New York State Department of Environmental Conservation

PRELIMINARY BASELINE HEALTH RISK ASSESSMENT VOLUME II

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

Booth Oil Site City of North Tonawanda, Niagara County, New York (Site Registry No. 9-32-100)

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IN ASSOCIATION WITH

SADAT ASSOCIATES

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PRELIMINARY BASELINE HUMAN HEALTH RISK ASSESSMENT BOOTH OIL SITE, NORTH TONAWANDA NIAGARA COUNTY, NEW YORK

VOLUME II

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5.1 Methodology

5.1.1 Calculation of Noncarcinogenic Risk

To assess noncarcinogenic risk, the exposure doses calculated for noncarcinogens in the exposure assessment are compared to published EPA Reference Doses (RfDs) for chronic exposure through the calculation of hazard ratios. An RfD is defined as "an estimate of a daily exposure level for the human population, including sensitive sub-populations, that is likely to be without an appreciable risk of deleterious effects during a lifetime" (EPA, 1989b). A hazard ratio is simply the ratio of the exposure dose calculated for a noncarcinogenic compound for a given exposure route over the route-specific RfD for that compound (EPA, 1989b). The hazard ratio is calculated by:

$$HR_{ij} = \frac{EX_{ij}}{RfD_{ij}}$$

where:

HR_{ij} = hazard ratio for contaminant i via exposure route j (dimensionless)

EX_{ij} = calculated noncarcinogenic exposure dose for contaminant i via exposure route j (mg/kg-day)

RfD_{ij} = reference dose for contaminant i via exposure route j (mg/kg-day)

RfDs for the indicator chemicals at the Booth Oil Site are listed in Table 3-1. It must be noted that there are two RfDs listed in Table 3-1 for lead, corresponding to the inorganic and organic forms of this compound. As analyses performed in the Phase I RI identified lead as total lead and did not specify the organic and inorganic fractions, it cannot be assumed that the lead at the site is entirely inorganic or organic in form. Accordingly, hazard ratios are calculated for each inorganic and organic lead herein. The results of these calculations should be interpreted as a range of risk and not actual measures of noncarcinogenic risk.

A hazard ratio assumes that there is a level of exposure below which adverse health effects are not expected to occur (i.e., the RfD) (EPA, 1989c). Exposure doses above this threshold indicate the potential for noncarcinogenic effects. Conversely, an exposure dose less than the RfD for the compound in question (i.e., hazard ratio <1.0) indicates that adverse health effects are not likely to occur from the exposure to that compound.

To assess the potential for noncarcinogenic health effects posed by multiple chemicals for a given exposure route, a hazard index is calculated. The hazard index is the sum of each of the chemical-specific hazard ratios for a given exposure route (EPA, 1989c):

$$HI_j = \sum_i^n HR_{ij}$$

where:

HI_j = hazard index for exposure route j (dimensionless)

HR_{ij} = calculated hazard ratio for contaminant i via exposure route j (dimensionless)

n = number of contaminants evaluated for exposure route j (dimensionless)

Similarly, to assess the overall potential for non-carcinogenic health effects posed by combined exposures to a site, the hazard indices calculated for the individual exposure pathways are summed to yield a total hazard index (EPA, 1989c):

$$HI_T = \sum_j^n HI_j$$

where:

HI_T = total hazard index (dimensionless)

HI_j = calculated hazard index for exposure route j (dimensionless)

n = number of exposure routes evaluated in the assessment

For multiple-chemical, multiple-pathway exposures, the total hazard index may exceed one even if no single hazard ratio or route-specific hazard index exceeds its acceptable level. The assumption of additivity reflected in the hazard index equations is most properly applied to compounds that induce the same effect by the same mechanism. This additive relationship of toxic effects is not strictly accurate for the noncarcinogenic contaminants of concern at the Booth Oil Site. However, the hazard index is a useful screening tool in evaluating the potential effects of environmental exposures to mixtures of noncarcinogens.

5.1.2 Calculation of Carcinogenic Risk

For carcinogens, risks are estimated as the incremental probability of an individual developing cancer over a lifetime as the result of exposure to a given compound. For example, a carcinogenic risk of 1.00E-06 for a chemical exposure indicates

that, given an exposure to one million persons, one additional cancer above the expected incidence rate is likely to occur from that exposure. Carcinogenic risk is calculated by multiplying the contaminant-specific exposure dose for a given exposure route by the slope factor of the dose-response curve (Carcinogenic Slope Factor) for that chemical and exposure route (EPA, 1989c):

$$Risk_{ij} = EX_{ij} \times CSF_{ij}$$

where:

$Risk_{ij}$ = carcinogenic risk for contaminant i via exposure route j (dimensionless)

EX_{ij} = calculated carcinogenic exposure dose for contaminant i via exposure route j (mg/kg-day)

CSF_{ij} = carcinogenic slope factor for contaminant i via exposure route j $(mg/kg\text{-}day)^{-1}$

Carcinogenic slope factors for the indicator chemicals at the Booth Oil Site are listed in Table 3-1.

EPA utilizes a range of 1.00E-04 to 1.00E-06 to evaluate risks posed to the general population by Superfund sites. The New York State Department of Health (NYSDOH) utilizes a risk level of 1.00E-06 as an acceptable risk level for hazardous waste sites in New

York State. This risk level will be used herein to evaluate risks to the general population due to exposures to contaminants at and emanating from the Booth Oil Site.

As discussed earlier, OSHA regulations will provide for the safety and health of construction workers on-site. This population is assessed herein solely as part of the baseline assessment. Risk of one in ten (1.00E-01) to one in one thousand (1.00E-03) correspond to OSHA threshold limit values (TLVs) for carcinogens in occupational settings (Alavania, et al., 1990). The conservative risk level of 1.00E-03 will be used herein to evaluate the potential risks posed to unprotected construction workers on-site.

To assess the carcinogenic risk posed by multiple chemicals for a given exposure route, the chemical-specific carcinogenic risks are summed (EPA, 1989c):

$$Risk_j = \sum_{i}^{n} Risk_{ij}$$

where:

$Risk_j$ = carcinogenic risk for exposure route j (dimensionless)

$Risk_{ij}$ = calculated carcinogenic risk for contaminant i via exposure route j (dimensionless)

n = number of contaminants in exposure route j (dimensionless)

Similarly, to assess the overall carcinogenic risk posed by combined exposures to a site, the carcinogenic risks calculated for the individual exposure pathways are summed to yield a total carcinogenic risk (EPA, 1989c):

$$Risk_T = \sum_{j}^{n} Risk_j$$

where:

$Risk_T$ = total carcinogenic risk (dimensionless)

$Risk_j$ = calculated carcinogenic risk for exposure route j (dimensionless)

n = number of exposure routes evaluated in the assessment

For multiple-chemical, multiple-pathway exposures, the total carcinogenic risk may exceed the acceptable range even if no single contaminant or route results in unacceptable risk. The assumption of additivity reflected in the carcinogenic risk equations may tend

to overestimate risks where antagonistic interactions between chemicals occur or underestimate risks where synergistic interactions occur. The uncertainties associated with this assumption are discussed further in Section 7.0 of this report.

5.2 Risks Due to Ingestion

Tables 5-1 through 5-4 list the noncarcinogenic hazard indices and carcinogenic risks calculated for ingestion exposures of children to surficial soils at the Booth Oil Site. Table 5-1 presents the hazard indices and risks calculated for ingestion of soil from Area A. The total hazard indices calculated for Area A using the RfD for inorganic lead are 7.04E-03 for non-pica children and 7.04E-02 for pica children. Each of these values are less than 1.0, indicating that adverse noncarcinogenic health effects are not expected from the exposure. However, it must be noted that use of the RfD for organic lead results in hazard ratios of 8.87E+01 and 8.87E+02 for non-pica and pica children, respectively. Each of these values exceeds the acceptable limit of 1.0. The hazard ratios calculated in Table 5-1 for inorganic and organic lead should be interpreted as the range of possible noncarcinogenic hazard due to ingestion. The actual hazard due to lead exposure, if it were readily measurable, would lie somewhere within the range calculated above.

Table 5-1
Calculated Ingestion Exposure Risks
Area A Surficial Soil

	Upper 95% Confidence Arith Mean (mg/kg)	Non-Pica Non-Carc. Hazard Index	Non-Pica Carc. Risk	Pica Non-Carc. Hazard Index	Pica Carc. Risk
VOLATILES					
Benzene	4.13E-01	NA	1.35E-11	NA	1.35E-10
Carbon Disulfide	1.07E-01	1.06E-08	NA	1.06E-07	NA
1,1-Dichloroethane	9.30E-01	9.19E-08	NA	9.19E-07	NA
1,2-Dichloroethene (total)	1.90E-01	9.39E-08	NA	9.39E-07	NA
Ethylbenzene	5.84E-01	5.77E-08	NA	5.77E-07	NA
Tetrachloroethene	1.66E-01	1.64E-07	9.57E-12	1.64E-06	9.57E-11
Toluene	4.13E-01	1.36E-08	NA	1.36E-07	NA
Trichloroethene	4.13E-01	NA	5.13E-12	NA	5.13E-11
Xylene (total)	1.19E+01	5.89E-08	NA	5.89E-07	NA
SEMI-VOLATILES					
Acenaphthene	1.88E+00	3.09E-07	NA	3.09E-06	NA
Acenaphthylene	1.70E+00	NA	NA	NA	NA
Anthracene	1.72E+00	5.65E-08	NA	5.65E-07	NA
Benzo(a)anthracene	1.58E+00	NA	2.05E-08	NA	2.05E-07
Benzo(b)fluoranthene	1.62E+00	NA	2.10E-08	NA	2.10E-07
Benzo(k)fluoranthene	1.72E+00	NA	2.23E-08	NA	2.23E-07
Benzoic acid	8.33E+00	2.06E-08	NA	2.06E-07	NA
Benzo(a)pyrene	1.60E+00	NA	2.08E-08	NA	2.08E-07
Butylbenzylphthalate	8.21E-01	4.06E-09	NA	4.06E-08	NA
Chrysene	1.38E+00	NA	1.79E-08	NA	1.79E-07
Dibenzo(a,h)anthracene	1.72E+00	NA	2.23E-08	NA	2.23E-07
2,4-Dimethylphenol	1.75E+00	8.63E-07	NA	8.63E-06	NA
bis(2-Ethylhexyl)phthalate	3.03E+00	1.50E-06	4.79E-11	1.50E-05	4.79E-10
Fluoranthene	2.73E+00	6.75E-07	NA	6.75E-06	NA
Fluorene	1.75E+00	4.32E-07	NA	4.32E-06	NA
Indeno(1,2,3-cd)pyrene	1.71E+00	NA	2.22E-08	NA	2.22E-07
2-Methylnaphthalene	6.77E+00	NA	NA	NA	NA
2-Methylphenol	1.72E+00	3.39E-07	NA	3.39E-06	NA
4-Methylphenol	1.71E+00	3.38E-07	NA	3.38E-06	NA
Naphthalene	1.56E+00	3.85E-06	NA	3.85E-05	NA
Di-n-octylphthalate	1.76E+00	8.71E-07	NA	8.71E-06	NA
Phenanthrene	3.43E+00	NA	NA	NA	NA
Phenol	1.72E+00	2.83E-08	NA	2.83E-07	NA
Pyrene	2.17E+00	7.16E-07	NA	7.16E-06	NA

Table 5-1 (cont'd)
Calculated Ingestion Exposure Risks
Area A Surficial Soil

	Upper 95% Confidence Arith Mean (mg/kg)	Non-Pica Non-Carc. Hazard Index	Non-Pica Carc. Risk	Pica Non-Carc. Hazard Index	Pica Carc. Risk
INORGANICS					
Aluminum	1.12E+04	NA	NA	NA	NA
Antimony	6.79E+00	1.68E-04	NA	1.68E-03	NA
Arsenic	2.69E+01	2.66E-04	NA	2.66E-03	NA
Barium	2.02E+02	3.98E-05	NA	3.98E-04	NA
Beryllium	1.46E+00	2.88E-06	7.08E-09	2.88E-05	7.08E-08
Cadmium	1.66E+00	1.64E-05	NA	1.64E-04	NA
Calcium	1.11E+05	NA	NA	NA	NA
Chromium	2.35E+01	2.32E-07	NA	2.32E-06	NA
Cobalt	6.96E+00	NA	NA	NA	NA
Copper	8.44E+01	NA	NA	NA	NA
Iron	2.86E+04	NA	NA	NA	NA
Lead (inorganic)	8.98E+02	6.34E-03	NA	6.34E-02	NA
Magnesium	5.71E+04	NA	NA	NA	NA
Manganese	9.60E+02	4.74E-05	NA	4.74E-04	NA
Mercury	2.87E-01	9.45E-06	NA	9.45E-05	NA
Nickel	1.97E+01	9.71E-06	NA	9.71E-05	NA
Potassium	1.82E+03	NA	NA	NA	NA
Selenium	1.60E+00	NA	NA	NA	NA
Silver	9.27E-01	3.05E-06	NA	3.05E-05	NA
Sodium	4.79E+02	NA	NA	NA	NA
Thallium	5.24E-01	7.40E-05	NA	7.40E-04	NA
Vanadium	2.31E+01	3.26E-05	NA	3.26E-04	NA
Zinc	3.55E+02	1.76E-05	NA	1.76E-04	NA
Cyanide	8.95E+00	4.42E-06	NA	4.42E-05	NA
PESTICIDES/PCBs					
PCB-1242	5.17E-01	NA	4.50E-09	NA	4.50E-08
PCB-1254	1.45E+01	NA	1.26E-07	NA	1.26E-06
PCB-1260	1.12E+01	NA	9.74E-08	NA	9.74E-07
PCB-1248	1.68E+01	NA	1.46E-07	NA	1.46E-06
TOTAL	2.13E+05	7.04E-03	5.28E-07	7.04E-02	5.28E-06
Lead (organic)	8.98E+02	8.87E+01	NA	8.87E+02	NA

The carcinogenic risks calculated for ingestion of surficial soil in Area A (see Table 5-1) are 5.28E-07 and 5.28E-06 for non-pica and pica children, respectively. The carcinogenic risk calculated for pica children exceeds the NYSDOH goal of 1.00E-06. Review of Table 5-1 indicates that this elevated carcinogenic risk is attributed to PCB-1254, PCB-1248, and PCB-1260 with individual carcinogenic risks of 1.26E-06, 1.46E-06 and 9.74E-07, respectively. Review of Table 2-4 indicates that these elevated risks are due to actual detected concentrations of these compounds in Area A surficial soil.

Table 5-2 presents the hazard indices and carcinogenic risks calculated for ingestion of surficial soil in Area B by children. The total hazard indices calculated with the RfD for inorganic lead used for total lead are 2.30E-02 and 2.30E-01 for non-pica and pica children, respectively. Each of these values is less than 1.0, indicating that adverse noncarcinogenic health effects are not likely from the exposure. However, further review of Table 5-2 indicates that when the RfD for organic lead is used to estimate the risks for total lead, the hazard indices for ingestion exposure to lead in Area B surficial soil become 2.42E+02 and 2.42E+03 for non-pica and pica children, respectively. Each of these values exceeds the acceptable limit of 1.0. As noted previously, the actual risk due to ingestion of lead contaminated soil in Area B would lie somewhere between the range presented in Table 5-2.

Table 5-2

Calculated Ingestion Exposure Risks
Area B Surficial Soil

	Upper 95% Confidence Arith Mean (mg/kg)	Non-Pica Non-Carc. Hazard Index	Non-Pica Carc. Risk	Pica Non-Carc. Hazard Index	Pica Carc. Risk
VOLATILES					
Benzene	4.41E-01	NA	1.45E-11	NA	1.45E-10
Carbon Disulfide	3.88E-01	3.83E-08	NA	3.83E-07	NA
1,1-Dichloroethane	3.88E-01	3.83E-08	NA	3.83E-07	NA
1,2-Dichloroethene (total)	5.95E-01	2.94E-07	NA	2.94E-06	NA
Ethylbenzene	3.88E-01	3.83E-08	NA	3.83E-07	NA
Tetrachloroethene	1.55E+00	1.53E-06	8.93E-11	1.53E-05	8.93E-10
Toluene	3.88E-01	1.28E-08	NA	1.28E-07	NA
Trichloroethene	2.74E+00	NA	3.41E-11	NA	3.41E-10
Xylene (total)	3.88E-01	1.92E-09	NA	1.92E-08	NA
SEMI-VOLATILES					
Acenaphthene	1.67E+01	2.76E-06	NA	2.76E-05	NA
Acenaphthylene	1.67E+01	NA	NA	NA	NA
Anthracene	1.67E+01	5.51E-07	NA	5.51E-06	NA
Benzo(a)anthracene	1.67E+01	NA	2.18E-07	NA	2.18E-06
Benzo(b)fluoranthene	1.67E+01	NA	2.18E-07	NA	2.18E-06
Benzo(k)fluoranthene	1.67E+01	NA	2.18E-07	NA	2.18E-06
Benzoic acid	8.12E+01	2.00E-07	NA	2.00E-06	NA
Benzo(a)pyrene	1.67E+01	NA	2.18E-07	NA	2.18E-06
Butylbenzylphthalate	1.67E+01	8.27E-08	NA	8.27E-07	NA
Chrysene	1.67E+01	NA	2.18E-07	NA	2.18E-06
Dibenzo(a,h)anthracene	1.67E+01	NA	2.18E-07	NA	2.18E-06
2,4-Dimethylphenol	7.76E+01	3.83E-05	NA	3.83E-04	NA
bis(2-Ethylhexyl)phthalate	4.49E+01	2.22E-05	7.11E-10	2.22E-04	7.11E-09
Fluoranthene	1.67E+01	4.13E-06	NA	4.13E-05	NA
Fluorene	1.67E+01	4.13E-06	NA	4.13E-05	NA
Indeno(1,2,3-cd)pyrene	1.67E+01	NA	2.18E-07	NA	2.18E-06
2-Methylnaphthalene	4.15E+00	NA	NA	NA	NA
2-Methylphenol	5.69E+01	1.12E-05	NA	1.12E-04	NA
4-Methylphenol	4.27E+02	8.44E-05	NA	8.44E-04	NA
Naphthalene	1.69E+01	4.18E-05	NA	4.18E-04	NA
Di-n-octylphthalate	1.65E+01	8.13E-06	NA	8.13E-05	NA
Phenanthrene	2.48E+00	NA	NA	NA	NA
Phenol	2.50E+02	4.12E-06	NA	4.12E-05	NA
Pyrene	1.64E+01	5.41E-06	NA	5.41E-05	NA

Table 5-2 (cont'd)
Calculated Ingestion Exposure Risks
Area B Surficial Soil

	Upper 95% Confidence Arith Mean (mg/kg)	Non-Pica Non-Carc. Hazard Index	Non-Pica Carc. Risk	Pica Non-Carc. Hazard Index	Pica Carc. Risk
INORGANICS					
Aluminum	3.40E+04	NA	NA	NA	NA
Antimony	1.85E+02	4.58E-03	NA	4.58E-02	NA
Arsenic	1.39E+01	1.37E-04	NA	1.37E-03	NA
Barium	3.04E+03	6.00E-04	NA	6.00E-03	NA
Beryllium	6.30E+00	1.24E-05	3.06E-08	1.24E-04	3.06E-07
Cadmium	9.33E+00	9.22E-05	NA	9.22E-04	NA
Calcium	2.09E+05	NA	NA	NA	NA
Chromium	1.74E+02	1.72E-06	NA	1.72E-05	NA
Cobalt	1.33E+01	NA	NA	NA	NA
Copper	6.35E+02	NA	NA	NA	NA
Iron	5.14E+04	NA	NA	NA	NA
Lead (inorganic)	2.45E+03	1.69E-02	NA	1.69E-01	NA
Magnesium	6.55E+04	NA	NA	NA	NA
Manganese	2.84E+03	1.40E-04	NA	1.40E-03	NA
Mercury	1.72E-01	5.66E-06	NA	5.66E-05	NA
Nickel	4.59E+01	2.27E-05	NA	2.27E-04	NA
Potassium	2.55E+03	NA	NA	NA	NA
Selenium	2.18E+00	NA	NA	NA	NA
Silver	9.37E-01	3.09E-06	NA	3.09E-05	NA
Sodium	1.58E+03	NA	NA	NA	NA
Thallium	7.01E-01	9.89E-05	NA	9.89E-04	NA
Vanadium	2.89E+01	4.07E-05	NA	4.07E-04	NA
Zinc	1.36E+03	6.73E-05	NA	6.73E-04	NA
Cyanide	6.20E+00	3.06E-06	NA	3.06E-05	NA
PESTICIDES/PCBs					
PCB-1242	1.66E+01	NA	1.44E-07	NA	1.44E-06
PCB-1254	3.83E+01	NA	3.33E-07	NA	3.33E-06
PCB-1260	3.66E+01	NA	3.19E-07	NA	3.19E-06
PCB-1248	3.44E+01	NA	3.00E-07	NA	3.00E-06
TOTAL	3.76E+05	2.30E-02	2.65E-06	2.30E-01	2.65E-05
Lead (organic)	2.45E+03	2.42E+02	NA	2.42E+03	NA

The carcinogenic risks calculated for ingestion exposure to surficial soil in Area B are 2.56E-06 for non-pica children and 2.65E-05 for pica children. Each of these values exceed the NYSDOH goal of 1.00E-06. Review of Table 5-2 indicates that these elevated carcinogenic risks are due to CaPAHs and PCBs. CaPAHs, as a class, result in a total carcinogenic risk of 1.53E-06 for non-pica children and 1.53E-05 for pica children. PCBs, as a class, result in a total carcinogenic risk of 1.10E-06 for non-pica children and 1.10E-05 for pica children. Review of Table 2-2 indicates that the contaminant concentrations, and therefore the carcinogenic risks, for each of the CaPAHs in Area B surficial soil are attributed to proxy concentrations estimated from the sample detection limits. However, the contaminant concentrations listed in Table 2-4 for PCBs in Area B are a combination of actual detected concentrations and proxy values, with the detected concentrations being significantly (i.e., more than one order of magnitude) greater than the proxy values.

Table 5-3 presents the hazard indices and carcinogenic risks calculated for ingestion of surficial soil in Area C of the Booth Oil Site by children. The hazard indices calculated with the RfD for inorganic lead used for total lead are 5.83E-03 and 5.83E-02 for non-pica and pica children, respectively. Each of these values falls below the ceiling limit of 1.0. However, further review of the table indicates that, when the RfD for organic lead is used for

Table 5-3
Calculated Ingestion Exposure Risks
Area C Surficial Soil

	Soil Concentration (mg/kg)	Non-Pica Non-Carc. Hazard Index	Non-Pica Carc. Risk	Pica Non-Carc. Hazard Index	Pica Carc. Risk
VOLATILES					
Benzene	4.00E-03	NA	1.31E-13	NA	1.31E-12
Carbon Disulfide	5.00E-03	4.94E-10	NA	4.94E-09	NA
1,1-Dichloroethane	3.00E-03	2.96E-10	NA	2.96E-09	NA
1,2-Dichloroethene (tot.)	6.50E-02	3.21E-08	NA	3.21E-07	NA
Ethylbenzene	6.00E-03	5.93E-10	NA	5.93E-09	NA
Tetrachloroethene	7.00E-03	6.92E-09	4.03E-13	6.92E-08	4.03E-12
Toluene	1.40E-02	4.61E-10	NA	4.61E-09	NA
Trichloroethene	1.90E-02	NA	2.36E-13	NA	2.36E-12
Xylene (total)	3.60E-02	1.78E-10	NA	1.78E-09	NA
SEMI-VOLATILES					
Acenaphthene	1.41E+00	2.32E-07	NA	2.32E-06	NA
Acenaphthylene	1.41E+00	NA	NA	NA	NA
Anthracene	1.41E+00	4.63E-08	NA	4.63E-07	NA
Benzo(a)anthracene	1.41E+00	NA	1.83E-08	NA	1.83E-07
Benzo(b)fluoranthene	1.80E+00	NA	2.34E-08	NA	2.34E-07
Benzo(k)fluoranthene	8.10E-01	NA	1.05E-08	NA	1.05E-07
Benzoic acid	6.82E+00	1.68E-08	NA	1.68E-07	NA
Benzo(a)pyrene	1.41E+00	NA	1.83E-08	NA	1.83E-07
Butylbenzylphthalate	1.41E+00	6.95E-09	NA	6.95E-08	NA
Chrysene	1.10E+00	NA	1.43E-08	NA	1.43E-07
Dibenzo(a,h)anthracene	1.41E+00	NA	1.83E-08	NA	1.83E-07
2,4-Dimethylphenol	7.50E-01	3.71E-07	NA	3.71E-06	NA
bis(2-Ethylhexyl)phthalate	8.20E+00	4.05E-06	1.30E-10	4.05E-05	1.30E-09
Fluoranthene	1.50E+00	3.71E-07	NA	3.71E-06	NA
Fluorene	1.41E+00	3.47E-07	NA	3.47E-06	NA
Indeno(1,2,3-cd)pyrene	1.41E+00	NA	1.83E-08	NA	1.83E-07
2-Methylnaphthalene	1.10E+00	NA	NA	NA	NA
2-Methylphenol	1.41E+00	2.78E-07	NA	2.78E-06	NA
4-Methylphenol	1.41E+00	2.78E-07	NA	2.78E-06	NA
Naphthalene	1.41E+00	3.47E-06	NA	3.47E-05	NA
Di-n-octylphthalate	1.41E+00	6.95E-07	NA	6.95E-06	NA
Phenanthrene	1.70E+00	NA	NA	NA	NA
Phenol	1.41E+00	2.32E-08	NA	2.32E-07	NA
Pyrene	1.90E+00	6.26E-07	NA	6.26E-06	NA

Table 5-3 (cont'd)
Calculated Ingestion Exposure Risks
Area C Surficial Soil

	Soil Concentration (mg/kg)	Non-Pica Non-Carc. Hazard Index	Non-Pica Carc. Risk	Pica Non-Carc. Hazard Index	Pica Carc. Risk
INORGANICS					
Aluminum	1.33E+04	NA	NA	NA	NA
Antimony	4.80E+00	1.19E-04	NA	1.19E-03	NA
Arsenic	2.12E+01	2.09E-04	NA	2.09E-03	NA
Barium	2.37E+02	4.68E-05	NA	4.68E-04	NA
Beryllium	9.70E-01	1.92E-06	4.71E-09	1.92E-05	4.71E-08
Cadmium	2.40E+00	2.37E-05	NA	2.37E-04	NA
Calcium	7.33E+04	NA	NA	NA	NA
Chromium	2.97E+01	2.93E-07	NA	2.93E-06	NA
Cobalt	8.10E+00	NA	NA	NA	NA
Copper	7.39E+01	NA	NA	NA	NA
Iron	2.38E+04	NA	NA	NA	NA
Lead (inorganic)	7.44E+02	5.25E-03	NA	5.25E-02	NA
Magnesium	2.53E+04	NA	NA	NA	NA
Manganese	7.45E+02	3.68E-05	NA	3.68E-04	NA
Mercury	2.30E-01	7.57E-06	NA	7.57E-05	NA
Nickel	2.24E+01	1.11E-05	NA	1.11E-04	NA
Potassium	1.99E+03	NA	NA	NA	NA
Selenium	6.70E-01	NA	NA	NA	NA
Silver	8.30E-01	2.73E-06	NA	2.73E-05	NA
Sodium	3.01E+02	NA	NA	NA	NA
Thallium	4.20E-01	5.93E-05	NA	5.93E-04	NA
Vanadium	2.17E+01	3.06E-05	NA	3.06E-04	NA
Zinc	3.43E+02	1.69E-05	NA	1.69E-04	NA
Cyanide	5.40E-01	2.67E-07	NA	2.67E-06	NA
PESTICIDES/PCBS *					
PCB-1242	1.45E+00	NA	1.27E-08	NA	1.27E-07
PCB-1254	5.57E+01	NA	4.85E-07	NA	4.85E-06
PCB-1260	6.23E+00	NA	5.42E-08	NA	5.42E-07
PCB-1248	3.32E+01	NA	2.89E-07	NA	2.89E-06
TOTAL	1.40E+05	5.83E-03	9.67E-07	5.83E-02	9.67E-06
Lead (organic)	7.44E+02	7.35E+01	NA	7.35E+02	NA

NOTES:
* 95% Confidence Arithmatic Mean Used for Pesticides/PCB's

total lead, the hazard ratios for lead are 7.35E+01 for non-pica children and 7.35E+02 for pica children. Each of these values exceeds the acceptable limit of 1.0. As discussed previously, the actual risks posed by ingestion exposure to lead in Area C surficial soil would lie somewhere within the range of values presented in Table 5-3, as the soil may contain both, the inorganic and organic, forms of lead.

The carcinogenic risks presented in Table 5-3 for ingestion of Area C surficial soil by children are 9.67E-07 and 9.67E-06 for non-pica and pica children, respectively. The carcinogenic risk calculated for ingestion exposure of pica children in Area C exceeds the NYSDOH goal of 1.00E-06. Review of Table 5-3 indicates that the elevated risk level calculated for pica children is due primarily to PCBs, with individual carcinogenic risks of 1.27E-07 to 4.85E-06 and CaPAHs with individual risks of 1.05E-07 to 2.43E-07. PCBs, as a class, result in a total carcinogenic risk of 8.41E-06 for ingestion exposure of pica children to Area C surficial soil. Similarly, CaPAHs, as a class, result in a total carcinogenic risk of 1.21E-06 for this exposure route (see Table 5-3). Review of Tables 2-2 and 2-4 indicates that the contaminant concentrations, and therefore the carcinogenic risks, listed for benzo(a)anthracene and PCB-1242 are due to proxy concentrations estimated from the sample detection limits. However, the concentrations and risks associated with the majority of the CaPAHs

and PCBs are due to actual contaminant concentrations detected in the surficial soil of Area C.

Table 5-4 presents the carcinogenic and noncarcinogenic risks calculated for ingestion of surficial soil in Area D by children. The total hazard indices calculated using the RfD for inorganic lead are 4.56E-03 for non-pica children and 4.56E-02 for pica children. Each of these values is significantly less than the acceptable limit of 1.0, indicating that adverse health effects are not expected from the exposure. However, the hazard ratios calculated for lead using the RfD for organic lead are 4.63E+01 and 4.63E+02 for non-pica and pica children, respectively. Each of these values exceeds the acceptable limit of 1.0. As noted previously, the actual noncarcinogenic risk due to lead exposure would lie somewhere within the range presented in Table 5-4.

The carcinogenic risks calculated for ingestion exposure to surficial soil in Area D are 8.18E-08 for non-pica children and 8.18E-07 for pica children. Each of these values falls below the NYSDOH goal of 1.00E-06.

Total risks due to ingestion exposure are calculated as the sum of the area-specific ingestion risks. Table 5-5 presents the total hazard indices and carcinogenic risks calculated for ingestion exposures of children to surficial soils at the Booth Oil

Table 5-4

Calculated Ingestion Exposure Risks
Area D Surficial Soil

	Soil Concentration (mg/kg)	Non-Pica Non-Carc. Hazard Index	Non-Pica Carc. Risk	Pica Non-Carc. Hazard Index	Pica Carc. Risk
VOLATILES					
Benzene	3.00E-03	NA	9.83E-14	NA	9.83E-13
Carbon Disulfide	3.00E-03	2.96E-10	NA	2.96E-09	NA
1,1-Dichloroethane	3.00E-03	2.96E-10	NA	2.96E-09	NA
1,2-Dichloroethene (tot.)	3.00E-03	1.48E-09	NA	1.48E-08	NA
Ethylbenzene	3.00E-03	2.96E-10	NA	2.96E-09	NA
Tetrachloroethene	3.00E-03	2.96E-09	1.73E-13	2.96E-08	1.73E-12
Toluene	3.00E-03	9.88E-11	NA	9.88E-10	NA
Trichloroethene	3.00E-03	NA	3.73E-14	NA	3.73E-13
Xylene (total)	3.00E-03	1.48E-11	NA	1.48E-10	NA
SEMI-VOLATILES					
Acenaphthene	4.06E-01	6.69E-08	NA	6.69E-07	NA
Acenaphthylene	1.40E-01	NA	NA	NA	NA
Anthracene	8.70E-02	2.87E-09	NA	2.87E-08	NA
Benzo(a)anthracene	4.06E-01	NA	5.28E-09	NA	5.28E-08
Benzo(b)fluoranthene	1.50E+00	NA	1.95E-08	NA	1.95E-07
Benzo(k)fluoranthene	4.06E-01	NA	5.28E-09	NA	5.28E-08
Benzoic acid	2.00E-01	4.94E-10	NA	4.94E-09	NA
Benzo(a)pyrene	9.90E-01	NA	1.29E-08	NA	1.29E-07
Butylbenzylphthalate	4.06E-01	2.01E-09	NA	2.01E-08	NA
Chrysene	1.20E+00	NA	1.56E-08	NA	1.56E-07
Dibenzo(a,h)anthracene	1.20E-01	NA	1.56E-09	NA	1.56E-08
2,4-Dimethylphenol	4.06E-01	2.01E-07	NA	2.01E-06	NA
bis(2-Ethylhexyl)phthala	3.30E+00	1.63E-06	5.22E-11	1.63E-05	5.22E-10
Fluoranthene	2.20E+00	5.43E-07	NA	5.43E-06	NA
Fluorene	4.06E-01	1.00E-07	NA	1.00E-06	NA
Indeno(1,2,3-cd)pyrene	9.00E-01	NA	1.17E-08	NA	1.17E-07
2-Methylnaphthalene	1.20E-01	NA	NA	NA	NA
2-Methylphenol	4.06E-01	8.02E-08	NA	8.02E-07	NA
4-Methylphenol	4.06E-01	8.02E-08	NA	8.02E-07	NA
Naphthalene	6.80E-02	1.68E-07	NA	1.68E-06	NA
Di-n-octylphthalate	4.06E-01	2.01E-07	NA	2.01E-06	NA
Phenanthrene	6.20E-01	NA	NA	NA	NA
Phenol	4.06E-01	6.69E-09	NA	6.69E-08	NA
Pyrene	1.30E+00	4.28E-07	NA	4.28E-06	NA

Table 5-4 (cont'd)

Calculated Ingestion Exposure Risks
Area D Surficial Soil

	Soil Concentration (mg/kg)	Non-Pica Non-Carc. Hazard Index	Non-Pica Carc. Risk	Pica Non-Carc. Hazard Index	Pica Carc. Risk
INORGANICS					
Aluminum	1.54E+04	NA	NA	NA	NA
Antimony	4.20E+00	1.04E-04	NA	1.04E-03	NA
Arsenic	8.07E+01	7.97E-04	NA	7.97E-03	NA
Barium	2.81E+02	5.55E-05	NA	5.55E-04	NA
Beryllium	9.90E-01	1.96E-06	4.81E-09	1.96E-05	4.81E-08
Cadmium	2.90E+00	2.87E-05	NA	2.87E-04	NA
Calcium	2.58E+04	NA	NA	NA	NA
Chromium	3.12E+01	3.08E-07	NA	3.08E-06	NA
Cobalt	1.54E+01	NA	NA	NA	NA
Copper	8.99E+01	NA	NA	NA	NA
Iron	5.65E+04	NA	NA	NA	NA
Lead (inorganic)	4.69E+02	3.31E-03	NA	3.31E-02	NA
Magnesium	1.24E+04	NA	NA	NA	NA
Manganese	7.51E+02	3.71E-05	NA	3.71E-04	NA
Mercury	3.10E-01	1.02E-05	NA	1.02E-04	NA
Nickel	2.90E+01	1.43E-05	NA	1.43E-04	NA
Potassium	2.42E+03	NA	NA	NA	NA
Selenium	1.50E+00	NA	NA	NA	NA
Silver	9.30E-01	3.06E-06	NA	3.06E-05	NA
Sodium	2.86E+02	NA	NA	NA	NA
Thallium	6.20E-01	8.75E-05	NA	8.75E-04	NA
Vanadium	4.56E+01	6.44E-05	NA	6.44E-04	NA
Zinc	9.40E+02	4.64E-05	NA	4.64E-04	NA
Cyanide	7.50E-01	3.71E-07	NA	3.71E-06	NA
PESTICIDES/PCBS *					
PCB-1242	9.80E-02	NA	8.53E-10	NA	8.53E-09
PCB-1254	1.98E-01	NA	1.72E-09	NA	1.72E-08
PCB-1260	1.98E-01	NA	1.72E-09	NA	1.72E-08
PCB-1248	9.80E-02	NA	8.53E-10	NA	8.53E-09
TOTAL	1.16E+05	4.56E-03	8.18E-08	4.56E-02	8.18E-07
Lead (organic)	4.69E+02	4.63E+01	NA	4.63E+02	NA

NOTES:
* 95% Confidence Arithmatic Mean used for Pesticides/PCBs

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Table 5-5
Total Ingestion Exposure Risks
Booth Oil Site - Surficial Soil

	Non-Pica Children			Pica Children		
Area	Non-Carc. Hazard Index *	Non-Carc. Hazard Index **	Carcinogenic Risk	Non-Carc. Hazard Index *	Non-Carc. Hazard Index **	Carcinogenic Risk
Area A	7.04E-03	8.87E+01	5.28E-07	7.04E-02	8.87E+02	5.28E-06
Area B	2.30E-02	2.42E+02	2.65E-06	2.30E-01	2.42E+03	2.65E-05
Area C	5.83E-03	7.35E+01	9.67E-07	5.83E-02	7.35E+02	9.67E-06
Area D	4.56E-03	4.63E+01	8.18E-08	4.56E-02	4.63E+02	8.18E-07
Total	4.04E-02	4.51E+02	4.23E-06	4.04E-01	4.51E+03	4.23E-05

* RfD for inorganic lead is used for total lead.
* RfD for organic lead is used for total lead.

Site. The hazard indices calculated for ingestion exposure to surficial soil at the site are 4.04E-02 to 4.51E+02 for non-pica children and 4.04E-01 to 4.51E+03 for pica children. The table indicates that the lower ends of the hazard index ranges, calculated by using the RfD for inorganic lead to represent total lead, are below the acceptable limit of 1.0, indicating that adverse noncarcinogenic health effects are not expected from the exposures. However, the upper-bounds of the hazard index range, which are calculated by using the RfD for organic lead to represent total lead, exceed the acceptable limit of 1.0.

It must be noted that neither the upper or lower bounds of the hazard index range are likely to be representative of actual noncarcinogenic risks posed by ingestion of surficial soil at the site. The actual noncarcinogenic risk, were it readily measurable, would likely fall somewhere within the ranges shown in Table 5-5, as the total lead concentrations identified at the site are likely comprised of both organic and inorganic lead.

The total carcinogenic risks calculated for ingestion of surficial soil at the site are presented in Table 5-5. The total carcinogenic risk for non-pica ingestion of soil at the Booth Oil Site is 4.14E-06. The total carcinogenic risk for pica ingestion of soil at the Booth Oil Site is 4.14E-05. Each of these values exceeds the NYSDOH goal of 1.00E-06. Review of Table 5-5 indicates

the Areas B and C contribute most significantly to the elevated carcinogenic risk calculated for non-pica soil ingestion at the site. Similarly, Areas B, C and A contribute most significantly to the elevated carcinogenic risk calculated for pica soil ingestion at the Booth Oil Site. It is important to note that, in Area B, which contributes most significantly to the total risks posed by soil ingestion at the Booth Oil Site, the carcinogenic risks calculated for CaPAHs are due to proxy concentrations estimated from the sample detection limits.

Risks due to soil ingestion are also calculated for surficial soil at the playground (see Table 5-6). The hazard indices calculated for ingestion of surficial soil at the playground are 6.05E-03 and 5.48E+01 for non-pica children. The higher value represents the use of the organic lead RfD and the lower value represents the use of the inorganic lead RfD for total lead in the calculations. Similarly, the hazard indices calculated for pica children are 6.05E-02 and 5.48E+02. These values are one order of magnitude lower than those calculated for the entire Booth Oil Site. However, as with the Booth Oil Site, the hazard indices calculated for total lead as organic lead in the playground exceed the acceptable limit of 1.0.

The carcinogenic risks calculated for ingestion of surficial soil in the playground are 3.32E-07 and 3.32E-06 for non-pica and

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Table 5-6

Calculated Ingestion Exposure Risks
Playground Surficial Soil

	Upper 95% Confidence Arith Mean (mg/kg)	Non-Pica Non-Carc. Hazard Index	Non-Pica Carc. Risk	Pica Non-Carc. Hazard Index	Pica Carc. Risk
VOLATILES					
Benzene	4.69E-03	NA	6.15E-13	NA	6.15E-12
Carbon Disulfide	4.69E-03	1.85E-09	NA	1.85E-08	NA
1,1-Dichloroethane	4.69E-03	1.85E-09	NA	1.85E-08	NA
1,2-Dichloroethene (tot)	4.69E-03	9.26E-09	NA	9.26E-08	NA
Ethylbenzene	4.69E-03	1.85E-09	NA	1.85E-08	NA
Tetrachloroethene	4.69E-03	1.85E-08	1.08E-12	1.85E-07	1.08E-11
Toluene	4.69E-03	6.17E-10	NA	6.17E-09	NA
Trichloroethene	4.69E-03	NA	2.33E-13	NA	2.33E-12
Xylene (total)	4.69E-03	9.26E-11	NA	9.26E-10	NA
SEMI-VOLATILES					
Acenaphthene	4.76E-01	3.13E-07	NA	3.13E-06	NA
Acenaphthylene	4.67E-01	NA	NA	NA	NA
Anthracene	4.69E-01	6.18E-08	NA	6.18E-07	NA
Benzo(a)anthracene	7.09E-01	NA	3.69E-08	NA	3.69E-07
Benzo(b)fluoranthene	8.25E-01	NA	4.29E-08	NA	4.29E-07
Benzo(k)fluoranthene	8.22E-01	NA	4.27E-08	NA	4.27E-07
Benzoic acid	1.31E-01	1.29E-09	NA	1.29E-08	NA
Benzo(a)pyrene	7.35E-01	NA	3.82E-08	NA	3.82E-07
Butylbenzylphthalate	4.12E-01	8.14E-09	NA	8.14E-08	NA
Chrysene	1.08E+00	NA	5.62E-08	NA	5.62E-07
Dibenzo(a,h)anthracene	4.61E-01	NA	2.40E-08	NA	2.40E-07
2,4-Dimethylphenol	4.12E-01	8.14E-07	NA	8.14E-06	NA
bis(2-Ethylhexyl)phthala	4.12E-01	8.14E-07	2.61E-11	8.14E-06	2.61E-10
Fluoranthene	2.28E+00	2.25E-06	NA	2.25E-05	NA
Fluorene	4.52E-01	4.46E-07	NA	4.46E-06	NA
Indeno(1,2,3-cd)pyrene	6.95E-01	NA	3.61E-08	NA	3.61E-07
2-Methylnaphthalene	2.09E-01	NA	NA	NA	NA
2-Methylphenol	4.12E-01	3.25E-07	NA	3.25E-06	NA
4-Methylphenol	4.12E-01	3.25E-07	NA	3.25E-06	NA
Naphthalene	1.09E-01	1.08E-06	NA	1.08E-05	NA
Di-n-octylphthalate	4.12E-01	8.14E-07	NA	8.14E-06	NA
Phenanthrene	2.32E+00	NA	NA	NA	NA
Phenol	4.12E-01	2.71E-08	NA	2.71E-07	NA
Pyrene	1.61E+00	2.11E-06	NA	2.11E-05	NA

Table 5-6 (cont'd)

Calculated Ingestion Exposure Risks
Playground Surficial Soil

	Upper 95% Confidence Arith Mean (mg/kg)	Non-Pica Non-Carc. Hazard Index	Non-Pica Carc. Risk	Pica Non-Carc. Hazard Index	Pica Carc. Risk
INORGANICS					
Aluminum	1.71E+04	NA	NA	NA	NA
Antimony	4.34E+00	4.28E-04	NA	4.28E-03	NA
Arsenic	1.81E+01	7.15E-04	NA	7.15E-03	NA
Barium	1.37E+02	1.08E-04	NA	1.08E-03	NA
Beryllium	1.15E+00	9.05E-06	2.23E-08	9.05E-05	2.23E-07
Cadmium	9.80E-01	3.87E-05	NA	3.87E-04	NA
Calcium	1.46E+04	NA	NA	NA	NA
Chromium	2.67E+01	1.06E-06	NA	1.06E-05	NA
Cobalt	1.02E+01	NA	NA	NA	NA
Copper	7.46E+01	NA	NA	NA	NA
Iron	3.55E+04	NA	NA	NA	NA
Lead (inorganic)	1.39E+02	3.92E-03	NA	3.92E-02	NA
Magnesium	8.51E+03	NA	NA	NA	NA
Manganese	7.69E+02	1.52E-04	NA	1.52E-03	NA
Mercury	1.20E-01	1.58E-05	NA	1.58E-04	NA
Nickel	2.85E+01	5.63E-05	NA	5.63E-04	NA
Potassium	2.54E+03	NA	NA	NA	NA
Selenium	1.58E+00	NA	NA	NA	NA
Silver	9.70E-01	1.28E-05	NA	1.28E-04	NA
Sodium	2.81E+02	NA	NA	NA	NA
Thallium	5.50E-01	3.10E-04	NA	3.10E-03	NA
Vanadium	3.91E+01	2.20E-04	NA	2.20E-03	NA
Zinc	2.91E+02	5.75E-05	NA	5.75E-04	NA
Cyanide	6.50E-01	1.28E-06	NA	1.28E-05	NA
PESTICIDES/PCBs					
PCB-1242	1.54E-01	NA	5.36E-09	NA	5.36E-08
PCB-1254	3.17E-01	NA	1.10E-08	NA	1.10E-07
PCB-1260	3.17E-01	NA	1.10E-08	NA	1.10E-07
PCB-1248	1.54E-01	NA	5.36E-09	NA	5.36E-08
TOTAL	8.01E+04	6.05E-03	3.32E-07	6.05E-02	3.32E-06
Lead (organic)	1.39E+02	5.48E+01	NA	5.48E+02	NA

pica children, respectively. As with the hazard indices, these values are one order of magnitude lower than the total carcinogenic risks calculated for ingestion of surficial soil at the Booth Oil Site. However, it must be noted that the carcinogenic risk calculated for pica children ingesting surficial soil from the playground exceeds the NYSDOH goal of 1.00E-06. Review of the table indicates that this elevated risk level is attributed to primarily to CaPAHs, which, as a class, have a total carcinogenic risk of 2.77E-06, although none of the individual compounds results in a carcinogenic risk of 1.00E-06 or greater. Review of Table 2-2 indicates that the values listed for the individual CaPAHs in the surficial soil of the playground are due to actual detected concentrations.

5.3 Risks Due to Inhalation

The carcinogenic risks and hazard indices calculated for inhalation of volatilized contaminants from the Booth Oil Site are presented in Tables 5-7 through 5-10. It must be noted that, for all scenarios of inhalation exposure, a single hazard index is calculated since RfDs for inhalation exposure to lead (organic or inorganic) have not been developed by EPA. Table 5-7 presents the risks calculated for inhalation of volatilized contaminants from surficial soil in Area A. The hazard indices presented in Table 5-7 range from 1.27E-09 for unprotected construction workers on-site

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Table 5-7
Inhalation Exposure Risks
Due to Volatilization from
Surficial Soil - Area A

	Upper 95% Confidence Arith. Mean Soil Conc. (mg/kg)	Const.Wrkr On-Site Non-Carc. Hazard Index (mg/kg-day)	Const.Wrkr On-Site Carcinogenic Risk (mg/kg-day)	Children On-Site Non-Carc. Hazard Index (mg/kg-day)	Children On-Site Carcinogenic Risk (mg/kg-day)	Children Playground Non-Carc. Hazard Index (mg/kg-day)	Children Playground Carcinogenic Risk (mg/kg-day)	Residential N. Marion St. Non-Carc. Hazard Index (mg/kg-day)	Residential N. Marion St. Carcinogenic Risk (mg/kg-day)
VOLATILES									
Benzene	4.13E-01	N/A	1.32E-15	N/A	5.64E-15	N/A	9.83E-19	N/A	2.91E-17
Carbon Disulfide	1.07E-01	1.04E-09	N/A	5.59E-10	N/A	9.75E-14	N/A	6.34E-13	N/A
1,1-Dichloroethane	9.30E-01	1.81E-10	N/A	9.71E-11	N/A	1.69E-14	N/A	1.10E-13	N/A
1,2-Dichloroethene (total)	1.90E-01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	5.84E-01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	1.66E-01	N/A	2.15E-17	N/A	9.18E-17	N/A	1.60E-20	N/A	3.89E-19
Toluene	4.13E-01	1.84E-12	N/A	9.85E-13	N/A	1.72E-16	N/A	1.12E-15	N/A
Trichloroethene	4.13E-01	N/A	7.76E-16	N/A	3.32E-15	N/A	5.79E-19	N/A	1.41E-17
Xylene (total)	1.19E+01	3.79E-11	N/A	2.03E-11	N/A	3.53E-15	N/A	2.30E-14	N/A
T O T A L	1.51E+01	1.27E-09	2.12E-15	6.77E-10	9.05E-15	1.18E-13	1.58E-18	7.68E-13	4.36E-17

rivss1/bos8

Table 5-7 (cont'd)
Inhalation Exposure Risks
Due to Volatilization from
Surficial Soil - Area A

	Commercial Robinson St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Robinson St. Carcinogenic Risk (mg/kg-day)	Commercial River Road Non-Carc. Hazard Index (mg/kg-day)	Commercial River Road Carcinogenic Risk (mg/kg-day)	Residential Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Residential Sommer St. Carcinogenic Risk (mg/kg-day)	Commercial Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Sommer St. Carcinogenic Risk (mg/kg-day)
VOLATILES								
Benzene	N/A	6.54E-18	N/A	1.16E-17	N/A	1.02E-17	N/A	4.87E-18
Carbon Disulfide	1.30E-13	N/A	2.29E-13	N/A	2.72E-13	N/A	9.67E-14	N/A
1,1-Dichloroethane	2.25E-14	N/A	3.98E-14	N/A	4.72E-14	N/A	1.68E-14	N/A
1,2-Dichloroethene (total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	N/A	1.06E-19	N/A	1.88E-19	N/A	1.67E-19	N/A	7.93E-20
Toluene	2.29E-16	N/A	4.04E-16	N/A	4.79E-16	N/A	1.70E-16	N/A
Trichloroethene	N/A	3.85E-18	N/A	6.80E-18	N/A	6.03E-18	N/A	2.87E-18
Xylene (total)	4.70E-15	N/A	8.31E-15	N/A	9.84E-15	N/A	3.50E-15	N/A
T O T A L	1.57E-13	1.05E-17	2.78E-13	1.85E-17	3.29E-13	1.64E-17	1.17E-13	7.81E-18

to 1.17E-13 for commercial populations at Sommer Street. These values are significantly less than 1.0, indicating that adverse noncarcinogenic health threats are not likely to occur from the exposure. Similarly, the carcinogenic risks for this exposure scenario, ranging from 2.12E-15 for unprotected construction workers on-site to 1.58E-18 for children at the playground, are significantly lower than the NYSDOH goal of 1.00E-06 and OSHA guideline of 1.00E-03 for occupational exposure.

Table 5-8 presents the carcinogenic risks and hazard indices calculated for inhalation of volatile emissions from surficial soil in Area B of the Booth Oil Site. The hazard indices presented in Table 5-8 range from 1.15E-09 for children on-site to 1.59E-13 for commercial populations at River Road. As in Area A, these values are significantly lower than the acceptable limit of 1.0. Accordingly, adverse noncarcinogenic health effects are not likely to occur from the exposure. The carcinogenic risks presented in Table 5-8 range from 1.59E-14 for children on-site to 2.23E-18 for children at the playground. These values are significantly lower than the NYSDOH goal of 1.00E-06.

The carcinogenic risks and hazard indices calculated for inhalation of volatilized contaminants from Area C are presented in Table 5-9. The hazard indices calculated for volatile emissions from Area C range from 1.57E-10 for children on-site to 7.82E-15

rivss2/bos8

Table 5-8
Inhalation Exposure Risks
Due to Volatilization from
Surficial Soil - Area B

	Upper 95% Confidence Arith. Mean Soil Conc. (mg/kg)	Constr.Worker On-Site Non-Carc. Hazard Index (mg/kg-day)	Constr.Worker On-Site Carcinogenic Risk (mg/kg-day)	Children On-Site Non-Carc. Hazard Index (mg/kg-day)	Children On-Site Carcinogenic Risk (mg/kg-day)	Children Playground Non-Carc. Hazard Index (mg/kg-day)	Children Playground Carcinogenic Risk (mg/kg-day)	Residential N. Marion St. Non-Carc. Hazard Index (mg/kg-day)	Residential N. Marion St. Carcinogenic Risk (mg/kg-day)
VOLATILES									
Benzene	4.41E-01	N/A	7.80E-16	N/A	3.34E-15	N/A	4.67E-19	N/A	1.13E-16
Carbon Disulfide	3.88E-01	2.10E-09	N/A	1.13E-09	N/A	1.57E-13	N/A	1.54E-12	N/A
1,1-Dichloroethane	3.88E-01	4.20E-11	N/A	2.25E-11	N/A	3.14E-15	N/A	3.08E-14	N/A
1,2-Dichloroethene (total)	5.95E-01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	3.88E-01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	1.55E+00	N/A	1.10E-16	N/A	4.71E-16	N/A	6.59E-20	N/A	2.41E-18
Toluene	3.88E-01	9.50E-13	N/A	5.09E-13	N/A	7.11E-17	N/A	6.96E-16	N/A
Trichloroethene	2.74E+00	N/A	2.84E-15	N/A	1.21E-14	N/A	1.70E-18	N/A	6.22E-17
Xylene (total)	3.88E-01	6.78E-13	N/A	3.63E-13	N/A	5.07E-17	N/A	4.97E-16	N/A
T O T A L	7.27E+00	2.15E-09	3.73E-15	1.15E-09	1.59E-14	1.61E-13	2.23E-18	1.57E-12	1.78E-16

rivss2/bos8

Table 5-8 (cont'd)
Inhalation Exposure Risks
Due to Volatilization from
Surficial Soil - Area B

	Commercial Robinson St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Robinson St. Carcinogenic Risk (mg/kg-day)	Commercial River Road Non-Carc. Hazard Index (mg/kg-day)	Commercial River Road Carcinogenic Risk (mg/kg-day)	Residential Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Residential Sommer St. Carcinogenic Risk (mg/kg-day)	Commercial Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Sommer St. Carcinogenic Risk (mg/kg-day)
VOLATILES								
Benzene	N/A	8.67E-18	N/A	2.31E-18	N/A	9.34E-18	N/A	4.44E-18
Carbon Disulfide	5.86E-13	N/A	1.56E-13	N/A	8.42E-13	N/A	3.00E-13	N/A
1,1-Dichloroethane	1.17E-14	N/A	3.11E-15	N/A	1.68E-14	N/A	5.98E-15	N/A
1,2-Dichloroethene (total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	N/A	1.22E-18	N/A	3.26E-19	N/A	1.32E-18	N/A	6.27E-19
Toluene	2.65E-16	N/A	7.04E-17	N/A	3.80E-16	N/A	1.35E-16	N/A
Trichloroethene	N/A	3.15E-17	N/A	8.39E-18	N/A	3.40E-17	N/A	1.61E-17
Xylene (total)	1.89E-16	N/A	5.02E-17	N/A	2.71E-16	N/A	9.65E-17	N/A
T O T A L	5.98E-13	4.14E-17	1.59E-13	1.10E-17	8.60E-13	4.46E-17	3.06E-13	2.12E-17

rivss3/bos8

Table 5-9
Inhalation Exposure Risks
Due to Volatilization from
Surficial Soil - Area C

	Upper 95% Confidence Arith. Mean Soil Conc. (mg/kg)	Constr.Wrkr On-Site Non-Carc. Hazard Index (mg/kg-day)	Constr.Wrkr On-Site Carcinogenic Risk (mg/kg-day)	Children On-Site Non-Carc. Hazard Index (mg/kg-day)	Children On-Site Carcinogenic Risk (mg/kg-day)	Children Playground Non-Carc. Hazard Index (mg/kg-day)	Children Playground Carcinogenic Risk (mg/kg-day)	Residential N. Marion St. Non-Carc. Hazard Index (mg/kg-day)	Residential N. Marion St. Carcinogenic Risk (mg/kg-day)
VOLATILES									
Benzene	4.00E-03	N/A	7.59E-17	N/A	3.25E-16	N/A	9.71E-21	N/A	1.74E-16
Carbon Disulfide	5.00E-03	2.90E-10	N/A	1.55E-10	N/A	4.63E-15	N/A	2.21E-13	N/A
1,1-Dichloroethane	3.00E-03	3.47E-12	N/A	1.86E-12	N/A	5.55E-17	N/A	2.65E-15	N/A
1,2-Dichloroethene (total)	6.50E-02	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	6.00E-03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	7.00E-03	N/A	5.09E-18	N/A	2.18E-17	N/A	6.51E-22	N/A	1.16E-19
Toluene	1.40E-02	3.57E-13	N/A	1.91E-13	N/A	5.71E-18	N/A	2.72E-16	N/A
Trichloroethene	1.90E-02	N/A	2.04E-16	N/A	8.71E-16	N/A	2.61E-20	N/A	4.65E-18
Xylene (total)	3.60E-02	6.54E-13	N/A	3.50E-13	N/A	1.05E-17	N/A	4.99E-16	N/A
T O T A L	1.59E-01	2.94E-10	2.85E-16	1.57E-10	1.22E-15	4.70E-15	3.64E-20	2.24E-13	1.79E-16

Table 5-9 (cont'd)
Inhalation Exposure Risks
Due to Volatilization from
Surficial Soil - Area C

	Commercial Robinson St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Robinson St. Carcinogenic Risk (mg/kg-day)	Commercial River Road Non-Carc. Hazard Index (mg/kg-day)	Commercial River Road Carcinogenic Risk (mg/kg-day)	Residential Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Residential Sommer St. Carcinogenic Risk (mg/kg-day)	Commercial Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Sommer St. Carcinogenic Risk (mg/kg-day)
VOLATILES								
Benzene	N/A	1.11E-18	N/A	8.07E-20	N/A	4.76E-19	N/A	2.26E-19
Carbon Disulfide	1.06E-13	N/A	7.71E-15	N/A	6.07E-14	N/A	2.16E-14	N/A
1,1-Dichloroethane	1.27E-15	N/A	9.23E-17	N/A	7.28E-16	N/A	2.59E-16	N/A
1,2-Dichloroethene (total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	N/A	7.45E-20	N/A	5.40E-21	N/A	3.19E-20	N/A	1.52E-20
Toluene	1.31E-16	N/A	9.50E-18	N/A	7.49E-17	N/A	2.66E-17	N/A
Trichloroethene	N/A	2.98E-18	N/A	2.16E-19	N/A	1.28E-18	N/A	6.07E-19
Xylene (total)	2.40E-16	N/A	1.74E-17	N/A	1.37E-16	N/A	4.89E-17	N/A
T O T A L	1.08E-13	4.17E-18	7.82E-15	3.03E-19	6.17E-14	1.79E-18	2.20E-14	8.49E-19

for commercial populations at River Road. As in Areas A and B, these values are significantly less than 1.0, indicating that adverse noncarcinogenic effects are not expected from the exposures. The carcinogenic risks presented in Table 5-9 range from 1.22E-15 for children on-site to 3.64E-20 for children at the playground. Again, these values are significantly less than the NYSDOH goal of 1.00E-06.

Table 5-10 presents the carcinogenic risks and hazard indices calculated for volatile emissions from surficial soil in Area D. The hazard indices presented in Table 5-10 range from 1.11E-11 for unprotected construction workers on-site to 2.81E-16 for children at the playground. All of the hazard indices presented in Table 5-10 are significantly less than the ceiling limit of 1.0. Similarly, the carcinogenic risks calculated for inhalation of volatile emissions from Area D, ranging from 2.48E-17 for children on-site to 1.17E-21 for children at the playground, are significantly lower than the NYSDOH goal of 1.00E-06.

The total carcinogenic risks and hazard indices calculated for inhalation of volatilized contaminants from surficial soil at the Booth Oil Site are calculated as the sum of the area-specific risks, and are presented in Table 5-11. The total hazard indices for inhalation of volatilized contaminants from the Booth Oil Site range from 3.73E-09 for unprotected construction workers on-site to

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Table 5-10
Inhalation Exposure Risks
Due to Volatilization from
Surficial Soil - Area D

	Upper 95% Confidence Arith. Mean Soil Conc. (mg/kg)	Constr.Wrkr On-Site Non-Carc. Hazard Index (mg/kg-day)	Constr.Wrkr On-Site Carcinogenic Risk (mg/kg-day)	Children On-Site Non-Carc. Hazard Index (mg/kg-day)	Children On-Site Carcinogenic Risk (mg/kg-day)	Children Playground Non-Carc. Hazard Index (mg/kg-day)	Children Playground Carcinogenic Risk (mg/kg-day)	Residential N. Marion St. Non-Carc. Hazard Index (mg/kg-day)	Residential N. Marion St. Carcinogenic Risk (mg/kg-day)
VOLATILES									
Benzene	3.00E-03	N/A	3.57E-18	N/A	1.53E-17	N/A	7.21E-22	N/A	3.20E-19
Carbon Disulfide	3.00E-03	1.09E-11	N/A	5.82E-12	N/A	2.75E-16	N/A	1.88E-14	N/A
1,1-Dichloroethane	3.00E-03	2.18E-13	N/A	1.16E-13	N/A	5.50E-18	N/A	3.77E-16	N/A
1,2-Dichloroethene (total)	3.00E-03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	3.00E-03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	3.00E-03	N/A	1.43E-19	N/A	6.11E-19	N/A	2.89E-23	N/A	7.39E-21
Toluene	3.00E-03	4.92E-15	N/A	2.63E-15	N/A	1.24E-19	N/A	8.51E-18	N/A
Trichloroethene	3.00E-03	N/A	2.08E-18	N/A	8.89E-18	N/A	4.20E-22	N/A	1.08E-19
Xylene (total)	3.00E-03	3.50E-15	N/A	1.87E-15	N/A	8.85E-20	N/A	6.05E-18	N/A
T O T A L	2.70E-02	1.11E-11	5.79E-18	5.94E-12	2.48E-17	2.81E-16	1.17E-21	1.92E-14	4.35E-19

rivss4/bos8

Table 5-10 (cont'd)
Inhalation Exposure Risks
Due to Volatilization from
Surficial Soil - Area D

	Commercial Robinson St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Robinson St. Carcinogenic Risk (mg/kg-day)	Commercial River Road Non-Carc. Hazard Index (mg/kg-day)	Commercial River Road Carcinogenic Risk (mg/kg-day)	Residential Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Residential Sommer St. Carcinogenic Risk (mg/kg-day)	Commercial Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Sommer St. Carcinogenic Risk (mg/kg-day)
VOLATILES								
Benzene	N/A	3.33E-20	N/A	4.64E-21	N/A	3.88E-20	N/A	1.84E-20
Carbon Disulfide	2.54E-15	N/A	3.55E-16	N/A	3.95E-15	N/A	1.41E-15	N/A
1,1-Dichloroethane	5.08E-17	N/A	7.09E-18	N/A	7.90E-17	N/A	2.81E-17	N/A
1,2-Dichloroethene (total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	N/A	1.33E-21	N/A	1.86E-22	N/A	1.55E-21	N/A	7.37E-22
Toluene	1.15E-18	N/A	1.60E-19	N/A	1.79E-18	N/A	6.36E-19	N/A
Trichloroethene	N/A	1.94E-20	N/A	2.70E-21	N/A	2.26E-20	N/A	1.07E-20
Xylene (total)	8.16E-19	N/A	1.14E-19	N/A	1.27E-18	N/A	4.52E-19	N/A
T O T A L	2.59E-15	5.40E-20	3.62E-16	7.53E-21	4.03E-15	6.29E-20	1.44E-15	2.99E-20

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Table 5-11
Total Inhalation Exposure Risks Due to
Volatilization from Surficial Soil

Receptor	Area A (mg/kg-day)	Area B (mg/kg-day)	Area C (mg/kg-day)	Area D (mg/kg-day)	TOTAL (mg/kg-day)
Construction Worker On-Site					
Carcinogenic Risk	2.12E-15	3.73E-15	2.85E-16	5.79E-18	6.14E-15
Non-Carc. Hazard Index	1.27E-09	2.15E-09	2.94E-10	1.11E-11	3.73E-09
Children On-Site					
Carcinogenic Risk	9.05E-15	1.58E-14	1.22E-15	2.48E-17	2.61E-14
Non-Carc. Hazard Index	6.77E-10	1.15E-09	1.57E-10	5.94E-12	1.99E-09
Children at the Playground					
Carcinogenic Risk	1.58E-18	2.23E-18	3.64E-20	1.17E-21	3.85E-18
Non-Carc. Hazard Index	1.18E-13	1.61E-13	4.70E-15	2.81E-16	2.84E-13
Residents at No. Marion Street					
Carcinogenic Risk	4.36E-17	1.78E-16	1.79E-16	4.35E-19	4.01E-16
Non-Carc. Hazard Index	7.68E-13	1.57E-12	2.24E-13	1.92E-14	2.58E-12
Commercial Pop. at Robinson St.					
Carcinogenic Risk	1.05E-17	4.14E-17	4.17E-18	5.40E-20	5.61E-17
Non-Carc. Hazard Index	1.57E-13	5.98E-13	1.08E-13	2.59E-15	8.66E-13
Commercial Pop. at River Road					
Carcinogenic Risk	1.85E-17	1.10E-17	3.03E-19	7.53E-21	2.98E-17
Non-Carc. Hazard Index	2.78E-13	1.59E-13	7.82E-15	3.62E-16	4.45E-13
Residents at Sommer Street					
Carcinogenic Risk	1.64E-17	4.46E-17	1.79E-18	6.29E-20	6.29E-17
Non-Carc. Hazard Index	3.29E-13	8.60E-13	6.17E-14	4.03E-15	1.25E-12
Commercial Pop. at Sommer St.					
Carcinogenic Risk	7.81E-18	2.12E-17	8.49E-19	2.99E-20	2.99E-17
Non-Carc. Hazard Index	1.17E-13	3.06E-13	2.20E-14	1.44E-15	4.46E-13

2.84E-13 for children at the playground. All of the total hazard indices calculated for this exposure scenario are significantly lower than the acceptable limit of 1.0, indicating that adverse noncarcinogenic health effects are not expected from inhalation of volatilized contaminants from the surficial soil at the Booth Oil Site. Similarly, the carcinogenic risks calculated for this exposure scenario, ranging from 6.14E-15 for unprotected construction workers on-site to 3.85E-18 for children at the playground, are significantly less than the NYSDOH goal of 1.00E-06 for lifetime exposure and 1.00E-03 for occupational exposure.

The carcinogenic risks and hazard indices calculated for inhalation of fugitive dusts emitted from recreational traffic on-site are presented in Tables 5-12 through 5-15. Table 5-12 lists the carcinogenic risks and hazard indices calculated for populations due to inhalation of fugitive dusts from recreational traffic in Area A. The hazard indices presented in Table 5-12 range from 3.58E-05 for children on-site to 6.20E-09 for commercial populations at Sommer Street. These values all fall below the acceptable limit of 1.0. The carcinogenic risks calculated for inhalation exposures to fugitive dust due to recreational traffic in Area A range from 1.14E-09 for children on-site to 1.99E-13 for children at the playground. These values are all below the NYSDOH goal of 1.00E-06.

Table 5-12
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Recreational Traffic On-Site
Surficial Soil - Area A

	Upper 95% Confidence Arith. Mean Soil Conc. (mg/kg)	Children On-Site Non-Carc. Hazard Index	Children On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
VOLATILES							
Benzene	4.13E-01	N/A	9.41E-15	N/A	1.64E-18	N/A	3.99E-17
Carbon Disulfide	1.07E-01	2.45E-10	N/A	4.27E-14	N/A	2.78E-13	N/A
1,1-Dichloroethane	9.30E-01	6.39E-11	N/A	1.11E-14	N/A	7.24E-14	N/A
1,2-Dichloroethene (total)	1.90E-01	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	5.84E-01	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	1.66E-01	N/A	4.30E-16	N/A	7.50E-20	N/A	1.82E-18
Toluene	4.13E-01	4.98E-12	N/A	8.68E-16	N/A	5.64E-15	N/A
Trichloroethene	4.13E-01	N/A	5.51E-15	N/A	9.62E-19	N/A	2.34E-17
Xylene (total)	1.19E+01	2.73E-10	N/A	4.76E-14	N/A	3.10E-13	N/A
SEMI-VOLATILES							
Acenaphthene	1.88E+00	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	1.70E+00	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	1.72E+00	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	1.58E+00	N/A	7.57E-12	N/A	1.32E-15	N/A	3.21E-14
Benzo(b)fluoranthene	1.62E+00	N/A	7.76E-12	N/A	1.35E-15	N/A	3.29E-14
Benzo(k)fluoranthene	1.72E+00	N/A	8.23E-12	N/A	1.44E-15	N/A	3.49E-14
Benzoic acid	8.33E+00	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	1.60E+00	N/A	7.66E-12	N/A	1.34E-15	N/A	3.25E-14
Butylbenzylphthalate	8.21E-01	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	1.38E+00	N/A	6.59E-12	N/A	1.15E-15	N/A	2.79E-14
Dibenzo(a,h)anthracene	1.72E+00	N/A	8.23E-12	N/A	1.44E-15	N/A	3.49E-14
2,4-Dimethylphenol	1.75E+00	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	3.03E+00	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	2.73E+00	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	1.75E+00	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	1.71E+00	N/A	8.20E-12	N/A	1.43E-15	N/A	3.48E-14
2-Methylnaphthalene	6.77E+00	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	1.72E+00	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	1.71E+00	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	1.56E+00	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	1.76E+00	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	3.43E+00	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	1.72E+00	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	2.17E+00	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-12 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Recreational Traffic On-Site
Surficial Soil - Area A

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
INORGANICS								
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	N/A	1.23E-12	N/A	2.17E-12	N/A	1.92E-12	N/A	9.13E-13
Barium	3.21E-09	N/A	5.68E-09	N/A	6.73E-09	N/A	2.39E-09	N/A
Beryllium	N/A	1.11E-14	N/A	1.97E-14	N/A	1.75E-14	N/A	8.31E-15
Cadmium	N/A	9.21E-15	N/A	1.63E-14	N/A	1.44E-14	N/A	6.86E-15
Calcium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	5.10E-09	N/A	9.02E-09	N/A	1.07E-08	N/A	3.80E-09	N/A
Mercury	5.32E-12	N/A	9.41E-12	N/A	1.11E-11	N/A	3.96E-12	N/A
Nickel	N/A	1.50E-14	N/A	2.66E-14	N/A	2.36E-14	N/A	1.12E-14
Potassium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBs								
PCB-1242	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	8.32E-09	1.32E-12	1.47E-08	2.34E-12	1.74E-08	2.08E-12	6.20E-09	9.86E-13

Table 5-12 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Recreational Traffic On-Site
Surficial Soil - Area A

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
VOLATILES								
Benzene	N/A	1.09E-17	N/A	1.93E-17	N/A	1.71E-17	N/A	8.12E-18
Carbon Disulfide	5.69E-14	N/A	1.01E-13	N/A	1.19E-13	N/A	4.24E-14	N/A
1,1-Dichloroethane	1.48E-14	N/A	2.62E-14	N/A	3.10E-14	N/A	1.10E-14	N/A
1,2-Dichloroethene (total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	N/A	4.99E-19	N/A	8.82E-19	N/A	7.82E-19	N/A	3.71E-19
Toluene	1.16E-15	N/A	2.04E-15	N/A	2.42E-15	N/A	8.61E-16	N/A
Trichloroethene	N/A	6.39E-18	N/A	1.13E-17	N/A	1.00E-17	N/A	4.76E-18
Xylene (total)	6.34E-14	N/A	1.12E-13	N/A	1.33E-13	N/A	4.72E-14	N/A
SEMI-VOLATILES								
Acenaphthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	N/A	8.77E-15	N/A	1.55E-14	N/A	1.38E-14	N/A	6.54E-15
Benzo(b)fluoranthene	N/A	8.99E-15	N/A	1.59E-14	N/A	1.41E-14	N/A	6.70E-15
Benzo(k)fluoranthene	N/A	9.54E-15	N/A	1.69E-14	N/A	1.50E-14	N/A	7.11E-15
Benzoic acid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	8.88E-15	N/A	1.57E-14	N/A	1.39E-14	N/A	6.61E-15
Butylbenzylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	N/A	7.64E-15	N/A	1.35E-14	N/A	1.20E-14	N/A	5.69E-15
Dibenzo(a,h)anthracene	N/A	9.54E-15	N/A	1.69E-14	N/A	1.50E-14	N/A	7.11E-15
2,4-Dimethylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	9.50E-15	N/A	1.68E-14	N/A	1.49E-14	N/A	7.08E-15
2-Methylnaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-12 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Recreational Traffic On-Site
Surficial Soil - Area A

	Upper 95% Confidence Arith. Mean Soil Conc. (mg/kg)	Children On-Site Non-Carc. Hazard Index	Children On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
INORGANICS							
Aluminum	1.12E+04	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	6.79E+00	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	2.69E+01	N/A	1.06E-09	N/A	1.84E-13	N/A	4.49E-12
Barium	2.02E+02	1.38E-05	N/A	2.41E-09	N/A	1.57E-08	N/A
Beryllium	1.46E+00	N/A	9.62E-12	N/A	1.68E-15	N/A	4.08E-14
Cadmium	1.66E+00	N/A	7.94E-12	N/A	1.39E-15	N/A	3.37E-14
Calcium	1.11E+05	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	2.35E+01	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	6.96E+00	N/A	N/A	N/A	N/A	N/A	N/A
Copper	8.44E+01	N/A	N/A	N/A	N/A	N/A	N/A
Iron	2.86E+04	N/A	N/A	N/A	N/A	N/A	N/A
Lead	8.98E+02	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	5.71E+04	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	9.60E+02	2.20E-05	N/A	3.83E-09	N/A	2.49E-08	N/A
Mercury	2.87E-01	2.29E-08	N/A	4.00E-12	N/A	2.60E-11	N/A
Nickel	1.97E+01	N/A	1.30E-11	N/A	2.26E-15	N/A	5.50E-14
Potassium	1.82E+03	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	1.60E+00	N/A	N/A	N/A	N/A	N/A	N/A
Silver	9.27E-01	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	4.79E+02	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	5.24E-01	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	2.31E+01	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	3.55E+02	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	8.95E+00	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBs							
PCB-1242	5.17E-01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	1.45E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	1.12E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	1.68E+01	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	2.13E+05	3.58E-05	1.14E-09	6.25E-09	1.99E-13	4.06E-08	4.85E-12

Table 5-13 presents the carcinogenic risks and hazard indices calculated for inhalation of fugitive dusts due to recreational traffic in Area B. The hazard indices presented in Table 5-13 range from 2.48E-04 for children on-site to 3.43E-08 for commercial populations at River Road. These values are all significantly below the acceptable limit of 1.0, indicating that adverse noncarcinogenic health effects are not likely to occur from the exposure. The carcinogenic risks calculated for this exposure scenario range from 1.1E-09 for children on-site to 1.55E-13 for children at the playground. These values are significantly lower than the NYSDOH goal of 1.00E-06.

The carcinogenic risks and hazard indices calculated for inhalation exposures to fugitive dusts from recreational traffic in Area C are presented in Table 5-14. As in Areas A and B, the hazard indices calculated for this exposure scenario are all significantly lower than the acceptable limit of 1.0. Similarly, the carcinogenic risks calculated for this exposure scenario are significantly lower than the NYSDOH goal of 1.00E-06.

Table 5-15 presents the carcinogenic risks and hazard indices calculated for inhalation exposures to fugitive dusts from recreational traffic in Area D. As in the previous scenarios, the hazard indices and carcinogenic risks calculated for this exposure scenario are well within acceptable limits.

Table 5-13
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Recreational Traffic On-Site
Surficial Soil - Area B

	Commercial Robinson St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Robinson St. Carcinogenic Risk (mg/kg-day)	Commercial River Road Non-Carc. Hazard Index (mg/kg-day)	Commercial River Road Carcinogenic Risk (mg/kg-day)	Residential Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Residential Sommer St. Carcinogenic Risk (mg/kg-day)	Commercial Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Sommer St. Carcinogenic Risk (mg/kg-day)
VOLATILES								
Benzene	N/A	2.36E-17	N/A	6.28E-18	N/A	2.54E-17	N/A	1.21E-17
Carbon Disulfide	4.18E-13	N/A	1.11E-13	N/A	6.01E-13	N/A	2.14E-13	N/A
1,1-Dichloroethane	1.25E-14	N/A	3.34E-15	N/A	1.80E-14	N/A	6.42E-15	N/A
1,2-Dichloroethene (total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	N/A	9.44E-18	N/A	2.51E-18	N/A	1.02E-17	N/A	4.83E-18
Toluene	2.20E-15	N/A	5.86E-16	N/A	3.17E-15	N/A	1.13E-15	N/A
Trichloroethene	N/A	8.61E-17	N/A	2.29E-17	N/A	9.27E-17	N/A	4.41E-17
Xylene (total)	4.18E-15	N/A	1.11E-15	N/A	6.01E-15	N/A	2.14E-15	N/A
SEMI-VOLATILES								
Acenaphthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	N/A	1.88E-13	N/A	5.01E-14	N/A	2.03E-13	N/A	9.65E-14
Benzo(b)fluoranthene	N/A	1.88E-13	N/A	5.01E-14	N/A	2.03E-13	N/A	9.65E-14
Benzo(k)fluoranthene	N/A	1.88E-13	N/A	5.01E-14	N/A	2.03E-13	N/A	9.65E-14
Benzoic acid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	1.88E-13	N/A	5.01E-14	N/A	2.03E-13	N/A	9.65E-14
Butylbenzylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	N/A	1.88E-13	N/A	5.01E-14	N/A	2.03E-13	N/A	9.65E-14
Dibenzo(a,h)anthracene	N/A	1.88E-13	N/A	5.01E-14	N/A	2.03E-13	N/A	9.65E-14
2,4-Dimethylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	1.88E-13	N/A	5.01E-14	N/A	2.03E-13	N/A	9.65E-14
2-Methylnaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-13 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Recreational Traffic On-Site
Surficial Soil - Area B

	Upper 95% Confidence Arith. Mean Soil Conc. (mg/kg)	Children On-Site Non-Carc. Hazard Index (mg/kg-day)	Children On-Site Carcinogenic Risk (mg/kg-day)	Children Playground Non-Carc. Hazard Index (mg/kg-day)	Children Playground Carcinogenic Risk (mg/kg-day)	Residential N. Marion St. Non-Carc. Hazard Index (mg/kg-day)	Residential N. Marion St. Carcinogenic Risk (mg/kg-day)
VOLATILES							
Benzene	4.41E-01	N/A	9.09E-15	N/A	1.27E-18	N/A	4.66E-17
Carbon Disulfide	3.88E-01	8.04E-10	N/A	1.12E-13	N/A	1.10E-12	N/A
1,1-Dichloroethane	3.88E-01	2.41E-11	N/A	3.37E-15	N/A	3.30E-14	N/A
1,2-Dichloroethene (total)	5.95E-01	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	3.88E-01	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	1.55E+00	N/A	3.64E-15	N/A	5.08E-19	N/A	1.86E-17
Toluene	3.88E-01	4.23E-12	N/A	5.92E-16	N/A	5.79E-15	N/A
Trichloroethene	2.74E+00	N/A	3.31E-14	N/A	4.63E-18	N/A	1.70E-16
Xylene (total)	3.88E-01	8.04E-12	N/A	1.12E-15	N/A	1.10E-14	N/A
SEMI-VOLATILES							
Acenaphthene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	1.67E+01	N/A	7.26E-11	N/A	1.01E-14	N/A	3.72E-13
Benzo(b)fluoranthene	1.67E+01	N/A	7.26E-11	N/A	1.01E-14	N/A	3.72E-13
Benzo(k)fluoranthene	1.67E+01	N/A	7.26E-11	N/A	1.01E-14	N/A	3.72E-13
Benzoic acid	8.12E+01	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	1.67E+01	N/A	7.26E-11	N/A	1.01E-14	N/A	3.72E-13
Butylbenzylphthalate	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	1.67E+01	N/A	7.26E-11	N/A	1.01E-14	N/A	3.72E-13
Dibenzo(a,h)anthracene	1.67E+01	N/A	7.26E-11	N/A	1.01E-14	N/A	3.72E-13
2,4-Dimethylphenol	7.76E+01	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	4.49E+01	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	1.67E+01	N/A	7.26E-11	N/A	1.01E-14	N/A	3.72E-13
2-Methylnaphthalene	4.15E+00	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	5.69E+01	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	4.27E+02	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	1.69E+01	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	1.65E+01	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	2.48E+00	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	2.50E+02	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	1.64E+01	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-13 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Recreational Traffic On-Site
Surficial Soil - Area B

	Upper 95% Confidence Arith. Mean Soil Conc. (mg/kg)	Children On-Site Non-Carc. Hazard Index (mg/kg-day)	Children On-Site Carcinogenic Risk (mg/kg-day)	Children Playground Non-Carc. Hazard Index (mg/kg-day)	Children Playground Carcinogenic Risk (mg/kg-day)	Residential N. Marion St. Non-Carc. Hazard Index (mg/kg-day)	Residential N. Marion St. Carcinogenic Risk (mg/kg-day)
INORGANICS							
Aluminum	3.40E+04	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	1.85E+02	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	1.39E+01	N/A	4.93E-10	N/A	6.90E-14	N/A	2.53E-12
Barium	3.04E+03	1.89E-04	N/A	2.64E-08	N/A	2.58E-07	N/A
Beryllium	6.30E+00	N/A	3.76E-11	N/A	5.25E-15	N/A	1.92E-13
Cadmium	9.33E+00	N/A	4.05E-11	N/A	5.66E-15	N/A	2.07E-13
Calcium	2.09E+05	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	1.74E+02	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	1.33E+01	N/A	N/A	N/A	N/A	N/A	N/A
Copper	6.35E+02	N/A	N/A	N/A	N/A	N/A	N/A
Iron	5.14E+04	N/A	N/A	N/A	N/A	N/A	N/A
Lead	2.45E+03	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	6.55E+04	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	2.84E+03	5.89E-05	N/A	8.23E-09	N/A	8.06E-08	N/A
Mercury	1.72E-01	1.24E-08	N/A	1.74E-12	N/A	1.70E-11	N/A
Nickel	4.59E+01	N/A	2.74E-11	N/A	3.83E-15	N/A	1.40E-13
Potassium	2.55E+03	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	2.18E+00	N/A	N/A	N/A	N/A	N/A	N/A
Silver	9.37E-01	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	1.58E+03	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	7.01E-01	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	2.89E+01	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	1.36E+03	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	6.20E+00	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBs							
PCB-1242	1.66E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	3.83E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	3.66E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	3.44E+01	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	3.76E+05	2.48E-04	1.11E-09	3.46E-08	1.55E-13	3.39E-07	5.67E-12

Table 5-13 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Recreational Traffic On-Site
Surficial Soil - Area B

	Commercial Robinson St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Robinson St. Carcinogenic Risk (mg/kg-day)	Commercial River Road Non-Carc. Hazard Index (mg/kg-day)	Commercial River Road Carcinogenic Risk (mg/kg-day)	Residential Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Residential Sommer St. Carcinogenic Risk (mg/kg-day)	Commercial Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Sommer St. Carcinogenic Risk (mg/kg-day)
INORGANICS								
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	N/A	1.28E-12	N/A	3.41E-13	N/A	1.38E-12	N/A	6.56E-13
Barium	9.81E-08	N/A	2.61E-08	N/A	1.41E-07	N/A	5.02E-08	N/A
Beryllium	N/A	9.76E-14	N/A	2.60E-14	N/A	1.05E-13	N/A	5.00E-14
Cadmium	N/A	1.05E-13	N/A	2.80E-14	N/A	1.13E-13	N/A	5.38E-14
Calcium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	3.06E-08	N/A	8.15E-09	N/A	4.40E-08	N/A	1.57E-08	N/A
Mercury	6.47E-12	N/A	1.72E-12	N/A	9.30E-12	N/A	3.31E-12	N/A
Nickel	N/A	7.12E-14	N/A	1.89E-14	N/A	7.67E-14	N/A	3.64E-14
Potassium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBs								
PCB-1242	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	1.29E-07	2.87E-12	3.43E-08	7.65E-13	1.85E-07	3.10E-12	6.59E-08	1.47E-12

Table 5-14
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Recreational Traffic On-Site
Surficial Soil - Area C

	Soil Conc. (mg/kg)	Children On-Site Non-Carc. Hazard Index (mg/kg-day)	Children On-Site Carcinogenic Risk (mg/kg-day)	Children Playground Non-Carc. Hazard Index (mg/kg-day)	Children Playground Carcinogenic Risk (mg/kg-day)	Residential N. Marion St. Non-Carc. Hazard Index (mg/kg-day)	Residential N. Marion St. Carcinogenic Risk (mg/kg-day)
VOLATILES							
Benzene	4.00E-03	N/A	1.50E-16	N/A	4.49E-21	N/A	8.01E-19
Carbon Disulfide	5.00E-03	1.89E-11	N/A	5.64E-16	N/A	2.69E-14	N/A
1,1-Dichloroethane	3.00E-03	3.40E-13	N/A	1.02E-17	N/A	4.84E-16	N/A
1,2-Dichloroethene (total)	6.50E-02	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	6.00E-03	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	7.00E-03	N/A	2.99E-17	N/A	8.94E-22	N/A	1.59E-19
Toluene	1.40E-02	2.78E-13	N/A	8.31E-18	N/A	3.96E-16	N/A
Trichloroethene	1.90E-02	N/A	4.18E-16	N/A	1.25E-20	N/A	2.23E-18
Xylene (total)	3.60E-02	1.36E-12	N/A	4.06E-17	N/A	1.94E-15	N/A
SEMI-VOLATILES							
Acenaphthene	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	1.41E+00	N/A	1.11E-11	N/A	3.32E-16	N/A	5.92E-14
Benzo(b)fluoranthene	1.80E+00	N/A	1.42E-11	N/A	4.25E-16	N/A	7.58E-14
Benzo(k)fluoranthene	8.10E-01	N/A	6.39E-12	N/A	1.91E-16	N/A	3.41E-14
Benzoic acid	6.82E+00	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	1.41E+00	N/A	1.11E-11	N/A	3.32E-16	N/A	5.92E-14
Butylbenzylphthalate	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	1.10E+00	N/A	8.68E-12	N/A	2.60E-16	N/A	4.63E-14
Dibenzo(a,h)anthracene	1.41E+00	N/A	1.11E-11	N/A	3.32E-16	N/A	5.92E-14
2,4-Dimethylphenol	7.50E-01	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	8.20E+00	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	1.50E+00	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	1.41E+00	N/A	1.11E-11	N/A	3.32E-16	N/A	5.92E-14
2-Methylnaphthalene	1.10E+00	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	1.70E+00	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	1.90E+00	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-14 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Recreational Traffic On-Site
Surficial Soil - Area C

	Commercial Robinson St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Robinson St. Carcinogenic Risk (mg/kg-day)	Commercial River Road Non-Carc. Hazard Index (mg/kg-day)	Commercial River Road Carcinogenic Risk (mg/kg-day)	Residential Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Residential Sommer St. Carcinogenic Risk (mg/kg-day)	Commercial Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Sommer St. Carcinogenic Risk (mg/kg-day)
VOLATILES								
Benzene	N/A	5.14E-19	N/A	3.73E-20	N/A	2.20E-19	N/A	1.05E-19
Carbon Disulfide	1.29E-14	N/A	9.38E-16	N/A	7.40E-15	N/A	2.63E-15	N/A
1,1-Dichloroethane	2.33E-16	N/A	1.69E-17	N/A	1.33E-16	N/A	4.74E-17	N/A
1,2-Dichloroethene (total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	N/A	1.02E-19	N/A	7.42E-21	N/A	4.39E-20	N/A	2.08E-20
Toluene	1.91E-16	N/A	1.38E-17	N/A	1.09E-16	N/A	3.88E-17	N/A
Trichloroethene	N/A	1.43E-18	N/A	1.04E-19	N/A	6.13E-19	N/A	2.91E-19
Xylene (total)	9.31E-16	N/A	6.75E-17	N/A	5.33E-16	N/A	1.90E-16	N/A
SEMI-VOLATILES								
Acenaphthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	N/A	3.80E-14	N/A	2.76E-15	N/A	1.63E-14	N/A	7.73E-15
Benzo(b)fluoranthene	N/A	4.86E-14	N/A	3.53E-15	N/A	2.08E-14	N/A	9.90E-15
Benzo(k)fluoranthene	N/A	2.19E-14	N/A	1.59E-15	N/A	9.38E-15	N/A	4.46E-15
Benzoic acid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	3.80E-14	N/A	2.76E-15	N/A	1.63E-14	N/A	7.73E-15
Butylbenzylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	N/A	2.97E-14	N/A	2.16E-15	N/A	1.27E-14	N/A	6.05E-15
Dibenzo(a,h)anthracene	N/A	3.80E-14	N/A	2.76E-15	N/A	1.63E-14	N/A	7.73E-15
2,4-Dimethylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	3.80E-14	N/A	2.76E-15	N/A	1.63E-14	N/A	7.73E-15
2-Methylnaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-14 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Recreational Traffic On-Site
Surficial Soil - Area C

	Soil Conc. (mg/kg)	Children On-Site Non-Carc. Hazard Index (mg/kg-day)	Children On-Site Carcinogenic Risk (mg/kg-day)	Children Playground Non-Carc. Hazard Index (mg/kg-day)	Children Playground Carcinogenic Risk (mg/kg-day)	Residential N. Marion St. Non-Carc. Hazard Index (mg/kg-day)	Residential N. Marion St. Carcinogenic Risk (mg/kg-day)
INORGANICS							
Aluminum	1.33E+04	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	4.80E+00	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	2.12E+01	N/A	1.37E-09	N/A	4.10E-14	N/A	7.32E-12
Barium	2.37E+02	2.68E-05	N/A	8.02E-10	N/A	3.82E-08	N/A
Beryllium	9.70E-01	N/A	1.05E-11	N/A	3.15E-16	N/A	5.62E-14
Cadmium	2.40E+00	N/A	1.89E-11	N/A	5.66E-16	N/A	1.01E-13
Calcium	7.33E+04	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	2.97E+01	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	8.10E+00	N/A	N/A	N/A	N/A	N/A	N/A
Copper	7.39E+01	N/A	N/A	N/A	N/A	N/A	N/A
Iron	2.38E+04	N/A	N/A	N/A	N/A	N/A	N/A
Lead	7.44E+02	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	2.53E+04	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	7.45E+02	2.81E-05	N/A	8.40E-10	N/A	4.01E-08	N/A
Mercury	2.30E-01	3.03E-08	N/A	9.05E-13	N/A	4.32E-11	N/A
Nickel	2.24E+01	N/A	2.43E-11	N/A	7.28E-16	N/A	1.30E-13
Potassium	1.99E+03	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	6.70E-01	N/A	N/A	N/A	N/A	N/A	N/A
Silver	8.30E-01	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	3.01E+02	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	4.20E-01	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	2.17E+01	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	3.43E+02	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	5.40E-01	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS *							
PCB-1242	1.45E+00	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	5.57E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	6.23E+00	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	3.32E+01	N/A	N/A	N/A	N/A	N/A	N/A
T O T A L	1.40E+05	5.50E-05	1.50E-09	1.64E-09	4.48E-14	7.84E-08	8.00E-12

* Upper 95% Confidence Arithmetic Mean Used For Pesticides/PCBs

Table 5-14 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Recreational Traffic On-Site
Surficial Soil - Area C

	Commercial Robinson St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Robinson St. Carcinogenic Risk (mg/kg-day)	Commercial River Road Non-Carc. Hazard Index (mg/kg-day)	Commercial River Road Carcinogenic Risk (mg/kg-day)	Residential Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Residential Sommer St. Carcinogenic Risk (mg/kg-day)	Commercial Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Sommer St. Carcinogenic Risk (mg/kg-day)
INORGANICS								
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	N/A	4.70E-12	N/A	3.41E-13	N/A	2.01E-12	N/A	9.56E-13
Barium	1.84E-08	N/A	1.33E-09	N/A	1.05E-08	N/A	3.74E-09	N/A
Beryllium	N/A	3.61E-14	N/A	2.62E-15	N/A	1.55E-14	N/A	7.35E-15
Cadmium	N/A	6.49E-14	N/A	4.70E-15	N/A	2.78E-14	N/A	1.32E-14
Calcium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	1.93E-08	N/A	1.40E-09	N/A	1.10E-08	N/A	3.92E-09	N/A
Mercury	2.08E-11	N/A	1.51E-12	N/A	1.19E-11	N/A	4.22E-12	N/A
Nickel	N/A	8.34E-14	N/A	6.05E-15	N/A	3.57E-14	N/A	1.70E-14
Potassium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS *								
PCB-1242	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T O T A L	3.77E-08	5.13E-12	2.73E-09	3.72E-13	2.16E-08	2.20E-12	7.67E-09	1.04E-12

Table 5-15
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Recreational Traffic On-Site
Surficial Soil - Area D

	Soil Conc. (mg/kg)	Children On-Site Non-Carc. Hazard Index (mg/kg-day)	Children On-Site Carcinogenic Risk (mg/kg-day)	Children Playground Non-Carc. Hazard Index (mg/kg-day)	Children Playground Carcinogenic Risk (mg/kg-day)	Residential N. Marion St. Non-Carc. Hazard Index (mg/kg-day)	Residential N. Marion St. Carcinogenic Risk (mg/kg-day)
VOLATILES							
Benzene	3.00E-03	N/A	6.15E-16	N/A	2.91E-21	N/A	7.43E-19
Carbon Disulfide	3.00E-03	6.18E-11	N/A	2.92E-16	N/A	2.00E-14	N/A
1,1-Dichloroethane	3.00E-03	1.85E-12	N/A	8.76E-18	N/A	5.99E-16	N/A
1,2-Dichloroethene (total)	3.00E-03	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	3.00E-03	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	3.00E-03	N/A	6.99E-17	N/A	3.31E-22	N/A	8.46E-20
Toluene	3.00E-03	3.25E-13	N/A	1.54E-18	N/A	1.05E-16	N/A
Trichloroethene	3.00E-03	N/A	3.60E-16	N/A	1.70E-21	N/A	4.36E-19
Xylene (total)	3.00E-03	6.18E-13	N/A	2.92E-18	N/A	2.00E-16	N/A
SEMI-VOLATILES							
Acenaphthene	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	1.40E-01	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	8.70E-02	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	4.06E-01	N/A	1.75E-11	N/A	8.27E-17	N/A	2.12E-14
Benzo(b)fluoranthene	1.50E+00	N/A	6.46E-11	N/A	3.06E-16	N/A	7.82E-14
Benzo(k)fluoranthene	4.06E-01	N/A	1.75E-11	N/A	8.27E-17	N/A	2.12E-14
Benzoic acid	2.00E-01	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	9.90E-01	N/A	4.27E-11	N/A	2.02E-16	N/A	5.16E-14
Butylbenzylphthalate	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	1.20E+00	N/A	5.17E-11	N/A	2.44E-16	N/A	6.25E-14
Dibenzo(a,h)anthracene	1.20E-01	N/A	5.17E-12	N/A	2.44E-17	N/A	6.25E-15
2,4-Dimethylphenol	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	3.30E+00	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	2.20E+00	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	9.00E-01	N/A	3.88E-11	N/A	1.83E-16	N/A	4.69E-14
2-Methylnaphthalene	1.20E-01	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	6.80E-02	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	6.20E-01	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	1.30E+00	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-15 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Recreational Traffic On-Site
Surficial Soil - Area D

	Commercial Robinson St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Robinson St. Carcinogenic Risk (mg/kg-day)	Commercial River Road Non-Carc. Hazard Index (mg/kg-day)	Commercial River Road Carcinogenic Risk (mg/kg-day)	Residential Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Residential Sommer St. Carcinogenic Risk (mg/kg-day)	Commercial Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Sommer St. Carcinogenic Risk (mg/kg-day)
VOLATILES								
Benzene	N/A	1.34E-19	N/A	1.87E-20	N/A	1.56E-19	N/A	7.41E-20
Carbon Disulfide	2.70E-15	N/A	3.76E-16	N/A	4.19E-15	N/A	1.49E-15	N/A
1,1-Dichloroethane	8.09E-17	N/A	1.13E-17	N/A	1.26E-16	N/A	4.48E-17	N/A
1,2-Dichloroethene (total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	N/A	1.52E-20	N/A	2.13E-21	N/A	1.78E-20	N/A	8.44E-21
Toluene	1.42E-17	N/A	1.98E-18	N/A	2.21E-17	N/A	7.86E-18	N/A
Trichloroethene	N/A	7.85E-20	N/A	1.10E-20	N/A	9.15E-20	N/A	4.35E-20
Xylene (total)	2.70E-17	N/A	3.76E-18	N/A	4.19E-17	N/A	1.49E-17	N/A
SEMI-VOLATILES								
Acenaphthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	N/A	3.81E-15	N/A	5.32E-16	N/A	4.44E-15	N/A	2.11E-15
Benzo(b)fluoranthene	N/A	1.41E-14	N/A	1.97E-15	N/A	1.64E-14	N/A	7.80E-15
Benzo(k)fluoranthene	N/A	3.81E-15	N/A	5.32E-16	N/A	4.44E-15	N/A	2.11E-15
Benzoic acid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	9.30E-15	N/A	1.30E-15	N/A	1.08E-14	N/A	5.15E-15
Butylbenzylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	N/A	1.13E-14	N/A	1.57E-15	N/A	1.31E-14	N/A	6.24E-15
Dibenzo(a,h)anthracene	N/A	1.13E-15	N/A	1.57E-16	N/A	1.31E-15	N/A	6.24E-16
2,4-Dimethylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	8.45E-15	N/A	1.18E-15	N/A	9.85E-15	N/A	4.68E-15
2-Methylnaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-15 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Recreational Traffic On-Site
Surficial Soil - Area D

	Soil Conc. (mg/kg)	Children On-Site Non-Carc. Hazard Index (mg/kg-day)	Children On-Site Carcinogenic Risk (mg/kg-day)	Children Playground Non-Carc. Hazard Index (mg/kg-day)	Children Playground Carcinogenic Risk (mg/kg-day)	Residential N. Marion St. Non-Carc. Hazard Index (mg/kg-day)	Residential N. Marion St. Carcinogenic Risk (mg/kg-day)
INORGANICS							
Aluminum	1.54E+04	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	4.20E+00	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	8.07E+01	N/A	2.85E-08	N/A	1.35E-13	N/A	3.45E-11
Barium	2.81E+02	1.74E-04	N/A	8.21E-10	N/A	5.61E-08	N/A
Beryllium	9.90E-01	N/A	5.88E-11	N/A	2.78E-16	N/A	7.11E-14
Cadmium	2.90E+00	N/A	1.25E-10	N/A	5.91E-16	N/A	1.51E-13
Calcium	2.58E+04	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	3.12E+01	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	1.54E+01	N/A	N/A	N/A	N/A	N/A	N/A
Copper	8.99E+01	N/A	N/A	N/A	N/A	N/A	N/A
Iron	5.65E+04	N/A	N/A	N/A	N/A	N/A	N/A
Lead	4.69E+02	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	1.24E+04	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	7.51E+02	1.55E-04	N/A	7.31E-10	N/A	5.00E-08	N/A
Mercury	3.10E-01	2.23E-07	N/A	1.05E-12	N/A	7.20E-11	N/A
Nickel	2.90E+01	N/A	1.72E-10	N/A	8.14E-16	N/A	2.08E-13
Potassium	2.42E+03	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	1.50E+00	N/A	N/A	N/A	N/A	N/A	N/A
Silver	9.30E-01	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	2.86E+02	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	6.20E-01	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	4.56E+01	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	9.40E+02	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	7.50E-01	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS *							
PCB-1242	9.80E-02	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	1.98E-01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	1.98E-01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	9.80E-02	N/A	N/A	N/A	N/A	N/A	N/A
T O T A L	1.16E+05	3.29E-04	2.91E-08	1.55E-09	1.38E-13	1.06E-07	3.52E-11

* Upper 95% Confidence Arithmetic Mean Used For Pesticides/PCBs

Table 5-15 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Recreational Traffic On-Site
Surficial Soil - Area D

	Commercial Robinson St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Robinson St. Carcinogenic Risk (mg/kg-day)	Commercial River Road Non-Carc. Hazard Index (mg/kg-day)	Commercial River Road Carcinogenic Risk (mg/kg-day)	Residential Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Residential Sommer St. Carcinogenic Risk (mg/kg-day)	Commercial Sommer St. Non-Carc. Hazard Index (mg/kg-day)	Commercial Sommer St. Carcinogenic Risk (mg/kg-day)
INORGANICS								
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	N/A	6.21E-12	N/A	8.67E-13	N/A	7.24E-12	N/A	3.44E-12
Barium	7.58E-09	N/A	1.06E-09	N/A	1.18E-08	N/A	4.19E-09	N/A
Beryllium	N/A	1.28E-14	N/A	1.79E-15	N/A	1.49E-14	N/A	7.09E-15
Cadmium	N/A	2.72E-14	N/A	3.80E-15	N/A	3.17E-14	N/A	1.51E-14
Calcium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	6.75E-09	N/A	9.42E-10	N/A	1.05E-08	N/A	3.74E-09	N/A
Mercury	9.72E-12	N/A	1.36E-12	N/A	1.51E-11	N/A	5.38E-12	N/A
Nickel	N/A	3.75E-14	N/A	5.23E-15	N/A	4.37E-14	N/A	2.08E-14
Potassium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS *								
PCB-1242	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	1.43E-08	6.34E-12	2.00E-09	8.85E-13	2.23E-08	7.39E-12	7.94E-09	3.51E-12

Table 5-16 presents the carcinogenic risks and hazard indices calculated for inhalation exposures to fugitive dust emissions generated by traffic parking in Area B of the Booth Oil Site. The hazard indices presented in Table 5-16, ranging from 1.45E-03 for children on-site to 2.01E-07 for commercial populations at River Road, are all significantly lower than the acceptable ceiling limit of 1.0. Similarly, the carcinogenic risks presented in Table 5-16 are significantly lower than the NYSDOH goal of 1.00E-06.

Table 5-17 presents the total carcinogenic risks and hazard indices calculated for inhalation of fugitive dusts from recreational traffic and parking at the Booth Oil Site. The totals presented in Table 5-17 are calculated as the sum of the area-specific risk totals calculated for each population. The total hazard indices presented in the table for inhalation exposures due to fugitive dust releases from traffic on-site range from 2.12E-03 for children on-site to 1.34E-06 for residents at Sommer Street. These values are significantly lower than the acceptable limit of 1.0, indicating that adverse noncarcinogenic health effects are not expected from the exposures. The total carcinogenic risks presented in Table 5-17 range from 3.93E-08 for children on-site to 1.44E-12 for children at the playground. These values fall significantly below the NYSDOH goal of 1.00E-06, indicating that these exposures are not of significant concern for carcinogenic risk.

Table 5-16
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Parking Traffic On-Site
Surficial Soil - Area B

	Upper 95% Confidence Arith. Mean Soil Conc. (mg/kg)	Children On-Site Non-Carc. Hazard Index	Children On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
VOLATILES							
Benzene	4.41E-01	N/A	5.33E-14	N/A	7.45E-18	N/A	2.73E-16
Carbon Disulfide	3.88E-01	4.71E-09	N/A	6.59E-13	N/A	6.46E-12	N/A
1,1-Dichloroethane	3.88E-01	1.41E-10	N/A	1.98E-14	N/A	1.94E-13	N/A
1,2-Dichloroethene (total)	5.95E-01	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	3.88E-01	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	1.55E+00	N/A	2.13E-14	N/A	2.98E-18	N/A	1.09E-16
Toluene	3.88E-01	2.48E-11	N/A	3.47E-15	N/A	3.40E-14	N/A
Trichloroethene	2.74E+00	N/A	1.94E-13	N/A	2.72E-17	N/A	9.95E-16
Xylene (total)	3.88E-01	4.71E-11	N/A	6.59E-15	N/A	6.46E-14	N/A
SEMI-VOLATILES							
Acenaphthene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	1.67E+01	N/A	4.26E-10	N/A	5.95E-14	N/A	2.18E-12
Benzo(b)fluoranthene	1.67E+01	N/A	4.26E-10	N/A	5.95E-14	N/A	2.18E-12
Benzo(k)fluoranthene	1.67E+01	N/A	4.26E-10	N/A	5.95E-14	N/A	2.18E-12
Benzoic acid	8.12E+01	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	1.67E+01	N/A	4.26E-10	N/A	5.95E-14	N/A	2.18E-12
Butylbenzylphthalate	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	1.67E+01	N/A	4.26E-10	N/A	5.95E-14	N/A	2.18E-12
Dibenzo(a,h)anthracene	1.67E+01	N/A	4.26E-10	N/A	5.95E-14	N/A	2.18E-12
2,4-Dimethylphenol	7.76E+01	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	4.49E+01	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	1.67E+01	N/A	4.26E-10	N/A	5.95E-14	N/A	2.18E-12
2-Methylnaphthalene	4.15E+00	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	5.69E+01	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	4.27E+02	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	1.69E+01	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	1.65E+01	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	2.48E+00	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	2.50E+02	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	1.64E+01	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-16 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Parking Traffic On-Site
Surficial Soil - Area B

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
VOLATILES								
Benzene	N/A	1.38E-16	N/A	3.68E-17	N/A	1.49E-16	N/A	7.08E-17
Carbon Disulfide	2.45E-12	N/A	6.53E-13	N/A	3.53E-12	N/A	1.26E-12	N/A
1,1-Dichloroethane	7.36E-14	N/A	1.96E-14	N/A	1.06E-13	N/A	3.77E-14	N/A
1,2-Dichloroethene (total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	N/A	5.54E-17	N/A	1.47E-17	N/A	5.96E-17	N/A	2.83E-17
Toluene	1.29E-14	N/A	3.43E-15	N/A	1.86E-14	N/A	6.61E-15	N/A
Trichloroethene	N/A	5.05E-16	N/A	1.34E-16	N/A	5.44E-16	N/A	2.58E-16
Xylene (total)	2.45E-14	N/A	6.53E-15	N/A	3.53E-14	N/A	1.26E-14	N/A
SEMI-VOLATILES								
Acenaphthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	N/A	1.11E-12	N/A	2.94E-13	N/A	1.19E-12	N/A	5.66E-13
Benzo(b)fluoranthene	N/A	1.11E-12	N/A	2.94E-13	N/A	1.19E-12	N/A	5.66E-13
Benzo(k)fluoranthene	N/A	1.11E-12	N/A	2.94E-13	N/A	1.19E-12	N/A	5.66E-13
Benzoic acid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	1.11E-12	N/A	2.94E-13	N/A	1.19E-12	N/A	5.66E-13
Butylbenzylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	N/A	1.11E-12	N/A	2.94E-13	N/A	1.19E-12	N/A	5.66E-13
Dibenzo(a,h)anthracene	N/A	1.11E-12	N/A	2.94E-13	N/A	1.19E-12	N/A	5.66E-13
2,4-Dimethylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	1.11E-12	N/A	2.94E-13	N/A	1.19E-12	N/A	5.66E-13
2-Methylnaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-16 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Parking Traffic On-Site
Surficial Soil - Area B

	Upper 95% Confidence Arith. Mean Soil Conc. (mg/kg)	Children On-Site Non-Carc. Hazard Index	Children On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
INORGANICS							
Aluminum	3.40E+04	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	1.85E+02	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	1.39E+01	N/A	2.89E-09	N/A	4.05E-13	N/A	1.48E-11
Barium	3.04E+03	1.11E-03	N/A	1.55E-07	N/A	1.51E-06	N/A
Beryllium	6.30E+00	N/A	2.20E-10	N/A	3.08E-14	N/A	1.13E-12
Cadmium	9.33E+00	N/A	2.37E-10	N/A	3.32E-14	N/A	1.22E-12
Calcium	2.09E+05	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	1.74E+02	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	1.33E+01	N/A	N/A	N/A	N/A	N/A	N/A
Copper	6.35E+02	N/A	N/A	N/A	N/A	N/A	N/A
Iron	5.14E+04	N/A	N/A	N/A	N/A	N/A	N/A
Lead	2.45E+03	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	6.55E+04	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	2.84E+03	3.45E-04	N/A	4.83E-08	N/A	4.73E-07	N/A
Mercury	1.72E-01	7.29E-08	N/A	1.02E-11	N/A	9.98E-11	N/A
Nickel	4.59E+01	N/A	1.61E-10	N/A	2.25E-14	N/A	8.23E-13
Potassium	2.55E+03	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	2.18E+00	N/A	N/A	N/A	N/A	N/A	N/A
Silver	9.37E-01	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	1.58E+03	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	7.01E-01	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	2.89E+01	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	1.36E+03	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	6.20E+00	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBs							
PCB-1242	1.66E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	3.83E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	3.66E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	3.44E+01	N/A	N/A	N/A	N/A	N/A	N/A
T O T A L	3.76E+05	1.45E-03	6.49E-09	2.03E-07	9.08E-13	1.99E-06	3.32E-11

Table 5-16 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Parking Traffic On-Site
Surficial Soil - Area B

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
INORGANICS								
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	N/A	7.52E-12	N/A	2.00E-12	N/A	8.09E-12	N/A	3.85E-12
Barium	5.76E-07	N/A	1.53E-07	N/A	8.28E-07	N/A	2.95E-07	N/A
Beryllium	N/A	5.73E-13	N/A	1.52E-13	N/A	6.17E-13	N/A	2.93E-13
Cadmium	N/A	6.16E-13	N/A	1.64E-13	N/A	6.64E-13	N/A	3.15E-13
Calcium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	1.80E-07	N/A	4.78E-08	N/A	2.58E-07	N/A	9.19E-08	N/A
Mercury	3.79E-11	N/A	1.01E-11	N/A	5.45E-11	N/A	1.94E-11	N/A
Nickel	N/A	4.18E-13	N/A	1.11E-13	N/A	4.50E-13	N/A	2.14E-13
Potassium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBs								
PCB-1242	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T O T A L	7.55E-07	1.69E-11	2.01E-07	4.49E-12	1.09E-06	1.82E-11	3.86E-07	8.63E-12

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Table 5-17
Total Inhalation Exposure Risks Due to
Fugitive Dust Releases From
Recreational Traffic and Parking On-site

Receptor	Recreational Traffic Area A (mg/kg-day)	Recreational Traffic Area B (mg/kg-day)	Recreational Traffic Area C (mg/kg-day)	Recreational Traffic Area D (mg/kg-day)	Parking Area B (mg/kg-day)	TOTAL (mg/kg-day)
Children On-Site						
Carcinogenic Risk	1.14E-09	1.11E-09	1.50E-09	2.91E-08	6.49E-09	3.93E-08
Non-Carc. Hazard Index	3.58E-05	2.48E-04	5.50E-05	3.29E-04	1.45E-03	2.12E-03
Children at the Playground						
Carcinogenic Risk	1.99E-13	1.55E-13	4.48E-14	1.38E-13	9.08E-13	1.44E-12
Non-Carc. Hazard Index	6.25E-09	3.46E-08	1.64E-09	1.55E-09	2.03E-07	2.47E-07
Residents at No. Marion Street						
Carcinogenic Risk	4.85E-12	5.67E-12	8.00E-12	3.52E-11	3.32E-11	8.69E-11
Non-Carc. Hazard Index	4.06E-08	3.39E-07	7.84E-08	1.06E-07	1.99E-06	2.55E-06
Commercial Pop. at Robinson St						
Carcinogenic Risk	1.32E-12	2.87E-12	5.13E-12	6.34E-12	1.69E-11	3.26E-11
Non-Carc. Hazard Index	8.32E-09	1.29E-07	3.77E-08	1.43E-08	7.55E-07	9.44E-07
Commercial Pop. at River Road						
Carcinogenic Risk	2.34E-12	7.65E-13	3.72E-13	8.85E-13	4.49E-12	8.85E-12
Non-Carc. Hazard Index	1.47E-08	3.43E-08	2.73E-09	2.00E-09	2.01E-07	2.55E-07
Residents at Sommer Street						
Carcinogenic Risk	2.08E-12	3.10E-12	2.20E-12	7.39E-12	1.82E-11	3.30E-11
Non-Carc. Hazard Index	1.74E-08	1.85E-07	2.16E-08	2.23E-08	1.09E-06	1.34E-06
Commercial Pop. at Sommer St.						
Carcinogenic Risk	9.86E-13	1.47E-12	1.04E-12	3.51E-12	8.63E-12	1.56E-11
Non-Carc. Hazard Index	6.20E-09	6.59E-08	7.67E-09	7.94E-09	3.86E-07	4.74E-07

Tables 5-18 through 5-21 present the carcinogenic risks and hazard indices calculated for inhalation exposures to fugitive dust releases from construction traffic at the Booth Oil Site. Table 5-18 presents the carcinogenic risks and hazard indices calculated for inhalation of fugitive dusts from construction traffic in Area A. The hazard indices presented in Table 5-18 range from 8.75E-03 for unprotected construction workers on-site to 8.10E-07 for commercial populations at Sommer Street. These values all fall below the acceptable limit of 1.0. Similarly, the carcinogenic risks presented in Table 5-18 all fall significantly below the NYSDOH goal of 1.00E-06.

The carcinogenic risks and hazard indices calculated for inhalation of fugitive dusts from construction traffic in Area B are listed in Table 5-19. The hazard indices presented in Table 5-19 range from 6.05E-02 for unprotected construction workers on-site to 4.53E-06 for children at the playground. These values fall below the acceptable limit of 1.0. The carcinogenic risks presented in Table 5-19 range from 3.38E-08 for children on-site to 2.51E-12 for commercial populations at River Road. These risks all fall significantly below the NYSDOH goal of 1.00E-06 for lifetime exposure and the OSHA guideline of 1.00E-03 for occupational exposure.

Table 5-18

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction Traffic On-Site
Surficial Soil - Area A

	Upper 95% Confidence Arith. Mean Soil Conc. (mg/kg)	Constr. Wrkrs On-Site Non-Carc. Hazard Index	Constr. Wrkrs On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
VOLATILES							
Benzene	4.13E-01	N/A	2.88E-13	N/A	2.14E-16	N/A	6.21E-17
Carbon Disulfide	1.07E-01	5.99E-08	N/A	5.59E-12	N/A	1.29E-11	N/A
1,1-Dichloroethane	9.30E-01	1.56E-08	N/A	1.46E-12	N/A	3.37E-12	N/A
1,2-Dichloroethene (total)	1.90E-01	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	5.84E-01	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	1.66E-01	N/A	1.31E-14	N/A	9.81E-18	N/A	2.84E-18
Toluene	4.13E-01	1.22E-09	N/A	1.14E-13	N/A	2.63E-13	N/A
Trichloroethene	4.13E-01	N/A	1.69E-13	N/A	1.26E-16	N/A	3.64E-17
Xylene (total)	1.19E+01	6.67E-08	N/A	6.23E-12	N/A	1.44E-11	N/A
SEMI-VOLATILES							
Acenaphthene	1.88E+00	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	1.70E+00	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	1.72E+00	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	1.58E+00	N/A	2.31E-10	N/A	1.73E-13	N/A	5.00E-14
Benzo(b)fluoranthene	1.62E+00	N/A	2.37E-10	N/A	1.77E-13	N/A	5.12E-14
Benzo(k)fluoranthene	1.72E+00	N/A	2.52E-10	N/A	1.88E-13	N/A	5.43E-14
Benzoic acid	8.33E+00	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	1.60E+00	N/A	2.34E-10	N/A	1.75E-13	N/A	5.06E-14
Butylbenzylphthalate	8.21E-01	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	1.38E+00	N/A	2.01E-10	N/A	1.50E-13	N/A	4.35E-14
Dibenzo(a,h)anthracene	1.72E+00	N/A	2.52E-10	N/A	1.88E-13	N/A	5.43E-14
2,4-Dimethylphenol	1.75E+00	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	3.03E+00	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	2.73E+00	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	1.75E+00	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	1.71E+00	N/A	2.51E-10	N/A	1.87E-13	N/A	5.41E-14
2-Methylnaphthalene	6.77E+00	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	1.72E+00	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	1.71E+00	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	1.56E+00	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	1.76E+00	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	3.43E+00	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	1.72E+00	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	2.17E+00	N/A	N/A	N/A	N/A	N/A	N/A

ritss1/bos5-3

Table 5-18 (cont'd)

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction Traffic On-Site
Surficial Soil - Area A

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
VOLATILES								
Benzene	N/A	3.57E-17	N/A	6.31E-17	N/A	2.66E-17	N/A	2.66E-17
Carbon Disulfide	7.44E-12	N/A	1.31E-11	N/A	5.54E-12	N/A	5.54E-12	N/A
1,1-Dichloroethane	1.94E-12	N/A	3.43E-12	N/A	1.44E-12	N/A	1.44E-12	N/A
1,2-Dichloroethene (total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	N/A	1.63E-18	N/A	2.89E-18	N/A	1.22E-18	N/A	1.22E-18
Toluene	1.51E-13	N/A	2.67E-13	N/A	1.13E-13	N/A	1.13E-13	N/A
Trichloroethene	N/A	2.09E-17	N/A	3.70E-17	N/A	1.56E-17	N/A	1.56E-17
Xylene (total)	8.29E-12	N/A	1.47E-11	N/A	6.18E-12	N/A	6.18E-12	N/A
SEMI-VOLATILES								
Acenaphthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	N/A	2.87E-14	N/A	5.08E-14	N/A	2.14E-14	N/A	2.14E-14
Benzo(b)fluoranthene	N/A	2.95E-14	N/A	5.21E-14	N/A	2.19E-14	N/A	2.19E-14
Benzo(k)fluoranthene	N/A	3.13E-14	N/A	5.52E-14	N/A	2.33E-14	N/A	2.33E-14
Benzoic acid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	2.91E-14	N/A	5.14E-14	N/A	2.17E-14	N/A	2.17E-14
Butylbenzylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	N/A	2.50E-14	N/A	4.42E-14	N/A	1.86E-14	N/A	1.86E-14
Dibenzo(a,h)anthracene	N/A	3.13E-14	N/A	5.52E-14	N/A	2.33E-14	N/A	2.33E-14
2,4-Dimethylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	3.11E-14	N/A	5.50E-14	N/A	2.32E-14	N/A	2.32E-14
2-Methylnaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-18 (cont'd)

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction Traffic On-Site
Surficial Soil - Area A

	Upper 95% Confidence Arith. Mean Soil Conc. (mg/kg)	Constr. Wrkrs On-Site Non-Carc. Hazard Index	Constr. Wrkrs On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
INORGANICS							
Aluminum	1.12E+04	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	6.79E+00	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	2.69E+01	N/A	3.23E-08	N/A	2.41E-11	N/A	6.98E-12
Barium	2.02E+02	3.38E-03	N/A	3.16E-07	N/A	7.30E-07	N/A
Beryllium	1.46E+00	N/A	2.94E-10	N/A	2.19E-13	N/A	6.35E-14
Cadmium	1.66E+00	N/A	2.43E-10	N/A	1.81E-13	N/A	5.24E-14
Calcium	1.11E+05	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	2.35E+01	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	6.96E+00	N/A	N/A	N/A	N/A	N/A	N/A
Copper	8.44E+01	N/A	N/A	N/A	N/A	N/A	N/A
Iron	2.86E+04	N/A	N/A	N/A	N/A	N/A	N/A
Lead	8.98E+02	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	5.71E+04	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	9.60E+02	5.37E-03	N/A	5.01E-07	N/A	1.16E-06	N/A
Mercury	2.87E-01	5.60E-06	N/A	5.23E-10	N/A	1.21E-09	N/A
Nickel	1.97E+01	N/A	3.96E-10	N/A	2.96E-13	N/A	8.56E-14
Potassium	1.82E+03	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	1.60E+00	N/A	N/A	N/A	N/A	N/A	N/A
Silver	9.27E-01	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	4.79E+02	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	5.24E-01	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	2.31E+01	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	3.55E+02	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	8.95E+00	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS							
PCB-1242	5.17E-01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	1.45E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	1.12E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	1.68E+01	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	2.13E+05	8.75E-03	3.49E-08	8.17E-07	2.61E-11	1.89E-06	7.54E-12

ritss1/bos5-3

Table 5-18 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction Traffic On-Site
Surficial Soil - Area A

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
INORGANICS								
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	N/A	4.02E-12	N/A	7.10E-12	N/A	2.99E-12	N/A	2.99E-12
Barium	4.20E-07	N/A	7.43E-07	N/A	3.13E-07	N/A	3.13E-07	N/A
Beryllium	N/A	3.65E-14	N/A	6.46E-14	N/A	2.72E-14	N/A	2.72E-14
Cadmium	N/A	3.02E-14	N/A	5.33E-14	N/A	2.25E-14	N/A	2.25E-14
Calcium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	6.67E-07	N/A	1.18E-06	N/A	4.97E-07	N/A	4.97E-07	N/A
Mercury	6.96E-10	N/A	1.23E-09	N/A	5.18E-10	N/A	5.18E-10	N/A
Nickel	N/A	4.93E-14	N/A	8.71E-14	N/A	3.67E-14	N/A	3.67E-14
Potassium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS								
PCB-1242	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	1.09E-06	4.34E-12	1.92E-06	7.67E-12	8.10E-07	3.23E-12	8.10E-07	3.23E-12

rlcTsum/BOS9

Table 5-22
Total Inhalation Exposure Risks Due to
Fugitive Dust Releases From
Construction Traffic On-site

Receptor	Area A (mg/kg-day)	Area B (mg/kg-day)	Area C (mg/kg-day)	Area D (mg/kg-day)	TOTAL (mg/kg-day)
Construction Worker On-Site					
Carcinogenic Risk	3.49E-08	3.38E-08	4.58E-08	8.90E-08	2.04E-07
Non-Carc. Hazard Index	8.75E-03	6.05E-02	1.34E-02	8.03E-03	9.07E-02
Children at the Playground					
Carcinogenic Risk	2.61E-11	2.02E-11	5.86E-12	1.80E-11	7.02E-11
Non-Carc. Hazard Index	8.17E-07	4.53E-06	2.15E-07	2.03E-07	5.77E-06
Residents at No. Marion Street					
Carcinogenic Risk	7.54E-12	8.82E-12	1.24E-11	5.48E-11	8.36E-11
Non-Carc. Hazard Index	1.89E-06	1.58E-05	3.65E-06	4.94E-06	2.63E-05
Commercial Pop. at Robinson St.					
Carcinogenic Risk	4.34E-12	9.42E-12	1.68E-11	2.08E-11	5.14E-11
Non-Carc. Hazard Index	1.09E-06	1.68E-05	4.93E-06	1.87E-06	2.47E-05
Commercial Pop. at River Road					
Carcinogenic Risk	7.67E-12	2.51E-12	1.22E-12	2.90E-12	1.43E-11
Non-Carc. Hazard Index	1.92E-06	4.48E-06	3.57E-07	2.62E-07	7.02E-06
Residents at Sommer Street					
Carcinogenic Risk	3.23E-12	4.82E-12	3.42E-12	1.15E-11	2.30E-11
Non-Carc. Hazard Index	8.10E-07	8.62E-06	1.00E-06	1.04E-06	1.15E-05
Commercial Pop. at Sommer St.					
Carcinogenic Risk	3.23E-12	4.82E-12	3.42E-12	1.15E-11	2.30E-11
Non-Carc. Hazard Index	8.10E-07	8.62E-06	1.00E-06	1.04E-06	1.15E-05

ritss3/bos5-4

Table 5-20 (cont'd)

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction Traffic On-Site
Surficial Soil - Area C

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
INORGANICS								
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	N/A	1.54E-11	N/A	1.12E-12	N/A	3.13E-12	N/A	3.13E-12
Barium	2.41E-06	N/A	1.74E-07	N/A	4.89E-07	N/A	4.89E-07	N/A
Beryllium	N/A	1.18E-13	N/A	8.58E-15	N/A	2.41E-14	N/A	2.41E-14
Cadmium	N/A	2.13E-13	N/A	1.54E-14	N/A	4.33E-14	N/A	4.33E-14
Calcium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	2.52E-06	N/A	1.83E-07	N/A	5.13E-07	N/A	5.13E-07	N/A
Mercury	2.71E-09	N/A	1.97E-10	N/A	5.52E-10	N/A	5.52E-10	N/A
Nickel	N/A	2.73E-13	N/A	1.98E-14	N/A	5.56E-14	N/A	5.56E-14
Potassium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS *								
PCB-1242	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	4.93E-06	1.68E-11	3.57E-07	1.22E-12	1.00E-06	3.42E-12	1.00E-06	3.42E-12

Table 5-20 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction Traffic On-Site
Surficial Soil - Area C

	Soil Conc. (mg/kg)	Constr. Wrkrs On-Site Non-Carc. Hazard Index	Constr. Wrkrs On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
INORGANICS							
Aluminum	1.33E+04	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	4.80E+00	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	2.12E+01	N/A	4.19E-08	N/A	5.36E-12	N/A	1.14E-11
Barium	2.37E+02	6.55E-03	N/A	1.05E-07	N/A	1.78E-06	N/A
Beryllium	9.70E-01	N/A	3.22E-10	N/A	4.12E-14	N/A	8.75E-14
Cadmium	2.40E+00	N/A	5.79E-10	N/A	7.41E-14	N/A	1.57E-13
Calcium	7.33E+04	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	2.97E+01	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	8.10E+00	N/A	N/A	N/A	N/A	N/A	N/A
Copper	7.39E+01	N/A	N/A	N/A	N/A	N/A	N/A
Iron	2.38E+04	N/A	N/A	N/A	N/A	N/A	N/A
Lead	7.44E+02	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	2.53E+04	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	7.45E+02	6.87E-03	N/A	1.10E-07	N/A	1.87E-06	N/A
Mercury	2.30E-01	7.40E-06	N/A	1.18E-10	N/A	2.01E-09	N/A
Nickel	2.24E+01	N/A	7.44E-10	N/A	9.52E-14	N/A	2.02E-13
Potassium	1.99E+03	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	6.70E-01	N/A	N/A	N/A	N/A	N/A	N/A
Silver	8.30E-01	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	3.01E+02	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	4.20E-01	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	2.17E+01	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	3.43E+02	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	5.40E-01	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS *							
PCB-1242	1.45E+00	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	5.57E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	6.23E+00	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	3.32E+01	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	1.40E+05	1.34E-02	4.58E-08	2.15E-07	5.86E-12	3.65E-06	1.24E-11

* 95% Confidence Arithmatic Mean used for Pesticides/PCBs

Table 5-20 (cont'd)

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction Traffic On-Site
Surficial Soil - Area C

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
VOLATILES								
Benzene	N/A	1.68E-18	N/A	1.22E-19	N/A	3.43E-19	N/A	3.43E-19
Carbon Disulfide	1.69E-12	N/A	1.23E-13	N/A	3.44E-13	N/A	3.44E-13	N/A
1,1-Dichloroethane	3.04E-14	N/A	2.21E-15	N/A	6.20E-15	N/A	6.20E-15	N/A
1,2-Dichloroethene (total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	N/A	3.35E-19	N/A	2.43E-20	N/A	6.82E-20	N/A	6.82E-20
Toluene	2.49E-14	N/A	1.81E-15	N/A	5.07E-15	N/A	5.07E-15	N/A
Trichloroethene	N/A	4.69E-18	N/A	3.40E-19	N/A	9.54E-19	N/A	9.54E-19
Xylene (total)	1.22E-13	N/A	8.83E-15	N/A	2.48E-14	N/A	2.48E-14	N/A
SEMI-VOLATILES								
Acenaphthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	N/A	1.24E-13	N/A	9.03E-15	N/A	2.53E-14	N/A	2.53E-14
Benzo(b)fluoranthene	N/A	1.59E-13	N/A	1.16E-14	N/A	3.24E-14	N/A	3.24E-14
Benzo(k)fluoranthene	N/A	7.17E-14	N/A	5.20E-15	N/A	1.46E-14	N/A	1.46E-14
Benzoic acid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	1.24E-13	N/A	9.03E-15	N/A	2.53E-14	N/A	2.53E-14
Butylbenzylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	N/A	9.74E-14	N/A	7.07E-15	N/A	1.98E-14	N/A	1.98E-14
Dibenzo(a,h)anthracene	N/A	1.24E-13	N/A	9.03E-15	N/A	2.53E-14	N/A	2.53E-14
2,4-Dimethylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	1.24E-13	N/A	9.03E-15	N/A	2.53E-14	N/A	2.53E-14
2-Methylnaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

ritss4/bos5-4

Table 5-21
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction Traffic On-Site
Surficial Soil - Area D

	Soil Conc. (mg/kg)	Constr. Wrkrs On-Site Non-Carc. Hazard Index	Constr. Wrkrs On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
VOLATILES							
Benzene	3.00E-03	N/A	1.88E-15	N/A	3.80E-19	N/A	1.16E-18
Carbon Disulfide	3.00E-03	1.51E-09	N/A	3.82E-14	N/A	9.30E-13	N/A
1,1-Dichloroethane	3.00E-03	4.53E-11	N/A	1.15E-15	N/A	2.79E-14	N/A
1,2-Dichloroethene (total)	3.00E-03	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	3.00E-03	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	3.00E-03	N/A	2.14E-16	N/A	4.32E-20	N/A	1.32E-19
Toluene	3.00E-03	7.95E-12	N/A	2.01E-16	N/A	4.89E-15	N/A
Trichloroethene	3.00E-03	N/A	1.10E-15	N/A	2.23E-19	N/A	6.78E-19
Xylene (total)	3.00E-03	1.51E-11	N/A	3.82E-16	N/A	9.30E-15	N/A
SEMI-VOLATILES							
Acenaphthene	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	1.40E-01	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	8.70E-02	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	4.06E-01	N/A	5.35E-11	N/A	1.08E-14	N/A	3.29E-14
Benzo(b)fluoranthene	1.50E+00	N/A	1.98E-10	N/A	4.00E-14	N/A	1.22E-13
Benzo(k)fluoranthene	4.06E-01	N/A	5.35E-11	N/A	1.08E-14	N/A	3.29E-14
Benzoic acid	2.00E-01	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	9.90E-01	N/A	1.30E-10	N/A	2.64E-14	N/A	8.03E-14
Butylbenzylphthalate	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	1.20E+00	N/A	1.58E-10	N/A	3.20E-14	N/A	9.74E-14
Dibenzo(a,h)anthracene	1.20E-01	N/A	1.58E-11	N/A	3.20E-15	N/A	9.74E-15
2,4-Dimethylphenol	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	3.30E+00	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	2.20E+00	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	9.00E-01	N/A	1.19E-10	N/A	2.40E-14	N/A	7.30E-14
2-Methylnaphthalene	1.20E-01	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	6.80E-02	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	6.20E-01	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	1.30E+00	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-21 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction Traffic On-Site
Surficial Soil - Area D

	Soil Conc. (mg/kg)	Constr. Wrkrs On-Site Non-Carc. Hazard Index	Constr. Wrkrs On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
INORGANICS							
Aluminum	1.54E+04	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	4.20E+00	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	8.07E+01	N/A	8.72E-08	N/A	1.76E-11	N/A	5.37E-11
Barium	2.81E+02	4.24E-03	N/A	1.07E-07	N/A	2.61E-06	N/A
Beryllium	9.90E-01	N/A	1.80E-10	N/A	3.63E-14	N/A	1.11E-13
Cadmium	2.90E+00	N/A	3.82E-10	N/A	7.72E-14	N/A	2.35E-13
Calcium	2.58E+04	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	3.12E+01	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	1.54E+01	N/A	N/A	N/A	N/A	N/A	N/A
Copper	8.99E+01	N/A	N/A	N/A	N/A	N/A	N/A
Iron	5.65E+04	N/A	N/A	N/A	N/A	N/A	N/A
Lead	4.69E+02	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	1.24E+04	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	7.51E+02	3.78E-03	N/A	9.56E-08	N/A	2.33E-06	N/A
Mercury	3.10E-01	5.44E-06	N/A	1.38E-10	N/A	3.35E-09	N/A
Nickel	2.90E+01	N/A	5.26E-10	N/A	1.06E-13	N/A	3.24E-13
Potassium	2.42E+03	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	1.50E+00	N/A	N/A	N/A	N/A	N/A	N/A
Silver	9.30E-01	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	2.86E+02	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	6.20E-01	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	4.56E+01	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	9.40E+02	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	7.50E-01	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS *							
PCB-1242	9.80E-02	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	1.98E-01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	1.98E-01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	9.80E-02	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	1.16E+05	8.03E-03	8.90E-08	2.03E-07	1.80E-11	4.94E-06	5.48E-11

* 95% Confidence Arithmatic Mean used for Pesticides/PCBs

Table 5-21 (cont'd)

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction Traffic On-Site
Surficial Soil - Area D

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
VOLATILES								
Benzene	N/A	4.39E-19	N/A	6.12E-20	N/A	2.43E-19	N/A	2.43E-19
Carbon Disulfide	3.53E-13	N/A	4.92E-14	N/A	1.95E-13	N/A	1.95E-13	N/A
1,1-Dichloroethane	1.06E-14	N/A	1.48E-15	N/A	5.85E-15	N/A	5.85E-15	N/A
1,2-Dichloroethene (total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	N/A	4.99E-20	N/A	6.97E-21	N/A	2.76E-20	N/A	2.76E-20
Toluene	1.86E-15	N/A	2.59E-16	N/A	1.03E-15	N/A	1.03E-15	N/A
Trichloroethene	N/A	2.57E-19	N/A	3.59E-20	N/A	1.42E-19	N/A	1.42E-19
Xylene (total)	3.53E-15	N/A	4.92E-16	N/A	1.95E-15	N/A	1.95E-15	N/A
SEMI-VOLATILES								
Acenaphthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	N/A	1.25E-14	N/A	1.74E-15	N/A	6.91E-15	N/A	6.91E-15
Benzo(b)fluoranthene	N/A	4.61E-14	N/A	6.44E-15	N/A	2.55E-14	N/A	2.55E-14
Benzo(k)fluoranthene	N/A	1.25E-14	N/A	1.74E-15	N/A	6.91E-15	N/A	6.91E-15
Benzoic acid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	3.05E-14	N/A	4.25E-15	N/A	1.69E-14	N/A	1.69E-14
Butylbenzylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	N/A	3.69E-14	N/A	5.15E-15	N/A	2.04E-14	N/A	2.04E-14
Dibenzo(a,h)anthracene	N/A	3.69E-15	N/A	5.15E-16	N/A	2.04E-15	N/A	2.04E-15
2,4-Dimethylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	2.77E-14	N/A	3.86E-15	N/A	1.53E-14	N/A	1.53E-14
2-Methylnaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-21 (cont'd)

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction Traffic On-Site
Surficial Soil - Area D

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
INORGANICS								
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	N/A	2.03E-11	N/A	2.84E-12	N/A	1.13E-11	N/A	1.13E-11
Barium	9.91E-07	N/A	1.38E-07	N/A	5.48E-07	N/A	5.48E-07	N/A
Beryllium	N/A	4.19E-14	N/A	5.85E-15	N/A	2.32E-14	N/A	2.32E-14
Cadmium	N/A	8.92E-14	N/A	1.24E-14	N/A	4.94E-14	N/A	4.94E-14
Calcium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	8.83E-07	N/A	1.23E-07	N/A	4.88E-07	N/A	4.88E-07	N/A
Mercury	1.27E-09	N/A	1.77E-10	N/A	7.03E-10	N/A	7.03E-10	N/A
Nickel	N/A	1.23E-13	N/A	1.71E-14	N/A	6.80E-14	N/A	6.80E-14
Potassium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS *								
PCB-1242	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T O T A L	1.87E-06	2.08E-11	2.62E-07	2.90E-12	1.04E-06	1.15E-11	1.04E-06	1.15E-11

ricss1/bos5-5

Table 5-23

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction On-Site
Surficial Soil - Area A

	Upper 95% Confidence Arith. Mean Soil Conc. (mg/kg)	Constr. Wrkrs On-Site Non-Carc. Hazard Index	Constr. Wrkrs On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
VOLATILES							
Benzene	4.13E-01	N/A	6.16E-10	N/A	4.60E-13	N/A	1.33E-13
Carbon Disulfide	1.07E-01	1.28E-04	N/A	1.20E-08	N/A	2.77E-08	N/A
1,1-Dichloroethane	9.30E-01	3.35E-05	N/A	3.12E-09	N/A	7.23E-09	N/A
1,2-Dichloroethene (total)	1.90E-01	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	5.84E-01	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	1.66E-01	N/A	2.82E-11	N/A	2.10E-14	N/A	6.09E-15
Toluene	4.13E-01	2.61E-06	N/A	2.43E-10	N/A	5.63E-10	N/A
Trichloroethene	4.13E-01	N/A	3.61E-10	N/A	2.70E-13	N/A	7.80E-14
Xylene (total)	1.19E+01	1.43E-04	N/A	1.34E-08	N/A	3.09E-08	N/A
SEMI-VOLATILES							
Acenaphthene	1.88E+00	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	1.70E+00	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	1.72E+00	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	1.58E+00	N/A	4.96E-07	N/A	3.70E-10	N/A	1.07E-10
Benzo(b)fluoranthene	1.62E+00	N/A	5.08E-07	N/A	3.79E-10	N/A	1.10E-10
Benzo(k)fluoranthene	1.72E+00	N/A	5.39E-07	N/A	4.02E-10	N/A	1.16E-10
Benzoic acid	8.33E+00	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	1.60E+00	N/A	5.02E-07	N/A	3.74E-10	N/A	1.08E-10
Butylbenzylphthalate	8.21E-01	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	1.38E+00	N/A	4.32E-07	N/A	3.22E-10	N/A	9.32E-11
Dibenzo(a,h)anthracene	1.72E+00	N/A	5.39E-07	N/A	4.02E-10	N/A	1.16E-10
2,4-Dimethylphenol	1.75E+00	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	3.03E+00	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	2.73E+00	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	1.75E+00	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	1.71E+00	N/A	5.37E-07	N/A	4.01E-10	N/A	1.16E-10
2-Methylnaphthalene	6.77E+00	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	1.72E+00	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	1.71E+00	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	1.56E+00	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	1.76E+00	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	3.43E+00	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	1.72E+00	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	2.17E+00	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-23 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction On-Site
Surficial Soil - Area A

	Upper 95% Confidence Arith. Mean Soil Conc. (mg/kg)	Constr. Wrkrs On-Site Non-Carc. Hazard Index	Constr. Wrkrs On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
INORGANICS							
Aluminum	1.12E+04	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	6.79E+00	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	2.69E+01	N/A	6.93E-05	N/A	5.17E-08	N/A	1.50E-08
Barium	2.02E+02	7.25E+00	N/A	6.77E-04	N/A	1.57E-03	N/A
Beryllium	1.46E+00	N/A	6.30E-07	N/A	4.70E-10	N/A	1.36E-10
Cadmium	1.66E+00	N/A	5.20E-07	N/A	3.88E-10	N/A	1.12E-10
Calcium	1.11E+05	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	2.35E+01	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	6.96E+00	N/A	N/A	N/A	N/A	N/A	N/A
Copper	8.44E+01	N/A	N/A	N/A	N/A	N/A	N/A
Iron	2.86E+04	N/A	N/A	N/A	N/A	N/A	N/A
Lead	8.98E+02	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	5.71E+04	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	9.60E+02	1.15E+01	N/A	1.07E-03	N/A	2.48E-03	N/A
Mercury	2.87E-01	1.20E-02	N/A	1.12E-06	N/A	2.59E-06	N/A
Nickel	1.97E+01	N/A	8.50E-07	N/A	6.34E-10	N/A	1.84E-10
Potassium	1.82E+03	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	1.60E+00	N/A	N/A	N/A	N/A	N/A	N/A
Silver	9.27E-01	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	4.79E+02	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	5.24E-01	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	2.31E+01	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	3.55E+02	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	8.95E+00	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS							
PCB-1242	5.17E-01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	1.45E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	1.12E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	1.68E+01	N/A	N/A	N/A	N/A	N/A	N/A
T O T A L	2.13E+05	1.88E+01	7.48E-05	1.75E-03	5.58E-08	4.05E-03	1.62E-08

Table 5-23 (cont'd)

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction On-Site
Surficial Soil - Area A

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
VOLATILES								
Benzene	N/A	7.66E-14	N/A	1.35E-13	N/A	5.70E-14	N/A	5.70E-14
Carbon Disulfide	1.59E-08	N/A	2.82E-08	N/A	1.19E-08	N/A	1.19E-08	N/A
1,1-Dichloroethane	4.16E-09	N/A	7.35E-09	N/A	3.10E-09	N/A	3.10E-09	N/A
1,2-Dichloroethene (total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	N/A	3.50E-15	N/A	6.19E-15	N/A	2.61E-15	N/A	2.61E-15
Toluene	3.24E-10	N/A	5.73E-10	N/A	2.41E-10	N/A	2.41E-10	N/A
Trichloroethene	N/A	4.49E-14	N/A	7.94E-14	N/A	3.34E-14	N/A	3.34E-14
Xylene (total)	1.78E-08	N/A	3.14E-08	N/A	1.32E-08	N/A	1.32E-08	N/A
SEMI-VOLATILES								
Acenaphthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	N/A	6.16E-11	N/A	1.09E-10	N/A	4.59E-11	N/A	4.59E-11
Benzo(b)fluoranthene	N/A	6.31E-11	N/A	1.12E-10	N/A	4.70E-11	N/A	4.70E-11
Benzo(k)fluoranthene	N/A	6.70E-11	N/A	1.18E-10	N/A	4.99E-11	N/A	4.99E-11
Benzoic acid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	6.23E-11	N/A	1.10E-10	N/A	4.65E-11	N/A	4.65E-11
Butylbenzylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	N/A	5.36E-11	N/A	9.48E-11	N/A	3.99E-11	N/A	3.99E-11
Dibenzo(a,h)anthracene	N/A	6.70E-11	N/A	1.18E-10	N/A	4.99E-11	N/A	4.99E-11
2,4-Dimethylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	6.67E-11	N/A	1.18E-10	N/A	4.97E-11	N/A	4.97E-11
2-Methylnaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-23 (cont'd)

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction On-Site
Surficial Soil - Area A

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
INORGANICS								
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	N/A	8.61E-09	N/A	1.52E-08	N/A	6.41E-09	N/A	6.41E-09
Barium	9.00E-04	N/A	1.59E-03	N/A	6.71E-04	N/A	6.71E-04	N/A
Beryllium	N/A	7.83E-11	N/A	1.38E-10	N/A	5.83E-11	N/A	5.83E-11
Cadmium	N/A	6.46E-11	N/A	1.14E-10	N/A	4.82E-11	N/A	4.82E-11
Calcium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	1.43E-03	N/A	2.53E-03	N/A	1.06E-03	N/A	1.06E-03	N/A
Mercury	1.49E-06	N/A	2.64E-06	N/A	1.11E-06	N/A	1.11E-06	N/A
Nickel	N/A	1.06E-10	N/A	1.87E-10	N/A	7.87E-11	N/A	7.87E-11
Potassium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS								
PCB-1242	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T O T A L	2.33E-03	9.30E-09	4.12E-03	1.64E-08	1.74E-03	6.93E-09	1.74E-03	6.93E-09

hazard index calculated for unprotected construction workers on-site is 1.88E+01. This value exceeds the acceptable limit of 1.0, indicating that adverse noncarcinogenic health effects are of concern for unprotected construction workers exposed to construction related fugitive dust emissions in Area A of the Booth Oil Site. Review the table indicates that this elevated hazard index is attributed to barium and manganese, with individual hazard indices of 7.25 and 1.15E+01, respectively. It must be noted that the construction emissions estimated herein resulted in on-site levels of respirable dust above the OSHA standard of 5 mg/m^3. It is expected that adherence to the OSHA standard for respirable dust will provide for mitigation of this elevated hazard index. In addition, as previously noted, this assessment assumes that construction workers are unprotected. The site-specific health and safety plan will provide for protection of construction workers on-site in accordance with OSHA guidelines.

The carcinogenic risks presented in Table 5-23 for off-site populations range from 5.58E-08 for children at the playground to 6.93E-09 for commercial and residential populations at Sommer Street. These values fall below the NYSDOH goal of 1.00E-06. However, the carcinogenic risk calculated for unprotected construction workers on-site for inhalation of construction related fugitive dust from Area A is 7.48E-05. Review of Table 5-23

indicates that this elevated carcinogenic risk is attributed primarily to arsenic, which has in individual risk of 6.93E-05. This value, which, as discussed previously, is based upon respirable dust levels above the OSHA guideline of 5.0 mg/m^3 respirable dust, exceeds the NYSDOH goal of 1.00E-06 for carcinogenic risks posed by exposure to inactive hazardous waste sites. However, this risk is two orders of magnitude below the OSHA guideline of 1.00E-03. In addition, it must be noted that the exposure scenario developed for unprotected construction workers herein does not account for the use of personal protective measures. Appropriate means of personal protection are described in the site-specific health and safety plan, and should provide for mitigation of the risks calculated for this exposure scenario. In addition, controls will be used during construction, if needed, to comply with the OSHA standard of 5.0 mg/m^3 for respirable dust.

Table 5-24 presents the carcinogenic risks and hazard indices calculated for inhalation of construction related fugitive dust from Area B. As in Area A, the hazard indices and carcinogenic risks calculated for off-site populations are all well within acceptable limits. However, the hazard index and carcinogenic risk calculated for unprotected construction workers on-site exceed the acceptable limit of 1.0 and the NYSDOH goal of 1.00E-06, respectively. Review of the table indicates that the elevated

Table 5-24

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction On-Site
Surficial Soil - Area B

	Upper 95% Confidence Arith. Mean Soil Conc. (mg/kg)	Constr. Wrkrs On-Site Non-Carc. Hazard Index	Constr. Wrkrs On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
VOLATILES							
Benzene	4.41E-01	N/A	5.95E-10	N/A	3.56E-13	N/A	1.55E-13
Carbon Disulfide	3.88E-01	4.21E-04	N/A	3.15E-08	N/A	1.10E-07	N/A
1,1-Dichloroethane	3.88E-01	1.26E-05	N/A	9.45E-10	N/A	3.29E-09	N/A
1,2-Dichloroethene (total)	5.95E-01	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	3.88E-01	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	1.55E+00	N/A	2.38E-10	N/A	1.42E-13	N/A	6.21E-14
Toluene	3.88E-01	2.22E-06	N/A	1.66E-10	N/A	5.78E-10	N/A
Trichloroethene	2.74E+00	N/A	2.17E-09	N/A	1.30E-12	N/A	5.66E-13
Xylene (total)	3.88E-01	4.21E-06	N/A	3.15E-10	N/A	1.10E-09	N/A
SEMI-VOLATILES							
Acenaphthene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	1.67E+01	N/A	4.75E-06	N/A	2.84E-09	N/A	1.24E-09
Benzo(b)fluoranthene	1.67E+01	N/A	4.75E-06	N/A	2.84E-09	N/A	1.24E-09
Benzo(k)fluoranthene	1.67E+01	N/A	4.75E-06	N/A	2.84E-09	N/A	1.24E-09
Benzoic acid	8.12E+01	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	1.67E+01	N/A	4.75E-06	N/A	2.84E-09	N/A	1.24E-09
Butylbenzylphthalate	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	1.67E+01	N/A	4.75E-06	N/A	2.84E-09	N/A	1.24E-09
Dibenzo(a,h)anthracene	1.67E+01	N/A	4.75E-06	N/A	2.84E-09	N/A	1.24E-09
2,4-Dimethylphenol	7.76E+01	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	4.49E+01	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	1.67E+01	N/A	4.75E-06	N/A	2.84E-09	N/A	1.24E-09
2-Methylnaphthalene	4.15E+00	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	5.69E+01	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	4.27E+02	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	1.69E+01	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	1.65E+01	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	2.48E+00	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	2.50E+02	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	1.64E+01	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-24 (cont'd)

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction On-Site
Surficial Soil - Area B

	Upper 95% Confidence Arith. Mean Soil Conc. (mg/kg)	Constr. Wrkrs On-Site Non-Carc. Hazard Index	Constr. Wrkrs On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
INORGANICS							
Aluminum	3.40E+04	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	1.85E+02	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	1.39E+01	N/A	3.23E-05	N/A	1.93E-08	N/A	8.43E-09
Barium	3.04E+03	9.88E+01	N/A	7.40E-03	N/A	2.58E-02	N/A
Beryllium	6.30E+00	N/A	2.46E-06	N/A	1.47E-09	N/A	6.42E-10
Cadmium	9.33E+00	N/A	2.65E-06	N/A	1.59E-09	N/A	6.91E-10
Calcium	2.09E+05	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	1.74E+02	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	1.33E+01	N/A	N/A	N/A	N/A	N/A	N/A
Copper	6.35E+02	N/A	N/A	N/A	N/A	N/A	N/A
Iron	5.14E+04	N/A	N/A	N/A	N/A	N/A	N/A
Lead	2.45E+03	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	6.55E+04	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	2.84E+03	3.08E+01	N/A	2.31E-03	N/A	8.04E-03	N/A
Mercury	1.72E-01	6.51E-03	N/A	4.87E-07	N/A	1.70E-06	N/A
Nickel	4.59E+01	N/A	1.80E-06	N/A	1.07E-09	N/A	4.68E-10
Potassium	2.55E+03	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	2.18E+00	N/A	N/A	N/A	N/A	N/A	N/A
Silver	9.37E-01	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	1.58E+03	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	7.01E-01	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	2.89E+01	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	1.36E+03	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	6.20E+00	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS							
PCB-1242	1.66E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	3.83E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	3.66E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	3.44E+01	N/A	N/A	N/A	N/A	N/A	N/A
T O T A L	3.76E+05	1.30E+02	7.25E-05	9.70E-03	4.34E-08	3.38E-02	1.89E-08

Table 5-24 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction On-Site
Surficial Soil - Area B

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
VOLATILES								
Benzene	N/A	1.66E-13	N/A	4.41E-14	N/A	8.49E-14	N/A	8.49E-14
Carbon Disulfide	1.17E-07	N/A	3.12E-08	N/A	6.00E-08	N/A	6.00E-08	N/A
1,1-Dichloroethane	3.52E-09	N/A	9.36E-10	N/A	1.80E-09	N/A	1.80E-09	N/A
1,2-Dichloroethene (total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	N/A	6.63E-14	N/A	1.76E-14	N/A	3.39E-14	N/A	3.39E-14
Toluene	6.17E-10	N/A	1.64E-10	N/A	3.16E-10	N/A	3.16E-10	N/A
Trichloroethene	N/A	6.05E-13	N/A	1.61E-13	N/A	3.09E-13	N/A	3.09E-13
Xylene (total)	1.17E-09	N/A	3.12E-10	N/A	6.00E-10	N/A	6.00E-10	N/A
SEMI-VOLATILES								
Acenaphthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	N/A	1.32E-09	N/A	3.52E-10	N/A	6.77E-10	N/A	6.77E-10
Benzo(b)fluoranthene	N/A	1.32E-09	N/A	3.52E-10	N/A	6.77E-10	N/A	6.77E-10
Benzo(k)fluoranthene	N/A	1.32E-09	N/A	3.52E-10	N/A	6.77E-10	N/A	6.77E-10
Benzoic acid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	1.32E-09	N/A	3.52E-10	N/A	6.77E-10	N/A	6.77E-10
Butylbenzylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	N/A	1.32E-09	N/A	3.52E-10	N/A	6.77E-10	N/A	6.77E-10
Dibenzo(a,h)anthracene	N/A	1.32E-09	N/A	3.52E-10	N/A	6.77E-10	N/A	6.77E-10
2,4-Dimethylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	1.32E-09	N/A	3.52E-10	N/A	6.77E-10	N/A	6.77E-10
2-Methylnaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

ricss2/bos5-5

Table 5-24 (cont'd)

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction On-Site
Surficial Soil - Area B

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
INORGANICS								
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	N/A	9.00E-09	N/A	2.39E-09	N/A	4.61E-09	N/A	4.61E-09
Barium	2.75E-02	N/A	7.32E-03	N/A	1.41E-02	N/A	1.41E-02	N/A
Beryllium	N/A	6.86E-10	N/A	1.82E-10	N/A	3.51E-10	N/A	3.51E-10
Cadmium	N/A	7.38E-10	N/A	1.96E-10	N/A	3.78E-10	N/A	3.78E-10
Calcium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	8.59E-03	N/A	2.28E-03	N/A	4.39E-03	N/A	4.39E-03	N/A
Mercury	1.81E-06	N/A	4.82E-07	N/A	9.28E-07	N/A	9.28E-07	N/A
Nickel	N/A	5.00E-10	N/A	1.33E-10	N/A	2.56E-10	N/A	2.56E-10
Potassium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS								
PCB-1242	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	3.61E-02	2.02E-08	9.60E-03	5.37E-09	1.85E-02	1.03E-08	1.85E-02	1.03E-08

hazard index calculated for this population is attributed primarily to barium and manganese. The carcinogenic risk calculated for unprotected construction workers exceeds the NYSDOH goal of 1.00E-06 for lifetime exposure, but not the OSHA guideline of 1.00E-03 for occupational exposure. The total carcinogenic risk calculated for unprotected construction workers is attributed to CaPAHs, arsenic, beryllium, cadmium and nickel. As discussed above, this exposure and the resultant risks may be mitigated by the use of personal protective measures outlined in the site-specific health and safety plan or the use of control measures to limit the amount of dust generation during construction.

Tables 5-25 and 5-26 present the carcinogenic risks and hazard indices calculated for inhalation exposures to construction related fugitive dusts from Areas C and D of the Booth Oil Site, respectively. Review of the tables indicates that, as in Areas A and B, the carcinogenic risks and hazard indices calculated for exposures of off-site populations are all within acceptable limits. However, the risks calculated for unprotected construction workers on-site exceed the acceptable limit of 1.0 for noncarcinogenic hazard index and the NYSDOH goal of 1.00E-06 for carcinogenic risk. It must be noted that the OSHA guideline of 1.00E-03 is not exceeded for unprotected construction workers.

Table 5-25
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction On-Site
Surficial Soil - Area C

	Soil Conc. (mg/kg)	Constr. Wrkrs On-Site Non-Carc. Hazard Index	Constr. Wrkrs On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
VOLATILES							
Benzene	4.00E-03	N/A	9.84E-12	N/A	1.26E-15	N/A	2.67E-15
Carbon Disulfide	5.00E-03	9.88E-06	N/A	1.58E-10	N/A	2.68E-09	N/A
1,1-Dichloroethane	3.00E-03	1.78E-07	N/A	2.85E-12	N/A	4.83E-11	N/A
1,2-Dichloroethene (total)	6.50E-02	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	6.00E-03	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	7.00E-03	N/A	1.96E-12	N/A	2.51E-16	N/A	5.32E-16
Toluene	1.40E-02	1.46E-07	N/A	2.33E-12	N/A	3.95E-11	N/A
Trichloroethene	1.90E-02	N/A	2.74E-11	N/A	3.50E-15	N/A	7.44E-15
Xylene (total)	3.60E-02	7.11E-07	N/A	1.14E-11	N/A	1.93E-10	N/A
SEMI-VOLATILES							
Acenaphthene	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	1.41E+00	N/A	7.27E-07	N/A	9.30E-11	N/A	1.97E-10
Benzo(b)fluoranthene	1.80E+00	N/A	9.31E-07	N/A	1.19E-10	N/A	2.53E-10
Benzo(k)fluoranthene	8.10E-01	N/A	4.19E-07	N/A	5.36E-11	N/A	1.14E-10
Benzoic acid	6.82E+00	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	1.41E+00	N/A	7.27E-07	N/A	9.30E-11	N/A	1.97E-10
Butylbenzylphthalate	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	1.10E+00	N/A	5.69E-07	N/A	7.28E-11	N/A	1.55E-10
Dibenzo(a,h)anthracene	1.41E+00	N/A	7.27E-07	N/A	9.30E-11	N/A	1.97E-10
2,4-Dimethylphenol	7.50E-01	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	8.20E+00	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	1.50E+00	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	1.41E+00	N/A	7.27E-07	N/A	9.30E-11	N/A	1.97E-10
2-Methylnaphthalene	1.10E+00	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	1.70E+00	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	1.90E+00	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-25 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction On-Site
Surficial Soil - Area C

	Soil Conc. (mg/kg)	Constr. Wrkrs On-Site Non-Carc. Hazard Index	Constr. Wrkrs On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
INORGANICS							
Aluminum	1.33E+04	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	4.80E+00	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	2.12E+01	N/A	8.99E-05	N/A	1.15E-08	N/A	2.44E-08
Barium	2.37E+02	1.40E+01	N/A	2.25E-04	N/A	3.82E-03	N/A
Beryllium	9.70E-01	N/A	6.91E-07	N/A	8.84E-11	N/A	1.88E-10
Cadmium	2.40E+00	N/A	1.24E-06	N/A	1.59E-10	N/A	3.37E-10
Calcium	7.33E+04	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	2.97E+01	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	8.10E+00	N/A	N/A	N/A	N/A	N/A	N/A
Copper	7.39E+01	N/A	N/A	N/A	N/A	N/A	N/A
Iron	2.38E+04	N/A	N/A	N/A	N/A	N/A	N/A
Lead	7.44E+02	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	2.53E+04	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	7.45E+02	1.47E+01	N/A	2.36E-04	N/A	4.00E-03	N/A
Mercury	2.30E-01	1.59E-02	N/A	2.54E-07	N/A	4.31E-06	N/A
Nickel	2.24E+01	N/A	1.60E-06	N/A	2.04E-10	N/A	4.33E-10
Potassium	1.99E+03	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	6.70E-01	N/A	N/A	N/A	N/A	N/A	N/A
Silver	8.30E-01	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	3.01E+02	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	4.20E-01	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	2.17E+01	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	3.43E+02	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	5.40E-01	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS *							
PCB-1242	1.45E+00	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	5.57E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	6.23E+00	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	3.32E+01	N/A	N/A	N/A	N/A	N/A	N/A
T O T A L	1.40E+05	2.88E+01	9.82E-05	4.61E-04	1.26E-08	7.82E-03	2.67E-08

* 95% Confidence Arithmatic Mean used for Pesticides/PCB's

Table 5-25 (cont'd)

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction On-Site
Surficial Soil - Area C

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
VOLATILES								
Benzene	N/A	3.61E-15	N/A	2.62E-16	N/A	7.35E-16	N/A	7.35E-16
Carbon Disulfide	3.63E-09	N/A	2.63E-10	N/A	7.38E-10	N/A	7.38E-10	N/A
1,1-Dichloroethane	6.53E-11	N/A	4.73E-12	N/A	1.33E-11	N/A	1.33E-11	N/A
1,2-Dichloroethene (total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	N/A	7.19E-16	N/A	5.21E-17	N/A	1.46E-16	N/A	1.46E-16
Toluene	5.34E-11	N/A	3.88E-12	N/A	1.09E-11	N/A	1.09E-11	N/A
Trichloroethene	N/A	1.01E-14	N/A	7.29E-16	N/A	2.05E-15	N/A	2.05E-15
Xylene (total)	2.61E-10	N/A	1.89E-11	N/A	5.31E-11	N/A	5.31E-11	N/A
SEMI-VOLATILES								
Acenaphthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	N/A	2.67E-10	N/A	1.94E-11	N/A	5.43E-11	N/A	5.43E-11
Benzo(b)fluoranthene	N/A	3.42E-10	N/A	2.48E-11	N/A	6.95E-11	N/A	6.95E-11
Benzo(k)fluoranthene	N/A	1.54E-10	N/A	1.12E-11	N/A	3.13E-11	N/A	3.13E-11
Benzoic acid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	2.67E-10	N/A	1.94E-11	N/A	5.43E-11	N/A	5.43E-11
Butylbenzylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	N/A	2.09E-10	N/A	1.51E-11	N/A	4.25E-11	N/A	4.25E-11
Dibenzo(a,h)anthracene	N/A	2.67E-10	N/A	1.94E-11	N/A	5.43E-11	N/A	5.43E-11
2,4-Dimethylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	2.67E-10	N/A	1.94E-11	N/A	5.43E-11	N/A	5.43E-11
2-Methylnaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-25 (cont'd)

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction On-Site
Surficial Soil - Area C

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
INORGANICS								
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	N/A	3.30E-08	N/A	2.39E-09	N/A	6.71E-09	N/A	6.71E-09
Barium	5.16E-03	N/A	3.74E-04	N/A	1.05E-03	N/A	1.05E-03	N/A
Beryllium	N/A	2.54E-10	N/A	1.84E-11	N/A	5.16E-11	N/A	5.16E-11
Cadmium	N/A	4.56E-10	N/A	3.30E-11	N/A	9.27E-11	N/A	9.27E-11
Calcium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	5.40E-03	N/A	3.92E-04	N/A	1.10E-03	N/A	1.10E-03	N/A
Mercury	5.82E-06	N/A	4.22E-07	N/A	1.18E-06	N/A	1.18E-06	N/A
Nickel	N/A	5.85E-10	N/A	4.25E-11	N/A	1.19E-10	N/A	1.19E-10
Potassium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS *								
PCB-1242	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	1.06E-02	3.60E-08	7.66E-04	2.61E-09	2.15E-03	7.34E-09	2.15E-03	7.34E-09

ricss4/bos5-6

Table 5-26

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction On-Site
Surficial Soil - Area D

	Soil Conc. (mg/kg)	Constr. Wrkrs On-Site Non-Carc. Hazard Index	Constr. Wrkrs On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
VOLATILES							
Benzene	3.00E-03	N/A	4.03E-12	N/A	8.14E-16	N/A	2.48E-15
Carbon Disulfide	3.00E-03	3.24E-06	N/A	8.19E-11	N/A	1.99E-09	N/A
1,1-Dichloroethane	3.00E-03	9.71E-08	N/A	2.46E-12	N/A	5.98E-11	N/A
1,2-Dichloroethene (total)	3.00E-03	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	3.00E-03	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	3.00E-03	N/A	4.58E-13	N/A	9.27E-17	N/A	2.82E-16
Toluene	3.00E-03	1.70E-08	N/A	4.31E-13	N/A	1.05E-11	N/A
Trichloroethene	3.00E-03	N/A	2.36E-12	N/A	4.77E-16	N/A	1.45E-15
Xylene (total)	3.00E-03	3.24E-08	N/A	8.19E-13	N/A	1.99E-11	N/A
SEMI-VOLATILES							
Acenaphthene	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	1.40E-01	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	8.70E-02	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	4.06E-01	N/A	1.15E-07	N/A	2.32E-11	N/A	7.06E-11
Benzo(b)fluoranthene	1.50E+00	N/A	4.24E-07	N/A	8.56E-11	N/A	2.61E-10
Benzo(k)fluoranthene	4.06E-01	N/A	1.15E-07	N/A	2.32E-11	N/A	7.06E-11
Benzoic acid	2.00E-01	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	9.90E-01	N/A	2.80E-07	N/A	5.65E-11	N/A	1.72E-10
Butylbenzylphthalate	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	1.20E+00	N/A	3.39E-07	N/A	6.85E-11	N/A	2.09E-10
Dibenzo(a,h)anthracene	1.20E-01	N/A	3.39E-08	N/A	6.85E-12	N/A	2.09E-11
2,4-Dimethylphenol	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	3.30E+00	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	2.20E+00	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	9.00E-01	N/A	2.54E-07	N/A	5.14E-11	N/A	1.56E-10
2-Methylnaphthalene	1.20E-01	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	6.80E-02	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	6.20E-01	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	4.06E-01	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	1.30E+00	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-26 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction On-Site
Surficial Soil - Area D

	Soil Conc. (mg/kg)	Constr. Wrkrs On-Site Non-Carc. Hazard Index	Constr. Wrkrs On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
INORGANICS							
Aluminum	1.54E+04	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	4.20E+00	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	8.07E+01	N/A	1.87E-04	N/A	3.78E-08	N/A	1.15E-07
Barium	2.81E+02	9.10E+00	N/A	2.30E-04	N/A	5.60E-03	N/A
Beryllium	9.90E-01	N/A	3.85E-07	N/A	7.78E-11	N/A	2.37E-10
Cadmium	2.90E+00	N/A	8.19E-07	N/A	1.66E-10	N/A	5.04E-10
Calcium	2.58E+04	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	3.12E+01	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	1.54E+01	N/A	N/A	N/A	N/A	N/A	N/A
Copper	8.99E+01	N/A	N/A	N/A	N/A	N/A	N/A
Iron	5.65E+04	N/A	N/A	N/A	N/A	N/A	N/A
Lead	4.69E+02	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	1.24E+04	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	7.51E+02	8.10E+00	N/A	2.05E-04	N/A	4.99E-03	N/A
Mercury	3.10E-01	1.17E-02	N/A	2.95E-07	N/A	7.18E-06	N/A
Nickel	2.90E+01	N/A	1.13E-06	N/A	2.28E-10	N/A	6.94E-10
Potassium	2.42E+03	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	1.50E+00	N/A	N/A	N/A	N/A	N/A	N/A
Silver	9.30E-01	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	2.86E+02	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	6.20E-01	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	4.56E+01	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	9.40E+02	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	7.50E-01	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS							
PCB-1242	9.80E-02	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	1.98E-01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	1.98E-01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	9.80E-02	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	1.16E+05	1.72E+01	1.91E-04	4.35E-04	3.86E-08	1.06E-02	1.17E-07

Table 5-28 (cont'd)
Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction On-Site
Surficial Soil - Area D

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
VOLATILES								
Benzene	N/A	9.40E-16	N/A	1.31E-16	N/A	5.21E-16	N/A	5.21E-16
Carbon Disulfide	7.56E-10	N/A	1.05E-10	N/A	4.18E-10	N/A	4.18E-10	N/A
1,1-Dichloroethane	2.27E-11	N/A	3.16E-12	N/A	1.25E-11	N/A	1.25E-11	N/A
1,2-Dichloroethene (total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	N/A	1.07E-16	N/A	1.49E-17	N/A	5.92E-17	N/A	5.92E-17
Toluene	3.98E-12	N/A	5.55E-13	N/A	2.20E-12	N/A	2.20E-12	N/A
Trichloroethene	N/A	5.51E-16	N/A	7.69E-17	N/A	3.05E-16	N/A	3.05E-16
Xylene (total)	7.56E-12	N/A	1.05E-12	N/A	4.18E-12	N/A	4.18E-12	N/A
SEMI-VOLATILES								
Acenaphthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	N/A	2.68E-11	N/A	3.74E-12	N/A	1.48E-11	N/A	1.48E-11
Benzo(b)fluoranthene	N/A	9.89E-11	N/A	1.38E-11	N/A	5.47E-11	N/A	5.47E-11
Benzo(k)fluoranthene	N/A	2.68E-11	N/A	3.74E-12	N/A	1.48E-11	N/A	1.48E-11
Benzoic acid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	6.53E-11	N/A	9.11E-12	N/A	3.61E-11	N/A	3.61E-11
Butylbenzylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	N/A	7.91E-11	N/A	1.10E-11	N/A	4.38E-11	N/A	4.38E-11
Dibenzo(a,h)anthracene	N/A	7.91E-12	N/A	1.10E-12	N/A	4.38E-12	N/A	4.38E-12
2,4-Dimethylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	5.93E-11	N/A	8.28E-12	N/A	3.28E-11	N/A	3.28E-11
2-Methylnaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-26 (cont'd)

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction On-Site
Surficial Soil - Area D

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
INORGANICS								
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	N/A	4.36E-08	N/A	6.09E-09	N/A	2.41E-08	N/A	2.41E-08
Barium	2.12E-03	N/A	2.96E-04	N/A	1.18E-03	N/A	1.18E-03	N/A
Beryllium	N/A	8.99E-11	N/A	1.25E-11	N/A	4.98E-11	N/A	4.98E-11
Cadmium	N/A	1.91E-10	N/A	2.67E-11	N/A	1.06E-10	N/A	1.06E-10
Calcium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	1.89E-03	N/A	2.64E-04	N/A	1.05E-03	N/A	1.05E-03	N/A
Mercury	2.72E-06	N/A	3.80E-07	N/A	1.51E-06	N/A	1.51E-06	N/A
Nickel	N/A	2.63E-10	N/A	3.67E-11	N/A	1.46E-10	N/A	1.46E-10
Potassium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS								
PCB-1242	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T O T A L	4.02E-03	4.45E-08	5.61E-04	6.21E-09	2.22E-03	2.46E-08	2.22E-03	2.46E-08

The risks calculated for inhalation exposure to construction related fugitive dust emissions in each area of the Booth Oil Site are summed to yield total carcinogenic risks and hazard indices in Table 5-27. As with the area-specific risks, the total carcinogenic risks and hazard indices presented in Table 5-27 for off-site populations are within the acceptable ranges, while the total hazard index calculated for unprotected construction workers on-site exceeds the acceptable limit of 1.0. The total carcinogenic risk calculated for unprotected construction workers exceeds the NYSDOH goal of 1.00E-06 for lifetime exposure, but falls below the OSHA guideline of 1.00E-03 for occupational exposures. As discussed above, the exposures to construction workers on-site and the risks associated with such exposures may be mitigated by the use of personal protective measures outlined in the site-specific health and safety plan and control measures to inhibit dust generation, if needed.

Table 5-28 presents the total carcinogenic risks and hazard indices calculated for each population exposed to airborne contaminants emitted from the Booth Oil Site. These total risks are calculated as the sum of the source-specific risks discussed above. Review of Table 5-28 reveals that the total carcinogenic risks posed by inhalation exposures of off-site populations are all below the NYSDOH goal of 1.00E-06. Similarly, the total hazard indices presented in the table for off-site populations are all

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Table 5-27
Total Inhalation Exposure Risks Due to
Fugitive Dust Releases From
Construction Activities On-site

Receptor	Area A (mg/kg-day)	Area B (mg/kg-day)	Area C (mg/kg-day)	Area D (mg/kg-day)	TOTAL (mg/kg-day)
Construction Worker On-Site					
Carcinogenic Risk	7.48E-05	7.25E-05	9.82E-05	1.91E-04	4.37E-04
Non-Carc. Hazard Index	1.88E+01	1.30E+02	2.88E+01	1.72E+01	1.95E+02
Children at the Playground					
Carcinogenic Risk	5.58E-08	4.34E-08	1.26E-08	3.86E-08	1.50E-07
Non-Carc. Hazard Index	1.75E-03	9.70E-03	4.61E-04	4.35E-04	1.23E-02
Residents at No. Marion Street					
Carcinogenic Risk	1.62E-08	1.89E-08	2.67E-08	1.17E-07	1.79E-07
Non-Carc. Hazard Index	4.05E-03	3.38E-02	7.82E-03	1.06E-02	5.63E-02
Commercial Pop. at Robinson St.					
Carcinogenic Risk	9.30E-09	2.02E-08	3.60E-08	4.45E-08	1.10E-07
Non-Carc. Hazard Index	2.33E-03	3.61E-02	1.06E-02	4.02E-03	5.31E-02
Commercial Pop. at River Road					
Carcinogenic Risk	1.64E-08	5.37E-09	2.61E-09	6.21E-09	3.06E-08
Non-Carc. Hazard Index	4.12E-03	9.60E-03	7.66E-04	5.61E-04	1.50E-02
Residents at Sommer Street					
Carcinogenic Risk	6.93E-09	1.03E-08	7.34E-09	2.46E-08	4.92E-08
Non-Carc. Hazard Index	1.74E-03	1.85E-02	2.15E-03	2.22E-03	2.46E-02
Commercial Pop. at Sommer St.					
Carcinogenic Risk	6.93E-09	1.03E-08	7.34E-09	2.46E-08	4.92E-08
Non-Carc. Hazard Index	1.74E-03	1.85E-02	2.15E-03	2.22E-03	2.46E-02

Table 5-28
Total Inhalation Exposure Risks
Booth Oil Site

Receptor	Volatilization	Recreation and Parking Traffic	Construction Traffic	Construction	T O T A L
Construction Worker On-Site					
Carcinogenic Risk	6.14E-15	N/A	2.04E-07	4.37E-04	4.37E-04
Non-Carc. Hazard Index	3.73E-09	N/A	9.07E-02	1.95E+02	1.95E+02
Children On-Site					
Carcinogenic Risk	2.61E-14	3.93E-08	N/A	N/A	3.93E-08
Non-Carc. Hazard Index	1.99E-09	2.12E-03	N/A	N/A	2.12E-03
Children at the Playground					
Carcinogenic Risk	3.85E-18	1.44E-12	7.02E-11	1.50E-07	1.50E-07
Non-Carc. Hazard Index	2.84E-13	2.47E-07	5.77E-06	1.23E-02	1.23E-02
Residents at No. Marion Street					
Carcinogenic Risk	4.01E-16	8.69E-11	8.36E-11	1.79E-07	1.79E-07
Non-Carc. Hazard Index	2.58E-12	2.55E-06	2.63E-05	5.63E-02	5.63E-02
Commercial Pop. at Robinson St.					
Carcinogenic Risk	5.61E-17	3.26E-11	5.14E-11	1.10E-07	1.10E-07
Non-Carc. Hazard Index	8.66E-13	9.44E-07	2.47E-05	5.31E-02	5.31E-02
Commercial Pop. at River Road					
Carcinogenic Risk	2.98E-17	8.85E-12	1.43E-11	3.06E-08	3.06E-08
Non-Carc. Hazard Index	4.45E-13	2.55E-07	7.02E-06	1.50E-02	1.50E-02
Residents at Sommer Street					
Carcinogenic Risk	6.29E-17	3.30E-11	2.30E-11	4.92E-08	4.93E-08
Non-Carc. Hazard Index	1.25E-12	1.34E-06	1.15E-05	2.46E-02	2.46E-02
Commercial Pop. at Sommer St.					
Carcinogenic Risk	2.99E-17	1.56E-11	2.30E-11	4.92E-08	4.92E-08
Non-Carc. Hazard Index	4.46E-13	4.74E-07	1.15E-05	2.46E-02	2.46E-02

below the acceptable limit of 1.0. The data indicate that the inhalation pathway does not pose a significant carcinogenic or noncarcinogenic risk for off-site exposures to contaminants emanating from the Booth Oil Site.

The total hazard index calculated for inhalation exposures of unprotected construction workers on-site exceeds the acceptable limit of 1.0. Review of Table 5-28 indicates that this elevated hazard index is due to construction related emissions of fugitive dust. As discussed above, this exposure may be mitigated through the use of personal protective measures described in the site-specific health and safety plan and adherence to the OSHA standard of 5.0 mg/m^3 for respirable dust.

5.4 Risks Due to Dermal Exposure

Dermal exposures are evaluated for children and unprotected construction workers exposed to surficial soil on-site and at the playground, and for unprotected construction workers exposed to subsurface soil on-site. However, as discussed in Section 4.4, in the absence of contaminant-specific absorption data, the methods employed to estimate doses due to dermal exposure provide highly conservative results, particularly for inorganic contaminants in soil. NYSDOH does not currently require quantitative assessment of

dermal exposure to inorganic contaminants in soil, as these compounds are generally unavailable for dermal uptake. However, EPA (1989b) does not provide for elimination of these contaminants from the assessment, although specific guidelines and appropriate data are not available. Conservative methods are employed herein to estimate dermal doses from contact with soil. Accordingly, the carcinogenic risks and hazard indices presented below for dermal exposures are expected to be overestimated by perhaps several orders of magnitude.

Tables 5-29 through 5-32 present the carcinogenic risks and hazard indices calculated for dermal exposures of children and unprotected construction workers to surficial soil at the Booth Oil Site. As with ingestion exposure, two hazard indices are calculated for each exposure scenario. The first hazard index is a total value for all of the contaminants at the site. To arrive at this total hazard index, the RfD for inorganic lead (adjusted for absorption) is used to represent total lead. The second hazard index presented in the tables is for total lead, as calculated with the RfD for organic lead. Calculation of two hazard indices in this manner is intended to provide a range of noncarcinogenic risk for each exposure scenario, as the total lead values reported for the Phase I RI are likely comprised of both organic and inorganic lead.

Table 5-29 presents the risks calculated for dermal exposures of these populations to surficial soil in Area A of the site. The hazard indices calculated for this exposure scenario are 3.64 to 4.41E+04 for children and 2.48 to 1.63E+04 for unprotected construction workers. These values all exceed the acceptable limit of 1.0, indicating that dermal exposure to surficial soil in Area A may pose a noncarcinogenic health threat. Review of Table 5-29 reveals that lead contributes most significantly to the elevated hazard indices calculated for this scenario. However, as discussed above, inorganic contaminants, including lead, are generally unavailable for dermal uptake from soil. Accordingly, the results of the calculations herein are significantly overestimated.

The carcinogenic risks calculated for dermal exposure to surficial soil in Area A (i.e., 1.45E-05 for children and 6.70E-06 for unprotected construction workers) exceed the NYSDOH goal of 1.00E-06. Review of Table 5-29 indicates that PCBs contribute most significantly to the elevated risks calculated for unprotected construction workers, and CaPAHs and PCBs contribute most significantly to the elevated risks calculated for children. Review of Tables 2-2 and 2-4 indicates that, with the exception of PCB-1242 and benzo(k)fluoranthene, the values listed for PCBs and CaPAHs are actual reported concentrations. However, as noted above, in the absence of contaminant-specific absorption data, highly conservative methods are employed in this assessment to

Table 5-29

Calculated Dermal Exposure Risks
Area A Surficial Soil

	Upper 95% Confidence Arith Mean (mg/kg)	Children Non-Carc. Hazard Index	Children Carc. Risk	Remed. Workers Non-Carc. Hazard Index	Remed. Workers Carc. Risk
VOLATILES					
Benzene	4.13E-01	NA	4.84E-10	NA	2.23E-10
Carbon Disulfide	1.07E-01	8.41E-07	NA	3.10E-06	NA
1,1-Dichloroethane	9.30E-01	3.65E-06	NA	NA	NA
1,2-Dichloroethene (tot	1.90E-01	7.47E-06	NA	2.76E-06	NA
Ethylbenzene	5.84E-01	2.30E-05	NA	8.47E-06	NA
Tetrachloroethene	1.66E-01	1.30E-05	7.45E-10	4.81E-06	3.44E-10
Toluene	4.13E-01	9.02E-07	NA	2.50E-06	NA
Trichloroethene	4.13E-01	NA	4.08E-10	NA	1.88E-10
Xylene (total)	1.19E+01	2.60E-06	NA	4.80E-06	NA
SEMI-VOLATILES					
Acenaphthene	1.88E+00	6.14E-05	NA	2.27E-05	NA
Acenaphthylene	1.70E+00	NA	NA	NA	NA
Anthracene	1.72E+00	1.12E-05	NA	4.14E-06	NA
Benzo(a)anthracene	1.58E+00	NA	1.63E-07	NA	7.52E-08
Benzo(b)fluoranthene	1.62E+00	NA	1.67E-07	NA	7.71E-08
Benzo(k)fluoranthene	1.72E+00	NA	1.77E-07	NA	8.18E-08
Benzoic acid	8.33E+00	2.05E-06	NA	7.55E-06	NA
Benzo(a)pyrene	1.60E+00	NA	1.65E-07	NA	7.61E-08
Butylbenzylphthalate	8.21E-01	3.23E-07	NA	1.19E-06	NA
Chrysene	1.38E+00	NA	1.42E-07	NA	6.55E-08
Dibenzo(a,h)anthracene	1.72E+00	NA	1.77E-07	NA	8.18E-08
2,4-Dimethylphenol	1.75E+00	6.86E-05	NA	2.53E-05	NA
bis(2-Ethylhexyl)phthala	3.03E+00	7.93E-05	1.43E-09	2.93E-04	6.58E-10
Fluoranthene	2.73E+00	1.34E-04	NA	4.95E-05	NA
Fluorene	1.75E+00	8.59E-05	NA	3.17E-05	NA
Indeno(1,2,3-cd)pyrene	1.71E+00	NA	1.77E-07	NA	8.15E-08
2-Methylnaphthalene	6.77E+00	NA	NA	NA	NA
2-Methylphenol	1.72E+00	2.70E-05	NA	9.96E-06	NA
4-Methylphenol	1.71E+00	2.69E-05	NA	9.94E-06	NA
Naphthalene	1.56E+00	7.66E-04	NA	2.83E-03	NA
Di-n-octylphthalate	1.76E+00	6.93E-05	NA	2.56E-04	NA
Phenanthrene	3.43E+00	NA	NA	NA	NA
Phenol	1.72E+00	2.81E-05	NA	1.04E-04	NA
Pyrene	2.17E+00	1.42E-04	NA	5.25E-05	NA

Table 5-29 (cont'd)
Calculated Dermal Exposure Risks
Area A Surficial Soil

	Upper 95% Confidence Arith Mean (mg/kg)	Children Non-Carc. Hazard Index	Children Carc. Risk	Remed. Workers Non-Carc. Hazard Index	Remed. Workers Carc. Risk
INORGANICS					
Aluminum	1.12E+04	NA	NA	NA	NA
Antimony	6.79E+00	1.33E-01	NA	4.92E-01	NA
Arsenic	2.69E+01	3.53E-02	NA	1.30E-01	NA
Barium	2.02E+02	1.58E-02	NA	5.84E-02	NA
Beryllium	1.46E+00	1.15E-02	2.81E-09	4.23E-02	1.30E-09
Cadmium	1.66E+00	1.09E-02	NA	NA	NA
Calcium	1.11E+05	NA	NA	NA	NA
Chromium	2.35E+01	2.31E-03	NA	8.51E-04	NA
Cobalt	6.96E+00	NA	NA	NA	NA
Copper	8.44E+01	NA	NA	NA	NA
Iron	2.86E+04	NA	NA	NA	NA
Lead (inorganic)	8.98E+02	3.15E+00	NA	1.16E+00	NA
Magnesium	5.71E+04	NA	NA	NA	NA
Manganese	9.60E+02	1.89E-01	NA	2.78E-01	NA
Mercury	2.87E-01	2.51E-03	NA	9.25E-03	NA
Nickel	1.97E+01	1.29E-02	NA	4.75E-02	NA
Potassium	1.82E+03	NA	NA	NA	NA
Selenium	1.60E+00	NA	NA	NA	NA
Silver	9.27E-01	5.78E-04	NA	2.13E-03	NA
Sodium	4.79E+02	NA	NA	NA	NA
Thallium	5.24E-01	2.94E-03	NA	1.09E-03	NA
Vanadium	2.31E+01	6.48E-02	NA	2.39E-01	NA
Zinc	3.55E+02	2.79E-03	NA	1.03E-02	NA
Cyanide	8.95E+00	3.52E-04	NA	1.30E-03	NA
PESTICIDES/PCBs					
PCB-1242	5.17E-01	NA	1.61E-07	NA	7.42E-08
PCB-1254	1.45E+01	NA	4.51E-06	NA	2.08E-06
PCB-1260	1.12E+01	NA	3.48E-06	NA	1.61E-06
PCB-1248	1.68E+01	NA	5.21E-06	NA	2.40E-06
TOTAL	2.13E+05	3.64E+00	1.45E-05	2.48E+00	6.70E-06
Lead (organic)	8.98E+02	4.41E+04	NA	1.63E+04	NA

estimate dermal doses. Accordingly, the actual risks posed by dermal exposures to surficial soil may be lower than those estimated herein.

The carcinogenic risks calculated for dermal exposures to surficial soil in Area B are presented in Table 5-30. The hazard indices presented in Table 5-30 are 1.33E+01 to 1.20E+05 for children and 1.91E+02 to 4.44E+04 for unprotected construction workers. Review of the table indicates that these elevated hazard indices are attributed primarily to lead (inorganic and organic) and arsenic. However, as discussed above, highly conservative methods are employed herein to estimate dermal doses due to contact with soil, particularly for inorganics. Accordingly, the hazard indices calculated herein for inorganic contaminants may be overestimated by several orders of magnitude.

The carcinogenic risks calculated for dermal exposure to surficial soil in Area B are 5.14E-05 for children and 2.37E-05 for unprotected construction workers. Review of Table 5-30 indicates that PCBs and CaPAHs contribute most significantly to the elevated carcinogenic risks calculated for dermal exposure of children and unprotected construction workers to surficial soil in Area B. However, it must be noted that the concentrations of CaPAHs in Area B surficial soil are due to proxy concentrations estimated from the sample detection limits (see Table 2-2). In addition, these risks

Table 5-30
Calculated Dermal Exposure Risks
Area B Surficial Soil

	Upper 95% Confidence Arith Mean (mg/kg)	Children Non-Carc. Hazard Index	Children Carc. Risk	Remed. Workers Non-Carc. Hazard Index	Remed. Workers Carc. Risk
VOLATILES					
Benzene	4.41E-01	NA	5.17E-10	NA	2.38E-10
Carbon Disulfide	3.88E-01	3.05E-06	NA	1.13E-05	NA
1,1-Dichloroethane	3.88E-01	1.52E-06	NA	NA	NA
1,2-Dichloroethene (tot	5.95E-01	2.34E-05	3.21E-08	8.63E-06	1.48E-08
Ethylbenzene	3.88E-01	1.52E-05	NA	5.63E-06	NA
Tetrachloroethene	1.55E+00	1.22E-04	6.96E-09	4.50E-05	3.21E-09
Toluene	3.88E-01	8.47E-07	NA	2.34E-06	NA
Trichloroethene	2.74E+00	NA	2.71E-09	NA	1.25E-09
Xylene (total)	3.88E-01	8.47E-08	NA	1.56E-07	NA
SEMI-VOLATILES					
Acenaphthene	1.67E+01	5.48E-04	NA	2.02E-04	NA
Acenaphthylene	1.67E+01	NA	NA	NA	NA
Anthracene	1.67E+01	1.10E-04	NA	4.05E-05	NA
Benzo(a)anthracene	1.67E+01	NA	1.73E-06	NA	7.97E-07
Benzo(b)fluoranthene	1.67E+01	NA	1.73E-06	NA	7.97E-07
Benzo(k)fluoranthene	1.67E+01	NA	1.73E-06	NA	7.97E-07
Benzoic acid	8.12E+01	1.99E-05	NA	7.35E-05	NA
Benzo(a)pyrene	1.67E+01	NA	1.73E-06	NA	7.97E-07
Butylbenzylphthalate	1.67E+01	6.58E-06	NA	2.43E-05	NA
Chrysene	1.67E+01	NA	1.73E-06	NA	7.97E-07
Dibenzo(a,h)anthracene	1.67E+01	NA	1.73E-06	NA	7.97E-07
2,4-Dimethylphenol	7.76E+01	3.05E-03	NA	1.12E-03	NA
bis(2-Ethylhexyl)phthala	4.49E+01	1.18E-03	2.12E-08	4.34E-03	9.77E-09
Fluoranthene	1.67E+01	8.22E-04	NA	3.03E-04	NA
Fluorene	1.67E+01	8.22E-04	NA	3.03E-04	NA
Indeno(1,2,3-cd)pyrene	1.67E+01	NA	1.73E-06	NA	7.97E-07
2-Methylnaphthalene	4.15E+00	NA	NA	NA	NA
2-Methylphenol	5.69E+01	8.94E-04	NA	3.30E-04	NA
4-Methylphenol	4.27E+02	6.71E-03	NA	2.48E-03	NA
Naphthalene	1.69E+01	8.32E-03	NA	3.07E-02	NA
Di-n-octylphthalate	1.65E+01	6.47E-04	NA	2.39E-03	NA
Phenanthrene	2.48E+00	NA	NA	NA	NA
Phenol	2.50E+02	4.10E-03	NA	1.51E-02	NA
Pyrene	1.64E+01	1.08E-03	NA	3.97E-04	NA

Table 5-30 (cont'd)

Calculated Dermal Exposure Risks
Area B Surficial Soil

	Upper 95% Confidence Arith Mean (mg/kg)	Children Non-Carc. Hazard Index	Children Carc. Risk	Remed. Workers Non-Carc. Hazard Index	Remed. Workers Carc. Risk
INORGANICS					
Aluminum	3.40E+04	NA	NA	NA	NA
Antimony	1.85E+02	3.64E+00	NA	1.34E+01	NA
Arsenic	1.39E+01	1.82E-02	NA	6.71E-02	NA
Barium	3.04E+03	2.39E-01	NA	8.80E-01	NA
Beryllium	6.30E+00	4.95E-02	1.22E-08	1.83E-01	5.60E-09
Cadmium	9.33E+00	6.11E-02	NA	NA	NA
Calcium	2.09E+05	NA	NA	NA	NA
Chromium	1.74E+02	1.71E-02	NA	6.29E-03	NA
Cobalt	1.33E+01	NA	NA	NA	NA
Copper	6.35E+02	NA	NA	NA	NA
Iron	5.14E+04	NA	NA	NA	NA
Lead (inorganic)	2.45E+03	8.60E+00	NA	3.17E+00	NA
Magnesium	6.55E+04	NA	NA	NA	NA
Manganese	2.84E+03	5.58E-01	NA	8.24E-01	NA
Mercury	1.72E-01	1.50E-03	NA	5.54E-03	NA
Nickel	4.59E+01	3.01E-02	NA	1.11E-01	NA
Potassium	2.55E+03	NA	NA	NA	NA
Selenium	2.18E+00	NA	NA	NA	NA
Silver	9.37E-01	5.85E-04	NA	2.16E-03	NA
Sodium	1.58E+03	NA	NA	NA	NA
Thallium	7.01E-01	3.94E-03	NA	1.45E-03	NA
Vanadium	2.89E+01	8.10E-02	NA	2.99E-01	NA
Zinc	1.36E+03	1.07E-02	NA	3.95E-02	NA
Cyanide	6.20E+00	2.43E-04	NA	8.98E-04	NA
PESTICIDES/PCBs					
PCB-1242	1.66E+01	NA	5.15E-06	NA	2.38E-06
PCB-1254	3.83E+01	NA	1.19E-05	NA	5.50E-06
PCB-1260	3.66E+01	NA	1.14E-05	NA	5.25E-06
PCB-1248	3.44E+01	NA	1.07E-05	NA	4.94E-06
TOTAL	3.76E+05	1.33E+01	5.14E-05	1.91E+01	2.37E-05
Lead (organic)	2.45E+03	1.20E+05	NA	4.44E+04	NA

are likely overestimated, due to the highly conservative methods employed herein.

Tables 5-31 and 5-32 present the carcinogenic risks and hazard indices calculated for children and unprotected construction workers due to dermal exposure to surficial soil in Areas C and D, respectively. As in Areas A and B, the hazard indices presented in Tables 5-31 and 5-32 exceed the acceptable limits. In each case, the elevated hazard indices are attributed primarily to lead. Again, it must be noted that the actual risks posed by dermal exposure to lead in soil at the Booth Oil Site are likely several orders of magnitude lower than estimated herein. Accordingly, these results should be interpreted with caution.

The carcinogenic risks presented in Table 5-31 for dermal exposures to surficial soil in Area C exceed the NYSDOH goal of 1.00E-06. Further review of the table indicates that the elevated carcinogenic risks calculated for Area C are attributed primarily to PCBs for each population and also CaPAHs for children. Review of Tables 2-2 and 2-4 indicates that, with the exception of benzo(a)anthracene and PCB-1242, the values presented for CaPAHs and PCBs in the tables are actual detected concentrations. However, as previously noted, the actual risks posed by dermal exposure to organic contaminants in soil may be lower than estimated herein.

Table 5-31
Calculated Dermal Exposure Risks
Area C Surficial Soil

	Soil Concentration (mg/kg)	Children Non-Carc. Hazard Index	Children Carc. Risk	Remed. Workers Non-Carc. Hazard Index	Remed. Workers Carc. Risk
VOLATILES					
Benzene	4.00E-03	NA	4.69E-12	NA	2.16E-12
Carbon Disulfide	5.00E-03	3.93E-08	NA	1.45E-07	NA
1,1-Dichloroethane	3.00E-03	1.18E-08	NA	NA	NA
1,2-Dichloroethene (tot	6.50E-02	2.55E-06	NA	9.43E-07	NA
Ethylbenzene	6.00E-03	2.36E-07	NA	8.70E-08	NA
Tetrachloroethene	7.00E-03	5.50E-07	3.14E-11	2.03E-07	1.45E-11
Toluene	1.40E-02	3.06E-08	NA	8.46E-08	NA
Trichloroethene	1.90E-02	NA	1.88E-11	NA	8.65E-12
Xylene (total)	3.60E-02	7.86E-09	NA	1.45E-08	NA
SEMI-VOLATILES					
Acenaphthene	1.41E+00	4.60E-05	NA	1.70E-05	NA
Acenaphthylene	1.41E+00	NA	NA	NA	NA
Anthracene	1.41E+00	9.21E-06	NA	3.40E-06	NA
Benzo(a)anthracene	1.41E+00	NA	1.45E-07	NA	6.69E-08
Benzo(b)fluoranthene	1.80E+00	NA	1.86E-07	NA	8.57E-08
Benzo(k)fluoranthene	8.10E-01	NA	8.36E-08	NA	3.86E-08
Benzoic acid	6.82E+00	1.67E-06	NA	6.18E-06	NA
Benzo(a)pyrene	1.41E+00	NA	1.45E-07	NA	6.69E-08
Butylbenzylphthalate	1.41E+00	5.53E-07	NA	2.04E-06	NA
Chrysene	1.10E+00	NA	1.14E-07	NA	5.24E-08
Dibenzo(a,h)anthracene	1.41E+00	NA	1.45E-07	NA	6.69E-08
2,4-Dimethylphenol	7.50E-01	2.95E-05	NA	1.09E-05	NA
bis(2-Ethylhexyl)phthala	8.20E+00	2.15E-04	3.87E-09	7.93E-04	1.78E-09
Fluoranthene	1.50E+00	7.37E-05	NA	2.72E-05	NA
Fluorene	1.41E+00	6.91E-05	NA	2.55E-05	NA
Indeno(1,2,3-cd)pyrene	1.41E+00	NA	1.45E-07	NA	6.69E-08
2-Methylnaphthalene	1.10E+00	NA	NA	NA	NA
2-Methylphenol	1.41E+00	2.21E-05	NA	8.15E-06	NA
4-Methylphenol	1.41E+00	2.21E-05	NA	8.15E-06	NA
Naphthalene	1.41E+00	6.91E-04	NA	2.55E-03	NA
Di-n-octylphthalate	1.41E+00	5.53E-05	NA	2.04E-04	NA
Phenanthrene	1.70E+00	NA	NA	NA	NA
Phenol	1.41E+00	2.30E-05	NA	8.49E-05	NA
Pyrene	1.90E+00	1.24E-04	NA	4.59E-05	NA

Table 5-31 (cont'd)
Calculated Dermal Exposure Risks
Area C Surficial Soil

	Soil Concentration (mg/kg)	Children Non-Carc. Hazard Index	Children Carc. Risk	Remed. Workers Non-Carc. Hazard Index	Remed. Workers Carc. Risk
INORGANICS					
Aluminum	1.33E+04	NA	NA	NA	NA
Antimony	4.80E+00	9.43E-02	NA	3.48E-01	NA
Arsenic	2.12E+01	2.78E-02	NA	1.02E-01	NA
Barium	2.37E+02	1.86E-02	NA	6.87E-02	NA
Beryllium	9.70E-01	7.62E-03	1.87E-09	2.81E-02	8.63E-10
Cadmium	2.40E+00	1.57E-02	NA	NA	NA
Calcium	7.33E+04	NA	NA	NA	NA
Chromium	2.97E+01	2.92E-03	NA	1.08E-03	NA
Cobalt	8.10E+00	NA	NA	NA	NA
Copper	7.39E+01	NA	NA	NA	NA
Iron	2.38E+04	NA	NA	NA	NA
Lead (inorganic)	7.44E+02	2.61E+00	NA	9.63E-01	NA
Magnesium	2.53E+04	NA	NA	NA	NA
Manganese	7.45E+02	1.46E-01	NA	2.16E-01	NA
Mercury	2.30E-01	2.01E-03	NA	7.41E-03	NA
Nickel	2.24E+01	1.47E-02	NA	5.41E-02	NA
Potassium	1.99E+03	NA	NA	NA	NA
Selenium	6.70E-01	NA	NA	NA	NA
Silver	8.30E-01	5.18E-04	NA	1.91E-03	NA
Sodium	3.01E+02	NA	NA	NA	NA
Thallium	4.20E-01	2.36E-03	NA	8.70E-04	NA
Vanadium	2.17E+01	6.09E-02	NA	2.25E-01	NA
Zinc	3.43E+02	2.70E-03	NA	9.95E-03	NA
Cyanide	5.40E-01	2.12E-05	NA	7.83E-05	NA
PESTICIDES/PCBS *					
PCB-1242	1.45E+00	NA	4.52E-07	NA	2.09E-07
PCB-1254	5.57E+01	NA	1.73E-05	NA	7.99E-06
PCB-1260	6.23E+00	NA	1.94E-06	NA	8.93E-07
PCB-1248	3.32E+01	NA	1.03E-05	NA	4.77E-06
TOTAL	1.40E+05	3.01E+00	3.10E-05	2.03E+00	1.43E-05
Lead (organic)	7.44E+02	3.65E+04	NA	1.35E+04	NA

NOTES:
* 95% Confidence Arithmetic Mean Used For Pesticides/PCBs

Table 5-32
Calculated Dermal Exposure Risks
Area D Surficial Soil

	Soil Concentration (mg/kg)	Children Non-Carc. Hazard Index	Children Carc. Risk	Remed. Workers Non-Carc. Hazard Index	Remed. Workers Carc. Risk
VOLATILES					
Benzene	3.00E-03	NA	3.52E-12	NA	1.62E-12
Carbon Disulfide	3.00E-03	2.36E-08	NA	8.70E-08	NA
1,1-Dichloroethane	3.00E-03	1.18E-08	NA	NA	NA
1,2-Dichloroethene (tot	3.00E-03	1.18E-07	NA	4.35E-08	NA
Ethylbenzene	3.00E-03	1.18E-07	NA	4.35E-08	NA
Tetrachloroethene	3.00E-03	2.36E-07	1.35E-11	8.70E-08	6.21E-12
Toluene	3.00E-03	6.55E-09	NA	1.81E-08	NA
Trichloroethene	3.00E-03	NA	2.96E-12	NA	1.37E-12
Xylene (total)	3.00E-03	6.55E-10	NA	1.21E-09	NA
SEMI-VOLATILES					
Acenaphthene	4.06E-01	1.33E-05	NA	4.91E-06	NA
Acenaphthylene	1.40E-01	NA	NA	NA	NA
Anthracene	8.70E-02	5.70E-07	NA	2.10E-07	NA
Benzo(a)anthracene	4.06E-01	NA	4.19E-08	NA	1.93E-08
Benzo(b)fluoranthene	1.50E+00	NA	1.55E-07	NA	7.14E-08
Benzo(k)fluoranthene	4.06E-01	NA	4.19E-08	NA	1.93E-08
Benzoic acid	2.00E-01	4.91E-08	NA	1.81E-07	NA
Benzo(a)pyrene	9.90E-01	NA	1.02E-07	NA	4.71E-08
Butylbenzylphthalate	4.06E-01	1.60E-07	NA	5.89E-07	NA
Chrysene	1.20E+00	NA	1.24E-07	NA	5.71E-08
Dibenzo(a,h)anthracene	1.20E-01	NA	1.24E-08	NA	5.71E-09
2,4-Dimethylphenol	4.06E-01	1.60E-05	NA	5.89E-06	NA
bis(2-Ethylhexyl)phthala	3.30E+00	8.65E-05	1.56E-09	3.19E-04	7.17E-10
Fluoranthene	2.20E+00	1.08E-04	NA	3.99E-05	NA
Fluorene	4.06E-01	1.99E-05	NA	7.36E-06	NA
Indeno(1,2,3-cd)pyrene	9.00E-01	NA	9.29E-08	NA	4.28E-08
2-Methylnaphthalene	1.20E-01	NA	NA	NA	NA
2-Methylphenol	4.06E-01	6.38E-06	NA	2.35E-06	NA
4-Methylphenol	4.06E-01	6.38E-06	NA	2.35E-06	NA
Naphthalene	6.80E-02	3.34E-05	NA	1.23E-04	NA
Di-n-octylphthalate	4.06E-01	1.60E-05	NA	5.89E-05	NA
Phenanthrene	6.20E-01	NA	NA	NA	NA
Phenol	4.06E-01	6.65E-06	NA	2.45E-05	NA
Pyrene	1.30E+00	8.52E-05	NA	3.14E-05	NA

Table 5-32 (cont'd)
Calculated Dermal Exposure Risks
Area D Surficial Soil

	Soil Concentration (mg/kg)	Children Non-Carc. Hazard Index	Children Carc. Risk	Remed. Workers Non-Carc. Hazard Index	Remed. Workers Carc. Risk
INORGANICS					
Aluminum	1.54E+04	NA	NA	NA	NA
Antimony	4.20E+00	8.25E-02	NA	3.05E-01	NA
Arsenic	8.07E+01	1.06E-01	NA	3.90E-01	NA
Barium	2.81E+02	2.21E-02	NA	8.15E-02	NA
Beryllium	9.90E-01	7.78E-03	1.91E-09	2.87E-02	NA
Cadmium	2.90E+00	1.90E-02	NA	NA	NA
Calcium	2.58E+04	NA	NA	NA	NA
Chromium	3.12E+01	3.07E-03	NA	1.13E-03	NA
Cobalt	1.54E+01	NA	NA	NA	NA
Copper	8.99E+01	NA	NA	NA	NA
Iron	5.65E+04	NA	NA	NA	NA
Lead (inorganic)	4.69E+02	1.65E+00	NA	6.07E-01	NA
Magnesium	1.24E+04	NA	NA	NA	NA
Manganese	7.51E+02	1.48E-01	NA	2.18E-01	NA
Mercury	3.10E-01	2.71E-03	NA	9.99E-03	NA
Nickel	2.90E+01	1.90E-02	NA	7.01E-02	NA
Potassium	2.42E+03	NA	NA	NA	NA
Selenium	1.50E+00	NA	NA	NA	NA
Silver	9.30E-01	5.80E-04	NA	2.14E-03	NA
Sodium	2.86E+02	NA	NA	NA	NA
Thallium	6.20E-01	3.48E-03	NA	1.28E-03	NA
Vanadium	4.56E+01	1.28E-01	NA	4.72E-01	NA
Zinc	9.40E+02	7.39E-03	NA	2.73E-02	NA
Cyanide	7.50E-01	2.95E-05	NA	1.09E-04	NA
PESTICIDES/PCBS *					
PCB-1242	9.80E-02	NA	3.05E-08	NA	1.41E-08
PCB-1254	1.98E-01	NA	6.16E-08	NA	2.84E-08
PCB-1260	1.98E-01	NA	6.16E-08	NA	2.84E-08
PCB-1248	9.80E-02	NA	3.05E-08	NA	1.41E-08
TOTAL	1.16E+05	2.20E+00	7.58E-07	2.21E+00	3.49E-07
Lead (organic)	4.69E+02	2.30E+04	NA	8.50E+03	NA

NOTES:
* 95% Confidence Arithmetic Mean Used For Pesticides/PCBs

Table 5-19

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction Traffic On-Site
Surficial Soil - Area B

	Upper 95% Confidence Arith. Mean Soil Conc. (mg/kg)	Constr. Wrkrs On-Site Non-Carc. Hazard Index	Constr. Wrkrs On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
VOLATILES							
Benzene	4.41E-01	N/A	2.78E-13	N/A	1.66E-16	N/A	7.25E-17
Carbon Disulfide	3.88E-01	1.96E-07	N/A	1.47E-11	N/A	5.12E-11	N/A
1,1-Dichloroethane	3.88E-01	5.89E-09	N/A	4.41E-13	N/A	1.54E-12	N/A
1,2-Dichloroethene (total)	5.95E-01	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	3.88E-01	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	1.55E+00	N/A	1.11E-13	N/A	6.65E-17	N/A	2.90E-17
Toluene	3.88E-01	1.03E-09	N/A	7.74E-14	N/A	2.70E-13	N/A
Trichloroethene	2.74E+00	N/A	1.01E-12	N/A	6.06E-16	N/A	2.64E-16
Xylene (total)	3.88E-01	1.96E-09	N/A	1.47E-13	N/A	5.12E-13	N/A
SEMI-VOLATILES							
Acenaphthene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	1.67E+01	N/A	2.22E-09	N/A	1.33E-12	N/A	5.78E-13
Benzo(b)fluoranthene	1.67E+01	N/A	2.22E-09	N/A	1.33E-12	N/A	5.78E-13
Benzo(k)fluoranthene	1.67E+01	N/A	2.22E-09	N/A	1.33E-12	N/A	5.78E-13
Benzoic acid	8.12E+01	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	1.67E+01	N/A	2.22E-09	N/A	1.33E-12	N/A	5.78E-13
Butylbenzylphthalate	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	1.67E+01	N/A	2.22E-09	N/A	1.33E-12	N/A	5.78E-13
Dibenzo(a,h)anthracene	1.67E+01	N/A	2.22E-09	N/A	1.33E-12	N/A	5.78E-13
2,4-Dimethylphenol	7.76E+01	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	4.49E+01	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	1.67E+01	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	1.67E+01	N/A	2.22E-09	N/A	1.33E-12	N/A	5.78E-13
2-Methylnaphthalene	4.15E+00	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	5.69E+01	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	4.27E+02	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	1.69E+01	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	1.65E+01	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	2.48E+00	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	2.50E+02	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	1.64E+01	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-19 (cont'd)

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction Traffic On-Site
Surficial Soil - Area B

	Upper 95% Confidence Arith. Mean Soil Conc. (mg/kg)	Constr. Wrkrs On-Site Non-Carc. Hazard Index	Constr. Wrkrs On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
INORGANICS							
Aluminum	3.40E+04	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	1.85E+02	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	1.39E+01	N/A	1.51E-08	N/A	9.02E-12	N/A	3.93E-12
Barium	3.04E+03	4.61E-02	N/A	3.45E-06	N/A	1.20E-05	N/A
Beryllium	6.30E+00	N/A	1.15E-09	N/A	6.87E-13	N/A	3.00E-13
Cadmium	9.33E+00	N/A	1.24E-09	N/A	7.40E-13	N/A	3.22E-13
Calcium	2.09E+05	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	1.74E+02	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	1.33E+01	N/A	N/A	N/A	N/A	N/A	N/A
Copper	6.35E+02	N/A	N/A	N/A	N/A	N/A	N/A
Iron	5.14E+04	N/A	N/A	N/A	N/A	N/A	N/A
Lead	2.45E+03	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	6.55E+04	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	2.84E+03	1.44E-02	N/A	1.08E-06	N/A	3.75E-06	N/A
Mercury	1.72E-01	3.04E-06	N/A	2.27E-10	N/A	7.92E-10	N/A
Nickel	4.59E+01	N/A	8.38E-10	N/A	5.01E-13	N/A	2.18E-13
Potassium	2.55E+03	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	2.18E+00	N/A	N/A	N/A	N/A	N/A	N/A
Silver	9.37E-01	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	1.58E+03	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	7.01E-01	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	2.89E+01	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	1.36E+03	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	6.20E+00	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS							
PCB-1242	1.66E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	3.83E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	3.66E+01	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	3.44E+01	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	3.76E+05	6.05E-02	3.38E-08	4.53E-06	2.02E-11	1.58E-05	8.82E-12

Table 5-19 (cont'd)

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction Traffic On-Site
Surficial Soil - Area B

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
VOLATILES								
Benzene	N/A	7.73E-17	N/A	2.06E-17	N/A	3.96E-17	N/A	3.96E-17
Carbon Disulfide	5.47E-11	N/A	1.46E-11	N/A	2.80E-11	N/A	2.80E-11	N/A
1,1-Dichloroethane	1.64E-12	N/A	4.37E-13	N/A	8.40E-13	N/A	8.40E-13	N/A
1,2-Dichloroethene (total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	N/A	3.09E-17	N/A	8.23E-18	N/A	1.58E-17	N/A	1.58E-17
Toluene	2.88E-13	N/A	7.66E-14	N/A	1.47E-13	N/A	1.47E-13	N/A
Trichloroethene	N/A	2.82E-16	N/A	7.50E-17	N/A	1.44E-16	N/A	1.44E-16
Xylene (total)	5.47E-13	N/A	1.46E-13	N/A	2.80E-13	N/A	2.80E-13	N/A
SEMI-VOLATILES								
Acenaphthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	N/A	6.18E-13	N/A	1.64E-13	N/A	3.16E-13	N/A	3.16E-13
Benzo(b)fluoranthene	N/A	6.18E-13	N/A	1.64E-13	N/A	3.16E-13	N/A	3.16E-13
Benzo(k)fluoranthene	N/A	6.18E-13	N/A	1.64E-13	N/A	3.16E-13	N/A	3.16E-13
Benzoic acid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	6.18E-13	N/A	1.64E-13	N/A	3.16E-13	N/A	3.16E-13
Butylbenzylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	N/A	6.18E-13	N/A	1.64E-13	N/A	3.16E-13	N/A	3.16E-13
Dibenzo(a,h)anthracene	N/A	6.18E-13	N/A	1.64E-13	N/A	3.16E-13	N/A	3.16E-13
2,4-Dimethylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	6.18E-13	N/A	1.64E-13	N/A	3.16E-13	N/A	3.16E-13
2-Methylnaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-19 (cont'd)

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction Traffic On-Site
Surficial Soil - Area B

	Commercial Robinson St. Non-Carc. Hazard Index	Commercial Robinson St. Carcinogenic Risk	Commercial River Road Non-Carc. Hazard Index	Commercial River Road Carcinogenic Risk	Residential Sommer St. Non-Carc. Hazard Index	Residential Sommer St. Carcinogenic Risk	Commercial Sommer St. Non-Carc. Hazard Index	Commercial Sommer St. Carcinogenic Risk
INORGANICS								
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	N/A	4.20E-12	N/A	1.12E-12	N/A	2.15E-12	N/A	2.15E-12
Barium	1.28E-05	N/A	3.41E-06	N/A	6.57E-06	N/A	6.57E-06	N/A
Beryllium	N/A	3.20E-13	N/A	8.51E-14	N/A	1.64E-13	N/A	1.64E-13
Cadmium	N/A	3.44E-13	N/A	9.16E-14	N/A	1.76E-13	N/A	1.76E-13
Calcium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	4.00E-06	N/A	1.07E-06	N/A	2.05E-06	N/A	2.05E-06	N/A
Mercury	8.46E-10	N/A	2.25E-10	N/A	4.33E-10	N/A	4.33E-10	N/A
Nickel	N/A	2.33E-13	N/A	6.21E-14	N/A	1.19E-13	N/A	1.19E-13
Potassium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cyanide	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES/PCBS								
PCB-1242	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T O T A L	1.68E-05	9.42E-12	4.48E-06	2.51E-12	8.62E-06	4.82E-12	8.62E-06	4.82E-12

Table 5-20 presents the carcinogenic risks and hazard indices calculated for inhalation of fugitive dusts emitted by construction traffic in Area C. The hazard indices presented in Table 5-20, ranging from 1.34E-02 for unprotected construction workers on-site to 2.15E-07 for children at the playground, all fall below the ceiling limit of 1.0. The carcinogenic risks calculated for this exposure scenario range from 4.58E-08 for unprotected construction workers on-site to 1.22E-12 for unprotected construction workers on-site. These values all fall below the NYSDOH goal of 1.00E-06 for carcinogenic risks posed by lifetime exposure to inactive hazardous waste sites and the OSHA guideline of 1.00E-03 for occupational exposure.

The carcinogenic risks and hazard indices calculated for inhalation of fugitive dusts emitted by construction traffic in Area D are presented in Table 5-21. The hazard indices presented in Table 5-21 range from 8.03E-03 for unprotected construction workers on-site to 2.03E-07 for children at the playground. These values all fall significantly below the acceptable limit of 1.0, indicating that adverse noncarcinogenic health effects are not likely to occur from the exposure. Similarly, the carcinogenic risks presented in Table 5-21, ranging from 8.90E-08 for unprotected construction workers on-site to 2.90E-12 for commercial populations at River Road, are significantly lower than the NYSDOH

Table 5-20

Inhalation Exposure Risks
Due to Fugitive Dust Releases
From Construction Traffic On-Site
Surficial Soil - Area C

	Soil Conc. (mg/kg)	Constr. Wrkrs On-Site Non-Carc. Hazard Index	Constr. Wrkrs On-Site Carcinogenic Risk	Children Playground Non-Carc. Hazard Index	Children Playground Carcinogenic Risk	Residential N. Marion St. Non-Carc. Hazard Index	Residential N. Marion St. Carcinogenic Risk
VOLATILES							
Benzene	4.00E-03	N/A	4.59E-15	N/A	5.87E-19	N/A	1.25E-18
Carbon Disulfide	5.00E-03	4.61E-09	N/A	7.38E-14	N/A	1.25E-12	N/A
1,1-Dichloroethane	3.00E-03	8.30E-11	N/A	1.33E-15	N/A	2.25E-14	N/A
1,2-Dichloroethene (total)	6.50E-02	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	6.00E-03	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	7.00E-03	N/A	9.14E-16	N/A	1.17E-19	N/A	2.48E-19
Toluene	1.40E-02	6.79E-11	N/A	1.09E-15	N/A	1.84E-14	N/A
Trichloroethene	1.90E-02	N/A	1.28E-14	N/A	1.63E-18	N/A	3.47E-18
Xylene (total)	3.60E-02	3.32E-10	N/A	5.31E-15	N/A	9.01E-14	N/A
SEMI-VOLATILES							
Acenaphthene	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Anthracene	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	1.41E+00	N/A	3.39E-10	N/A	4.34E-14	N/A	9.21E-14
Benzo(b)fluoranthene	1.80E+00	N/A	4.34E-10	N/A	5.55E-14	N/A	1.18E-13
Benzo(k)fluoranthene	8.10E-01	N/A	1.95E-10	N/A	2.50E-14	N/A	5.31E-14
Benzoic acid	6.82E+00	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	1.41E+00	N/A	3.39E-10	N/A	4.34E-14	N/A	9.21E-14
Butylbenzylphthalate	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	1.10E+00	N/A	2.65E-10	N/A	3.39E-14	N/A	7.21E-14
Dibenzo(a,h)anthracene	1.41E+00	N/A	3.39E-10	N/A	4.34E-14	N/A	9.21E-14
2,4-Dimethylphenol	7.50E-01	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate	8.20E+00	N/A	N/A	N/A	N/A	N/A	N/A
Fluoranthene	1.50E+00	N/A	N/A	N/A	N/A	N/A	N/A
Fluorene	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	1.41E+00	N/A	3.39E-10	N/A	4.34E-14	N/A	9.21E-14
2-Methylnaphthalene	1.10E+00	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylphenol	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
4-Methylphenol	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Di-n-octylphthalate	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Phenanthrene	1.70E+00	N/A	N/A	N/A	N/A	N/A	N/A
Phenol	1.41E+00	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	1.90E+00	N/A	N/A	N/A	N/A	N/A	N/A

The carcinogenic risks calculated for children and unprotected construction workers for dermal exposures to surficial soil in Area D are 7.58E-07 and 3.49E-07, respectively. Each of these values falls below the NYSDOH goal of 1.00E-06.

Table 5-33 presents the total carcinogenic risks and hazard indices calculated for children and unprotected construction workers for dermal exposures to surficial soils at the Booth Oil Site. The total carcinogenic risks and hazard indices calculated for these exposures exceed acceptable limits. However, as discussed above and in Section 4.4, the methods used herein to calculate dermal doses provide highly conservative estimates of exposures and, therefore, risks, particularly for inorganic contaminants. Actual dermal doses and risks posed by exposures to inorganic contaminants in surficial soil are likely several orders of magnitude lower than those estimated herein. Accordingly, the results of this assessment should be interpreted with caution. In addition, it must be noted that the carcinogenic risks calculated for exposure to surficial soil in Area B are due primarily to CaPAHs, the concentrations of which are proxy concentrations and not actual detected values.

Table 5-34 presents the carcinogenic risks and hazard indices calculated for dermal exposures of children and unprotected construction workers to surficial soil in the playground. The

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Table 5-33
Total Dermal Exposure Risks
Surficial Soil

	Children			Construction Workers		
Area	Non-Carc. Hazard Index *	Non-Carc. Hazard Index **	Carcinogenic Risk	Non-Carc. Hazard Index *	Non-Carc. Hazard Index **	Carcinogenic Risk
Area A	3.64E+00	4.41E+04	1.45E-05	2.48E+00	1.63E+04	6.70E-06
Area B	1.33E+01	1.20E+05	5.14E-05	1.91E+01	4.44E+04	2.37E-05
Area C	3.01E+00	3.65E+04	3.10E-05	2.03E+00	1.35E+04	1.43E-05
Area D	2.20E+00	2.30E+04	7.58E-07	2.21E+00	8.50E+03	3.49E-07
TOTAL	2.22E+01	2.24E+05	9.77E-05	2.58E+01	8.27E+04	4.50E-05

* RfD for inorganic lead is used for total lead.
** RfD for organic lead is used for total lead.

hazard indices listed in Table 5-34 are 9.12E-01 to 6.82E+03 for children and 1.37 to 2.52E+03 for unprotected construction workers. Comparison of these values with those presented in Table 5-33 for on-site exposures indicates that dermal exposure to surficial soil in the playground results in hazard indices approximately one to two orders of magnitude lower than those calculated for on-site exposures. However, the hazard index calculated for organic lead due to dermal exposure of children to surficial soil in the playground exceeds the acceptable limit of 1.0. Similarly, the range of hazard indices calculated for dermal exposures of unprotected construction workers to surficial soil in the playground exceeds the acceptable limit of 1.0. Review of Table 5-34 indicates that these elevated hazard indices are due primarily to lead. Again, these elevated hazard indices may be attributed to the conservative methods employed herein to estimate dermal exposure doses and risks.

The carcinogenic risks calculated for dermal exposures to surficial soil in the playground are 8.46E-07 for children and 3.90E-07 for unprotected construction workers. Comparison of these values with the total risks presented in Table 5-33 for on-site exposures reveals that dermal exposure to surficial soil at the playground results in carcinogenic risks approximately two orders of magnitude lower than those calculated for dermal exposure to surficial soil on-site. Each of the carcinogenic risks calculated

Table 5-34
Calculated Dermal Exposure Risks
Playground Surficial Soil

	Upper 95% Confidence Arith Mean (mg/kg)	Children Non-Carc. Hazard Index	Children Carc. Risk	Remed. Workers Non-Carc. Hazard Index	Remed. Workers Carc. Risk
VOLATILES					
Benzene	4.69E-03	NA	5.49E-12	NA	2.53E-12
Carbon Disulfide	4.69E-03	3.69E-08	NA	1.36E-07	NA
1,1-Dichloroethane	4.69E-03	1.84E-08	NA	NA	NA
1,2-Dichloroethene (tot	4.69E-03	1.84E-07	NA	6.80E-08	NA
Ethylbenzene	4.69E-03	1.84E-07	NA	6.80E-08	NA
Tetrachloroethene	4.69E-03	3.69E-07	2.11E-11	1.36E-07	9.71E-12
Toluene	4.69E-03	1.02E-08	NA	2.83E-08	NA
Trichloroethene	4.69E-03	NA	4.63E-12	NA	2.14E-12
Xylene (total)	4.69E-03	1.02E-09	NA	1.89E-09	NA
SEMI-VOLATILES					
Acenaphthene	4.76E-01	1.56E-05	NA	5.75E-06	NA
Acenaphthylene	4.67E-01	NA	NA	NA	NA
Anthracene	4.69E-01	3.07E-06	NA	1.13E-06	NA
Benzo(a)anthracene	7.09E-01	NA	7.32E-08	NA	3.38E-08
Benzo(b)fluoranthene	8.25E-01	NA	8.52E-08	NA	3.93E-08
Benzo(k)fluoranthene	8.22E-01	NA	8.49E-08	NA	3.91E-08
Benzoic acid	1.31E-01	3.22E-08	NA	1.19E-07	NA
Benzo(a)pyrene	7.35E-01	NA	7.59E-08	NA	3.50E-08
Butylbenzylphthalate	4.12E-01	1.62E-07	NA	5.97E-07	NA
Chrysene	1.08E+00	NA	1.12E-07	NA	5.15E-08
Dibenzo(a,h)anthracene	4.61E-01	NA	4.76E-08	NA	2.19E-08
2,4-Dimethylphenol	4.12E-01	1.62E-05	NA	5.97E-06	NA
bis(2-Ethylhexyl)phthala	4.12E-01	1.08E-05	1.94E-10	3.98E-05	8.95E-11
Fluoranthene	2.28E+00	1.12E-04	NA	4.13E-05	NA
Fluorene	4.52E-01	2.22E-05	NA	8.19E-06	NA
Indeno(1,2,3-cd)pyrene	6.95E-01	NA	7.18E-08	NA	3.31E-08
2-Methylnaphthalene	2.09E-01	NA	NA	NA	NA
2-Methylphenol	4.12E-01	6.48E-06	NA	2.39E-06	NA
4-Methylphenol	4.12E-01	6.48E-06	NA	2.39E-06	NA
Naphthalene	1.09E-01	5.35E-05	NA	1.98E-04	NA
Di-n-octylphthalate	4.12E-01	1.62E-05	NA	5.97E-05	NA
Phenanthrene	2.32E+00	NA	NA	NA	NA
Phenol	4.12E-01	6.75E-06	NA	2.49E-05	NA
Pyrene	1.61E+00	1.05E-04	NA	3.88E-05	NA

Table 5-34 (cont'd)
Calculated Dermal Exposure Risks
Playground Surficial Soil

	Upper 95% Confidence Arith Mean (mg/kg)	Children Non-Carc. Hazard Index	Children Carc. Risk	Remed. Workers Non-Carc. Hazard Index	Remed. Workers Carc. Risk
INORGANICS					
Aluminum	1.71E+04	NA	NA	NA	NA
Antimony	4.34E+00	8.53E-02	NA	3.15E-01	NA
Arsenic	1.81E+01	2.37E-02	NA	8.75E-02	NA
Barium	1.37E+02	1.07E-02	NA	3.96E-02	NA
Beryllium	1.15E+00	9.01E-03	2.21E-09	3.32E-02	1.02E-09
Cadmium	9.80E-01	6.42E-03	NA	NA	NA
Calcium	1.46E+04	NA	NA	NA	NA
Chromium	2.67E+01	2.62E-03	NA	9.68E-04	NA
Cobalt	1.02E+01	NA	NA	NA	NA
Copper	7.46E+01	NA	NA	NA	NA
Iron	3.55E+04	NA	NA	NA	NA
Lead (inorganic)	1.39E+02	4.87E-01	NA	1.80E-01	NA
Magnesium	8.51E+03	NA	NA	NA	NA
Manganese	7.69E+02	1.51E-01	NA	2.23E-01	NA
Mercury	1.20E-01	1.05E-03	NA	3.87E-03	NA
Nickel	2.85E+01	1.87E-02	NA	6.89E-02	NA
Potassium	2.54E+03	NA	NA	NA	NA
Selenium	1.58E+00	NA	NA	NA	NA
Silver	9.70E-01	6.05E-04	NA	2.23E-03	NA
Sodium	2.81E+02	NA	NA	NA	NA
Thallium	5.50E-01	3.09E-03	NA	1.14E-03	NA
Vanadium	3.91E+01	1.10E-01	NA	4.05E-01	NA
Zinc	2.91E+02	2.29E-03	NA	8.45E-03	NA
Cyanide	6.50E-01	2.55E-05	NA	9.43E-05	NA
PESTICIDES/PCBs					
PCB-1242	1.54E-01	NA	4.79E-08	NA	2.21E-08
PCB-1254	3.17E-01	NA	9.86E-08	NA	4.54E-08
PCB-1260	3.17E-01	NA	9.86E-08	NA	4.54E-08
PCB-1248	1.54E-01	NA	4.79E-08	NA	2.21E-08
TOTAL	8.01E+04	9.12E-01	8.46E-07	1.37E+00	3.90E-07
Lead (organic)	1.39E+02	6.82E+03	NA	2.52E+03	NA

for dermal exposure to surficial soil in the playground fall below the NYSDOH goal of 1.00E-06 for lifetime exposure and the OSHA guideline of 1.00E-03 for occupational exposure.

Tables 5-35 through 5-38 present the carcinogenic risks and hazard indices calculated for dermal exposures of unprotected construction workers to subsurface soil at the Booth Oil Site. The risks calculated for exposures of unprotected construction workers to subsurface soil in Area A are presented in Table 5-35. The hazard indices presented in Table 5-35 range from 1.43, as calculated with the RfD for inorganic lead, to 4.86E+03, as calculated with the RfD for organic lead. This range exceeds the acceptable limit of 1.0 for noncarcinogenic hazard index. Review of the table indicates that these elevated values are attributed primarily to lead. However, as noted for surficial soil, highly conservative methods are employed herein to assess dermal exposure to inorganic contaminants in soil. The actual risks posed by dermal exposure to inorganics in soil are likely several orders of magnitude lower than those estimated herein.

The carcinogenic risk calculated for dermal exposure of unprotected construction workers to subsurface soil in Area A (i.e., 4.52E-06) exceeds the NYSDOH goal of 1.00E-06 for lifetime exposure, but falls below the OSHA guideline of 1.00E-03 for occupational exposure. Review of the table indicates that this

Table 5-35
Calculated Dermal Exposure Risks
Area A Subsurface Soil

	Upper 95% Confidence Arith. Mean (mg/kg)	Remed. Workers Non Carc. Hazard Index	Remed. Workers Carc. Risk
VOLATILES			
Benzene	4.66E-01	NA	2.52E-10
Carbon Disulfide	4.66E-01	1.35E-05	NA
1,1-Dichloroethane	4.65E-01	6.74E-07	NA
1,1-Dichloroethene	4.66E-01	1.50E-04	1.16E-08
1,2-Dichloroethene (total)	6.32E-01	9.16E-06	NA
Ethylbenzene	3.80E+00	5.51E-05	NA
Tetrachloroethene	4.65E-01	1.35E-05	9.63E-10
Toluene	4.66E-01	2.82E-06	NA
Trichloroethene	3.65E-01	NA	1.66E-10
1,1,1-Trichloroethane	4.65E-01	1.50E-06	NA
Xylene (total)	2.45E+01	9.87E-06	NA
SEMIVOLATILES			
Acenaphthene	7.11E-01	8.59E-06	NA
Anthracene	6.78E-01	1.64E-06	NA
Benzo(a)anthracene	1.36E+00	NA	6.47E-08
Benzo(b)fluoranthene	2.54E+00	NA	1.21E-07
Benzo(k)fluoranthene	1.59E+00	NA	7.55E-08
Butylbenzylphthalate	7.11E-01	1.03E-06	NA
Chrysene	2.16E+00	NA	1.03E-07
1,2-Dichlorobenzene	7.11E-01	2.29E-06	NA
1,4-Dichlorobenzene	7.11E-01	NA	1.41E-10
Fluoranthene	3.32E+00	6.02E-05	NA
Fluorene	3.66E+00	6.63E-05	NA
2-Methylnaphthalene	3.31E+01	NA	NA
4-Methylphenol	1.66E+00	9.60E-06	NA
Naphthalene	7.40E+00	1.34E-02	NA
N-Nitrosodiphenylamine (1)	7.11E-01	NA	1.44E-10
Di-n-octylphthalate	6.76E-01	9.80E-05	NA
Phenanthrene	1.17E+01	NA	NA
Pyrene	4.89E+00	1.18E-04	NA
1,2,4-Trichlorobenzene	7.11E-01	1.03E-05	NA

Table 5-35 (cont'd)
Calculated Dermal Exposure Risks
Area A Subsurface Soil

	Upper 95% Confidence Arith. Mean (mg/kg)	Remed. Workers Non Carc. Hazard Index	Remed. Workers Carc. Risk
INORGANICS			
Aluminum	1.40E+04	NA	NA
Antimony	3.78E+00	2.74E-01	NA
Arsenic	3.83E+01	1.85E-01	NA
Barium	1.29E+02	3.73E-02	NA
Beryllium	9.50E-01	2.76E-02	8.46E-10
Cadmium	1.39E+00	NA	NA
Calcium	6.28E+04	NA	NA
Chromium	4.31E+01	1.56E-03	NA
Cobalt	1.12E+01	NA	NA
Copper	1.07E+02	NA	NA
Iron	4.96E+04	NA	NA
Lead (inorganic)	2.68E+02	3.47E-01	NA
Magnesium	2.68E+04	NA	NA
Manganese	6.65E+02	1.93E-01	NA
Mercury	1.70E-01	5.48E-03	NA
Nickel	2.52E+01	6.09E-02	NA
Potassium	1.99E+03	NA	NA
Selenium	1.68E+00	NA	NA
Silver	8.32E-01	1.91E-03	NA
Sodium	4.76E+02	NA	NA
Thallium	6.49E-01	1.34E-03	NA
Vanadium	2.49E+01	2.58E-01	NA
Zinc	2.47E+02	7.16E-03	NA
Cyanide	3.38E+00	4.90E-04	NA
PESTICIDES/PCBS			
Aldrin	2.60E-02	1.26E-02	9.15E-10
PCB - 1242	1.97E+01	NA	2.83E-06
PCB - 1254	4.89E-01	NA	7.01E-08
PCB - 1260	3.92E+00	NA	5.62E-07
PCB - 1248	4.77E+00	NA	6.84E-07
4,4'-DDD	5.30E-02	NA	2.37E-10
TOTAL	1.57E+05	1.43E+00	4.52E-06
Lead (organic)	2.68E+02	4.86E+03	NA

risk is attributed to primarily to PCBs. However, the exposure scenarios developed herein for construction workers do not account for the use of personal protective measures in accordance with the site-specific health and safety plan.

Table 5-36 presents the carcinogenic risks and hazard indices calculated for dermal exposures of unprotected construction workers to subsurface soil in Area B. The hazard indices presented in Table 5-36 range from 1.37 to 2.20E+03. This range exceeds the acceptable limit of 1.0. Review of the table indicates that these elevated hazard indices are attributed primarily to organic lead for the upper limit, and inorganic lead, antimony, manganese and vanadium for the lower limit. However, with the exception of organic lead, none of these compounds result in individual hazard ratios greater than 1.0. In addition, it must be noted that the actual risks associated with dermal contact with inorganic contaminants in soil are likely several orders of magnitude lower than those estimated herein, due to the highly conservative methods employed in this assessment.

The carcinogenic risk calculated for dermal exposure of unprotected construction workers to subsurface soil in Area B is 1.58E-06. This value exceeds the NYSDOH goal of 1.00E-06 for lifetime exposure, but falls below the OSHA guideline of 1.00E-03 for occupational exposure. Review of Table 5-36 indicates that

Table 5-36
Calculated Dermal Exposure Risks
Area B Subsurface Soil

	Upper 95% Confidence Arith. Mean (mg/kg)	Remed. Workers Non Carc. Hazard Index	Remed. Workers Carc. Risk
VOLATILES			
Benzene	4.14E-01	NA	2.24E-10
Carbon Disulfide	4.12E-01	1.19E-05	NA
1,1-Dichloroethane	4.13E-01	5.99E-07	NA
1,1-Dichloroethene	4.12E-01	1.33E-04	NA
1,2-Dichloroethene (total)	7.64E+00	1.11E-04	NA
Ethylbenzene	6.35E+00	9.21E-05	NA
Tetrachloroethene	1.58E+00	4.58E-05	NA
Toluene	7.05E+00	4.26E-05	NA
Trichloroethene	4.12E-01	NA	1.88E-10
1,1,1-Trichloroethane	1.09E+00	3.50E-06	NA
Xylene (total)	3.51E+01	1.41E-05	NA
SEMIVOLATILES			
Acenaphthene	6.83E-01	8.25E-06	NA
Anthracene	6.83E-01	1.65E-06	NA
Benzo(a)anthracene	6.83E-01	NA	3.25E-08
Benzo(b)fluoranthene	6.83E-01	NA	3.25E-08
Benzo(k)fluoranthene	6.83E-01	NA	3.25E-08
Butylbenzylphthalate	6.83E-01	9.90E-07	NA
Chrysene	6.83E-01	NA	3.25E-08
1,2-Dichlorobenzene	6.83E-01	2.20E-06	NA
1,4-Dichlorobenzene	6.83E-01	NA	1.36E-10
Fluoranthene	6.83E-01	1.24E-05	NA
Fluorene	1.13E+00	2.04E-05	NA
2-Methylnaphthalene	1.72E+01	NA	NA
4-Methylphenol	6.83E-01	3.96E-06	NA
Naphthalene	1.03E+01	1.87E-02	NA
N-Nitrosodiphenylamine (1)	1.62E+00	NA	3.29E-10
Di-n-octylphthalate	4.59E-01	6.66E-05	NA
Phenanthrene	2.02E+00	NA	NA
Pyrene	6.38E-01	1.54E-05	NA
1,2,4-Trichlorobenzene	1.00E+00	1.45E-05	NA

Table 5-36 (cont'd)
Calculated Dermal Exposure Risks
Area B Subsurface Soil

	Upper 95% Confidence Arith. Mean (mg/kg)	Remed. Workers Non Carc. Hazard Index	Remed. Workers Carc. Risk
INORGANICS			
Aluminum	1.98E+04	NA	NA
Antimony	4.51E+00	3.27E-01	NA
Arsenic	2.93E+00	1.42E-02	NA
Barium	1.32E+02	3.83E-02	NA
Beryllium	1.77E+00	5.12E-02	1.57E-09
Cadmium	7.13E-01	NA	NA
Calcium	1.24E+05	NA	NA
Chromium	2.52E+01	9.12E-04	NA
Cobalt	1.28E+01	NA	NA
Copper	2.93E+01	NA	NA
Iron	2.87E+04	NA	NA
Lead (inorganic)	1.22E+02	1.57E-01	NA
Magnesium	5.18E+04	NA	NA
Manganese	1.18E+03	3.42E-01	NA
Mercury	1.25E-01	4.03E-03	NA
Nickel	2.55E+01	6.17E-02	NA
Potassium	4.85E+03	NA	NA
Selenium	4.15E-01	NA	NA
Silver	9.20E-01	2.12E-03	NA
Sodium	6.88E+02	NA	NA
Thallium	2.07E-01	4.29E-04	NA
Vanadium	3.36E+01	3.48E-01	NA
Zinc	7.61E+01	2.21E-03	NA
Cyanide	2.08E+00	3.02E-04	NA
PESTICIDES/PCBS			
Aldrin	1.00E-02	4.83E-03	3.52E-10
PCB - 1242	5.31E+00	NA	7.62E-07
PCB - 1254	1.20E+00	NA	1.72E-07
PCB - 1260	1.45E+00	NA	2.08E-07
PCB - 1248	2.10E+00	NA	3.02E-07
4,4'-DDD	2.20E-02	NA	9.84E-11
TOTAL	2.32E+05	1.37E+00	1.58E-06

Lead (organic)	1.22E+02	2.20E+03	NA

this risk is attributed primarily to PCBs, although none of the individual compounds result in a carcinogenic risk greater than 1.00E-06. Again, it must be noted that this exposure scenario does not account for personal protective measure required in the health and safety plan, which will serve to mitigate exposures of construction workers.

Tables 5-37 and 5-38 present the carcinogenic risks and hazard indices calculated for dermal exposures of unprotected construction workers to subsurface soil in Areas C and D. The hazard indices presented in Tables 5-37 and 5-38 are 3.33 to 2.15E+04 and 4.63E+01 to 5.99E+05, respectively. Each of these ranges exceeds the acceptable limit of 1.0. Review of the tables indicates that lead contributed most significantly to the elevated hazard indices in each case. In addition, barium results in an individual hazard ratio of 1.09 for dermal exposure of unprotected construction workers to subsurface soil in Area D. However, it must be noted that, due to the highly conservative methods employed herein to estimated dermal exposure, these hazard indices are likely overestimated by several orders of magnitude.

The carcinogenic risks calculated for dermal exposure of unprotected construction workers to subsurface soil in Areas C and D are 7.01E-06 and 1.40E-05, respectively. Each of these risks exceeds the NYSDOH goal of 1.00E-06 for lifetime exposure, but

Table 5-37
Calculated Dermal Exposure Risks
Area C Subsurface Soil

	Upper 95% Confidence Arith. Mean (mg/kg)	Remed. Workers Non Carc. Hazard Index	Remed. Workers Carc. Risk
VOLATILES			
Benzene	3.26E-01	NA	1.76E-10
Carbon Disulfide	3.25E-01	9.43E-06	NA
1,1-Dichloroethane	3.26E-01	4.73E-07	NA
1,1-Dichloroethene	3.26E-01	1.05E-04	8.10E-09
1,2-Dichloroethene (total)	5.50E-01	7.98E-06	NA
Ethylbenzene	1.75E-01	2.54E-06	NA
Tetrachloroethene	3.41E-01	9.89E-06	7.06E-10
Toluene	2.61E-01	1.58E-06	NA
Trichloroethene	3.30E-01	NA	1.50E-10
1,1,1-Trichloroethane	3.26E-01	1.05E-06	NA
Xylene (total)	1.05E+00	4.21E-07	NA
SEMIVOLATILES			
Acenaphthene	1.55E+00	1.87E-05	NA
Anthracene	1.55E+00	3.74E-06	NA
Benzo(a)anthracene	1.55E+00	NA	7.36E-08
Benzo(b)fluoranthene	1.55E+00	NA	7.36E-08
Benzo(k)fluoranthene	1.55E+00	NA	7.36E-08
Butylbenzylphthalate	1.55E+00	2.24E-06	NA
Chrysene	1.34E+00	NA	6.37E-08
1,2-Dichlorobenzene	4.16E-01	1.34E-06	NA
1,4-Dichlorobenzene	3.17E-01	NA	6.30E-11
Fluoranthene	5.17E-01	9.37E-06	NA
Fluorene	1.54E+00	2.80E-05	NA
2-Methylnaphthalene	3.56E+00	NA	NA
4-Methylphenol	5.93E-01	3.44E-06	NA
Naphthalene	1.74E+00	3.15E-03	NA
N-Nitrosodiphenylamine (1)	1.55E+00	NA	3.14E-10
Di-n-octylphthalate	1.54E+00	2.23E-04	NA
Phenanthrene	3.05E+00	NA	NA
Pyrene	1.53E+00	3.69E-05	NA
1,2,4-Trichlorobenzene	1.55E+00	2.24E-05	NA

Table 5-37 (cont'd)
Calculated Dermal Exposure Risks
Area C Subsurface Soil

	Upper 95% Confidence Arith. Mean (mg/kg)	Remed. Workers Non Carc. Hazard Index	Remed. Workers Carc. Risk
INORGANICS			
Aluminum	2.34E+04	NA	NA
Antimony	9.62E+00	6.97E-01	NA
Arsenic	1.56E+01	7.55E-02	NA
Barium	5.53E+02	1.60E-01	NA
Beryllium	1.46E+00	4.23E-02	1.30E-09
Cadmium	2.18E+00	NA	NA
Calcium	8.31E+04	NA	NA
Chromium	7.80E+01	2.83E-03	NA
Cobalt	1.55E+01	NA	NA
Copper	1.24E+02	NA	NA
Iron	3.40E+04	NA	NA
Lead (inorganic)	1.19E+03	1.54E+00	NA
Magnesium	3.67E+04	NA	NA
Manganese	7.81E+02	2.27E-01	NA
Mercury	1.44E-01	4.64E-03	NA
Nickel	3.26E+01	7.87E-02	NA
Potassium	5.41E+03	NA	NA
Selenium	1.39E+00	NA	NA
Silver	8.62E-01	1.98E-03	NA
Sodium	7.69E+02	NA	NA
Thallium	4.74E-01	9.82E-04	NA
Vanadium	4.38E+01	4.54E-01	NA
Zinc	3.74E+02	1.08E-02	NA
Cyanide	7.15E-01	1.04E-04	NA
PESTICIDES/PCBS			
Aldrin	7.90E-02	3.82E-02	2.78E-09
PCB - 1242	7.09E-01	NA	1.02E-07
PCB - 1254	1.56E+01	NA	2.24E-06
PCB - 1260	9.46E+00	NA	1.36E-06
PCB - 1248	2.10E+01	NA	3.02E-06
4,4'-DDD	1.64E-01	NA	7.33E-10
TOTAL	1.87E+05	3.33E+00	7.01E-06

Lead (organic)	1.19E+03	2.15E+04	NA

Table 5-38

Calculated Dermal Exposure Risks
Area D Subsurface Soil

	Upper 95% Confidence Arith. Mean (mg/kg)	Remed. Workers Non Carc. Hazard Index	Remed. Workers Carc. Risk
VOLATILES			
Benzene	3.58E+00	NA	1.93E-09
Carbon Disulfide	4.74E+00	1.37E-04	NA
1,1-Dichloroethane	1.79E+01	2.59E-05	NA
1,1-Dichloroethene	4.74E+00	1.53E-03	1.18E-07
1,2-Dichloroethene (total)	1.91E+02	2.77E-03	NA
Ethylbenzene	8.95E+01	1.30E-03	NA
Tetrachloroethene	2.62E+02	7.61E-03	5.43E-07
Toluene	3.58E+02	2.16E-03	NA
Trichloroethene	2.03E+02	NA	9.24E-08
1,1,1-Trichloroethane	2.62E+01	8.46E-05	NA
Xylene (total)	4.65E+02	1.87E-04	NA
SEMIVOLATILES			
Acenaphthene	1.90E+01	2.30E-04	NA
Anthracene	4.12E+00	9.94E-06	NA
Benzo(a)anthracene	4.10E+00	NA	1.95E-07
Benzo(b)fluoranthene	4.09E+00	NA	1.95E-07
Benzo(k)fluoranthene	4.09E+00	NA	1.95E-07
Butylbenzylphthalate	1.17E+01	1.70E-05	NA
Chrysene	8.05E+00	NA	3.83E-07
1,2-Dichlorobenzene	7.69E+00	2.48E-05	NA
1,4-Dichlorobenzene	9.98E-01	NA	1.98E-10
Fluoranthene	7.06E+00	1.28E-04	NA
Fluorene	4.09E+00	7.41E-05	NA
2-Methylnaphthalene	1.67E+02	NA	NA
4-Methylphenol	7.16E+02	4.15E-03	NA
Naphthalene	9.06E+01	1.64E-01	NA
N-Nitrosodiphenylamine (1)	3.86E+00	NA	7.83E-10
Di-n-octylphthalate	4.09E+00	5.93E-04	NA
Phenanthrene	6.40E+01	NA	NA
Pyrene	6.53E+01	1.58E-03	NA
1,2,4-Trichlorobenzene	4.09E+00	5.93E-05	NA

Table 5-38 (cont'd)

Calculated Dermal Exposure Risks
Area D Subsurface Soil

	Upper 95% Confidence Arith. Mean (mg/kg)	Remed. Workers Non Carc. Hazard Index	Remed. Workers Carc. Risk
INORGANICS			
Aluminum	1.23E+03	NA	NA
Antimony	1.18E+01	8.58E-01	NA
Arsenic	3.21E+01	1.55E-01	NA
Barium	3.76E+03	1.09E+00	NA
Beryllium	5.17E-01	1.50E-02	4.60E-10
Cadmium	2.29E+01	NA	NA
Calcium	9.07E+04	NA	NA
Chromium	2.36E+02	8.56E-03	NA
Cobalt	1.19E+01	NA	NA
Copper	1.38E+03	NA	NA
Iron	3.33E+04	NA	NA
Lead (inorganic)	3.30E+04	4.28E+01	NA
Magnesium	5.04E+04	NA	NA
Manganese	5.99E+02	1.74E-01	NA
Mercury	2.01E+00	6.47E-02	NA
Nickel	2.14E+02	5.18E-01	NA
Potassium	3.82E+03	NA	NA
Selenium	4.62E-01	NA	NA
Silver	2.23E+00	5.14E-03	NA
Sodium	1.76E+03	NA	NA
Thallium	4.16E-01	8.62E-04	NA
Vanadium	2.18E+01	2.26E-01	NA
Zinc	3.61E+03	1.05E-01	NA
Cyanide	1.05E+01	1.52E-03	NA
PESTICIDES/PCBS			
Aldrin	3.36E-01	1.62E-01	1.18E-08
PCB - 1242	1.08E+01	NA	1.55E-06
PCB - 1254	2.16E+01	NA	3.10E-06
PCB - 1260	7.37E+00	NA	1.06E-06
PCB - 1248	4.58E+01	NA	6.57E-06
4,4'-DDD	6.72E-01	NA	3.00E-09
TOTAL	2.27E+05	4.63E+01	1.40E-05
Lead (organic)	3.30E+04	5.99E+05	NA

falls below the OSHA guideline of 1.00E-03 for occupational exposure. Review of the tables indicates that PCBs contribute most significantly to the calculated risks in each case. Review of Table 2-9 indicates that, with the exception of PCB-1242, the values listed for PCBs in Area C are actual reported concentrations. Similarly, the majority of values listed in Table 2-9 for PCBs in Area D are actual detected concentrations. However, the exposure scenarios developed herein for construction workers do not account for the use of personal protective measures. Accordingly, the actual risks posed to construction workers due to dermal exposure are likely several orders of magnitude lower than those estimated herein.

The total dermal exposure risks for unprotected construction workers due to exposure to subsurface soil are calculated as the sum of the area-specific risks. Table 5-39 presents the total carcinogenic risks and hazard indices calculated for dermal exposure of unprotected construction workers to subsurface soil at the Booth Oil Site. The hazard indices presented in Table 5-39 are 5.24E+01, as calculated with the RfD for inorganic lead used to represent organic lead, and 6.28E+05, as calculated for organic lead. These values exceed the acceptable limit of 1.0. Similarly, the carcinogenic risk calculated for dermal exposure of unprotected construction workers to subsurface soil (i.e., 2.35E-05) exceeds

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Table 5-39
Total Dermal Exposure Risks
Subsurface Soil

Construction Workers

Area	Non-Carc. Hazard Index *	Non-Carc. Hazard Index **	Carcinogenic Risk
Area A	1.43E+00	4.86E+03	4.52E-06
Area B	1.37E+00	2.20E+03	1.58E-06
Area C	3.33E+00	2.15E+04	7.01E-06
Area D	4.63E+01	5.99E+05	1.04E-05
TOTAL	5.24E+01	6.28E+05	2.35E-05

* RfD for inoragnic lead used for total lead.
** RfD for oragnic lead used for total lead.

the NYSDOH goal of 1.00E-06 for lifetime exposure, but falls below the OSHA guideline of 1.00E-03 for occupational exposure.

Table 5-40 presents the total hazard indices and carcinogenic risks calculated for dermal exposures of children and unprotected construction workers to soil at the Booth Oil Site. The hazard indices calculated for dermal exposure of unprotected construction workers and children are 7.82E+01 to 7.11E+05 and 2.22E+01 and 2.24E+05, respectively. These values all exceed the acceptable limit of 1.0. Similarly, the carcinogenic risks calculated for dermal exposure of unprotected construction workers (6.85E-05) and children (9.77E-05) exceed the NYSDOH goal of 1.00E-06 for lifetime exposure.

However, as discussed in Section 4.4, due to the lack of contaminant-specific absorption data in the available literature, the methods employed herein to estimate dermal absorption conservatively assume a single absorption factor for all contaminants. This simplified approach results in overestimation of dermal doses and, therefore, risks to many contaminants identified at the Booth Oil Site. This is particularly true for the inorganic contaminants which resulted in the highest noncarcinogenic hazard indices for dermal exposure. In addition, the dermal exposure scenarios developed herein for construction workers do not account for the use of personal protective

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Table 5-40
Total Dermal Exposure Risks
Booth Oil Site

Receptor	Surficial Soil	Subsurface Soil	TOTAL
Construction Worker On-Site			
Carcinogenic Risk	4.50E-05	2.35E-05	6.85E-05
Non-Carc. Hazard Index *	2.58E+01	5.24E+01	7.82E+01
Non-Carc. Hazard Index **	8.27E+04	6.28E+05	7.11E+05
Children On-Site			
Carcinogenic Dose	9.77E-05	N/A	9.77E-05
Non-Carc. Hazard Index *	2.22E+01		2.22E+01
Non-Carc. Hazard Index **	2.24E+05	N/A	2.24E+05

* RfD for inorganic lead is used for total lead
** RfD for organic lead is used for total lead

equipment. Accordingly, actual risks posed by dermal exposures of children and construction workers at the Booth Oil Site are likely several orders of magnitude lower than those estimated herein.

5.5 Total Risks to Exposed Populations

The total risks posed to each population due to exposures to contaminants at and emanating from the Booth Oil Site are calculated as the sum of the risks calculated for ingestion, inhalation and dermal exposures. The total risks calculated for each population exposed to the Booth Oil Site are presented in Table 5-41.

Review of Table 5-41 indicates that the carcinogenic risks and hazard indices calculated for residential and commercial populations within the vicinity of the Booth Oil Site are within acceptable limits. However, the carcinogenic risks and ranges of hazard indices calculated for children and unprotected construction workers at the site all exceed the acceptable limits of 1.0 for hazard index and 1.00E-06 for carcinogenic risk. In addition, the total carcinogenic risks and the hazard indices calculated with the RfD for organic lead for children at the playground exceed the acceptable limit of 1.0.

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Table 5-41
Total Carcinogenic Risks and Non-Carcinogenic Hazard Indices
Booth Oil Site

Receptor	Ingestion Exposure		Inhalation Exposure		Dermal Exposure		TOTAL	
Construction Worker On-Site								
Carcinogenic Risk	N/A		4.37E-04	+	6.85E-05	+	5.06E-04	+
Non-Carc. Hazard Index *	N/A		1.95E+02	+	7.82E+01	+	2.73E+02	+
Non-Carc. Hazard Index**	N/A		1.95E+02	+	7.11E+05	+	7.11E+05	+
Non-Pica Children On-Site								
Carcinogenic Risk	4.23E-06	+	3.93E-08		9.77E-05	+	1.02E-04	+
Non-Carc. Hazard Index *	4.04E-02		2.12E-03		2.21E+01	+	2.21E+01	+
Non-Carc. Hazard Index**	4.51E+02	+	2.12E-03		2.24E+05	+	2.24E+05	+
Pica Children On-Site								
Carcinogenic Risk	4.23E-05	+	3.93E-08		9.77E-05	+	1.40E-04	+
Non-Carc. Hazard Index *	4.04E-01		2.12E-03		2.21E+01	+	2.25E+01	+
Non-Carc. Hazard Index**	4.51E+03	+	2.12E-03		2.24E+05	+	2.29E+05	+
Non-Pica Children at the Playground								
Carcinogenic Risk	3.32E-07		1.50E-07		8.46E-07		1.33E-06	+
Non-Carc. Hazard Index *	6.05E-03		1.23E-02		9.12E-01		9.30E-01	
Non-Carc. Hazard Index**	5.48E+01	+	1.23E-02		6.82E+03	+	6.87E+03	+
Pica Children at the Playground								
Carcinogenic Risk	3.32E-06	+	1.50E-07		8.46E-07		4.32E-06	+
Non-Carc. Hazard Index *	6.05E-02		1.23E-02		9.12E-01		9.85E-01	
Non-Carc. Hazard Index**	5.48E+02	+	1.23E-02		6.82E+03	+	7.37E+03	+

(continued..)

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Table 5-41
Total Carcinogenic Risks and Non-Carcinogenic Hazard Indices
Booth Oil Site

Receptor	Ingestion Exposure	Inhalation Exposure	Dermal Exposure	TOTAL
Residents at No. Marion Street				
Carcinogenic Risk	N/A	1.79E-07	N/A	1.79E-07
Non-Carc. Hazard Index	N/A	5.63E-02	N/A	5.63E-02
Commercial Pop. at Robinson St.				
Carcinogenic Risk	N/A	1.10E-07	N/A	1.10E-07
Non-Carc. Hazard Index	N/A	5.31E-02	N/A	5.31E-02
Commercial Pop. at River Road				
Carcinogenic Risk	N/A	3.06E-08	N/A	3.06E-08
Non-Carc. Hazard Index	N/A	1.50E-02	N/A	1.50E-02
Residents at Sommer Street				
Carcinogenic Risk	N/A	4.93E-08	N/A	4.93E-08
Non-Carc. Hazard Index	N/A	2.46E-02	N/A	2.46E-02
Commercial Pop. at Sommer St.				
Carcinogenic Risk	N/A	4.92E-08	N/A	4.92E-08
Non-Carc. Hazard Index	N/A	2.46E-02	N/A	2.46E-02

* RfD for inorganic lead is used for total lead in ingestion and dermal exposure scenarios.

** RfD for organic lead is used for total lead in ingestion and dermal exposure scenarios.

+ Exceeds acceptable limits of 1.00E-06 for carcinogenic risk or hazard index of 1.0 for non-carcinogenic risk.

Inspection of Table 5-41 indicates that dermal exposures contribute most significantly to the elevated risks and hazard indices calculated for children at the Booth Oil Site. However, as discussed previously, the dermal risks presented herein are expected to be overestimated due to the extremely conservative methods employed in the dose estimations. Actual dermal risks and hazard indices due to exposure to soil at the Booth Oil Site are likely several orders of magnitude lower than those presented in Table 5-41.

Inhalation exposures contribute most significantly to the total carcinogenic and noncarcinogenic risks posed to unprotected construction workers at the Booth Oil Site. However, it must be noted that this scenario is included herein as a baseline assessment. These risks may be mitigated through the use of control measures, such as dust suppression, or through the use of personal protective equipment. The site-specific health and safety plan will address the personal protection and control measures deemed necessary for construction workers at the site during remedial activities, and provide mitigation of the risks calculated herein for this population.

Based upon the above, the overly conservative risks calculated for dermal exposures of children and unprotected construction workers, and the inhalation risks calculated for unprotected

construction workers, which will be mitigated by the provisions of the health and safety plan, may be couched as not indicative of actual risks posed by exposures at the Booth Oil Site. Therefore, the remaining data presented in Table 5-41 indicate that ingestion exposures of children remains a scenario of concern at the site. The scenarios of soil ingestion developed herein result in carcinogenic risks above the NYSDOH goal of 1.00E-06 and the noncarcinogenic hazard indices greater than 1.0.

Review of Table 5-41 indicates that elevated hazard indices are calculated for ingestion exposures of children when the RfD for organic lead is used to represent total lead, while elevated hazard indices are not calculated when the RfD for inorganic lead is used for total lead. As previously discussed, the two hazard indices calculated for lead are intended to represent the upper and lower bounds of the risk which may be posed by lead at the site. Samples collected at the site were analyzed for total lead, however, it is likely that the soil at the site contains a mixture of organic and inorganic lead. Accordingly, the actual risks posed by exposure to lead would lie somewhere between the risks calculated for total lead as inorganic lead and total lead as organic lead.

As previously discussed, Area B surficial soil contributes most significantly to the elevated carcinogenic risks calculated for ingestion exposure of children, and that CaPAHs and PCBs are

responsible for the bulk of the ingestion risk in Area B. However, CaPAHs in Area B surficial soil are based upon proxy concentrations estimated from the sample detection limits and not upon actual reported concentrations. It is expected that, if lower detection limits were achievable for these samples, the reported concentrations, and therefore, the risks associated with ingestion of this soil would be somewhat lower than calculated herein.

However, the risks due to ingestion of surficial soils in Areas A and C by non-pica children, which are only marginally below the NYSDOH goal of 1.00E-06, and the elevated risks calculated for ingestion exposures of pica children to surficial soils in Areas A and C are due to actual detected contaminant concentrations. Therefore, based upon the above analysis, PCBs and CaPAHs result in elevated risks for the "maximum reasonable exposure" scenarios of soil ingestion developed herein. Exposure to these contaminants are therefore of concern at the Booth Oil Site. In addition, notwithstanding the uncertainties discussed previously, lead remains a potential contaminant of concern at the site, due to the elevated hazard indices calculated for organic lead in the soil ingestion scenarios.

Section 6

6.0 IMPACTS OF SURFACE RUNOFF

Stormwater runoff from the Booth Oil Site discharges to a catch basin/stormwater sewer system ("catch basin") located along the southern border of the site and empties into the Little River, approximately 1,500 feet away, through the Robinson Street outfall pipe. The transport of contaminated surface runoff to the Little River and uptake of contaminants by fish is a potential route of exposure to area fishermen and their families.

In order to characterize the transport of contaminants from the site via stormwater discharge to the Little River, sediment and surface water samples were collected from the catch basin during the Phase I RI. The results of chemical analyses of these samples is discussed in Section 2.0 of this report.

An attempt was made to calculate the contaminant loading in the Little River from stormwater runoff from the Booth Oil Site. However, telecommunications with NYSDEC, the U.S. Geological Survey, City of Tonawanda Water Supply Authority, and U.S. Army Corps of Engineers, indicate that flow data, which are essential to such an analysis, are not collected for the Little River. Therefore, the approach utilized herein back-calculates, from acceptable risk levels, the required flow in the Little River to provide adequate dilution of the contaminants of concern.

The following assumptions are used in the analysis:

- 2.5 acres of the Booth Oil Site drains to the catch basin where the samples were collected.

- No other site contributes to the storm sewer system.

- Contaminant concentrations in the Little River upstream of the Robinson Street outfall are not considered.

- Flow in the Little River is adequate to promote thorough mixing.

- Contaminant concentrations at the storm sewer outfall are equal to those measured in the catch basin surface water.

The first step in the analysis is the calculation of acceptable contaminant doses to human receptors via ingestion of fish. For noncarcinogenic contaminants, the acceptable dose is calculated by the formula:

$$AI_{ni} = HI \times RfD_i$$

where:

AI_{ni} = acceptable intake for noncarcinogenic contaminant i (mg/kg-day)

HI = acceptable hazard index = 1.0

RfD_i = EPA reference dose for contaminant i (mg/kg-day)

The acceptable dose for carcinogenic contaminants is calculated by the formula:

$$AI_{ci} = \frac{R_t}{CSF_i}$$

where:

AI_{ci} = acceptable intake for carcinogenic contaminant i (mg/kg-day)

R_t = target carcinogenic risk = 1.00E-06

CSF_i = carcinogenic slope factor for contaminant i $(mg/kg\text{-}day)^{-1}$

Table 6-1 presents the acceptable intake values calculated for ingestion of contaminated fish, as calculated above. Review of the table indicates that acceptable intakes cannot be calculated for the following compounds due to the absence of EPA toxicity factors: aluminum, calcium, copper, iron, magnesium, potassium and sodium. The uncertainties associated with the exclusion of these

swfing/bos

Table 6-1

Maximum Risk-Based Contaminant Levels in
Surface Water Based Upon Ingestion of Fish

	Upper 95% Confidence Arith. Mean (mg/L)	BCF (l/kg)	Acceptable Carc. Intake (mg/kg-day)	Acceptable Non-Carc. Intake (mg/kg-day)	Acceptable Carc. Fish Conc. (mg/kg)	Acceptable Non-Carc. Fish Conc. (mg/kg)	Acceptable Carc. Swtr Conc. (mg/l)	Acceptable Non-Carc. Swtr Conc. (mg/l)
VOLATILES								
Acetone	1.20E-02	3.87E-01	N/A	1.00E-01	N/A	1.93E+02	N/A	5.00E+02
Benzene	2.20E-02	5.20E+00	3.45E-05	N/A	1.56E-01	N/A	3.00E-02	N/A
1,1-Dichloroethane	4.30E-02	1.35E+01	N/A	1.00E-01	N/A	1.93E+02	N/A	1.43E+01
1,2-Dichloroethene (tot	2.34E-01	2.00E+00	N/A	2.00E-02	N/A	3.87E+01	N/A	1.93E+01
Ethylbenzene	1.70E-02	3.75E+01	N/A	1.00E-01	N/A	1.93E+02	N/A	5.16E+00
Toluene	7.70E-02	1.07E+01	N/A	3.00E-01	N/A	5.80E+02	N/A	5.42E+01
Vinyl Chloride	2.78E-01	1.17E+00	4.35E-07	N/A	1.97E-03	0.00E+00	1.68E-03	N/A
Xylene (total)	7.40E-02	1.77E+02	N/A	2.00E+00	N/A	3.87E+03	N/A	2.19E+01
SEMIVOLATILES								
Benzoic acid	2.30E-02	2.09E+01	N/A	4.00E+00	N/A	7.74E+03	N/A	3.70E+02
Di-n-butylphthalate	2.00E-03	1.06E+04	N/A	1.00E-01	N/A	1.93E+02	N/A	1.82E-02
2,4-Dimethylphenol	4.60E-02	1.50E+02	N/A	2.00E-02	N/A	3.87E+01	N/A	2.58E-01
Fluoranthene	4.00E-03	1.15E+03	N/A	4.00E-02	N/A	7.74E+01	N/A	6.73E-02
2-Methylphenol	1.10E-02	1.85E+01	N/A	5.00E-02	N/A	9.67E+01	N/A	5.23E+00
4-Methylphenol	6.00E-02	1.85E+01	N/A	5.00E-02	N/A	9.67E+01	N/A	5.23E+00

swfing/bos

Table 6-1 (cont'd)

Maximum Risk-Based Contaminant Levels in
Surface Water Based Upon Ingestion of Fish

	Upper 95% Confidence Arith. Mean (mg/L)	BCF (l/kg)	Acceptable Carc. Intake (mg/kg-day)	Acceptable Non-Carc. Intake (mg/kg-day)	Acceptable Carc. Fish Conc. (mg/kg)	Acceptable Non-Carc. Fish Conc. (mg/kg)	Acceptable Carc. Swtr Conc. (mg/l)	Acceptable Non-Carc. Swtr Conc. (mg/l)
INORGANICS								
Aluminum	4.43E-01	-	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	8.00E-03	4.40E+01	N/A	1.00E-03	N/A	1.93E+00	N/A	4.40E-02
Barium	3.19E-01	-	N/A	5.00E-02	N/A	9.67E+01	N/A	N/A
Calcium	1.27E+02	-	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	7.00E-03	1.60E+01	N/A	1.00E+00	N/A	1.93E+03	N/A	1.21E+02
Copper	3.90E-02	2.00E+01	N/A	N/A	N/A	N/A	N/A	N/A
Iron	2.95E+00	-	N/A	N/A	N/A	N/A	N/A	N/A
Lead (inorganic)	1.30E-02	4.90E+01	N/A	1.40E-03	N/A	2.71E+00	N/A	5.53E-02
Magnesium	2.90E+01	-	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	4.11E-01	-	N/A	2.00E-01	N/A	3.87E+02	N/A	N/A
Nickel	6.00E-03	4.70E+01	N/A	2.00E-02	N/A	3.87E+01	N/A	8.23E-01
Potassium	6.56E+00	-	N/A	N/A	N/A	N/A	N/A	N/A
Sodium	2.93E+02	-	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	6.00E-03	-	N/A	7.00E-03	N/A	1.35E+01	N/A	N/A
Zinc	1.40E-01	4.70E+01	N/A	2.00E-01	N/A	3.87E+02	N/A	8.23E+00
Cyanide	1.70E-02	-	N/A	2.00E-02	N/A	3.87E+01	N/A	N/A
PESTICIDES/PCBs								
gamma-Chlordane	1.00E-03	1.40E+04	N/A	6.00E-05	N/A	1.16E-01	N/A	8.29E-06
Lead (organic)	1.30E-02	4.90E+01	N/A	1.00E-07	N/A	1.93E-04	N/A	3.95E-06

compounds from the quantitative assessment are discussed in Sections 3.0 and 7.0 of this report.

Acceptable concentrations in fish are calculated from the acceptable intake values by the formula:

$$AC_{fi} = \frac{AI_i \times BW \times T}{ER_f \times a \times FI \times ED \times f}$$

where:

AC_{fi}	=	Acceptable concentration of contaminant i in fish (mg/kg)
BW	=	average adult body weight (kg)
T	=	averaging time (days)
ER_f	=	ingestion rate for fish consumption (g/day)
a	=	conversion factor (1.00E-03 kg/g)
FI	=	fraction of fish ingested from the Little River (dimensionless)
ED	=	exposure duration (years)
f	=	frequency of exposure (days/year)

It must be noted that NYSDEC has issued a health advisory for consumption of carp from the Niagara River. A maximum of 1.1 kg/meal at a rate of 1 meal/month is advised for individuals

ingesting carp from the Niagara River south of the Falls. This value is higher than the EPA averages for fish consumption (EPA, 1989b). Accordingly, the higher, NYSDEC limit of 1.1 kg/meal at a frequency of 12 meals/year is utilized herein as a conservative estimate of annual consumption of fish from the Little River.

The following assumptions are used in the calculation of acceptable contaminant concentrations in fish:

- Average body weight (BW) for adults is 70 kg (EPA, 1989b).

- The averaging time (T) for noncarcinogens is 10950 days. This value represents an exposure duration (ED) of 30 years multiplied by 365 days/year.

- The averaging time (T) for carcinogens is 25,550 days. This value represents the standard 70 year lifetime multiplied by 365 days/year.

- The ingestion rate for fish consumption (ER_f), as discussed above, is equal to 1.1 kg/meal.

- The frequency of exposure (f) is equal to 12 meals/year.

- The fraction of fish ingested (FI) from the Little River is 1.0.

- The exposure duration (ED) is 30 years. This value corresponds to the upper 95% confidence interval mean residence time (EPA, 1989b).

Table 6-1 presents the calculated fish concentrations corresponding to acceptable levels of carcinogenic and noncarcinogenic risk.

Based upon the acceptable fish concentrations calculated above, acceptable concentrations in surface water are back-calculated through the use of bioconcentration factors (BCFs). The concept of bioconcentration is based upon the premise that tissue contaminant concentrations in aquatic animals are a function of equilibrium contaminant partitioning between water and organic tissue. The bioconcentration factor is defined as the ratio of the contaminant concentration in aquatic animal tissue to the average ambient water concentration at equilibrium:

$$BCF_i = \frac{C_{fi}}{C_{wi}}$$

where:

BCF_i = bioconcentration factor for contaminant i (l/kg)

C_{fi} = concentration of contaminant i in aquatic animal tissue (mg/kg)

C_{wi} = concentration of contaminant i in surface water (mg/l)

This ratio is highly contaminant-specific and varies depending upon the aquatic species and site-specific conditions. Accordingly, the most reliable BCFs are obtained from site-specific monitoring and tissue sampling investigations. In cases where sufficient site monitoring data are not collected to develop site-specific BCFs, EPA (1988b) recommends using BCF values reported in the technical literature for similar conditions, contamination and species, or calculating BCF values based upon the structure or physio-chemical properties of the individual contaminants. The BCFs utilized herein are a combination of those reported in the technical literature as well as those calculated from physio-chemical constants.

Table 6-1 presents the BCFs used in this analysis and the corresponding acceptable surface water concentrations for each contaminant. It must be noted that, in addition to those compounds excluded from the quantitative assessment due to the lack of toxicity factors, barium and manganese are also excluded from the

assessment as they do not have BCFs which are reported in the literature and calculation of BCFs from physio-chemical properties are not possible. The uncertainties associated with exclusion of these compounds from the assessment are discussed in Section 7.0 of this report.

Review of Table 6-1 indicates that the concentration of vinyl chloride in the catch basin surface water (2.78E-01 mg/l) exceeds the acceptable concentration of vinyl chloride in surface water for carcinogenic effects due to ingestion of fish (1.68E-03 mg/l). In addition, the concentrations of gamma-chlordane (1.00E-03 mg/l) and lead (1.30E-02 mg/l) in the catch basin surface water exceed their respective calculated acceptable surface water concentrations for noncarcinogenic effects (i.e., 8.29E-06 mg/l for gamma-chlordane, and 3.95E-06 mg/l for organic lead). It must be stressed, however, that these exceedances occur in the surface water samples collected in the catch basin, and that significant dilution is expected in the Little River.

In the absence of flow data for the Little River, the dilution required to meet the risk-based surface water concentrations is calculated by the formula:

$$Q_{lr} = \frac{(Q_s \times C_{si}) - (Q_s \times AC_{si})}{AC_{si}}$$

where:

Q_{lr} = required flow in the Little River to provide adequate dilution to meet the risk-based acceptable concentrations in surface water (ft^3/sec)

Q_s = site runoff flow rate (ft^3/sec)

C_{si} = concentration of contaminant i in the catch basin surface water sample (mg/l)

AC_{si} = acceptable concentration of contaminant i in surface water to provide acceptable risk for ingestion of fish (mg/l)

Site runoff is calculated by the empirical formula:

$$Q_s = R \times I \times A$$

where:

Q_s = site runoff flow rate (ft^3/sec)

R = runoff coefficient (dimensionless)

I = rainfall intensity (inches)

A = drainage area (acres)

The following assumptions are used in the above calculations:

- The runoff coefficient (R) for unimproved sites ranges from 0.1 to 0.3. A conservative average value of 0.25 is used in the calculation of site runoff flow (Burke, 1981).

- The rainfall intensity on the date of the catch basin sampling is 0.1 inch (NCDC, verbal communication, 12/18/90).

- Based upon site contour maps provided by Dvirka and Bartilucci Consulting Engineers, it is assumed that the catch basin drains 2.5 acres of the Booth Oil Site.

- The site runoff flow rate (Q_s) is equal to the flow rate of the Robinson Street discharge into the Little River.

As vinyl chloride, gamma-chlordane and organic lead are the only contaminants for which the risk based surface water concentrations were exceeded in the catch basin, these are the only contaminant for which required flow rates in the Little River are calculated. Table 6-2 presents the required flow in the Little River to provide adequate dilution to meet the target risk of 1.00E-06 for vinyl chloride, gamma-chlordane and organic lead in the runoff from the Booth Oil Site. Review of Table 6-2 indicates that the highest dilution of the three is required to meet the

rflow/bos-t

Table 6-2
Required Flows in the Little River
To Provide Acceptable Risks Via Ingestion of Fish

Compound	Required Flow (cfs)	% Flow of Niagara River (cfs)
vinyl chloride	10.28	0.017
gamma-chlordane	7.47	0.012
organic lead	205.63	0.332

acceptable surface water concentration for organic lead (205.63 ft^3/sec).

The NYSDEC reports that the flow of the Niagara River at Tonawanda Island is approximately 62,000 ft^3/sec. This value is used to calculated the percent flows required in the Little River (see Table 6-2). For example, a flow rate of 10.28 ft^3/sec is required in the Little River to meet the acceptable concentration of vinyl chloride for ingestion of fish. Dividing by the estimated flow in the Niagara River indicates that the flow in the Little River must be at least 0.017% of that in the Niagara River to meet the acceptable concentration of vinyl chloride for the Booth Oil Site runoff. Based upon the configurations of these water bodies (see Figure 2-1), it appears to be highly likely that the flow in the Little River will meet such a requirement. Similarly, 0.012% of the Niagara River flow is required in the Little River to meet the acceptable concentration of gamma-chlordane, and 0.33% of the Niagara River flow is required in the Little River to meet the acceptable concentration of organic lead for ingestion of fish. Again, it appears to be highly likely from the configurations of the rivers that the flow in the Little River will meet these required flows. Accordingly, runoff from the Booth Oil Site is not expected to contribute significantly to the contamination in the Niagara/Little River system.

Section 7

7.0 UNCERTAINTY ANALYSIS

There are a number of uncertainties involved in performing the health risk assessment. General sources of uncertainty include:

- Environmental sampling
- Analytical chemistry
- Environmental parameter measurement
- Environmental transport and fate
- Toxicological data
- Exposure scenario development
- Complex interactions of the above

The first three sources of uncertainty are common to any sampling and measurements routine. The uncertainties are associated with the representativeness of the sampling, as well as the analytical capabilities of the instrumentation. The EPA (1989b) guidance requires the use of the 95% confidence interval on the arithmetic mean contaminant concentrations in the assessment to characterize average levels of contaminants at the site. This is a conservative approach, in that, by definition, 95% of the potential data at the site are expected to be lower than the concentration used in the quantitative risk assessment. In addition, the use of proxy concentrations for contaminants which are not detected in a given sample adds uncertainty to the

analysis. In fact, the contaminant may be absent from the sample or may be present at a level slightly below the sample detection limit.

The fugitive dust and vapor emission estimation methods used in this assessment employ conservative assumptions and involve several potential sources of error. The EPA dust emission equation for construction activities and SCREEN dispersion model required several conservative assumptions regarding the nature and extent of construction activities conducted at the site. For example, the exposure models conservatively assume that the construction activities are conducted for the same intensity throughout the entire exposure period. Similarly, the vapor emission rates are assumed to be constant throughout the duration of exposure. These conservative assumptions may result in over-estimation of airborne contaminant levels at and emanating from the site.

The development of exposure scenarios also adds to the uncertainty of the analysis. Average values for life span and body weight, as well as for skin surface area, breathing rate, lung capacity, etc., are used in calculating chronic doses. The values used for these factors are obtained from literature (see specific references in text). Uncertainty lies in the extent to which each of these values characterizes the populations at the Booth Oil Site.

Other values used in the calculations which contribute to the uncertainty of the dose values include: consumption rate, and the nature, frequency and duration of exposure. Conservative values are used throughout each of the exposure scenarios, although an attempt has been made to account for realistic exposure frequencies of children exposed to the site. For example, the values for ingestion rate and dust adherence used in the ingestion and dermal exposure scenarios represent conservative estimates of exposure and may result in the calculation of exaggerated risk levels. Further, the risks posed to construction workers by dermal contact may be mitigated by adherence to standard practices of personal hygiene and occupational safety.

In addition, as discussed in Section 4.4, the simplified methods used herein to estimated absorbed dermal doses are expected to result in overestimation of dermal exposures and risks. Specifically, the method employed herein to estimate dermal absorption assumes a singe absorption factor for all contaminants in soil, in accordance with Hawley (1985). In fact, there is great variability in the dermal bioavailability of contaminants in soil. However, the available literature present little data on dermal absorption rates and bioavailability of contaminants in soil. Therefore, the extremely conservative methods set forth by Hawley (1985) are used in this assessment. In addition, inorganic contaminants are generally unavailable for dermal uptake from soil.

This fact is recognized by NYSDOH, which generally does not require risk assessment for dermal contact with inorganics in soil. However, EPA does not currently provide for exclusion of this exposure scenario from the risk assessment process, although it does not provide specific guidance for assessment of this scenario. Accordingly, the methods set forth by Hawley (1985) are used herein to estimate the doses and risks associated with this exposure scenario. However, the actual risks posed by dermal exposure to inorganics in soil are likely to be several orders of magnitude lower than estimated in this assessment.

The toxicity factors (Carcinogenic Slope Factors and Reference Doses) used in the computation of risk are derived primarily from animal studies at high doses. These factors also contribute to the uncertainty in the analysis. EPA (1986) states,

> A single toxicity parameter based on an animal study does not convey the route of administration of test doses of the suspect chemicals, the organ(s) in which the response occurred, or the severity of endpoints in the animal experiment used to calculate the dose-response relationship.

In addition, species differ in their responses to the toxic properties of chemicals. Therefore, extrapolation of animal toxicity studies to humans is a potential source of uncertainty. Similarly, animal toxicity studies are often conducted at relatively high doses for relatively short periods of time, and the

extrapolation to long-term chronic exposure increases the uncertainty in toxicity values.

EPA incorporates the uncertainties associated with extrapolating toxicity values from animal studies into the acceptable intake values for non-carcinogens through the use of an "uncertainty factor". The reference dose value is derived by dividing the "no-observed-adverse-effect-level" (NOAEL) or the "lowest-observed-adverse-effect level" (LOAEL) by an uncertainty factor (UF) multiplied by a modifying factor (MF) (EPA, 1989c).

EPA (1989c) states,

> The uncertainty factor used in calculating reference dose values reflects scientific judgment regarding the various types of data used to estimate [the values]. An uncertainty factor of 10 is usually used to account for variations in human sensitivity when extrapolating from valid human studies involving...exposure of average, healthy subjects. An additional 10-fold factor is usually used for each of the following extrapolations: from long-term animal studies..., from a LOAEL to a NOAEL, and from subchronic studies to a chronic reference dose.

The modifying factor (MF), ranging from >1 to 10, is used to incorporate professional assessment of the uncertainties of the study and database not included in the uncertainty factor. Table 3-1 lists the combined uncertainty factor/modifying factors for the noncarcinogenic indicator chemicals encountered in this risk assessment, as listed by EPA (1989c).

Use of the RfDs for organic and inorganic lead contribute additional uncertainties to the assessment. Since samples collected during the RI were analyzed for total lead, it cannot be determined what percentage of the lead is due to organic compounds and what percentage is due to inorganic compounds. Accordingly, a range of noncarcinogenic risk is calculated herein, with the upper limit calculated for the more toxic organic lead and the lower limit calculated for the less toxic inorganic lead. Additional uncertainty in the assessment of lies in the use of the RfD for inorganic lead. EPA has rescinded this RfD as non-conservative, and is currently developing a bio-kinetic model for the assessment of lead contamination. However, in the interim, EPA does not provide guidance for the risk assessment of inorganic lead. Accordingly, the RfD for inorganic lead is retained for use in this assessment to provide an estimate of the potential magnitude of risk associated with exposure to inorganic lead. However, the actual risks posed by lead contamination at the site may be greater than those estimated herein for inorganic lead.

Similarly, the CSF utilized herein to estimate the risks associated with CaPAHs is actually the EPA CSF for benzo(a)pyrene, in accordance with NYSDOH guidance. This conservative approach is likely to overestimate the cancer risk for PAH mixtures, since it appears that benzo(a)pyrene is more potent than most other environmentally prevalent CaPAHs. In addition, experiments with

PAHs in combustion emissions indicate that most PAH mixtures are considerably less potent than benzo(a)pyrene alone. However, given the limited amount of data concerning the carcinogenic potency of many CaPAHs, the cocarcinogenic potential of several non-carcinogenic PAHs and the epidemiological evidence linking PAH-containing materials and cancer, the CSF for benzo(a)pyrene is generally accepted as an interim toxicity factor for CaPAHs.

A number of compounds were excluded from the quantitative risk assessment due to the absence of EPA toxicity factors. These compounds, and the levels at which they were detected at the Booth Oil Site are listed in Table 3-2. Review of the table indicates that the following organic compounds were excluded from the quantitative assessment due to the lack of EPA toxicity factors: 2-hexanone, acenaphthylene, 2-methylnaphthalene and phenanthrene. Review of the table indicates that these compounds were detected at levels comparable to other organic contaminants identified at the Booth Oil Site. Further review of Table 3-2 indicates that a number of the inorganic contaminant, specifically calcium, iron, magnesium, potassium and sodium are essential nutrients which are beneficial to human health at low levels. Exclusion of the compounds listed in Table 3-2 from the quantitative assessment may result in underestimation of the risks associated with exposures to the Booth Oil Site. However, at the levels listed in the table,

these compounds are not expected to contribute significantly to the risks posed by exposures to the site.

Uncertainty also lies in the nature of the exposure in the studies compared to the nature of the exposures being addressed in the assessment. Toxicity studies are generally conducted for exposure to a single compound of concern. However, chemical toxicity can be affected by the presence of other chemicals. The toxicity of a chemical may be intensified (synergism), decreased (antagonism) in the presence of another chemical, or the individual chemicals may retain their individual toxic mechanisms (additivity). For example, synergism may be likened to 2 plus 2 equaling 6 (or any other number greater their sum). When chemicals interact antagonistically, the toxic effect of the combination is less than what would be expected from the individual toxicities of the chemicals (e.g., 2 plus 2 equals 3 or any number less than their sum). Accordingly, the equation 2 plus 2 equals 4 may be used to describe the concept of additivity. Toxicity values do not account for these types of interactions between chemicals in combined exposures.

The risk computations in this report are based upon the assumption of additivity of chemical effects. This assumption may tend to overestimate risks where antagonistic chemical and exposure interactions occur and underestimate the actual risks where

synergistic interactions occur. However, at very low doses, the effects of synergism and antagonism may cancel out, and are assumed to be insignificant. Therefore, due to the lack of scientific literature and consensus on synergism and antagonism for chronic effects of chemicals in combined exposures, the assumption of additivity used in this report is assumed to provide an accurate estimate of risk posed by the multiple-chemical exposures from the area of concern.

Overall, the assumptions used in this assessment are intended to provide realistic estimates of contaminant migration, exposure potential and duration, and risk. However, as discussed above, the methods employed herein to estimate dermal exposure are highly conservative. Therefore, the total risks for dermal exposures presented in this report are likely overestimated by several orders of magnitude.

Section 8

8.0 DEVELOPMENT OF RISK-BASED CLEANUP LEVELS

The preceding sections of this report provide data regarding the potential health risks posed by the present levels of contamination at the Booth Oil Site. In this section of this report, the results of the Preliminary Baseline Human Health Risk Assessment are used to develop target concentrations (i.e., clean-up goals) to provide acceptable levels of carcinogenic and noncarcinogenic risk to exposed populations.

A target concentration for a potentially carcinogenic contaminant is the concentration of that contaminant which would result in an acceptable risk, based upon exposure to all contaminants in the given medium. The NYSDOH has set 1.00E-06 as a remediation goal for inactive hazardous waste sites in New York State. Therefore, a total risk of 1.00E-06 is targeted in this analysis for exposures at the Booth Oil Site. Similarly, a total hazard index of 1.0 is targeted for noncarcinogenic exposures at the site. Target concentrations are calculated for those contaminants which result in unacceptable risks under the scenarios of baseline exposure. It must be noted that target concentrations are not developed herein to provide for acceptable risks to construction workers, as protection of this population is provided in the site-specific health and safety plan. In addition, due to the highly conservative methods employed herein to assess dermal

RT_T = total target carcinogenic risk or hazard index for the exposure (1.00E-06 for carcinogenic risk and 1.0 for noncarcinogenic hazard index)

The target contaminant risk (TR_i) is then used to derive individual target contaminant doses. Target contaminant doses for carcinogens are calculated by the formula:

$$TD_i = \frac{TR_i}{CSF_i}$$

where:

TD_i = target dose for contaminant i (mg/kg-day)

TR_i = target carcinogenic risk for contaminant i (dimensionless)

CSF_i = carcinogenic slope factor for contaminant i $(mg/kg\text{-}day)^{-1}$

Individual contaminant doses for noncarcinogens are calculated by the formula:

$$TD_i = TR_i \times RfD_i$$

where:

TD_i = target dose for contaminant i (mg/kg-day)

TR_i = target risk for contaminant i (dimensionless)

RfD_i = reference dose for contaminant i (mg/kg-day)

Reference doses (RfD) and carcinogenic slope factors (CSF) for contaminants at the Booth Oil Site are obtained from the Health Effects Summary Tables and EPA's "Integrated Risk Information System" (IRIS), and are listed in Table 3-1.

The target contaminant doses are used to calculate target contaminant concentrations for each exposure pathway resulting in elevated risks to children or residential populations in the Preliminary Baseline Human Health Risk Assessment. Review of Table 5-41 indicates that elevated carcinogenic risks and hazard indices are calculated for ingestion exposure of pica and non-pica children at the site, and dermal exposure of children at the site. However, as noted earlier, target concentrations are not calculated for dermal exposure due to the extremely conservative nature of this exposure scenario. Inhalation exposures of children and residents to fugitive dusts from the Booth Oil Site do not result in elevated carcinogenic risks or hazard indices. Accordingly, target concentrations are not calculated for the inhalation and dermal pathways in this assessment.

Review of Section 5.0 reveals that the elevated carcinogenic risks calculated for ingestion exposures of children are attributed to CaPAHs and PCBs. The elevated hazard indices calculated for ingestion exposure of children are due to lead. Accordingly, target contaminant concentrations are calculated for each of these compounds in this assessment. It must be noted that although inorganic lead did not result in unacceptable risks for ingestion exposure, target concentrations are calculated for ingestion of both organic and inorganic lead to provide a range of concentrations for consideration as cleanup targets.

Target contaminant concentrations are calculated from the target doses through the use of the exposure formulae and assumptions developed in the baseline assessment. Target contaminant concentrations based upon ingestion exposure are calculated by the formula:

$$TC_i = \frac{TD_i \times BW \times T}{a \times ER \times f \times ED}$$

where:

TC_i = target concentration of contaminant i (mg/kg)

TD_i = target dose for contaminant i (mg/kg-day)

BW = average body weight (kg)

T = averaging time (days)

a = conversion factor (1.00E-06 kg/mg)

ER = soil ingestion rate (mg/day)

f = frequency of exposure (days/year)

ED = exposure duration (years)

The same assumptions used in the baseline assessment are used in the above formula to calculate target contaminant concentrations.

Table 8-1 presents the target risks, target doses and target concentrations calculated for ingestion and dermal exposures of children. As discussed above, the target carcinogenic risks and hazard indices for each contaminant are based upon the percent contribution of the contaminant to the total risk or hazard index calculated for the exposure. For example, CaPAHs contributed an average of 46.3% of the total carcinogenic risk calculated for ingestion exposure in the baseline assessment. Therefore, to obtain a total risk of 1.00E-06 for the exposure, CaPAHs may contribute 46.3% of 1.00E-06, or 4.63E-07. This value is listed in Table 8-1 as the target risk for CaPAHs. Similarly, inorganic lead contributed 81.5% of the total hazard index for ingestion exposure in the baseline assessment. Therefore, to obtain a total hazard index of 1.0 for the exposure, inorganic lead may contribute 81.5% of 1.0, or 8.15E-01. This value is listed in Table 8-1 as the target hazard index for inorganic lead.

tce/bos-t

Table 8-1
Target Contaminant Concentrations in Surficial Soil
Based Upon Acceptable Risks and Ingestion Exposure

CARCINOGENIC RISK	Target Carcinogenic Risk *	Carcinogenic Slope Factor (mg/kg-day) ^ (-1)	Target Non-Pica Dose (mg/kg-day)	Target Pica Dose (mg/kg-day)	Target Non-Pica Soil Conc. (mg/kg)	Target Pica Soil Conc. (mg/kg)
Total CaPAHs	4.63E-07	1.15E+01	4.02E-08	4.02E-08	3.56E+01	3.56E+00
Total PCBs	5.13E-07	7.70E+00	6.66E-08	6.66E-08	5.90E+01	5.90E+00

NON-CARCINOGENIC HAZARD INDEX	Target Hazard Index *	Reference Dose (Oral) (mg/kg-day)	Target Non-Pica Dose (mg/kg-day)	Target Pica Dose (mg/kg-day)	Target Non-Pica Soil Conc. (mg/kg)	Target Pica Soil Conc. (mg/kg)
Lead (organic)	9.99E-01	1.00E-07	9.99E-08	9.99E-08	1.01E+01	1.01E+00
Lead (inorganic)	8.15E-01	1.40E-03	1.14E-03	1.14E-03	1.15E+05	1.15E+04

* Based upon % contribution to total risk in the assessment.

Review of Table 8-1 indicates that the difference between the target concentrations calculated for ingestion of organic lead (1.01 mg/kg) and inorganic lead (1.15E+04 mg/kg) is significant. The target concentration for ingestion of organic lead is highly restrictive in comparison to the EPA guideline of 500-1000 ppm, while the target concentration for ingestion of inorganic lead is extremely lenient in comparison with this guideline. These discrepancies are attributed to the great uncertainties associated with quantification of risks due to lead exposure.

First, it is highly unlikely that the lead contamination at the site is comprised entirely of organic lead, and therefore, the risks and target concentration calculated for ingestion of organic lead in this assessment are overly conservative. Second, the apparent leniency of the target concentration for inorganic lead is attributed to a combination of two factors. First, the EPA guidance range for lead is based upon a Centers for Disease Control (CDC) recommendation for protection of children in direct contact with soil in residential settings. The scenarios developed herein for ingestion exposure of children to contaminated soil involve less frequent exposure than would be expected in a residential setting. Accordingly, acceptable levels of contaminants in soil at the Booth Oil Site are higher than acceptable levels in residential settings where exposures of children would be more frequent. Second, the use of the RfD for inorganic lead for quantitative risk

assessment contributes to the development of an non-conservative target concentration. As previously discussed, the RfD for inorganic lead has been rescinded by EPA as a non-conservative value. EPA is currently developing a bio-kinetic model for the development of site-specific cleanup levels for lead. However, in the interim, a method for quantitative assessment of risks associated with inorganic lead exposure is not provided by EPA. The RfD for inorganic lead is retained in this assessment to provide an estimate of the risks associated with inorganic lead in the absence of specific guidance from EPA. Accordingly, the risks associated with exposure to inorganic lead at the Booth Oil Site may be greater than those estimated herein for inorganic lead. Based upon these uncertainties, it is suggested that the EPA range of 500 - 1000 ppm for lead in soil be considered for remediation at the Booth Oil Site.

Section 9

9.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This Preliminary Baseline Human Health Risk Assessment evaluates the potential health risks posed to children, residents, commercial populations and unprotected construction workers at and in the vicinity of the Booth Oil Site. Specifically, the following exposure scenarios are evaluated:

1. Children exposed to contamination during recreational activities on-site. Exposure pathways include ingestion of surficial soil, dermal contact with surficial soil, and inhalation of contaminated fugitive dust and volatilized contaminants during on-site recreational activities.

2. Children exposed to contamination during recreational activities at the playground. Exposure pathways include ingestion of surficial soil at the playground, dermal contact with surficial soil at the playground, and inhalation of contaminated fugitive dust and volatilized contaminants from the site while at the playground.

3. Nearby residential and commercial populations exposed to contamination through inhalation of fugitive dust and volatilized contaminants from the site.

4. Unprotected construction workers exposed to contamination through inhalation of contaminated fugitive dust and volatilized contaminants on-site, and direct contact with contaminated surficial and subsurface soil.

In addition, the potential impacts to the Little River by surface runoff from the Booth Oil Site are evaluated.

Table 9-1 presents a summary of the risks calculated for populations exposed to the Booth Oil Site. Review of Table 9-1 indicates that the carcinogenic risks and hazard indices calculated for residential and commercial populations within the vicinity of the Booth Oil Site are within acceptable limits. However, the carcinogenic risks and ranges of hazard indices calculated for children and unprotected construction workers at the site all exceed the acceptable limits of 1.0 for hazard index and 1.00E-06 for carcinogenic risk. In addition, the total carcinogenic risks and the hazard indices calculated with the RfD for organic lead for children at the playground exceed the NYSDOH goal.

It must be noted that exposure of unprotected construction workers at the Booth Oil Site is included herein as a baseline assessment. These risks may be mitigated through the use of control measures, such as dust suppression, or through the use of personal protective equipment. The site-specific health and safety

plan will address the personal protection and control measures deemed necessary for construction workers at the site during remedial activities.

Overall, the data presented in Table 9-1 indicate that ingestion and dermal exposures of children are of concern at the Booth Oil Site. Table 9-2 presents a summary of the individual contaminants which result in risks above the NYSDOH goal of 1.00E-06, based upon the conservative scenarios of exposure developed herein. It must be noted that the elevated risks calculated for construction workers are not included in this table, as they will be protected under the provisions of the site-specific health and safety plan. Review of Table 9-2 indicates that total PCBs, total CaPAHs and organic lead consistently result in elevated risks to children due to ingestion and dermal exposures at the Booth Oil Site. In addition, inorganic lead and antimony result in hazard indices that exceed the limit of 1.0 for dermal exposures of children to surficial soil for the conservative exposure scenarios utilized in this assessment.

Inspection of Tables 9-1 and 9-2 indicates that dermal exposures contribute most significantly to the elevated risks and hazard indices calculated for children at the Booth Oil Site. However, the dermal risks presented herein are expected to be overestimated due to the conservative methods employed in the dose

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Table 9-1
Total Carcinogenic Risks and Non-Carcinogenic Hazard Indices
Booth Oil Site

Receptor	Ingestion Exposure		Inhalation Exposure		Dermal Exposure		TOTAL	
Construction Worker On-Site								
Carcinogenic Risk	N/A		4.37E-04	+	6.85E-05	+	5.06E-04	+
Non-Carc. Hazard Index *	N/A		1.95E+02	+	7.82E+01	+	2.73E+02	+
Non-Carc. Hazard Index**	N/A		1.95E+02	+	7.11E+05	+	7.11E+05	+
Non-Pica Children On-Site								
Carcinogenic Risk	4.23E-06	+	3.93E-08		9.77E-05	+	1.02E-04	+
Non-Carc. Hazard Index *	4.04E-02		2.12E-03		2.21E+01	+	2.21E+01	+
Non-Carc. Hazard Index**	4.51E+02	+	2.12E-03		2.24E+05	+	2.24E+05	+
Pica Children On-Site								
Carcinogenic Risk	4.23E-05	+	3.93E-08		9.77E-05	+	1.40E-04	+
Non-Carc. Hazard Index *	4.04E-01		2.12E-03		2.21E+01	+	2.25E+01	+
Non-Carc. Hazard Index**	4.51E+03	+	2.12E-03		2.24E+05	+	2.29E+05	+
Non-Pica Children at the Playground								
Carcinogenic Risk	3.32E-07		1.50E-07		8.46E-07		1.33E-06	+
Non-Carc. Hazard Index *	6.05E-03		1.23E-02		9.12E-01		9.30E-01	
Non-Carc. Hazard Index**	5.48E+01	+	1.23E-02		6.82E+03	+	6.87E+03	+
Pica Children at the Playground								
Carcinogenic Risk	3.32E-06	+	1.50E-07		8.46E-07		4.32E-06	+
Non-Carc. Hazard Index *	6.05E-02		1.23E-02		9.12E-01		9.85E-01	
Non-Carc. Hazard Index**	5.48E+02	+	1.23E-02		6.82E+03	+	7.37E+03	+

(continued..)

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Table 9-1
Total Carcinogenic Risks and Non-Carcinogenic Hazard Indices
Booth Oil Site

Receptor	Ingestion Exposure	Inhalation Exposure	Dermal Exposure	TOTAL
Residents at No. Marion Street				
Carcinogenic Risk	N/A	1.79E-07	N/A	1.79E-07
Non-Carc. Hazard Index	N/A	5.63E-02	N/A	5.63E-02
Commercial Pop. at Robinson St.				
Carcinogenic Risk	N/A	1.10E-07	N/A	1.10E-07
Non-Carc. Hazard Index	N/A	5.31E-02	N/A	5.31E-02
Commercial Pop. at River Road				
Carcinogenic Risk	N/A	3.06E-08	N/A	3.06E-08
Non-Carc. Hazard Index	N/A	1.50E-02	N/A	1.50E-02
Residents at Sommer Street				
Carcinogenic Risk	N/A	4.93E-08	N/A	4.93E-08
Non-Carc. Hazard Index	N/A	2.46E-02	N/A	2.46E-02
Commercial Pop. at Sommer St.				
Carcinogenic Risk	N/A	4.92E-08	N/A	4.92E-08
Non-Carc. Hazard Index	N/A	2.46E-02	N/A	2.46E-02

* RfD for inorganic lead is used for total lead in ingestion and dermal exposure scenarios.

** RfD for organic lead is used for total lead in ingestion and dermal exposure scenarios.

+ Exceeds acceptable limits of 1.00E-06 for carcinogenic risk or hazard index of 1.0 for non-carcinogenic risk.

Table 9-2
Summary of Elevated Risks By Area and Contaminant

Area	Risk	Receptor	Total Risk	Contaminant/Risk
INGESTION				
AREA A	Non-Carcinogenic	Non-Pica Children	7.04E-03 - 8.87E+01	Organic Lead / 8.87E+01
	Carcinogenic	Pica Children	5.26E-06	Total PCBs / 3.74E-06
	Carcinogenic	Pica Children	5.26E-06	Total CaPAHs / 1.47E-06
	Non-Carcinogenic	Pica Children	7.04E-02 - 8.87E+02	Organic Lead / 8.87E+02
AREA B	Carcinogenic	Non-Pica Children	2.65E-06	Total PCBs / 1.10E-06
	Carcinogenic	Non-Pica Children	2.65E-06	Total CaPAHs / 1.53E-06
	Non-Carcinogenic	Non-Pica Children	2.30E-02 - 2.42E+02	Organic Lead / 2.42E+02
	Carcinogenic	Pica Children	2.65E-05	Total PCBs / 1.10E-05
	Carcinogenic	Pica Children	2.65E-05	Total CaPAHs / 1.53E-05
	Non-Carcinogenic	Pica Children	2.30E-01 - 2.42E+03	Organic Lead / 2.42E+03
AREA C	Non-Carcinogenic	Non-Pica Children	5.83E-03 - 7.35E+01	Organic Lead / 7.35E+01
	Carcinogenic	Pica Children	9.67E-06	Total PCBs / 8.41E-06
	Carcinogenic	Pica Children	9.67E-06	Total CaPAHs / 1.21E-06
	Non-Carcinogenic	Pica Children	5.83E-02 - 7.35E+02	Organic Lead / 7.35E+02
AREA D	Non-Carcinogenic	Non-Pica Children	4.56E-03 - 4.63E+01	Organic Lead / 4.63E+01
	Non-Carcinogenic	Pica Children	4.56E-02 - 4.63E+02	Organic Lead / 4.63E+02
DERMAL				
AREA A	Non-Carcinogenic	Children	3.64E+00 - 4.41E+04	Inorganic Lead / 3.15E+00
	Non-Carcinogenic	Children	3.64E+00 - 4.41E+04	Organic Lead / 4.41E+04
	Carcinogenic	Children	1.45E-05	Total PCBs / 1.34E-05
	Carcinogenic	Children	1.45E-05	Total CaPAHs / 1.17E-06
AREA B	Non-Carcinogenic	Children	1.33E+01 - 1.20E+05	Inorganic Lead / 8.60E+00
	Non-Carcinogenic	Children	1.33E+01 - 1.20E+05	Antimony / 3.64E+00
	Non-Carcinogenic	Children	1.33E+01 - 1.20E+05	Organic Lead / 1.20E+05
	Carcinogenic	Children	5.14E-05	Total PCBs / 3.92E-05
	Carcinogenic	Children	5.14E-05	Total CaPAHs / 1.21E-06
AREA C	Non-Carcinogenic	Children	3.01E+00 - 3.65E+04	Inorganic Lead / 2.61E+00
	Non-Carcinogenic	Children	3.01E+00 - 3.65E+04	Organic Lead / 3.65E+04
	Carcinogenic	Children	3.10E-05	Total PCBs / 3.00E-05
AREA D	Non-Carcinogenic	Children	2.20E+00 - 2.30E+04	Inorganic Lead / 1.65E+00
	Non-Carcinogenic	Children	2.20E+00 - 2.30E+04	Organic Lead / 2.30E+04

estimations. In addition, it must be noted that NYSDOH does not currently require risk assessment for dermal exposure to inorganics in soil, due to the limited availability of these contaminants for dermal uptake from soil. Accordingly, the elevated risks calculated herein for dermal exposure, particularly those for inorganics, are likely overestimated by several orders of magnitude.

Further review of Table 9-2 indicates that Area B surficial soil contributes most significantly to the elevated risks and hazard indices calculated for ingestion exposure of children. It is important to note that the risks due to CaPAHs, which are responsible for the bulk of the ingestion risk in Area B, are based upon proxy concentrations estimated from the sample detection limits and not upon actual reported concentrations. However, the risks due to ingestion of surficial soils in Areas A and C by non-pica children, which are only marginally below the NYSDOH goal of 1.00E-06, and the elevated risks to pica children by surficial soils in Areas A and C are due to actual detected contaminant concentrations.

Risk-based target contaminant concentrations are calculated for those contaminants which result in elevated carcinogenic and noncarcinogenic risks for ingestion exposure in this assessment. These risk-based target concentrations are presented in Table 8-1.

The target concentration calculated for total CaPAHs is 3.56 mg/kg. The target concentration calculated for total PCBs is 5.90 mg/kg.

The target concentrations calculated for ingestion exposure to inorganic lead is 1.15E+04 mg/kg, and the target concentration calculated for organic lead is 1.01 mg/kg. There is a large discrepancy between the target concentrations calculated for inorganic and organic lead. The target concentration calculated for ingestion exposure to organic lead (1.01 mg/kg) is four orders of magnitude lower than that calculated for inorganic lead (1.15E+04 mg/kg). In addition, the target concentration for ingestion of organic lead is highly restrictive in comparison to the EPA guideline of 500-1000 ppm, while the target concentration for ingestion of inorganic lead is extremely lenient in comparison with this guideline. These discrepancies are attributed to the great uncertainties associated with quantification of risks due to lead exposure, as discussed herein. Accordingly, it is suggested that the EPA guideline of 500 - 1000 ppm be considered for use in the selection of remedial goals for the Booth Oil Site.

In the absence of measured flow data, a method of back-calculation was employed herein to assess the potential impact of surface runoff from the Booth Oil Site on the Little River. Required flows in the Little River to provide adequate dilution of surface runoff from the Booth Oil Site are calculated herein based

upon acceptable contaminant levels in fish. The results of this analysis indicate that the flow of the Little River must be at least 205 cubic feet per second (cfs) to provide acceptable levels of lead (as organic lead), in fish inhabiting the river for human consumption. This is the most stringent requirement calculated in the analysis. The NYSDEC reports that the flow of the Niagara River at Tonawanda Island is approximately 62,000 cfs. Based upon this flow rate, it is highly likely that the flow in the Little River will be significantly greater than the requirements calculated herein. Accordingly, runoff from the Booth Oil Site is not expected to contribute significantly to the contaminant levels in the Little/Niagara River System.

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