darcy Velocity	U_{gw}	ft/year	110		Default
Groundwater Mixing Zone Length	L_{mz}	ft	40		Default
Groundwater Mixing Zone Thickness	δ_{gw}	ft	5.02		Default
Groundwater Mixing Zone Width	W_{gw}	ft	40		Default
Infiltration Rate	I	ft/year	0.82		Default

Exposure and Compliance Point Distances from Source

Groundwater / Surface Water Protection

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Groundwater Protection Parameters					
Distance to Point of Exposure (POE)	$X_{poe,gw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
Distance to the Point of Compliance (POC)	$X_{poc,gw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
Surface Water Protection Parameters					
Distance to the Point of Discharge	$X_{poe,sw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
Distance to the Point of Compliance	$X_{poc,sw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
pH of the receiving surface water	pH		7		Default
Temperature of the receiving surface water	T	°C	15		Default
Hardness of the receiving surface water	H	mg/L	25		Default

Vapor Intrusion: Soil and Source

Parameter	Symbol	Unit	Default Value	Value Used	Justification

Interview Questions

Which of the following best describes the building?
The model does not accommodate structures with crawl spaces or dirt floors. Contact DEQ for more information on how to address these types of situations.

Vapor Intrusion: Enclosed Space

Parameter	Symbol	Unit	Default Value	Value Used	Justification

Please complete the Interview Questions on the Vapor Intrusion tab.

Enter site-specific decay rates for this site if they vary from the default values.

	First Order Decay Rate [day^{-1}]		Unsaturated Zone DAF	
	Default Value	Site-Specific Value	Default Value	Site-Specific Value
Anthracene	0		1	
Benz(a)anthracene	0		1	
Benzo(a)pyrene	0		1	
Benzo(b)fluoranthene	0		1	
Benzo(k)fluoranthene	0		1	
Chrysene	0		1	
Fluoranthene	0		1	
Pyrene	0		1	

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Averaging Time					
Averaging Time for Carcinogens	AT_c	year	70		Default
Averaging Time for Non-Carcinogens, Adult	AT_{nc}	year		30	Calculated
Averaging Time for Non-Carcinogens, Age Adjusted Adult	AT_{nc}	year		24	Calculated
Averaging Time for Non-Carcinogens, Child	AT_{nc}	year		6	Calculated
Averaging Time for Non-Carcinogens, Non-residential	AT_{nc}	year		25	Calculated
Averaging Time for Non-Carcinogens, Construction Worker	AT_{nc}	year		1	Calculated
Body Weight					
Body Weight Resident Adult	BW_a	kg	70		Default
Body Weight Resident Child	BW_c	kg	15		Default
Body Weight Non-residential	BW_{com}	kg	70		Default
Body Weight Construction Worker	BW_{con}	kg	70		Default
Exposure Duration					
Exposure Duration Resident Adult	ED_a	year	30		Default
Exposure Duration Resident Age Adjusted Adult	ED_{aa}	year	24		Default
Exposure Duration Resident Child	ED_c	year	6		Default
Exposure Duration Non-residential	ED_{com}	year	25		Default
Exposure Duration Construction Worker	ED_{con}	year	1		Default
Exposure Frequency for Indirect Pathways					
Exposure Frequency for Indirect Pathway Resident Child	EF_c	day/year	350		Default
Exposure Frequency for Indirect Pathway Resident Adult	EF_a	day/year	350		Default
Exposure Frequency for Indirect Pathway Non-residential	EF_{com}	day/year	250		Default
Exposure Frequency for Indirect Pathway Construction Worker	EF_{con}	day/year	30		Default

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Exposure Frequency for Direct Contact Pathways					
Exposure Frequency for Direct Contact Pathways Resident Adult	EF_{da}	day/year	270		Default
Exposure Frequency for Direct Contact Pathways Non-residential	EF_{dcom}	day/year	180		Default
Exposure Frequency for Direct Contact Pathways Construction Worker	EF_{dcon}	day/year	30		Default
Exposure Frequency for Direct Contact Pathways Resident Child	EF_{dc}	day/year	270		Default
Indoor Exposure Time					
Indoor Exposure Time Resident Adult	ET_{i-a}	hrs/day	24		Default
Indoor Exposure Time Resident Child	ET_{i-c}	hrs/day	24		Default
Indoor Exposure Time Non-residential	ET_{i-com}	hrs/day	8		Default
Outdoor Exposure Time					
Outdoor Exposure Time Resident Adult	ET_{o-a}	hrs/day	2		Default
Outdoor Exposure Time Resident Child	ET_{o-c}	hrs/day	2		Default
Outdoor Exposure Time Non-residential	ET_{o-com}	hrs/day	6		Default
Outdoor Exposure Time Construction Worker	ET_{o-con}	hrs/day	10		Default
Soil Ingestion Rate					
Soil Ingestion Rate Age-adjusted	IR_{s-aa}	mg/day		114	Calculated
Soil Ingestion Rate Age-Adjusted Mutagenic Chemicals	IR_{s-aam}	mg-yr/kg-day		490	Calculated
Soil Ingestion Rate Resident Adult	IR_{s-a}	mg/day	100		Default
Soil Ingestion Ingestion Rate Resident Child	IR_{s-c}	mg/day	200		Default
Soil Ingestion Rate Non-residential	IR_{s-com}	mg/day	100		Default
Soil Ingestion Rate Construction Worker	IR_{s-con}	mg/day	330		Default

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Groundwater Ingestion Rate					
Groundwater Ingestion RateAge-adjusted	IR_{w-aa}	L-yr/kg-day		1.09	Calculated
Groundwater Ingestion Rate Age-Adjusted Mutagenic Chemicals	IR_{w-aam}	L-yr/kg-day		3.39	Calculated
Groundwater Ingestion Rate Resident Adult	IR_{w-a}	L/day	2		Default
Groundwater Ingestion Rate Resident Child	IR_{w-c}	L/day	1		Default
Groundwater Ingestion Rate Non-residential	IR_{w-com}	L/day	1		Default
Skin Surface Area					
Skin Surface Area Age-adjusted	SA_{aa}	mg-yr/kg-day		361	Calculated
Skin Surface AreaAge-Adjusted Mutagenic Dermal	SA_{aam}	mg-yr/kg-day		1,450	Calculated
Skin Surface Area Resident Adult	SA_a	cm^2/day	5,700		Default
Skin Surface Area Resident Child	SA_c	cm^2/day	2,800		Default
Skin Surface Area Non-residential	SA_{com}	cm^2/day	3,300		Default
Skin Surface Area Construction Worker	SA_{con}	cm^2/day	3,300		Default
Soil to Skin Adherence Factor					
Soil to Skin Adherence Resident Adult	M_a	mg/cm^2	0.07		Default
Soil to Skin Adherence Resident Child	M_c	mg/cm^2	0.2		Default
Soil to Skin Adherence Non-residential	M_{com}	mg/cm^2	0.2		Default
Soil to Skin Adherence Construction Worker	M_{con}	mg/cm^2	0.3		Default
Averaging Time for Vapor Flux					
Averaging Time for Vapor Flux Resident Adult	τ	s		946,000,000	Calculated
Averaging Time for Vapor Flux Age-adjusted Resident	τ	s		757,000,000	Calculated
Averaging Time for Vapor Flux Resident Child	τ	s		189,000,000	Calculated
Averaging Time for Vapor Flux Commercial Worker	τ	s		788,000,000	Calculated
Averaging Time for Vapor Flux Construction Worker	τ	s		31,500,000	Calculated
Target Hazard Index	THI		1		Default

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Target Risk	TR		0.00001		Default

RISK/HAZARD QUOTIENT: RESIDENTIAL

RISK EVALUATION RESULTS

Red highlight indicates highest risk and hazard

	Direct Contact Soil			Total Risk Estimate & Hazard Index by Chemical	
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil				
	EPC	Risk	HI	Risk	HI
Anthracene	2.11E-02	*NTOX*	9.46E-07	*NA*	9.46E-07
Benz(a)anthracene	1.35E-01	7.06E-07	*NTOX*	7.06E-07	*NA*
Benzo(a)pyrene	1.28E-01	6.69E-06	*NTOX*	6.69E-06	*NA*
Benzo(b)fluoranthene	2.17E-01	1.13E-06	*NTOX*	1.13E-06	*NA*
Benzo(k)fluoranthene	6.87E-02	3.60E-08	*NTOX*	3.60E-08	*NA*
Chrysene	1.92E-01	1.01E-08	*NTOX*	1.01E-08	*NA*
Fluoranthene	2.54E-01	*NTOX*	8.54E-05	*NA*	8.54E-05
Pyrene	2.75E-01	*NTOX*	1.23E-04	*NA*	1.23E-04
Totals by Pathway		8.58E-06	2.10E-04	**8.58E-06**	**2.10E-04**

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

RISK/HAZARD QUOTIENT: NON-RESIDENTIAL

RISK EVALUATION RESULTS

Red highlight indicates highest risk and hazard

	Direct Contact Soil			Total Risk Estimate & Hazard Index by Chemical	
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil				
	EPC	Risk	HI	Risk	HI
Anthracene	2.11E-02	*NTOX*	9.21E-08	*NA*	9.21E-08
Benz(a)anthracene	1.35E-01	4.65E-08	*NTOX*	4.65E-08	*NA*
Benzo(a)pyrene	1.28E-01	4.38E-07	*NTOX*	4.38E-07	*NA*
Benzo(b)fluoranthene	2.17E-01	7.42E-08	*NTOX*	7.42E-08	*NA*
Benzo(k)fluoranthene	6.87E-02	2.39E-09	*NTOX*	2.39E-09	*NA*
Chrysene	1.92E-01	6.90E-10	*NTOX*	6.90E-10	*NA*
Fluoranthene	2.54E-01	*NTOX*	8.31E-06	*NA*	8.31E-06
Pyrene	2.75E-01	*NTOX*	1.20E-05	*NA*	1.20E-05
Totals by Pathway		5.61E-07	2.04E-05	**5.61E-07**	**2.04E-05**

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

RISK/HAZARD QUOTIENT: CONSTRUCTION WORKER

Red highlight indicates highest risk and hazard

	Direct Contact Soil			Total Risk Estimate & Hazard Index by Chemical	
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil				
	EPC	Risk	HI	Risk	HI
Anthracene	2.11E-02	*NTOX*	3.79E-08	*NA*	3.79E-08
Benz(a)anthracene	1.35E-01	7.83E-10	*NTOX*	7.83E-10	*NA*
Benzo(a)pyrene	1.28E-01	7.23E-09	*NTOX*	7.23E-09	*NA*
Benzo(b)fluoranthene	2.17E-01	1.23E-09	*NTOX*	1.23E-09	*NA*
Benzo(k)fluoranthene	6.87E-02	4.11E-11	*NTOX*	4.11E-11	*NA*
Chrysene	1.92E-01	1.27E-11	*NTOX*	1.27E-11	*NA*
Fluoranthene	2.54E-01	*NTOX*	3.42E-06	*NA*	3.42E-06
Pyrene	2.75E-01	*NTOX*	4.94E-06	*NA*	4.94E-06
Totals by Pathway		9.30E-09	8.40E-06	**9.30E-09**	**8.40E-06**

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

RISK/HAZARD QUOTIENT: SUMMARY

RISK EVALUATION RESULTS

Red highlight indicates target Risk or Hazard Index exceeded for receptor.

Routes of Exposure	Receptor					
	Residential		Non-Residential		Construction Worker	
	Risk	HI	Risk	HI	Risk	HI
Direct Contact Soil Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil	8.58E-06	2.10E-04	5.61E-07	2.04E-05	9.30E-09	8.40E-06
Subsurface Soil Indoor Inhalation of Vapor Emissions	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Groundwater Indoor Inhalation of Vapor Emissions	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Soil-Vapor Indoor Inhalation of Vapor Emissions	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Site Risk	8.58E-06		5.61E-07		9.30E-09	
Site Hazard Index		2.10E-04		2.04E-05		8.40E-06
Target Risk/HI Exceeded?	NO	NO	NO	NO	NO	NO

Exposure Area DU1.3

Site-specific
Resident Equation Inputs for Soil

Variable	Value
THQ (target hazard quotient) unitless	1
TR (target risk) unitless	0.00001
LT (lifetime) years	70
ET_{res} (exposure time) hours/day	24
$ET_{res\text{-}c}$ (child exposure time) hours/day	24
$ET_{res\text{-}a}$ (adult exposure time) hours/day	24
$ET_{0\text{-}2}$ (mutagenic exposure time) hours/day	24
$ET_{2\text{-}6}$ (mutagenic exposure time) hours/day	24
$ET_{6\text{-}16}$ (mutagenic exposure time) hours/day	24
$ET_{16\text{-}26}$ (mutagenic exposure time) hours/day	24
ED_{res} (exposure duration) years	26
$ED_{res\text{-}c}$ (exposure duration - child) years	6
$ED_{res\text{-}a}$ (exposure duration - adult) years	20
$ED_{0\text{-}2}$ (mutagenic exposure duration) years	2
$ED_{2\text{-}6}$ (mutagenic exposure duration) years	4
$ED_{6\text{-}16}$ (mutagenic exposure duration) years	10
$ED_{16\text{-}26}$ (mutagenic exposure duration) years	10
$BW_{res\text{-}c}$ (body weight - child) kg	15
$BW_{res\text{-}a}$ (body weight - adult) kg	80
$BW_{0\text{-}2}$ (mutagenic body weight) kg	15
$BW_{2\text{-}6}$ (mutagenic body weight) kg	15
$BW_{6\text{-}16}$ (mutagenic body weight) kg	80
$BW_{16\text{-}26}$ (mutagenic body weight) kg	80
$SA_{res\text{-}c}$ (skin surface area - child) cm^2/day	2373
$SA_{res\text{-}a}$ (skin surface area - adult) cm^2/day	6032
$SA_{0\text{-}2}$ (mutagenic skin surface area) cm^2/day	2373
$SA_{2\text{-}6}$ (mutagenic skin surface area) cm^2/day	2373
$SA_{6\text{-}16}$ (mutagenic skin surface area) cm^2/day	6032
$SA_{16\text{-}26}$ (mutagenic skin surface area) cm^2/day	6032
EF_{res} (exposure frequency) days/year	350
$EF_{res\text{-}c}$ (exposure frequency - child) days/year	350
$EF_{res\text{-}a}$ (exposure frequency - adult) days/year	350
$EF_{0\text{-}2}$ (mutagenic exposure frequency) days/year	350
$EF_{2\text{-}6}$ (mutagenic exposure frequency) days/year	350
$EF_{6\text{-}16}$ (mutagenic exposure frequency) days/year	350
$EF_{16\text{-}26}$ (mutagenic exposure frequency) days/year	350
$IFS_{res\text{-}adj}$ (age-adjusted soil ingestion factor) mg/kg	36750
$IFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	166833.33
$IRS_{res\text{-}c}$ (soil intake rate - child) mg/day	200
$IRS_{res\text{-}a}$ (soil intake rate - adult) mg/day	100
$IRS_{0\text{-}2}$ (mutagenic soil intake rate) mg/day	200

Site-specific
Resident Equation Inputs for Soil

Variable	Value
IRS_{2-6} (mutagenic soil intake rate) mg/day	200
IRS_{6-16} (mutagenic soil intake rate) mg/day	100
IRS_{16-26} (mutagenic soil intake rate) mg/day	100
AF_{res-a} (skin adherence factor - adult) mg/cm^2	0.07
AF_{res-c} (skin adherence factor - child) mg/cm^2	0.2
AF_{0-2} (mutagenic skin adherence factor) mg/cm^2	0.2
AF_{2-6} (mutagenic skin adherence factor) mg/cm^2	0.2
AF_{6-16} (mutagenic skin adherence factor) mg/cm^2	0.07
AF_{16-26} (mutagenic skin adherence factor) mg/cm^2	0.07
$DFS_{res-adj}$ (age-adjusted soil dermal factor) mg/kg	103390
$DFSM_{res-adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	428260
$City_{PEF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	1.93
Q/C_{wp} (inverse of the ratio of the geometric mean air concentration to the emission flu	56.24068479
PEF (particulate emission factor) m^3/kg	3901760993
A (PEF Dispersion Constant)	11.3161
B (PEF Dispersion Constant)	19.6437
C (PEF Dispersion Constant)	224.8172
V (fraction of vegetative cover) unitless	0.33
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.0495
$City_{VF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	1.93
Q/C_{vol}(inverse of the ratio of the geometric mean air concentration to the emission flu	56.24068479
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	11.3161
B (VF Dispersion Constant)	19.6437
C (VF Dispersion Constant)	224.8172
$City_{VF\ mass\text{-}loading}$ (Climate Zone) Selection	Boise, ID (4)
VF_{ml} (volitization factor - mass-limit) m^3/kg	102475.0269
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	56.24068479
A_s (acres)	1.93
T (exposure interval) yr	26
d_s (depth of source) m	0.3

Site-specific
Resident Equation Inputs for Soil

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
A (VF Dispersion Constant - Mass Limit)	11.3161
B (VF Dispersion Constant - Mass Limit)	19.6437
C (VF Dispersion Constant - Mass Limit)	224.8172

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Site-specific
Resident Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1

	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)	S (mg/L)	K_{oc} (cm3/g)	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)
Chromium, Total	-	1	-	-	-	-	-	3900000000	-	-	-	-
Mercury (elemental)	-	1	102000	0.352	0.06	-	3.13	3900000000	-	-	-	-
Selenium	-	1	-	-	-	-	-	3900000000	-	-	-	-

	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)	Ingestion SL Adult THQ=1 (mg/kg)	Dermal SL Adult THQ=1 (mg/kg)	Inhalation SL Adult THQ=1 (mg/kg)	Noncarcinogenic SL Adult THI=1 (mg/kg)	Screening Level (mg/kg)
Chromium, Total	-	-	-	-	-	-	-	-	
Mercury (elemental)	-	-	32.1	32.1	-	-	32.1	32.1	3.21E+01 sat
Selenium	391	-	81400000	391	4170	-	81400000	4170	3.91E+02 nc

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Site-specific
Resident Risk for Soil

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)	S (mg/L)	K_{oc} (cm3/g)
Chromium, Total	-		-		-		-		0.013	-	1	-	-	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	102000	0.352	0.06	-
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-	-	-
*Total Risk/HI	-		-		-		-		-	-	-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion Child HQ	Dermal Child HQ	Inhalation Child HQ	Noncarcinogenic Child HI	Ingestion Adult HQ	Dermal Adult HQ	Inhalation Adult HQ	Noncarcinogenic Adult HI
	-	3900000000	21.4	-	-	-	-	-	-	-	-	-	-	-	-
	3.13	3900000000	0.058	-	-	-	-	-	-	0.00181	0.00181	-	-	0.00181	0.00181
	-	3900000000	4	-	-	-	-	0.0102	-	4.92E-08	0.0102	0.000959	-	4.92E-08	0.000959
*Total Risk/HI	-	-	-	-	-	-	-	0.0102	-	0.00181	0.012	0.000959	-	0.00181	0.00277

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Site-specific
Composite Worker Equation Inputs for Soil

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
AT_w (averaging time)	365
EF_w (exposure frequency) d/yr	250
ED_w (exposure duration) yr	25
ET_w (exposure time) hr	8
LT (lifetime) yr	70
BW_w (body weight)	80
IR_w (soil ingestion rate) mg/day	100
SA_w (surface area) cm^2/day	3527
AF_w (skin adherence factor) mg/cm^2	0.12
$City_{PEF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	1.93
Q/C_{wp} (inverse of the ratio of the geometric mean air concentration to the emission flu	56.24068479
PEF (particulate emission factor) m^3/kg	3901760993
A (PEF Dispersion Constant)	11.3161
B (PEF Dispersion Constant)	19.6437
C (PEF Dispersion Constant)	224.8172
V (fraction of vegetative cover) unitless	0.33
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.0495
$City_{VF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	1.93
Q/C_{vol}(inverse of the ratio of the geometric mean air concentration to the emission flu	56.24068479
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	11.3161
B (VF Dispersion Constant)	19.6437
C (VF Dispersion Constant)	224.8172
$City_{VF\ mass\text{-}loading}$ (Climate Zone) Selection	Boise, ID (4)
VF_{ml} (volitization factor - mass-limit) m^3/kg	102475.0269
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	56.24068479
A_s (acres)	1.93
T (exposure interval) yr	26
d_s (depth of source) m	0.3

Site-specific
Composite Worker Equation Inputs for Soil

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
A (VF Dispersion Constant - Mass Limit)	11.3161
B (VF Dispersion Constant - Mass Limit)	19.6437
C (VF Dispersion Constant - Mass Limit)	224.8172

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Site-specific
Composite Worker Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	102000	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	3900000000	-	-	-	-	-	-	-	-	
3.13	0.06	-	3900000000	-	-	-	-	-	-	135	135	1.35E+02 sat
-	-	-	3900000000	-	-	-	-	5840	-	342000000	5840	5.84E+03 nc

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Site-specific
Composite Worker Risk for Soil

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	102000	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	3900000000	21.4	-	-	-	-	-	-	-	-
	3.13	0.06	-	3900000000	0.058	-	-	-	-	-	-	0.000431	0.000431
	-	-	-	3900000000	4	-	-	-	-	0.000685	-	1.17E-08	0.000685
**Total Risk/HI*	-	-	-	-	-	-	-	-	-	*0.000685*	-	*0.000431*	*0.00112*

Output generated 27OCT2017:16:36:13

Site-specific
Construction Worker Equation Inputs for Soil - Unpaved Road Traffic

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
EF_{cw} (exposure frequency - construction worker) day/yr	250
ED_{cw} (exposure duration - construction worker) yr	1
ET_{cw} (exposure time - construction worker) hr/day	8
LT (lifetime) yr	70
BW_{cw} (body weight - construction worker) kg	80
IR_{cw} (soil ingestion rate - construction worker) mg/day	330
SA_{cw} (surface area - construction worker) cm^2/day	3527
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3
AT_{cw} (averaging time - construction worker carcinogenic)	365
AT_{cw-a} (averaging time - construction worker non-carcinogenic)	350
EW_{cw} (overall duration of construction) weeks/year	50
DW_{cw} (days worked - construction worker) days/week	5
A_s (PEF_{sc} - acres)	1.93
s (road surface silt content) %	8.5
M_{dry} (road surface material moisture content under dry, uncontrolled conditions) %	0.2
p (days per year with at least .01" of precipitation) days/year	0.3
L_R (length of road segment) ft	289.9502166
W_R (width of road segment) ft	60
number of cars	0
number of trucks	86
tons/car	2.6
tons/truck	44.4
F_D Unitless Dispersion Correction Factor	0.185837208
t_c (overall duration of construction) hours	8400
distance (road length) km/day	0.088376693
T_t (overall duration of traffic) s	7200000
total number of vehicles	0
A_R (surface area of contaminated road segment) m^2	1616.234698
W (mean vehicle weight) tons	0
SigmaVKT (sum of fleet vehicle km traveled) km	0
Q/C_{sr} (inverse of the ratio of the 1-h. geometric mean air concentration to the emission	18.5342489
PEF_{sc} (particulate emission factor) m^3/kg	0
A (Dispersion Constant)	12.9351
B (Dispersion Constant)	5.7383
C (Dispersion Constant)	71.7711
A_{surf} (areal extent of site) m^2	7810.4398
A_s ($VF_{ulim-sc}$ acres)	1.93
T (temperature) C	25
foc (fraction organic carbon in soil) g/g	0.006

Site-specific
Construction Worker Equation Inputs for Soil - Unpaved Road Traffic

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
A (VF Dispersion Constant)	2.4538
B (VF Dispersion Constant)	17.566
C (VF Dispersion Constant)	189.0426
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	11.13371505
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
A_s ($VF_{mlim\text{-}sc}$ acres)	1.93
p_b (dry soil bulk density) g/cm^3	1.5
d_s (average source depth) m	0.3
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	11.13371505
$VF_{mlim\text{-}sc}$ (volitization factor) m^3_{air}/kg_{soil}	4026.027186

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Site-specific
Construction Worker Screening Levels (RSL) for Soil - Unpaved Road Traffic

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	4030	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	0	-	-	-	-	-	-	-	-	
3.13	0.06	-	0	-	-	-	-	-	-	-	-	
-	-	-	0	-	-	-	-	1700	-	-	1700	1.70E+03 nc

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Site-specific
Construction Worker Risk for Soil - Unpaved Road Traffic

Chemical	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	4030	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	0	21.4	-	-	-	-	-	-	-	-
	3.13	0.06	-	0	0.058	-	-	-	-	-	-	-	-
	-	-	-	0	4	-	-	-	-	0.00236	-	-	0.00236
**Total Risk/HI*	-	-	-	-	-	-	-	-	-	*0.00236*	-	-	*0.00236*

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Site-specific
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
EF_{cw} (exposure frequency - construction worker) day/yr	250
ED_{cw} (exposure duration - construction worker) yr	1
ET_{cw} (exposure time - construction worker) hr/day	8
LT (lifetime) yr	70
BW_{cw} (body weight - construction worker) kg	80
IR_{cw} (soil ingestion rate - construction worker) mg/day	330
SA_{cw} (surface area - construction worker) cm^2/day	3527
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3
AT_{cw} (averaging time - construction worker carcinogenic)	365
AT_{cw-a} (averaging time - construction worker non-carcinogenic)	350
EW_{cw} (overall duration of construction) weeks/year	50
DW_{cw} (days worked - construction worker) days/week	5
A_c (acres)	1.93
A_{till} (areal extent of tilling) acres	1.93
A_{excav} (area of excavation site) m^2	7803.85
$A_{c\text{-}grade}$ (areal extent of grading) acres	1.93
$A_{c\text{-}doz}$ (areal extent of dozing) acres	1.93
$M_{m\text{-}doz}$ (Gravimetric soil moisture content) %	7.9
$M_{m\text{-}excav}$ (Gravimetric soil moisture content) %	12
p_{soil} (density) g/cm^3 - chemical-specific	1.68
$N_{A\text{-}dump}$ (number of times soil is dumped)	2
$N_{A\text{-}till}$ (number of times soil is tilled)	2
s_{till} (soil silt content) %	18
s_{doz} (soil silt content) %	6.9
B_l (dozing blade length) m	3.7
B_l (grading blade length) m	2.5
$N_{A\text{-}doz}$ (number of times site was dozed)	0
$N_{A\text{-}grade}$ (number of times site was graded)	1
S_{doz} (dozing speed) kph	11.4
S_{grade} (dozing speed) kph	11.4
d_{excav} (average depth of excavation site) m	0.3
V (fraction of vegetative cover)	0.33
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value) m/s	11.32
t_c (overall duration of construction) hours	8400
F_D Unitless Dispersion Correction Factor	0.185837208
T (time over which traffic occurs) s	7200000
$J`_T$ (g/m^2s)	4.34809E-06
F(x) (function dependant on U_m/U_t derived using Cowherd et al. (1985))	0.0495

Site-specific
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value
M_{wind} (dust emitted by wind erosion) g	51288.84717
M_{doz} (dust emitted from dozing operations) g	
M_{till} (dust emitted from tilling operations) g	9733.67177
M_{grade} (dust emitted from grading operations) g	1364.267347
M_{excav} (dust emitted from excavation soil dumping) g	959.2259785
$SigmaVKT_{doz}$ (sum of fleet vehicle km traveled) km	
$SigmaVKT_{grade}$ (sum of fleet vehicle km traveled) km	3.124284
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	11.13371505
$PEF`_{sc}$ (particulate emission factor) m^3/kg	13778718.6
A (PEF Dispersion Constant)	2.4538
B (PEF Dispersion Constant)	17.566
C (PEF Dispersion Constant)	189.0426
A_{surf} (areal extent of site) m^2	7810.4398
A_s ($VF_{ulim-sc}$ acres)	1.93
T (temperature) C	25
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
A (VF Dispersion Constant)	2.4538
B (VF Dispersion Constant)	17.566
C (VF Dispersion Constant)	189.0426
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	11.13371505
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
A_s ($VF_{mlim-sc}$ acres)	1.93
p_b (dry soil bulk density) g/cm^3	1.5
d_s (average source depth) m	0.3
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	11.13371505
$VF_{mlim-sc}$ (volitization factor) m^3_{air}/kg_{soil}	4026.027186
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Site-specific
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	4030	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	13800000	-	-	-	-	-	-	-	-	
3.13	0.06	-	13800000	-	-	-	-	-	-	5.07	5.07	5.07E+00 sat
-	-	-	13800000	-	-	-	-	1700	-	1160000	1690	1.69E+03 nc

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Site-specific
Construction Worker Risk for Soil - Other Construction Activities

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	4030	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	13800000	21.4	-	-	-	-	-	-	-	-
	3.13	0.06	-	13800000	0.058	-	-	-	-	-	-	0.0114	0.0114
	-	-	-	13800000	4	-	-	-	-	0.00236	-	0.00000346	0.00236
**Total Risk/HI*	-	-	-	-	-	-	-	-	-	*0.00236*	-	*0.0114*	*0.0138*

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SITE INFORMATION

Facility ID	
Site Name	CDA BNSF R2R ROW
Date	May 16, 2017
Name of Preparer	Rachel Gibeault
Address	DU1.3
Latitude	
Longitude	

EXPOSURE POINT CONCENTRATIONS: RESIDENTIAL

Chemical	Direct Contact Soil
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil
	Representative Concentration [mg/kg]
Anthracene	0.361
Benz(a)anthracene	0.456
Benzo(a)pyrene	0.44
Benzo(b)fluoranthene	1
Benzo(k)fluoranthene	0.317
Chrysene	0.839
Fluoranthene	1.08
Pyrene	1.06

EXPOSURE POINT CONCENTRATIONS: NON-RESIDENTIAL

Chemical	Direct Contact Soil
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil
	Representative Concentration [mg/kg]
Anthracene	0.361
Benz(a)anthracene	0.456
Benzo(a)pyrene	0.44
Benzo(b)fluoranthene	1
Benzo(k)fluoranthene	0.317
Chrysene	0.839
Fluoranthene	1.08
Pyrene	1.06

EXPOSURE POINT CONCENTRATIONS: CONSTRUCTION WORKER

Chemical	Direct Contact Soil
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil
	Representative Concentration [mg/kg]
Anthracene	0.361
Benz(a)anthracene	0.456
Benzo(a)pyrene	0.44
Benzo(b)fluoranthene	1
Benzo(k)fluoranthene	0.317
Chrysene	0.839
Fluoranthene	1.08
Pyrene	1.06

EXPOSURE POINT CONCENTRATIONS: GROUNDWATER / SURFACE WATER PROTECTION

Chemical	Groundwater and/or Surface Water Protection		
	Representative Groundwater Concentration at the Source [mg/L]	Representative Soil Concentration at the Source [mg/kg] NOT USED IN CALCULATIONS	Representative Groundwater Concentration at the POC [mg/L]
Anthracene			
Benz(a)anthracene			
Benzo(a)pyrene			
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Chrysene			
Fluoranthene			
Pyrene			
	Paste Values...	Paste Values...	Paste Values...

Direct Contact

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Cowherd Particulate Emission Model					
Parameters					
Site size for calculation of Q/C parameter		acres	~~0.5~~	1.52	Calculated
Inverse of Mean Concentration in the Middle of a Square Source	Q/C			60.9	Calculated
Fraction of Vegetative Cover	V	m^2/m^2	~~0.5~~	0.33	Calculated
Mean Annual Wind Speed	U_m	m/s	3.98		Default
Equivalent Threshold Value of Windspeed at 7m	U_t	m/s	11.3		Default
Windspeed Distribution Function from Cowherd et. al, 1985	$F_{(x)}$		0.0495		Default
Soil Properties					
Immediately Below the Building					
Soil Bulk Density	ρ_{sA}	cm^3	1.64		Default
Total Porosity	Θ_{TA}	cm^3/cm^3-soil	0.39		Default
Fractional Organic Carbon Content	foc_A	g-C/g-soil	0.001		Default
Volumetric Water Content	Θ_{wsA}	cm^3/cm^3	0.17		Default
Volumetric Air Content	Θ_{asA}	cm^3/cm^3		0.22	Calculated

Groundwater / Surface Water Protection

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Common Water Inputs					
Source Zone Soil Properties					
Dry Soil Bulk Density of the source zone soil	ρ_s	g/cm³	1.64		Default
Fractional Organic Carbon Content in the source zone soil	foc	g-C/g-soil	0.001		Default
Total Soil Porosity of the source zone soil	Θ_T	cm³/cm³-soil	0.39		Default
Volumetric Water Content in the source zone soil	Θ_{ws}	cm³/cm³	0.17		Default
Volumetric Air Content in the source zone soil	Θ_{as}	cm³/cm³		0.22	Calculated
Saturated Zone Soil Properties					
Dry Soil Bulk Density of the saturated zone soil	ρ_{ss}	g/cm³	1.64		Default
Fractional Organic Carbon Content in the saturated zone soil	focs	g-C/g-soil	0.001		Default
Total Soil Porosity in the saturated zone soil	Θ_{ts}	cm³/cm³-soil	0.39		Default
Source Area Parameters					
Groundwater Darcy Velocity	U_{gw}	ft/year	110		Default
Groundwater Mixing Zone Length	L_{mz}	ft	40		Default
Groundwater Mixing Zone Thickness	δ_{gw}	ft	5.02		Default
Groundwater Mixing Zone Width	W_{gw}	ft	40		Default
Infiltration Rate	I	ft/year	0.82		Default

Exposure and Compliance Point Distances from Source

Groundwater / Surface Water Protection

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Groundwater Protection Parameters					
Distance to Point of Exposure (POE)	$X_{poe,gw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
Distance to the Point of Compliance (POC)	$X_{poc,gw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
Surface Water Protection Parameters					
Distance to the Point of Discharge	$X_{poe,sw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
Distance to the Point of Compliance	$X_{poc,sw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
pH of the receiving surface water	pH		7		Default
Temperature of the receiving surface water	T	°C	15		Default
Hardness of the receiving surface water	H	mg/L	25		Default

Vapor Intrusion: Soil and Source

Parameter	Symbol	Unit	Default Value	Value Used	Justification

Interview Questions

Which of the following best describes the building?
The model does not accommodate structures with crawl spaces or dirt floors. Contact DEQ for more information on how to address these types of situations.

Vapor Intrusion: Enclosed Space

Parameter	Symbol	Unit	Default Value	Value Used	Justification

Please complete the Interview Questions on the Vapor Intrusion tab.

Enter site-specific decay rates for this site if they vary from the default values.

	First Order Decay Rate [day^{-1}]		Unsaturated Zone DAF	
	Default Value	Site-Specific Value	Default Value	Site-Specific Value
Anthracene	0		1	
Benz(a)anthracene	0		1	
Benzo(a)pyrene	0		1	
Benzo(b)fluoranthene	0		1	
Benzo(k)fluoranthene	0		1	
Chrysene	0		1	
Fluoranthene	0		1	
Pyrene	0		1	

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Averaging Time					
Averaging Time for Carcinogens	AT_c	year	70		Default
Averaging Time for Non-Carcinogens, Adult	AT_{nc}	year		30	Calculated
Averaging Time for Non-Carcinogens, Age Adjusted Adult	AT_{nc}	year		24	Calculated
Averaging Time for Non-Carcinogens, Child	AT_{nc}	year		6	Calculated
Averaging Time for Non-Carcinogens, Non-residential	AT_{nc}	year		25	Calculated
Averaging Time for Non-Carcinogens, Construction Worker	AT_{nc}	year		1	Calculated
Body Weight					
Body Weight Resident Adult	BW_a	kg	70		Default
Body Weight Resident Child	BW_c	kg	15		Default
Body Weight Non-residential	BW_{com}	kg	70		Default
Body Weight Construction Worker	BW_{con}	kg	70		Default
Exposure Duration					
Exposure Duration Resident Adult	ED_a	year	30		Default
Exposure Duration Resident Age Adjusted Adult	ED_{aa}	year	24		Default
Exposure Duration Resident Child	ED_c	year	6		Default
Exposure Duration Non-residential	ED_{com}	year	25		Default
Exposure Duration Construction Worker	ED_{con}	year	1		Default
Exposure Frequency for Indirect Pathways					
Exposure Frequency for Indirect Pathway Resident Child	EF_c	day/year	350		Default
Exposure Frequency for Indirect Pathway Resident Adult	EF_a	day/year	350		Default
Exposure Frequency for Indirect Pathway Non-residential	EF_{com}	day/year	250		Default
Exposure Frequency for Indirect Pathway Construction Worker	EF_{con}	day/year	30		Default

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Exposure Frequency for Direct Contact Pathways					
Exposure Frequency for Direct Contact Pathways Resident Adult	EF_{da}	day/year	270		Default
Exposure Frequency for Direct Contact Pathways Non-residential	EF_{dcom}	day/year	180		Default
Exposure Frequency for Direct Contact Pathways Construction Worker	EF_{dcon}	day/year	30		Default
Exposure Frequency for Direct Contact Pathways Resident Child	EF_{dc}	day/year	270		Default
Indoor Exposure Time					
Indoor Exposure Time Resident Adult	ET_{i-a}	hrs/day	24		Default
Indoor Exposure Time Resident Child	ET_{i-c}	hrs/day	24		Default
Indoor Exposure Time Non-residential	ET_{i-com}	hrs/day	8		Default
Outdoor Exposure Time					
Outdoor Exposure Time Resident Adult	ET_{o-a}	hrs/day	2		Default
Outdoor Exposure Time Resident Child	ET_{o-c}	hrs/day	2		Default
Outdoor Exposure Time Non-residential	ET_{o-com}	hrs/day	6		Default
Outdoor Exposure Time Construction Worker	ET_{o-con}	hrs/day	10		Default
Soil Ingestion Rate					
Soil Ingestion Rate Age-adjusted	IR_{s-aa}	mg/day		114	Calculated
Soil Ingestion Rate Age-Adjusted Mutagenic Chemicals	IR_{s-aam}	mg-yr/kg-day		490	Calculated
Soil Ingestion Rate Resident Adult	IR_{s-a}	mg/day	100		Default
Soil Ingestion Ingestion Rate Resident Child	IR_{s-c}	mg/day	200		Default
Soil Ingestion Rate Non-residential	IR_{s-com}	mg/day	100		Default
Soil Ingestion Rate Construction Worker	IR_{s-con}	mg/day	330		Default

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Groundwater Ingestion Rate					
Groundwater Ingestion RateAge-adjusted	IR_{w-aa}	L-yr/kg-day		1.09	Calculated
Groundwater Ingestion Rate Age-Adjusted Mutagenic Chemicals	IR_{w-aam}	L-yr/kg-day		3.39	Calculated
Groundwater Ingestion Rate Resident Adult	IR_{w-a}	L/day	2		Default
Groundwater Ingestion Rate Resident Child	IR_{w-c}	L/day	1		Default
Groundwater Ingestion Rate Non-residential	IR_{w-com}	L/day	1		Default
Skin Surface Area					
Skin Surface Area Age-adjusted	SA_{aa}	mg-yr/kg-day		361	Calculated
Skin Surface AreaAge-Adjusted Mutagenic Dermal	SA_{aam}	mg-yr/kg-day		1,450	Calculated
Skin Surface Area Resident Adult	SA_a	cm^2/day	5,700		Default
Skin Surface Area Resident Child	SA_c	cm^2/day	2,800		Default
Skin Surface Area Non-residential	SA_{com}	cm^2/day	3,300		Default
Skin Surface Area Construction Worker	SA_{con}	cm^2/day	3,300		Default
Soil to Skin Adherence Factor					
Soil to Skin Adherence Resident Adult	M_a	mg/cm^2	0.07		Default
Soil to Skin Adherence Resident Child	M_c	mg/cm^2	0.2		Default
Soil to Skin Adherence Non-residential	M_{com}	mg/cm^2	0.2		Default
Soil to Skin Adherence Construction Worker	M_{con}	mg/cm^2	0.3		Default
Averaging Time for Vapor Flux					
Averaging Time for Vapor Flux Resident Adult	τ	s		946,000,000	Calculated
Averaging Time for Vapor Flux Age-adjusted Resident	τ	s		757,000,000	Calculated
Averaging Time for Vapor Flux Resident Child	τ	s		189,000,000	Calculated
Averaging Time for Vapor Flux Commercial Worker	τ	s		788,000,000	Calculated
Averaging Time for Vapor Flux Construction Worker	τ	s		31,500,000	Calculated
Target Hazard Index	THI		1		Default

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Target Risk	TR		0.00001		Default

RISK/HAZARD QUOTIENT: RESIDENTIAL

RISK EVALUATION RESULTS

Red highlight indicates highest risk and hazard

	Direct Contact Soil			Total Risk Estimate & Hazard Index by Chemical	
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil				
	EPC	Risk	HI	Risk	HI
Anthracene	3.61E-01	*NTOX*	1.62E-05	*NA*	1.62E-05
Benz(a)anthracene	4.56E-01	2.39E-06	*NTOX*	2.39E-06	*NA*
Benzo(a)pyrene	4.40E-01	2.30E-05	*NTOX*	2.30E-05	*NA*
Benzo(b)fluoranthene	1.00E+00	5.23E-06	*NTOX*	5.23E-06	*NA*
Benzo(k)fluoranthene	3.17E-01	1.66E-07	*NTOX*	1.66E-07	*NA*
Chrysene	8.39E-01	4.41E-08	*NTOX*	4.41E-08	*NA*
Fluoranthene	1.08E+00	*NTOX*	3.63E-04	*NA*	3.63E-04
Pyrene	1.06E+00	*NTOX*	4.75E-04	*NA*	4.75E-04
Totals by Pathway		3.08E-05	8.55E-04	**3.08E-05**	**8.55E-04**

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

RISK/HAZARD QUOTIENT: NON-RESIDENTIAL

RISK EVALUATION RESULTS

Red highlight indicates highest risk and hazard

	Direct Contact Soil			Total Risk Estimate & Hazard Index by Chemical	
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil				
	EPC	Risk	HI	Risk	HI
Anthracene	3.61E-01	*NTOX*	1.58E-06	*NA*	1.58E-06
Benz(a)anthracene	4.56E-01	1.57E-07	*NTOX*	1.57E-07	*NA*
Benzo(a)pyrene	4.40E-01	1.50E-06	*NTOX*	1.50E-06	*NA*
Benzo(b)fluoranthene	1.00E+00	3.42E-07	*NTOX*	3.42E-07	*NA*
Benzo(k)fluoranthene	3.17E-01	1.10E-08	*NTOX*	1.10E-08	*NA*
Chrysene	8.39E-01	3.02E-09	*NTOX*	3.02E-09	*NA*
Fluoranthene	1.08E+00	*NTOX*	3.53E-05	*NA*	3.53E-05
Pyrene	1.06E+00	*NTOX*	4.63E-05	*NA*	4.63E-05
Totals by Pathway		2.02E-06	8.32E-05	**2.02E-06**	**8.32E-05**

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

RISK/HAZARD QUOTIENT: CONSTRUCTION WORKER

Red highlight indicates highest risk and hazard

	Direct Contact Soil			Total Risk Estimate & Hazard Index by Chemical	
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil				
	EPC	Risk	HI	Risk	HI
Anthracene	3.61E-01	*NTOX*	6.48E-07	*NA*	6.48E-07
Benz(a)anthracene	4.56E-01	2.65E-09	*NTOX*	2.65E-09	*NA*
Benzo(a)pyrene	4.40E-01	2.49E-08	*NTOX*	2.49E-08	*NA*
Benzo(b)fluoranthene	1.00E+00	5.65E-09	*NTOX*	5.65E-09	*NA*
Benzo(k)fluoranthene	3.17E-01	1.90E-10	*NTOX*	1.90E-10	*NA*
Chrysene	8.39E-01	5.56E-11	*NTOX*	5.56E-11	*NA*
Fluoranthene	1.08E+00	*NTOX*	1.45E-05	*NA*	1.45E-05
Pyrene	1.06E+00	*NTOX*	1.90E-05	*NA*	1.90E-05
Totals by Pathway		3.34E-08	3.42E-05	**3.34E-08**	**3.42E-05**

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

RISK/HAZARD QUOTIENT: SUMMARY

RISK EVALUATION RESULTS

Red highlight indicates target Risk or Hazard Index exceeded for receptor.

Routes of Exposure	Receptor					
	Residential		Non-Residential		Construction Worker	
	Risk	HI	Risk	HI	Risk	HI
Direct Contact Soil Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil	3.08E-05	8.55E-04	2.02E-06	8.32E-05	3.34E-08	3.42E-05
Subsurface Soil Indoor Inhalation of Vapor Emissions	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Groundwater Indoor Inhalation of Vapor Emissions	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Soil-Vapor Indoor Inhalation of Vapor Emissions	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Site Risk	3.08E-05		2.02E-06		3.34E-08	
Site Hazard Index		8.55E-04		8.32E-05		3.42E-05
Target Risk/HI Exceeded?	YES	NO	NO	NO	NO	NO

Exposure Area DU2.1

Site-specific
Resident Equation Inputs for Soil

Variable	Value
THQ (target hazard quotient) unitless	1
TR (target risk) unitless	0.00001
LT (lifetime) years	70
ET_{res} (exposure time) hours/day	24
$ET_{res\text{-}c}$ (child exposure time) hours/day	24
$ET_{res\text{-}a}$ (adult exposure time) hours/day	24
$ET_{0\text{-}2}$ (mutagenic exposure time) hours/day	24
$ET_{2\text{-}6}$ (mutagenic exposure time) hours/day	24
$ET_{6\text{-}16}$ (mutagenic exposure time) hours/day	24
$ET_{16\text{-}26}$ (mutagenic exposure time) hours/day	24
ED_{res} (exposure duration) years	26
$ED_{res\text{-}c}$ (exposure duration - child) years	6
$ED_{res\text{-}a}$ (exposure duration - adult) years	20
$ED_{0\text{-}2}$ (mutagenic exposure duration) years	2
$ED_{2\text{-}6}$ (mutagenic exposure duration) years	4
$ED_{6\text{-}16}$ (mutagenic exposure duration) years	10
$ED_{16\text{-}26}$ (mutagenic exposure duration) years	10
$BW_{res\text{-}c}$ (body weight - child) kg	15
$BW_{res\text{-}a}$ (body weight - adult) kg	80
$BW_{0\text{-}2}$ (mutagenic body weight) kg	15
$BW_{2\text{-}6}$ (mutagenic body weight) kg	15
$BW_{6\text{-}16}$ (mutagenic body weight) kg	80
$BW_{16\text{-}26}$ (mutagenic body weight) kg	80
$SA_{res\text{-}c}$ (skin surface area - child) cm^2/day	2373
$SA_{res\text{-}a}$ (skin surface area - adult) cm^2/day	6032
$SA_{0\text{-}2}$ (mutagenic skin surface area) cm^2/day	2373
$SA_{2\text{-}6}$ (mutagenic skin surface area) cm^2/day	2373
$SA_{6\text{-}16}$ (mutagenic skin surface area) cm^2/day	6032
$SA_{16\text{-}26}$ (mutagenic skin surface area) cm^2/day	6032
EF_{res} (exposure frequency) days/year	350
$EF_{res\text{-}c}$ (exposure frequency - child) days/year	350
$EF_{res\text{-}a}$ (exposure frequency - adult) days/year	350
$EF_{0\text{-}2}$ (mutagenic exposure frequency) days/year	350
$EF_{2\text{-}6}$ (mutagenic exposure frequency) days/year	350
$EF_{6\text{-}16}$ (mutagenic exposure frequency) days/year	350
$EF_{16\text{-}26}$ (mutagenic exposure frequency) days/year	350
$IFS_{res\text{-}adj}$ (age-adjusted soil ingestion factor) mg/kg	36750
$IFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	166833.33
$IRS_{res\text{-}c}$ (soil intake rate - child) mg/day	200
$IRS_{res\text{-}a}$ (soil intake rate - adult) mg/day	100
$IRS_{0\text{-}2}$ (mutagenic soil intake rate) mg/day	200

Site-specific
Resident Equation Inputs for Soil

Variable	Value
IRS_{2-6} (mutagenic soil intake rate) mg/day	200
IRS_{6-16} (mutagenic soil intake rate) mg/day	100
IRS_{16-26} (mutagenic soil intake rate) mg/day	100
AF_{res-a} (skin adherence factor - adult) mg/cm^2	0.07
AF_{res-c} (skin adherence factor - child) mg/cm^2	0.2
AF_{0-2} (mutagenic skin adherence factor) mg/cm^2	0.2
AF_{2-6} (mutagenic skin adherence factor) mg/cm^2	0.2
AF_{6-16} (mutagenic skin adherence factor) mg/cm^2	0.07
AF_{16-26} (mutagenic skin adherence factor) mg/cm^2	0.07
$DFS_{res-adj}$ (age-adjusted soil dermal factor) mg/kg	103390
$DFSM_{res-adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	428260
$City_{PEF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	1.72
Q/C_{wp} (inverse of the ratio of the geometric mean air concentration to the emission flu	57.34905593
PEF (particulate emission factor) m^3/kg	3978655493
A (PEF Dispersion Constant)	11.3161
B (PEF Dispersion Constant)	19.6437
C (PEF Dispersion Constant)	224.8172
V (fraction of vegetative cover) unitless	0.33
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.0495
$City_{VF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	1.72
Q/C_{vol}(inverse of the ratio of the geometric mean air concentration to the emission flu	57.34905593
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	11.3161
B (VF Dispersion Constant)	19.6437
C (VF Dispersion Constant)	224.8172
$City_{VF\ mass\text{-}loading}$ (Climate Zone) Selection	Boise, ID (4)
VF_{ml} (volitization factor - mass-limit) m^3/kg	104494.5678
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	57.34905593
A_s (acres)	1.72
T (exposure interval) yr	26
d_s (depth of source) m	0.3

Site-specific
Resident Equation Inputs for Soil

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
A (VF Dispersion Constant - Mass Limit)	11.3161
B (VF Dispersion Constant - Mass Limit)	19.6437
C (VF Dispersion Constant - Mass Limit)	224.8172

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Site-specific
Resident Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1

Chemical	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)	S (mg/L)	K_{oc} (cm3/g)	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)
Chromium, Total	-	1	-	-	-	-	-	3980000000	-	-	-	-
Mercury (elemental)	-	1	104000	0.352	0.06	-	3.13	3980000000	-	-	-	-
Selenium	-	1	-	-	-	-	-	3980000000	-	-	-	-

Chemical	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)	Ingestion SL Adult THQ=1 (mg/kg)	Dermal SL Adult THQ=1 (mg/kg)	Inhalation SL Adult THQ=1 (mg/kg)	Noncarcinogenic SL Adult THI=1 (mg/kg)	Screening Level (mg/kg)
Chromium, Total	-	-	-	-	-	-	-	-	
Mercury (elemental)	-	-	32.7	32.7	-	-	32.7	32.7	3.27E+01 sat
Selenium	391	-	83000000	391	4170	-	83000000	4170	3.91E+02 nc

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Site-specific
Resident Risk for Soil

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)	S (mg/L)	K_{oc} (cm3/g)
Chromium, Total	-		-		-		-		0.013	-	1	-	-	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	104000	0.352	0.06	-
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-	-	-
*Total Risk/HI	-		-		-		-		-	-	-	-	-	-	-

Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion Child HQ	Dermal Child HQ	Inhalation Child HQ	Noncarcinogenic Child HI	Ingestion Adult HQ	Dermal Adult HQ	Inhalation Adult HQ	Noncarcinogenic Adult HI
-	3980000000	21.4	-	-	-	-	-	-	-	-	-	-	-	-
3.13	3980000000	0.285	-	-	-	-	-	-	0.00872	0.00872	-	-	0.00872	0.00872
-	3980000000	4	-	-	-	-	0.0102	-	4.82E-08	0.0102	0.000959	-	4.82E-08	0.000959
*Total Risk/HI	-	-	-	-	-	-	*0.0102*	-	*0.00872*	*0.0189*	*0.000959*	-	*0.00872*	*0.00968*

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Site-specific
Composite Worker Equation Inputs for Soil

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
AT_w (averaging time)	365
EF_w (exposure frequency) d/yr	250
ED_w (exposure duration) yr	25
ET_w (exposure time) hr	8
LT (lifetime) yr	70
BW_w (body weight)	80
IR_w (soil ingestion rate) mg/day	100
SA_w (surface area) cm^2/day	3527
AF_w (skin adherence factor) mg/cm^2	0.12
$City_{PEF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	1.72
Q/C_{wp} (inverse of the ratio of the geometric mean air concentration to the emission flu	57.34905593
PEF (particulate emission factor) m^3/kg	3978655493
A (PEF Dispersion Constant)	11.3161
B (PEF Dispersion Constant)	19.6437
C (PEF Dispersion Constant)	224.8172
V (fraction of vegetative cover) unitless	0.33
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.0495
$City_{VF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	1.72
Q/C_{vol}(inverse of the ratio of the geometric mean air concentration to the emission flu	57.34905593
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	11.3161
B (VF Dispersion Constant)	19.6437
C (VF Dispersion Constant)	224.8172
$City_{VF\ mass\text{-}loading}$ (Climate Zone) Selection	Boise, ID (4)
VF_{ml} (volitization factor - mass-limit) m^3/kg	104494.5678
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	57.34905593
A_s (acres)	1.72
T (exposure interval) yr	26
d_s (depth of source) m	0.3

Site-specific
Composite Worker Equation Inputs for Soil

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
A (VF Dispersion Constant - Mass Limit)	11.3161
B (VF Dispersion Constant - Mass Limit)	19.6437
C (VF Dispersion Constant - Mass Limit)	224.8172

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Site-specific
Composite Worker Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	104000	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	3980000000	-	-	-	-	-	-	-	-	
3.13	0.06	-	3980000000	-	-	-	-	-	-	137	137	1.37E+02 sat
-	-	-	3980000000	-	-	-	-	5840	-	349000000	5840	5.84E+03 nc

Output generated 27OCT2017:16:41:08

Site-specific
Composite Worker Risk for Soil

Chemical	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	104000	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	3980000000	21.4	-	-	-	-	-	-	-	-
	3.13	0.06	-	3980000000	0.285	-	-	-	-	-	-	0.00208	0.00208
	-	-	-	3980000000	4	-	-	-	-	0.000685	-	1.15E-08	0.000685
**Total Risk/HI*	-	-	-	-	-	-	-	-	-	*0.000685*	-	*0.00208*	*0.00276*

Output generated 27OCT2017:16:41:08

Site-specific
Construction Worker Equation Inputs for Soil - Unpaved Road Traffic

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
EF_{cw} (exposure frequency - construction worker) day/yr	250
ED_{cw} (exposure duration - construction worker) yr	1
ET_{cw} (exposure time - construction worker) hr/day	8
LT (lifetime) yr	70
BW_{cw} (body weight - construction worker) kg	80
IR_{cw} (soil ingestion rate - construction worker) mg/day	330
SA_{cw} (surface area - construction worker) cm^2/day	3527
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3
AT_{cw} (averaging time - construction worker carcinogenic)	365
AT_{cw-a} (averaging time - construction worker non-carcinogenic)	350
EW_{cw} (overall duration of construction) weeks/year	50
DW_{cw} (days worked - construction worker) days/week	5
A_s (PEF_{sc} - acres)	1.72
s (road surface silt content) %	8.5
M_{dry} (road surface material moisture content under dry, uncontrolled conditions) %	0.2
p (days per year with at least .01" of precipitation) days/year	90
L_R (length of road segment) ft	273.72156
W_R (width of road segment) ft	60
number of cars	0
number of trucks	77
tons/car	2.6
tons/truck	44.4
F_D Unitless Dispersion Correction Factor	0.185837208
t_c (overall duration of construction) hours	8400
distance (road length) km/day	0.083430206
T_t (overall duration of traffic) s	7200000
total number of vehicles	0
A_R (surface area of contaminated road segment) m^2	1525.773245
W (mean vehicle weight) tons	0
SigmaVKT (sum of fleet vehicle km traveled) km	0
Q/C_{sr} (inverse of the ratio of the 1-h. geometric mean air concentration to the emission	18.84249985
PEF_{sc} (particulate emission factor) m^3/kg	0
A (Dispersion Constant)	12.9351
B (Dispersion Constant)	5.7383
C (Dispersion Constant)	71.7711
A_{surf} (areal extent of site) m^2	6960.5992
A_s ($VF_{ulim-sc}$ acres)	1.72
T (temperature) C	25
foc (fraction organic carbon in soil) g/g	0.006

Site-specific
Construction Worker Equation Inputs for Soil - Unpaved Road Traffic

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
A (VF Dispersion Constant)	2.4538
B (VF Dispersion Constant)	17.566
C (VF Dispersion Constant)	189.0426
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	11.36632371
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
A_s ($VF_{mlim\text{-}sc}$ acres)	1.72
p_b (dry soil bulk density) g/cm^3	1.5
d_s (average source depth) m	0.3
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	11.36632371
$VF_{mlim\text{-}sc}$ (volitization factor) m^3_{air}/kg_{soil}	4110.140062

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Site-specific
Construction Worker Screening Levels (RSL) for Soil - Unpaved Road Traffic

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	4110	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	0	-	-	-	-	-	-	-	-	
3.13	0.06	-	0	-	-	-	-	-	-	-	-	
-	-	-	0	-	-	-	-	1700	-	-	1700	1.70E+03 nc

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Site-specific
Construction Worker Risk for Soil - Unpaved Road Traffic

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	4110	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	0	21.4	-	-	-	-	-	-	-	-
	3.13	0.06	-	0	0.285	-	-	-	-	-	-	-	-
	-	-	-	0	4	-	-	-	-	0.00236	-	-	0.00236
**Total Risk/HI*	-	-	-	-	-	-	-	-	-	*0.00236*	-	-	*0.00236*

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Site-specific
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
EF_{cw} (exposure frequency - construction worker) day/yr	250
ED_{cw} (exposure duration - construction worker) yr	1
ET_{cw} (exposure time - construction worker) hr/day	8
LT (lifetime) yr	70
BW_{cw} (body weight - construction worker) kg	80
IR_{cw} (soil ingestion rate - construction worker) mg/day	330
SA_{cw} (surface area - construction worker) cm^2/day	3527
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3
AT_{cw} (averaging time - construction worker carcinogenic)	365
AT_{cw-a} (averaging time - construction worker non-carcinogenic)	350
EW_{cw} (overall duration of construction) weeks/year	50
DW_{cw} (days worked - construction worker) days/week	5
A_c (acres)	1.72
A_{till} (areal extent of tilling) acres	1.72
A_{excav} (area of excavation site) m^2	6967.73
$A_{c\text{-}grade}$ (areal extent of grading) acres	1.72
$A_{c\text{-}doz}$ (areal extent of dozing) acres	1.72
$M_{m\text{-}doz}$ (Gravimetric soil moisture content) %	7.9
$M_{m\text{-}excav}$ (Gravimetric soil moisture content) %	12
p_{soil} (density) g/cm^3 - chemical-specific	1.68
$N_{A\text{-}dump}$ (number of times soil is dumped)	2
$N_{A\text{-}till}$ (number of times soil is tilled)	2
s_{till} (soil silt content) %	18
s_{doz} (soil silt content) %	6.9
B_l (dozing blade length) m	3.7
B_l (grading blade length) m	2.5
$N_{A\text{-}doz}$ (number of times site was dozed)	0
$N_{A\text{-}grade}$ (number of times site was graded)	1
S_{doz} (dozing speed) kph	11.4
S_{grade} (dozing speed) kph	11.4
d_{excav} (average depth of excavation site) m	0.3
V (fraction of vegetative cover)	0.33
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value) m/s	11.32
t_c (overall duration of construction) hours	8400
F_D Unitless Dispersion Correction Factor	0.185837208
T (time over which traffic occurs) s	7200000
$J`_T$ (g/m^2s)	4.25815E-06
F(x) (function dependant on U_m/U_t derived using Cowherd et al. (1985))	0.0495

Site-specific
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value
M_{wind} (dust emitted by wind erosion) g	51288.84717
M_{doz} (dust emitted from dozing operations) g	
M_{till} (dust emitted from tilling operations) g	8674.567588
M_{grade} (dust emitted from grading operations) g	1215.82375
M_{excav} (dust emitted from excavation soil dumping) g	856.4526006
$SigmaVKT_{doz}$ (sum of fleet vehicle km traveled) km	
$SigmaVKT_{grade}$ (sum of fleet vehicle km traveled) km	2.784336
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	11.36632371
$PEF`_{sc}$ (particulate emission factor) m^3/kg	14363702.61
A (PEF Dispersion Constant)	2.4538
B (PEF Dispersion Constant)	17.566
C (PEF Dispersion Constant)	189.0426
A_{surf} (areal extent of site) m^2	6960.5992
A_s ($VF_{ulim-sc}$ acres)	1.72
T (temperature) C	25
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
A (VF Dispersion Constant)	2.4538
B (VF Dispersion Constant)	17.566
C (VF Dispersion Constant)	189.0426
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	11.36632371
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
A_s ($VF_{mlim-sc}$ acres)	1.72
p_b (dry soil bulk density) g/cm^3	1.5
d_s (average source depth) m	0.3
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	11.36632371
$VF_{mlim-sc}$ (volitization factor) m^3_{air}/kg_{soil}	4110.140062
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Site-specific
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	4110	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	14400000	-	-	-	-	-	-	-	-	
3.13	0.06	-	14400000	-	-	-	-	-	-	5.18	5.18	5.18E+00 sat
-	-	-	14400000	-	-	-	-	1700	-	1210000	1690	1.69E+03 nc

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Site-specific
Construction Worker Risk for Soil - Other Construction Activities

Chemical	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	4110	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	14400000	21.4	-	-	-	-	-	-	-	-
	3.13	0.06	-	14400000	0.285	-	-	-	-	-	-	0.055	0.055
	-	-	-	14400000	4	-	-	-	-	0.00236	-	0.00000332	0.00236
**Total Risk/HI*	-	-	-	-	-	-	-	-	-	*0.00236*	-	*0.0551*	*0.0574*

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SITE INFORMATION

Facility ID	
Site Name	CDA BNSF R2R ROW
Date	May 16, 2017
Name of Preparer	Rachel Gibeault
Address	DU 2.1
Latitude	
Longitude	

EXPOSURE POINT CONCENTRATIONS: RESIDENTIAL

Chemical	Direct Contact Soil
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil
	Representative Concentration [mg/kg]
Anthracene	0.34
Benz(a)anthracene	0.468
Benzo(a)pyrene	0.505
Benzo(b)fluoranthene	0.942
Benzo(k)fluoranthene	0.282
Chrysene	0.815
Fluoranthene	1.17
Pyrene	1.12

EXPOSURE POINT CONCENTRATIONS: NON-RESIDENTIAL

Chemical	Direct Contact Soil
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil
	Representative Concentration [mg/kg]
Anthracene	0.34
Benz(a)anthracene	0.468
Benzo(a)pyrene	0.505
Benzo(b)fluoranthene	0.942
Benzo(k)fluoranthene	0.282
Chrysene	0.815
Fluoranthene	1.17
Pyrene	1.12

EXPOSURE POINT CONCENTRATIONS: CONSTRUCTION WORKER

Chemical	Direct Contact Soil
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil
	Representative Concentration [mg/kg]
Anthracene	0.34
Benz(a)anthracene	0.468
Benzo(a)pyrene	0.505
Benzo(b)fluoranthene	0.942
Benzo(k)fluoranthene	0.282
Chrysene	0.815
Fluoranthene	1.17
Pyrene	1.12

EXPOSURE POINT CONCENTRATIONS: GROUNDWATER / SURFACE WATER PROTECTION

Chemical	Groundwater and/or Surface Water Protection		
	Representative Groundwater Concentration at the Source [mg/L]	Representative Soil Concentration at the Source [mg/kg] NOT USED IN CALCULATIONS	Representative Groundwater Concentration at the POC [mg/L]
Anthracene			
Benz(a)anthracene			
Benzo(a)pyrene			
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Chrysene			
Fluoranthene			
Pyrene			
	Paste Values...	Paste Values...	Paste Values...

Direct Contact

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Cowherd Particulate Emission Model					
Parameters					
Site size for calculation of Q/C parameter		acres	~~0.5~~	1.72	Calculated
Inverse of Mean Concentration in the Middle of a Square Source	Q/C			60.9	Calculated
Fraction of Vegetative Cover	V	m^2/m^2	~~0.5~~	0.33	Calculated
Mean Annual Wind Speed	U_m	m/s	3.98		Default
Equivalent Threshold Value of Windspeed at 7m	U_t	m/s	11.3		Default
Windspeed Distribution Function from Cowherd et. al, 1985	$F_{(x)}$		0.0495		Default
Soil Properties					
Immediately Below the Building					
Soil Bulk Density	ρ_{sA}	cm^3	1.64		Default
Total Porosity	Θ_{TA}	cm^3/cm^3-soil	0.39		Default
Fractional Organic Carbon Content	foc_A	g-C/g-soil	0.001		Default
Volumetric Water Content	Θ_{wsA}	cm^3/cm^3	0.17		Default
Volumetric Air Content	Θ_{asA}	cm^3/cm^3		0.22	Calculated

Groundwater / Surface Water Protection

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Common Water Inputs					
Source Zone Soil Properties					
Dry Soil Bulk Density of the source zone soil	ρ_s	g/cm³	1.64		Default
Fractional Organic Carbon Content in the source zone soil	foc	g-C/g-soil	0.001		Default
Total Soil Porosity of the source zone soil	Θ_T	cm³/cm³-soil	0.39		Default
Volumetric Water Content in the source zone soil	Θ_{ws}	cm³/cm³	0.17		Default
Volumetric Air Content in the source zone soil	Θ_{as}	cm³/cm³		0.22	Calculated
Saturated Zone Soil Properties					
Dry Soil Bulk Density of the saturated zone soil	ρ_{ss}	g/cm³	1.64		Default
Fractional Organic Carbon Content in the saturated zone soil	focs	g-C/g-soil	0.001		Default
Total Soil Porosity in the saturated zone soil	Θ_{ts}	cm³/cm³-soil	0.39		Default
Source Area Parameters					
Groundwater Darcy Velocity	U_{gw}	ft/year	110		Default
Groundwater Mixing Zone Length	L_{mz}	ft	40		Default
Groundwater Mixing Zone Thickness	δ_{gw}	ft	5.02		Default
Groundwater Mixing Zone Width	W_{gw}	ft	40		Default
Infiltration Rate	I	ft/year	0.82		Default

Exposure and Compliance Point Distances from Source

Groundwater / Surface Water Protection

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Groundwater Protection Parameters					
Distance to Point of Exposure (POE)	$X_{poe,gw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
Distance to the Point of Compliance (POC)	$X_{poc,gw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
Surface Water Protection Parameters					
Distance to the Point of Discharge	$X_{poe,sw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
Distance to the Point of Compliance	$X_{poc,sw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
pH of the receiving surface water	pH		7		Default
Temperature of the receiving surface water	T	°C	15		Default
Hardness of the receiving surface water	H	mg/L	25		Default

Vapor Intrusion: Soil and Source

Parameter	Symbol	Unit	Default Value	Value Used	Justification

Interview Questions

Which of the following best describes the building?
The model does not accommodate structures with crawl spaces or dirt floors. Contact DEQ for more information on how to address these types of situations.

Vapor Intrusion: Enclosed Space

Parameter	Symbol	Unit	Default Value	Value Used	Justification

Please complete the Interview Questions on the Vapor Intrusion tab.

Enter site-specific decay rates for this site if they vary from the default values.

	First Order Decay Rate [day^{-1}]		Unsaturated Zone DAF	
	Default Value	Site-Specific Value	Default Value	Site-Specific Value
Anthracene	0		1	
Benz(a)anthracene	0		1	
Benzo(a)pyrene	0		1	
Benzo(b)fluoranthene	0		1	
Benzo(k)fluoranthene	0		1	
Chrysene	0		1	
Fluoranthene	0		1	
Pyrene	0		1	

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Averaging Time					
Averaging Time for Carcinogens	AT_c	year	70		Default
Averaging Time for Non-Carcinogens, Adult	AT_{nc}	year		30	Calculated
Averaging Time for Non-Carcinogens, Age Adjusted Adult	AT_{nc}	year		24	Calculated
Averaging Time for Non-Carcinogens, Child	AT_{nc}	year		6	Calculated
Averaging Time for Non-Carcinogens, Non-residential	AT_{nc}	year		25	Calculated
Averaging Time for Non-Carcinogens, Construction Worker	AT_{nc}	year		1	Calculated
Body Weight					
Body Weight Resident Adult	BW_a	kg	70		Default
Body Weight Resident Child	BW_c	kg	15		Default
Body Weight Non-residential	BW_{com}	kg	70		Default
Body Weight Construction Worker	BW_{con}	kg	70		Default
Exposure Duration					
Exposure Duration Resident Adult	ED_a	year	30		Default
Exposure Duration Resident Age Adjusted Adult	ED_{aa}	year	24		Default
Exposure Duration Resident Child	ED_c	year	6		Default
Exposure Duration Non-residential	ED_{com}	year	25		Default
Exposure Duration Construction Worker	ED_{con}	year	1		Default
Exposure Frequency for Indirect Pathways					
Exposure Frequency for Indirect Pathway Resident Child	EF_c	day/year	350		Default
Exposure Frequency for Indirect Pathway Resident Adult	EF_a	day/year	350		Default
Exposure Frequency for Indirect Pathway Non-residential	EF_{com}	day/year	250		Default
Exposure Frequency for Indirect Pathway Construction Worker	EF_{con}	day/year	30		Default

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Exposure Frequency for Direct Contact Pathways					
Exposure Frequency for Direct Contact Pathways Resident Adult	EF_{da}	day/year	270		Default
Exposure Frequency for Direct Contact Pathways Non-residential	EF_{dcom}	day/year	180		Default
Exposure Frequency for Direct Contact Pathways Construction Worker	EF_{dcon}	day/year	30		Default
Exposure Frequency for Direct Contact Pathways Resident Child	EF_{dc}	day/year	270		Default
Indoor Exposure Time					
Indoor Exposure Time Resident Adult	ET_{i-a}	hrs/day	24		Default
Indoor Exposure Time Resident Child	ET_{i-c}	hrs/day	24		Default
Indoor Exposure Time Non-residential	ET_{i-com}	hrs/day	8		Default
Outdoor Exposure Time					
Outdoor Exposure Time Resident Adult	ET_{o-a}	hrs/day	2		Default
Outdoor Exposure Time Resident Child	ET_{o-c}	hrs/day	2		Default
Outdoor Exposure Time Non-residential	ET_{o-com}	hrs/day	6		Default
Outdoor Exposure Time Construction Worker	ET_{o-con}	hrs/day	10		Default
Soil Ingestion Rate					
Soil Ingestion Rate Age-adjusted	IR_{s-aa}	mg/day		114	Calculated
Soil Ingestion Rate Age-Adjusted Mutagenic Chemicals	IR_{s-aam}	mg-yr/kg-day		490	Calculated
Soil Ingestion Rate Resident Adult	IR_{s-a}	mg/day	100		Default
Soil Ingestion Ingestion Rate Resident Child	IR_{s-c}	mg/day	200		Default
Soil Ingestion Rate Non-residential	IR_{s-com}	mg/day	100		Default
Soil Ingestion Rate Construction Worker	IR_{s-con}	mg/day	330		Default

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Groundwater Ingestion Rate					
Groundwater Ingestion RateAge-adjusted	IR_{w-aa}	L-yr/kg-day		1.09	Calculated
Groundwater Ingestion Rate Age-Adjusted Mutagenic Chemicals	IR_{w-aam}	L-yr/kg-day		3.39	Calculated
Groundwater Ingestion Rate Resident Adult	IR_{w-a}	L/day	2		Default
Groundwater Ingestion Rate Resident Child	IR_{w-c}	L/day	1		Default
Groundwater Ingestion Rate Non-residential	IR_{w-com}	L/day	1		Default
Skin Surface Area					
Skin Surface Area Age-adjusted	SA_{aa}	mg-yr/kg-day		361	Calculated
Skin Surface AreaAge-Adjusted Mutagenic Dermal	SA_{aam}	mg-yr/kg-day		1,450	Calculated
Skin Surface Area Resident Adult	SA_a	cm^2/day	5,700		Default
Skin Surface Area Resident Child	SA_c	cm^2/day	2,800		Default
Skin Surface Area Non-residential	SA_{com}	cm^2/day	3,300		Default
Skin Surface Area Construction Worker	SA_{con}	cm^2/day	3,300		Default
Soil to Skin Adherence Factor					
Soil to Skin Adherence Resident Adult	M_a	mg/cm^2	0.07		Default
Soil to Skin Adherence Resident Child	M_c	mg/cm^2	0.2		Default
Soil to Skin Adherence Non-residential	M_{com}	mg/cm^2	0.2		Default
Soil to Skin Adherence Construction Worker	M_{con}	mg/cm^2	0.3		Default
Averaging Time for Vapor Flux					
Averaging Time for Vapor Flux Resident Adult	τ	s		946,000,000	Calculated
Averaging Time for Vapor Flux Age-adjusted Resident	τ	s		757,000,000	Calculated
Averaging Time for Vapor Flux Resident Child	τ	s		189,000,000	Calculated
Averaging Time for Vapor Flux Commercial Worker	τ	s		788,000,000	Calculated
Averaging Time for Vapor Flux Construction Worker	τ	s		31,500,000	Calculated
Target Hazard Index	THI		1		Default

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Target Risk	TR		0.00001		Default

RISK/HAZARD QUOTIENT: RESIDENTIAL

RISK EVALUATION RESULTS

Red highlight indicates highest risk and hazard

	Direct Contact Soil			Total Risk Estimate & Hazard Index by Chemical	
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil				
	EPC	Risk	HI	Risk	HI
Anthracene	3.40E-01	*NTOX*	1.52E-05	*NA*	1.52E-05
Benz(a)anthracene	4.68E-01	2.45E-06	*NTOX*	2.45E-06	*NA*
Benzo(a)pyrene	5.05E-01	2.64E-05	*NTOX*	2.64E-05	*NA*
Benzo(b)fluoranthene	9.42E-01	4.92E-06	*NTOX*	4.92E-06	*NA*
Benzo(k)fluoranthene	2.82E-01	1.48E-07	*NTOX*	1.48E-07	*NA*
Chrysene	8.15E-01	4.29E-08	*NTOX*	4.29E-08	*NA*
Fluoranthene	1.17E+00	*NTOX*	3.94E-04	*NA*	3.94E-04
Pyrene	1.12E+00	*NTOX*	5.02E-04	*NA*	5.02E-04
Totals by Pathway		3.40E-05	9.11E-04	**3.40E-05**	**9.11E-04**

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

RISK/HAZARD QUOTIENT: NON-RESIDENTIAL

RISK EVALUATION RESULTS

Red highlight indicates highest risk and hazard

	Direct Contact Soil			Total Risk Estimate & Hazard Index by Chemical	
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil				
	EPC	Risk	HI	Risk	HI
Anthracene	3.40E-01	*NTOX*	1.48E-06	*NA*	1.48E-06
Benz(a)anthracene	4.68E-01	1.61E-07	*NTOX*	1.61E-07	*NA*
Benzo(a)pyrene	5.05E-01	1.73E-06	*NTOX*	1.73E-06	*NA*
Benzo(b)fluoranthene	9.42E-01	3.22E-07	*NTOX*	3.22E-07	*NA*
Benzo(k)fluoranthene	2.82E-01	9.81E-09	*NTOX*	9.81E-09	*NA*
Chrysene	8.15E-01	2.93E-09	*NTOX*	2.93E-09	*NA*
Fluoranthene	1.17E+00	*NTOX*	3.83E-05	*NA*	3.83E-05
Pyrene	1.12E+00	*NTOX*	4.89E-05	*NA*	4.89E-05
Totals by Pathway		2.22E-06	8.86E-05	**2.22E-06**	**8.86E-05**

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

RISK/HAZARD QUOTIENT: CONSTRUCTION WORKER

Red highlight indicates highest risk and hazard

	Direct Contact Soil			Total Risk Estimate & Hazard Index by Chemical	
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil				
	EPC	Risk	HI	Risk	HI
Anthracene	3.40E-01	*NTOX*	6.10E-07	*NA*	6.10E-07
Benz(a)anthracene	4.68E-01	2.72E-09	*NTOX*	2.72E-09	*NA*
Benzo(a)pyrene	5.05E-01	2.85E-08	*NTOX*	2.85E-08	*NA*
Benzo(b)fluoranthene	9.42E-01	5.33E-09	*NTOX*	5.33E-09	*NA*
Benzo(k)fluoranthene	2.82E-01	1.69E-10	*NTOX*	1.69E-10	*NA*
Chrysene	8.15E-01	5.40E-11	*NTOX*	5.40E-11	*NA*
Fluoranthene	1.17E+00	*NTOX*	1.58E-05	*NA*	1.58E-05
Pyrene	1.12E+00	*NTOX*	2.01E-05	*NA*	2.01E-05
Totals by Pathway		3.68E-08	3.65E-05	**3.68E-08**	**3.65E-05**

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

RISK/HAZARD QUOTIENT: SUMMARY

RISK EVALUATION RESULTS

Red highlight indicates target Risk or Hazard Index exceeded for receptor.

Routes of Exposure	Receptor					
	Residential		Non-Residential		Construction Worker	
	Risk	HI	Risk	HI	Risk	HI
Direct Contact Soil Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil	3.40E-05	9.11E-04	2.22E-06	8.86E-05	3.68E-08	3.65E-05
Subsurface Soil Indoor Inhalation of Vapor Emissions	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Groundwater Indoor Inhalation of Vapor Emissions	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Soil-Vapor Indoor Inhalation of Vapor Emissions	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Site Risk	3.40E-05		2.22E-06		3.68E-08	
Site Hazard Index		9.11E-04		8.86E-05		3.65E-05
Target Risk/HI Exceeded?	YES	NO	NO	NO	NO	NO

Exposure Area DU2.2

Site-specific
Resident Equation Inputs for Soil

Variable	Value
THQ (target hazard quotient) unitless	1
TR (target risk) unitless	0.00001
LT (lifetime) years	70
ET_{res} (exposure time) hours/day	24
$ET_{res\text{-}c}$ (child exposure time) hours/day	24
$ET_{res\text{-}a}$ (adult exposure time) hours/day	24
$ET_{0\text{-}2}$ (mutagenic exposure time) hours/day	24
$ET_{2\text{-}6}$ (mutagenic exposure time) hours/day	24
$ET_{6\text{-}16}$ (mutagenic exposure time) hours/day	24
$ET_{16\text{-}26}$ (mutagenic exposure time) hours/day	24
ED_{res} (exposure duration) years	26
$ED_{res\text{-}c}$ (exposure duration - child) years	6
$ED_{res\text{-}a}$ (exposure duration - adult) years	20
$ED_{0\text{-}2}$ (mutagenic exposure duration) years	2
$ED_{2\text{-}6}$ (mutagenic exposure duration) years	4
$ED_{6\text{-}16}$ (mutagenic exposure duration) years	10
$ED_{16\text{-}26}$ (mutagenic exposure duration) years	10
$BW_{res\text{-}c}$ (body weight - child) kg	15
$BW_{res\text{-}a}$ (body weight - adult) kg	80
$BW_{0\text{-}2}$ (mutagenic body weight) kg	15
$BW_{2\text{-}6}$ (mutagenic body weight) kg	15
$BW_{6\text{-}16}$ (mutagenic body weight) kg	80
$BW_{16\text{-}26}$ (mutagenic body weight) kg	80
$SA_{res\text{-}c}$ (skin surface area - child) cm^2/day	2373
$SA_{res\text{-}a}$ (skin surface area - adult) cm^2/day	6032
$SA_{0\text{-}2}$ (mutagenic skin surface area) cm^2/day	2373
$SA_{2\text{-}6}$ (mutagenic skin surface area) cm^2/day	2373
$SA_{6\text{-}16}$ (mutagenic skin surface area) cm^2/day	6032
$SA_{16\text{-}26}$ (mutagenic skin surface area) cm^2/day	6032
EF_{res} (exposure frequency) days/year	350
$EF_{res\text{-}c}$ (exposure frequency - child) days/year	350
$EF_{res\text{-}a}$ (exposure frequency - adult) days/year	350
$EF_{0\text{-}2}$ (mutagenic exposure frequency) days/year	350
$EF_{2\text{-}6}$ (mutagenic exposure frequency) days/year	350
$EF_{6\text{-}16}$ (mutagenic exposure frequency) days/year	350
$EF_{16\text{-}26}$ (mutagenic exposure frequency) days/year	350
$IFS_{res\text{-}adj}$ (age-adjusted soil ingestion factor) mg/kg	36750
$IFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	166833.33
$IRS_{res\text{-}c}$ (soil intake rate - child) mg/day	200
$IRS_{res\text{-}a}$ (soil intake rate - adult) mg/day	100
$IRS_{0\text{-}2}$ (mutagenic soil intake rate) mg/day	200

Site-specific
Resident Equation Inputs for Soil

Variable	Value
IRS_{2-6} (mutagenic soil intake rate) mg/day	200
IRS_{6-16} (mutagenic soil intake rate) mg/day	100
IRS_{16-26} (mutagenic soil intake rate) mg/day	100
AF_{res-a} (skin adherence factor - adult) mg/cm^2	0.07
AF_{res-c} (skin adherence factor - child) mg/cm^2	0.2
AF_{0-2} (mutagenic skin adherence factor) mg/cm^2	0.2
AF_{2-6} (mutagenic skin adherence factor) mg/cm^2	0.2
AF_{6-16} (mutagenic skin adherence factor) mg/cm^2	0.07
AF_{16-26} (mutagenic skin adherence factor) mg/cm^2	0.07
$DFS_{res-adj}$ (age-adjusted soil dermal factor) mg/kg	103390
$DFSM_{res-adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	428260
$City_{PEF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	4.06
Q/C_{wp} (inverse of the ratio of the geometric mean air concentration to the emission flu	49.72427513
PEF (particulate emission factor) m^3/kg	3449677717
A (PEF Dispersion Constant)	11.3161
B (PEF Dispersion Constant)	19.6437
C (PEF Dispersion Constant)	224.8172
V (fraction of vegetative cover) unitless	0.33
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.0495
$City_{VF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	4.06
Q/C_{vol}(inverse of the ratio of the geometric mean air concentration to the emission flu	49.72427513
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	11.3161
B (VF Dispersion Constant)	19.6437
C (VF Dispersion Constant)	224.8172
$City_{VF\ mass\text{-}loading}$ (Climate Zone) Selection	Boise, ID (4)
VF_{ml} (volitization factor - mass-limit) m^3/kg	90601.60722
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	49.72427513
A_s (acres)	4.06
T (exposure interval) yr	26
d_s (depth of source) m	0.3

Site-specific
Resident Equation Inputs for Soil

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
A (VF Dispersion Constant - Mass Limit)	11.3161
B (VF Dispersion Constant - Mass Limit)	19.6437
C (VF Dispersion Constant - Mass Limit)	224.8172

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Site-specific
Resident Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS
Cadmium (Diet)	7440-43-9	No	No	-		0.0018	I	0.0005	SA	0.00001	CA	0.025
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1

Chemical	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)	S (mg/L)	K_{oc} (cm3/g)	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)
Cadmium (Diet)	0.001	1	-	-	-	-	-	3450000000	-	-	53800	53800
Chromium, Total	-	1	-	-	-	-	-	3450000000	-	-	-	-
Mercury (elemental)	-	1	90600	0.352	0.06	-	3.13	3450000000	-	-	-	-
Selenium	-	1	-	-	-	-	-	3450000000	-	-	-	-

Chemical	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)	Ingestion SL Adult THQ=1 (mg/kg)	Dermal SL Adult THQ=1 (mg/kg)	Inhalation SL Adult THQ=1 (mg/kg)	Noncarcinogenic SL Adult THI=1 (mg/kg)	Screening Level (mg/kg)
Cadmium (Diet)	39.1	412	36000	35.7	417	2470	36000	353	3.57E+01 nc
Chromium, Total	-	-	-	-	-	-	-	-	
Mercury (elemental)	-	-	28.3	28.3	-	-	28.3	28.3	2.83E+01 sat
Selenium	391	-	72000000	391	4170	-	72000000	4170	3.91E+02 nc

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Site-specific
Resident Risk for Soil

Chemical	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)	S (mg/L)	K_{oc} (cm3/g)
Cadmium (Diet)	-		0.0018	I	0.0005	SA	0.00001	CA	0.025	0.001	1	-	-	-	-
Chromium, Total	-		-		-		-		0.013	-	1	-	-	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	90600	0.352	0.06	-
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion Child HQ	Dermal Child HQ	Inhalation Child HQ	Noncarcinogenic Child HI	Ingestion Adult HQ	Dermal Adult HQ	Inhalation Adult HQ	Noncarcinogenic Adult HI
	-	3450000000	0.75	-	-	1.39E-10	1.39E-10	0.0192	0.00182	0.0000208	0.021	0.0018	0.000304	0.0000208	0.00212
	-	3450000000	23.7	-	-	-	-	-	-	-	-	-	-	-	-
	3.13	3450000000	0.193	-	-	-	-	-	-	0.00681	0.00681	-	-	0.00681	0.00681
	-	3450000000	4	-	-	-	-	0.0102	-	5.56E-08	0.0102	0.000959	-	5.56E-08	0.000959
**Total Risk/HI*	-	-	-	-	-	*1.39E-10*	*1.39E-10*	*0.0294*	*0.00182*	*0.00683*	*0.0381*	*0.00276*	*0.000304*	*0.00683*	*0.00989*

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Site-specific
Composite Worker Equation Inputs for Soil

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
AT_w (averaging time)	365
EF_w (exposure frequency) d/yr	250
ED_w (exposure duration) yr	25
ET_w (exposure time) hr	8
LT (lifetime) yr	70
BW_w (body weight)	80
IR_w (soil ingestion rate) mg/day	100
SA_w (surface area) cm^2/day	3527
AF_w (skin adherence factor) mg/cm^2	0.12
$City_{PEF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	4.06
Q/C_{wp} (inverse of the ratio of the geometric mean air concentration to the emission flu	49.72427513
PEF (particulate emission factor) m^3/kg	3449677717
A (PEF Dispersion Constant)	11.3161
B (PEF Dispersion Constant)	19.6437
C (PEF Dispersion Constant)	224.8172
V (fraction of vegetative cover) unitless	0.33
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.0495
$City_{VF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	4.06
Q/C_{vol}(inverse of the ratio of the geometric mean air concentration to the emission flu	49.72427513
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	11.3161
B (VF Dispersion Constant)	19.6437
C (VF Dispersion Constant)	224.8172
$City_{VF\ mass\text{-}loading}$ (Climate Zone) Selection	Boise, ID (4)
VF_{ml} (volitization factor - mass-limit) m^3/kg	90601.60722
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	49.72427513
A_s (acres)	4.06
T (exposure interval) yr	26
d_s (depth of source) m	0.3

Site-specific
Composite Worker Equation Inputs for Soil

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
A (VF Dispersion Constant - Mass Limit)	11.3161
B (VF Dispersion Constant - Mass Limit)	19.6437
C (VF Dispersion Constant - Mass Limit)	224.8172

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Site-specific
Composite Worker Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Cadmium (Diet)	7440-43-9	No	No	-		0.0018	I	0.0005	SA	0.00001	CA	0.025	0.001	1	-	-
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	90600	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	3450000000	-	-	235000	235000	584	3450	151000	498	4.98E+02 nc
-	-	-	3450000000	-	-	-	-	-	-	-	-	
3.13	0.06	-	3450000000	-	-	-	-	-	-	119	119	1.19E+02 sat
-	-	-	3450000000	-	-	-	-	5840	-	302000000	5840	5.84E+03 nc

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Site-specific
Composite Worker Risk for Soil

Chemical	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Cadmium (Diet)	-		0.0018	I	0.0005	SA	0.00001	CA	0.025	0.001	1	-	-
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	90600	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	3450000000	0.75	-	-	3.19E-11	3.19E-11	0.00128	0.000217	0.00000496	0.00151
	-	-	-	3450000000	23.7	-	-	-	-	-	-	-	-
	3.13	0.06	-	3450000000	0.193	-	-	-	-	-	-	0.00162	0.00162
	-	-	-	3450000000	4	-	-	-	-	0.000685	-	1.32E-08	0.000685
**Total Risk/HI*	-	-	-	-	-	-	-	*3.19E-11*	*3.19E-11*	*0.00197*	*0.000217*	*0.00163*	*0.00381*

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Site-specific
Construction Worker Equation Inputs for Soil - Unpaved Road Traffic

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
EF_{cw} (exposure frequency - construction worker) day/yr	250
ED_{cw} (exposure duration - construction worker) yr	1
ET_{cw} (exposure time - construction worker) hr/day	8
LT (lifetime) yr	70
BW_{cw} (body weight - construction worker) kg	80
IR_{cw} (soil ingestion rate - construction worker) mg/day	330
SA_{cw} (surface area - construction worker) cm^2/day	3527
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3
AT_{cw} (averaging time - construction worker carcinogenic)	365
AT_{cw-a} (averaging time - construction worker non-carcinogenic)	350
EW_{cw} (overall duration of construction) weeks/year	50
DW_{cw} (days worked - construction worker) days/week	5
A_s (PEF_{sc} - acres)	4.06
s (road surface silt content) %	8.5
M_{dry} (road surface material moisture content under dry, uncontrolled conditions) %	0.2
p (days per year with at least .01" of precipitation) days/year	90
L_R (length of road segment) ft	420.5404739
W_R (width of road segment) ft	60
number of cars	0
number of trucks	182
tons/car	2.6
tons/truck	44.4
F_D Unitless Dispersion Correction Factor	0.185837208
t_c (overall duration of construction) hours	8400
distance (road length) km/day	0.128180543
T_t (overall duration of traffic) s	7200000
total number of vehicles	0
A_R (surface area of contaminated road segment) m^2	2344.168299
W (mean vehicle weight) tons	0
SigmaVKT (sum of fleet vehicle km traveled) km	0
Q/C_{sr} (inverse of the ratio of the 1-h. geometric mean air concentration to the emission	16.81104131
PEF_{sc} (particulate emission factor) m^3/kg	0
A (Dispersion Constant)	12.9351
B (Dispersion Constant)	5.7383
C (Dispersion Constant)	71.7711
A_{surf} (areal extent of site) m^2	16430.2516
A_s ($VF_{ulim-sc}$ acres)	4.06
T (temperature) C	25
foc (fraction organic carbon in soil) g/g	0.006

Site-specific
Construction Worker Equation Inputs for Soil - Unpaved Road Traffic

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
A (VF Dispersion Constant)	2.4538
B (VF Dispersion Constant)	17.566
C (VF Dispersion Constant)	189.0426
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	9.775437902
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
A_s ($VF_{mlim\text{-}sc}$ acres)	4.06
p_b (dry soil bulk density) g/cm^3	1.5
d_s (average source depth) m	0.3
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	9.775437902
$VF_{mlim\text{-}sc}$ (volitization factor) m^3_{air}/kg_{soil}	3534.864918

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Site-specific
Construction Worker Screening Levels (RSL) for Soil - Unpaved Road Traffic

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Cadmium (Diet)	7440-43-9	No	No	-		0.0018	I	0.0005	SA	0.00001	CA	0.025	0.001	1	-	-
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	3530	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	0	-	-	-	-	170	1320	-	150	1.50E+02 nc
-	-	-	0	-	-	-	-	-	-	-	-	
3.13	0.06	-	0	-	-	-	-	-	-	-	-	
-	-	-	0	-	-	-	-	1700	-	-	1700	1.70E+03 nc

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Site-specific
Construction Worker Risk for Soil - Unpaved Road Traffic

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Cadmium (Diet)	-		0.0018	I	0.0005	SA	0.00001	CA	0.025	0.001	1	-	-
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	3530	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	0	0.75	-	-	-	-	0.00442	0.000567	-	0.00499
	-	-	-	0	23.7	-	-	-	-	-	-	-	-
	3.13	0.06	-	0	0.193	-	-	-	-	-	-	-	-
	-	-	-	0	4	-	-	-	-	0.00236	-	-	0.00236
**Total Risk/HI*	-	-	-	-	-	-	-	-	-	*0.00678*	*0.000567*	-	*0.00734*

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Site-specific
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
EF_{cw} (exposure frequency - construction worker) day/yr	250
ED_{cw} (exposure duration - construction worker) yr	1
ET_{cw} (exposure time - construction worker) hr/day	8
LT (lifetime) yr	70
BW_{cw} (body weight - construction worker) kg	80
IR_{cw} (soil ingestion rate - construction worker) mg/day	330
SA_{cw} (surface area - construction worker) cm^2/day	3527
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3
AT_{cw} (averaging time - construction worker carcinogenic)	365
AT_{cw-a} (averaging time - construction worker non-carcinogenic)	350
EW_{cw} (overall duration of construction) weeks/year	50
DW_{cw} (days worked - construction worker) days/week	5
A_c (acres)	4.06
A_{till} (areal extent of tilling) acres	4.06
A_{excav} (area of excavation site) m^2	16443.83
$A_{c\text{-}grade}$ (areal extent of grading) acres	4.06
$A_{c\text{-}doz}$ (areal extent of dozing) acres	4.06
$M_{m\text{-}doz}$ (Gravimetric soil moisture content) %	7.9
$M_{m\text{-}excav}$ (Gravimetric soil moisture content) %	12
p_{soil} (density) g/cm^3 - chemical-specific	1.68
$N_{A\text{-}dump}$ (number of times soil is dumped)	2
$N_{A\text{-}till}$ (number of times soil is tilled)	2
s_{till} (soil silt content) %	18
s_{doz} (soil silt content) %	6.9
B_l (dozing blade length) m	3.7
B_l (grading blade length) m	2.5
$N_{A\text{-}doz}$ (number of times site was dozed)	0
$N_{A\text{-}grade}$ (number of times site was graded)	1
S_{doz} (dozing speed) kph	11.4
S_{grade} (dozing speed) kph	11.4
d_{excav} (average depth of excavation site) m	0.3
V (fraction of vegetative cover)	0.33
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value) m/s	11.32
t_c (overall duration of construction) hours	8400
F_D Unitless Dispersion Correction Factor	0.185837208
T (time over which traffic occurs) s	7200000
$J`_T$ (g/m^2s)	5.26169E-06
F(x) (function dependant on U_m/U_t derived using Cowherd et al. (1985))	0.0495

Site-specific
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value
M_{wind} (dust emitted by wind erosion) g	51288.84717
M_{doz} (dust emitted from dozing operations) g	
M_{till} (dust emitted from tilling operations) g	20476.01419
M_{grade} (dust emitted from grading operations) g	2869.90955
M_{excav} (dust emitted from excavation soil dumping) g	2021.226564
$SigmaVKT_{doz}$ (sum of fleet vehicle km traveled) km	
$SigmaVKT_{grade}$ (sum of fleet vehicle km traveled) km	6.572328
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	9.775437902
$PEF`_{sc}$ (particulate emission factor) m^3/kg	9997193.338
A (PEF Dispersion Constant)	2.4538
B (PEF Dispersion Constant)	17.566
C (PEF Dispersion Constant)	189.0426
A_{surf} (areal extent of site) m^2	16430.2516
A_s ($VF_{ulim-sc}$ acres)	4.06
T (temperature) C	25
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
A (VF Dispersion Constant)	2.4538
B (VF Dispersion Constant)	17.566
C (VF Dispersion Constant)	189.0426
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	9.775437902
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
A_s ($VF_{mlim-sc}$ acres)	4.06
p_b (dry soil bulk density) g/cm^3	1.5
d_s (average source depth) m	0.3
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	9.775437902
$VF_{mlim-sc}$ (volitization factor) m^3_{air}/kg_{soil}	3534.864918
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Site-specific
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Cadmium (Diet)	7440-43-9	No	No	-		0.0018	I	0.0005	SA	0.00001	CA	0.025	0.001	1	-	-
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	3530	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Chemical	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
	-	-	-	10000000	-	-	17000	17000	170	1320	420	111	1.11E+02 nc
	-	-	-	10000000	-	-	-	-	-	-	-	-	
	3.13	0.06	-	10000000	-	-	-	-	-	-	4.45	4.45	4.45E+00 sat
	-	-	-	10000000	-	-	-	-	1700	-	840000	1690	1.69E+03 nc

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Site-specific
Construction Worker Risk for Soil - Other Construction Activities

Chemical	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Cadmium (Diet)	-		0.0018	I	0.0005	SA	0.00001	CA	0.025	0.001	1	-	-
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	3530	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	10000000	0.75	-	-	4.4E-10	4.4E-10	0.00442	0.000567	0.00179	0.00677
	-	-	-	10000000	23.7	-	-	-	-	-	-	-	-
	3.13	0.06	-	10000000	0.193	-	-	-	-	-	-	0.0433	0.0433
	-	-	-	10000000	4	-	-	-	-	0.00236	-	0.00000476	0.00236
**Total Risk/HI*	-	-	-	-	-	-	-	*4.4E-10*	*4.4E-10*	*0.00678*	*0.000567*	*0.0451*	*0.0525*

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SITE INFORMATION

Facility ID	
Site Name	CDA BNSF R2R ROW
Date	May 16, 2017
Name of Preparer	Rachel Gibeault
Address	DU 2.2
Latitude	
Longitude	

EXPOSURE POINT CONCENTRATIONS: RESIDENTIAL

Chemical	Direct Contact Soil
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil
	Representative Concentration [mg/kg]
Anthracene	0.349
Benz(a)anthracene	0.52
Benzo(a)pyrene	0.606
Benzo(b)fluoranthene	0.942
Benzo(k)fluoranthene	0.288
Chrysene	0.679
Fluoranthene	0.938
Pyrene	1.01

EXPOSURE POINT CONCENTRATIONS: NON-RESIDENTIAL

Chemical	Direct Contact Soil
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil
	Representative Concentration [mg/kg]
Anthracene	0.349
Benz(a)anthracene	0.52
Benzo(a)pyrene	0.606
Benzo(b)fluoranthene	0.942
Benzo(k)fluoranthene	0.288
Chrysene	0.679
Fluoranthene	0.938
Pyrene	1.01

EXPOSURE POINT CONCENTRATIONS: CONSTRUCTION WORKER

Chemical	Direct Contact Soil
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil
	Representative Concentration [mg/kg]
Anthracene	0.349
Benz(a)anthracene	0.52
Benzo(a)pyrene	0.606
Benzo(b)fluoranthene	0.942
Benzo(k)fluoranthene	0.288
Chrysene	0.679
Fluoranthene	0.938
Pyrene	1.01

EXPOSURE POINT CONCENTRATIONS: GROUNDWATER / SURFACE WATER PROTECTION

Chemical	Groundwater and/or Surface Water Protection		
	Representative Groundwater Concentration at the Source [mg/L]	Representative Soil Concentration at the Source [mg/kg] NOT USED IN CALCULATIONS	Representative Groundwater Concentration at the POC [mg/L]
Anthracene			
Benz(a)anthracene			
Benzo(a)pyrene			
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Chrysene			
Fluoranthene			
Pyrene			
	Paste Values...	Paste Values...	Paste Values...

Direct Contact

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Cowherd Particulate Emission Model					
Parameters					
Site size for calculation of Q/C parameter		acres	~~0.5~~	4.06	Calculated
Inverse of Mean Concentration in the Middle of a Square Source	Q/C			53.9	Calculated
Fraction of Vegetative Cover	V	m^2/m^2	~~0.5~~	0.33	Calculated
Mean Annual Wind Speed	U_m	m/s	3.98		Default
Equivalent Threshold Value of Windspeed at 7m	U_t	m/s	11.3		Default
Windspeed Distribution Function from Cowherd et. al, 1985	$F_{(x)}$		0.0495		Default
Soil Properties					
Immediately Below the Building					
Soil Bulk Density	ρ_{sA}	cm^3	1.64		Default
Total Porosity	Θ_{TA}	cm^3/cm^3-soil	0.39		Default
Fractional Organic Carbon Content	foc_A	g-C/g-soil	0.001		Default
Volumetric Water Content	Θ_{wsA}	cm^3/cm^3	0.17		Default
Volumetric Air Content	Θ_{asA}	cm^3/cm^3		0.22	Calculated

Groundwater / Surface Water Protection

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Common Water Inputs					
Source Zone Soil Properties					
Dry Soil Bulk Density of the source zone soil	ρ_s	g/cm³	1.64		Default
Fractional Organic Carbon Content in the source zone soil	foc	g-C/g-soil	0.001		Default
Total Soil Porosity of the source zone soil	Θ_T	cm³/cm³-soil	0.39		Default
Volumetric Water Content in the source zone soil	Θ_{ws}	cm³/cm³	0.17		Default
Volumetric Air Content in the source zone soil	Θ_{as}	cm³/cm³		0.22	Calculated
Saturated Zone Soil Properties					
Dry Soil Bulk Density of the saturated zone soil	ρ_{ss}	g/cm³	1.64		Default
Fractional Organic Carbon Content in the saturated zone soil	focs	g-C/g-soil	0.001		Default
Total Soil Porosity in the saturated zone soil	Θ_{ts}	cm³/cm³-soil	0.39		Default
Source Area Parameters					
Groundwater Darcy Velocity	U_{gw}	ft/year	110		Default
Groundwater Mixing Zone Length	L_{mz}	ft	40		Default
Groundwater Mixing Zone Thickness	δ_{gw}	ft	5.02		Default
Groundwater Mixing Zone Width	W_{gw}	ft	40		Default
Infiltration Rate	I	ft/year	0.82		Default

Exposure and Compliance Point Distances from Source

Groundwater / Surface Water Protection

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Groundwater Protection Parameters					
Distance to Point of Exposure (POE)	$X_{poe,gw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
Distance to the Point of Compliance (POC)	$X_{poc,gw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
Surface Water Protection Parameters					
Distance to the Point of Discharge	$X_{poe,sw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
Distance to the Point of Compliance	$X_{poc,sw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
pH of the receiving surface water	pH		7		Default
Temperature of the receiving surface water	T	°C	15		Default
Hardness of the receiving surface water	H	mg/L	25		Default

Vapor Intrusion: Soil and Source

Parameter	Symbol	Unit	Default Value	Value Used	Justification

Interview Questions

Which of the following best describes the building?
The model does not accommodate structures with crawl spaces or dirt floors. Contact DEQ for more information on how to address these types of situations.

Vapor Intrusion: Enclosed Space

Parameter	Symbol	Unit	Default Value	Value Used	Justification

Please complete the Interview Questions on the Vapor Intrusion tab.

Enter site-specific decay rates for this site if they vary from the default values.

	First Order Decay Rate [day^{-1}]		Unsaturated Zone DAF	
	Default Value	Site-Specific Value	Default Value	Site-Specific Value
Anthracene	0		1	
Benz(a)anthracene	0		1	
Benzo(a)pyrene	0		1	
Benzo(b)fluoranthene	0		1	
Benzo(k)fluoranthene	0		1	
Chrysene	0		1	
Fluoranthene	0		1	
Pyrene	0		1	

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Averaging Time					
Averaging Time for Carcinogens	AT_c	year	70		Default
Averaging Time for Non-Carcinogens, Adult	AT_{nc}	year		30	Calculated
Averaging Time for Non-Carcinogens, Age Adjusted Adult	AT_{nc}	year		24	Calculated
Averaging Time for Non-Carcinogens, Child	AT_{nc}	year		6	Calculated
Averaging Time for Non-Carcinogens, Non-residential	AT_{nc}	year		25	Calculated
Averaging Time for Non-Carcinogens, Construction Worker	AT_{nc}	year		1	Calculated
Body Weight					
Body Weight Resident Adult	BW_a	kg	70		Default
Body Weight Resident Child	BW_c	kg	15		Default
Body Weight Non-residential	BW_{com}	kg	70		Default
Body Weight Construction Worker	BW_{con}	kg	70		Default
Exposure Duration					
Exposure Duration Resident Adult	ED_a	year	30		Default
Exposure Duration Resident Age Adjusted Adult	ED_{aa}	year	24		Default
Exposure Duration Resident Child	ED_c	year	6		Default
Exposure Duration Non-residential	ED_{com}	year	25		Default
Exposure Duration Construction Worker	ED_{con}	year	1		Default
Exposure Frequency for Indirect Pathways					
Exposure Frequency for Indirect Pathway Resident Child	EF_c	day/year	350		Default
Exposure Frequency for Indirect Pathway Resident Adult	EF_a	day/year	350		Default
Exposure Frequency for Indirect Pathway Non-residential	EF_{com}	day/year	250		Default
Exposure Frequency for Indirect Pathway Construction Worker	EF_{con}	day/year	30		Default

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Exposure Frequency for Direct Contact Pathways					
Exposure Frequency for Direct Contact Pathways Resident Adult	EF_{da}	day/year	270		Default
Exposure Frequency for Direct Contact Pathways Non-residential	EF_{dcom}	day/year	180		Default
Exposure Frequency for Direct Contact Pathways Construction Worker	EF_{dcon}	day/year	30		Default
Exposure Frequency for Direct Contact Pathways Resident Child	EF_{dc}	day/year	270		Default
Indoor Exposure Time					
Indoor Exposure Time Resident Adult	ET_{i-a}	hrs/day	24		Default
Indoor Exposure Time Resident Child	ET_{i-c}	hrs/day	24		Default
Indoor Exposure Time Non-residential	ET_{i-com}	hrs/day	8		Default
Outdoor Exposure Time					
Outdoor Exposure Time Resident Adult	ET_{o-a}	hrs/day	2		Default
Outdoor Exposure Time Resident Child	ET_{o-c}	hrs/day	2		Default
Outdoor Exposure Time Non-residential	ET_{o-com}	hrs/day	6		Default
Outdoor Exposure Time Construction Worker	ET_{o-con}	hrs/day	10		Default
Soil Ingestion Rate					
Soil Ingestion Rate Age-adjusted	IR_{s-aa}	mg/day		114	Calculated
Soil Ingestion Rate Age-Adjusted Mutagenic Chemicals	IR_{s-aam}	mg-yr/kg-day		490	Calculated
Soil Ingestion Rate Resident Adult	IR_{s-a}	mg/day	100		Default
Soil Ingestion Ingestion Rate Resident Child	IR_{s-c}	mg/day	200		Default
Soil Ingestion Rate Non-residential	IR_{s-com}	mg/day	100		Default
Soil Ingestion Rate Construction Worker	IR_{s-con}	mg/day	330		Default

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Groundwater Ingestion Rate					
Groundwater Ingestion RateAge-adjusted	IR_{w-aa}	L-yr/kg-day		1.09	Calculated
Groundwater Ingestion Rate Age-Adjusted Mutagenic Chemicals	IR_{w-aam}	L-yr/kg-day		3.39	Calculated
Groundwater Ingestion Rate Resident Adult	IR_{w-a}	L/day	2		Default
Groundwater Ingestion Rate Resident Child	IR_{w-c}	L/day	1		Default
Groundwater Ingestion Rate Non-residential	IR_{w-com}	L/day	1		Default
Skin Surface Area					
Skin Surface Area Age-adjusted	SA_{aa}	mg-yr/kg-day		361	Calculated
Skin Surface AreaAge-Adjusted Mutagenic Dermal	SA_{aam}	mg-yr/kg-day		1,450	Calculated
Skin Surface Area Resident Adult	SA_a	cm^2/day	5,700		Default
Skin Surface Area Resident Child	SA_c	cm^2/day	2,800		Default
Skin Surface Area Non-residential	SA_{com}	cm^2/day	3,300		Default
Skin Surface Area Construction Worker	SA_{con}	cm^2/day	3,300		Default
Soil to Skin Adherence Factor					
Soil to Skin Adherence Resident Adult	M_a	mg/cm^2	0.07		Default
Soil to Skin Adherence Resident Child	M_c	mg/cm^2	0.2		Default
Soil to Skin Adherence Non-residential	M_{com}	mg/cm^2	0.2		Default
Soil to Skin Adherence Construction Worker	M_{con}	mg/cm^2	0.3		Default
Averaging Time for Vapor Flux					
Averaging Time for Vapor Flux Resident Adult	τ	s		946,000,000	Calculated
Averaging Time for Vapor Flux Age-adjusted Resident	τ	s		757,000,000	Calculated
Averaging Time for Vapor Flux Resident Child	τ	s		189,000,000	Calculated
Averaging Time for Vapor Flux Commercial Worker	τ	s		788,000,000	Calculated
Averaging Time for Vapor Flux Construction Worker	τ	s		31,500,000	Calculated
Target Hazard Index	THI		1		Default

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Target Risk	TR		0.00001		Default

RISK/HAZARD QUOTIENT: RESIDENTIAL

RISK EVALUATION RESULTS

Red highlight indicates highest risk and hazard

	Direct Contact Soil			Total Risk Estimate & Hazard Index by Chemical	
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil				
	EPC	Risk	HI	Risk	HI
Anthracene	3.49E-01	*NTOX*	1.57E-05	*NA*	1.57E-05
Benz(a)anthracene	5.20E-01	2.72E-06	*NTOX*	2.72E-06	*NA*
Benzo(a)pyrene	6.06E-01	3.17E-05	*NTOX*	3.17E-05	*NA*
Benzo(b)fluoranthene	9.42E-01	4.92E-06	*NTOX*	4.92E-06	*NA*
Benzo(k)fluoranthene	2.88E-01	1.51E-07	*NTOX*	1.51E-07	*NA*
Chrysene	6.79E-01	3.57E-08	*NTOX*	3.57E-08	*NA*
Fluoranthene	9.38E-01	*NTOX*	3.15E-04	*NA*	3.15E-04
Pyrene	1.01E+00	*NTOX*	4.53E-04	*NA*	4.53E-04
Totals by Pathway		3.95E-05	7.84E-04	**3.95E-05**	**7.84E-04**

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

RISK/HAZARD QUOTIENT: NON-RESIDENTIAL

RISK EVALUATION RESULTS

Red highlight indicates highest risk and hazard

	Direct Contact Soil			Total Risk Estimate & Hazard Index by Chemical	
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil				
	EPC	Risk	HI	Risk	HI
Anthracene	3.49E-01	*NTOX*	1.52E-06	*NA*	1.52E-06
Benz(a)anthracene	5.20E-01	1.79E-07	*NTOX*	1.79E-07	*NA*
Benzo(a)pyrene	6.06E-01	2.07E-06	*NTOX*	2.07E-06	*NA*
Benzo(b)fluoranthene	9.42E-01	3.22E-07	*NTOX*	3.22E-07	*NA*
Benzo(k)fluoranthene	2.88E-01	1.00E-08	*NTOX*	1.00E-08	*NA*
Chrysene	6.79E-01	2.46E-09	*NTOX*	2.46E-09	*NA*
Fluoranthene	9.38E-01	*NTOX*	3.07E-05	*NA*	3.07E-05
Pyrene	1.01E+00	*NTOX*	4.41E-05	*NA*	4.41E-05
Totals by Pathway		2.59E-06	7.63E-05	**2.59E-06**	**7.63E-05**

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

RISK/HAZARD QUOTIENT: CONSTRUCTION WORKER

Red highlight indicates highest risk and hazard

	Direct Contact Soil			Total Risk Estimate & Hazard Index by Chemical	
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil				
	EPC	Risk	HI	Risk	HI
Anthracene	3.49E-01	*NTOX*	6.27E-07	*NA*	6.27E-07
Benz(a)anthracene	5.20E-01	3.03E-09	*NTOX*	3.03E-09	*NA*
Benzo(a)pyrene	6.06E-01	3.43E-08	*NTOX*	3.43E-08	*NA*
Benzo(b)fluoranthene	9.42E-01	5.33E-09	*NTOX*	5.33E-09	*NA*
Benzo(k)fluoranthene	2.88E-01	1.74E-10	*NTOX*	1.74E-10	*NA*
Chrysene	6.79E-01	4.58E-11	*NTOX*	4.58E-11	*NA*
Fluoranthene	9.38E-01	*NTOX*	1.26E-05	*NA*	1.26E-05
Pyrene	1.01E+00	*NTOX*	1.81E-05	*NA*	1.81E-05
Totals by Pathway		4.29E-08	3.14E-05	**4.29E-08**	**3.14E-05**

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

RISK/HAZARD QUOTIENT: SUMMARY

RISK EVALUATION RESULTS

Red highlight indicates target Risk or Hazard Index exceeded for receptor.

Routes of Exposure	Receptor					
	Residential		Non-Residential		Construction Worker	
	Risk	HI	Risk	HI	Risk	HI
Direct Contact Soil Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil	3.95E-05	7.84E-04	2.59E-06	7.63E-05	4.29E-08	3.14E-05
Subsurface Soil Indoor Inhalation of Vapor Emissions	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Groundwater Indoor Inhalation of Vapor Emissions	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Soil-Vapor Indoor Inhalation of Vapor Emissions	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Site Risk	3.95E-05		2.59E-06		4.29E-08	
Site Hazard Index		7.84E-04		7.63E-05		3.14E-05
Target Risk/HI Exceeded?	YES	NO	NO	NO	NO	NO

Exposure Area DU3.1

Site-specific
Resident Equation Inputs for Soil

Variable	Value
THQ (target hazard quotient) unitless	1
TR (target risk) unitless	0.00001
LT (lifetime) years	70
ET_{res} (exposure time) hours/day	24
$ET_{res\text{-}c}$ (child exposure time) hours/day	24
$ET_{res\text{-}a}$ (adult exposure time) hours/day	24
$ET_{0\text{-}2}$ (mutagenic exposure time) hours/day	24
$ET_{2\text{-}6}$ (mutagenic exposure time) hours/day	24
$ET_{6\text{-}16}$ (mutagenic exposure time) hours/day	24
$ET_{16\text{-}26}$ (mutagenic exposure time) hours/day	24
ED_{res} (exposure duration) years	26
$ED_{res\text{-}c}$ (exposure duration - child) years	6
$ED_{res\text{-}a}$ (exposure duration - adult) years	20
$ED_{0\text{-}2}$ (mutagenic exposure duration) years	2
$ED_{2\text{-}6}$ (mutagenic exposure duration) years	4
$ED_{6\text{-}16}$ (mutagenic exposure duration) years	10
$ED_{16\text{-}26}$ (mutagenic exposure duration) years	10
$BW_{res\text{-}c}$ (body weight - child) kg	15
$BW_{res\text{-}a}$ (body weight - adult) kg	80
$BW_{0\text{-}2}$ (mutagenic body weight) kg	15
$BW_{2\text{-}6}$ (mutagenic body weight) kg	15
$BW_{6\text{-}16}$ (mutagenic body weight) kg	80
$BW_{16\text{-}26}$ (mutagenic body weight) kg	80
$SA_{res\text{-}c}$ (skin surface area - child) cm^2/day	2373
$SA_{res\text{-}a}$ (skin surface area - adult) cm^2/day	6032
$SA_{0\text{-}2}$ (mutagenic skin surface area) cm^2/day	2373
$SA_{2\text{-}6}$ (mutagenic skin surface area) cm^2/day	2373
$SA_{6\text{-}16}$ (mutagenic skin surface area) cm^2/day	6032
$SA_{16\text{-}26}$ (mutagenic skin surface area) cm^2/day	6032
EF_{res} (exposure frequency) days/year	350
$EF_{res\text{-}c}$ (exposure frequency - child) days/year	350
$EF_{res\text{-}a}$ (exposure frequency - adult) days/year	350
$EF_{0\text{-}2}$ (mutagenic exposure frequency) days/year	350
$EF_{2\text{-}6}$ (mutagenic exposure frequency) days/year	350
$EF_{6\text{-}16}$ (mutagenic exposure frequency) days/year	350
$EF_{16\text{-}26}$ (mutagenic exposure frequency) days/year	350
$IFS_{res\text{-}adj}$ (age-adjusted soil ingestion factor) mg/kg	36750
$IFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	166833.33
$IRS_{res\text{-}c}$ (soil intake rate - child) mg/day	200
$IRS_{res\text{-}a}$ (soil intake rate - adult) mg/day	100
$IRS_{0\text{-}2}$ (mutagenic soil intake rate) mg/day	200

Site-specific
Resident Equation Inputs for Soil

Variable	Value
IRS_{2-6} (mutagenic soil intake rate) mg/day	200
IRS_{6-16} (mutagenic soil intake rate) mg/day	100
IRS_{16-26} (mutagenic soil intake rate) mg/day	100
AF_{res-a} (skin adherence factor - adult) mg/cm^2	0.07
AF_{res-c} (skin adherence factor - child) mg/cm^2	0.2
AF_{0-2} (mutagenic skin adherence factor) mg/cm^2	0.2
AF_{2-6} (mutagenic skin adherence factor) mg/cm^2	0.2
AF_{6-16} (mutagenic skin adherence factor) mg/cm^2	0.07
AF_{16-26} (mutagenic skin adherence factor) mg/cm^2	0.07
$DFS_{res-adj}$ (age-adjusted soil dermal factor) mg/kg	103390
$DFSM_{res-adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	428260
$City_{PEF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	4.06
Q/C_{wp} (inverse of the ratio of the geometric mean air concentration to the emission flu	49.72427513
PEF (particulate emission factor) m^3/kg	3449677717
A (PEF Dispersion Constant)	11.3161
B (PEF Dispersion Constant)	19.6437
C (PEF Dispersion Constant)	224.8172
V (fraction of vegetative cover) unitless	0.33
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.0495
$City_{VF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	4.06
Q/C_{vol}(inverse of the ratio of the geometric mean air concentration to the emission flu	49.72427513
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	11.3161
B (VF Dispersion Constant)	19.6437
C (VF Dispersion Constant)	224.8172
$City_{VF\ mass\text{-}loading}$ (Climate Zone) Selection	Boise, ID (4)
VF_{ml} (volitization factor - mass-limit) m^3/kg	90601.60722
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	49.72427513
A_s (acres)	4.06
T (exposure interval) yr	26
d_s (depth of source) m	0.3

Site-specific
Resident Equation Inputs for Soil

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
A (VF Dispersion Constant - Mass Limit)	11.3161
B (VF Dispersion Constant - Mass Limit)	19.6437
C (VF Dispersion Constant - Mass Limit)	224.8172

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Site-specific
Resident Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS
Barium	7440-39-3	No	No	-		-		0.2	SA	0.005	SH	0.07
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1

	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)	S (mg/L)	K_{oc} (cm3/g)	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)
Barium	-	1	-	-	-	-	-	3450000000	-	-	-	-
Chromium, Total	-	1	-	-	-	-	-	3450000000	-	-	-	-
Mercury (elemental)	-	1	90600	0.352	0.06	-	3.13	3450000000	-	-	-	-
Selenium	-	1	-	-	-	-	-	3450000000	-	-	-	-

	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)	Ingestion SL Adult THQ=1 (mg/kg)	Dermal SL Adult THQ=1 (mg/kg)	Inhalation SL Adult THQ=1 (mg/kg)	Noncarcinogenic SL Adult THI=1 (mg/kg)	Screening Level (mg/kg)
Barium	15600	-	18000000	15600	167000	-	18000000	165000	1.56E+04 nc
Chromium, Total	-	-	-	-	-	-	-	-	
Mercury (elemental)	-	-	28.3	28.3	-	-	28.3	28.3	2.83E+01 sat
Selenium	391	-	72000000	391	4170	-	72000000	4170	3.91E+02 nc

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Site-specific
Resident Risk for Soil

Chemical	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)	S (mg/L)	K_{oc} (cm3/g)
Barium	-		-		0.2	SA	0.005	SH	0.07	-	1	-	-	-	-
Chromium, Total	-		-		-		-		0.013	-	1	-	-	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	90600	0.352	0.06	-
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion Child HQ	Dermal Child HQ	Inhalation Child HQ	Noncarcinogenic Child HI	Ingestion Adult HQ	Dermal Adult HQ	Inhalation Adult HQ	Noncarcinogenic Adult HI
	-	3450000000	297	-	-	-	-	0.019	-	0.0000165	0.019	0.00178	-	0.0000165	0.0018
	-	3450000000	19.6	-	-	-	-	-	-	-	-	-	-	-	-
	3.13	3450000000	0.31	-	-	-	-	-	-	0.0109	0.0109	-	-	0.0109	0.0109
	-	3450000000	4	-	-	-	-	0.0102	-	5.56E-08	0.0102	0.000959	-	5.56E-08	0.000959
**Total Risk/HI*	-	-	-	-	-	-	-	*0.0292*	-	*0.011*	*0.0402*	*0.00274*	-	*0.011*	*0.0137*

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Site-specific
Composite Worker Equation Inputs for Soil

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
AT_w (averaging time)	365
EF_w (exposure frequency) d/yr	250
ED_w (exposure duration) yr	25
ET_w (exposure time) hr	8
LT (lifetime) yr	70
BW_w (body weight)	80
IR_w (soil ingestion rate) mg/day	100
SA_w (surface area) cm^2/day	3527
AF_w (skin adherence factor) mg/cm^2	0.12
$City_{PEF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	4.06
Q/C_{wp} (inverse of the ratio of the geometric mean air concentration to the emission flu	49.72427513
PEF (particulate emission factor) m^3/kg	3449677717
A (PEF Dispersion Constant)	11.3161
B (PEF Dispersion Constant)	19.6437
C (PEF Dispersion Constant)	224.8172
V (fraction of vegetative cover) unitless	0.33
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.0495
$City_{VF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	4.06
Q/C_{vol}(inverse of the ratio of the geometric mean air concentration to the emission flu	49.72427513
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	11.3161
B (VF Dispersion Constant)	19.6437
C (VF Dispersion Constant)	224.8172
$City_{VF\ mass\text{-}loading}$ (Climate Zone) Selection	Boise, ID (4)
VF_{ml} (volitization factor - mass-limit) m^3/kg	90601.60722
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	49.72427513
A_s (acres)	4.06
T (exposure interval) yr	26
d_s (depth of source) m	0.3

Site-specific
Composite Worker Equation Inputs for Soil

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
A (VF Dispersion Constant - Mass Limit)	11.3161
B (VF Dispersion Constant - Mass Limit)	19.6437
C (VF Dispersion Constant - Mass Limit)	224.8172

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Site-specific
Composite Worker Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Barium	7440-39-3	No	No	-		-		0.2	SA	0.005	SH	0.07	-	1	-	-
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	90600	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	3450000000	-	-	-	-	234000	-	75500000	233000	2.33E+05 max
-	-	-	3450000000	-	-	-	-	-	-	-	-	
3.13	0.06	-	3450000000	-	-	-	-	-	-	119	119	1.19E+02 sat
-	-	-	3450000000	-	-	-	-	5840	-	302000000	5840	5.84E+03 nc

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Site-specific
Composite Worker Risk for Soil

Chemical	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Barium	-		-		0.2	SA	0.005	SH	0.07	-	1	-	-
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	90600	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	3450000000	297	-	-	-	-	0.00127	-	0.00000393	0.00128
	-	-	-	3450000000	19.6	-	-	-	-	-	-	-	-
	3.13	0.06	-	3450000000	0.31	-	-	-	-	-	-	0.0026	0.0026
	-	-	-	3450000000	4	-	-	-	-	0.000685	-	1.32E-08	0.000685
**Total Risk/HI*	-	-	-	-	-	-	-	-	-	*0.00196*	-	*0.00261*	*0.00456*

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Site-specific
Construction Worker Equation Inputs for Soil - Unpaved Road Traffic

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
EF_{cw} (exposure frequency - construction worker) day/yr	250
ED_{cw} (exposure duration - construction worker) yr	1
ET_{cw} (exposure time - construction worker) hr/day	8
LT (lifetime) yr	70
BW_{cw} (body weight - construction worker) kg	80
IR_{cw} (soil ingestion rate - construction worker) mg/day	330
SA_{cw} (surface area - construction worker) cm^2/day	3527
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3
AT_{cw} (averaging time - construction worker carcinogenic)	365
AT_{cw-a} (averaging time - construction worker non-carcinogenic)	350
EW_{cw} (overall duration of construction) weeks/year	50
DW_{cw} (days worked - construction worker) days/week	5
A_s (PEF_{sc} - acres)	4.06
s (road surface silt content) %	8.5
M_{dry} (road surface material moisture content under dry, uncontrolled conditions) %	0.2
p (days per year with at least .01" of precipitation) days/year	90
L_R (length of road segment) ft	420.5404739
W_R (width of road segment) ft	60
number of cars	0
number of trucks	182
tons/car	2.6
tons/truck	44.4
F_D Unitless Dispersion Correction Factor	0.185837208
t_c (overall duration of construction) hours	8400
distance (road length) km/day	0.128180543
T_t (overall duration of traffic) s	7200000
total number of vehicles	0
A_R (surface area of contaminated road segment) m^2	2344.168299
W (mean vehicle weight) tons	0
SigmaVKT (sum of fleet vehicle km traveled) km	0
Q/C_{sr} (inverse of the ratio of the 1-h. geometric mean air concentration to the emission	16.81104131
PEF_{sc} (particulate emission factor) m^3/kg	0
A (Dispersion Constant)	12.9351
B (Dispersion Constant)	5.7383
C (Dispersion Constant)	71.7711
A_{surf} (areal extent of site) m^2	16430.2516
A_s ($VF_{ulim-sc}$ acres)	4.06
T (temperature) C	25
foc (fraction organic carbon in soil) g/g	0.006

Site-specific
Construction Worker Equation Inputs for Soil - Unpaved Road Traffic

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
A (VF Dispersion Constant)	2.4538
B (VF Dispersion Constant)	17.566
C (VF Dispersion Constant)	189.0426
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	9.775437902
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
A_s ($VF_{mlim\text{-}sc}$ acres)	4.06
p_b (dry soil bulk density) g/cm^3	1.5
d_s (average source depth) m	0.3
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	9.775437902
$VF_{mlim\text{-}sc}$ (volitization factor) m^3_{air}/kg_{soil}	3534.864918
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Site-specific
Construction Worker Screening Levels (RSL) for Soil - Unpaved Road Traffic

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Barium	7440-39-3	No	No	-		-		0.2	SA	0.005	SH	0.07	-	1	-	-
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	3530	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	0	-	-	-	-	67900	-	-	67900	6.79E+04 nc
-	-	-	0	-	-	-	-	-	-	-	-	
3.13	0.06	-	0	-	-	-	-	-	-	-	-	
-	-	-	0	-	-	-	-	1700	-	-	1700	1.70E+03 nc

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Site-specific
Construction Worker Risk for Soil - Unpaved Road Traffic

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Barium	-		-		0.2	SA	0.005	SH	0.07	-	1	-	-
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	3530	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	0	297	-	-	-	-	0.00438	-	-	0.00438
	-	-	-	0	19.6	-	-	-	-	-	-	-	-
	3.13	0.06	-	0	0.31	-	-	-	-	-	-	-	-
	-	-	-	0	4	-	-	-	-	0.00236	-	-	0.00236
**Total Risk/HI*	-	-	-	-	-	-	-	-	-	*0.00673*	-	-	*0.00673*

Output generated 30OCT2017:15:21:41

Site-specific
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
EF_{cw} (exposure frequency - construction worker) day/yr	250
ED_{cw} (exposure duration - construction worker) yr	1
ET_{cw} (exposure time - construction worker) hr/day	8
LT (lifetime) yr	70
BW_{cw} (body weight - construction worker) kg	80
IR_{cw} (soil ingestion rate - construction worker) mg/day	330
SA_{cw} (surface area - construction worker) cm^2/day	3527
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3
AT_{cw} (averaging time - construction worker carcinogenic)	365
AT_{cw-a} (averaging time - construction worker non-carcinogenic)	350
EW_{cw} (overall duration of construction) weeks/year	50
DW_{cw} (days worked - construction worker) days/week	5
A_c (acres)	4.06
A_{till} (areal extent of tilling) acres	4.06
A_{excav} (area of excavation site) m^2	16443.83
$A_{c\text{-}grade}$ (areal extent of grading) acres	4.06
$A_{c\text{-}doz}$ (areal extent of dozing) acres	4.06
$M_{m\text{-}doz}$ (Gravimetric soil moisture content) %	7.9
$M_{m\text{-}excav}$ (Gravimetric soil moisture content) %	12
p_{soil} (density) g/cm^3 - chemical-specific	1.68
$N_{A\text{-}dump}$ (number of times soil is dumped)	2
$N_{A\text{-}till}$ (number of times soil is tilled)	2
s_{till} (soil silt content) %	18
s_{doz} (soil silt content) %	6.9
B_l (dozing blade length) m	3.7
B_l (grading blade length) m	2.5
$N_{A\text{-}doz}$ (number of times site was dozed)	0
$N_{A\text{-}grade}$ (number of times site was graded)	1
S_{doz} (dozing speed) kph	11.4
S_{grade} (dozing speed) kph	11.4
d_{excav} (average depth of excavation site) m	0.3
V (fraction of vegetative cover)	0.33
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value) m/s	11.32
t_c (overall duration of construction) hours	8400
F_D Unitless Dispersion Correction Factor	0.185837208
T (time over which traffic occurs) s	7200000
$J`_T$ (g/m^2s)	5.26169E-06
F(x) (function dependant on U_m/U_t derived using Cowherd et al. (1985))	0.0495

Site-specific
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value
M_{wind} (dust emitted by wind erosion) g	51288.84717
M_{doz} (dust emitted from dozing operations) g	
M_{till} (dust emitted from tilling operations) g	20476.01419
M_{grade} (dust emitted from grading operations) g	2869.90955
M_{excav} (dust emitted from excavation soil dumping) g	2021.226564
$SigmaVKT_{doz}$ (sum of fleet vehicle km traveled) km	
$SigmaVKT_{grade}$ (sum of fleet vehicle km traveled) km	6.572328
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	9.775437902
$PEF`_{sc}$ (particulate emission factor) m^3/kg	9997193.338
A (PEF Dispersion Constant)	2.4538
B (PEF Dispersion Constant)	17.566
C (PEF Dispersion Constant)	189.0426
A_{surf} (areal extent of site) m^2	16430.2516
A_s ($VF_{ulim-sc}$ acres)	4.06
T (temperature) C	25
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
A (VF Dispersion Constant)	2.4538
B (VF Dispersion Constant)	17.566
C (VF Dispersion Constant)	189.0426
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	9.775437902
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
A_s ($VF_{mlim-sc}$ acres)	4.06
p_b (dry soil bulk density) g/cm^3	1.5
d_s (average source depth) m	0.3
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	9.775437902
$VF_{mlim-sc}$ (volitization factor) m^3_{air}/kg_{soil}	3534.864918
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Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Barium	7440-39-3	No	No	-		-		0.2	SA	0.005	SH	0.07	-	1	-	-
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	3530	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	10000000	-	-	-	-	67900	-	210000	51300	5.13E+04 nc
-	-	-	10000000	-	-	-	-	-	-	-	-	
3.13	0.06	-	10000000	-	-	-	-	-	-	4.45	4.45	4.45E+00 sat
-	-	-	10000000	-	-	-	-	1700	-	840000	1690	1.69E+03 nc

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Site-specific
Construction Worker Risk for Soil - Other Construction Activities

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Barium	-		-		0.2	SA	0.005	SH	0.07	-	1	-	-
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	3530	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	10000000	297	-	-	-	-	0.00438	-	0.00141	0.00579
	-	-	-	10000000	19.6	-	-	-	-	-	-	-	-
	3.13	0.06	-	10000000	0.31	-	-	-	-	-	-	0.0696	0.0696
	-	-	-	10000000	4	-	-	-	-	0.00236	-	0.00000476	0.00236
**Total Risk/HI*	-	-	-	-	-	-	-	-	-	*0.00673*	-	*0.071*	*0.0778*

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SITE INFORMATION

Facility ID	
Site Name	CDA BNSF R2R ROW
Date	May 16, 2017
Name of Preparer	Rachel Gibeault
Address	DU 3.1
Latitude	
Longitude	

EXPOSURE POINT CONCENTRATIONS: RESIDENTIAL

Chemical	Direct Contact Soil
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil
	Representative Concentration [mg/kg]
Anthracene	0.0571
Benz(a)anthracene	0.0856
Benzo(a)pyrene	0.121
Benzo(b)fluoranthene	0.196
Benzo(k)fluoranthene	0.0634
Chrysene	0.125
Fluoranthene	0.142
Pyrene	0.247

EXPOSURE POINT CONCENTRATIONS: NON-RESIDENTIAL

Chemical	Direct Contact Soil
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil
	Representative Concentration [mg/kg]
Anthracene	0.0571
Benz(a)anthracene	0.0856
Benzo(a)pyrene	0.121
Benzo(b)fluoranthene	0.196
Benzo(k)fluoranthene	0.0634
Chrysene	0.125
Fluoranthene	0.142
Pyrene	0.247

EXPOSURE POINT CONCENTRATIONS: CONSTRUCTION WORKER

Chemical	Direct Contact Soil Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil Representative Concentration [mg/kg]
Anthracene	0.0571
Benz(a)anthracene	0.0856
Benzo(a)pyrene	0.121
Benzo(b)fluoranthene	0.196
Benzo(k)fluoranthene	0.0634
Chrysene	0.125
Fluoranthene	0.142
Pyrene	0.247

EXPOSURE POINT CONCENTRATIONS: GROUNDWATER / SURFACE WATER PROTECTION

Chemical	Groundwater and/or Surface Water Protection		
	Representative Groundwater Concentration at the Source [mg/L]	Representative Soil Concentration at the Source [mg/kg] NOT USED IN CALCULATIONS	Representative Groundwater Concentration at the POC [mg/L]
Anthracene			
Benz(a)anthracene			
Benzo(a)pyrene			
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Chrysene			
Fluoranthene			
Pyrene			
	Paste Values...	Paste Values...	Paste Values...

Direct Contact

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Cowherd Particulate Emission Model					
Parameters					
Site size for calculation of Q/C parameter		acres	~~0.5~~	4.06	Calculated
Inverse of Mean Concentration in the Middle of a Square Source	Q/C			53.9	Calculated
Fraction of Vegetative Cover	V	m^2/m^2	~~0.5~~	0.33	Calculated
Mean Annual Wind Speed	U_m	m/s	3.98		Default
Equivalent Threshold Value of Windspeed at 7m	U_t	m/s	11.3		Default
Windspeed Distribution Function from Cowherd et. al, 1985	$F_{(x)}$		0.0495		Default
Soil Properties					
Immediately Below the Building					
Soil Bulk Density	ρ_{sA}	cm^3	1.64		Default
Total Porosity	Θ_{TA}	cm^3/cm^3-soil	0.39		Default
Fractional Organic Carbon Content	foc_A	g-C/g-soil	0.001		Default
Volumetric Water Content	Θ_{wsA}	cm^3/cm^3	0.17		Default
Volumetric Air Content	Θ_{asA}	cm^3/cm^3		0.22	Calculated

Groundwater / Surface Water Protection

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Common Water Inputs					
Source Zone Soil Properties					
Dry Soil Bulk Density of the source zone soil	ρ_s	g/cm³	1.64		Default
Fractional Organic Carbon Content in the source zone soil	foc	g-C/g-soil	0.001		Default
Total Soil Porosity of the source zone soil	Θ_T	cm³/cm³-soil	0.39		Default
Volumetric Water Content in the source zone soil	Θ_{ws}	cm³/cm³	0.17		Default
Volumetric Air Content in the source zone soil	Θ_{as}	cm³/cm³		0.22	Calculated
Saturated Zone Soil Properties					
Dry Soil Bulk Density of the saturated zone soil	ρ_{ss}	g/cm³	1.64		Default
Fractional Organic Carbon Content in the saturated zone soil	focs	g-C/g-soil	0.001		Default
Total Soil Porosity in the saturated zone soil	Θ_{ts}	cm³/cm³-soil	0.39		Default
Source Area Parameters					
Groundwater Darcy Velocity	U_{gw}	ft/year	110		Default
Groundwater Mixing Zone Length	L_{mz}	ft	40		Default
Groundwater Mixing Zone Thickness	δ_{gw}	ft	5.02		Default
Groundwater Mixing Zone Width	W_{gw}	ft	40		Default
Infiltration Rate	I	ft/year	0.82		Default

Exposure and Compliance Point Distances from Source

Groundwater / Surface Water Protection

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Groundwater Protection Parameters					
Distance to Point of Exposure (POE)	$X_{poe,gw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
Distance to the Point of Compliance (POC)	$X_{poc,gw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
Surface Water Protection Parameters					
Distance to the Point of Discharge	$X_{poe,sw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
Distance to the Point of Compliance	$X_{poc,sw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
pH of the receiving surface water	pH		7		Default
Temperature of the receiving surface water	T	°C	15		Default
Hardness of the receiving surface water	H	mg/L	25		Default

Vapor Intrusion: Soil and Source

Parameter	Symbol	Unit	Default Value	Value Used	Justification

Interview Questions

Which of the following best describes the building?
The model does not accommodate structures with crawl spaces or dirt floors. Contact DEQ for more information on how to address these types of situations.

Vapor Intrusion: Enclosed Space

Parameter	Symbol	Unit	Default Value	Value Used	Justification

Please complete the Interview Questions on the Vapor Intrusion tab.

Enter site-specific decay rates for this site if they vary from the default values.

	First Order Decay Rate [day^{-1}]		Unsaturated Zone DAF	
	Default Value	Site-Specific Value	Default Value	Site-Specific Value
Anthracene	0		1	
Benz(a)anthracene	0		1	
Benzo(a)pyrene	0		1	
Benzo(b)fluoranthene	0		1	
Benzo(k)fluoranthene	0		1	
Chrysene	0		1	
Fluoranthene	0		1	
Pyrene	0		1	

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Averaging Time					
Averaging Time for Carcinogens	AT_c	year	70		Default
Averaging Time for Non-Carcinogens, Adult	AT_{nc}	year		30	Calculated
Averaging Time for Non-Carcinogens, Age Adjusted Adult	AT_{nc}	year		24	Calculated
Averaging Time for Non-Carcinogens, Child	AT_{nc}	year		6	Calculated
Averaging Time for Non-Carcinogens, Non-residential	AT_{nc}	year		25	Calculated
Averaging Time for Non-Carcinogens, Construction Worker	AT_{nc}	year		1	Calculated
Body Weight					
Body Weight Resident Adult	BW_a	kg	70		Default
Body Weight Resident Child	BW_c	kg	15		Default
Body Weight Non-residential	BW_{com}	kg	70		Default
Body Weight Construction Worker	BW_{con}	kg	70		Default
Exposure Duration					
Exposure Duration Resident Adult	ED_a	year	30		Default
Exposure Duration Resident Age Adjusted Adult	ED_{aa}	year	24		Default
Exposure Duration Resident Child	ED_c	year	6		Default
Exposure Duration Non-residential	ED_{com}	year	25		Default
Exposure Duration Construction Worker	ED_{con}	year	1		Default
Exposure Frequency for Indirect Pathways					
Exposure Frequency for Indirect Pathway Resident Child	EF_c	day/year	350		Default
Exposure Frequency for Indirect Pathway Resident Adult	EF_a	day/year	350		Default
Exposure Frequency for Indirect Pathway Non-residential	EF_{com}	day/year	250		Default
Exposure Frequency for Indirect Pathway Construction Worker	EF_{con}	day/year	30		Default

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Exposure Frequency for Direct Contact Pathways					
Exposure Frequency for Direct Contact Pathways Resident Adult	EF_{da}	day/year	270		Default
Exposure Frequency for Direct Contact Pathways Non-residential	EF_{dcom}	day/year	180		Default
Exposure Frequency for Direct Contact Pathways Construction Worker	EF_{dcon}	day/year	30		Default
Exposure Frequency for Direct Contact Pathways Resident Child	EF_{dc}	day/year	270		Default
Indoor Exposure Time					
Indoor Exposure Time Resident Adult	ET_{i-a}	hrs/day	24		Default
Indoor Exposure Time Resident Child	ET_{i-c}	hrs/day	24		Default
Indoor Exposure Time Non-residential	ET_{i-com}	hrs/day	8		Default
Outdoor Exposure Time					
Outdoor Exposure Time Resident Adult	ET_{o-a}	hrs/day	2		Default
Outdoor Exposure Time Resident Child	ET_{o-c}	hrs/day	2		Default
Outdoor Exposure Time Non-residential	ET_{o-com}	hrs/day	6		Default
Outdoor Exposure Time Construction Worker	ET_{o-con}	hrs/day	10		Default
Soil Ingestion Rate					
Soil Ingestion Rate Age-adjusted	IR_{s-aa}	mg/day		114	Calculated
Soil Ingestion Rate Age-Adjusted Mutagenic Chemicals	IR_{s-aam}	mg-yr/kg-day		490	Calculated
Soil Ingestion Rate Resident Adult	IR_{s-a}	mg/day	100		Default
Soil Ingestion Ingestion Rate Resident Child	IR_{s-c}	mg/day	200		Default
Soil Ingestion Rate Non-residential	IR_{s-com}	mg/day	100		Default
Soil Ingestion Rate Construction Worker	IR_{s-con}	mg/day	330		Default

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Groundwater Ingestion Rate					
Groundwater Ingestion RateAge-adjusted	IR_{w-aa}	L-yr/kg-day		1.09	Calculated
Groundwater Ingestion Rate Age-Adjusted Mutagenic Chemicals	IR_{w-aam}	L-yr/kg-day		3.39	Calculated
Groundwater Ingestion Rate Resident Adult	IR_{w-a}	L/day	2		Default
Groundwater Ingestion Rate Resident Child	IR_{w-c}	L/day	1		Default
Groundwater Ingestion Rate Non-residential	IR_{w-com}	L/day	1		Default
Skin Surface Area					
Skin Surface Area Age-adjusted	SA_{aa}	mg-yr/kg-day		361	Calculated
Skin Surface AreaAge-Adjusted Mutagenic Dermal	SA_{aam}	mg-yr/kg-day		1,450	Calculated
Skin Surface Area Resident Adult	SA_a	cm^2/day	5,700		Default
Skin Surface Area Resident Child	SA_c	cm^2/day	2,800		Default
Skin Surface Area Non-residential	SA_{com}	cm^2/day	3,300		Default
Skin Surface Area Construction Worker	SA_{con}	cm^2/day	3,300		Default
Soil to Skin Adherence Factor					
Soil to Skin Adherence Resident Adult	M_a	mg/cm^2	0.07		Default
Soil to Skin Adherence Resident Child	M_c	mg/cm^2	0.2		Default
Soil to Skin Adherence Non-residential	M_{com}	mg/cm^2	0.2		Default
Soil to Skin Adherence Construction Worker	M_{con}	mg/cm^2	0.3		Default
Averaging Time for Vapor Flux					
Averaging Time for Vapor Flux Resident Adult	τ	s		946,000,000	Calculated
Averaging Time for Vapor Flux Age-adjusted Resident	τ	s		757,000,000	Calculated
Averaging Time for Vapor Flux Resident Child	τ	s		189,000,000	Calculated
Averaging Time for Vapor Flux Commercial Worker	τ	s		788,000,000	Calculated
Averaging Time for Vapor Flux Construction Worker	τ	s		31,500,000	Calculated
Target Hazard Index	THI		1		Default

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Target Risk	TR		0.00001		Default

RISK/HAZARD QUOTIENT: RESIDENTIAL

RISK EVALUATION RESULTS

Red highlight indicates highest risk and hazard

	Direct Contact Soil			Total Risk Estimate & Hazard Index by Chemical	
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil				
	EPC	Risk	HI	Risk	HI
Anthracene	5.71E-02	*NTOX*	2.56E-06	*NA*	2.56E-06
Benz(a)anthracene	8.56E-02	4.48E-07	*NTOX*	4.48E-07	*NA*
Benzo(a)pyrene	1.21E-01	6.32E-06	*NTOX*	6.32E-06	*NA*
Benzo(b)fluoranthene	1.96E-01	1.02E-06	*NTOX*	1.02E-06	*NA*
Benzo(k)fluoranthene	6.34E-02	3.32E-08	*NTOX*	3.32E-08	*NA*
Chrysene	1.25E-01	6.58E-09	*NTOX*	6.58E-09	*NA*
Fluoranthene	1.42E-01	*NTOX*	4.78E-05	*NA*	4.78E-05
Pyrene	2.47E-01	*NTOX*	1.11E-04	*NA*	1.11E-04
Totals by Pathway		7.84E-06	1.61E-04	**7.84E-06**	**1.61E-04**

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

RISK/HAZARD QUOTIENT: NON-RESIDENTIAL

RISK EVALUATION RESULTS

Red highlight indicates highest risk and hazard

	Direct Contact Soil			Total Risk Estimate & Hazard Index by Chemical	
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil				
	EPC	Risk	HI	Risk	HI
Anthracene	5.71E-02	*NTOX*	2.49E-07	*NA*	2.49E-07
Benz(a)anthracene	8.56E-02	2.95E-08	*NTOX*	2.95E-08	*NA*
Benzo(a)pyrene	1.21E-01	4.14E-07	*NTOX*	4.14E-07	*NA*
Benzo(b)fluoranthene	1.96E-01	6.70E-08	*NTOX*	6.70E-08	*NA*
Benzo(k)fluoranthene	6.34E-02	2.21E-09	*NTOX*	2.21E-09	*NA*
Chrysene	1.25E-01	4.52E-10	*NTOX*	4.52E-10	*NA*
Fluoranthene	1.42E-01	*NTOX*	4.65E-06	*NA*	4.65E-06
Pyrene	2.47E-01	*NTOX*	1.08E-05	*NA*	1.08E-05
Totals by Pathway		5.13E-07	1.57E-05	**5.13E-07**	**1.57E-05**

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

RISK/HAZARD QUOTIENT: CONSTRUCTION WORKER

Red highlight indicates highest risk and hazard

	Direct Contact Soil			Total Risk Estimate & Hazard Index by Chemical	
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil				
	EPC	Risk	HI	Risk	HI
Anthracene	5.71E-02	*NTOX*	1.03E-07	*NA*	1.03E-07
Benz(a)anthracene	8.56E-02	4.99E-10	*NTOX*	4.99E-10	*NA*
Benzo(a)pyrene	1.21E-01	6.84E-09	*NTOX*	6.84E-09	*NA*
Benzo(b)fluoranthene	1.96E-01	1.11E-09	*NTOX*	1.11E-09	*NA*
Benzo(k)fluoranthene	6.34E-02	3.82E-11	*NTOX*	3.82E-11	*NA*
Chrysene	1.25E-01	8.44E-12	*NTOX*	8.44E-12	*NA*
Fluoranthene	1.42E-01	*NTOX*	1.91E-06	*NA*	1.91E-06
Pyrene	2.47E-01	*NTOX*	4.43E-06	*NA*	4.43E-06
Totals by Pathway		8.50E-09	6.45E-06	**8.50E-09**	**6.45E-06**

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

RISK/HAZARD QUOTIENT: SUMMARY

RISK EVALUATION RESULTS

Red highlight indicates target Risk or Hazard Index exceeded for receptor.

Routes of Exposure	Receptor					
	Residential		Non-Residential		Construction Worker	
	Risk	HI	Risk	HI	Risk	HI
Direct Contact Soil Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil	7.84E-06	1.61E-04	5.13E-07	1.57E-05	8.50E-09	6.45E-06
Subsurface Soil Indoor Inhalation of Vapor Emissions	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Groundwater Indoor Inhalation of Vapor Emissions	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Soil-Vapor Indoor Inhalation of Vapor Emissions	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Site Risk	7.84E-06		5.13E-07		8.50E-09	
Site Hazard Index		1.61E-04		1.57E-05		6.45E-06
Target Risk/HI Exceeded?	NO	NO	NO	NO	NO	NO

Exposure Area DU3.2

Site-specific
Resident Equation Inputs for Soil

Variable	Value
THQ (target hazard quotient) unitless	1
TR (target risk) unitless	0.00001
LT (lifetime) years	70
ET_{res} (exposure time) hours/day	24
$ET_{res\text{-}c}$ (child exposure time) hours/day	24
$ET_{res\text{-}a}$ (adult exposure time) hours/day	24
$ET_{0\text{-}2}$ (mutagenic exposure time) hours/day	24
$ET_{2\text{-}6}$ (mutagenic exposure time) hours/day	24
$ET_{6\text{-}16}$ (mutagenic exposure time) hours/day	24
$ET_{16\text{-}26}$ (mutagenic exposure time) hours/day	24
ED_{res} (exposure duration) years	26
$ED_{res\text{-}c}$ (exposure duration - child) years	6
$ED_{res\text{-}a}$ (exposure duration - adult) years	20
$ED_{0\text{-}2}$ (mutagenic exposure duration) years	2
$ED_{2\text{-}6}$ (mutagenic exposure duration) years	4
$ED_{6\text{-}16}$ (mutagenic exposure duration) years	10
$ED_{16\text{-}26}$ (mutagenic exposure duration) years	10
$BW_{res\text{-}c}$ (body weight - child) kg	15
$BW_{res\text{-}a}$ (body weight - adult) kg	80
$BW_{0\text{-}2}$ (mutagenic body weight) kg	15
$BW_{2\text{-}6}$ (mutagenic body weight) kg	15
$BW_{6\text{-}16}$ (mutagenic body weight) kg	80
$BW_{16\text{-}26}$ (mutagenic body weight) kg	80
$SA_{res\text{-}c}$ (skin surface area - child) cm^2/day	2373
$SA_{res\text{-}a}$ (skin surface area - adult) cm^2/day	6032
$SA_{0\text{-}2}$ (mutagenic skin surface area) cm^2/day	2373
$SA_{2\text{-}6}$ (mutagenic skin surface area) cm^2/day	2373
$SA_{6\text{-}16}$ (mutagenic skin surface area) cm^2/day	6032
$SA_{16\text{-}26}$ (mutagenic skin surface area) cm^2/day	6032
EF_{res} (exposure frequency) days/year	350
$EF_{res\text{-}c}$ (exposure frequency - child) days/year	350
$EF_{res\text{-}a}$ (exposure frequency - adult) days/year	350
$EF_{0\text{-}2}$ (mutagenic exposure frequency) days/year	350
$EF_{2\text{-}6}$ (mutagenic exposure frequency) days/year	350
$EF_{6\text{-}16}$ (mutagenic exposure frequency) days/year	350
$EF_{16\text{-}26}$ (mutagenic exposure frequency) days/year	350
$IFS_{res\text{-}adj}$ (age-adjusted soil ingestion factor) mg/kg	36750
$IFSM_{res\text{-}adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	166833.33
$IRS_{res\text{-}c}$ (soil intake rate - child) mg/day	200
$IRS_{res\text{-}a}$ (soil intake rate - adult) mg/day	100
$IRS_{0\text{-}2}$ (mutagenic soil intake rate) mg/day	200

Site-specific
Resident Equation Inputs for Soil

Variable	Value
IRS_{2-6} (mutagenic soil intake rate) mg/day	200
IRS_{6-16} (mutagenic soil intake rate) mg/day	100
IRS_{16-26} (mutagenic soil intake rate) mg/day	100
AF_{res-a} (skin adherence factor - adult) mg/cm^2	0.07
AF_{res-c} (skin adherence factor - child) mg/cm^2	0.2
AF_{0-2} (mutagenic skin adherence factor) mg/cm^2	0.2
AF_{2-6} (mutagenic skin adherence factor) mg/cm^2	0.2
AF_{6-16} (mutagenic skin adherence factor) mg/cm^2	0.07
AF_{16-26} (mutagenic skin adherence factor) mg/cm^2	0.07
$DFS_{res-adj}$ (age-adjusted soil dermal factor) mg/kg	103390
$DFSM_{res-adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	428260
$City_{PEF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	1.24
Q/C_{wp} (inverse of the ratio of the geometric mean air concentration to the emission flu	60.6570145
PEF (particulate emission factor) m^3/kg	4208148853
A (PEF Dispersion Constant)	11.3161
B (PEF Dispersion Constant)	19.6437
C (PEF Dispersion Constant)	224.8172
V (fraction of vegetative cover) unitless	0.33
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.0495
$City_{VF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	1.24
Q/C_{vol}(inverse of the ratio of the geometric mean air concentration to the emission flu	60.6570145
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	11.3161
B (VF Dispersion Constant)	19.6437
C (VF Dispersion Constant)	224.8172
$City_{VF\ mass\text{-}loading}$ (Climate Zone) Selection	Boise, ID (4)
VF_{ml} (volitization factor - mass-limit) m^3/kg	110521.933
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	60.6570145
A_s (acres)	1.24
T (exposure interval) yr	26
d_s (depth of source) m	0.3

Site-specific
Resident Equation Inputs for Soil

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
A (VF Dispersion Constant - Mass Limit)	11.3161
B (VF Dispersion Constant - Mass Limit)	19.6437
C (VF Dispersion Constant - Mass Limit)	224.8172

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Site-specific
Resident Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1

	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)	S (mg/L)	K_{oc} (cm3/g)	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)
Chromium, Total	-	1	-	-	-	-	-	4210000000	-	-	-	-
Mercury (elemental)	-	1	111000	0.352	0.06	-	3.13	4210000000	-	-	-	-
Selenium	-	1	-	-	-	-	-	4210000000	-	-	-	-

	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)	Ingestion SL Adult THQ=1 (mg/kg)	Dermal SL Adult THQ=1 (mg/kg)	Inhalation SL Adult THQ=1 (mg/kg)	Noncarcinogenic SL Adult THI=1 (mg/kg)	Screening Level (mg/kg)
Chromium, Total	-	-	-	-	-	-	-	-	
Mercury (elemental)	-	-	34.6	34.6	-	-	34.6	34.6	3.46E+01 sat
Selenium	391	-	87800000	391	4170	-	87800000	4170	3.91E+02 nc

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Site-specific
Resident Risk for Soil

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)	S (mg/L)	K_{oc} (cm3/g)
Chromium, Total	-		-		-		-		0.013	-	1	-	-	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	111000	0.352	0.06	-
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion Child HQ	Dermal Child HQ	Inhalation Child HQ	Noncarcinogenic Child HI	Ingestion Adult HQ	Dermal Adult HQ	Inhalation Adult HQ	Noncarcinogenic Adult HI
	-	4210000000	25.3	-	-	-	-	-	-	-	-	-	-	-	-
	3.13	4210000000	0.342	-	-	-	-	-	-	0.00989	0.00989	-	-	0.00989	0.00989
	-	4210000000	4	-	-	-	-	0.0102	-	4.56E-08	0.0102	0.000959	-	4.56E-08	0.000959
**Total Risk/HI*	-	-	-	-	-	-	-	*0.0102*	-	*0.00989*	*0.0201*	*0.000959*	-	*0.00989*	*0.0109*

Output generated 27OCT2017:14:03:02

Site-specific
Composite Worker Equation Inputs for Soil

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
AT_w (averaging time)	365
EF_w (exposure frequency) d/yr	250
ED_w (exposure duration) yr	25
ET_w (exposure time) hr	8
LT (lifetime) yr	70
BW_w (body weight)	80
IR_w (soil ingestion rate) mg/day	100
SA_w (surface area) cm^2/day	3527
AF_w (skin adherence factor) mg/cm^2	0.12
$City_{PEF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	1.24
Q/C_{wp} (inverse of the ratio of the geometric mean air concentration to the emission flu	60.6570145
PEF (particulate emission factor) m^3/kg	4208148853
A (PEF Dispersion Constant)	11.3161
B (PEF Dispersion Constant)	19.6437
C (PEF Dispersion Constant)	224.8172
V (fraction of vegetative cover) unitless	0.33
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.0495
$City_{VF}$ (Climate Zone) Selection	Boise, ID (4)
A_s (acres)	1.24
Q/C_{vol}(inverse of the ratio of the geometric mean air concentration to the emission flu	60.6570145
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	11.3161
B (VF Dispersion Constant)	19.6437
C (VF Dispersion Constant)	224.8172
$City_{VF\ mass\text{-}loading}$ (Climate Zone) Selection	Boise, ID (4)
VF_{ml} (volitization factor - mass-limit) m^3/kg	110521.933
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	60.6570145
A_s (acres)	1.24
T (exposure interval) yr	26
d_s (depth of source) m	0.3

Site-specific
Composite Worker Equation Inputs for Soil

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
A (VF Dispersion Constant - Mass Limit)	11.3161
B (VF Dispersion Constant - Mass Limit)	19.6437
C (VF Dispersion Constant - Mass Limit)	224.8172

Output generated 27OCT2017:16:51:59

Site-specific
Composite Worker Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	111000	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	4210000000	-	-	-	-	-	-	-	-	
3.13	0.06	-	4210000000	-	-	-	-	-	-	145	145	1.45E+02 sat
-	-	-	4210000000	-	-	-	-	5840	-	369000000	5840	5.84E+03 nc

Output generated 27OCT2017:16:51:59

Site-specific
Composite Worker Risk for Soil

Chemical	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	111000	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	4210000000	25.3	-	-	-	-	-	-	-	-
	3.13	0.06	-	4210000000	0.342	-	-	-	-	-	-	0.00236	0.00236
	-	-	-	4210000000	4	-	-	-	-	0.000685	-	1.09E-08	0.000685
**Total Risk/HI*	-	-	-	-	-	-	-	-	-	*0.000685*	-	*0.00236*	*0.00304*

Output generated 27OCT2017:16:51:59

Site-specific
Construction Worker Equation Inputs for Soil - Unpaved Road Traffic

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
EF_{cw} (exposure frequency - construction worker) day/yr	250
ED_{cw} (exposure duration - construction worker) yr	1
ET_{cw} (exposure time - construction worker) hr/day	8
LT (lifetime) yr	70
BW_{cw} (body weight - construction worker) kg	80
IR_{cw} (soil ingestion rate - construction worker) mg/day	330
SA_{cw} (surface area - construction worker) cm^2/day	3527
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3
AT_{cw} (averaging time - construction worker carcinogenic)	365
AT_{cw-a} (averaging time - construction worker non-carcinogenic)	350
EW_{cw} (overall duration of construction) weeks/year	50
DW_{cw} (days worked - construction worker) days/week	5
A_s (PEF_{sc} - acres)	1.24
s (road surface silt content) %	8.5
M_{dry} (road surface material moisture content under dry, uncontrolled conditions) %	0.2
p (days per year with at least .01" of precipitation) days/year	90
L_R (length of road segment) ft	232.4104361
W_R (width of road segment) ft	60
number of cars	0
number of trucks	56
tons/car	2.6
tons/truck	44.4
F_D Unitless Dispersion Correction Factor	0.185837208
t_c (overall duration of construction) hours	8400
distance (road length) km/day	0.070838594
T_t (overall duration of traffic) s	7200000
total number of vehicles	0
A_R (surface area of contaminated road segment) m^2	1295.497605
W (mean vehicle weight) tons	0
SigmaVKT (sum of fleet vehicle km traveled) km	0
Q/C_{sr} (inverse of the ratio of the 1-h. geometric mean air concentration to the emission	19.78620314
PEF_{sc} (particulate emission factor) m^3/kg	0
A (Dispersion Constant)	12.9351
B (Dispersion Constant)	5.7383
C (Dispersion Constant)	71.7711
A_{surf} (areal extent of site) m^2	5018.1064
A_s ($VF_{ulim-sc}$ acres)	1.24
T (temperature) C	25
foc (fraction organic carbon in soil) g/g	0.006

Site-specific
Construction Worker Equation Inputs for Soil - Unpaved Road Traffic

Variable	Value
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
A (VF Dispersion Constant)	2.4538
B (VF Dispersion Constant)	17.566
C (VF Dispersion Constant)	189.0426
Q/C_{sa} (inverse of the ratio of the geometric mean air concentration to the emission flu	12.06312994
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
A_s ($VF_{mlim-sc}$ acres)	1.24
p_b (dry soil bulk density) g/cm^3	1.5
d_s (average source depth) m	0.3
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission flu	12.06312994
$VF_{mlim-sc}$ (volitization factor) m^3_{air}/kg_{soil}	4362.10994
Output generated 30OCT2017:15:25:10	

Site-specific
Construction Worker Screening Levels (RSL) for Soil - Unpaved Road Traffic

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	4360	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	0	-	-	-	-	-	-	-	-	
3.13	0.06	-	0	-	-	-	-	-	-	-	-	
-	-	-	0	-	-	-	-	1700	-	-	1700	1.70E+03 nc

Output generated 30OCT2017:15:25:10

Site-specific
Construction Worker Risk for Soil - Unpaved Road Traffic

Chemical	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	4360	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	0	25.3	-	-	-	-	-	-	-	-
	3.13	0.06	-	0	0.342	-	-	-	-	-	-	-	-
	-	-	-	0	4	-	-	-	-	0.00236	-	-	0.00236
**Total Risk/HI*	-	-	-	-	-	-	-	-	-	*0.00236*	-	-	*0.00236*

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Site-specific
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
EF_{cw} (exposure frequency - construction worker) day/yr	250
ED_{cw} (exposure duration - construction worker) yr	1
ET_{cw} (exposure time - construction worker) hr/day	8
LT (lifetime) yr	70
BW_{cw} (body weight - construction worker) kg	80
IR_{cw} (soil ingestion rate - construction worker) mg/day	330
SA_{cw} (surface area - construction worker) cm^2/day	3527
AF_{cw} (skin adherence factor - construction worker) mg/cm^2	0.3
AT_{cw} (averaging time - construction worker carcinogenic)	365
AT_{cw-a} (averaging time - construction worker non-carcinogenic)	350
EW_{cw} (overall duration of construction) weeks/year	50
DW_{cw} (days worked - construction worker) days/week	5
A_c (acres)	1.24
A_{till} (areal extent of tilling) acres	1.24
A_{excav} (area of excavation site) m^2	5016.76
$A_{c\text{-}grade}$ (areal extent of grading) acres	1.24
$A_{c\text{-}doz}$ (areal extent of dozing) acres	1.24
$M_{m\text{-}doz}$ (Gravimetric soil moisture content) %	7.9
$M_{m\text{-}excav}$ (Gravimetric soil moisture content) %	12
p_{soil} (density) g/cm^3 - chemical-specific	1.68
$N_{A\text{-}dump}$ (number of times soil is dumped)	2
$N_{A\text{-}till}$ (number of times soil is tilled)	2
s_{till} (soil silt content) %	18
s_{doz} (soil silt content) %	6.9
B_l (dozing blade length) m	3.7
B_l (grading blade length) m	2.5
$N_{A\text{-}doz}$ (number of times site was dozed)	0
$N_{A\text{-}grade}$ (number of times site was graded)	1
S_{doz} (dozing speed) kph	11.4
S_{grade} (dozing speed) kph	11.4
d_{excav} (average depth of excavation site) m	0.3
V (fraction of vegetative cover)	0.33
U_m (mean annual wind speed) m/s	3.98
U_t (equivalent threshold value) m/s	11.32
t_c (overall duration of construction) hours	8400
F_D Unitless Dispersion Correction Factor	0.185837208
T (time over which traffic occurs) s	7200000
$J`_T$ (g/m^2s)	4.05223E-06
F(x) (function dependant on U_m/U_t derived using Cowherd et al. (1985))	0.0495

Site-specific
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value
M_{wind} (dust emitted by wind erosion) g	51288.84717
M_{doz} (dust emitted from dozing operations) g	
M_{till} (dust emitted from tilling operations) g	6253.758029
M_{grade} (dust emitted from grading operations) g	876.5240989
M_{excav} (dust emitted from excavation soil dumping) g	616.6451841
$SigmaVKT_{doz}$ (sum of fleet vehicle km traveled) km	
$SigmaVKT_{grade}$ (sum of fleet vehicle km traveled) km	2.007312
flu	12.06312994
$PEF`_{sc}$ (particulate emission factor) m^3/kg	16018902.21
A (PEF Dispersion Constant)	2.4538
B (PEF Dispersion Constant)	17.566
C (PEF Dispersion Constant)	189.0426
A_{surf} (areal extent of site) m^2	5018.1064
A_s ($VF_{ulim-sc}$ acres)	1.24
T (temperature) C	25
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
A (VF Dispersion Constant)	2.4538
B (VF Dispersion Constant)	17.566
C (VF Dispersion Constant)	189.0426
flu	12.06312994
n (total soil porosity) L_{pore}/L_{soil}	0.43396
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
A_s ($VF_{mlim-sc}$ acres)	1.24
p_b (dry soil bulk density) g/cm^3	1.5
d_s (average source depth) m	0.3
Q/C_{vol} (inverse of the ratio of the geometric mean air concentration to the emission fl	12.06312994
$VF_{mlim-sc}$ (volitization factor) m^3_{air}/kg_{soil}	4362.10994
Output generated 30OCT2017:15:25:10	

Site-specific
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	7440-47-3	No	No	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	7439-97-6	No	Yes	-		-		-		0.0003	SH	1	-	1	4360	0.352
Selenium	7782-49-2	No	No	-		-		0.005	SH	0.02	CC	1	-	1	-	-

Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-5 (mg/kg)	Dermal SL TR=1.0E-5 (mg/kg)	Inhalation SL TR=1.0E-5 (mg/kg)	Carcinogenic SL TR=1.0E-5 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	16000000	-	-	-	-	-	-	-	-	
3.13	0.06	-	16000000	-	-	-	-	-	-	5.49	5.49	5.49E+00 sat
-	-	-	16000000	-	-	-	-	1700	-	1350000	1690	1.69E+03 nc

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Site-specific
Construction Worker Risk for Soil - Other Construction Activities

Chemical	Ingestion SF ($(mg/kg\text{-}day)^{-1}$)	SFO Ref	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Henry's Law Constant (unitless)
Chromium, Total	-		-		-		-		0.013	-	1	-	-
Mercury (elemental)	-		-		-		0.0003	SH	1	-	1	4360	0.352
Selenium	-		-		0.005	SH	0.02	CC	1	-	1	-	-
**Total Risk/HI*	-		-		-		-		-	-	-	-	-

	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm3/g)	Particulate Emission Factor (m^3/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
	-	-	-	16000000	25.3	-	-	-	-	-	-	-	-
	3.13	0.06	-	16000000	0.342	-	-	-	-	-	-	0.0622	0.0622
	-	-	-	16000000	4	-	-	-	-	0.00236	-	0.00000297	0.00236
**Total Risk/HI*	-	-	-	-	-	-	-	-	-	*0.00236*	-	*0.0622*	*0.0646*

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SITE INFORMATION

Facility ID	
Site Name	CDA BNSF R2R ROW
Date	May 16, 2017
Name of Preparer	Rachel Gibeault
Address	DU 3.2
Latitude	
Longitude	

EXPOSURE POINT CONCENTRATIONS: RESIDENTIAL

Chemical	Direct Contact Soil Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil Representative Concentration [mg/kg]
Naphthalene	0.0693
Acenaphthene	0.015
Anthracene	0.138
Benz(a)anthracene	0.224
Benzo(a)pyrene	0.234
Benzo(b)fluoranthene	0.416
Benzo(k)fluoranthene	0.117
Chrysene	0.301
Fluoranthene	0.373
Pyrene	0.402

EXPOSURE POINT CONCENTRATIONS: NON-RESIDENTIAL

Chemical	Direct Contact Soil
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil
	Representative Concentration [mg/kg]
Naphthalene	0.0693
Acenaphthene	0.015
Anthracene	0.138
Benz(a)anthracene	0.224
Benzo(a)pyrene	0.234
Benzo(b)fluoranthene	0.416
Benzo(k)fluoranthene	0.117
Chrysene	0.301
Fluoranthene	0.373
Pyrene	0.402

EXPOSURE POINT CONCENTRATIONS: CONSTRUCTION WORKER

Chemical	Direct Contact Soil Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil Representative Concentration [mg/kg]
Naphthalene	0.0693
Acenaphthene	0.015
Anthracene	0.138
Benz(a)anthracene	0.224
Benzo(a)pyrene	0.234
Benzo(b)fluoranthene	0.416
Benzo(k)fluoranthene	0.117
Chrysene	0.301
Fluoranthene	0.373
Pyrene	0.402

EXPOSURE POINT CONCENTRATIONS: GROUNDWATER / SURFACE WATER PROTECTION

Chemical	Groundwater and/or Surface Water Protection		
	Representative Groundwater Concentration at the Source [mg/L]	Representative Soil Concentration at the Source [mg/kg] NOT USED IN CALCULATIONS	Representative Groundwater Concentration at the POC [mg/L]
Naphthalene			
Acenaphthene			
Anthracene			
Benz(a)anthracene			
Benzo(a)pyrene			
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Chrysene			
Fluoranthene			
Pyrene			
	Paste Values...	Paste Values...	Paste Values...

Direct Contact

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Cowherd Particulate Emission Model					
Parameters					
Site size for calculation of Q/C parameter		acres	~~0.5~~	1.24	Calculated
Inverse of Mean Concentration in the Middle of a Square Source	Q/C			60.9	Calculated
Fraction of Vegetative Cover	V	m^2/m^2	~~0.5~~	0.33	Calculated
Mean Annual Wind Speed	U_m	m/s	3.98		Default
Equivalent Threshold Value of Windspeed at 7m	U_t	m/s	11.3		Default
Windspeed Distribution Function from Cowherd et. al, 1985	$F_{(x)}$		0.0495		Default
Soil Properties					
Immediately Below the Building					
Soil Bulk Density	ρ_{sA}	cm^3	1.64		Default
Total Porosity	Θ_{TA}	cm^3/cm^3-soil	0.39		Default
Fractional Organic Carbon Content	foc_A	g-C/g-soil	0.001		Default
Volumetric Water Content	Θ_{wsA}	cm^3/cm^3	0.17		Default
Volumetric Air Content	Θ_{asA}	cm^3/cm^3		0.22	Calculated

Groundwater / Surface Water Protection

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Common Water Inputs					
Source Zone Soil Properties					
Dry Soil Bulk Density of the source zone soil	ρ_s	g/cm³	1.64		Default
Fractional Organic Carbon Content in the source zone soil	foc	g-C/g-soil	0.001		Default
Total Soil Porosity of the source zone soil	Θ_T	cm³/cm³-soil	0.39		Default
Volumetric Water Content in the source zone soil	Θ_{ws}	cm³/cm³	0.17		Default
Volumetric Air Content in the source zone soil	Θ_{as}	cm³/cm³		0.22	Calculated
Saturated Zone Soil Properties					
Dry Soil Bulk Density of the saturated zone soil	ρ_{ss}	g/cm³	1.64		Default
Fractional Organic Carbon Content in the saturated zone soil	focs	g-C/g-soil	0.001		Default
Total Soil Porosity in the saturated zone soil	Θ_{ts}	cm³/cm³-soil	0.39		Default
Source Area Parameters					
Groundwater Darcy Velocity	U_{gw}	ft/year	110		Default
Groundwater Mixing Zone Length	L_{mz}	ft	40		Default
Groundwater Mixing Zone Thickness	δ_{gw}	ft	5.02		Default
Groundwater Mixing Zone Width	W_{gw}	ft	40		Default
Infiltration Rate	I	ft/year	0.82		Default

Exposure and Compliance Point Distances from Source

Groundwater / Surface Water Protection

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Groundwater Protection Parameters					
Distance to Point of Exposure (POE)	$X_{poe,gw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
Distance to the Point of Compliance (POC)	$X_{poc,gw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
Surface Water Protection Parameters					
Distance to the Point of Discharge	$X_{poe,sw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
Distance to the Point of Compliance	$X_{poc,sw}$	ft	0		Default
Longitudinal dispersivity	α_x	ft		0	Calculated
Transverse dispersivity	α_y	ft		0	Calculated
Vertical dispersivity	α_z	ft		0	Calculated
pH of the receiving surface water	pH		7		Default
Temperature of the receiving surface water	T	°C	15		Default
Hardness of the receiving surface water	H	mg/L	25		Default

Vapor Intrusion: Soil and Source

Parameter	Symbol	Unit	Default Value	Value Used	Justification

Interview Questions

Which of the following best describes the building?
The model does not accommodate structures with crawl spaces or dirt floors. Contact DEQ for more information on how to address these types of situations.

Vapor Intrusion: Enclosed Space

Parameter	Symbol	Unit	Default Value	Value Used	Justification

Please complete the Interview Questions on the Vapor Intrusion tab.

Enter site-specific decay rates for this site if they vary from the default values.

	First Order Decay Rate [day^{-1}]		Unsaturated Zone DAF	
	Default Value	Site-Specific Value	Default Value	Site-Specific Value
Naphthalene	0		1	
Acenaphthene	0		1	
Anthracene	0		1	
Benz(a)anthracene	0		1	
Benzo(a)pyrene	0		1	
Benzo(b)fluoranthene	0		1	
Benzo(k)fluoranthene	0		1	
Chrysene	0		1	
Fluoranthene	0		1	
Pyrene	0		1	

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Averaging Time					
Averaging Time for Carcinogens	AT_c	year	70		Default
Averaging Time for Non-Carcinogens, Adult	AT_{nc}	year		30	Calculated
Averaging Time for Non-Carcinogens, Age Adjusted Adult	AT_{nc}	year		24	Calculated
Averaging Time for Non-Carcinogens, Child	AT_{nc}	year		6	Calculated
Averaging Time for Non-Carcinogens, Non-residential	AT_{nc}	year		25	Calculated
Averaging Time for Non-Carcinogens, Construction Worker	AT_{nc}	year		1	Calculated
Body Weight					
Body Weight Resident Adult	BW_a	kg	70		Default
Body Weight Resident Child	BW_c	kg	15		Default
Body Weight Non-residential	BW_{com}	kg	70		Default
Body Weight Construction Worker	BW_{con}	kg	70		Default
Exposure Duration					
Exposure Duration Resident Adult	ED_a	year	30		Default
Exposure Duration Resident Age Adjusted Adult	ED_{aa}	year	24		Default
Exposure Duration Resident Child	ED_c	year	6		Default
Exposure Duration Non-residential	ED_{com}	year	25		Default
Exposure Duration Construction Worker	ED_{con}	year	1		Default
Exposure Frequency for Indirect Pathways					
Exposure Frequency for Indirect Pathway Resident Child	EF_c	day/year	350		Default
Exposure Frequency for Indirect Pathway Resident Adult	EF_a	day/year	350		Default
Exposure Frequency for Indirect Pathway Non-residential	EF_{com}	day/year	250		Default
Exposure Frequency for Indirect Pathway Construction Worker	EF_{con}	day/year	30		Default

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Exposure Frequency for Direct Contact Pathways					
Exposure Frequency for Direct Contact Pathways Resident Adult	EF_{da}	day/year	270		Default
Exposure Frequency for Direct Contact Pathways Non-residential	EF_{dcom}	day/year	180		Default
Exposure Frequency for Direct Contact Pathways Construction Worker	EF_{dcon}	day/year	30		Default
Exposure Frequency for Direct Contact Pathways Resident Child	EF_{dc}	day/year	270		Default
Indoor Exposure Time					
Indoor Exposure Time Resident Adult	ET_{i-a}	hrs/day	24		Default
Indoor Exposure Time Resident Child	ET_{i-c}	hrs/day	24		Default
Indoor Exposure Time Non-residential	ET_{i-com}	hrs/day	8		Default
Outdoor Exposure Time					
Outdoor Exposure Time Resident Adult	ET_{o-a}	hrs/day	2		Default
Outdoor Exposure Time Resident Child	ET_{o-c}	hrs/day	2		Default
Outdoor Exposure Time Non-residential	ET_{o-com}	hrs/day	6		Default
Outdoor Exposure Time Construction Worker	ET_{o-con}	hrs/day	10		Default
Soil Ingestion Rate					
Soil Ingestion Rate Age-adjusted	IR_{s-aa}	mg/day		114	Calculated
Soil Ingestion Rate Age-Adjusted Mutagenic Chemicals	IR_{s-aam}	mg-yr/kg-day		490	Calculated
Soil Ingestion Rate Resident Adult	IR_{s-a}	mg/day	100		Default
Soil Ingestion Ingestion Rate Resident Child	IR_{s-c}	mg/day	200		Default
Soil Ingestion Rate Non-residential	IR_{s-com}	mg/day	100		Default
Soil Ingestion Rate Construction Worker	IR_{s-con}	mg/day	330		Default

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Groundwater Ingestion Rate					
Groundwater Ingestion RateAge-adjusted	IR_{w-aa}	L-yr/kg-day		1.09	Calculated
Groundwater Ingestion Rate Age-Adjusted Mutagenic Chemicals	IR_{w-aam}	L-yr/kg-day		3.39	Calculated
Groundwater Ingestion Rate Resident Adult	IR_{w-a}	L/day	2		Default
Groundwater Ingestion Rate Resident Child	IR_{w-c}	L/day	1		Default
Groundwater Ingestion Rate Non-residential	IR_{w-com}	L/day	1		Default
Skin Surface Area					
Skin Surface Area Age-adjusted	SA_{aa}	mg-yr/kg-day		361	Calculated
Skin Surface AreaAge-Adjusted Mutagenic Dermal	SA_{aam}	mg-yr/kg-day		1,450	Calculated
Skin Surface Area Resident Adult	SA_a	cm^2/day	5,700		Default
Skin Surface Area Resident Child	SA_c	cm^2/day	2,800		Default
Skin Surface Area Non-residential	SA_{com}	cm^2/day	3,300		Default
Skin Surface Area Construction Worker	SA_{con}	cm^2/day	3,300		Default
Soil to Skin Adherence Factor					
Soil to Skin Adherence Resident Adult	M_a	mg/cm^2	0.07		Default
Soil to Skin Adherence Resident Child	M_c	mg/cm^2	0.2		Default
Soil to Skin Adherence Non-residential	M_{com}	mg/cm^2	0.2		Default
Soil to Skin Adherence Construction Worker	M_{con}	mg/cm^2	0.3		Default
Averaging Time for Vapor Flux					
Averaging Time for Vapor Flux Resident Adult	τ	s		946,000,000	Calculated
Averaging Time for Vapor Flux Age-adjusted Resident	τ	s		757,000,000	Calculated
Averaging Time for Vapor Flux Resident Child	τ	s		189,000,000	Calculated
Averaging Time for Vapor Flux Commercial Worker	τ	s		788,000,000	Calculated
Averaging Time for Vapor Flux Construction Worker	τ	s		31,500,000	Calculated
Target Hazard Index	THI		1		Default

Parameter	Symbol	Unit	Default Value	Value Used	Justification
Target Risk	TR		0.00001		Default

RISK/HAZARD QUOTIENT: RESIDENTIAL

RISK EVALUATION RESULTS

Red highlight indicates highest risk and hazard

	Direct Contact Soil			Total Risk Estimate & Hazard Index by Chemical	
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil				
	EPC	Risk	HI	Risk	HI
Naphthalene	6.93E-02	2.54E-09	1.76E-04	2.54E-09	1.76E-04
Acenaphthene	1.50E-02	*NTOX*	3.36E-06	*NA*	3.36E-06
Anthracene	1.38E-01	*NTOX*	6.19E-06	*NA*	6.19E-06
Benz(a)anthracene	2.24E-01	1.17E-06	*NTOX*	1.17E-06	*NA*
Benzo(a)pyrene	2.34E-01	1.22E-05	*NTOX*	1.22E-05	*NA*
Benzo(b)fluoranthene	4.16E-01	2.17E-06	*NTOX*	2.17E-06	*NA*
Benzo(k)fluoranthene	1.17E-01	6.13E-08	*NTOX*	6.13E-08	*NA*
Chrysene	3.01E-01	1.58E-08	*NTOX*	1.58E-08	*NA*
Fluoranthene	3.73E-01	*NTOX*	1.25E-04	*NA*	1.25E-04
Pyrene	4.02E-01	*NTOX*	1.80E-04	*NA*	1.80E-04
Totals by Pathway		1.57E-05	4.92E-04	**1.57E-05**	**4.92E-04**

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

Red highlight indicates highest risk and hazard

	Direct Contact Soil			Total Risk Estimate & Hazard Index by Chemical	
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil				
	EPC	Risk	HI	Risk	HI
Naphthalene	6.93E-02	4.63E-09	1.32E-04	4.63E-09	1.32E-04
Acenaphthene	1.50E-02	*NTOX*	3.27E-07	*NA*	3.27E-07
Anthracene	1.38E-01	*NTOX*	6.02E-07	*NA*	6.02E-07
Benz(a)anthracene	2.24E-01	7.72E-08	*NTOX*	7.72E-08	*NA*
Benzo(a)pyrene	2.34E-01	8.00E-07	*NTOX*	8.00E-07	*NA*
Benzo(b)fluoranthene	4.16E-01	1.42E-07	*NTOX*	1.42E-07	*NA*
Benzo(k)fluoranthene	1.17E-01	4.07E-09	*NTOX*	4.07E-09	*NA*
Chrysene	3.01E-01	1.08E-09	*NTOX*	1.08E-09	*NA*
Fluoranthene	3.73E-01	*NTOX*	1.22E-05	*NA*	1.22E-05
Pyrene	4.02E-01	*NTOX*	1.75E-05	*NA*	1.75E-05
Totals by Pathway		1.03E-06	1.62E-04	**1.03E-06**	**1.62E-04**

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

RISK/HAZARD QUOTIENT: CONSTRUCTION WORKER

RISK EVALUATION RESULTS

Red highlight indicates highest risk and hazard

	Direct Contact Soil			Total Risk Estimate & Hazard Index by Chemical	
	Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil				
	EPC	Risk	HI	Risk	HI
Naphthalene	6.93E-02	2.57E-10	1.79E-04	2.57E-10	1.79E-04
Acenaphthene	1.50E-02	*NTOX*	1.35E-07	*NA*	1.35E-07
Anthracene	1.38E-01	*NTOX*	2.48E-07	*NA*	2.48E-07
Benz(a)anthracene	2.24E-01	1.30E-09	*NTOX*	1.30E-09	*NA*
Benzo(a)pyrene	2.34E-01	1.32E-08	*NTOX*	1.32E-08	*NA*
Benzo(b)fluoranthene	4.16E-01	2.35E-09	*NTOX*	2.35E-09	*NA*
Benzo(k)fluoranthene	1.17E-01	7.00E-11	*NTOX*	7.00E-11	*NA*
Chrysene	3.01E-01	1.99E-11	*NTOX*	1.99E-11	*NA*
Fluoranthene	3.73E-01	*NTOX*	5.02E-06	*NA*	5.02E-06
Pyrene	4.02E-01	*NTOX*	7.22E-06	*NA*	7.22E-06
Totals by Pathway		1.72E-08	1.91E-04	**1.72E-08**	**1.91E-04**

NOTES:
NTOX: A toxicity parameter required in the calculation of the value is not available.

RISK/HAZARD QUOTIENT: SUMMARY

RISK EVALUATION RESULTS

Red highlight indicates target Risk or Hazard Index exceeded for receptor.

Routes of Exposure	Receptor					
	Residential		Non-Residential		Construction Worker	
	Risk	HI	Risk	HI	Risk	HI
Direct Contact Soil Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil	1.57E-05	4.92E-04	1.03E-06	1.62E-04	1.72E-08	1.91E-04
Subsurface Soil Indoor Inhalation of Vapor Emissions	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Groundwater Indoor Inhalation of Vapor Emissions	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Soil-Vapor Indoor Inhalation of Vapor Emissions	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Site Risk	1.57E-05		1.03E-06		1.72E-08	
Site Hazard Index		4.92E-04		1.62E-04		1.91E-04
Target Risk/HI Exceeded?	YES	NO	NO	NO	NO	NO

Appendix C.

Letter Health Consultation, BNSF Railway Corridor Site: Soil Arsenic Coeur d'Alene, Idaho.

Letter Health Consultation

BNSF Railway Corridor Site: Soil Arsenic

Coeur d'Alene, Idaho

October 11, 2017

Prepared By:

Environmental Health Program
Bureau of Community and Environmental Health
Division of Public Health
Idaho Department of Health and Welfare
Under a Cooperative Agreement with the Agency for Toxic Substances and Disease Registry

IDAHO DEPARTMENT OF HEALTH & WELFARE
DIVISION OF PUBLIC HEALTH

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IDAHO DEPARTMENT OF
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October 11, 2017

Eric Traynor
Brownfields Program Manager
Waste Management and Remediation Division
State of Idaho Department of Environmental Quality
1410 North Hilton
Boise, Idaho 83706

Dear Mr. Traynor:

Per a request of the Idaho Department of Environmental Quality (DEQ), the Idaho Department of Health and Welfare, Division of Public Health, Bureau of Community and Environmental Health (BCEH) assessed possible health risks from exposure to arsenic in soils at the Burlington Northern Santa Fe (BNSF) railway corridor site in Coeur d'Alene, Idaho. The BCEH evaluates the public health risk of contaminated sites through a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). The results of the health risk assessment did not indicate any significant noncancerous or cancerous adverse health effects expected for potential residents at the site. Further description of the assessment and results are included below.

Background and Statement of Issues

The BNSF railway company corridor of right of way at the Riverstone to Huetter Site located in Coeur d'Alene, Idaho was historically used as a railway corridor where mining and industrial products were frequently transported. Because of transport of these materials, the site was identified as likely having heavy metal and polycyclic aromatic hydrocarbon (PAH) contamination in soils. The BNSF site is approximately 20−60 feet wide and 11,950 feet long, is surrounded by residential and commercial property, and is adjacent to the Spokane River. Presently, the site is vacant but is proposed to be redeveloped for residential use and/or public greenspace and a pedestrian trail with riverfront access.

Before redevelopment, DEQ requested TerraGraphics Environmental Engineering complete a site risk evaluation to determine potential human health risks associated with exposure to heavy metals and PAH compounds at the site. Results of the site risk assessment indicated that for a

residential exposure scenario soil arsenic concentrations exceeded the target risk level for acceptable lifetime cancer risk (10^{-5}) [1].

Based on the results of the TerraGraphics risk evaluation, BCEH was requested to conduct a health risk assessment for exposure to arsenic in soils and evaluate possible site-specific health effects. Results of this risk assessment can help determine if there is a likely health risk to populations that may occupy or use this site under future residential and use scenarios. Residents occupying the site would have the highest likely exposure compared to any recreational site users.

Soil Sampling and Results

The BNSF site was subdivided into seven separate decision units based on historical grade elevations. Surface soil sampling (0−12 inches below ground surface) and analysis were completed by TerraGraphics in 2016 for each decision unit [1]. Arsenic values in soil ranged from 13.1 to 25.6 milligrams per kilogram (mg/kg) with the highest concentration located in decision unit 1.1 (Table 1). The arsenic soil concentration values were compared to health effects based screening comparison values to determine potential for risk based on the highest likely exposure scenario. Arsenic concentrations in two decision units (1.1 and 1.2) were greater than the ATSDR Environmental Media Evaluation Guide (EMEG) comparison value of 17 mg/kg in soil based on chronic exposure to arsenic for a child (Table 1). The EMEG comparison value screens for potential chronic non-cancerous health effects. However, all decision units exceeded the Cancer Risk Evaluation Guide (CREG) value. Exceedance of comparison values does not indicate adverse health effects, but does warrant need for further investigation to determine risks.

According to the TerraGraphics risk assessment using the U.S. Geological Survey soil database, mean soil arsenic concentrations for Kootenai County are 7.88 mg/kg with a standard deviation of 2.42 mg/kg, and a maximum value of 21.0 mg/kg [1]. This indicates that arsenic concentrations measured at the BNSF site may not greatly exceed background concentrations. Although these soil sampling data are limited, exposure to soil at the BNSF site may not cause increased health risks considering background exposure levels to arsenic in the area.

Table 1: Arsenic soil concentrations within each decision unit at the BNSF site and health screening comparison values.

Decision Units	Soil Arsenic concentrations (mg/kg)	Comparison Values (mg/kg)
1.1	25.6	17[a] 0.25[b]
1.2	20.7	
1.3	13.1	
2.1	14.8	
2.2	15.7	
3.1	14.4	
3.2	15.4	

[a]ATSDR child's chronic Environmental Media Evaluation Guide (EMEG)
[b]ATSDR Cancer Risk Evaluation Guide (CREG)

Health Risk Assessment

Soil arsenic concentrations in several decision units exceeded the health effects screening values (EMEG and CREG). Based on these comparisons, BCEH evaluated chronic non-cancer risk and cancer risk using ATSDR's Public Health Assessment Tool (Appendix A) [2]. Risk was assessed based on ingestion of contaminated soils. Metals are poorly absorbed through the skin, and soil concentrations were not high enough to contribute significantly to dermal or inhalation risk when compared to the ingestion pathway [3]. Risk was evaluated using the maximum soil arsenic concentration (25.6 mg/kg) for both a central tendency exposure (CTE; an "average" ingestion rate) and the reasonable maximum exposure (RME; likely maximum ingestion rates). Seven age-based exposure groups (ranging from infant to adult) were assessed (Appendix B). A residential exposure scenario was chosen and the tool used default ATSDR exposure duration values and assumed daily exposure via soil for each exposure group (Appendix B) [3]. This scenario is the most conservative due to the length of potential exposure to arsenic in the soil and would be considered protective of recreational site users.

Non-cancer residential scenario

Children have the greatest potential exposure to arsenic from soils due to behaviors that can increase their likelihood of ingesting contaminated soils [4]. For all exposure groups, the expected chronic daily dose did not exceed ATSDR's Minimal Risk Level (MRL) of 0.0003 mg/kg-day, indicating that there is no reasonable risk of non-cancerous health effects (Table 2). The highest dose for children age 1 to <2 years (0.00027 mg/kg-day) was at the chronic MRL. Additionally, for children 1 to 6 years old who may consume large quantities of soil (up to 5,000 mg/day; pica scenario[1]), the highest acute dose was 0.0029 mg/kg-day, which is 1.7 times lower than the acute MRL of 0.005 mg/kg-day [4]. Therefore, there are no expected non-cancerous health effects for children or adults due to arsenic in soil.

Cancer risk residential scenario

Arsenic is classified as a "Group A" human carcinogen by the U.S. Environmental Protection Agency (EPA), meaning there is sufficient evidence to link arsenic exposure with cancerous health effects [5]. Because the concentration of arsenic in soils exceeded the ATSDR CREG comparison value of 0.25 mg/kg (Table 1), further assessment of effects of exposure to soils was completed [3]. Cumulative combined cancer risk for children from birth to age 21 was 4.1×10^{-5} using the reasonable maximum exposure scenario (Table 2). This indicates that for the highest expected exposure to arsenic, there may be 4 additional excess cancer cases per 100,000 children. For the central tendency exposure, cancer risk for children was 1.6×10^{-5}, indicating that at an average expected soil ingestion rate, less than 2 excess cancer cases are expected in 100,000 children. These excess cancer risk levels are considered a low increased risk of excess cancer and are within the EPA's acceptable excess cancer risk guidance levels of 10^{-4} to 10^{-6} (Table 2) [3]. For potential adult residents at the site (Exposure Duration = 33 years), cancer risk was 1.2×10^{-5}, which was a lower risk than for children and is also within the range of acceptable cancer risk (Table 2).

[1]ATSDR considers pica for children ages 1—6 years old who may consume 5,000 mg/day of soil 3 times a week [3].

Table 2: Results of ingestion dose calculations and cancer risk by age group for a residential exposure scenario.

Exposure Group (Age)	Chronic Dose (mg/kg-day)		Cancer Risk	
	CTE[a]	RME[b]	CTE[a]	RME[b]
6 weeks to < 1 year	0.00011	0.00019	1.6E-5	4.1E-5
1 to < 2 years	0.00013	0.00027		
2 to < 6 years	8.8E-5	0.00018		
6 to < 11 years	4.8E-5	9.7E-5		
11 to < 16 years	2.7E-5	5.4E-5		
16 to < 21 years	2.1E-5	4.3E-5		
Adult	9.6E-6	1.9E-5	2.2E-6	1.2E-5
Health Effects Guidelines	MRL[c] 0.0003 mg/kg-day		Acceptable cancer risk level[d] 10^{-4} to 10^{-6}	

[a]CTE: Central Tendency Exposure (Appendix B) [2,3]
[b]RME: Reasonable Maximum Exposure (Appendix B) [2,3]
[c]MRL: ATSDR Minimal Risk Level [4]
[d]EPA acceptable excess cancer risk levels [3]

Conclusions

Based on the potential exposure to arsenic in the soil for future child or adult residents at the BNSF site, there was no likely risk of chronic non-cancerous health effects. Additional risks of excess cancer cases for children were within EPA acceptable cancer risk levels. Notably, as described above, arsenic concentrations measured at the BNSF site may not greatly exceed background concentrations for the county. Therefore, BCEH does not expect exposure to arsenic in soil to increase risk of cancer beyond typical population-level cancer incidence rates.

This assessment used a conservative evaluation approach by comparing the highest measured arsenic concentration and assessing risks using reasonable maximum exposures. Arsenic concentrations in other decision units were lower than the maximum value, indicating that overall risk is also likely to be less. If areas of the site will primarily be used for recreation, it is unlikely that chronic exposure for the residential scenario would be a concern. Therefore, health risks would also be reduced. Additionally, if portions of the site are planned to be paved and likely redeveloped with vegetation, this would also limit direct exposure to soils.

Recommendations

- BCEH recommends following the guidance in the TerraGraphics risk evaluation regarding exposure of workers at this site during redevelopment activities. Wearing appropriate personal protective equipment and following best management practices can reduce exposure to arsenic from soils and dust.
- Though significant health risks are not expected, if portions of the BNSF site are redeveloped as private residences, educating homeowners on possible health effects of

arsenic in the soil and appropriate hygiene practices (e.g., hand washing after outdoor activities) could further reduce potential health risks, especially for children.

Please contact me if you have any questions,

Sincerely,

Morgan Willming, PhD
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Bureau of Community and Environmental Health
Division of Public Health
Idaho Department of Health and Welfare
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References

[1] TerraGraphics. 2017. Risk Evaluation of the Burlington Northern Santa Fe Railway Company Corridor Right of Way Riverstone to Huetter Site in Coeur d'Alene, Idaho. Prepared for Idaho Department of Environmental Quality.

[2] Agency for Toxic Substances and Disease Registry (ATSDR). 2017. Public Health Assessment Tool. Available online at: https://csams.cdc.gov/PHAST/Home/Index.

[3] Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Public Health Assessment Guidance Manual.

[4] Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Arsenic Toxicological Profile. Available on line at: https://www.atsdr.cdc.gov/toxprofiles/tp2.pdf

[5] US Environmental Protection Agency Integrated Risk Information System and Chemical-Specific Factors Data Base. Arsenic. Available on line at: https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0278_summary.pdf

[6] US Environmental Protection Agency. 2012. Recommendations for Default Value for Relative Bioavailability of Arsenic in Soil. Available online at: https://semspub.epa.gov/work/HQ/175338.pdf

Appendix A

Equations

A1. Non-cancer Dose Equation for Ingestion:

$$D = \frac{(C \times IR \times BF \times CF \times EF)}{BW}$$

Where:

D = Dose in milligram per kilogram of body weight per day (mg/kg-day)
C = Contaminant concentration in milligrams per kilogram (mg/kg)
IR[1]= Ingestion rate in mg/kg
BF[2] = Bioavailability Factor
CF = Conversion Factor $1x10^{-6}$
EF[3]= Exposure Factor
BW[4] = Body Weight in kilograms

Sources:
[1]ATSDR default age-specific exposure ingestion rates (Appendix B). [2]
[2]BF: US EPA 60% bioavailability default value [6]
[3]EF: Chronic residential exposure default (365 days/365 days) = 1 [2]
[4]BW: ATSDR default age-specific values (Appendix B) [2,3]

A2. Cancer Risk Equation for Ingestion:

$$Cancer\ Risk = [D \times CSF \times \frac{Exposure\ years}{78\ years}]$$

D = Dose mg/kg-day
CSF = Cancer Slope Factor 1.5 mg/kg-day from EPA IRIS [5]
Exposure years = Default exposure duration for each age group (Appendix B)

Appendix B

Table B1: Exposure calculation inputs for ATSDR default residential exposure scenario [2,3].

Exposure Group	Body Weight (kg)	CTE[a]		RME[b]	
		Ingestion Rate (mg/day)	Exposure Duration (yrs)	Ingestion Rate (mg/day)	Exposure Duration (yrs)
6 weeks to < 1 year	8.2	60	0.88	100	0.88
1 to < 2 years	11.4	100	1	200	1
2 to < 6 years	17.4	100	4	200	4
6 to < 11 years	31.8	100	5	200	5
11 to < 16 years	56.8	100	1	200	5
16 to < 21 years	71.6	100	0	200	5
Adult	80	50	12	100	33

[a]CTE: Central Tendency Exposure [2,3]
[b]RME: Reasonable Maximum Exposure [2,3]

Appendix D.

Assessment Memorandum for the Coeur d'Alene, Idaho, BNSF ROW R2R DU 2.2B Soil Sampling.

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M E M O R A N D U M

To: Steve Gill, IDEQ Coeur d'Alene, ID: Regional Office
Eric Traynor, IDEQ Boise, ID: State Office

From: Tom Jenkins, Alta, Moscow
Jon Munkers, Alta, Boise

Date: November 17, 2017

Job Code: 17085-04

Subject: Assessment Memorandum for the Coeur d'Alene, Idaho, BNSF ROW R2R DU 2.2B Soil Sampling

Section 1 Introduction

This memorandum provides a summary of the fieldwork activities for the additional Incremental Sampling Methodology (ISM) activities in Decision Unit (DU) 2.2B of the Burlington Northern Santa Fe Railway Company (BNSF) Right of Way (ROW) Site Assessment in Coeur d'Alene, Idaho.

The purpose of this additional sampling was to identify recognized environmental conditions associated with DU 2.2B within the 2.2-mile section of BNSF Railroad ROW. The recent removal of the railroad lines and the excavation of approximately the top 2 feet of soil provided an opportunity to sample soils within the 2- to 3-foot depth interval within this DU. The results will allow for the comparison of soil arsenic and PAH concentrations at the surface and 1-foot depth. This information will be used to inform the potential purchase and future redevelopment of the property.

Section 2 Field Work Summary

Sampling procedures and the quality assurance/quality control (QA/QC) review followed guidelines set forth in the following documents:

- Amendment to the Quality Assurance Project Plan [QAPP Amendment] for the BNSF ROW R2R, Coeur d'Alene, Idaho; Final Technical Memorandum (TerraGraphics 2017)
- Quality Assurance Project Plan [QAPP] for BNSF ROW R2R, Coeur d'Alene, Idaho, Final (TerraGraphics 2016)
- National Functional Guidelines for Inorganic Superfund Methods Data Review (USEPA 2017a)

- National Functional Guidelines for Organic Superfund Methods Data Review (USEPA 2017b)
- Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use (USEPA 2009)
- USEPA Guidance on Environmental Data Verification and Data Validation (USEPA 2002)

There were no noted deviations from the QAPP (TerraGraphcis 2016) or the Amendment to the QAPP (TerraGraphics 2017).

On August 28, 2017, the Alta Science and Engineering, Inc. (Alta) field crew, Tom Jenkins and Ben Bailey, met with Steve Gill, Idaho Department of Environmental Quality (IDEQ), at the BNSF site located in Coeur d'Alene, Idaho (Figure 1). The Alta field crew used a multi-incremental sampling approach consistent with the Interstate Technology and Regulatory Council (ITRC) ISM guidance document (ITRC 2012) to collect ISM samples from the excavated portion of DU 2.2B.

The field crew collected three rounds of 30 subsamples at predetermined locations to create a triplicate sample. Prior to the sampling event, Alta generated random subsample locations within the DU using a pre-programmed procedure in ArcGIS named "Create Random Points." The field crew used a hand auger and dedicated 5-gallon buckets to collect soil from these subsample locations. At each subsample location the field crew removed approximately 2 inches of overburden surface soil, and then collected soil from approximately 2 inches to 6 inches below ground surface (bgs). The 30 subsamples were composited, homogenized, sieved, and sampled according to ITRC's ISM guidance document (ITRC 2012) and following protocols outlined in the QAPP (TerraGraphics 2016).

The field crew sent four 8-ounce soil samples to SVL Analytical Inc. (SVL) in Kellogg, Idaho, for arsenic analysis using US Environmental Protection Agency (USEPA) Method 6010 (USEPA 2000) and sent one 4-ounce soil sample in triplicate (three replicate samples) to ESC Lab Sciences (ESC) in Mt. Juliet, Tennessee, for polycyclic aromatic hydrocarbon (PAH) analysis using USEPA Method 8270-selective ion monitoring (SIM; USEPA 1998).

Section 3 Sample Results

Table A1 in Attachment A provides a summary of the soil sample results.

3.1 Arsenic

Alta compared arsenic results collected from this sampling event to results collected at a depth of 6 inches bgs in October 2016, and also compared results to USEPA Regional Screening Levels (RSLs; USEPA 2017c). Alta also reviewed a letter prepared by a representative of the Idaho Department of Health and Welfare regarding arsenic concentrations in Site soils (IDHW 2017). Conclusions from this letter indicate that arsenic concentrations measured at the Site are similar to area background concentrations based in part on a Risk Evaluation that Alta completed in 2017 (Alta 2017). Results from this sampling event support this conclusion. The arsenic concentration at the 0-1 foot depth interval was 14.5 milligrams per kilogram (mg/kg) and the arsenic concentration at the 1-2 foot depth interval was 14.4 mg/kg.

3.2 Polycyclic Aromatic Hydrocarbons

Alta compared PAH results to Idaho Administrative Procedures Act (IDAPA) 58.01.24 Residential Use Screening Levels (RUSLs). All PAHs were detected above the reporting limit; however, benzo(a)pyrene was the only PAH that was detected above its respective RUSL (0.0200 mg/kg) with a concentration of 0.0309 mg/kg.

Section 4 Data Validation

This section provides information on the data quality assessment and data validation performed for the Sample Delivery Group (SDG) and Work Order listed in Table B1 in Attachment B. Data qualifiers used in this review are defined by USEPA (USEPA 2017a and 2017b).

4.1 Data Validation and Quality Assessment Soil Result Summary

The laboratory followed the specified analytical methods and submitted all required deliverables. Alta Stage 2A validation of the analytical data and review of the field data are tabulated below. Procedures/checks that require further discussion are explained below the tables, as necessary.

Data Validation Procedure or Check	Acceptable Frequency? [a]	Acceptable Performance? [b]	Data Qualified?	Discussion Item Number
Sample condition upon receipt at laboratory	--	N	Y	1
Preservation	--	Y	N	
Holding times	--	Y	N	
Laboratories followed specified analytical methods	--	N	N	2
Method Blanks	Y	Y	N	
Surrogate Recoveries/Deuterated Monitoring Compounds Recoveries	Y	Y	N	
Laboratory Control Samples	Y	Y	N	
Laboratory Control Sample Duplicates	Y	Y	N	
Matrix Spikes/Matrix Spike Duplicates	--	--	--	3
Serial Dilution	--	--	--	
Post Digestion Spikes	--	--	--	
Rinsate Blanks (Table B2)	Y	N	N	4
Trip Blanks	--	--	--	
Field Duplicates	--	--	--	

[a] Frequencies as defined in the QAPP (TerraGraphics 2016).
[b] As defined in the QAPP (TerraGraphics 2016) or based on professional judgement of the data validator.
-- = not applicable

1) Sample Condition Upon Receipt at Laboratory

From SDG L932693, the sample container for the field sample CDA-BNSF-ROW-SS3 was broken upon arrival at ESC. The laboratory contacted Alta regarding the broken container that might be contaminated with cooler water. Alta responded to proceed with the analysis. Based on the potential contamination, Alta has qualified the detected analytes in this sample as estimates (*J*).

2) Laboratories followed specified analytical methods

The QAPP Amendment states that ESC will use Method 8270D-SIM to analyze for PAHs in the soil. However, ESC analyzed the data using Method 8270C-SIM. Upon request, ESC informed Alta that 8270D-SIM is a slightly updated version of 8270C-SIM. The compounds, detection limits, and the way the samples are analyzed is exactly the same between both versions. The only difference comes in minor QC range differences which did not affect the quality or usage of the data. Alta did not qualify any results based on the change in analytical methods.

3) Matrix Spike/Matrix Spike Duplicate

Given that no site specific matrix spike/matrix spike duplicate (MS/MSD) sample was collected as guided in the QAPP (Section 12.2.4; TerraGraphics 2016), Alta cannot use the data from the laboratories' QC batch MS/MSD. Therefore, Alta will rely upon accuracy and precision measurements from the LCS/LCSD, which are within acceptable limits. Nevertheless, project completeness is affected.

4) Rinsate Blanks

From SDG L932693, naphthalene was detected above the reporting limit in the rinsate blank with a concentration of 0.000741 milligrams per liter (mg/L). Detected naphthalene concentrations in the soil field samples were greater than 10 times this detection or were not detected above the reporting limit. Therefore, according to the National Functional Guidelines for Blanks in Semivolatiles (USEPA 2017b), Alta did not qualify any field samples based on the rinsate blanks.

4.2 Field Replicates

Alta calculated the percent relative standard deviations (RSDs), or coefficients of variation, by dividing the mean by the standard deviation (as shown in Table B3) for DU 2.2B to demonstrate the soil's heterogeneity. High RSD values for field samples strongly suggest a substantial degree of heterogeneity in the DU contaminant concentrations; whereas, low RSD values indicate that the field replicates are providing reproducible estimates of the mean (Section 7.3, ITRC 2012).

The field crew collected the replicate samples (or three rounds of samples) and analyzed for PAHs and arsenic. As shown in Table B3, arsenic had an RSD of 3%. In the instances where PAHs in SS-2 and SS-3 were below the reporting limit, Alta used the reporting limit in calculating the RSD; however, if results for two of the three replicates were below the reporting limit, Alta did not calculate an RSD. Consequently, Alta was able to calculate RSDs for only 4 of the 11 PAHs: anthracene (104%), benzo(b)fluoranthene (60%), fluoranthene (137%), and pyrene (124%). All four calculated PAH RSDs were greater than 35%. When RSDs were greater than 35%, Alta calculated a Chebyshev 95% upper confidence limit (UCL) using the

ITRC ISM calculator for 1-sided UCL for the mean (Section 4.2.2, ITRC 2012). Table B4 displays the calculated UCL. Alta did not qualify any data based on ISM field replicate results.

ITRC recommends using the highest analyte concentration of the replicate samples as the representative analyte concentration for the DU when the analyte RSD is equal to or less than 35%. ITRC also recommends using the calculated Chebyshev 95% UCL as the representative concentration when the analyte RSD is greater than 35%. However, according to *USEPA Supplemental Guidance to RAGS: Calculating the Concentration Term* (1992), when the calculated UCL is greater than the maximum concentration, then the maximum concentration should be used for risk assessment purposes. Nevertheless, these instances suggest that the true mean may be higher than the maximum value obtained from the replicate samples collected (i.e., the 95% UCL indicates a higher mean is possible).

4.3 Overall Validation Assessment

Based on this data quality review, Alta determines the laboratory and field data to be of acceptable quality, although Alta has qualified the following:

- PAH results from sample SS-3 because the glass sample container was cracked in the shipping container when it arrived at the analytical laboratory.

Accuracy and precision are acceptable based on the laboratories' control sample and duplicate pairs. Based on the calculated RSD of the replicate samples collected according to the ITRC ISM, the site soil appears to be heterogeneous. However, based on *USEPA Supplemental Guidance to RAGS: Calculating the Concentration Term* (1992), since the Chebyshev 95% UCLs exceed the maximum analyte concentrations, Alta recommends using the maximum concentrations if a risk evaluation is to be completed using these data.

Alta did not reject data or consider data as unusable for this project. However, the Alta field crew did not collect a site-specific MS/MSD sample as planned in the QAPP; therefore, Alta has calculated completeness for this sampling event at 99%, which meets the project goal of 90% (Table 5 in TerraGraphics 2016).

Section 5 Investigative Derived Waste

There was no investigative derived waste generated as part of this project.

Section 6 Clean and Green Reporting

In accordance with the Green Remediation Objectives outlined in USEPA Region 10 Clean and Green Policy, Alta implemented several sustainable technologies and practices to minimize the overall environmental footprint on this project including the following:

- Conveyed project correspondence, plans, and reports via electronic transmittal to reduce the use of paper products.
- Used an incremental sampling approach to reduce investigative derived waste and analytical costs.
- Used hand tooling for sample collection compared to diesel or gas powered direct push methods to reduce emissions.

Section 7 Conclusions and Recommendations

Table A1 in Attachment 1 compares arsenic and PAH concentrations collected within DU2.2B to arsenic and PAH concentrations from October 2016 and also compares all concentrations to USEPA RSLs (arsenic) and IDAPA RUSLs (PAHs). Arsenic concentrations appear similar for surface and sub-surface soils with a surface soil concentration of 14.5 mg/kg and 14.4 mg/kg after excavation. PAH concentrations appear to decrease at depth. However, there remains a PAH soil concentration above the RUSL; benzo(a) pyrene was detected at 0.0309 mg/kg compared to an RUSL of 0.0200 mg/kg. Based upon those comparisons, Alta concludes the following:

- Arsenic concentrations appear similar and are possibly representative of naturally occurring background concentrations. This data further supports the conclusions associated with arsenic risks in soils outlined within the Consultation conducted by the Idaho Department of Health and Welfare attached as Appendix C in the *Risk Evaluation of the Burlington Northern Santa Fe Railway Company Corridor Right of Way Riverstone to Huetter Site in Coeur d'Alene, Idaho* (Alta 2017).
- PAH concentrations decrease within the first couple feet. However, benzo(a)pyrene slightly exceeds the IDAPA RUSL in the deeper soil. Based upon the Site's historic use, a similar decreasing trend from the surface soil to depth could be expected in other DUs that have PAH impacts. However, additional sampling in each DU would be necessary to confirm this trend.

Based upon the available data, Alta recommends IDEQ consider evaluating potential PAH exposure scenarios for soils at depth at each DU in conjunction with the proposed redevelopment and/or future land use. Risk from PAH soils could likely be mitigated with land use restrictions, onsite soil barriers, and/or shallow soil removals.

Section 8 References and Resources Used

Alta Science and Engineering, Inc. (Alta), 2017. Risk Evaluation of the Burlington Northern Santa Fe Railway Company Corridor Right of Way Riverstone to Huetter Site in Coeur d'Alene, Idaho. Prepared for the Idaho Department of Environmental Quality: Waste and Remediation Division, Brownfields Program, State Office and Coeur d'Alene Regional Office. Revision 2. November 14.

Idaho Administrative Procedures Act (IDAPA) 58.01.24: Standards and Procedures for Application of Risk Based Corrective Action at Petroleum Release Sites.

Idaho Department of Health and Welfare (IDHW), 2017. "Letter Health Consultation, BNSF Railway Corridor Site: Soil Arsenic Coeur d'Alene, Idaho." Prepared for E. Traynor (Brownfields Program Manager, Idaho Department of Environmental Quality) prepared by M. Willming (PhD Toxicologist/Health Assessor, Idaho Department of Health and Welfare). October 11.

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U.S. Environmental Protection Agency (USEPA), 1992. Supplemental Guidance to RAGS: Calculating the Concentration Term. Publication 9285.7-081, Intermittent Bulletin Volume 1 Number 1. May.

USEPA. 1998. Method 8270D (SW-846): Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)-SIM. Revision 4. January.

USEPA. 2000. Method 6010C (SW-846): Inductively Coupled Plasma-Atomic Emission Spectrometry. Revision 3. November.

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USEPA, 2009. Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use. OSWER No. 9200.1-85, EPA 540-R-08-005 prepared by the Office of Solid Waste and Emergency Response; January.

USEPA, 2017a. National Functional Guidelines for Inorganic Superfund Methods Data Review, (ISM02.4), OLEM 9355.0-135, USEPA-540-R-2017-001; January.

USEPA, 2017b. National Functional Guidelines for Organic Superfund Methods Data Review, (SOM02.4), OLEM 9355.0-136, USEPA-540-R-2017-002; January.

USEPA, 2017c. Regional Screening Levels for Chemical Contaminants at Superfund Sites. Resident Soil Table. June.

Attachment A
Data Summary Table

Table A1. Data Summary for Soil Arsenic and PAHs (mg/kg) for the Coeur d'Alene, Idaho, BNSF ROW R2R DU 2.2B Soil Sampling

Sample ID	Sample Date	Sample Depth (in. bgs)		Arsenic		Anthracene	Acenaphthene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Chrysene	Fluoranthene	Fluorene	Naphthalene	Pyrene
DU 2.2B	10/3/2016	12	Metals Results	**14.5**	PAH Results	0.349	<0.0600	**0.520**	**0.606**	**0.942**	0.288	0.679	0.938	<0.0600	<0.200	1.01
	8/28/2017	~ 24–36		**14.4**		0.130	0.0778	0.0520	**0.0309**	0.0573	0.0211	0.0656	0.351	0.0618	0.0498	0.237
			RSL	0.680	RUSL	3,200	200	0.090	0.0200	0.190	1.90	9.50	1,400	240	0.120	1,000
			USEPA RSL Critical Receptor	*Residential Direct Contact; Carcinogenic*	RUSL Critical Receptor	*Groundwater Protection*	*Groundwater Protection*	*Groundwater Protection*	*Direct Contact*	*Direct Contact*	*Direct Contact*	*Groundwater Protection*	*Groundwater Protection*	*Groundwater Protection*	*Vapor Intrusion*	*Groundwater Protection*

Notes:

Concentrations displayed are the maximum concentration from the replicate Incremental Sampling Methodology (ISM) sample (triplicate sample)

< denotes that the result was not detected above method detection limit.

Bold arsenic concentration exceeds the USEPA Regional Screening Level (RSL). https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-june-2017

Bold PAH concentrations exceed the IDAPA 58.01.24 Residential Use Screening Levels (RUSLs). https://adminrules.idaho.gov/rules/2016%20Archive/58/0124.pdf

in. bgs = inches below ground surface

Attachment B
QA/QC Tables

Table B1. SDG/Work Order Data Validation

Laboratory	SDG / Work Order	Analysis	Matrix	Data Validation Level (USEPA 2009)	Review Conducted by
SVL	X7H0678	Arsenic [a]	Soil, Rinsate Blank	Stage 2A	Alta
ESC	L932693	PAHs [b]	Soil	Stage 2A	Alta

Notes:

[a] Analyzed by USEPA Method 6010D (soil) (USEPA 2014a) and 6020B (water) (USEPA 2014b).

[b] PAH = Polycyclic aromatic hydrocarbons; target analytes are anthracene, acenaphthene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, naphthalene, and pyrene analyzed by USEPA Method 8270C-SIM [selective ion monitoring] (USEPA 1996). Other reported analytes in the data package are not a part of this review.

ESC = ESC Lab Sciences in Mount Juliet, Tennessee.

SVL = SVL Analytical, Inc. in Kellogg, Idaho.

Table B2. Rinsate Blanks for the 2017 DU2.2B Sampling of the BNSF ROW R2R

Sample ID	Sample Date	Work Order / SDG	Target Analytes	Concentration (mg/L)	Lab
BNSF-RB1	8/28/2017	X7H0678	Arsenic	<0.00300	SVL
BNSF-RB1	8/28/2017	L920275	Anthracene	<0.0000500	ESC
			Acenaphthene	<0.0000500	
			Benzo(a)anthracene	<0.0000500	
			Benzo(a)pyrene	<0.0000500	
			Benzo(b)fluoranthene	<0.0000500	
			Benzo(k)fluoranthene	<0.0000500	
			Chrysene	<0.0000500	
			Fluoranthene	<0.0000500	
			Fluorene	<0.0000500	
			Naphthalene	0.000741	
			Pyrene	<0.0000500	

Notes:

< = less than the reporting limit

mg/L = milligrams per liter

SDG = sample delivery group

Table B3. Relative Standard Deviations for Soil Arsenic and PAHs (mg/kg) for the 2017 CDA, Idaho, BNSF ROW R2R DU 2.2B Soil Sampling

Sample ID	Arsenic	Anthracene	Acenaphthene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Chrysene	Fluoranthene	Fluorene	Naphthalene	Pyrene
SS-1	13.8	0.130	0.0778	0.0520	0.0309	0.0573	0.0211	0.0656	0.351	0.0618	0.0498	0.237
SS-2	13.6	0.0300 U	0.0300 U	0.0300 U	0.0300 U	0.0300 U	0.0300 U	0.0300 U	0.0384	0.0300 U	0.100 U	0.0361
SS-3	14.4	0.0177 J	0.0120 UJ	0.0120 UJ	0.0120 UJ	0.0167 J	0.0120 UJ	0.0120 UJ	0.0196 J	0.0120 UJ	0.0400 UJ	0.0194 J
Mean	13.9	0.0592	--	--	--	0.0347	--	--	0.136	--	--	0.0975
Standard Deviation	0.416	0.0616	--	--	--	0.0207	--	--	0.186	--	--	0.121
RSD	3%	**104%**	**--**	**--**	**--**	**60%**	**--**	**--**	**137%**	**--**	**--**	**124%**

Notes:

-- = When two results are not detected, a relative standard deviation is not calculated.

J = Result is an estimate.

U = Result was not detected above the reporting limit.

UJ = Estimated result was not detected above the reporting limit.

NA = Not applicable.

RSD = relative standard deviation or =(standard deviation/mean)

Bold percentages are greater than 35% and a 1-sided upper confidence limit for the mean is calculated (ITRC 2012).

When one result is not detected (U), the reporting limit is used in the calculation.

Note on Selecting a UCL Method. The following worksheets are used to calculate 95% UCLs from ISM data using both the Chebyshev and Student's-t methods. Since data suggests that the variability is high or the variability is unknown, use the Chebyshev method. Because the Chebyshev method tends to yield higher UCL values for the same data set, it's statistical performance is desirable - it achieves the desired 95% coverage of the mean under conditions when the variability of concentrations throughout the DU are moderate or high (See Table 4-4 in ITCR 2012). One drawback of this performance is that the Chebyshev will tend to more severely overestimate the true mean than Student's t. Nevertheless, if no discrete data are available to estimate this variability, then Chebyshev is generally preferred over Student's t. Do not mistake the standard deviation (SD) of replicates as a measure of this variability. The SD of replicates is a measure of consistency in estimates of the mean - this is considered a reliable indicator of the laboratory processing steps, but not an indicator of the degree of variability in the distribution of concentrations throughout the DU (ITRC 2012).

Table B4. ISM Calculator for 1-sided Upper Confidence Limit for the Mean of DU 2.2B PAHs

Replicate Number	Replicate Results			
	Anthracene	Benzo(b)fluoranthene	Fluoranthene	Pyrene
Rep 1 (SS-1)	0.130	0.0573	0.351	0.237
Rep 2 (SS-2)	0.0300	0.0300	0.0384	0.0361
Rep 3 (SS-3)	0.0177	0.0167	0.0196	0.0194
arithmetic mean	0.0592	0.0347	0.136	0.0975
standard deviation	0.0616	0.0207	0.186	0.121
CV = SD / mean	1.04	0.597	1.37	1.24
count (r)	3	3	3	3
alpha (95% = 0.05)	0.05	0.05	0.05	0.05
t(alpha, df=r-1)	2.92	2.92	2.92	2.92
Student's t UCL	0.163	0.0696	0.450	0.302
Chebychev UCL	**0.214**	**0.0868**	**0.605**	**0.402**