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5.0 RISK CHARACTERIZATION

This chapter describes the final step of the baseline health risk assessment process, risk characterization. In this step, the toxicity and exposure assessments are summarized and integrated into quantitative and qualitative expressions of risk. Comparisons are made between projected intakes of substances and reference doses to characterize potential non-carcinogenic effects. The probabilities that individuals will develop cancer over a lifetime of exposure are estimated from projected intakes and chemical-specific dose-response information. Major assumptions, scientific judgments, and to the extent possible, estimates of the uncertainties embodied in the assessment are also presented.

5.1 REVIEW OF EXPOSURE AND TOXICITY ASSESSMENT RESULTS

The purpose of this section is to ensure that the exposure estimates correspond as closely as possible to the assumptions used in developing the toxicity values. These assumptions include the averaging period for exposure, the exposure route, and absorption adjustments.

5.1.1 AVERAGING PERIODS

The exposure duration used in the intake equations (Section 3.6) must be consistent with the averaging period that the toxicity value is based upon. Average lifetime exposures must be used to estimate cancer risks (i.e., exposures lasting less than a lifetime must be converted to equivalent lifetime exposures) because the slope factors are based on a 70 year exposure. Subchronic RfD's are based on exposures lasting two weeks to seven years and should be used to evaluate the potential noncarcinogenic effects associated with exposure periods between two weeks and seven years (U. S. EPA, 1989a). Chronic RfD's are developed to be protective for long-term exposures to a chemical. Chronic RfD's should be used to evaluate the potential noncarcinogenic effects associated with exposure periods between 7 years and 70 years. Exposures for children were calculated based on a six-year exposure (ages 1-7). This duration correlates with subchronic reference doses used to evaluate this shorter exposure period, which are based on an exposure duration of 2 weeks to 7 years. The averaging period used for non-carcinogens was 30 years, which is equivalent to the exposure duration. A lifetime averaging period (70 years) was used to evaluate exposure to carcinogens to be consistent with assumptions used to develop the slope factors for carcinogens. The 1-7 year age range for children corresponds closely to the 1-6 year range used to estimate soil ingestion rates

by children (U.S. EPA, 1989a), and has been used throughout the assessment in evaluating potential risks to children.

5.1.2 Exposure Routes

The toxicity values used for the chemicals of concern were chosen to reflect the exposure route in each potential pathway at the site. Chronic oral reference doses were used for ingestion pathways for adults and were used to extrapolate dermal toxicity values as recommended in the U.S. EPA Superfund Human Health Evaluation Manual (U.S. EPA, 1989a). Subchronic reference doses were used similarly to estimate intakes for children. These subchronic RfD's were used because they more closely correlate to exposure assumptions for children ages 1-7.

5.1.3 Absorption Adjustments

Exposure estimates are expressed in the form of chemical intakes. Chemical specific absorption factors for dermal intake are not available for the chemicals of concern. The concentration of chemicals absorbed through dermal contact is generally expected to be far less than the concentration of chemical that actually comes in contact with the skin. Information from "Assessing Risk from Dermal Exposures at Hazardous Waste Sites" (Ryan, *et al*, 1987) was used to estimate dermal absorption efficiencies for various constituents (25% for volatile organics; 10% for semi-volatile organics; 1% for inorganics).

5.2 QUANTIFYING RISKS

This section describes steps for quantifying risk or hazard indices for both carcinogenic and non-carcinogenic effects for each exposure pathway analyzed. The first subsection covers procedures for individual chemicals of concern and the second subsection presents procedures for quantifying risks associated with simultaneous exposures to all of the chemicals of concern.

5.2.1 Risk Estimates for Individual Chemicals of Concern

5.2.1.1 Carcinogenic Effects

Risks for carcinogens are estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the potential carcinogen (i.e., incremental or excess individual lifetime cancer risk above background). The slope

factor (SF) converts estimated daily intakes averaged over a lifetime of exposure directly to the incremental risk of an individual developing cancer. Because relatively low intakes (compared to those experienced by test animals) are most likely to occur from the environmental exposures at the site, it was assumed that the dose-response relationships will be linear in the low-dose portion of the multistage model dose-response curve. With this assumption, the slope factor is constant, and risk will be directly related to intake. Equation 7 is the linear low-dose equation used to estimate risks due to long-term exposure to low doses of carcinogens.

Because the slope factor is the upper 95th percentile confidence limit of the probability of response based on experimental animal data used in the multistage model, the carcinogenic risk estimate will generally be an upper-bound estimate. This means that the "true risk" will probably not exceed the risk estimate derived through use of the model and is likely to be less than that predicted.

The following sections detail the estimated risks of developing cancer resulting from current or potential future exposures to affected media at the Skinner site. They are organized according to media (soil, ground water, surface water, sediments) and detail cancer risks on a route-specific basis.

a. Soils

1. Waste Lagoon Area

Intakes of carcinogenic chemicals of concern through the ingestion of and/or dermal contact with surface soils in the waste lagoon area were below the one-in-one million risk level for all current populations and for all future populations, assuming no residential development occurs in this vicinity (see Tables 5-1 through 5-3). This assumes no excavation or disruption of deep soils in the waste lagoon area.

The estimated carcinogenic risks from total intake (ingestion and/or dermal contact) of waste lagoon soil for several chemicals were above one-in-one- million for all potentially exposed populations, assuming future residential development (excavation of deep soils) of the waste lagoon area (see Tables 5-1 through 5-3). The greater portion of risks result from dermal contact with soils. Table 5-2 shows that exposure through dermal contact to hexachlorobenzene would result in risks exceeding one-in-one-million by an estimated four orders of magnitude. Additionally, dermal exposures to several chemicals may result in excess cancer risks exceeding one-in-one-million by two orders of magnitude,

including carbon tetrachloride, heptachlor, aldrin, dieldrin, a number of dioxins and dibenzofurans, and several semi-volatile chemicals. Of those semi-volatiles, several are PAHs including benzo(a)pyrene, chyrsene, and indeno (1,2,3-cd) pyrene. These chemicals were evaluated using the slope factor for benzo(a)pyrene, the only PAH for which a slope factor has been calculated. This grouping of PAHs may affect the overall carcinogenic risk resulting from exposure to soils in the waste lagoon area by over- or under-estimating the actual risks. Intakes (ingestion or and/or dermal contact) of hexachlorobenzene, the carcinogenic PAHs, the dioxins and furans contribute most significantly to estimate excess cancer risks due to exposure to waste lagoon soils.

2. Remaining Site-Wide Soils

Estimated carcinogenic risks due to intakes of the chemicals of concern in remaining site-wide soils, as denoted in Tables 5-4 through 5-6, exceed the one-in-one-million risk level for all current and future potentially exposed populations.

For current populations, exposure through ingestion of PCB Aroclor 1254 in soils exceeds the one-in-one-million cancer risk level by three orders of magnitude (see Table 5-4). Exposure through dermal contact with PCB Aroclor 1254 in soils exceeds the one-in-one-million cancer risk level by four orders of magnitude (see Table 5-5). Further excess risks result from ingestion of and/or dermal contact with several carcinogenic PAHs and hexachlorobenzene in site-wide soils.

For future populations, it is estimated that excess cancer risks would exceed one-in-one-million by three orders of magnitude resulting from total intake or chemicals in site-wide soils (see Table 5-6). Intakes of PCB Aroclor 1254 contributes most significantly to these excess risks, in addition to hexachlorobenzene and several carcinogenic PAHs.

b. Ground Water

Carcinogenic risks were estimated for current and future populations for a number of exposure pathways, including ingestion, dermal contact via showering, inhalation via showering, and total intake of ground water. The estimated risks for each population are presented in Tables 5-7 through 5-10.

Intakes of PCB Aroclor 1254 through ingestion of ground water may result in cancer risks in excess of one-in-one-million for the current residential adult and child populations by one order of magnitude or less (see Table 5-7). For future residential

populations, estimated carcinogenic risks exceed one-in-one-million for a number of chemicals, including arsenic, vinyl chloride, benzene, and bis(2-chloroethyl) ether by three orders of magnitude. Intakes of other chemicals exceed the one-in-one-million risk by two orders of magnitude or less (see Table 5-7).

Intakes of chemicals through dermal contact via showering are presented in Table 5-8. Current adult populations are estimated to have dermal intakes of chloroform through showering that slightly exceed one-in-one-million. For future populations, intakes of several chemicals would result in estimated cancer risks that exceed one-in-one-million, including vinyl chloride, benzene, and number of other chlorinated chemicals (see Table 5-8).

As shown in Table 5-9, no estimated carcinogenic risks through inhalation via showering exceeded the one-in-one-million risk level for any current population. Intakes of several chemicals through inhalation via showering for future residential populations may result in cancer risks in excess of one-in-one-million, specifically for vinyl chloride, chloroform, 1,2-dichloroethane, and benzene.

Total intakes of ground water for current and future residential populations are presented in Table 5-10. Intakes of chloroform and PCB Aroclor 1254 may result in cancer risks in excess of one-in-one-million for current residential populations. For future populations, intakes of several chemicals may result in excess cancer risks of two to three orders of magnitude. Intakes of arsenic, vinyl chloride, benzene, and bis (2-chloroethyl) ether contribute the most to these estimated carcinogenic risks.

c. Surface Water

Tables 5-11 through 5-16 show the carcinogenic risks from exposure to surface water. Creeks and ponds have been evaluated separately for each population. Intakes through ingestion of and dermal contact with surface waters have been estimated individually and the total intakes calculated for each surface water body.

1. Creeks

No excess carcinogenic risks are estimated to exist for current populations through incidental ingestion of surface water from any creek at the site (see Table 5-11). Carcinogenic risks slightly exceeding one-in-one-million may occur for future populations through ingestion of surface water from Mill Creek due to estimated future

concentrations of 1,2-dichloropropane, 1,1,2-trichloroethane, bis(2-chloroethyl)ether and hexachlorobenzene.

As depicted in Table 5-12, cancer risks for current populations through dermal contact with surface water from any creek at the site are not estimated to exceed one-in-one-million. Potentially exposed future populations may receive intakes of several chemicals through dermal contact with water in Mill Creek that exceed the one-in-one-million cancer risk level by a factor of two to three orders of magnitude. Dermal intakes of 1,2-dichloropropane, 1,1,2-trichloroethane, and 1,1,2,2-tetrachloroethane contribute most to these excess risks.

No current population is likely to receive total intakes of chemicals through exposure to surface water from any creek that exceeds the one-in-one-million cancer risk level (see Table 5-13). Future residential and recreational populations may receive intakes of chemicals from Mill Creek that exceed the one-in-one-million cancer risk level by two to three orders of magnitude. The particular chemicals of concern contributing to these excess risks are noted in Table 5-13.

2. Ponds

As noted in Tables 5-14, 5-15, and 5-16, no excess cancer risks have been determined for any current or future population resulting from ingestion of and/or dermal contact with surface water from any pond on site.

d. Sediments

Tables 5-17 through 5-22 show the carcinogenic risks from exposure to sediments. Creeks and ponds have been evaluated separately for each population. Intakes through ingestion of and dermal contact with sediments have been estimated individually and the total intakes calculated for all creeks and ponds.

1. Creeks

No excess carcinogenic risks are estimated to exist for any current or future populations through incidental ingestion of sediments from any creek at the site (see Table 5-17). Intakes of chemicals through dermal contact with sediments in both Mill and Skinner Creeks may result in carcinogenic risks slightly exceeding one-in-one-million for current and future residential populations, as shown in Table 5-18. The chemicals of concern

contributing most significantly to these risks are several carcinogenic PAH's. Total intakes of chemicals through exposure to creek sediments are shown in Table 5-19. Estimated carcinogenic risks resulting from these exposures exceed one-in-one-million by one order of magnitude or less in each affected current and future population.

2. Ponds

As noted in Table 5-20, no excess cancer risks have been determined for any current or future population resulting from ingestion of chemicals of concern in sediments from any pond on site.

Table 5-21 shows estimated carcinogenic risks resulting from dermal contact with pond sediments. Current and future residential and recreational adult populations may receive dermal intakes from sediments in Diving Pond that result in carcinogenic risks slightly exceeding one-in-one-million. These exceedances are less than one order of magnitude and result from the additive effect of exposure to various chemicals of concern in Diving Pond sediments. The intakes of individual chemicals in pond sediments via dermal contact do not result in chemical-specific risks greater than one-in-one-million.

Estimated carcinogenic risks from total intakes of pond sediments are shown in Table 5-22. Current and future adult residential and recreational populations may receive intakes of chemicals in Diving Pond sediments that result in carcinogenic risks that slightly exceed the one-in-one-million risk level. No other exposures to pond sediments were found to result in carcinogenic risks exceeding one-in-one-million.

5.2.1.2 Non-carcinogenic Effects

The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified time period with a reference dose derived for a similar exposure period. This ratio of exposure to toxicity is called the hazard quotient, and it is calculated using Equation 8.

The non-cancer hazard quotient assumes that there is a level of exposure (the reference dose) below which it is unlikely for even sensitive populations to experience adverse health effects. If the exposure level (E) exceeds this threshold (i.e., if E/RfD exceeds one), there may be adverse non-cancer health effects.

Tables 5-23 through 5-44 present the hazard quotients for each potentially exposed population due to exposure to soil, ground water, surface water, and sediments.

The following sections detail exceedances of reference doses (RfD's) resulting from exposures to affected media at the Skinner site.

a. Soils

1. Waste Lagoon Area

Two scenarios were evaluated for soils in the waste lagoon area: current and future exposures assuming no residential development in this area (no excavation of deep soils), and future exposures assuming residential development will occur in the area (excavation of deep soils).

No chemical intakes via ingestion of soils in the waste lagoon area were found to exceed relevant RfD's (no hazard quotients greater than one) for any current population or future population assuming no residential development (see Table 5-23). Ingestion of waste lagoon soils by future populations assuming residential development may result exposures resulting in hazard indices greater than one for a number of chemicals, as shown in Table 5-23. Chemicals of concern contributing most significantly to these excess risks are hexachlorobenzene and chlordene.

No chemical intakes via dermal contact with soils in the waste lagoon area were found to result in hazard quotients greater than one for any current population or future population assuming no residential development (see Table 5-24). Dermal contact with waste lagoon soils by future populations assuming residential development may result in exposures resulting in hazard indices greater than one for a number of chemicals, as shown in Table 5-24. Chemicals of concern contributing most significantly to these excess risks are carbon tetrachloride, toluene, aldrin, chlordene, chlordane, and hexachlorobenzene.

Table 5-25 shows the hazard quotients and indices from total intake of waste lagoon soils by current and future populations in both potential future scenarios. No chemical intakes by current populations (or future populations assuming no residential development) would result in hazard indices or quotients exceeding one. For future populations (assuming residential development), hazard indices greater than one are estimated for

several chemicals, as shown in Table 5-25. These exceedances are two to three orders of magnitude above unity (or one).

2. Site-Wide Soils

Tables 5-26 through 5-28 show the hazard quotients and indices resulting from exposure to site-wide soils via ingestion and/or dermal contact for all current and future populations.

Intakes of PCB Aroclor 1254 via ingestion by all current populations exceed the RfD and results in hazard quotients greater than one, as shown in Table 5-26. For future populations, no intakes of specific chemicals of concern result in hazard quotients of more than one; however, the total hazard index for the future residential child population slightly exceeds one.

Intakes of chemicals through dermal contact with site-wide soils may result in excess non-cancer risks for all current and future potentially exposed populations (see Table 5-27). Chemicals of concern contributing to these risks include PCB Aroclor 1254, hexachlorobenzene, and two dioxins. These exceedances result in hazard indices that exceed one by one or two orders of magnitude.

Table 5-28 depicts hazard quotients and indices from total intake of site-wide soils. All current and future potentially exposed populations are subject to excess non-cancer risks (expressed as hazard quotients greater than one) through total intake of site-wide soils by one to two orders of magnitude.

b. Ground Water

Non-cancer risks have been estimated for current and future populations for a number of exposure pathways, including ingestion, dermal contact and inhalation via showering, and total intake of ground water. The hazard quotients and indices for each population are presented in Tables 5-29 through 5-32.

No current population is subject to excess non-cancer risks (hazard quotients exceeding one) through ingestion of ground water at the site (see Table 5-29). Ingestion of ground water by future populations, however, may result in some excess non-cancer risks, as shown in Table 5-29. The chemicals of concern contributing most significantly to these excess non-cancer risks are cobalt and 1,2-dichloroethene.

As shown in Table 5-30, no current population is subject to excess non-cancer risks (hazard quotients exceeding one) through dermal contact with ground water via showering. Future residential adult and child populations may be subject to excess non-cancer risks through dermal contact with cobalt, acetone, and 1,2-dichloroethene in ground water via showering. These hazard quotients exceed one by one order of magnitude or less.

Table 5-31 shows the hazard quotients and indices from inhalation of ground water via showering. No chemical intakes via this pathway result in excess non-cancer risks for any current or future population.

Total intakes of ground water do not result in excess non-cancer risks for current populations, as shown in Table 5-32. Intakes of several chemicals by future residential and occupational populations may result in hazard quotients and indices exceeding one. The specific chemicals of concern resulting in these excess non-cancer risks, which are two orders of magnitude above unity, are shown in Table 5-32.

c. Surface Water

Tables 5-33 through 5-38 show the hazard quotients and indices from exposure to surface water for all current and future populations. Creeks and ponds have been evaluated separately for each population. Intakes through ingestion of and dermal contact with surface waters have been estimated individually and the total intakes calculated for each surface water body.

1. Creeks

No excess non-cancer risks were estimated for any current or future population resulting from ingestion of surface water from any creek (see Table 5-33).

No excess non-cancer risks were estimated for any current population resulting from dermal contact with surface water from any creek. As shown in Table 5-34, dermal contact with surface water in Mill Creek may result in some excess non-cancer risks (hazard quotients exceeding one) for future residential and recreational populations. Chemicals of concern with hazard quotients exceeding unity include carbon tetrachloride, 1,1,2-trichloroethane, and toluene.

No excess non-cancer risks were estimated (no hazard quotients exceeded one) for any current population resulting from total intakes of surface water from Mill Creek. Future populations may be subject to excess non-cancer risks of one order of magnitude or less resulting from total intake of creek surface water from Mill Creek. No other creeks had concentrations of chemicals resulting in hazard quotients exceeding one.

2. Ponds

As shown in Tables 5-36 through 5-38, no excess non-cancer risks were estimated for any current or future population resulting from intakes of chemicals through ingestion and/or dermal contact of surface water from any pond on the site.

d. Sediments

Tables 5-39 through 5-44 show the hazard quotients and indices from exposure to sediments for all current and future populations. Creeks and ponds have been evaluated separately for each population. Intakes through ingestion of and dermal contact with sediments have been estimated individually and the total intakes calculated for each surface water body. As shown in these tables, no excess non-cancer risks (hazard quotients exceeding one) were estimated for any current or future population resulting from ingestion of and/or dermal contact with sediments in any pond or creek.

5.2.2 Aggregate Risks for Multiple Chemicals

A number of chemicals are present at the site and the aggregate risks that could occur due to exposure to all of these chemicals must be evaluated. This evaluation is performed utilizing different methods for carcinogens and non-carcinogens.

5.2.2.1 Aggregate Carcinogenic Effects

Equation 9 estimates the incremental individual lifetime cancer risk for simultaneous exposure to several carcinogens and is based on the U. S. EPA's (1986a, b) risk assessment guidelines. This equation accounts for the possibility of the same individual developing cancer as a consequence of exposure to two or more carcinogens. This equation assumes the intakes of each chemical are relatively small, which is usually an appropriate assumption at this site. The equation also assumes independence of action for the chemicals involved, or that there are no antagonistic or synergistic chemical effects and that all the chemicals produce cancer.

Equation 9 has several significant limitations. First, because each slope factor is an upper 95th percentile estimate of potency, and because upper 95th percentiles of probability distributions are not additive, the total cancer risk estimate may be artificially more conservative as risks from a number of different carcinogens are summed. Second, the cancer risk equation for multiple chemicals sums all carcinogens equally, giving equal weight to all classes of carcinogens. Also, slope factors derived from animal data will be given the same weight as slope factors derived from human data. Finally, the actions of two carcinogens may not be independent. Tables 5-3, 5-6, 5-10, 5-13, 5-16, 5-19, and 5-22 give estimated risks for total intakes by all populations for current and future exposures. Table 5-45 presents a summary of carcinogenic risks for all exposure routes and exposed populations.

a. Soils

1. Waste Lagoon Area

The total estimated carcinogenic risk for all current populations and future populations (assuming no residential development) through exposure (dermal contact or ingestion) to waste lagoon soils is below one-in-one-million (see Table 5-3). The total carcinogenic risk resulting from exposure (dermal contact and ingestion) to soils in the waste lagoon areas exceed one-in-one-million for all potentially exposed future populations (assuming residential development) by four orders of magnitude. Exposures to hexachlorobenzene, several pesticides and dioxins, and several PAHs in soils accounts for the majority of the total risk.

2. Site-Wide Soils

As shown in Table 5-6, the total carcinogenic risk resulting from intakes of site-wide soils exceed one-in-one-million for all current and future potentially exposed populations. Intakes of hexachlorobenzene and PCB, Aroclor-1254, account for the major portion of the exceedances for site-wide soils.

b. Ground Water

As shown in Table 5-10 total carcinogenic risk through ingestion of ground water (and dermal contact and inhalation via showering) exceeds one-in-one-million for current and future residential populations (adult and child). It was assumed that the recreational population would not be exposed to ground water, so there is no risk to the recreational

population (current or future) via ingestion of ground water. For current populations, the risk is due to exposure to chloroform and PCB Aroclor 1254 and only slightly exceeds one-in-one-million (one order of magnitude or less). Under the future use scenario, however, the risks are three to four orders of magnitude greater than one-in-one-million. Intakes of arsenic, benzene, vinyl chloride, and bis(2-chloroethyl)ether most notably exceed the one-in-one-million risk level for future exposures.

c. Surface Water

1. Creeks

Total estimated carcinogenic risk due to intakes of surface water from any creek at the site are below the one-in-one-million risk level for all current populations (see Table 5-13). For potentially exposed future residential and recreational populations, excess cancer risks (two to three orders of magnitude) are estimated as a result of total intakes of surface water from Mill Creek. No excess cancer risks for future populations were estimated to result from exposures to Skinner Creek.

2. Ponds

As shown in Table 5-16, the total estimated carcinogenic risk due to intakes of surface water from any pond were well below the one-in-one-million level for all current and future populations.

d. Sediments

1. Creeks

The estimated carcinogenic risk from total intake of creek sediments slightly exceeds one-in-one million (by one order of magnitude or less) for all current and future residential and recreational populations (see Table 5-19). Carcinogenic PAHs present in sediments contribute most significantly to these excess risks.

2. Ponds

As shown in Table 5-22, the total estimated carcinogenic risk from intake of ponds sediments were well below the one-in-one million level for all current and future populations.

5.2.2.2 Aggregate Non-carcinogenic Effects

To assess the overall potential for non-carcinogenic effects posed by more than one chemical, a hazard index approach has been developed based on the U. S. EPA's (1986b) *Guidelines for Health Risk Assessment of Chemical Mixtures*. This approach assumes that simultaneous subthreshold exposures to several chemicals could result in adverse health effects. It also assumes that the magnitude of the adverse effect will be proportional to the sum of the ratios of the subthreshold exposures to reference doses. The hazard index is equal to the sum of the hazard quotients (Equation 10), where E (the exposure level or intake) and the RfD represent the same exposure period (sub-chronic or chronic). If the hazard index exceeds one, there may be adverse health effects.

There are several limitations to this additive approach. Hazard quotients may be combined for substances with RfD's based on critical effects of varying toxicological significance. Also, RfD's of varying levels of confidence that include different uncertainty adjustments and modifying factors may be combined. The assumption of dose additivity implicit in Equation 10 is most properly applied to compounds that induce the same effect by the same mechanism of action. Consequently, application of the hazard index equation to a number of compounds that are not expected to induce the same type of effect or that do not act by the same mechanism, although appropriate as a screening method, can over estimate the potential for effects. In this assessment, all hazard indices were added regardless of differing toxicity end points. This contributes to the overall uncertainty of the assessment.

Tables 5-25, 5-28, 5-32, 5-35, 5-38, 5-40, and 5-44 present the hazard indices for total intakes of chemicals by all current and future populations. Table 5-46 presents a summary of the hazard indices for all exposure routes and exposed populations.

a. Soils

1. Waste Lagoon Area

Exposure to non-carcinogens in soils in the waste lagoon area may result in unacceptable non-cancer risks for current and future populations (see Table 5-25). The hazard indices for current residential child and all future populations are greater than one for total intake of chemicals from the waste lagoon area. The excess non-cancer risk for the current child population slightly exceeds one due to intakes of antimony. Exceedances for future

populations are two to three orders of magnitude greater than unity and result largely from intakes of hexachlorobenzene and chlordane.

2. Site-Wide Soils

Total intake of site-wide soils by all current and future populations may result in non-cancer risks exceeding one by two orders of magnitude or less, as shown in Table 5-28. Intakes of PCB Aroclor 1254 contribute most significantly to these excess non-cancer risks.

b. Ground Water

As shown in Table 5-32, the hazard indices for total intake of chemicals from ground water are below unity for current occupational and residential populations. Intakes of ground water by future populations may result in excess non-cancer risks. These excess risks are due largely to intakes of cobalt and 1,2-dichloroethene. No intakes were estimated for recreational populations due to the assumption that these persons would not consume ground water on-site.

c. Surface Water

1. Creeks

No excess non-cancer risks were estimated for any current populations through total intake of creek surface water (see Table 5-35). For future populations, hazard indices exceeded unity by one order of magnitude or less for total intake of surface water from Mill Creek. No excess non-cancer risks were estimated for future populations resulting from intakes of surface water from Skinner Creek.

2. Ponds

As shown in Table 5-38, no excess non-cancer risks (no hazard indices exceeding one) were estimated for any current or future populations as a result of intakes of surface water from any pond.

d. Sediments

1. Creeks

No hazard indices for any current or future populations were found to exceed one as a result of intakes of sediments from any creek on-site (see Table 5-41).

2. Ponds

As shown in Table 5-44, hazard indices for all current and future populations from total intake of pond sediments were all well below unity or one.

5.3 COMBINING RISKS ACROSS EXPOSURE PATHWAYS

An individual may be exposed to chemicals or combinations of chemicals through several pathways. The total exposure to various chemicals will equal the sum of the exposures by all appropriate pathways. This section identifies the pathways combined under the various exposure scenarios and describes the combining of the multi-chemical risk estimates across these exposure pathways.

5.3.1 IDENTIFICATION OF EXPOSURE PATHWAY COMBINATIONS

There are two steps required to determine whether risks or hazard indices for two or more pathways should be combined for a single exposed individual or group of individuals. The first is to identify reasonable exposure pathway combinations. The second is to examine whether it is likely that the same individuals would consistently face the reasonable maximum exposure (RME) by more than one pathway.

The occupational population could be exposed by direct dermal contact with and/or incidental ingestion of soils and ingestion of ground water. The current and future occupational populations were assumed to live off-site and work on-site. It is possible that some individuals could both live and work on the site. The exposure assumptions used for the existing and potential future residential adult population account for this possibility. The residential population has all the potential exposures of the occupational population plus additional exposures pertinent to on-site residence.

Persons recreating at the site could be exposed by direct dermal contact with and/or incidental ingestion of soils, surface water, and sediments. Recreational events were included in the model for residential populations (i.e., swimming events, incidental soil

ingestion, etc.). It was assumed that the recreational population would not live on or near the site and would therefore not receive the exposure of the current or future residential population.

It was assumed that each pathway for children (residential and recreational) is unique; that is, the pathways are not additive. This assumption was made due to the fact that recreational events have been included in the model for residential populations (i.e., swimming events, incidental soil ingestion, etc.). Therefore, those children in the recreational populations are assumed to live far enough off-site so as not to experience the residential exposures. Children in the residential population have all of the potential exposures of those in the recreational population plus additional exposures pertinent to on-site residence (i.e., drinking water ingestion, etc.).

The residential populations (current and future) are exposed to the same extent as the occupational and recreational populations plus additional exposures as a consequence of residence on the site. Therefore it was not necessary to combine exposures for different populations. The assumptions used to estimate exposure of residential populations accounts for a combination of exposure pathways.

5.3.2 Summation of Cancer Risks for Multiple Pathways

Equation 11 sums the cancer risks for each exposure pathway contributing to exposure of the same individual or subpopulation. Cancer risks from various exposure pathways are assumed to be additive. Table 5-45 summarizes the cancer risks for multiple pathway exposures.

Using Equation 11, the total carcinogenic risks for current occupational and residential adults are 3.6×10^{-2} and 9.1×10^{-2}, respectively (see Table 5-45). For future occupational and residential adults, the total carcinogenic risks are 1.5×10^{-3} and 2.5×10^{-2}, respectively (assuming no residential development occurs in the waste lagoon area in the future). Assuming residential development does occur in the waste lagoon area in the future, the total carcinogenic risks for future occupational and residential adults are 2.0×10^{-2} and 7.0×10^{-2}, respectively. The total cancer risk for current recreational adults is 8.6×10^{-2}; for future recreational adults, the total cancer risk is 5.5×10^{-3}, assuming no residential development of the waste lagoon area. Each of these risks are greater than one-in-one-million, and therefore present excess risks of cancer due to on-site exposures for all current and future adult populations. Cancer risks are slightly lower for the future

use scenario assuming no future residential development in the waste lagoon area (see Table 5-45). Cancer risks for children are also presented in Table 5-45.

The use of Equations 9 and 11 to calculate total cancer risks introduces some uncertainty to the total risk estimates. Section 5.2.2.1 discusses some limitations that apply to these equations.

5.3.3 Summation of Non-cancer Hazard Indices for Multiple Pathways

Equation 12 estimates the total non-cancer hazard indices for each exposure pathway contributing to exposure of the same individual or subpopulation. The hazard indices are assumed to be additive for a screening level of analysis. If the total hazard index for an exposed individual or group exceeds one, there may be non-cancer health effects. Table 5-46 summarizes the hazard indices and presents the total hazard index for each population. These summations have been calculated for chronic exposures for adult populations. Subchronic toxicity values were used in calculating hazard indices for children. No subchronic hazard indices were calculated for adults.

The total hazard index for a current occupational worker (adult) is 7.1×10^1; for future occupational adults, the hazard index is 3.2×10^2 (assuming no residential development in the waste lagoon area). For residential child populations, the total hazard index for current exposures is 6.8×10^1 and for future exposures, 2.5×10^2 (assuming no development in the waste lagoon area). For residential adults, the total hazard index for current exposures is 2.8×10^2, and for future exposures, 9.8×10^2.

The hazard indices for recreational populations also exceed one for both current and potential future exposures. For current recreational children, the hazard index is 5.3×10^1; for future exposures, the hazard index is 6.3×10^0. For current recreational adults, the hazard index is 2.7×10^2; for future exposures, and the hazard index is 2.2×10^1. If waste lagoon soils are excavated for future residential development, the hazard indices are greater (see Table 5-46).

While several conservative assumptions have been employed in developing these indices, as discussed in the uncertainty section below, they do suggest that both current and future exposures to chemicals of concern at the Skinner site are above unity or one for all potentially exposed populations.

Figures 7 through 16 summarize excess cancer risks (exceeding one-in-one-million) and hazard indices greater than one for each potentially exposed current and future population. The greatest cancer risks are associated with current exposures to site-wide soils and future exposures to waste lagoon soil and site-wide soils, ground water, and Mill Creek surface water. Similarly, the greatest potential for non-carcinogenic health effects would result from exposures to site-wide soils, ground water (current and future), and Mill Creek surface water and sediments.

5.4 UNCERTAINTY ASSESSMENT

The risk measures used in risk assessments usually are not precise estimates of risk, but conditional estimates given a considerable number of assumptions about exposure and toxicity. The purposes of the uncertainty assessment are to fully clarify the assumptions and uncertainties inherent in the risk assessment in order to place the risk estimates in proper perspective. Another use of the uncertainty assessment is to identify areas where a moderate amount of additional data collection might significantly improve the basis for selection of a remedial alternative.

Uncertainty in all risk assessments is generally large, at least an order of magnitude (U.S. EPA, 1989a). Consequently, it is more important to identify the key site-related variables and assumptions that contribute most to the uncertainty than to precisely quantify the degree of uncertainty in the risk assessment. Thus, the focus of the uncertainty assessment is on qualitative and semi-quantitative approaches rather than detailed quantitative approaches.

There are several categories of uncertainties associated with risk assessments. One is the initial selection of substances used to characterize exposures and risk on the basis of the sampling data. Other sources of uncertainty are inherent in the toxicity values for each chemical of concern used to characterize risk. Additional uncertainties are inherent in the exposure assessment for individual substances and individual exposures. These uncertainties are due to uncertainty in the chemical monitoring data, uncertainty in the models used to estimate exposure concentrations in the absence of monitoring data, and uncertainty in estimates of population intake parameters. Additional uncertainties are incorporated in the risk assessment when exposures to several substances across multiple pathways are summed.

The physical setting for the Skinner site has been described in terms of current and potential future land uses, the identification of possible exposure pathways, and defining the chemicals of concern present at the site. Some uncertainty arises in the characterization of the site setting. Depending upon their magnitude, these uncertainties may influence the outcome of this assessment. The following section will elaborate on the relative uncertainties inherent in this assessment.

5.4.1 Selection of Chemicals of Concern

Section 2.2.3 details the uncertainties associated with the Data Evaluation Process. As described in Section 2, several steps were used to define the list of chemicals of concern to be carried through the risk assessment. This process necessarily results in the elimination of several chemicals for consideration, whether through comparison with background, comparison with laboratory blanks, or best professional judgement. The discussion of chemicals which were deleted and the reasons for their deletion are presented in detail throughout Section 2.

The quantity of data was generally sufficient to reasonably characterize the site, although there were few surface soil samples in the waste lagoon to characterize current exposures. In some of the media of concern, there were insufficient background data to characterize background concentrations in a statistical comparison. (One background sample each was taken for Skinner Creek surface waters, Dump Creek sediments and surface waters, and bedrock wells). Uncertainty is introduced when insufficient data are used to characterize the background concentrations which may result in under- or overestimation of chemical intakes.

SQLs were not provided for the Phase I data; therefore, it was not possible to determine a proxy concentration for chemicals which fell below the SQL. Instead, concentrations which were not detected could not be quantified and were excluded from consideration. This causes uncertainty by overestimating concentrations because only those Phase I samples in which a given concentration was detected were included. This uncertainty will result in a more conservative risk assessment.

Phase I data for the site were not obtained from original laboratory data packages but were obtained from summary tables presented in the Phase I Interim Remedial Investigation Report (WESTON, 1988). Qualifiers presented on the WESTON tables for

Round III samples conflicted with those provided for use under the CLP program and exact meanings were unclear.

There were two tentatively identified compounds detected in the samples. These chemicals both had low estimated concentrations in the few samples they were identified in, but because their identity is uncertain, they were not carried through the risk assessment.

Chemicals which were not detected in any of the media of concern were excluded from the risk assessment. These chemicals could be present at concentrations below SQLs and could add to the overall risk at the site. Several of these chemicals have CRQLs which exceed toxicity-based reference concentrations (see Appendix B). Therefore, chemicals may have been deleted which are present at concentrations exceeding toxicity reference values.

Background comparisons were made to determine if concentrations of chemicals found at the site were significantly higher than background concentrations (see Appendix B). Chemicals which were not significantly higher than background in any of the media of concern were excluded from the risk assessment.

Because there was a long list of chemicals of potential concern after the initial data evaluation process, additional screening steps were taken to further reduce the list. Chemicals which were detected in five percent or fewer samples in all areas of concern at low concentrations were deleted from the list. This creates uncertainty because there were chemicals associated with the site which were not carried through the risk assessment. This step was considered reasonable because the risk associated with these chemicals was assumed to be significantly less than those which were detected more frequently and at higher concentrations at the site.

5.4.2 Exposure Assessment Uncertainty

Section 3.7 details the uncertainty associated with the exposure assessments. The current land use model reflects as accurately as possible present conditions at the Skinner site based on site visits and examination of aerial photographs and topographic maps. The future land use scenario of residential development of the site is realistic in that surrounding land use patterns (based on local zoning information) are consistent with this assumption. It is unlikely that homes would be constructed over the waste lagoon area, due to public knowledge of past practices in that region of the site and because this area

is part of a landfill. However, a future scenario including the use of this area for residential purposes has been included for comparison.

Although sufficient data were generally available to calculate accurate exposure concentrations, only two surface soil samples from the waste lagoon were available for this purpose. This was insufficient data to calculate upper 95% confidence limits for the arithmetic mean concentrations in waste lagoon soils; therefore, the maximum observed concentrations were used to assess current exposure and future exposure (under the scenario in which future residential development in the waste lagoon is not considered). These exposure concentrations are highly uncertain because they may not be representative of actual concentrations in waste lagoon soils.

Several areas of uncertainty regarding current and future residential exposures include the duration of the residence of people on site; the extent to which people use the site for recreational purposes; and the extent of utilization of ground water for drinking and showering purposes. It has been assumed that people will live on or near the site for 30 years; this assumption probably overestimates the duration of residence because it is a national upperbound statistic.

While there are several residential wells that may currently provide ground water as the principle drinking (and showering) water supply at residences, it is not clear whether these supplies are in fact being used. Nonetheless, the fact that wells exist mandate the assumption that residents might use these ground water sources. In the future use scenario, the assumption that residential wells will be used is also realistic, although the development of residences or subdivisions may lead to the installation of a municipal water supply system. Additionally, uncertainties arise in the mathematical modeling of exposure to chemicals during showering.

The assumption that residents and off-site recreational users will swim in on-site ponds and creeks is appropriate in that these surface waters could support this activity. The frequency and duration of these events has been estimated based on national averages for recreation; actual frequencies and durations may be greater or less than has been assumed.

Uncertainty arises in the exclusion of air modeling for volatilization and fugitive dust emissions for on- and off-site inhalation exposures. As discussed in Section 3, conditions at the site may effectively eliminate or reduce the inhalation pathway from concern as a

potential exposure route. Without air modeling or adequate information on the inhalation toxicity of many of the chemicals of concern, the significance of inhalation exposures is unknown.

Exposure of people to chemicals of concern that may be present in game, domestic animals, or edible wild or cultivated plants has not been quantified. No vegetable gardens, fruit gardens, or edible livestock were observed on the site, so significant exposure via these routes is probably not occurring at present. Such exposures could occur in the future, which adds to uncertainty of the exposure assessment.

5.4.3 Toxicity Assessment Uncertainty

Details regarding the uncertainties associated with the toxicity assessment are presented in Section 4.4 Uncertainty factors associated with the calculation of oral reference doses are listed in Table 4-2. These factors reflect the uncertainty associated with the database used to calculate these values, and were obtained from HEAST (U.S. EPA, 1990), IRIS, or ECAO (Appendix H). In general, higher uncertainty factors are applied when animal data are used in the determination of these values; the use of reliable human data is associated with lower uncertainty factors. Uncertainty arising in extrapolating from animal data can be due to differences in chemical uptake, distribution, and metabolism; differences in enzyme subspecies and differences in relative surface area to body weight ratios. When human data are used to calculate reference doses, safety factors are still applied to reflect the relative quantity or quality of the data or to protect from intra-species variations, such as allergenic or hypersensitive responses. Uncertainty may also result from low confidence in laboratory experimental or epidemiological methodologies.

Additional uncertainties arise when toxicity values are extrapolated from one chemical to another based on similar chemical structure and activity. Conservative assumptions are used when comparisons are made based on structure and activity relationships. For example, the total chromium toxicity value is assumed to be equal to that of the most toxic valence state chromium compound, chromium VI. This assumption likely overestimates risk because most or all of the chromium present is probably present as the less toxic chromium III.

Risks were not evaluated for some chemicals of concern because there were no toxicity data for these chemicals. The possibility therefore exists that the total risk has been underestimated. However, since many of the chemicals lack *either* slope factors or

reference doses, the likelihood of the most serious health risk of the chemical exposure not being evaluated is reduced. Inadequate toxicity information was available for several chemicals (Section 4.3). Possible health effects of these chemicals and consequences of their exclusion from the risk assessment are unknown.

Slope factors calculated by U.S. EPA for potential carcinogens have inherent uncertainty because they are calculations of lifetime cancer risks based on less-than-lifetime exposures and low-dose extrapolations.

There are opportunities for interactions between chemicals at the Skinner Landfill. However, little or no information is available on the thousands of potential interactions. The degree to which synergistic and antagonistic interactions among chemicals present at Skinner Landfill effect exposed populations is uncertain.

5.4.4 Risk Characterization Uncertainty

There are several uncertainties associated with the characterization of risk at the Skinner site. First, the exclusion of particular exposure routes, such as air inhalation, fugitive dust emissions, and consumption of fish or game from the site contributes to the uncertainty of the assessment. The quantification of these pathways would likely slightly increase overall risks resulting from exposure to the site.

A number of assumptions have been made in quantifying the potential for carcinogenic risk resulting from exposures at the site. First, the individual cancer risks for each chemical have been summed to establish the overall risk of cancer for each population under each exposure scenario. This assumes that the carcinogenic properties for each chemical are indeed additive. This assumption likely overestimates the actual risk of contracting cancer for any one population, as several of the carcinogens exert their effects on different systems or target organs (i.e., lung, liver, hematopoetic system). Additionally, the equation used to add these cancer risks sums the 95 percent confidence limit for each slope factor, thereby adding to the over-estimation of actual risks.

Similarly, the summation of all non-carcinogenic effects through the addition of hazard quotients for each chemical also likely overestimates the risk. Many of these chemicals affect different systems in the body and may not be additive in their total chronic health effects. Conversely, the synergistic effects of these chemicals has not been addressed. The possibility for exaggerated health effects resulting from the exposure to the

combination of two or more chemicals of concern also creates some uncertainty in this assessment.

Tables

TABLE 5-1
ESTIMATED CARCINOGENIC RISK FROM INGESTION OF WASTE LAGOON SOILS
(unitless)

Chemical	Current & Future (No Residential Development)					Future (with Residential Development)				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Antimony	na	na	na	na	na	na	na	na	na	na
Cadmium	na	na	na	na	na	na	na	na	na	na
Lead	na	na	na	na	na	na	na	na	na	na
Silver	na	na	na	na	na	na	na	na	na	na
Thallium	na	na	na	na	na	na	na	na	na	na
Tin	na	na	na	na	na	na	na	na	na	na
Cyanide	na	na	na	na	na	na	na	na	na	na
Methylene Chloride	1.6 E-11	5.4 E-11	2.9 E-11	3.4 E-12	1.9 E-12	1.3 E-8	4.5 E-8	2.4 E-8	2.8 E-9	1.5 E-9
Acetone	na	na	na	na	na	na	na	na	na	na
Chloroform	na	na	na	na	na	6.6 E-8	2.3 E-7	1.2 E-7	1.4 E-8	7.8 E-9
1,2-Dichloroethane	na	na	na	na	na	6.3 E-6	2.2 E-5	1.2 E-5	1.4 E-6	7.4 E-7
2-Butanone	na	na	na	na	na	na	na	na	na	na
1,1,1-Trichloroethane	na	na	na	na	na	na	na	na	na	na
Carbon Tetrachloride	na	na	na	na	na	6.8 E-6	2.4 E-5	1.3 E-5	1.5 E-6	8.0 E-7
1,2-Dichloropropane	na	na	na	na	na	7.6 E-6	2.6 E-5	1.4 E-5	1.6 E-6	8.9 E-7
Trichloroethene	na	na	na	na	na	5.1 E-7	1.7 E-6	9.4 E-7	1.1 E-7	5.9 E-8
1,1,2-Trichloroethane	na	na	na	na	na	6.9 E-6	2.4 E-5	1.3 E-5	1.5 E-6	8.1 E-7
Benzene	na	na	na	na	na	5.7 E-7	2.0 E-6	1.1 E-6	1.2 E-7	6.7 E-8
Tetrachloroethene	na	na	na	na	na	7.4 E-7	2.5 E-6	1.4 E-6	1.6 E-7	8.7 E-8
1,1,2,2-Tetrachloroethane	na	na	na	na	na	8.5 E-6	3.0 E-5	1.6 E-5	1.8 E-6	1.0 E-6
Toluene	na	na	na	na	na	na	na	na	na	na
Chlorobenzene	na	na	na	na	na	na	na	na	na	na
Ethylbenzene	na	na	na	na	na	na	na	na	na	na
Xylene (total)	na	na	na	na	na	na	na	na	na	na
Phenol	na	na	na	na	na	na	na	na	na	na
bis(2-Chloroethyl)Ether	na	na	na	na	na	2.3 E-6	7.9 E-6	4.3 E-6	4.9 E-7	2.7 E-7
1,3-Dichlorobenzene	na	na	na	na	na	na	na	na	na	na
1,4-Dichlorobenzene	na	na	na	na	na	1.5 E-7	5.2 E-7	2.8 E-7	3.2 E-8	1.8 E-8
Benzyl Alcohol	na	na	na	na	na	na	na	na	na	na
1,2-Dichlorobenzene	na	na	na	na	na	na	na	na	na	na
2-Methylphenol	na	na	na	na	na	na	na	na	na	na

TABLE 5-1
ESTIMATED CARCINOGENIC RISK FROM INGESTION OF WASTE LAGOON SOILS
(unitless)

Chemical	Current & Future (No Residential Development)					Future (with Residential Development)				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
4-Methylphenol	na	na	na	na	na	na	na	na	na	na
Hexachloroethane	na	na	na	na	na	3.0 E-8	1.0 E-7	5.6 E-8	6.5 E-9	3.6 E-9
Benzoic Acid	na	na	na	na	na	na	na	na	na	na
Naphthalene	na	na	na	na	na	na	na	na	na	na
2-Methylnaphthalene	na	na	na	na	na	na	na	na	na	na
Dimethyl Phthalate	na	na	na	na	na	na	na	na	na	na
Acenaphthylene	na	na	na	na	na	na	na	na	na	na
Acenaphthene	na	na	na	na	na	na	na	na	na	na
Dibenzofuran	na	na	na	na	na	na	na	na	na	na
Fluorene	na	na	na	na	na	na	na	na	na	na
Phenanthrene	na	na	na	na	na	na	na	na	na	na
Anthracene	na	na	na	na	na	na	na	na	na	na
Di-n-Butylphthalate	na	na	na	na	na	na	na	na	na	na
Fluoranthene	na	na	na	na	na	na	na	na	na	na
Pyrene	na	na	na	na	na	na	na	na	na	na
Butylbenzylphthalate	na	na	na	na	na	na	na	na	na	na
Benzo(a)Anthracene	na	na	na	na	na	2.4 E-5	8.4 E-5	4.5 E-5	5.2 E-6	2.9 E-6
Chrysene	na	na	na	na	na	2.8 E-5	9.6 E-5	5.2 E-5	6.0 E-6	3.2 E-6
bis(2-Ethylhexyl)Phthalate	7.4 E-10	2.5 E-9	1.4 E-9	1.6 E-10	8.6 E-11	9.6 E-8	3.3 E-7	1.8 E-7	2.1 E-8	1.1 E-8
Di-n-Octyl Phthalate	na	na	na	na	na	na	na	na	na	na
Benzo(b)Fluoranthene	na	na	na	na	na	2.6 E-5	8.9 E-5	4.8 E-5	5.6 E-6	3.0 E-6
Benzo(k)Fluoranthene	na	na	na	na	na	1.9 E-5	6.5 E-5	3.5 E-5	4.1 E-6	2.2 E-6
Benzo(a)Pyrene	na	na	na	na	na	2.7 E-5	9.2 E-5	4.9 E-5	5.7 E-6	3.1 E-6
Indeno(1,2,3-cd)Pyrene	na	na	na	na	na	1.3 E-5	4.4 E-5	2.4 E-5	2.8 E-6	1.5 E-6
Benzo(g,h,i)Perylene	na	na	na	na	na	na	na	na	na	na
beta-BHC	na	na	na	na	na	5.7 E-9	2.0 E-8	1.1 E-8	1.2 E-9	6.7 E-10
Heptachlor	na	na	na	na	na	2.0 E-5	7.0 E-5	3.8 E-5	4.4 E-6	2.4 E-6
Aldrin	na	na	na	na	na	2.3 E-5	8.0 E-5	4.3 E-5	5.0 E-6	2.7 E-6
Dieldrin	na	na	na	na	na	1.0 E-5	3.5 E-5	1.9 E-5	2.2 E-6	1.2 E-6
4,4'-DDD	na	na	na	na	na	6.2 E-9	2.2 E-8	1.2 E-8	1.3 E-9	7.3 E-10
4,4'-DDT	na	na	na	na	na	6.1 E-9	2.1 E-8	1.1 E-8	1.3 E-9	7.2 E-10

TABLE 5-1
ESTIMATED CARCINOGENIC RISK FROM INGESTION OF WASTE LAGOON SOILS
(unitless)

Chemical	Current & Future (No Residential Development)					Future (with Residential Development)				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Endrin ketone	na	na	na	na	na	na	na	na	na	na
gamma-Chlordane	na	na	na	na	na	4.8 E-6	1.6 E-5	8.9 E-6	1.0 E-6	5.6 E-7
Aroclor-1248	na	na	na	na	na	2.0 E-6	6.8 E-6	3.7 E-6	4.3 E-7	2.3 E-7
Aroclor-1260	na	na	na	na	na	3.0 E-6	1.0 E-5	5.7 E-6	6.6 E-7	3.6 E-7
Hexachlorobenzene	na	na	na	na	na	9.5 E-4	3.3 E-3	1.8 E-3	2.0 E-4	1.1 E-4
Hexachlorocyclopentadiene	na	na	na	na	na	na	na	na	na	na
Hexachlorobutadiene	na	na	na	na	na	6.7 E-6	2.3 E-5	1.2 E-5	1.4 E-6	7.8 E-7
Octachlorocyclopentene	na	na	na	na	na	na	na	na	na	na
Heptachloronorborene	na	na	na	na	na	na	na	na	na	na
Chlordene	na	na	na	na	na	na	na	na	na	na
2,3,7,8-TCDD	na	na	na	na	na	9.9 E-8	3.4 E-7	1.8 E-7	2.1 E-8	1.2 E-8
Total TETRA CDD	na	na	na	na	na	1.4 E-7	4.9 E-7	2.6 E-7	3.1 E-8	1.7 E-8
Total PENTA CDD	na	na	na	na	na	3.3 E-7	1.1 E-6	6.2 E-7	7.2 E-8	3.9 E-8
Total HEXA CDD	na	na	na	na	na	3.6 E-7	1.3 E-6	6.8 E-7	7.9 E-8	4.3 E-8
Total HEPTA CDD	na	na	na	na	na	1.1 E-6	3.9 E-6	2.1 E-6	2.4 E-7	1.3 E-7
Total OCTA CDD	na	na	na	na	na	8.6 E-6	3.0 E-5	1.6 E-5	1.9 E-6	1.0 E-6
2,3,7,8-TCDF	na	na	na	na	na	8.3 E-8	2.9 E-7	1.6 E-7	1.8 E-8	9.8 E-9
Total TETRA CDF	na	na	na	na	na	1.9 E-6	6.4 E-6	3.5 E-6	4.0 E-7	2.2 E-7
Total PENTA CDF	na	na	na	na	na	2.5 E-6	8.7 E-6	4.7 E-6	5.4 E-7	3.0 E-7
Total HEXA CDF	na	na	na	na	na	2.7 E-6	9.4 E-6	5.1 E-6	5.9 E-7	3.2 E-7
Total HEPTA CDF	na	na	na	na	na	6.3 E-6	2.2 E-5	1.2 E-5	1.4 E-6	7.4 E-7
Total OCTA CDF	na	na	na	na	na	7.3 E-6	2.5 E-5	1.4 E-5	1.6 E-6	8.6 E-7
TOTAL:	**7.5 E-10**	**2.6 E-9**	**1.4 E-9**	**1.6 E-10**	**8.8 E-11**	**1.2 E-3**	**4.2 E-3**	**2.3 E-3**	**2.6 E-4**	**1.4 E-4**

na = not available

Shaded numbers exceed 10^-6 cancer risk.

TABLE 5-2
ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT WITH WASTE LAGOON SOILS
(unitless)

Chemical	Current & Future (No Residential Development)					Future (with Residential Development)				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Antimony	na	na	na	na	na	na	na	na	na	na
Cadmium	na	na	na	na	na	na	na	na	na	na
Lead	na	na	na	na	na	na	na	na	na	na
Silver	na	na	na	na	na	na	na	na	na	na
Thallium	na	na	na	na	na	na	na	na	na	na
Tin	na	na	na	na	na	na	na	na	na	na
Cyanide	na	na	na	na	na	na	na	na	na	na
Methylene Chloride	5.2 E-10	5.1 E-10	1.3 E-9	5.1 E-10	1.3 E-9	4.3 E-7	4.2 E-7	1.1 E-6	4.2 E-7	1.1 E-6
Acetone	na	na	na	na	na	na	na	na	na	na
Chloroform	na	na	na	na	na	2.2 E-6	2.1 E-6	5.6 E-6	2.1 E-6	5.6 E-6
1,2-Dichloroethane	na	na	na	na	na	2.1 E-4	2.0 E-4	5.3 E-4	2.0 E-4	5.3 E-4
2-Butanone	na	na	na	na	na	na	na	na	na	na
1,1,1-Trichloroethane	na	na	na	na	na	na	na	na	na	na
Carbon Tetrachloride	na	na	na	na	na	2.2 E-4	2.2 E-4	5.8 E-4	2.2 E-4	5.8 E-4
1,2-Dichloropropane	na	na	na	na	na	2.5 E-4	2.4 E-4	6.4 E-4	2.4 E-4	6.4 E-4
Trichloroethene	na	na	na	na	na	1.7 E-5	1.6 E-5	4.3 E-5	1.6 E-5	4.3 E-5
1,1,2-Trichloroethane	na	na	na	na	na	2.3 E-4	2.2 E-4	5.9 E-4	2.2 E-4	5.9 E-4
Benzene	na	na	na	na	na	1.9 E-5	1.8 E-5	4.8 E-5	1.8 E-5	4.8 E-5
Tetrachloroethene	na	na	na	na	na	2.4 E-5	2.4 E-5	6.2 E-5	2.4 E-5	6.2 E-5
1,1,2,2-Tetrachloroethane	na	na	na	na	na	2.8 E-4	2.8 E-4	7.2 E-4	2.8 E-4	7.2 E-4
Toluene	na	na	na	na	na	na	na	na	na	na
Chlorobenzene	na	na	na	na	na	na	na	na	na	na
Ethylbenzene	na	na	na	na	na	na	na	na	na	na
Xylene (total)	na	na	na	na	na	na	na	na	na	na
Phenol	na	na	na	na	na	na	na	na	na	na
bis(2-Chloroethyl)Ether	na	na	na	na	na	3.0 E-5	2.9 E-5	7.7 E-5	2.9 E-5	7.7 E-5
1,3-Dichlorobenzene	na	na	na	na	na	na	na	na	na	na
1,4-Dichlorobenzene	na	na	na	na	na	2.0 E-6	1.9 E-6	5.1 E-6	1.9 E-6	5.1 E-6
Benzyl Alcohol	na	na	na	na	na	na	na	na	na	na
1,2-Dichlorobenzene	na	na	na	na	na	na	na	na	na	na
2-Methylphenol	na	na	na	na	na	na	na	na	na	na

TABLE 5-2
ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT WITH WASTE LAGOON SOILS
(unitless)

Chemical	Current & Future (No Residential Development)					Future (with Residential Development)				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
4-Methylphenol	na	na	na	na	na	na	na	na	na	na
Hexachloroethane	na	na	na	na	na	4.0 E-7	3.9 E-7	1.0 E-6	3.9 E-7	1.0 E-6
Benzoic Acid	na	na	na	na	na	na	na	na	na	na
Naphthalene	na	na	na	na	na	na	na	na	na	na
2-Methylnaphthalene	na	na	na	na	na	na	na	na	na	na
Dimethyl Phthalate	na	na	na	na	na	na	na	na	na	na
Acenaphthylene	na	na	na	na	na	na	na	na	na	na
Acenaphthene	na	na	na	na	na	na	na	na	na	na
Dibenzofuran	na	na	na	na	na	na	na	na	na	na
Fluorene	na	na	na	na	na	na	na	na	na	na
Phenanthrene	na	na	na	na	na	na	na	na	na	na
Anthracene	na	na	na	na	na	na	na	na	na	na
Di-n-Butylphthalate	na	na	na	na	na	na	na	na	na	na
Fluoranthene	na	na	na	na	na	na	na	na	na	na
Pyrene	na	na	na	na	na	na	na	na	na	na
Butylbenzylphthalate	na	na	na	na	na	na	na	na	na	na
Benzo(a)Anthracene	na	na	na	na	na	3.2 E-4	3.1 E-4	8.2 E-4	3.1 E-4	8.2 E-4
Chrysene	na	na	na	na	na	3.6 E-4	3.6 E-4	9.4 E-4	3.6 E-4	9.4 E-4
bis(2-Ethylhexyl)Phthalate	9.7 E-9	9.5 E-9	2.5 E-8	9.5 E-9	2.5 E-8	1.3 E-6	1.2 E-6	3.3 E-6	1.2 E-6	3.3 E-6
Di-n-Octyl Phthalate	na	na	na	na	na	na	na	na	na	na
Benzo(b)Fluoranthene	na	na	na	na	na	3.4 E-4	3.3 E-4	8.7 E-4	3.3 E-4	8.7 E-4
Benzo(k)Fluoranthene	na	na	na	na	na	2.5 E-4	2.4 E-4	6.4 E-4	2.4 E-4	6.4 E-4
Benzo(a)Pyrene	na	na	na	na	na	3.5 E-4	3.4 E-4	9.0 E-4	3.4 E-4	9.0 E-4
Indeno(1,2,3-cd)Pyrene	na	na	na	na	na	1.7 E-4	1.7 E-4	4.4 E-4	1.7 E-4	4.4 E-4
Benzo(g,h,i)Perylene	na	na	na	na	na	na	na	na	na	na
beta-BHC	na	na	na	na	na	7.5 E-8	7.3 E-8	1.9 E-7	7.3 E-8	1.9 E-7
Heptachlor	na	na	na	na	na	2.7 E-4	2.6 E-4	6.9 E-4	2.6 E-4	6.9 E-4
Aldrin	na	na	na	na	na	3.1 E-4	3.0 E-4	7.9 E-4	3.0 E-4	7.9 E-4
Dieldrin	na	na	na	na	na	1.3 E-4	1.3 E-4	3.4 E-4	1.3 E-4	3.4 E-4
4,4'-DDD	na	na	na	na	na	8.2 E-8	8.0 E-8	2.1 E-7	8.0 E-8	2.1 E-7
4,4'-DDT	na	na	na	na	na	8.1 E-8	7.9 E-8	2.1 E-7	7.9 E-8	2.1 E-7

TABLE 5-2
ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT WITH WASTE LAGOON SOILS
(unitless)

Chemical	Current & Future (No Residential Development)					Future (with Residential Development)				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Endrin ketone	na	na	na	na	na	na	na	na	na	na
gamma-Chlordane	na	na	na	na	na	6.3 E-5	6.1 E-5	1.6 E-4	6.1 E-5	1.6 E-4
Aroclor-1248	na	na	na	na	na	2.6 E-5	2.5 E-5	6.7 E-5	2.5 E-5	6.7 E-5
Aroclor-1260	na	na	na	na	na	4.0 E-5	3.9 E-5	1.0 E-4	3.9 E-5	1.0 E-4
Hexachlorobenzene	na	na	na	na	na	1.2 E-2	1.2 E-2	3.2 E-2	1.2 E-2	3.2 E-2
Hexachlorocyclopentadiene	na	na	na	na	na	na	na	na	na	na
Hexachlorobutadiene	na	na	na	na	na	8.8 E-5	8.6 E-5	2.3 E-4	8.6 E-5	2.3 E-4
Octachlorocyclopentene	na	na	na	na	na	na	na	na	na	na
Heptachloronorborene	na	na	na	na	na	na	na	na	na	na
Chlordene	na	na	na	na	na	na	na	na	na	na
2,3,7,8-TCDD	na	na	na	na	na	1.3 E-6	1.3 E-6	3.3 E-6	1.3 E-6	3.3 E-6
Total TETRA CDD	na	na	na	na	na	1.9 E-6	1.8 E-6	4.8 E-6	1.8 E-6	4.8 E-6
Total PENTA CDD	na	na	na	na	na	4.4 E-6	4.3 E-6	1.1 E-5	4.3 E-6	1.1 E-5
Total HEXA CDD	na	na	na	na	na	4.8 E-6	4.7 E-6	1.2 E-5	4.7 E-6	1.2 E-5
Total HEPTA CDD	na	na	na	na	na	1.5 E-5	1.4 E-5	3.8 E-5	1.4 E-5	3.8 E-5
Total OCTA CDD	na	na	na	na	na	1.1 E-4	1.1 E-4	2.9 E-4	1.1 E-4	2.9 E-4
2,3,7,8-TCDF	na	na	na	na	na	1.1 E-6	1.1 E-6	2.8 E-6	1.1 E-6	2.8 E-6
Total TETRA CDF	na	na	na	na	na	2.4 E-5	2.4 E-5	6.3 E-5	2.4 E-5	6.3 E-5
Total PENTA CDF	na	na	na	na	na	3.3 E-5	3.2 E-5	8.5 E-5	3.2 E-5	8.5 E-5
Total HEXA CDF	na	na	na	na	na	3.6 E-5	3.5 E-5	9.3 E-5	3.5 E-5	9.3 E-5
Total HEPTA CDF	na	na	na	na	na	8.3 E-5	8.2 E-5	2.1 E-4	8.2 E-5	2.1 E-4
Total OCTA CDF	na	na	na	na	na	9.6 E-5	9.4 E-5	2.5 E-4	9.4 E-5	2.5 E-4
TOTAL:	1.0 E-8	1.0 E-8	2.6 E-8	1.0 E-8	2.6 E-8	1.7 E-2	1.7 E-2	4.3 E-2	1.7 E-2	4.3 E-2

na = not available

Shaded numbers exceed 10^-6 cancer risk.

TABLE 5-3
ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF WASTE LAGOON SOILS
(unitless)

Chemical	Current & Future (No Residential Development)					Future (with Residential Development)				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Antimony	na	na	na	na	na	na	na	na	na	na
Cadmium	na	na	na	na	na	na	na	na	na	na
Lead	na	na	na	na	na	na	na	na	na	na
Silver	na	na	na	na	na	na	na	na	na	na
Thallium	na	na	na	na	na	na	na	na	na	na
Tin	na	na	na	na	na	na	na	na	na	na
Cyanide	na	na	na	na	na	na	na	na	na	na
Methylene Chloride	5.3 E-10	5.6 E-10	1.4 E-9	5.1 E-10	1.3 E-9	4.4 E-7	4.7 E-7	1.1 E-6	4.2 E-7	1.1 E-6
Acetone	na	na	na	na	na	na	na	na	na	na
Chloroform	na	na	na	na	na	2.2 E-6	2.4 E-6	5.7 E-6	2.1 E-6	5.6 E-6
1,2-Dichloroethane	na	na	na	na	na	2.1 E-4	2.2 E-4	3.4 E-4	2.0 E-4	3.3 E-4
2-Butanone	na	na	na	na	na	na	na	na	na	na
1,1,1-Trichloroethane	na	na	na	na	na	na	na	na	na	na
Carbon Tetrachloride	na	na	na	na	na	2.3 E-4	2.4 E-4	5.9 E-4	2.2 E-4	5.8 E-4
1,2-Dichloropropane	na	na	na	na	na	2.6 E-4	2.7 E-4	6.6 E-4	2.5 E-4	6.4 E-4
Trichloroethene	na	na	na	na	na	1.7 E-5	1.8 E-5	4.4 E-5	1.6 E-5	4.3 E-5
1,1,2-Trichloroethane	na	na	na	na	na	2.3 E-4	2.5 E-4	6.0 E-4	2.2 E-4	5.9 E-4
Benzene	na	na	na	na	na	1.9 E-5	2.0 E-5	5.0 E-5	1.9 E-5	4.9 E-5
Tetrachloroethene	na	na	na	na	na	2.5 E-5	2.6 E-5	6.4 E-5	2.4 E-5	6.3 E-5
1,1,2,2-Tetrachloroethane	na	na	na	na	na	2.9 E-4	3.0 E-4	7.4 E-4	2.8 E-4	7.2 E-4
Toluene	na	na	na	na	na	na	na	na	na	na
Chlorobenzene	na	na	na	na	na	na	na	na	na	na
Ethylbenzene	na	na	na	na	na	na	na	na	na	na
Xylene (total)	na	na	na	na	na	na	na	na	na	na
Phenol	na	na	na	na	na	na	na	na	na	na
bis(2-Chloroethyl)Ether	na	na	na	na	na	3.2 E-5	3.7 E-5	8.2 E-5	3.0 E-5	7.8 E-5
1,3-Dichlorobenzene	na	na	na	na	na	na	na	na	na	na
1,4-Dichlorobenzene	na	na	na	na	na	2.1 E-6	2.4 E-6	5.4 E-6	2.0 E-6	5.1 E-6
Benzyl Alcohol	na	na	na	na	na	na	na	na	na	na
1,2-Dichlorobenzene	na	na	na	na	na	na	na	na	na	na
2-Methylphenol	na	na	na	na	na	na	na	na	na	na

TABLE 5-3
ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF WASTE LAGOON SOILS
(unitless)

Chemical	Current & Future (No Residential Development)					Future (with Residential Development)				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
4-Methylphenol	na	na	na	na	na	na	na	na	na	na
Hexachloroethane	na	na	na	na	na	4.3 E-7	4.9 E-7	1.1 E-6	4.0 E-7	1.0 E-6
Benzoic Acid	na	na	na	na	na	na	na	na	na	na
Naphthalene	na	na	na	na	na	na	na	na	na	na
2-Methylnaphthalene	na	na	na	na	na	na	na	na	na	na
Dimethyl Phthalate	na	na	na	na	na	na	na	na	na	na
Acenaphthylene	na	na	na	na	na	na	na	na	na	na
Acenaphthene	na	na	na	na	na	na	na	na	na	na
Dibenzofuran	na	na	na	na	na	na	na	na	na	na
Fluorene	na	na	na	na	na	na	na	na	na	na
Phenanthrene	na	na	na	na	na	na	na	na	na	na
Anthracene	na	na	na	na	na	na	na	na	na	na
Di-n-Butylphthalate	na	na	na	na	na	na	na	na	na	na
Fluoranthene	na	na	na	na	na	na	na	na	na	na
Pyrene	na	na	na	na	na	na	na	na	na	na
Butylbenzylphthalate	na	na	na	na	na	na	na	na	na	na
Benzo(a)Anthracene	na	na	na	na	na	3.4 E-4	4.0 E-4	8.7 E-4	3.2 E-4	8.3 E-4
Chrysene	na	na	na	na	na	3.9 E-4	4.5 E-4	9.9 E-4	3.6 E-4	9.4 E-4
bis(2-Ethylhexyl)Phthalate	1.0 E-8	1.2 E-8	2.6 E-8	9.6 E-9	2.5 E-8	1.4 E-6	1.6 E-6	3.4 E-6	1.3 E-6	3.3 E-6
Di-n-Octyl Phthalate	na	na	na	na	na	na	na	na	na	na
Benzo(b)Fluoranthene	na	na	na	na	na	3.7 E-4	4.2 E-4	9.2 E-4	3.4 E-4	8.8 E-4
Benzo(k)Fluoranthene	na	na	na	na	na	2.7 E-4	3.1 E-4	6.8 E-4	2.5 E-4	6.4 E-4
Benzo(a)Pyrene	na	na	na	na	na	3.8 E-4	4.3 E-4	9.5 E-4	3.5 E-4	9.0 E-4
Indeno(1,2,3-cd)Pyrene	na	na	na	na	na	1.8 E-4	2.1 E-4	4.6 E-4	1.7 E-4	4.4 E-4
Benzo(g,h,i)Perylene	na	na	na	na	na	na	na	na	na	na
beta-BHC	na	na	na	na	na	8.0 E-8	9.3 E-8	2.0 E-7	7.4 E-8	1.9 E-7
Heptachlor	na	na	na	na	na	2.9 E-4	3.3 E-4	7.2 E-4	2.7 E-4	6.9 E-4
Aldrin	na	na	na	na	na	3.3 E-4	3.8 E-4	8.3 E-4	3.0 E-4	7.9 E-4
Dieldrin	na	na	na	na	na	1.4 E-4	1.6 E-4	3.6 E-4	1.3 E-4	3.4 E-4
4,4'-DDD	na	na	na	na	na	8.8 E-8	1.0 E-7	2.2 E-7	8.2 E-8	2.1 E-7
4,4'-DDT	na	na	na	na	na	8.7 E-8	1.0 E-7	2.2 E-7	8.1 E-8	2.1 E-7

TABLE 5-3
ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF WASTE LAGOON SOILS
(unitless)

Chemical	Current & Future (No Residential Development)					Future (with Residential Development)				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Endrin ketone	na	na	na	na	na	na	na	na	na	na
gamma-Chlordane	na	na	na	na	na	6.7 E-5	7.8 E-5	1.7 E-4	6.2 E-5	1.6 E-4
Aroclor-1248	na	na	na	na	na	2.8 E-5	3.2 E-5	7.1 E-5	2.6 E-5	6.7 E-5
Aroclor-1260	na	na	na	na	na	4.3 E-5	5.0 E-5	1.1 E-4	4.0 E-5	1.0 E-4
Hexachlorobenzene	na	na	na	na	na	1.3 E-2	1.5 E-2	3.4 E-2	1.2 E-2	3.2 E-2
Hexachlorocyclopentadiene	na	na	na	na	na	na	na	na	na	na
Hexachlorobutadiene	na	na	na	na	na	9.4 E-5	1.1 E-4	2.4 E-4	8.7 E-5	2.3 E-4
Octachlorocyclopentene	na	na	na	na	na	na	na	na	na	na
Heptachloronorborene	na	na	na	na	na	na	na	na	na	na
Chlordene	na	na	na	na	na	na	na	na	na	na
2,3,7,8-TCDD	na	na	na	na	na	1.4 E-6	1.6 E-6	3.5 E-6	1.3 E-6	3.4 E-6
Total TETRA CDD	na	na	na	na	na	2.0 E-6	2.3 E-6	5.1 E-6	1.9 E-6	4.8 E-6
Total PENTA CDD	na	na	na	na	na	4.7 E-6	5.4 E-6	1.2 E-5	4.3 E-6	1.1 E-5
Total HEXA CDD	na	na	na	na	na	5.2 E-6	6.0 E-6	1.3 E-5	4.8 E-6	1.2 E-5
Total HEPTA CDD	na	na	na	na	na	1.6 E-5	1.8 E-5	4.0 E-5	1.5 E-5	3.8 E-5
Total OCTA CDD	na	na	na	na	na	1.2 E-4	1.4 E-4	3.1 E-4	1.1 E-4	2.9 E-4
2,3,7,8-TCDF	na	na	na	na	na	1.2 E-6	1.4 E-6	3.0 E-6	1.1 E-6	2.8 E-6
Total TETRA CDF	na	na	na	na	na	2.6 E-5	3.0 E-5	6.6 E-5	2.4 E-5	6.3 E-5
Total PENTA CDF	na	na	na	na	na	3.6 E-5	4.1 E-5	9.0 E-5	3.3 E-5	8.6 E-5
Total HEXA CDF	na	na	na	na	na	3.9 E-5	4.5 E-5	9.8 E-5	3.6 E-5	9.3 E-5
Total HEPTA CDF	na	na	na	na	na	9.0 E-5	1.0 E-4	2.3 E-4	8.3 E-5	2.2 E-4
Total OCTA CDF	na	na	na	na	na	1.0 E-4	1.2 E-4	2.6 E-4	9.5 E-5	2.5 E-4
TOTAL:	**1.1 E-8**	**1.3 E-8**	**2.8 E-8**	**1.0 E-8**	**2.6 E-8**	**1.8 E-2**	**2.1 E-2**	**4.6 E-2**	**1.7 E-2**	**4.4 E-2**

na = not available

Shaded numbers exceed 10^-6 cancer risk.

TABLE 5-4

ESTIMATED CARCINOGENIC RISK FROM INGESTION OF SITE-WIDE SOILS

(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Antimony	na	na	na	na	na	na	na	na	na	na
Cadmium	na	na	na	na	na	na	na	na	na	na
Chromium	na	na	na	na	na	na	na	na	na	na
Copper	na	na	na	na	na	na	na	na	na	na
Lead	na	na	na	na	na	na	na	na	na	na
Silver	na	na	na	na	na	na	na	na	na	na
Zinc	na	na	na	na	na	na	na	na	na	na
Cyanide	na	na	na	na	na	na	na	na	na	na
Methylene Chloride	7.3 E-11	2.5 E-10	1.4 E-10	1.6 E-11	8.6 E-12	6.2 E-10	2.1 E-9	1.2 E-9	1.3 E-10	7.2 E-11
Acetone	na	na	na	na	na	na	na	na	na	na
2-Butanone	na	na	na	na	na	na	na	na	na	na
Benzene	2.1 E-11	7.2 E-11	3.9 E-11	4.5 E-12	2.5 E-12	2.1 E-11	7.2 E-11	3.9 E-11	4.5 E-12	2.5 E-12
Tetrachloroethene	1.4 E-10	4.9 E-10	2.6 E-10	3.0 E-11	1.7 E-11	6.5 E-9	2.2 E-8	1.2 E-8	1.4 E-9	7.6 E-10
Toluene	na	na	na	na	na	na	na	na	na	na
Chlorobenzene	na	na	na	na	na	na	na	na	na	na
Ethylbenzene	na	na	na	na	na	na	na	na	na	na
Xylene (total)	na	na	na	na	na	na	na	na	na	na
4-Methylphenol	na	na	na	na	na	na	na	na	na	na
Naphthalene	na	na	na	na	na	na	na	na	na	na
2-Methylnaphthalene	na	na	na	na	na	na	na	na	na	na
Diethylphthalate	na	na	na	na	na	na	na	na	na	na
Phenanthrene	na	na	na	na	na	na	na	na	na	na
Anthracene	na	na	na	na	na	na	na	na	na	na
Di-n-Butylphthalate	na	na	na	na	na	na	na	na	na	na
Fluoranthene	na	na	na	na	na	na	na	na	na	na
Pyrene	na	na	na	na	na	na	na	na	na	na
Butylbenzylphthalate	na	na	na	na	na	na	na	na	na	na
Benzo(a)Anthracene	4.6 E-6	1.6 E-5	8.7 E-6	1.0 E-6	5.5 E-7	2.6 E-6	8.9 E-6	4.8 E-6	5.6 E-7	3.0 E-7
Chrysene	4.2 E-6	1.5 E-5	7.8 E-6	9.1 E-7	4.9 E-7	2.6 E-6	9.1 E-6	4.9 E-6	5.7 E-7	3.1 E-7
bis(2-Ethylhexyl)Phthalate	7.0 E-9	2.4 E-8	1.3 E-8	1.5 E-9	8.3 E-10	4.3 E-9	1.5 E-8	7.9 E-9	9.2 E-10	5.0 E-10

TABLE 5-4

ESTIMATED CARCINOGENIC RISK FROM INGESTION OF SITE-WIDE SOILS

(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Di-n-Octyl Phthalate	na	na	na	na	na	na	na	na	na	na
Benzo(b)Fluoranthene	6.3 E-6	2.2 E-5	1.2 E-5	1.4 E-6	7.4 E-7	3.4 E-6	1.2 E-5	6.3 E-6	7.3 E-7	3.9 E-7
Benzo(k)Fluoranthene	2.1 E-6	7.3 E-6	3.9 E-6	4.6 E-7	2.5 E-7	1.7 E-6	5.9 E-6	3.2 E-6	3.7 E-7	2.0 E-7
Benzo(a)Pyrene	3.5 E-6	1.2 E-5	6.6 E-6	7.6 E-7	4.1 E-7	2.4 E-6	8.3 E-6	4.5 E-6	5.2 E-7	2.8 E-7
Indeno(1,2,3-cd)Pyrene	1.9 E-6	6.6 E-6	3.6 E-6	4.1 E-7	2.2 E-7	1.6 E-6	5.6 E-6	3.0 E-6	3.5 E-7	1.9 E-7
Benzo(g,h,i)Perylene	na	na	na	na	na	na	na	na	na	na
4,4'-DDE	na	na	na	na	na	2.5 E-9	8.8 E-9	4.7 E-9	5.5 E-10	3.0 E-10
Endrin	na	na	na	na	na	na	na	na	na	na
4,4'-DDD	7.9 E-10	2.7 E-9	1.5 E-9	1.7 E-10	9.3 E-11	2.0 E-9	7.0 E-9	3.8 E-9	4.4 E-10	2.4 E-10
4,4'-DDT	1.5 E-9	5.0 E-9	2.7 E-9	3.1 E-10	1.7 E-10	2.8 E-9	9.7 E-9	5.2 E-9	6.1 E-10	3.3 E-10
Aroclor-1254	2.5 E-3	8.6 E-3	4.6 E-3	5.4 E-4	2.9 E-4	7.6 E-5	2.6 E-4	1.4 E-4	1.6 E-5	8.9 E-6
Hexachlorobenzene	1.2 E-5	4.2 E-5	2.3 E-5	2.6 E-6	1.4 E-6	1.2 E-5	4.2 E-5	2.3 E-5	2.6 E-6	1.4 E-6
Hexachlorobutadiene	1.1 E-10	3.6 E-10	2.0 E-10	2.3 E-11	1.2 E-11	1.1 E-10	3.6 E-10	2.0 E-10	2.3 E-11	1.2 E-11
Heptachloronorborene	na	na	na	na	na	na	na	na	na	na
Total HEPTA CDD	1.0 E-5	3.5 E-5	1.9 E-5	2.2 E-6	1.2 E-6	3.4 E-7	1.2 E-6	6.3 E-7	7.3 E-8	3.9 E-8
Total OCTA CDD	9.5 E-6	3.3 E-5	1.8 E-5	2.0 E-6	1.1 E-6	6.2 E-8	2.1 E-7	1.2 E-7	1.3 E-8	7.3 E-9
2,3,7,8-TCDD	na	na	na	na	na	3.9 E-7	1.4 E-6	7.3 E-7	8.5 E-8	4.6 E-8
Total TETRA CDF	na	na	na	na	na	3.9 E-7	1.4 E-6	7.3 E-7	8.5 E-8	4.6 E-8
TOTAL:	2.5 E-3	8.8 E-3	4.7 E-3	5.5 E-4	3.0 E-4	1.0 E-4	3.6 E-4	1.9 E-4	2.2 E-5	1.2 E-5

na = not available

Shaded numbers exceed 10^-6 cancer risk.

TABLE 5-5

ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT WITH SITE-WIDE SOILS

(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Antimony	na	na	na	na	na	na	na	na	na	na
Cadmium	na	na	na	na	na	na	na	na	na	na
Chromium	na	na	na	na	na	na	na	na	na	na
Copper	na	na	na	na	na	na	na	na	na	na
Lead	na	na	na	na	na	na	na	na	na	na
Silver	na	na	na	na	na	na	na	na	na	na
Zinc	na	na	na	na	na	na	na	na	na	na
Cyanide	na	na	na	na	na	na	na	na	na	na
Methylene Chloride	2.4 E-9	2.4 E-9	6.2 E-9	2.4 E-9	6.2 E-9	2.0 E-8	2.0 E-8	5.2 E-8	2.0 E-8	5.2 E-8
Acetone	na	na	na	na	na	na	na	na	na	na
2-Butanone	na	na	na	na	na	na	na	na	na	na
Benzene	6.9 E-10	6.8 E-10	1.8 E-9	6.8 E-10	1.8 E-9	6.9 E-10	6.8 E-10	1.8 E-9	6.8 E-10	1.8 E-9
Tetrachloroethene	4.6 E-9	4.5 E-9	1.2 E-8	4.5 E-9	1.2 E-8	2.1 E-7	2.1 E-7	5.5 E-7	2.1 E-7	5.5 E-7
Toluene	na	na	na	na	na	na	na	na	na	na
Chlorobenzene	na	na	na	na	na	na	na	na	na	na
Ethylbenzene	na	na	na	na	na	na	na	na	na	na
Xylene (total)	na	na	na	na	na	na	na	na	na	na
4-Methylphenol	na	na	na	na	na	na	na	na	na	na
Naphthalene	na	na	na	na	na	na	na	na	na	na
2-Methylnaphthalene	na	na	na	na	na	na	na	na	na	na
Diethylphthalate	na	na	na	na	na	na	na	na	na	na
Phenanthrene	na	na	na	na	na	na	na	na	na	na
Anthracene	na	na	na	na	na	na	na	na	na	na
Di-n-Butylphthalate	na	na	na	na	na	na	na	na	na	na
Fluoranthene	na	na	na	na	na	na	na	na	na	na
Pyrene	na	na	na	na	na	na	na	na	na	na
Butylbenzylphthalate	na	na	na	na	na	na	na	na	na	na
Benzo(a)Anthracene	6.1 E-5	6.0 E-5	1.6 E-4	6.0 E-5	1.6 E-4	3.4 E-5	3.3 E-5	8.7 E-5	3.3 E-5	8.7 E-5
Chrysene	5.5 E-5	5.4 E-5	1.4 E-4	5.4 E-5	1.4 E-4	3.5 E-5	3.4 E-5	9.0 E-5	3.4 E-5	9.0 E-5
bis(2-Ethylhexyl)Phthalate	9.3 E-8	9.1 E-8	2.4 E-7	9.1 E-8	2.4 E-7	5.6 E-8	5.5 E-8	1.4 E-7	5.5 E-8	1.4 E-7

TABLE 5-5

ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT WITH SITE-WIDE SOILS

(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Di-n-Octyl Phthalate	na	na	na	na	na	na	na	na	na	na
Benzo(b)Fluoranthene	8.3 E-5	8.2 E-5	2.1 E-4	8.2 E-5	2.1 E-4	4.4 E-5	4.3 E-5	1.1 E-4	4.3 E-5	1.1 E-4
Benzo(k)Fluoranthene	2.8 E-5	2.7 E-5	7.2 E-5	2.7 E-5	7.2 E-5	2.3 E-5	2.2 E-5	5.8 E-5	2.2 E-5	5.8 E-5
Benzo(a)Pyrene	4.6 E-5	4.5 E-5	1.2 E-4	4.5 E-5	1.2 E-4	3.2 E-5	3.1 E-5	8.2 E-5	3.1 E-5	8.2 E-5
Indeno(1,2,3-cd)Pyrene	2.5 E-5	2.5 E-5	6.5 E-5	2.5 E-5	6.5 E-5	2.2 E-5	2.1 E-5	5.5 E-5	2.1 E-5	5.5 E-5
Benzo(g,h,i)Perylene	na	na	na	na	na	na	na	na	na	na
4,4'-DDE	na	na	na	na	na	3.4 E-8	3.3 E-8	8.6 E-8	3.3 E-8	8.6 E-8
Endrin	na	na	na	na	na	na	na	na	na	na
4,4'-DDD	1.0 E-8	1.0 E-8	2.7 E-8	1.0 E-8	2.7 E-8	2.7 E-8	2.6 E-8	6.8 E-8	2.6 E-8	6.8 E-8
4,4'-DDT	1.9 E-8	1.9 E-8	4.9 E-8	1.9 E-8	4.9 E-8	3.7 E-8	3.6 E-8	9.5 E-8	3.6 E-8	9.5 E-8
Aroclor-1254	3.3 E-2	3.2 E-2	8.4 E-2	3.2 E-2	8.4 E-2	1.0 E-3	9.8 E-4	2.6 E-3	9.8 E-4	2.6 E-3
Hexachlorobenzene	1.6 E-4	1.6 E-4	4.1 E-4	1.6 E-4	4.1 E-4	1.6 E-4	1.6 E-4	4.1 E-4	1.6 E-4	4.1 E-4
Hexachlorobutadiene	1.4 E-9	1.4 E-9	3.6 E-9	1.4 E-9	3.6 E-9	1.4 E-9	1.4 E-9	3.6 E-9	1.4 E-9	3.6 E-9
Heptachloronorborene	na	na	na	na	na	na	na	na	na	na
Total HEPTA CDD	1.3 E-4	1.3 E-4	3.4 E-4	1.3 E-4	3.4 E-4	4.4 E-6	4.3 E-6	1.1 E-5	4.3 E-6	1.1 E-5
Total OCTA CDD	1.2 E-4	1.2 E-4	3.2 E-4	1.2 E-4	3.2 E-4	8.1 E-7	8.0 E-7	2.1 E-6	8.0 E-7	2.1 E-6
2,3,7,8-TCDD	na	na	na	na	na	5.2 E-6	5.1 E-6	1.3 E-5	5.1 E-6	1.3 E-5
Total TETRA CDF	na	na	na	na	na	5.2 E-6	5.1 E-6	1.3 E-5	5.1 E-6	1.3 E-5
TOTAL:	**3.3 E-2**	**3.3 E-2**	**8.6 E-2**	**3.3 E-2**	**8.6 E-2**	**1.4 E-3**	**1.3 E-3**	**3.5 E-3**	**1.3 E-3**	**3.5 E-3**

na = not available

Shaded numbers exceed 10^-6 cancer risk.

TABLE 5-6
ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF SITE-WIDE SOILS
(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Antimony	na	na	na	na	na	na	na	na	na	na
Cadmium	na	na	na	na	na	na	na	na	na	na
Chromium	na	na	na	na	na	na	na	na	na	na
Copper	na	na	na	na	na	na	na	na	na	na
Lead	na	na	na	na	na	na	na	na	na	na
Silver	na	na	na	na	na	na	na	na	na	na
Zinc	na	na	na	na	na	na	na	na	na	na
Cyanide	na	na	na	na	na	na	na	na	na	na
Methylene Chloride	2.5 E-9	2.6 E-9	6.3 E-9	2.4 E-9	6.2 E-9	2.1 E-8	2.2 E-8	5.3 E-8	2.0 E-8	5.2 E-8
Acetone	na	na	na	na	na	na	na	na	na	na
2-Butanone	na	na	na	na	na	na	na	na	na	na
Benzene	7.1 E-10	7.5 E-10	1.8 E-9	6.8 E-10	1.8 E-9	7.1 E-10	7.5 E-10	1.8 E-9	6.8 E-10	1.8 E-9
Tetrachloroethene	4.8 E-9	5.0 E-9	1.2 E-8	4.6 E-9	1.2 E-8	2.2 E-7	2.3 E-7	5.6 E-7	2.1 E-7	5.5 E-7
Toluene	na	na	na	na	na	na	na	na	na	na
Chlorobenzene	na	na	na	na	na	na	na	na	na	na
Ethylbenzene	na	na	na	na	na	na	na	na	na	na
Xylene (total)	na	na	na	na	na	na	na	na	na	na
4-Methylphenol	na	na	na	na	na	na	na	na	na	na
Naphthalene	na	na	na	na	na	na	na	na	na	na
2-Methylnaphthalene	na	na	na	na	na	na	na	na	na	na
Diethylphthalate	na	na	na	na	na	na	na	na	na	na
Phenanthrene	na	na	na	na	na	na	na	na	na	na
Anthracene	na	na	na	na	na	na	na	na	na	na
Di-n-Butylphthalate	na	na	na	na	na	na	na	na	na	na
Fluoranthene	na	na	na	na	na	na	na	na	na	na
Pyrene	na	na	na	na	na	na	na	na	na	na
Butylbenzylphthalate	na	na	na	na	na	na	na	na	na	na
Benzo(a)Anthracene	6.6 E-5	7.6 E-5	1.7 E-4	6.1 E-5	1.6 E-4	3.6 E-5	4.2 E-5	9.2 E-5	3.4 E-5	8.7 E-5
Chrysene	6.0 E-5	6.9 E-5	1.5 E-4	5.5 E-5	1.4 E-4	3.7 E-5	4.3 E-5	9.5 E-5	3.5 E-5	9.0 E-5
bis(2-Ethylhexyl)Phthalate	1.0 E-7	1.2 E-7	2.5 E-7	9.2 E-8	2.4 E-7	6.0 E-8	7.0 E-8	1.5 E-7	5.6 E-8	1.5 E-7

TABLE 5-6

ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF SITE-WIDE SOILS

(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Di-n-Octyl Phthalate	na	na	na	na	na	na	na	na	na	na
Benzo(b)Fluoranthene	9.0 E-5	1.0 E-4	2.3 E-4	8.3 E-5	2.2 E-4	4.8 E-5	5.5 E-5	1.2 E-4	4.4 E-5	1.1 E-4
Benzo(k)Fluoranthene	3.0 E-5	3.5 E-5	7.6 E-5	2.8 E-5	7.2 E-5	2.4 E-5	2.8 E-5	6.1 E-5	2.2 E-5	5.8 E-5
Benzo(a)Pyrene	5.0 E-5	5.8 E-5	1.3 E-4	4.6 E-5	1.2 E-4	3.4 E-5	3.9 E-5	8.6 E-5	3.2 E-5	8.2 E-5
Indeno(1,2,3-cd)Pyrene	2.7 E-5	3.1 E-5	6.8 E-5	2.5 E-5	6.5 E-5	2.3 E-5	2.7 E-5	5.8 E-5	2.1 E-5	5.6 E-5
Benzo(g,h,i)Perylene	na	na	na	na	na	na	na	na	na	na
4,4'-DDE	na	na	na	na	na	3.6 E-8	4.2 E-8	9.1 E-8	3.3 E-8	8.7 E-8
Endrin	na	na	na	na	na	na	na	na	na	na
4,4'-DDD	1.1 E-8	1.3 E-8	2.8 E-8	1.0 E-8	2.7 E-8	2.9 E-8	3.3 E-8	7.2 E-8	2.6 E-8	6.9 E-8
4,4'-DDT	2.1 E-8	2.4 E-8	5.2 E-8	1.9 E-8	4.9 E-8	4.0 E-8	4.6 E-8	1.0 E-7	3.7 E-8	9.5 E-8
Aroclor-1254	3.5 E-2	4.1 E-2	8.9 E-2	3.2 E-2	8.4 E-2	1.1 E-3	1.2 E-3	2.7 E-3	9.9 E-4	2.6 E-3
Hexachlorobenzene	1.7 E-4	2.0 E-4	4.3 E-4	1.6 E-4	4.1 E-4	1.7 E-4	2.0 E-4	4.3 E-4	1.6 E-4	4.1 E-4
Hexachlorobutadiene	1.5 E-9	1.7 E-9	3.8 E-9	1.4 E-9	3.6 E-9	1.5 E-9	1.7 E-9	3.8 E-9	1.4 E-9	3.6 E-9
Heptachloronorborene	na	na	na	na	na	na	na	na	na	na
Total HEPTA CDD	1.4 E-4	1.7 E-4	3.6 E-4	1.3 E-4	3.4 E-4	4.8 E-6	5.5 E-6	1.2 E-5	4.4 E-6	1.1 E-5
Total OCTA CDD	1.3 E-4	1.5 E-4	3.4 E-4	1.2 E-4	3.2 E-4	8.8 E-7	1.0 E-6	2.2 E-6	8.1 E-7	2.1 E-6
2,3,7,8-TCDD	na	na	na	na	na	5.6 E-6	6.4 E-6	1.4 E-5	5.2 E-6	1.3 E-5
Total TETRA CDF	na	na	na	na	na	5.6 E-6	6.4 E-6	1.4 E-5	5.2 E-6	1.3 E-5
TOTAL:	3.6 E-2	4.1 E-2	9.1 E-2	3.3 E-2	8.6 E-2	1.5 E-3	1.7 E-3	3.7 E-3	1.4 E-3	3.5 E-3

na = not available

Shaded numbers exceed 10^-6 cancer risk.

TABLE 5-7
ESTIMATED CARCINOGENIC RISK FROM INGESTION OF GROUND WATER
(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	na	na	na	ne	ne	na	na	na	ne	ne
Arsenic	na	na	na	ne	ne	na	6.1 E-4	1.3 E-3	ne	ne
Barium	na	na	na	ne	ne	na	na	na	ne	ne
Cadmium	na	na	na	ne	ne	na	na	na	ne	ne
Chromium	na	na	na	ne	ne	na	na	na	ne	ne
Cobalt	na	na	na	ne	ne	na	na	na	ne	ne
Copper	na	na	na	ne	ne	na	na	na	ne	ne
Lead	na	na	na	ne	ne	na	na	na	ne	ne
Manganese	na	na	na	ne	ne	na	na	na	ne	ne
Nickel	na	na	na	ne	ne	na	na	na	ne	ne
Vanadium	na	na	na	ne	ne	na	na	na	ne	ne
Zinc	na	na	na	ne	ne	na	na	na	ne	ne
Cyanide	na	na	na	ne	ne	na	na	na	ne	ne
Vinyl Chloride	na	na	na	ne	ne	na	5.2 E-4	1.1 E-3	ne	ne
Chloroethane	na	na	na	ne	ne	na	na	na	ne	ne
Methylene Chloride	na	na	na	ne	ne	na	6.0 E-7	1.3 E-6	ne	ne
Acetone	na	na	na	ne	ne	na	na	na	ne	ne
1,1-Dichloroethane	na	na	na	ne	ne	na	na	na	ne	ne
1,2-Dichloroethene	na	na	na	ne	ne	na	na	na	ne	ne
Chloroform	na	2.8 E-7	6.0 E-7	ne	ne	na	2.9 E-6	6.3 E-6	ne	ne
1,2-Dichloroethane	na	na	na	ne	ne	na	9.3 E-5	2.0 E-4	ne	ne
2-Butanone	na	na	na	ne	ne	na	na	na	ne	ne
1,1,1-Trichloroethane	na	na	na	ne	ne	na	na	na	ne	ne
Carbon Tetrachloride	na	na	na	ne	ne	na	4.9 E-6	1.1 E-5	ne	ne
1,2-Dichloropropane	na	na	na	ne	ne	na	1.4 E-4	3.1 E-4	ne	ne
Trichloroethene	na	na	na	ne	ne	na	4.4 E-6	9.6 E-6	ne	ne
1,1,2-Trichloroethane	na	na	na	ne	ne	na	1.8 E-5	3.8 E-5	ne	ne
Benzene	na	na	na	ne	ne	na	3.3 E-3	7.1 E-3	ne	ne
Tetrachloroethene	na	na	na	ne	ne	na	5.8 E-6	1.2 E-5	ne	ne
1,1,2,2-Tetrachloroethane	na	na	na	ne	ne	na	6.8 E-6	1.5 E-5	ne	ne
Toluene	na	na	na	ne	ne	na	na	na	ne	ne
Chlorobenzene	na	na	na	ne	ne	na	na	na	ne	ne

TABLE 5-7
ESTIMATED CARCINOGENIC RISK FROM INGESTION OF GROUND WATER
(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Ethylbenzene	na	na	na	ne	ne	na	na	na	ne	ne
Xylene (total)	na	na	na	ne	ne	na	na	na	ne	ne
Phenol	na	na	na	ne	ne	na	na	na	ne	ne
bis(2-Chloroethyl)Ether	na	na	na	ne	ne	na	1.5 E-3	3.2 E-3	ne	ne
1,4-Dichlorobenzene	na	na	na	ne	ne	na	1.5 E-6	3.2 E-6	ne	ne
Benzyl Alcohol	na	na	na	ne	ne	na	na	na	ne	ne
1,2-Dichlorobenzene	na	na	na	ne	ne	na	na	na	ne	ne
2-Methylphenol	na	na	na	ne	ne	na	na	na	ne	ne
4-Methylphenol	na	na	na	ne	ne	na	na	na	ne	ne
Naphthalene	na	na	na	ne	ne	na	na	na	ne	ne
2-Methylnaphthalene	na	na	na	ne	ne	na	na	na	ne	ne
Pentachlorophenol	na	na	na	ne	ne	na	1.8 E-4	3.8 E-4	ne	ne
Di-n-Butylphthalate	na	na	na	ne	ne	na	na	na	ne	ne
bis(2-Ethylhexyl)Phthalate	na	na	na	ne	ne	na	9.5 E-7	2.1 E-6	ne	ne
Aldrin	na	na	na	ne	ne	na	4.8 E-5	1.0 E-4	ne	ne
Dieldrin	na	na	na	ne	ne	na	1.2 E-5	2.5 E-5	ne	ne
4,4'-DDT	na	1.7 E-7	3.7 E-7	ne	ne	na	1.7 E-7	3.7 E-7	ne	ne
Aroclor-1254	na	8.7 E-6	1.9 E-5	ne	ne	na	8.7 E-6	1.9 E-5	ne	ne
Hexachlorobenzene	na	na	na	ne	ne	na	2.2 E-6	4.7 E-6	ne	ne
Hexachlorobutadiene	na	na	na	ne	ne	na	3.9 E-8	8.3 E-8	ne	ne
Heptachloronorborene	na	na	na	ne	ne	na	na	na	ne	ne
TOTAL:	na	9.2 E-6	2.0 E-5	ne	ne	na	6.4 E-3	1.4 E-2	ne	ne

na = not available

ne = no exposure

Shaded numbers exceed 10^-6 cancer risk

TABLE 5-8
ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT WITH GROUND WATER VIA SHOWERING
(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	ne	ne	ne	na	na	ne	ne
Arsenic	ne	na	na	ne	ne	ne	1.3 E-6	3.8 E-6	ne	ne
Barium	ne	na	na	ne	ne	ne	na	na	ne	ne
Cadmium	ne	na	na	ne	ne	ne	na	na	ne	ne
Chromium	ne	na	na	ne	ne	ne	na	na	ne	ne
Cobalt	ne	na	na	ne	ne	ne	na	na	ne	ne
Copper	ne	na	na	ne	ne	ne	na	na	ne	ne
Lead	ne	na	na	ne	ne	ne	na	na	ne	ne
Manganese	ne	na	na	ne	ne	ne	na	na	ne	ne
Nickel	ne	na	na	ne	ne	ne	na	na	ne	ne
Vanadium	ne	na	na	ne	ne	ne	na	na	ne	ne
Zinc	ne	na	na	ne	ne	ne	na	na	ne	ne
Cyanide	ne	na	na	ne	ne	ne	na	na	ne	ne
Vinyl Chloride	ne	na	na	ne	ne	ne	7.6 E-4	2.2 E-3	ne	ne
Chloroethane	ne	na	na	ne	ne	ne	na	na	ne	ne
Methylene Chloride	ne	na	na	ne	ne	ne	8.8 E-7	2.5 E-6	ne	ne
Acetone	ne	na	na	ne	ne	ne	na	na	ne	ne
1,1-Dichloroethane	ne	na	na	ne	ne	ne	na	na	ne	ne
1,2-Dichloroethene	ne	na	na	ne	ne	ne	na	na	ne	ne
Chloroform	ne	4.1 E-7	1.2 E-6	ne	ne	ne	4.3 E-6	1.2 E-5	ne	ne
1,2-Dichloroethane	ne	na	na	ne	ne	ne	1.4 E-4	3.9 E-4	ne	ne
2-Butanone	ne	na	na	ne	ne	ne	na	na	ne	ne
1,1,1-Trichloroethane	ne	na	na	ne	ne	ne	na	na	ne	ne
Carbon Tetrachloride	ne	na	na	ne	ne	ne	7.3 E-6	2.1 E-5	ne	ne
1,2-Dichloropropane	ne	na	na	ne	ne	ne	2.1 E-4	6.0 E-4	ne	ne
Trichloroethene	ne	na	na	ne	ne	ne	6.5 E-6	1.9 E-5	ne	ne
1,1,2-Trichloroethane	ne	na	na	ne	ne	ne	2.6 E-5	7.5 E-5	ne	ne
Benzene	ne	na	na	ne	ne	ne	5.3 E-4	1.5 E-3	ne	ne
Tetrachloroethene	ne	na	na	ne	ne	ne	8.5 E-6	2.4 E-5	ne	ne
1,1,2,2-Tetrachloroethane	ne	na	na	ne	ne	ne	1.0 E-5	2.9 E-5	ne	ne
Toluene	ne	na	na	ne	ne	ne	na	na	ne	ne
Chlorobenzene	ne	na	na	ne	ne	ne	na	na	ne	ne

TABLE 5-8
ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT WITH GROUND WATER VIA SHOWERING
(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Ethylbenzene	ne	na	na	ne	ne	ne	na	na	ne	ne
Xylene (total)	ne	na	na	ne	ne	ne	na	na	ne	ne
Phenol	ne	na	na	ne	ne	ne	na	na	ne	ne
bis(2-Chloroethyl)Ether	ne	na	na	ne	ne	ne	3.3 E-6	9.4 E-6	ne	ne
1,4-Dichlorobenzene	ne	na	na	ne	ne	ne	3.3 E-9	9.4 E-9	ne	ne
Benzyl Alcohol	ne	na	na	ne	ne	ne	na	na	ne	ne
1,2-Dichlorobenzene	ne	na	na	ne	ne	ne	na	na	ne	ne
2-Methylphenol	ne	na	na	ne	ne	ne	na	na	ne	ne
4-Methylphenol	ne	na	na	ne	ne	ne	na	na	ne	ne
Naphthalene	ne	na	na	ne	ne	ne	na	na	ne	ne
2-Methylnaphthalene	ne	na	na	ne	ne	ne	na	na	ne	ne
Pentachlorophenol	ne	na	na	ne	ne	ne	3.9 E-7	1.1 E-6	ne	ne
Di-n-Butylphthalate	ne	na	na	ne	ne	ne	na	na	ne	ne
bis(2-Ethylhexyl)Phthalate	ne	na	na	ne	ne	ne	2.1 E-9	6.0 E-9	ne	ne
Aldrin	ne	na	na	ne	ne	ne	1.1 E-7	3.0 E-7	ne	ne
Dieldrin	ne	na	na	ne	ne	ne	2.6 E-8	7.4 E-8	ne	ne
4,4'-DDT	ne	3.8 E-10	1.1 E-9	ne	ne	ne	3.8 E-10	1.1 E-9	ne	ne
Aroclor-1254	ne	1.9 E-8	5.5 E-8	ne	ne	ne	1.9 E-8	5.5 E-8	ne	ne
Hexachlorobenzene	ne	na	na	ne	ne	ne	5.1 E-10	1.5 E-9	ne	ne
Hexachlorobutadiene	ne	na	na	ne	ne	ne	8.4 E-11	2.4 E-10	ne	ne
Heptachloronorborene	ne	na	na	ne	ne	ne	na	na	ne	ne
TOTAL:	ne	4.3 E-7	1.2 E-6	ne	ne	ne	1.7 E-3	4.9 E-3	ne	ne

na = not available

ne = no exposure

Shaded numbers exceed 10^-6 cancer risk

TABLE 5-9
ESTIMATED CARCINOGENIC RISK FROM INHALATION OF GROUND WATER VIA SHOWERING
(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	ne	ne	ne	na	na	ne	ne
Arsenic	ne	na	na	ne	ne	ne	na	na	ne	ne
Barium	ne	na	na	ne	ne	ne	na	na	ne	ne
Cadmium	ne	na	na	ne	ne	ne	na	na	ne	ne
Chromium	ne	na	na	ne	ne	ne	na	na	ne	ne
Cobalt	ne	na	na	ne	ne	ne	na	na	ne	ne
Copper	ne	na	na	ne	ne	ne	na	na	ne	ne
Lead	ne	na	na	ne	ne	ne	na	na	ne	ne
Manganese	ne	na	na	ne	ne	ne	na	na	ne	ne
Nickel	ne	na	na	ne	ne	ne	na	na	ne	ne
Vanadium	ne	na	na	ne	ne	ne	na	na	ne	ne
Zinc	ne	na	na	ne	ne	ne	na	na	ne	ne
Cyanide	ne	na	na	ne	ne	ne	na	na	ne	ne
Vinyl Chloride	ne	na	na	ne	ne	ne	5.4 E-5	5.8 E-5	ne	ne
Chloroethane	ne	na	na	ne	ne	ne	na	na	ne	ne
Methylene Chloride	ne	na	na	ne	ne	ne	1.6 E-7	1.7 E-7	ne	ne
Acetone	ne	na	na	ne	ne	ne	na	na	ne	ne
1,1-Dichloroethane	ne	na	na	ne	ne	ne	na	na	ne	ne
1,2-Dichloroethene	ne	na	na	ne	ne	ne	na	na	ne	ne
Chloroform	ne	2.5 E-7	2.7 E-7	ne	ne	ne	2.7 E-6	2.9 E-6	ne	ne
1,2-Dichloroethane	ne	na	na	ne	ne	ne	2.4 E-6	2.6 E-6	ne	ne
2-Butanone	ne	na	na	ne	ne	ne	na	na	ne	ne
1,1,1-Trichloroethane	ne	na	na	ne	ne	ne	na	na	ne	ne
Carbon Tetrachloride	ne	na	na	ne	ne	ne	2.0 E-7	2.2 E-7	ne	ne
1,2-Dichloropropane	ne	na	na	ne	ne	ne	na	na	ne	ne
Trichloroethene	ne	na	na	ne	ne	ne	1.9 E-7	2.1 E-7	ne	ne
1,1,2-Trichloroethane	ne	na	na	ne	ne	ne	1.9 E-7	2.0 E-7	ne	ne
Benzene	ne	na	na	ne	ne	ne	1.2 E-4	1.3 E-4	ne	ne
Tetrachloroethene	ne	na	na	ne	ne	ne	1.7 E-9	1.8 E-9	ne	ne
1,1,2,2-Tetrachloroethane	ne	na	na	ne	ne	ne	3.1 E-7	3.3 E-7	ne	ne
Toluene	ne	na	na	ne	ne	ne	na	na	ne	ne
Chlorobenzene	ne	na	na	ne	ne	ne	na	na	ne	ne

TABLE 5-9
ESTIMATED CARCINOGENIC RISK FROM INHALATION OF GROUND WATER VIA SHOWERING
(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Ethylbenzene	ne	na	na	ne	ne	ne	na	na	ne	ne
Xylene (total)	ne	na	na	ne	ne	ne	na	na	ne	ne
Phenol	ne	na	na	ne	ne	ne	na	na	ne	ne
bis(2-Chloroethyl)Ether	ne	na	na	ne	ne	ne	6.2 E-7	6.7 E-7	ne	ne
1,4-Dichlorobenzene	ne	na	na	ne	ne	ne	na	na	ne	ne
Benzyl Alcohol	ne	na	na	ne	ne	ne	na	na	ne	ne
1,2-Dichlorobenzene	ne	na	na	ne	ne	ne	na	na	ne	ne
2-Methylphenol	ne	na	na	ne	ne	ne	na	na	ne	ne
4-Methylphenol	ne	na	na	ne	ne	ne	na	na	ne	ne
Naphthalene	ne	na	na	ne	ne	ne	na	na	ne	ne
2-Methylnaphthalene	ne	na	na	ne	ne	ne	na	na	ne	ne
Pentachlorophenol	ne	na	na	ne	ne	ne	na	na	ne	ne
Di-n-Butylphthalate	ne	na	na	ne	ne	ne	na	na	ne	ne
bis(2-Ethylhexyl)Phthalate	ne	na	na	ne	ne	ne	na	na	ne	ne
Aldrin	ne	na	na	ne	ne	ne	na	na	ne	ne
Dieldrin	ne	na	na	ne	ne	ne	na	na	ne	ne
4,4'-DDT	ne	na	na	ne	ne	ne	na	na	ne	ne
Aroclor-1254	ne	na	na	ne	ne	ne	na	na	ne	ne
Hexachlorobenzene	ne	na	na	ne	ne	ne	na	na	ne	ne
Hexachlorobutadiene	ne	na	na	ne	ne	ne	na	na	ne	ne
Heptachloronorborene	ne	na	na	ne	ne	ne	na	na	ne	ne
TOTAL:	ne	2.5 E-7	2.7 E-7	ne	ne	ne	1.8 E-4	1.9 E-4	ne	ne

na = not available

ne = no exposure

Shaded numbers exceed 10^-6 cancer risk

TABLE 5-10
ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF GROUND WATER
(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	na	na	na	ne	ne	na	na	na	ne	ne
Arsenic	na	na	na	ne	ne	na	6.1 E-4	1.3 E-3	ne	ne
Barium	na	na	na	ne	ne	na	na	na	ne	ne
Cadmium	na	na	na	ne	ne	na	na	na	ne	ne
Chromium	na	na	na	ne	ne	na	na	na	ne	ne
Cobalt	na	na	na	ne	ne	na	na	na	ne	ne
Copper	na	na	na	ne	ne	na	na	na	ne	ne
Lead	na	na	na	ne	ne	na	na	na	ne	ne
Manganese	na	na	na	ne	ne	na	na	na	ne	ne
Nickel	na	na	na	ne	ne	na	na	na	ne	ne
Vanadium	na	na	na	ne	ne	na	na	na	ne	ne
Zinc	na	na	na	ne	ne	na	na	na	ne	ne
Cyanide	na	na	na	ne	ne	na	na	na	ne	ne
Vinyl Chloride	na	na	na	ne	ne	na	1.3 E-3	3.4 E-3	ne	ne
Chloroethane	na	na	na	ne	ne	na	na	na	ne	ne
Methylene Chloride	na	na	na	ne	ne	na	1.6 E-6	4.0 E-6	ne	ne
Acetone	na	na	na	ne	ne	na	na	na	ne	ne
1,1-Dichloroethane	na	na	na	ne	ne	na	na	na	ne	ne
1,2-Dichloroethene	na	na	na	ne	ne	na	na	na	ne	ne
Chloroform	na	9.3 E-7	2.0 E-6	ne	ne	na	9.9 E-6	2.2 E-5	ne	ne
1,2-Dichloroethane	na	na	na	ne	ne	na	2.3 E-4	6.0 E-4	ne	ne
2-Butanone	na	na	na	ne	ne	na	na	na	ne	ne
1,1,1-Trichloroethane	na	na	na	ne	ne	na	na	na	ne	ne
Carbon Tetrachloride	na	na	na	ne	ne	na	1.2 E-5	3.2 E-5	ne	ne
1,2-Dichloropropane	na	na	na	ne	ne	na	3.5 E-4	9.1 E-4	ne	ne
Trichloroethene	na	na	na	ne	ne	na	1.1 E-5	2.9 E-5	ne	ne
1,1,2-Trichloroethane	na	na	na	ne	ne	na	4.4 E-5	1.1 E-4	ne	ne
Benzene	na	na	na	ne	ne	na	3.9 E-3	8.8 E-3	ne	ne
Tetrachloroethene	na	na	na	ne	ne	na	1.4 E-5	3.7 E-5	ne	ne
1,1,2,2-Tetrachloroethane	na	na	na	ne	ne	na	1.7 E-5	4.4 E-5	ne	ne
Toluene	na	na	na	ne	ne	na	na	na	ne	ne
Chlorobenzene	na	na	na	ne	ne	na	na	na	ne	ne

TABLE 5-10
ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF GROUND WATER
(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Ethylbenzene	na	na	na	ne	ne	na	na	na	ne	ne
Xylene (total)	na	na	na	ne	ne	na	na	na	ne	ne
Phenol	na	na	na	ne	ne	na	na	na	ne	ne
bis(2-Chloroethyl)Ether	na	na	na	ne	ne	na	1.5 E-3	3.2 E-3	ne	ne
1,4-Dichlorobenzene	na	na	na	ne	ne	na	1.5 E-6	3.2 E-6	ne	ne
Benzyl Alcohol	na	na	na	ne	ne	na	na	na	ne	ne
1,2-Dichlorobenzene	na	na	na	ne	ne	na	na	na	ne	ne
2-Methylphenol	na	na	na	ne	ne	na	na	na	ne	ne
4-Methylphenol	na	na	na	ne	ne	na	na	na	ne	ne
Naphthalene	na	na	na	ne	ne	na	na	na	ne	ne
2-Methylnaphthalene	na	na	na	ne	ne	na	na	na	ne	ne
Pentachlorophenol	na	na	na	ne	ne	na	1.8 E-4	3.8 E-4	ne	ne
Di-n-Butylphthalate	na	na	na	ne	ne	na	na	na	ne	ne
bis(2-Ethylhexyl)Phthalate	na	na	na	ne	ne	na	9.6 E-7	2.1 E-6	ne	ne
Aldrin	na	na	na	ne	ne	na	4.8 E-5	1.0 E-4	ne	ne
Dieldrin	na	na	na	ne	ne	na	1.2 E-5	2.6 E-5	ne	ne
4,4'-DDT	na	1.7 E-7	3.8 E-7	ne	ne	na	1.7 E-7	3.8 E-7	ne	ne
Aroclor-1254	na	8.8 E-6	1.9 E-5	ne	ne	na	8.8 E-6	1.9 E-5	ne	ne
Hexachlorobenzene	na	na	na	ne	ne	na	2.2 E-6	4.7 E-6	ne	ne
Hexachlorobutadiene	na	na	na	ne	ne	na	3.9 E-8	8.3 E-8	ne	ne
Heptachloronorborene	na	na	na	ne	ne	na	na	na	ne	ne
TOTAL:	na	9.9 E-6	2.1 E-5	ne	ne	na	8.3 E-3	1.9 E-2	ne	ne

na = not available

ne = no exposure

Shaded numbers exceed 10^-6 cancer risk

TABLE 5-11
ESTIMATED CARCINOGENIC RISK FROM INGESTION OF CREEK SURFACE WATER
(unitless)

Chemical	Mill Creek - Current					Mill Creek - Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Arsenic	ne	na	na	na	na	ne	1.6 E-8	1.7 E-8	1.6 E-8	1.7 E-8
Barium	ne	na	na	na	na	ne	na	na	na	na
Cadmium	ne	na	na	na	na	ne	na	na	na	na
Chromium	ne	na	na	na	na	ne	na	na	na	na
Cobalt	ne	na	na	na	na	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Manganese	ne	na	na	na	na	ne	na	na	na	na
Nickel	ne	na	na	na	na	ne	na	na	na	na
Vanadium	ne	na	na	na	na	ne	na	na	na	na
Zinc	ne	na	na	na	na	ne	na	na	na	na
Cyanide	ne	na	na	na	na	ne	na	na	na	na
Vinyl Chloride	ne	na	na	na	na	ne	5.4 E-9	5.9 E-9	5.4 E-9	5.9 E-9
Chloroethane	ne	na	na	na	na	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na	ne	5.4 E-12	5.9 E-12	5.4 E-12	5.9 E-12
Acetone	ne	na	na	na	na	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na	ne	na	na	na	na
1,1-Dichloroethane	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
Chloroform	ne	na	na	na	na	ne	1.9 E-8	2.0 E-8	1.9 E-8	2.0 E-8
1,2-Dichloroethane	ne	na	na	na	na	ne	1.4 E-9	1.5 E-9	1.4 E-9	1.5 E-9
2-Butanone	ne	na	na	na	na	ne	na	na	na	na
1,1,1-Trichloroethane	ne	na	na	na	na	ne	na	na	na	na
Carbon Tetrachloride	ne	na	na	na	na	ne	1.9 E-7	2.1 E-7	1.9 E-7	2.1 E-7
1,2-Dichloropropane	ne	na	na	na	na	ne	1.9 E-6	2.0 E-6	1.9 E-6	2.0 E-6
Trichloroethene	ne	na	na	na	na	ne	5.0 E-8	5.4 E-8	5.0 E-8	5.4 E-8
1,1,2-Trichloroethane	ne	na	na	na	na	ne	1.5 E-6	1.7 E-6	1.5 E-6	1.7 E-6
Benzene	ne	na	na	na	na	ne	8.6 E-8	9.3 E-8	8.6 E-8	9.3 E-8
Tetrachloroethene	ne	na	na	na	na	ne	2.5 E-8	2.7 E-8	2.5 E-8	2.7 E-8
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	9.1 E-7	9.8 E-7	9.1 E-7	9.8 E-7
Toluene	ne	na	na	na	na	ne	na	na	na	na

TABLE 5-11
ESTIMATED CARCINOGENIC RISK FROM INGESTION OF CREEK SURFACE WATER
(unitless)

Chemical	Mill Creek - Current					Mill Creek - Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Chlorobenzene	ne	na	na	na	na	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na	ne	na	na	na	na
Phenol	ne	na	na	na	na	ne	na	na	na	na
bis(2-Chloroethyl)Ether	ne	na	na	na	na	ne	9.6 E-7	1.0 E-6	9.6 E-7	1.0 E-6
1,4-Dichlorobenzene	ne	na	na	na	na	ne	1.1 E-9	1.2 E-9	1.1 E-9	1.2 E-9
Benzyl Alcohol	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichlorobenzene	ne	na	na	na	na	ne	na	na	na	na
2-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
bis(2-Chloroisopropyl)Ether	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
Naphthalene	ne	na	na	na	na	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Dimethyl Phthalate	ne	na	na	na	na	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na	ne	na	na	na	na
Pentachlorophenol	ne	na	na	na	na	ne	3.1 E-9	3.4 E-9	3.1 E-9	3.4 E-9
Di-n-Butylphthalate	ne	na	na	na	na	ne	na	na	na	na
Pyrene	ne	na	na	na	na	ne	na	na	na	na
Butylbenzylphthalate	ne	na	na	na	na	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	2.3 E-9	2.5 E-9	2.3 E-9	2.5 E-9	ne	1.1 E-10	1.2 E-10	1.1 E-10	1.2 E-10
Di-n-Octyl Phthalate	ne	na	na	na	na	ne	na	na	na	na
Aldrin	ne	na	na	na	na	ne	2.9 E-7	3.1 E-7	2.9 E-7	3.1 E-7
Dieldrin	ne	na	na	na	na	ne	1.2 E-7	1.3 E-7	1.2 E-7	1.3 E-7
4,4'-DDT	ne	na	na	na	na	ne	7.7 E-11	8.3 E-11	7.7 E-11	8.3 E-11
Aroclor-1254	ne	na	na	na	na	ne	1.4 E-9	1.5 E-9	1.4 E-9	1.5 E-9
Hexachlorobenzene	ne	na	na	na	na	ne	3.0 E-6	3.3 E-6	3.0 E-6	3.3 E-6
Hexachlorobutadiene	ne	na	na	na	na	ne	2.9 E-9	3.1 E-9	2.9 E-9	3.1 E-9
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
TOTAL:	**ne**	**2.3 E-9**	**2.5 E-9**	**2.3 E-9**	**2.5 E-9**	**ne**	**9.1 E-6**	**9.9 E-6**	**9.1 E-6**	**9.9 E-6**

na = not available ne = no exposure Shaded numbers exceed 10^-6 cancer risk

TABLE 5-11
ESTIMATED CARCINOGENIC RISK FROM INGESTION OF CREEK SURFACE WATER
(unitless)

Chemical	Skinner Creek - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na
Arsenic	ne	na	na	na	na
Barium	ne	na	na	na	na
Cadmium	ne	na	na	na	na
Chromium	ne	na	na	na	na
Cobalt	ne	na	na	na	na
Copper	ne	na	na	na	na
Lead	ne	na	na	na	na
Manganese	ne	na	na	na	na
Nickel	ne	na	na	na	na
Vanadium	ne	na	na	na	na
Zinc	ne	na	na	na	na
Cyanide	ne	na	na	na	na
Vinyl Chloride	ne	na	na	na	na
Chloroethane	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na
Acetone	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na
1,1-Dichloroethane	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na
Chloroform	ne	na	na	na	na
1,2-Dichloroethane	ne	na	na	na	na
2-Butanone	ne	na	na	na	na
1,1,1-Trichloroethane	ne	na	na	na	na
Carbon Tetrachloride	ne	na	na	na	na
1,2-Dichloropropane	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na
1,1,2-Trichloroethane	ne	na	na	na	na
Benzene	ne	na	na	na	na
Tetrachloroethene	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na
Toluene	ne	na	na	na	na

TABLE 5-11
ESTIMATED CARCINOGENIC RISK FROM INGESTION OF CREEK SURFACE WATER
(unitless)

Chemical	Skinner Creek - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Chlorobenzene	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na
Phenol	ne	na	na	na	na
bis(2-Chloroethyl)Ether	ne	na	na	na	na
1,4-Dichlorobenzene	ne	na	na	na	na
Benzyl Alcohol	ne	na	na	na	na
1,2-Dichlorobenzene	ne	na	na	na	na
2-Methylphenol	ne	na	na	na	na
bis(2-Chloroisopropyl)Ether	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na
Naphthalene	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na
Dimethyl Phthalate	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na
Pentachlorophenol	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na
Pyrene	ne	na	na	na	na
Butylbenzylphthalate	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	9.3 E-9	1.0 E-8	9.3 E-9	1.0 E-8
Di-n-Octyl Phthalate	ne	na	na	na	na
Aldrin	ne	na	na	na	na
Dieldrin	ne	na	na	na	na
4,4'-DDT	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na
Hexachlorobenzene	ne	na	na	na	na
Hexachlorobutadiene	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na
TOTAL:	**ne**	**9.3 E-9**	**1.0 E-8**	**9.3 E-9**	**1.0 E-8**

na = not available ne = no exposure

TABLE 5-12
ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT WITH CREEK SURFACE WATER
(unitless)

Chemical	Mill Creek - Current					Mill Creek - Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Arsenic	ne	na	na	na	na	ne	3.4 E-9	9.9 E-9	3.4 E-9	9.9 E-9
Barium	ne	na	na	na	na	ne	na	na	na	na
Cadmium	ne	na	na	na	na	ne	na	na	na	na
Chromium	ne	na	na	na	na	ne	na	na	na	na
Cobalt	ne	na	na	na	na	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Manganese	ne	na	na	na	na	ne	na	na	na	na
Nickel	ne	na	na	na	na	ne	na	na	na	na
Vanadium	ne	na	na	na	na	ne	na	na	na	na
Zinc	ne	na	na	na	na	ne	na	na	na	na
Cyanide	ne	na	na	na	na	ne	na	na	na	na
Vinyl Chloride	ne	na	na	na	na	ne	8.0 E-7	2.3 E-6	8.0 E-7	2.3 E-6
Chloroethane	ne	na	na	na	na	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na	ne	8.0 E-10	2.3 E-9	8.0 E-10	2.3 E-9
Acetone	ne	na	na	na	na	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na	ne	na	na	na	na
1,1-Dichloroethane	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
Chloroform	ne	na	na	na	na	ne	2.8 E-6	8.0 E-6	2.3 E-6	8.0 E-6
1,2-Dichloroethane	ne	na	na	na	na	ne	2.1 E-7	6.0 E-7	2.1 E-7	6.0 E-7
2-Butanone	ne	na	na	na	na	ne	na	na	na	na
1,1,1-Trichloroethane	ne	na	na	na	na	ne	na	na	na	na
Carbon Tetrachloride	ne	na	na	na	na	ne	2.9 E-5	8.2 E-5	2.9 E-5	8.2 E-5
1,2-Dichloropropane	ne	na	na	na	na	ne	2.7 E-4	7.9 E-4	2.7 E-4	7.9 E-4
Trichloroethene	ne	na	na	na	na	ne	7.4 E-6	2.1 E-5	7.4 E-6	2.1 E-5
1,1,2-Trichloroethane	ne	na	na	na	na	ne	2.3 E-4	6.5 E-4	2.3 E-4	6.5 E-4
Benzene	ne	na	na	na	na	ne	1.4 E-6	4.0 E-6	1.4 E-6	4.0 E-6
Tetrachloroethene	ne	na	na	na	na	ne	3.7 E-6	1.1 E-5	3.7 E-6	1.1 E-5
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	1.3 E-4	3.8 E-4	1.3 E-4	3.8 E-4
Toluene	ne	na	na	na	na	ne	na	na	na	na

TABLE 5-12
ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT WITH CREEK SURFACE WATER
(unitless)

Chemical	Mill Creek - Current					Mill Creek - Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Chlorobenzene	ne	na	na	na	na	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na	ne	na	na	na	na
Phenol	ne	na	na	na	na	ne	na	na	na	na
bis(2-Chloroethyl)Ether	ne	na	na	na	na	ne	2.1 E-7	6.0 E-7	2.1 E-7	6.0 E-7
1,4-Dichlorobenzene	ne	na	na	na	na	ne	2.4 E-10	6.9 E-10	2.4 E-10	6.9 E-10
Benzyl Alcohol	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichlorobenzene	ne	na	na	na	na	ne	na	na	na	na
2-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
bis(2-Chloroisopropyl)Ether	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
Naphthalene	ne	na	na	na	na	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Dimethyl Phthalate	ne	na	na	na	na	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na	ne	na	na	na	na
Pentachlorophenol	ne	na	na	na	na	ne	6.9 E-10	2.0 E-9	6.9 E-10	2.0 E-9
Di-n-Butylphthalate	ne	na	na	na	na	ne	na	na	na	na
Pyrene	ne	na	na	na	na	ne	na	na	na	na
Butylbenzylphthalate	ne	na	na	na	na	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	5.0 E-10	1.4 E-9	5.0 E-10	1.4 E-9	ne	2.5 E-11	7.1 E-11	2.5 E-11	7.1 E-11
Di-n-Octyl Phthalate	ne	na	na	na	na	ne	na	na	na	na
Aldrin	ne	na	na	na	na	ne	6.3 E-8	1.8 E-7	6.3 E-8	1.8 E-7
Dieldrin	ne	na	na	na	na	ne	2.7 E-8	7.8 E-8	2.7 E-8	7.8 E-8
4,4'-DDT	ne	na	na	na	na	ne	1.7 E-11	4.8 E-11	1.7 E-11	4.8 E-11
Aroclor-1254	ne	na	na	na	na	ne	3.0 E-10	8.6 E-10	3.0 E-10	8.6 E-10
Hexachlorobenzene	ne	na	na	na	na	ne	7.1 E-8	2.0 E-7	7.1 E-8	2.0 E-7
Hexachlorobutadiene	ne	na	na	na	na	ne	6.3 E-10	1.8 E-9	6.3 E-10	1.8 E-9
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
TOTAL:	**ne**	**5.0 E-10**	**1.4 E-9**	**5.0 E-10**	**1.4 E-9**	**ne**	**6.8 E-4**	**2.0 E-3**	**6.8 E-4**	**2.0 E-3**

na = not available ne = no exposure Shaded numbers exceed 10^-6 cancer risk

TABLE 5-12
ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT WITH CREEK SURFACE WATER
(unitless)

Chemical	Skinner Creek - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na
Arsenic	ne	na	na	na	na
Barium	ne	na	na	na	na
Cadmium	ne	na	na	na	na
Chromium	ne	na	na	na	na
Cobalt	ne	na	na	na	na
Copper	ne	na	na	na	na
Lead	ne	na	na	na	na
Manganese	ne	na	na	na	na
Nickel	ne	na	na	na	na
Vanadium	ne	na	na	na	na
Zinc	ne	na	na	na	na
Cyanide	ne	na	na	na	na
Vinyl Chloride	ne	na	na	na	na
Chloroethane	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na
Acetone	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na
1,1-Dichloroethane	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na
Chloroform	ne	na	na	na	na
1,2-Dichloroethane	ne	na	na	na	na
2-Butanone	ne	na	na	na	na
1,1,1-Trichloroethane	ne	na	na	na	na
Carbon Tetrachloride	ne	na	na	na	na
1,2-Dichloropropane	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na
1,1,2-Trichloroethane	ne	na	na	na	na
Benzene	ne	na	na	na	na
Tetrachloroethene	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na
Toluene	ne	na	na	na	na

TABLE 5-12
ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT WITH CREEK SURFACE WATER
(unitless)

Chemical	Skinner Creek - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Chlorobenzene	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na
Phenol	ne	na	na	na	na
bis(2-Chloroethyl)Ether	ne	na	na	na	na
1,4-Dichlorobenzene	ne	na	na	na	na
Benzyl Alcohol	ne	na	na	na	na
1,2-Dichlorobenzene	ne	na	na	na	na
2-Methylphenol	ne	na	na	na	na
bis(2-Chloroisopropyl)Ether	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na
Naphthalene	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na
Dimethyl Phthalate	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na
Pentachlorophenol	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na
Pyrene	ne	na	na	na	na
Butylbenzylphthalate	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	2.0 E-9	5.8 E-9	2.0 E-9	5.8 E-9
Di-n-Octyl Phthalate	ne	na	na	na	na
Aldrin	ne	na	na	na	na
Dieldrin	ne	na	na	na	na
4,4'-DDT	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na
Hexachlorobenzene	ne	na	na	na	na
Hexachlorobutadiene	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na
TOTAL:	**ne**	**2.0 E-9**	**5.8 E-9**	**2.0 E-9**	**5.8 E-9**

na = not available ne = no exposure

TABLE 5-13
ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF CREEK SURFACE WATER
(unitless)

Chemical	Mill Creek - Current					Mill Creek - Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Arsenic	ne	na	na	na	na	ne	1.9 E-8	2.7 E-8	1.9 E-8	2.7 E-8
Barium	ne	na	na	na	na	ne	na	na	na	na
Cadmium	ne	na	na	na	na	ne	na	na	na	na
Chromium	ne	na	na	na	na	ne	na	na	na	na
Cobalt	ne	na	na	na	na	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Manganese	ne	na	na	na	na	ne	na	na	na	na
Nickel	ne	na	na	na	na	ne	na	na	na	na
Vanadium	ne	na	na	na	na	ne	na	na	na	na
Zinc	ne	na	na	na	na	ne	na	na	na	na
Cyanide	ne	na	na	na	na	ne	na	na	na	na
Vinyl Chloride	ne	na	na	na	na	ne	8.0 E-7	2.3 E-6	8.0 E-7	2.3 E-6
Chloroethane	ne	na	na	na	na	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na	ne	8.0 E-10	2.3 E-9	8.0 E-10	2.3 E-9
Acetone	ne	na	na	na	na	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na	ne	na	na	na	na
1,1-Dichloroethane	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
Chloroform	ne	na	na	na	na	ne	2.8 E-6	8.0 E-6	2.8 E-6	8.0 E-6
1,2-Dichloroethane	ne	na	na	na	na	ne	2.1 E-7	6.0 E-7	2.1 E-7	6.0 E-7
2-Butanone	ne	na	na	na	na	ne	na	na	na	na
1,1,1-Trichloroethane	ne	na	na	na	na	ne	na	na	na	na
Carbon Tetrachloride	ne	na	na	na	na	ne	2.9 E-5	8.3 E-5	2.9 E-5	8.3 E-5
1,2-Dichloropropane	ne	na	na	na	na	ne	2.8 E-4	7.9 E-4	2.8 E-4	7.9 E-4
Trichloroethene	ne	na	na	na	na	ne	7.4 E-6	2.1 E-5	7.4 E-6	2.1 E-5
1,1,2-Trichloroethane	ne	na	na	na	na	ne	2.3 E-4	6.6 E-4	2.3 E-4	6.6 E-4
Benzene	ne	na	na	na	na	ne	1.5 E-6	4.1 E-6	1.5 E-6	4.1 E-6
Tetrachloroethene	ne	na	na	na	na	ne	3.8 E-6	1.1 E-5	3.8 E-6	1.1 E-5
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	1.3 E-4	3.8 E-4	1.3 E-4	3.8 E-4
Toluene	ne	na	na	na	na	ne	na	na	na	na

TABLE 5-13
ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF CREEK SURFACE WATER
(unitless)

Chemical	Mill Creek - Current					Mill Creek - Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Chlorobenzene	ne	na	na	na	na	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na	ne	na	na	na	na
Phenol	ne	na	na	na	na	ne	na	na	na	na
bis(2-Chloroethyl)Ether	ne	na	na	na	na	ne	1.2 E-6	1.6 E-6	1.2 E-6	1.6 E-6
1,4-Dichlorobenzene	ne	na	na	na	na	ne	1.3 E-9	1.9 E-9	1.3 E-9	1.9 E-9
Benzyl Alcohol	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichlorobenzene	ne	na	na	na	na	ne	na	na	na	na
2-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
bis(2-Chloroisopropyl)Ether	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
Naphthalene	ne	na	na	na	na	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Dimethyl Phthalate	ne	na	na	na	na	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na	ne	na	na	na	na
Pentachlorophenol	ne	na	na	na	na	ne	3.8 E-9	5.4 E-9	3.8 E-9	5.4 E-9
Di-n-Butylphthalate	ne	na	na	na	na	ne	na	na	na	na
Pyrene	ne	na	na	na	na	ne	na	na	na	na
Butylbenzylphthalate	ne	na	na	na	na	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	2.8 E-9	3.9 E-9	2.8 E-9	3.9 E-9	ne	1.4 E-10	1.9 E-10	1.4 E-10	1.9 E-10
Di-n-Octyl Phthalate	ne	na	na	na	na	ne	na	na	na	na
Aldrin	ne	na	na	na	na	ne	3.5 E-7	5.0 E-7	3.5 E-7	5.0 E-7
Dieldrin	ne	na	na	na	na	ne	1.5 E-7	2.1 E-7	1.5 E-7	2.1 E-7
4,4'-DDT	ne	na	na	na	na	ne	9.4 E-11	1.3 E-10	9.4 E-11	1.3 E-10
Aroclor-1254	ne	na	na	na	na	ne	1.7 E-9	2.3 E-9	1.7 E-9	2.3 E-9
Hexachlorobenzene	ne	na	na	na	na	ne	3.1 E-6	3.5 E-6	3.1 E-6	3.5 E-6
Hexachlorobutadiene	ne	na	na	na	na	ne	3.5 E-9	4.9 E-9	3.5 E-9	4.9 E-9
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
TOTAL:	**ne**	**2.8 E-9**	**3.9 E-9**	**2.8 E-9**	**3.9 E-9**	**ne**	**6.9 E-4**	**2.0 E-3**	**6.9 E-4**	**2.0 E-3**

na = not available ne = no exposure Shaded numbers exceed 10^-6 cancer risk

TABLE 5-13
ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF CREEK SURFACE WATER
(unitless)

Chemical	Skinner Creek - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na
Arsenic	ne	na	na	na	na
Barium	ne	na	na	na	na
Cadmium	ne	na	na	na	na
Chromium	ne	na	na	na	na
Cobalt	ne	na	na	na	na
Copper	ne	na	na	na	na
Lead	ne	na	na	na	na
Manganese	ne	na	na	na	na
Nickel	ne	na	na	na	na
Vanadium	ne	na	na	na	na
Zinc	ne	na	na	na	na
Cyanide	ne	na	na	na	na
Vinyl Chloride	ne	na	na	na	na
Chloroethane	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na
Acetone	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na
1,1-Dichloroethane	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na
Chloroform	ne	na	na	na	na
1,2-Dichloroethane	ne	na	na	na	na
2-Butanone	ne	na	na	na	na
1,1,1-Trichloroethane	ne	na	na	na	na
Carbon Tetrachloride	ne	na	na	na	na
1,2-Dichloropropane	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na
1,1,2-Trichloroethane	ne	na	na	na	na
Benzene	ne	na	na	na	na
Tetrachloroethene	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na
Toluene	ne	na	na	na	na

TABLE 5-13
ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF CREEK SURFACE WATER
(unitless)

Chemical	Skinner Creek - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Chlorobenzene	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na
Phenol	ne	na	na	na	na
bis(2-Chloroethyl)Ether	ne	na	na	na	na
1,4-Dichlorobenzene	ne	na	na	na	na
Benzyl Alcohol	ne	na	na	na	na
1,2-Dichlorobenzene	ne	na	na	na	na
2-Methylphenol	ne	na	na	na	na
bis(2-Chloroisopropyl)Ether	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na
Naphthalene	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na
Dimethyl Phthalate	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na
Pentachlorophenol	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na
Pyrene	ne	na	na	na	na
Butylbenzylphthalate	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	1.1 E-8	1.6 E-8	1.1 E-8	1.6 E-8
Di-n-Octyl Phthalate	ne	na	na	na	na
Aldrin	ne	na	na	na	na
Dieldrin	ne	na	na	na	na
4,4'-DDT	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na
Hexachlorobenzene	ne	na	na	na	na
Hexachlorobutadiene	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na
TOTAL:	**ne**	**1.1 E-8**	**1.6 E-8**	**1.1 E-8**	**1.6 E-8**

na = not available

ne = no exposure

TABLE 5-14
ESTIMATED CARCINOGENIC RISK FROM INGESTION OF POND SURFACE WATER
(unitless)

Chemical	Diving Pond - Current & Future					Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Arsenic	ne	na	na	na	na	ne	na	na	na	na
Barium	ne	na	na	na	na	ne	na	na	na	na
Cadmium	ne	na	na	na	na	ne	na	na	na	na
Chromium	ne	na	na	na	na	ne	na	na	na	na
Cobalt	ne	na	na	na	na	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Manganese	ne	na	na	na	na	ne	na	na	na	na
Nickel	ne	na	na	na	na	ne	na	na	na	na
Vanadium	ne	na	na	na	na	ne	na	na	na	na
Zinc	ne	na	na	na	na	ne	na	na	na	na
Cyanide	ne	na	na	na	na	ne	na	na	na	na
Vinyl Chloride	ne	na	na	na	na	ne	na	na	na	na
Chloroethane	ne	na	na	na	na	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na	ne	na	na	na	na
Acetone	ne	na	na	na	na	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na	ne	na	na	na	na
1,1-Dichloroethane	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
Chloroform	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethane	ne	na	na	na	na	ne	na	na	na	na
2-Butanone	ne	na	na	na	na	ne	na	na	na	na
1,1,1-Trichloroethane	ne	na	na	na	na	ne	na	na	na	na
Carbon Tetrachloride	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloropropane	ne	na	na	na	na	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na	ne	na	na	na	na
1,1,2-Trichloroethane	ne	na	na	na	na	ne	na	na	na	na
Benzene	ne	na	na	na	na	ne	na	na	na	na
Tetrachloroethene	ne	na	na	na	na	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	na	na	na	na
Toluene	ne	na	na	na	na	ne	na	na	na	na

TABLE 5-14
ESTIMATED CARCINOGENIC RISK FROM INGESTION OF POND SURFACE WATER
(unitless)

Chemical	Diving Pond - Current & Future					Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Chlorobenzene	ne	na	na	na	na	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na	ne	na	na	na	na
Phenol	ne	na	na	na	na	ne	na	na	na	na
bis(2-Chloroethyl)Ether	ne	na	na	na	na	ne	na	na	na	na
1,4-Dichlorobenzene	ne	na	na	na	na	ne	na	na	na	na
Benzyl Alcohol	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichlorobenzene	ne	na	na	na	na	ne	na	na	na	na
2-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
bis(2-Chloroisopropyl)Ether	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
Naphthalene	ne	na	na	na	na	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Dimethyl Phthalate	ne	na	na	na	na	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na	ne	na	na	na	na
Pentachlorophenol	ne	na	na	na	na	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na	ne	na	na	na	na
Pyrene	ne	na	na	na	na	ne	na	na	na	na
Butylbenzylphthalate	ne	na	na	na	na	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	8.1 E-9	8.7 E-9	8.1 E-9	8.7 E-9	ne	na	na	na	na
Di-n-Octyl Phthalate	ne	na	na	na	na	ne	na	na	na	na
Aldrin	ne	na	na	na	na	ne	na	na	na	na
Dieldrin	ne	na	na	na	na	ne	na	na	na	na
4,4'-DDT	ne	na	na	na	na	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na	ne	na	na	na	na
Hexachlorobenzene	ne	7.5 E-10	8.1 E-10	7.5 E-10	8.1 E-10	ne	na	na	na	na
Hexachlorobutadiene	ne	8.8 E-12	9.5 E-12	8.8 E-12	9.5 E-12	ne	1.2 E-11	1.3 E-11	1.2 E-11	1.3 E-11
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
TOTAL:	**ne**	**8.9 E-9**	**9.6 E-9**	**8.9 E-9**	**9.6 E-9**	**ne**	**1.2 E-11**	**1.3 E-11**	**1.2 E-11**	**1.3 E-11**

na = not available ne = no exposure

TABLE 5-15
ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT WITH POND SURFACE WATER
(unitless)

Chemical	Diving Pond - Current & Future					Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Arsenic	ne	na	na	na	na	ne	na	na	na	na
Barium	ne	na	na	na	na	ne	na	na	na	na
Cadmium	ne	na	na	na	na	ne	na	na	na	na
Chromium	ne	na	na	na	na	ne	na	na	na	na
Cobalt	ne	na	na	na	na	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Manganese	ne	na	na	na	na	ne	na	na	na	na
Nickel	ne	na	na	na	na	ne	na	na	na	na
Vanadium	ne	na	na	na	na	ne	na	na	na	na
Zinc	ne	na	na	na	na	ne	na	na	na	na
Cyanide	ne	na	na	na	na	ne	na	na	na	na
Vinyl Chloride	ne	na	na	na	na	ne	na	na	na	na
Chloroethane	ne	na	na	na	na	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na	ne	na	na	na	na
Acetone	ne	na	na	na	na	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na	ne	na	na	na	na
1,1-Dichloroethane	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
Chloroform	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethane	ne	na	na	na	na	ne	na	na	na	na
2-Butanone	ne	na	na	na	na	ne	na	na	na	na
1,1,1-Trichloroethane	ne	na	na	na	na	ne	na	na	na	na
Carbon Tetrachloride	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloropropane	ne	na	na	na	na	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na	ne	na	na	na	na
1,1,2-Trichloroethane	ne	na	na	na	na	ne	na	na	na	na
Benzene	ne	na	na	na	na	ne	na	na	na	na
Tetrachloroethene	ne	na	na	na	na	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	na	na	na	na
Toluene	ne	na	na	na	na	ne	na	na	na	na

TABLE 5-15
ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT WITH POND SURFACE WATER
(unitless)

Chemical	Diving Pond - Current & Future					Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Chlorobenzene	ne	na	na	na	na	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na	ne	na	na	na	na
Phenol	ne	na	na	na	na	ne	na	na	na	na
bis(2-Chloroethyl)Ether	ne	na	na	na	na	ne	na	na	na	na
1,4-Dichlorobenzene	ne	na	na	na	na	ne	na	na	na	na
Benzyl Alcohol	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichlorobenzene	ne	na	na	na	na	ne	na	na	na	na
2-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
bis(2-Chloroisopropyl)Ether	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
Naphthalene	ne	na	na	na	na	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Dimethyl Phthalate	ne	na	na	na	na	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na	ne	na	na	na	na
Pentachlorophenol	ne	na	na	na	na	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na	ne	na	na	na	na
Pyrene	ne	na	na	na	na	ne	na	na	na	na
Butylbenzylphthalate	ne	na	na	na	na	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	1.8 E-9	5.1 E-9	1.8 E-9	5.1 E-9	ne	na	na	na	na
Di-n-Octyl Phthalate	ne	na	na	na	na	ne	na	na	na	na
Aldrin	ne	na	na	na	na	ne	na	na	na	na
Dieldrin	ne	na	na	na	na	ne	na	na	na	na
4,4'-DDT	ne	na	na	na	na	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na	ne	na	na	na	na
Hexachlorobenzene	ne	1.7 E-11	5.0 E-11	1.7 E-11	5.0 E-11	ne	na	na	na	na
Hexachlorobutadiene	ne	1.9 E-12	5.5 E-12	1.9 E-12	5.5 E-12	ne	2.7 E-12	7.6 E-12	2.7 E-12	7.6 E-12
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
TOTAL:	**ne**	**1.8 E-9**	**5.1 E-9**	**1.8 E-9**	**5.1 E-9**	**ne**	**2.7 E-12**	**7.6 E-12**	**2.7 E-12**	**7.6 E-12**

na = not available ne = no exposure

TABLE 5-16
ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF POND SURFACE WATER
(unitless)

Chemical	Diving Pond - Current & Future					Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Arsenic	ne	na	na	na	na	ne	na	na	na	na
Barium	ne	na	na	na	na	ne	na	na	na	na
Cadmium	ne	na	na	na	na	ne	na	na	na	na
Chromium	ne	na	na	na	na	ne	na	na	na	na
Cobalt	ne	na	na	na	na	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Manganese	ne	na	na	na	na	ne	na	na	na	na
Nickel	ne	na	na	na	na	ne	na	na	na	na
Vanadium	ne	na	na	na	na	ne	na	na	na	na
Zinc	ne	na	na	na	na	ne	na	na	na	na
Cyanide	ne	na	na	na	na	ne	na	na	na	na
Vinyl Chloride	ne	na	na	na	na	ne	na	na	na	na
Chloroethane	ne	na	na	na	na	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na	ne	na	na	na	na
Acetone	ne	na	na	na	na	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na	ne	na	na	na	na
1,1-Dichloroethane	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
Chloroform	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethane	ne	na	na	na	na	ne	na	na	na	na
2-Butanone	ne	na	na	na	na	ne	na	na	na	na
1,1,1-Trichloroethane	ne	na	na	na	na	ne	na	na	na	na
Carbon Tetrachloride	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloropropane	ne	na	na	na	na	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na	ne	na	na	na	na
1,1,2-Trichloroethane	ne	na	na	na	na	ne	na	na	na	na
Benzene	ne	na	na	na	na	ne	na	na	na	na
Tetrachloroethene	ne	na	na	na	na	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	na	na	na	na
Toluene	ne	na	na	na	na	ne	na	na	na	na

TABLE 5-16
ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF POND SURFACE WATER
(unitless)

Chemical	Diving Pond - Current & Future					Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Chlorobenzene	ne	na	na	na	na	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na	ne	na	na	na	na
Phenol	ne	na	na	na	na	ne	na	na	na	na
bis(2-Chloroethyl)Ether	ne	na	na	na	na	ne	na	na	na	na
1,4-Dichlorobenzene	ne	na	na	na	na	ne	na	na	na	na
Benzyl Alcohol	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichlorobenzene	ne	na	na	na	na	ne	na	na	na	na
2-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
bis(2-Chloroisopropyl)Ether	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
Naphthalene	ne	na	na	na	na	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Dimethyl Phthalate	ne	na	na	na	na	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na	ne	na	na	na	na
Pentachlorophenol	ne	na	na	na	na	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na	ne	na	na	na	na
Pyrene	ne	na	na	na	na	ne	na	na	na	na
Butylbenzylphthalate	ne	na	na	na	na	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	9.9 E-9	1.4 E-8	9.9 E-9	1.4 E-8	ne	na	na	na	na
Di-n-Octyl Phthalate	ne	na	na	na	na	ne	na	na	na	na
Aldrin	ne	na	na	na	na	ne	na	na	na	na
Dieldrin	ne	na	na	na	na	ne	na	na	na	na
4,4'-DDT	ne	na	na	na	na	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na	ne	na	na	na	na
Hexachlorobenzene	ne	7.6 E-10	8.6 E-10	7.6 E-10	8.6 E-10	ne	na	na	na	na
Hexachlorobutadiene	ne	1.1 E-11	1.5 E-11	1.1 E-11	1.5 E-11	ne	1.5 E-11	2.1 E-11	1.5 E-11	2.1 E-11
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
TOTAL:	**ne**	**1.1 E-8**	**1.5 E-8**	**1.1 E-8**	**1.5 E-8**	**ne**	**1.5 E-11**	**2.1 E-11**	**1.5 E-11**	**2.1 E-11**

na = not available ne = no exposure

TABLE 5-17
ESTIMATED CARCINOGENIC RISK FROM INGESTION OF CREEK SEDIMENTS
(unitless)

Chemical	Mill Creek - Current & Future					Skinner Creek - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Barium	ne	na	na	na	na	ne	na	na	na	na
Beryllium	ne	na	na	na	na	ne	na	na	na	na
Chromium	ne	na	na	na	na	ne	na	na	na	na
Cobalt	ne	na	na	na	na	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Mercury	ne	na	na	na	na	ne	na	na	na	na
Nickel	ne	na	na	na	na	ne	na	na	na	na
Thallium	ne	na	na	na	na	ne	na	na	na	na
Tin	ne	na	na	na	na	ne	na	na	na	na
Vanadium	ne	na	na	na	na	ne	na	na	na	na
Zinc	ne	na	na	na	na	ne	na	na	na	na
Acetone	ne	na	na	na	na	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na	ne	na	na	na	na
1,1-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
2-Butanone	ne	na	na	na	na	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na	ne	3.1 E-13	1.7 E-13	3.1 E-13	1.7 E-13
Benzene	ne	na	na	na	na	ne	na	na	na	na
4-Methyl-2-Pentanone	ne	na	na	na	na	ne	na	na	na	na
2-Hexanone	ne	na	na	na	na	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	9.6 E-13	5.2 E-13	9.6 E-13	5.2 E-13
Ethylbenzene	ne	na	na	na	na	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na	ne	na	na	na	na
Phenol	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
Nitrobenzene	ne	na	na	na	na	ne	na	na	na	na
Naphthalene	ne	na	na	na	na	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthylene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthene	ne	na	na	na	na	ne	na	na	na	na

TABLE 5-17
ESTIMATED CARCINOGENIC RISK FROM INGESTION OF CREEK SEDIMENTS
(unitless)

Chemical	Mill Creek - Current & Future					Skinner Creek - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Dibenzofuran	ne	na	na	na	na	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na	ne	na	na	na	na
Fluorene	ne	na	na	na	na	ne	na	na	na	na
Phenanthrene	ne	na	na	na	na	ne	na	na	na	na
Anthracene	ne	na	na	na	na	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na	ne	na	na	na	na
Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Pyrene	ne	na	na	na	na	ne	na	na	na	na
Benzo(a)Anthracene	ne	1.9 E-8	1.0 E-8	1.9 E-8	1.0 E-8	ne	1.9 E-8	1.0 E-8	1.9 E-8	1.0 E-8
Chrysene	ne	2.3 E-8	1.2 E-8	2.3 E-8	1.2 E-8	ne	1.9 E-8	1.0 E-8	1.9 E-8	1.0 E-8
bis(2-Ethylhexyl)Phthalate	ne	6.0 E-12	3.3 E-12	6.0 E-12	3.3 E-12	ne	na	na	na	na
Benzo(b)Fluoranthene	ne	2.5 E-8	1.4 E-8	2.5 E-8	1.4 E-8	ne	1.4 E-8	7.6 E-9	1.4 E-8	7.6 E-9
Benzo(k)Fluoranthene	ne	1.8 E-8	1.0 E-8	1.8 E-8	1.0 E-8	ne	1.4 E-8	7.6 E-9	1.4 E-8	7.6 E-9
Benzo(a)Pyrene	ne	1.9 E-8	1.0 E-8	1.9 E-8	1.0 E-8	ne	9.1 E-9	4.9 E-9	9.1 E-9	4.9 E-9
Indeno(1,2,3-cd)Pyrene	ne	1.1 E-8	6.0 E-9	1.1 E-8	6.0 E-9	ne	7.2 E-9	3.9 E-9	7.2 E-9	3.9 E-9
Dibenzo(a,h)Anthracene	ne	3.6 E-9	1.9 E-9	3.6 E-9	1.9 E-9	ne	na	na	na	na
Benzo(g,h,i)Perylene	ne	na	na	na	na	ne	na	na	na	na
beta-BHC	ne	1.2 E-10	6.5 E-11	1.2 E-10	6.5 E-11	ne	na	na	na	na
4,4'-DDD	ne	2.2 E-12	1.2 E-12	2.2 E-12	1.2 E-12	ne	na	na	na	na
alpha-Chlordane	ne	1.3 E-11	7.1 E-12	1.3 E-11	7.1 E-12	ne	na	na	na	na
Aroclor-1254	ne	3.0 E-9	1.6 E-9	3.0 E-9	1.6 E-9	ne	na	na	na	na
Aroclor-1260	ne	na	na	na	na	ne	5.5 E-10	3.0 E-10	5.5 E-10	3.0 E-10
Hexachlorobenzene	ne	6.1 E-11	3.3 E-11	6.1 E-11	3.3 E-11	ne	1.1 E-11	6.2 E-12	1.1 E-11	6.2 E-12
Hexachlorocyclopentadiene	ne	na	na	na	na	ne	na	na	na	na
Hexachlorobutadiene	ne	3.5 E-13	1.9 E-13	3.5 E-13	1.9 E-13	ne	5.0 E-12	2.7 E-12	5.0 E-12	2.7 E-12
Octachlorocyclopentene	ne	na	na	na	na	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
Chlordene	ne	na	na	na	na	ne	na	na	na	na
TOTAL:	**ne**	**1.2 E-7**	**6.6 E-8**	**1.2 E-7**	**6.6 E-8**	**ne**	**8.3 E-8**	**4.5 E-8**	**8.3 E-8**	**4.5 E-8**

ne = no exposure

na = not available

TABLE 5-18
ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT OF CREEK SEDIMENTS
(unitless)

Chemical	Mill Creek - Current & Future					Skinner Creek - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Barium	ne	na	na	na	na	ne	na	na	na	na
Beryllium	ne	na	na	na	na	ne	na	na	na	na
Chromium	ne	na	na	na	na	ne	na	na	na	na
Cobalt	ne	na	na	na	na	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Mercury	ne	na	na	na	na	ne	na	na	na	na
Nickel	ne	na	na	na	na	ne	na	na	na	na
Thallium	ne	na	na	na	na	ne	na	na	na	na
Tin	ne	na	na	na	na	ne	na	na	na	na
Vanadium	ne	na	na	na	na	ne	na	na	na	na
Zinc	ne	na	na	na	na	ne	na	na	na	na
Acetone	ne	na	na	na	na	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na	ne	na	na	na	na
1,1-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
2-Butanone	ne	na	na	na	na	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na	ne	2.7 E-11	7.0 E-11	2.7 E-11	7.0 E-11
Benzene	ne	na	na	na	na	ne	na	na	na	na
4-Methyl-2-Pentanone	ne	na	na	na	na	ne	na	na	na	na
2-Hexanone	ne	na	na	na	na	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	8.1 E-11	2.1 E-10	8.1 E-11	2.1 E-10
Ethylbenzene	ne	na	na	na	na	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na	ne	na	na	na	na
Phenol	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
Nitrobenzene	ne	na	na	na	na	ne	na	na	na	na
Naphthalene	ne	na	na	na	na	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthylene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthene	ne	na	na	na	na	ne	na	na	na	na

TABLE 5-18
ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT OF CREEK SEDIMENTS
(unitless)

Chemical	Mill Creek - Current & Future					Skinner Creek - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Dibenzofuran	ne	na	na	na	na	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na	ne	na	na	na	na
Fluorene	ne	na	na	na	na	ne	na	na	na	na
Phenanthrene	ne	na	na	na	na	ne	na	na	na	na
Anthracene	ne	na	na	na	na	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na	ne	na	na	na	na
Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Pyrene	ne	na	na	na	na	ne	na	na	na	na
Benzo(a)Anthracene	ne	6.5 E-7	1.7 E-6	6.5 E-7	1.7 E-6	ne	6.3 E-7	1.7 E-6	6.3 E-7	1.7 E-6
Chrysene	ne	7.8 E-7	2.1 E-6	7.8 E-7	2.1 E-6	ne	6.4 E-7	1.7 E-6	6.4 E-7	1.7 E-6
bis(2-Ethylhexyl)Phthalate	ne	2.0 E-10	5.4 E-10	2.0 E-10	5.4 E-10	ne	na	na	na	na
Benzo(b)Fluoranthene	ne	8.6 E-7	2.3 E-6	8.6 E-7	2.3 E-6	ne	4.8 E-7	1.3 E-6	4.8 E-7	1.3 E-6
Benzo(k)Fluoranthene	ne	6.3 E-7	1.6 E-6	6.3 E-7	1.6 E-6	ne	4.8 E-7	1.3 E-6	4.8 E-7	1.3 E-6
Benzo(a)Pyrene	ne	6.5 E-7	1.7 E-6	6.5 E-7	1.7 E-6	ne	3.1 E-7	8.1 E-7	3.1 E-7	8.1 E-7
Indeno(1,2,3-cd)Pyrene	ne	3.8 E-7	9.9 E-7	3.8 E-7	9.9 E-7	ne	2.4 E-7	6.4 E-7	2.4 E-7	6.4 E-7
Dibenzo(a,h)Anthracene	ne	1.2 E-7	3.2 E-7	1.2 E-7	3.2 E-7	ne	na	na	na	na
Benzo(g,h,i)Perylene	ne	na	na	na	na	ne	na	na	na	na
beta-BHC	ne	4.1 E-9	1.1 E-8	4.1 E-9	1.1 E-8	ne	na	na	na	na
4,4'-DDD	ne	7.4 E-11	1.9 E-10	7.4 E-11	1.9 E-10	ne	na	na	na	na
alpha-Chlordane	ne	4.4 E-10	1.2 E-9	4.4 E-10	1.2 E-9	ne	na	na	na	na
Aroclor-1254	ne	1.0 E-7	2.6 E-7	1.0 E-7	2.6 E-7	ne	na	na	na	na
Aroclor-1260	ne	na	na	na	na	ne	1.9 E-8	4.9 E-8	1.9 E-8	4.9 E-8
Hexachlorobenzene	ne	2.1 E-9	5.5 E-9	2.1 E-9	5.5 E-9	ne	3.9 E-10	1.0 E-9	3.9 E-10	1.0 E-9
Hexachlorocyclopentadiene	ne	na	na	na	na	ne	na	na	na	na
Hexachlorobutadiene	ne	1.2 E-11	3.2 E-11	1.2 E-11	3.2 E-11	ne	1.7 E-10	4.5 E-10	1.7 E-10	4.5 E-10
Octachlorocyclopentene	ne	na	na	na	na	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
Chlordene	ne	na	na	na	na	ne	na	na	na	na
TOTAL:	**ne**	**4.2 E-6**	**1.1 E-5**	**4.2 E-6**	**1.1 E-5**	**ne**	**2.8 E-6**	**7.4 E-6**	**2.8 E-6**	**7.4 E-6**

ne = no exposure

na = not available

Shaded numbers exceed 10^-6 cancer risk

TABLE 5-19
ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF CREEK SEDIMENTS
(unitless)

Chemical	Mill Creek - Current & Future					Skinner Creek - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Barium	ne	na	na	na	na	ne	na	na	na	na
Beryllium	ne	na	na	na	na	ne	na	na	na	na
Chromium	ne	na	na	na	na	ne	na	na	na	na
Cobalt	ne	na	na	na	na	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Mercury	ne	na	na	na	na	ne	na	na	na	na
Nickel	ne	na	na	na	na	ne	na	na	na	na
Thallium	ne	na	na	na	na	ne	na	na	na	na
Tin	ne	na	na	na	na	ne	na	na	na	na
Vanadium	ne	na	na	na	na	ne	na	na	na	na
Zinc	ne	na	na	na	na	ne	na	na	na	na
Acetone	ne	na	na	na	na	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na	ne	na	na	na	na
1,1-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
2-Butanone	ne	na	na	na	na	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na	ne	2.7 E-11	7.0 E-11	2.7 E-11	7.0 E-11
Benzene	ne	na	na	na	na	ne	na	na	na	na
4-Methyl-2-Pentanone	ne	na	na	na	na	ne	na	na	na	na
2-Hexanone	ne	na	na	na	na	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	8.2 E-11	2.1 E-10	8.2 E-11	2.1 E-10
Ethylbenzene	ne	na	na	na	na	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na	ne	na	na	na	na
Phenol	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
Nitrobenzene	ne	na	na	na	na	ne	na	na	na	na
Naphthalene	ne	na	na	na	na	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthylene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthene	ne	na	na	na	na	ne	na	na	na	na

TABLE 5-19
ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF CREEK SEDIMENTS
(unitless)

Chemical	Mill Creek - Current & Future					Skinner Creek - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Dibenzofuran	ne	na	na	na	na	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na	ne	na	na	na	na
Fluorene	ne	na	na	na	na	ne	na	na	na	na
Phenanthrene	ne	na	na	na	na	ne	na	na	na	na
Anthracene	ne	na	na	na	na	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na	ne	na	na	na	na
Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Pyrene	ne	na	na	na	na	ne	na	na	na	na
Benzo(a)Anthracene	ne	6.7 E-7	1.7 E-6	6.7 E-7	1.7 E-6	ne	6.5 E-7	1.7 E-6	6.5 E-7	1.7 E-6
Chrysene	ne	8.0 E-7	2.1 E-6	8.0 E-7	2.1 E-6	ne	6.6 E-7	1.7 E-6	6.6 E-7	1.7 E-6
bis(2-Ethylhexyl)Phthalate	ne	2.1 E-10	5.4 E-10	2.1 E-10	5.4 E-10	ne	na	na	na	na
Benzo(b)Fluoranthene	ne	8.9 E-7	2.3 E-6	8.9 E-7	2.3 E-6	ne	4.9 E-7	1.3 E-6	4.9 E-7	1.3 E-6
Benzo(k)Fluoranthene	ne	6.4 E-7	1.7 E-6	6.4 E-7	1.7 E-6	ne	4.9 E-7	1.3 E-6	4.9 E-7	1.3 E-6
Benzo(a)Pyrene	ne	6.7 E-7	1.7 E-6	6.7 E-7	1.7 E-6	ne	3.2 E-7	8.2 E-7	3.2 E-7	8.2 E-7
Indeno(1,2,3-cd)Pyrene	ne	3.9 E-7	9.9 E-7	3.9 E-7	9.9 E-7	ne	2.5 E-7	6.4 E-7	2.5 E-7	6.4 E-7
Dibenzo(a,h)Anthracene	ne	1.2 E-7	3.2 E-7	1.2 E-7	3.2 E-7	ne	na	na	na	na
Benzo(g,h,i)Perylene	ne	na	na	na	na	ne	na	na	na	na
beta-BHC	ne	4.2 E-9	1.1 E-8	4.2 E-9	1.1 E-8	ne	na	na	na	na
4,4'-DDD	ne	7.6 E-11	2.0 E-10	7.6 E-11	2.0 E-10	ne	na	na	na	na
alpha-Chlordane	ne	4.6 E-10	1.2 E-9	4.6 E-10	1.2 E-9	ne	na	na	na	na
Aroclor-1254	ne	1.0 E-7	2.6 E-7	1.0 E-7	2.6 E-7	ne	na	na	na	na
Aroclor-1260	ne	na	na	na	na	ne	1.9 E-8	4.9 E-8	1.9 E-8	4.9 E-8
Hexachlorobenzene	ne	2.1 E-9	5.5 E-9	2.1 E-9	5.5 E-9	ne	4.0 E-10	1.0 E-9	4.0 E-10	1.0 E-9
Hexachlorocyclopentadiene	ne	na	na	na	na	ne	na	na	na	na
Hexachlorobutadiene	ne	1.2 E-11	3.2 E-11	1.2 E-11	3.2 E-11	ne	1.8 E-10	4.5 E-10	1.8 E-10	4.5 E-10
Octachlorocyclopentene	ne	na	na	na	na	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
Chlordene	ne	na	na	na	na	ne	na	na	na	na
TOTAL:	**ne**	**4.3 E-6**	**1.1 E-5**	**4.3 E-6**	**1.1 E-5**	**ne**	**2.9 E-6**	**7.4 E-6**	**2.9 E-6**	**7.4 E-6**

ne = no exposure

na = not available

Shaded numbers exceed 10^-6 cancer risk

TABLE 5-20
ESTIMATED CARCINOGENIC RISK FROM INGESTION OF POND SEDIMENTS
(unitless)

Chemical	Duck Pond - Current & Future					Diving Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Barium	ne	na	na	na	na	ne	na	na	na	na
Beryllium	ne	na	na	na	na	ne	na	na	na	na
Chromium	ne	na	na	na	na	ne	na	na	na	na
Cobalt	ne	na	na	na	na	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Mercury	ne	na	na	na	na	ne	na	na	na	na
Nickel	ne	na	na	na	na	ne	na	na	na	na
Thallium	ne	na	na	na	na	ne	na	na	na	na
Tin	ne	na	na	na	na	ne	na	na	na	na
Vanadium	ne	na	na	na	na	ne	na	na	na	na
Zinc	ne	na	na	na	na	ne	na	na	na	na
Acetone	ne	na	na	na	na	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na	ne	na	na	na	na
1,1-Dichloroethene	ne	na	na	na	na	ne	4.3 E-11	2.3 E-11	4.3 E-11	2.3 E-11
1,2-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
2-Butanone	ne	na	na	na	na	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na	ne	4.2 E-14	2.3 E-14	4.2 E-14	2.3 E-14
Benzene	ne	na	na	na	na	ne	2.8 E-12	1.5 E-12	2.8 E-12	1.5 E-12
4-Methyl-2-Pentanone	ne	na	na	na	na	ne	na	na	na	na
2-Hexanone	ne	na	na	na	na	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na	ne	na	na	na	na
Phenol	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
Nitrobenzene	ne	na	na	na	na	ne	na	na	na	na
Naphthalene	ne	na	na	na	na	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthylene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthene	ne	na	na	na	na	ne	na	na	na	na

TABLE 5-20
ESTIMATED CARCINOGENIC RISK FROM INGESTION OF POND SEDIMENTS
(unitless)

Chemical	Duck Pond - Current & Future					Diving Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Dibenzofuran	ne	na	na	na	na	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na	ne	na	na	na	na
Fluorene	ne	na	na	na	na	ne	na	na	na	na
Phenanthrene	ne	na	na	na	na	ne	na	na	na	na
Anthracene	ne	na	na	na	na	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na	ne	na	na	na	na
Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Pyrene	ne	na	na	na	na	ne	na	na	na	na
Benzo(a)Anthracene	ne	na	na	na	na	ne	2.8 E-9	1.5 E-9	2.8 E-9	1.5 E-9
Chrysene	ne	na	na	na	na	ne	3.9 E-9	2.1 E-9	3.9 E-9	2.1 E-9
bis(2-Ethylhexyl)Phthalate	ne	2.7 E-12	1.4 E-12	2.7 E-12	1.4 E-12	ne	4.5 E-12	2.4 E-12	4.5 E-12	2.4 E-12
Benzo(b)Fluoranthene	ne	na	na	na	na	ne	4.4 E-9	2.4 E-9	4.4 E-9	2.4 E-9
Benzo(k)Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Benzo(a)Pyrene	ne	na	na	na	na	ne	na	na	na	na
Indeno(1,2,3-cd)Pyrene	ne	na	na	na	na	ne	na	na	na	na
Dibenzo(a,h)Anthracene	ne	na	na	na	na	ne	na	na	na	na
Benzo(g,h,i)Perylene	ne	na	na	na	na	ne	na	na	na	na
beta-BHC	ne	na	na	na	na	ne	na	na	na	na
4,4'-DDD	ne	na	na	na	na	ne	na	na	na	na
alpha-Chlordane	ne	na	na	na	na	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na	ne	5.3 E-9	2.9 E-9	5.3 E-9	2.9 E-9
Aroclor-1260	ne	na	na	na	na	ne	8.2 E-9	4.4 E-9	8.2 E-9	4.4 E-9
Hexachlorobenzene	ne	1.2 E-11	6.6 E-12	1.2 E-11	6.6 E-12	ne	2.8 E-11	1.5 E-11	2.8 E-11	1.5 E-11
Hexachlorocyclopentadiene	ne	na	na	na	na	ne	na	na	na	na
Hexachlorobutadiene	ne	na	na	na	na	ne	6.4 E-13	3.4 E-13	6.4 E-13	3.4 E-13
Octachlorocyclopentene	ne	na	na	na	na	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
Chlordene	ne	na	na	na	na	ne	na	na	na	na
TOTAL:	**ne**	**1.5 E-11**	**8.1 E-12**	**1.5 E-11**	**8.1 E-12**	**ne**	**2.5 E-8**	**1.3 E-8**	**2.5 E-8**	**1.3 E-8**

ne = no exposure

na = not available

TABLE 5-20
ESTIMATED CARCINOGENIC RISK FROM INGESTION OF POND SEDIMENTS
(unitless)

Chemical	Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na
Barium	ne	na	na	na	na
Beryllium	ne	2.4 E-8	1.3 E-8	2.4 E-8	1.3 E-8
Chromium	ne	na	na	na	na
Cobalt	ne	na	na	na	na
Copper	ne	na	na	na	na
Lead	ne	na	na	na	na
Mercury	ne	na	na	na	na
Nickel	ne	na	na	na	na
Thallium	ne	na	na	na	na
Tin	ne	na	na	na	na
Vanadium	ne	na	na	na	na
Zinc	ne	na	na	na	na
Acetone	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na
1,1-Dichloroethene	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na
2-Butanone	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na
Benzene	ne	na	na	na	na
4-Methyl-2-Pentanone	ne	na	na	na	na
2-Hexanone	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na
Phenol	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na
Nitrobenzene	ne	na	na	na	na
Naphthalene	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na
Acenaphthylene	ne	na	na	na	na
Acenaphthene	ne	na	na	na	na

TABLE 5-20
ESTIMATED CARCINOGENIC RISK FROM INGESTION OF POND SEDIMENTS
(unitless)

Chemical	Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Dibenzofuran	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na
Fluorene	ne	na	na	na	na
Phenanthrene	ne	na	na	na	na
Anthracene	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na
Fluoranthene	ne	na	na	na	na
Pyrene	ne	na	na	na	na
Benzo(a)Anthracene	ne	na	na	na	na
Chrysene	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	7.8 E-12	4.2 E-12	7.8 E-12	4.2 E-12
Benzo(b)Fluoranthene	ne	na	na	na	na
Benzo(k)Fluoranthene	ne	na	na	na	na
Benzo(a)Pyrene	ne	na	na	na	na
Indeno(1,2,3-cd)Pyrene	ne	na	na	na	na
Dibenzo(a,h)Anthracene	ne	na	na	na	na
Benzo(g,h,i)Perylene	ne	na	na	na	na
beta-BHC	ne	na	na	na	na
4,4'-DDD	ne	na	na	na	na
alpha-Chlordane	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na
Aroclor-1260	ne	na	na	na	na
Hexachlorobenzene	ne	na	na	na	na
Hexachlorocyclopentadiene	ne	na	na	na	na
Hexachlorobutadiene	ne	na	na	na	na
Octachlorocyclopentene	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na
Chlordene	ne	na	na	na	na
TOTAL:	**ne**	**2.4 E-8**	**1.3 E-8**	**2.4 E-8**	**1.3 E-8**

TABLE 5-21
ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT OF POND SEDIMENTS
(unitless)

Chemical	Duck Pond - Current & Future					Diving Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Barium	ne	na	na	na	na	ne	na	na	na	na
Beryllium	ne	na	na	na	na	ne	na	na	na	na
Chromium	ne	na	na	na	na	ne	na	na	na	na
Cobalt	ne	na	na	na	na	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Mercury	ne	na	na	na	na	ne	na	na	na	na
Nickel	ne	na	na	na	na	ne	na	na	na	na
Thallium	ne	na	na	na	na	ne	na	na	na	na
Tin	ne	na	na	na	na	ne	na	na	na	na
Vanadium	ne	na	na	na	na	ne	na	na	na	na
Zinc	ne	na	na	na	na	ne	na	na	na	na
Acetone	ne	na	na	na	na	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na	ne	na	na	na	na
1,1-Dichloroethene	ne	na	na	na	na	ne	3.6 E-9	9.6 E-9	3.6 E-9	9.6 E-9
1,2-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
2-Butanone	ne	na	na	na	na	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na	ne	3.6 E-12	9.4 E-12	3.6 E-12	9.4 E-12
Benzene	ne	na	na	na	na	ne	2.4 E-10	6.2 E-10	2.4 E-10	6.2 E-10
4-Methyl-2-Pentanone	ne	na	na	na	na	ne	na	na	na	na
2-Hexanone	ne	na	na	na	na	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na	ne	na	na	na	na
Phenol	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
Nitrobenzene	ne	na	na	na	na	ne	na	na	na	na
Naphthalene	ne	na	na	na	na	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthylene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthene	ne	na	na	na	na	ne	na	na	na	na

TABLE 5-21
ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT OF POND SEDIMENTS
(unitless)

Chemical	Duck Pond - Current & Future					Diving Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Dibenzofuran	ne	na	na	na	na	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na	ne	na	na	na	na
Fluorene	ne	na	na	na	na	ne	na	na	na	na
Phenanthrene	ne	na	na	na	na	ne	na	na	na	na
Anthracene	ne	na	na	na	na	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na	ne	na	na	na	na
Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Pyrene	ne	na	na	na	na	ne	na	na	na	na
Benzo(a)Anthracene	ne	na	na	na	na	ne	9.3 E-8	2.5 E-7	9.3 E-8	2.5 E-7
Chrysene	ne	na	na	na	na	ne	1.3 E-7	3.4 E-7	1.3 E-7	3.4 E-7
bis(2-Ethylhexyl)Phthalate	ne	9.1 E-11	2.4 E-10	9.1 E-11	2.4 E-10	ne	1.5 E-10	4.0 E-10	1.5 E-10	4.0 E-10
Benzo(b)Fluoranthene	ne	na	na	na	na	ne	1.5 E-7	3.9 E-7	1.5 E-7	3.9 E-7
Benzo(k)Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Benzo(a)Pyrene	ne	na	na	na	na	ne	na	na	na	na
Indeno(1,2,3-cd)Pyrene	ne	na	na	na	na	ne	na	na	na	na
Dibenzo(a,h)Anthracene	ne	na	na	na	na	ne	na	na	na	na
Benzo(g,h,i)Perylene	ne	na	na	na	na	ne	na	na	na	na
beta-BHC	ne	na	na	na	na	ne	na	na	na	na
4,4'-DDD	ne	na	na	na	na	ne	na	na	na	na
alpha-Chlordane	ne	na	na	na	na	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na	ne	1.8 E-7	4.8 E-7	1.8 E-7	4.8 E-7
Aroclor-1260	ne	na	na	na	na	ne	2.8 E-7	7.3 E-7	2.8 E-7	7.3 E-7
Hexachlorobenzene	ne	4.2 E-10	1.1 E-9	4.2 E-10	1.1 E-9	ne	9.4 E-10	2.5 E-9	9.4 E-10	2.5 E-9
Hexachlorocyclopentadiene	ne	na	na	na	na	ne	na	na	na	na
Hexachlorobutadiene	ne	na	na	na	na	ne	2.2 E-11	5.7 E-11	2.2 E-11	5.7 E-11
Octachlorocyclopentene	ne	na	na	na	na	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
Chlordene	ne	na	na	na	na	ne	na	na	na	na
TOTAL:	**ne**	**5.1 E-10**	**1.3 E-9**	**5.1 E-10**	**1.3 E-9**	**ne**	**8.4 E-7**	**2.2 E-6**	**8.4 E-7**	**2.2 E-6**

ne = no exposure

na = not available

Shaded numbers exceed 10^-6 cancer risk

TABLE 5-21
ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT OF POND SEDIMENTS
(unitless)

Chemical	Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na
Barium	ne	na	na	na	na
Beryllium	ne	8.0 E-8	2.1 E-7	8.0 E-8	2.1 E-7
Chromium	ne	na	na	na	na
Cobalt	ne	na	na	na	na
Copper	ne	na	na	na	na
Lead	ne	na	na	na	na
Mercury	ne	na	na	na	na
Nickel	ne	na	na	na	na
Thallium	ne	na	na	na	na
Tin	ne	na	na	na	na
Vanadium	ne	na	na	na	na
Zinc	ne	na	na	na	na
Acetone	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na
1,1-Dichloroethene	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na
2-Butanone	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na
Benzene	ne	na	na	na	na
4-Methyl-2-Pentanone	ne	na	na	na	na
2-Hexanone	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na
Phenol	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na
Nitrobenzene	ne	na	na	na	na
Naphthalene	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na
Acenaphthylene	ne	na	na	na	na
Acenaphthene	ne	na	na	na	na

TABLE 5-21
ESTIMATED CARCINOGENIC RISK FROM DERMAL CONTACT OF POND SEDIMENTS
(unitless)

Chemical	Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Dibenzofuran	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na
Fluorene	ne	na	na	na	na
Phenanthrene	ne	na	na	na	na
Anthracene	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na
Fluoranthene	ne	na	na	na	na
Pyrene	ne	na	na	na	na
Benzo(a)Anthracene	ne	na	na	na	na
Chrysene	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	2.6 E-10	6.9 E-10	2.6 E-10	6.9 E-10
Benzo(b)Fluoranthene	ne	na	na	na	na
Benzo(k)Fluoranthene	ne	na	na	na	na
Benzo(a)Pyrene	ne	na	na	na	na
Indeno(1,2,3-cd)Pyrene	ne	na	na	na	na
Dibenzo(a,h)Anthracene	ne	na	na	na	na
Benzo(g,h,i)Perylene	ne	na	na	na	na
beta-BHC	ne	na	na	na	na
4,4'-DDD	ne	na	na	na	na
alpha-Chlordane	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na
Aroclor-1260	ne	na	na	na	na
Hexachlorobenzene	ne	na	na	na	na
Hexachlorocyclopentadiene	ne	na	na	na	na
Hexachlorobutadiene	ne	na	na	na	na
Octachlorocyclopentene	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na
Chlordene	ne	na	na	na	na
TOTAL:	**ne**	**8.1 E-8**	**2.1 E-7**	**8.1 E-8**	**2.1 E-7**

TABLE 5-22
ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF POND SEDIMENTS
(unitless)

Chemical	Duck Pond - Current & Future					Diving Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Barium	ne	na	na	na	na	ne	na	na	na	na
Beryllium	ne	na	na	na	na	ne	na	na	na	na
Chromium	ne	na	na	na	na	ne	na	na	na	na
Cobalt	ne	na	na	na	na	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Mercury	ne	na	na	na	na	ne	na	na	na	na
Nickel	ne	na	na	na	na	ne	na	na	na	na
Thallium	ne	na	na	na	na	ne	na	na	na	na
Tin	ne	na	na	na	na	ne	na	na	na	na
Vanadium	ne	na	na	na	na	ne	na	na	na	na
Zinc	ne	na	na	na	na	ne	na	na	na	na
Acetone	ne	na	na	na	na	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na	ne	na	na	na	na
1,1-Dichloroethene	ne	na	na	na	na	ne	3.7 E-9	9.6 E-9	3.7 E-9	9.6 E-9
1,2-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
2-Butanone	ne	na	na	na	na	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na	ne	3.6 E-12	9.4 E-12	3.6 E-12	9.4 E-12
Benzene	ne	na	na	na	na	ne	2.4 E-10	6.3 E-10	2.4 E-10	6.3 E-10
4-Methyl-2-Pentanone	ne	na	na	na	na	ne	na	na	na	na
2-Hexanone	ne	na	na	na	na	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na	ne	na	na	na	na
Phenol	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
Nitrobenzene	ne	na	na	na	na	ne	na	na	na	na
Naphthalene	ne	na	na	na	na	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthylene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthene	ne	na	na	na	na	ne	na	na	na	na

TABLE 5-22
ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF POND SEDIMENTS
(unitless)

Chemical	Duck Pond - Current & Future					Diving Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Dibenzofuran	ne	na	na	na	na	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na	ne	na	na	na	na
Fluorene	ne	na	na	na	na	ne	na	na	na	na
Phenanthrene	ne	na	na	na	na	ne	na	na	na	na
Anthracene	ne	na	na	na	na	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na	ne	na	na	na	na
Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Pyrene	ne	na	na	na	na	ne	na	na	na	na
Benzo(a)Anthracene	ne	na	na	na	na	ne	9.6 E-8	2.5 E-7	9.6 E-8	2.5 E-7
Chrysene	ne	na	na	na	na	ne	1.3 E-7	3.5 E-7	1.3 E-7	3.5 E-7
bis(2-Ethylhexyl)Phthalate	ne	9.4 E-11	2.4 E-10	9.4 E-11	2.4 E-10	ne	1.6 E-10	4.0 E-10	1.6 E-10	4.0 E-10
Benzo(b)Fluoranthene	ne	na	na	na	na	ne	1.5 E-7	4.0 E-7	1.5 E-7	4.0 E-7
Benzo(k)Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Benzo(a)Pyrene	ne	na	na	na	na	ne	na	na	na	na
Indeno(1,2,3-cd)Pyrene	ne	na	na	na	na	ne	na	na	na	na
Dibenzo(a,h)Anthracene	ne	na	na	na	na	ne	na	na	na	na
Benzo(g,h,i)Perylene	ne	na	na	na	na	ne	na	na	na	na
beta-BHC	ne	na	na	na	na	ne	na	na	na	na
4,4'-DDD	ne	na	na	na	na	ne	na	na	na	na
alpha-Chlordane	ne	na	na	na	na	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na	ne	1.9 E-7	4.8 E-7	1.9 E-7	4.8 E-7
Aroclor-1260	ne	na	na	na	na	ne	2.8 E-7	7.3 E-7	2.8 E-7	7.3 E-7
Hexachlorobenzene	ne	4.3 E-10	1.1 E-9	4.3 E-10	1.1 E-9	ne	9.6 E-10	2.5 E-9	9.6 E-10	2.5 E-9
Hexachlorocyclopentadiene	ne	na	na	na	na	ne	na	na	na	na
Hexachlorobutadiene	ne	na	na	na	na	ne	2.2 E-11	5.7 E-11	2.2 E-11	5.7 E-11
Octachlorocyclopentene	ne	na	na	na	na	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
Chlordene	ne	na	na	na	na	ne	na	na	na	na
TOTAL:	**ne**	**5.2 E-10**	**1.3 E-9**	**5.2 E-10**	**1.3 E-9**	**ne**	**8.6 E-7**	**2.2 E-6**	**8.6 E-7**	**2.2 E-6**

ne = no exposure

na = not available

Shaded numbers exceed 10^-6 cancer risk

TABLE 5-22
ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF POND SEDIMENTS
(unitless)

Chemical	Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na
Barium	ne	na	na	na	na
Beryllium	ne	1.0 E-7	2.2 E-7	1.0 E-7	2.2 E-7
Chromium	ne	na	na	na	na
Cobalt	ne	na	na	na	na
Copper	ne	na	na	na	na
Lead	ne	na	na	na	na
Mercury	ne	na	na	na	na
Nickel	ne	na	na	na	na
Thallium	ne	na	na	na	na
Tin	ne	na	na	na	na
Vanadium	he	na	na	na	na
Zinc	ne	na	na	na	na
Acetone	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na
1,1-Dichloroethene	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na
2-Butanone	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na
Benzene	ne	na	na	na	na
4-Methyl-2-Pentanone	ne	na	na	na	na
2-Hexanone	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na
Phenol	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na
Nitrobenzene	ne	na	na	na	na
Naphthalene	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na
Acenaphthylene	ne	na	na	na	na
Acenaphthene	ne	na	na	na	na

TABLE 5-22
ESTIMATED CARCINOGENIC RISK FROM TOTAL INTAKE OF POND SEDIMENTS
(unitless)

Chemical	Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Dibenzofuran	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na
Fluorene	ne	na	na	na	na
Phenanthrene	ne	na	na	na	na
Anthracene	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na
Fluoranthene	ne	na	na	na	na
Pyrene	ne	na	na	na	na
Benzo(a)Anthracene	ne	na	na	na	na
Chrysene	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	2.7 E-10	7.0 E-10	2.7 E-10	7.0 E-10
Benzo(b)Fluoranthene	ne	na	na	na	na
Benzo(k)Fluoranthene	ne	na	na	na	na
Benzo(a)Pyrene	ne	na	na	na	na
Indeno(1,2,3-cd)Pyrene	ne	na	na	na	na
Dibenzo(a,h)Anthracene	ne	na	na	na	na
Benzo(g,h,i)Perylene	ne	na	na	na	na
beta-BHC	ne	na	na	na	na
4,4'-DDD	ne	na	na	na	na
alpha-Chlordane	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na
Aroclor-1260	ne	na	na	na	na
Hexachlorobenzene	ne	na	na	na	na
Hexachlorocyclopentadiene	ne	na	na	na	na
Hexachlorobutadiene	ne	na	na	na	na
Octachlorocyclopentene	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na
Chlordene	ne	na	na	na	na
TOTAL:	**ne**	**1.0 E-7**	**2.2 E-7**	**1.0 E-7**	**2.2 E-7**

ne = no exposure na = not available

TABLE 5-23
HAZARD QUOTIENTS AND INDICES FROM INGESTION OF WASTE LAGOON SOILS
(unitless)

Chemical	Current & Future (No Residential Development)					Future (with Residential Development)				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Antimony	2.8 E-2	7.6 E-1	8.2 E-2	4.8 E-2	5.2 E-3	8.8 E-3	2.4 E-1	2.6 E-2	1.5 E-2	1.6 E-3
Cadmium	na	na	na	na	na	7.1 E-4	1.9 E-3	2.1 E-3	1.2 E-4	1.3 E-4
Lead	na	na	na	na	na	na	na	na	na	na
Silver	na	na	na	na	na	1.4 E-4	3.8 E-3	4.1 E-4	2.4 E-4	2.6 E-5
Thallium	na	na	na	na	na	6.3 E-3	1.7 E-2	1.9 E-2	1.1 E-3	1.2 E-3
Tin	3.3 E-4	9.0 E-3	9.7 E-4	5.6 E-4	6.1 E-5	3.3 E-4	9.0 E-3	9.7 E-4	5.6 E-4	6.1 E-5
Cyanide	na	na	na	na	na	4.0 E-5	1.1 E-3	1.2 E-4	6.8 E-5	7.3 E-6
Methylene Chloride	5.2 E-8	1.4 E-6	1.5 E-7	8.8 E-8	9.6 E-9	4.3 E-5	1.2 E-3	1.3 E-4	7.3 E-5	8.0 E-6
Acetone	6.8 E-8	1.9 E-7	2.0 E-7	1.2 E-8	1.3 E-8	6.8 E-4	1.9 E-3	2.0 E-3	1.2 E-4	1.3 E-4
Chloroform	na	na	na	na	na	1.6 E-3	4.4 E-2	4.7 E-3	2.7 E-3	3.0 E-4
1,2-Dichloroethane	na	na	na	na	na	na	na	na	na	na
2-Butanone	na	na	na	na	na	3.8 E-4	1.0 E-3	1.1 E-3	6.5 E-5	7.0 E-5
1,1,1-Trichloroethane	na	na	na	na	na	3.4 E-4	9.3 E-4	1.0 E-3	5.8 E-5	6.3 E-5
Carbon Tetrachloride	na	na	na	na	na	1.1 E-1	3.0 E-1	3.3 E-1	1.9 E-2	2.1 E-2
1,2-Dichloropropane	na	na	na	na	na	1.8 E-3	5.0 E-3	5.4 E-3	3.1 E-4	3.4 E-4
Trichloroethene	na	na	na	na	na	9.3 E-3	2.5 E-2	2.7 E-2	1.6 E-3	1.7 E-3
1,1,2-Trichloroethane	na	na	na	na	na	4.5 E-2	1.2 E-1	1.3 E-1	7.7 E-3	8.3 E-3
Benzene	na	na	na	na	na	na	na	na	na	na
Tetrachloroethene	na	na	na	na	na	2.2 E-3	5.8 E-3	6.3 E-3	3.6 E-4	4.0 E-4
1,1,2,2-Tetrachloroethane	na	na	na	na	na	na	na	na	na	na
Toluene	9.3 E-9	2.5 E-8	2.7 E-8	1.6 E-9	1.7 E-9	7.6 E-2	2.1 E-1	2.2 E-1	1.3 E-2	1.4 E-2
Chlorobenzene	na	na	na	na	na	3.7 E-4	9.9 E-4	1.1 E-3	6.2 E-5	6.8 E-5
Ethylbenzene	na	na	na	na	na	4.8 E-4	1.3 E-3	1.4 E-3	8.1 E-5	8.8 E-5
Xylene (total)	na	na	na	na	na	4.9 E-5	6.6 E-4	1.4 E-4	4.1 E-5	9.0 E-6
Phenol	na	na	na	na	na	9.3 E-6	2.5 E-4	2.7 E-5	1.6 E-5	1.7 E-6
bis(2-Chloroethyl)Ether	na	na	na	na	na	na	na	na	na	na
1,3-Dichlorobenzene	na	na	na	na	na	1.2 E-4	3.2 E-4	3.5 E-4	2.0 E-5	2.2 E-5
1,4-Dichlorobenzene	na	na	na	na	na	na	na	na	na	na
Benzyl Alcohol	na	na	na	na	na	1.4 E-5	1.1 E-4	4.1 E-5	7.1 E-6	2.6 E-6
1,2-Dichlorobenzene	na	na	na	na	na	6.7 E-5	1.8 E-4	2.0 E-4	1.1 E-5	1.2 E-5
2-Methylphenol	na	na	na	na	na	7.6 E-5	2.1 E-4	2.2 E-4	1.3 E-5	1.4 E-5

TABLE 5-23
HAZARD QUOTIENTS AND INDICES FROM INGESTION OF WASTE LAGOON SOILS
(unitless)

Chemical	Current & Future (No Residential Development)					Future (with Residential Development)				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
4-Methylphenol	na	na	na	na	na	1.1 E-4	2.9 E-4	3.1 E-4	1.8 E-5	2.0 E-5
Hexachloroethane	na	na	na	na	na	3.2 E-3	8.7 E-3	9.4 E-3	5.4 E-4	5.9 E-4
Benzoic Acid	na	na	na	na	na	2.2 E-5	5.9 E-4	6.3 E-5	3.7 E-5	4.0 E-6
Naphthalene	na	na	na	na	na	1.1 E-2	3.1 E-2	3.3 E-2	1.9 E-3	2.1 E-3
2-Methylnaphthalene	na	na	na	na	na	na	na	na	na	na
Dimethyl Phthalate	na	na	na	na	na	4.4 E-6	1.2 E-4	1.3 E-5	7.4 E-6	8.1 E-7
Acenaphthylene	na	na	na	na	na	1.0 E-3	2.8 E-3	3.0 E-3	1.8 E-4	1.9 E-4
Acenaphthene	na	na	na	na	na	6.4 E-5	1.7 E-4	1.9 E-4	1.1 E-5	1.2 E-5
Dibenzofuran	na	na	na	na	na	3.4 E-3	9.3 E-3	1.0 E-2	5.8 E-4	6.3 E-4
Fluorene	na	na	na	na	na	9.6 E-5	2.6 E-4	2.8 E-4	1.6 E-5	1.8 E-5
Phenanthrene	na	na	na	na	na	2.5 E-3	6.8 E-3	7.3 E-3	4.3 E-4	4.6 E-4
Anthracene	na	na	na	na	na	1.5 E-5	4.1 E-5	4.5 E-5	2.6 E-6	2.8 E-6
Di-n-Butylphthalate	na	na	na	na	na	5.8 E-5	1.6 E-4	1.7 E-4	9.7 E-6	1.1 E-5
Fluoranthene	na	na	na	na	na	1.1 E-4	3.0 E-4	3.3 E-4	1.9 E-5	2.1 E-5
Pyrene	na	na	na	na	na	1.4 E-4	3.9 E-4	4.2 E-4	2.4 E-5	2.6 E-5
Butylbenzylphthalate	na	na	na	na	na	3.9 E-5	1.1 E-4	1.1 E-4	6.6 E-6	7.2 E-6
Benzo(a)Anthracene	na	na	na	na	na	na	na	na	na	na
Chrysene	na	na	na	na	na	na	na	na	na	na
bis(2-Ethylhexyl)Phthalate	3.9 E-6	1.1 E-4	1.1 E-5	6.6 E-6	7.2 E-7	5.1 E-4	1.4 E-2	1.5 E-3	8.7 E-4	9.4 E-5
Di-n-Octyl Phthalate	na	na	na	na	na	2.4 E-4	6.6 E-3	7.1 E-4	4.1 E-4	4.5 E-5
Benzo(b)Fluoranthene	na	na	na	na	na	na	na	na	na	na
Benzo(k)Fluoranthene	na	na	na	na	na	na	na	na	na	na
Benzo(a)Pyrene	na	na	na	na	na	na	na	na	na	na
Indeno(1,2,3-cd)Pyrene	na	na	na	na	na	na	na	na	na	na
Benzo(g,h,i)Perylene	na	na	na	na	na	5.0 E-4	1.4 E-3	1.5 E-3	8.5 E-5	9.2 E-5
beta-BHC	na	na	na	na	na	na	na	na	na	na
Heptachlor	na	na	na	na	na	1.3 E-2	3.6 E-1	3.9 E-2	2.3 E-2	2.5 E-3
Aldrin	na	na	na	na	na	6.8 E-2	1.8 E+0	2.0 E-1	1.1 E-1	1.2 E-2
Dieldrin	na	na	na	na	na	1.9 E-2	5.0 E-1	5.4 E-2	3.1 E-2	3.4 E-3
4,4'-DDD	na	na	na	na	na	na	na	na	na	na
4,4'-DDT	na	na	na	na	na	5.4 E-5	1.5 E-3	1.6 E-4	9.1 E-5	9.9 E-6

TABLE 5-23
HAZARD QUOTIENTS AND INDICES FROM INGESTION OF WASTE LAGOON SOILS
(unitless)

Chemical	Current & Future (No Residential Development)					Future (with Residential Development)				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Endrin ketone	na	na	na	na	na	na	na	na	na	na
gamma-Chlordane	na	na	na	na	na	9.1 E-2	2.5 E+0	2.7 E-1	1.5 E-1	1.7 E-2
Aroclor-1248	na	na	na	na	na	3.8 E-3	1.0 E-2	1.1 E-2	6.5 E-4	7.0 E-4
Aroclor-1260	na	na	na	na	na	5.9 E-3	1.6 E-2	1.7 E-2	9.9 E-4	1.1 E-3
Hexachlorobenzene	na	na	na	na	na	1.1 E+0	3.0 E+1	3.2 E+0	1.9 E+0	2.0 E-1
Hexachlorocyclopentadiene	na	na	na	na	na	3.0 E-1	8.1 E-1	8.8 E-1	5.1 E-2	5.5 E-2
Hexachlorobutadiene	na	na	na	na	na	6.4 E-2	1.7 E+0	1.9 E-1	1.1 E-1	1.2 E-2
Octachlorocyclopentene	na	na	na	na	na	na	na	na	na	na
Heptachloronorborene	na	na	na	na	na	na	na	na	na	na
Chlordene	na	na	na	na	na	9.8 E+0	2.6 E+2	2.9 E+1	1.7 E+1	1.8 E+0
2,3,7,8-TCDD	na	na	na	na	na	9.8 E-4	2.7 E-3	2.9 E-3	1.7 E-4	1.8 E-4
Total TETRA CDD	na	na	na	na	na	1.4 E-3	3.8 E-3	4.1 E-3	2.4 E-4	2.6 E-4
Total PENTA CDD	na	na	na	na	na	3.3 E-3	8.9 E-3	9.6 E-3	5.6 E-4	6.1 E-4
Total HEXA CDD	na	na	na	na	na	3.6 E-3	9.8 E-3	1.1 E-2	6.1 E-4	6.7 E-4
Total HEPTA CDD	na	na	na	na	na	1.1 E-2	3.0 E-2	3.3 E-2	1.9 E-3	2.0 E-3
Total OCTA CDD	na	na	na	na	na	8.6 E-2	2.3 E-1	2.5 E-1	1.5 E-2	1.6 E-2
2,3,7,8-TCDF	na	na	na	na	na	8.3 E-4	2.2 E-3	2.4 E-3	1.4 E-4	1.5 E-4
Total TETRA CDF	na	na	na	na	na	1.8 E-2	5.0 E-2	5.4 E-2	3.1 E-3	3.4 E-3
Total PENTA CDF	na	na	na	na	na	2.5 E-2	6.8 E-2	7.3 E-2	4.2 E-3	4.6 E-3
Total HEXA CDF	na	na	na	na	na	2.7 E-2	7.3 E-2	7.9 E-2	4.6 E-3	5.0 E-3
Total HEPTA CDF	na	na	na	na	na	6.3 E-2	1.7 E-1	1.8 E-1	1.1 E-2	1.2 E-2
Total OCTA CDF	na	na	na	na	na	7.2 E-2	2.0 E-1	2.1 E-1	1.2 E-2	1.3 E-2
HAZARD INDICES:	**2.8 E-2**	**7.7 E-1**	**8.3 E-2**	**4.8 E-2**	**5.2 E-3**	**1.2 E+1**	**3.0 E+2**	**3.5 E+1**	**1.9 E+1**	**2.2 E+0**

na = not available

Shaded numbers exceed hazard quotient of one.

TABLE 5-24
HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH WASTE LAGOON SOILS
(unitless)

Chemical	Current & Future (No Residential Development)					Future (with Residential Development)				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Antimony	3.7 E-2	2.8 E-1	1.5 E-1	2.8 E-1	1.5 E-1	1.2 E-2	8.9 E-2	4.7 E-2	8.9 E-2	4.7 E-2
Cadmium	na	na	na	na	na	9.4 E-4	7.2 E-4	3.8 E-3	7.2 E-4	3.8 E-3
Lead	na	na	na	na	na	na	na	na	na	na
Silver	na	na	na	na	na	1.9 E-4	1.4 E-3	7.5 E-4	1.4 E-3	7.5 E-4
Thallium	na	na	na	na	na	8.3 E-3	6.4 E-3	3.4 E-2	6.4 E-3	3.4 E-2
Tin	4.4 E-4	3.4 E-3	1.8 E-3	3.4 E-3	1.8 E-3	4.4 E-4	3.4 E-3	1.8 E-3	3.4 E-3	1.8 E-3
Cyanide	na	na	na	na	na	5.3 E-5	4.0 E-4	2.1 E-4	4.0 E-4	2.1 E-4
Methylene Chloride	1.7 E-6	1.3 E-5	6.9 E-6	1.3 E-5	6.9 E-6	1.4 E-3	1.1 E-2	5.7 E-3	1.1 E-2	5.7 E-3
Acetone	2.3 E-6	1.7 E-6	9.1 E-6	1.7 E-6	9.1 E-6	2.3 E-2	1.7 E-2	9.1 E-2	1.7 E-2	9.1 E-2
Chloroform	na	na	na	na	na	5.3 E-2	4.1 E-1	2.1 E-1	4.1 E-1	2.1 E-1
1,2-Dichloroethane	na	na	na	na	na	na	na	na	na	na
2-Butanone	na	na	na	na	na	1.3 E-2	9.6 E-3	5.1 E-2	9.6 E-3	5.1 E-2
1,1,1-Trichloroethane	na	na	na	na	na	1.1 E-2	8.6 E-3	4.5 E-2	8.6 E-3	4.5 E-2
Carbon Tetrachloride	na	na	na	na	na	3.7 E+0	2.8 E+0	1.5 E+1	2.8 E+0	1.5 E+1
1,2-Dichloropropane	na	na	na	na	na	6.1 E-2	4.7 E-2	2.5 E-1	4.7 E-2	2.5 E-1
Trichloroethene	na	na	na	na	na	3.1 E-1	2.4 E-1	1.2 E+0	2.4 E-1	1.2 E+0
1,1,2-Trichloroethane	na	na	na	na	na	1.5 E+0	1.1 E+0	6.0 E+0	1.1 E+0	6.0 E+0
Benzene	na	na	na	na	na	na	na	na	na	na
Tetrachloroethene	na	na	na	na	na	7.1 E-2	5.4 E-2	2.9 E-1	5.4 E-2	2.9 E-1
1,1,2,2-Tetrachloroethane	na	na	na	na	na	na	na	na	na	na
Toluene	3.1 E-7	2.3 E-7	1.2 E-6	2.3 E-7	1.2 E-6	2.5 E+0	1.9 E+0	1.0 E+1	1.9 E+0	1.0 E+1
Chlorobenzene	na	na	na	na	na	1.2 E-2	9.3 E-3	4.9 E-2	9.3 E-3	4.9 E-2
Ethylbenzene	na	na	na	na	na	1.6 E-2	1.2 E-2	6.4 E-2	1.2 E-2	6.4 E-2
Xylene (total)	na	na	na	na	na	1.6 E-3	6.2 E-3	6.5 E-3	6.2 E-3	6.5 E-3
Phenol	na	na	na	na	na	1.2 E-4	9.4 E-4	4.9 E-4	9.4 E-4	4.9 E-4
bis(2-Chloroethyl)Ether	na	na	na	na	na	na	na	na	na	na
1,3-Dichlorobenzene	na	na	na	na	na	1.6 E-3	1.2 E-3	6.3 E-3	1.2 E-3	6.3 E-3
1,4-Dichlorobenzene	na	na	na	na	na	na	na	na	na	na
Benzyl Alcohol	na	na	na	na	na	1.8 E-4	4.3 E-4	7.5 E-4	4.3 E-4	7.5 E-4
1,2-Dichlorobenzene	na	na	na	na	na	8.8 E-4	6.8 E-4	3.6 E-3	6.8 E-4	3.6 E-3
2-Methylphenol	na	na	na	na	na	1.0 E-3	7.7 E-4	4.1 E-3	7.7 E-4	4.1 E-3

TABLE 5-24
HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH WASTE LAGOON SOILS
(unitless)

Chemical	Current & Future (No Residential Development)					Future (with Residential Development)				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
4-Methylphenol	na	na	na	na	na	1.4 E-3	1.1 E-3	5.7 E-3	1.1 E-3	5.7 E-3
Hexachloroethane	na	na	na	na	na	4.2 E-2	3.2 E-2	1.7 E-1	3.2 E-2	1.7 E-1
Benzoic Acid	na	na	na	na	na	2.9 E-4	2.2 E-3	1.2 E-3	2.2 E-3	1.2 E-3
Naphthalene	na	na	na	na	na	1.5 E-1	1.1 E-1	6.0 E-1	1.1 E-1	6.0 E-1
2-Methylnaphthalene	na	na	na	na	na	na	na	na	na	na
Dimethyl Phthalate	na	na	na	na	na	5.8 E-5	4.4 E-4	2.3 E-4	4.4 E-4	2.3 E-4
Acenaphthylene	na	na	na	na	na	1.4 E-2	1.1 E-2	5.5 E-2	1.1 E-2	5.5 E-2
Acenaphthene	na	na	na	na	na	8.5 E-4	6.5 E-4	3.4 E-3	6.5 E-4	3.4 E-3
Dibenzofuran	na	na	na	na	na	4.5 E-2	3.5 E-2	1.8 E-1	3.5 E-2	1.8 E-1
Fluorene	na	na	na	na	na	1.3 E-3	9.7 E-4	5.1 E-3	9.7 E-4	5.1 E-3
Phenanthrene	na	na	na	na	na	3.3 E-2	2.5 E-2	1.3 E-1	2.5 E-2	1.3 E-1
Anthracene	na	na	na	na	na	2.0 E-4	1.5 E-4	8.1 E-4	1.5 E-4	8.1 E-4
Di-n-Butylphthalate	na	na	na	na	na	7.6 E-4	5.8 E-4	3.1 E-3	5.8 E-4	3.1 E-3
Fluoranthene	na	na	na	na	na	1.5 E-3	1.1 E-3	5.9 E-3	1.1 E-3	5.9 E-3
Pyrene	na	na	na	na	na	1.9 E-3	1.4 E-3	7.6 E-3	1.4 E-3	7.6 E-3
Butylbenzylphthalate	na	na	na	na	na	5.2 E-4	4.0 E-4	2.1 E-3	4.0 E-4	2.1 E-3
Benzo(a)Anthracene	na	na	na	na	na	na	na	na	na	na
Chrysene	na	na	na	na	na	na	na	na	na	na
bis(2-Ethylhexyl)Phthalate	5.2 E-5	4.0 E-4	2.1 E-4	4.0 E-4	2.1 E-4	6.7 E-3	5.2 E-2	2.7 E-2	5.2 E-2	2.7 E-2
Di-n-Octyl Phthalate	na	na	na	na	na	3.2 E-3	2.5 E-2	1.3 E-2	2.5 E-2	1.3 E-2
Benzo(b)Fluoranthene	na	na	na	na	na	na	na	na	na	na
Benzo(k)Fluoranthene	na	na	na	na	na	na	na	na	na	na
Benzo(a)Pyrene	na	na	na	na	na	na	na	na	na	na
Indeno(1,2,3-cd)Pyrene	na	na	na	na	na	na	na	na	na	na
Benzo(g,h,i)Perylene	na	na	na	na	na	6.6 E-3	5.1 E-3	2.7 E-2	5.1 E-3	2.7 E-2
beta-BHC	na	na	na	na	na	na	na	na	na	na
Heptachlor	na	na	na	na	na	1.8 E-1	1.4 E+0	7.1 E-1	1.4 E+0	7.1 E-1
Aldrin	na	na	na	na	na	8.9 E-1	6.8 E+0	3.6 E+0	6.8 E+0	3.6 E+0
Dieldrin	na	na	na	na	na	2.4 E-1	1.9 E+0	9.9 E-1	1.9 E+0	9.9 E-1
4,4'-DDD	na	na	na	na	na	na	na	na	na	na
4,4'-DDT	na	na	na	na	na	7.1 E-4	5.4 E-3	2.9 E-3	5.4 E-3	2.9 E-3

TABLE 5-24
HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH WASTE LAGOON SOILS
(unitless)

Chemical	Current & Future (No Residential Development)					Future (with Residential Development)				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Endrin ketone	na	na	na	na	na	na	na	na	na	na
gamma-Chlordane	na	na	na	na	na	1.2 E+0	9.2 E+0	4.8 E+0	9.2 E+0	4.8 E+0
Aroclor-1248	na	na	na	na	na	5.0 E-2	3.9 E-2	2.0 E-1	3.9 E-2	2.0 E-1
Aroclor-1260	na	na	na	na	na	7.7 E-2	5.9 E-2	3.1 E-1	5.9 E-2	3.1 E-1
Hexachlorobenzene	na	na	na	na	na	1.4 E+1	1.1 E+2	5.8 E+1	1.1 E+2	5.8 E+1
Hexachlorocyclopentadiene	na	na	na	na	na	4.0 E+0	3.0 E+0	1.6 E+1	3.0 E+0	1.6 E+1
Hexachlorobutadiene	na	na	na	na	na	8.4 E-1	6.4 E+0	3.4 E+0	6.4 E+0	3.4 E+0
Octachlorocyclopentene	na	na	na	na	na	na	na	na	na	na
Heptachloronorborene	na	na	na	na	na	na	na	na	na	na
Chlordene	na	na	na	na	na	1.3 E+2	9.9 E+2	5.2 E+2	9.9 E+2	5.2 E+2
2,3,7,8-TCDD	na	na	na	na	na	1.3 E-2	9.9 E-3	5.2 E-2	9.9 E-3	5.2 E-2
Total TETRA CDD	na	na	na	na	na	1.9 E-2	1.4 E-2	7.5 E-2	1.4 E-2	7.5 E-2
Total PENTA CDD	na	na	na	na	na	4.3 E-2	3.3 E-2	1.7 E-1	3.3 E-2	1.7 E-1
Total HEXA CDD	na	na	na	na	na	4.8 E-2	3.7 E-2	1.9 E-1	3.7 E-2	1.9 E-1
Total HEPTA CDD	na	na	na	na	na	1.5 E-1	1.1 E-1	5.9 E-1	1.1 E-1	5.9 E-1
Total OCTA CDD	na	na	na	na	na	1.1 E+0	8.7 E-1	4.6 E+0	8.7 E-1	4.6 E+0
2,3,7,8-TCDF	na	na	na	na	na	1.1 E-2	8.4 E-3	4.4 E-2	8.4 E-3	4.4 E-2
Total TETRA CDF	na	na	na	na	na	2.4 E-1	1.9 E-1	9.8 E-1	1.9 E-1	9.8 E-1
Total PENTA CDF	na	na	na	na	na	3.3 E-1	2.5 E-1	1.3 E+0	2.5 E-1	1.3 E+0
Total HEXA CDF	na	na	na	na	na	3.6 E-1	2.7 E-1	1.4 E+0	2.7 E-1	1.4 E+0
Total HEPTA CDF	na	na	na	na	na	8.3 E-1	6.3 E-1	3.3 E+0	6.3 E-1	3.3 E+0
Total OCTA CDF	na	na	na	na	na	9.5 E-1	7.3 E-1	3.8 E+0	7.3 E-1	3.8 E+0
HAZARD INDICES:	**3.8 E-2**	**2.9 E-1**	**1.5 E-1**	**2.9 E-1**	**1.5 E-1**	**1.6 E+2**	**1.1 E+3**	**6.6 E+2**	**1.1 E+3**	**6.6 E+2**

na = not available

Shaded numbers exceed hazard quotient of one.

TABLE 5-25
HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF WASTE LAGOON SOILS
(unitless)

Chemical	Current & Future (No Residential Development)					Future (with Residential Development)				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Antimony	6.5 E-2	1.0 E+0	2.3 E-1	3.3 E-1	1.5 E-1	2.0 E-2	3.3 E-1	7.2 E-2	1.0 E-1	4.8 E-2
Cadmium	na	na	na	na	na	1.6 E-3	2.6 E-3	5.9 E-3	8.4 E-4	3.9 E-3
Lead	na	na	na	na	na	na	na	na	na	na
Silver	na	na	na	na	na	3.3 E-4	5.2 E-3	1.2 E-3	1.7 E-3	7.7 E-4
Thallium	na	na	na	na	na	1.5 E-2	2.4 E-2	5.2 E-2	7.5 E-3	3.5 E-2
Tin	7.7 E-4	1.2 E-2	2.7 E-3	3.9 E-3	1.8 E-3	7.7 E-4	1.2 E-2	2.7 E-3	3.9 E-3	1.8 E-3
Cyanide	na	na	na	na	na	9.2 E-5	1.5 E-3	3.3 E-4	4.7 E-4	2.2 E-4
Methylene Chloride	1.8 E-6	1.5 E-5	7.1 E-6	1.3 E-5	6.9 E-6	1.5 E-3	1.2 E-2	5.9 E-3	1.1 E-2	5.7 E-3
Acetone	2.3 E-6	1.9 E-6	9.3 E-6	1.7 E-6	9.1 E-6	2.3 E-2	1.9 E-2	9.3 E-2	1.7 E-2	9.1 E-2
Chloroform	na	na	na	na	na	5.5 E-2	4.5 E-1	2.2 E-1	4.1 E-1	2.1 E-1
1,2-Dichloroethane	na	na	na	na	na	na	na	na	na	na
2-Butanone	na	na	na	na	na	1.3 E-2	1.1 E-2	5.2 E-2	9.7 E-3	5.1 E-2
1,1,1-Trichloroethane	na	na	na	na	na	1.2 E-2	9.6 E-3	4.6 E-2	8.7 E-3	4.6 E-2
Carbon Tetrachloride	na	na	na	na	na	3.8 E+0	3.1 E+0	1.5 E+1	2.8 E+0	1.5 E+1
1,2-Dichloropropane	na	na	na	na	na	6.3 E-2	5.2 E-2	2.5 E-1	4.7 E-2	2.5 E-1
Trichloroethene	na	na	na	na	na	3.2 E-1	2.6 E-1	1.3 E+0	2.4 E-1	1.2 E+0
1,1,2-Trichloroethane	na	na	na	na	na	1.5 E+0	1.3 E+0	6.1 E+0	1.1 E+0	6.0 E+0
Benzene	na	na	na	na	na	na	na	na	na	na
Tetrachloroethene	na	na	na	na	na	7.3 E-2	6.0 E-2	2.9 E-1	5.5 E-2	2.9 E-1
1,1,2,2-Tetrachloroethane	na	na	na	na	na	na	na	na	na	na
Toluene	3.2 E-7	2.6 E-7	1.3 E-6	2.4 E-7	1.2 E-6	2.6 E+0	2.1 E+0	1.0 E+1	1.9 E+0	1.0 E+1
Chlorobenzene	na	na	na	na	na	1.2 E-2	1.0 E-2	5.0 E-2	9.3 E-3	4.9 E-2
Ethylbenzene	na	na	na	na	na	1.6 E-2	1.3 E-2	6.5 E-2	1.2 E-2	6.4 E-2
Xylene (total)	na	na	na	na	na	1.7 E-3	6.8 E-3	6.6 E-3	6.2 E-3	6.5 E-3
Phenol	na	na	na	na	na	1.3 E-4	1.2 E-3	5.2 E-4	9.6 E-4	5.0 E-4
bis(2-Chloroethyl)Ether	na	na	na	na	na	na	na	na	na	na
1,3-Dichlorobenzene	na	na	na	na	na	1.7 E-3	1.5 E-3	6.7 E-3	1.2 E-3	6.3 E-3
1,4-Dichlorobenzene	na	na	na	na	na	na	na	na	na	na
Benzyl Alcohol	na	na	na	na	na	2.0 E-4	5.4 E-4	7.9 E-4	4.3 E-4	7.5 E-4
1,2-Dichlorobenzene	na	na	na	na	na	9.5 E-4	8.6 E-4	3.8 E-3	6.9 E-4	3.6 E-3
2-Methylphenol	na	na	na	na	na	1.1 E-3	9.8 E-4	4.3 E-3	7.8 E-4	4.1 E-3

TABLE 5-25
HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF WASTE LAGOON SOILS
(unitless)

Chemical	Current & Future (No Residential Development)					Future (with Residential Development)				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
4-Methylphenol	na	na	na	na	na	1.5 E-3	1.4 E-3	6.0 E-3	1.1 E-3	5.7 E-3
Hexachloroethane	na	na	na	na	na	4.6 E-2	4.1 E-2	1.8 E-1	3.3 E-2	1.7 E-1
Benzoic Acid	na	na	na	na	na	3.1 E-4	2.8 E-3	1.2 E-3	2.2 E-3	1.2 E-3
Naphthalene	na	na	na	na	na	1.6 E-1	1.5 E-1	6.4 E-1	1.2 E-1	6.1 E-1
2-Methylnaphthalene	na	na	na	na	na	na	na	na	na	na
Dimethyl Phthalate	na	na	na	na	na	6.2 E-5	5.6 E-4	2.5 E-4	4.5 E-4	2.3 E-4
Acenaphthylene	na	na	na	na	na	1.5 E-2	1.3 E-2	5.8 E-2	1.1 E-2	5.6 E-2
Acenaphthene	na	na	na	na	na	9.1 E-4	8.2 E-4	3.6 E-3	6.6 E-4	3.4 E-3
Dibenzofuran	na	na	na	na	na	4.9 E-2	4.4 E-2	1.9 E-1	3.5 E-2	1.8 E-1
Fluorene	na	na	na	na	na	1.4 E-3	1.2 E-3	5.4 E-3	9.8 E-4	5.1 E-3
Phenanthrene	na	na	na	na	na	3.6 E-2	3.2 E-2	1.4 E-1	2.6 E-2	1.3 E-1
Anthracene	na	na	na	na	na	2.2 E-4	2.0 E-4	8.6 E-4	1.6 E-4	8.2 E-4
Di-n-Butylphthalate	na	na	na	na	na	8.2 E-4	7.4 E-4	3.2 E-3	5.9 E-4	3.1 E-3
Fluoranthene	na	na	na	na	na	1.6 E-3	1.4 E-3	6.3 E-3	1.1 E-3	6.0 E-3
Pyrene	na	na	na	na	na	2.0 E-3	1.8 E-3	8.0 E-3	1.5 E-3	7.6 E-3
Butylbenzylphthalate	na	na	na	na	na	5.6 E-4	5.0 E-4	2.2 E-3	4.0 E-4	2.1 E-3
Benzo(a)Anthracene	na	na	na	na	na	na	na	na	na	na
Chrysene	na	na	na	na	na	na	na	na	na	na
bis(2-Ethylhexyl)Phthalate	5.5 E-5	5.0 E-4	2.2 E-4	4.0 E-4	2.1 E-4	7.3 E-3	6.6 E-2	2.9 E-2	5.3 E-2	2.7 E-2
Di-n-Octyl Phthalate	na	na	na	na	na	3.5 E-3	3.1 E-2	1.4 E-2	2.5 E-2	1.3 E-2
Benzo(b)Fluoranthene	na	na	na	na	na	na	na	na	na	na
Benzo(k)Fluoranthene	na	na	na	na	na	na	na	na	na	na
Benzo(a)Pyrene	na	na	na	na	na	na	na	na	na	na
Indeno(1,2,3-cd)Pyrene	na	na	na	na	na	na	na	na	na	na
Benzo(g,h,i)Perylene	na	na	na	na	na	7.1 E-3	6.4 E-3	2.8 E-2	5.1 E-3	2.7 E-2
beta-BHC	na	na	na	na	na	na	na	na	na	na
Heptachlor	na	na	na	na	na	1.9 E-1	1.7 E+0	7.5 E-1	1.4 E+0	7.1 E-1
Aldrin	na	na	na	na	na	9.6 E-1	8.7 E+0	3.8 E+0	7.0 E+0	3.6 E+0
Dieldrin	na	na	na	na	na	2.6 E-1	2.4 E+0	1.0 E+0	1.9 E+0	9.9 E-1
4,4'-DDD	na	na	na	na	na	na	na	na	na	na
4,4'-DDT	na	na	na	na	na	7.6 E-4	6.9 E-3	3.0 E-3	5.5 E-3	2.9 E-3

TABLE 5-25
HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF WASTE LAGOON SOILS
(unitless)

Chemical	Current & Future (No Residential Development)					Future (with Residential Development)				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Endrin ketone	na	na	na	na	na	na	na	na	na	na
gamma-Chlordane	na	na	na	na	na	1.3 E+0	1.2 E+1	5.1 E+0	9.3 E+0	4.8 E+0
Aroclor-1248	na	na	na	na	na	5.4 E-2	4.9 E-2	2.1 E-1	3.9 E-2	2.0 E-1
Aroclor-1260	na	na	na	na	na	8.3 E-2	7.5 E-2	3.3 E-1	6.0 E-2	3.1 E-1
Hexachlorobenzene	na	na	na	na	na	1.6 E+1	1.4 E+2	6.2 E+1	1.1 E+2	5.9 E+1
Hexachlorocyclopentadiene	na	na	na	na	na	4.3 E+0	3.8 E+0	1.7 E+1	3.1 E+0	1.6 E+1
Hexachlorobutadiene	na	na	na	na	na	9.0 E-1	8.1 E+0	3.6 E+0	6.5 E+0	3.4 E+0
Octachlorocyclopentene	na	na	na	na	na	na	na	na	na	na
Heptachloronorborene	na	na	na	na	na	na	na	na	na	na
Chlordene	na	na	na	na	na	1.4 E+2	1.3 E+3	5.5 E+2	1.0 E+3	5.2 E+2
2,3,7,8-TCDD	na	na	na	na	na	1.4 E-2	1.3 E-2	5.5 E-2	1.0 E-2	5.2 E-2
Total TETRA CDD	na	na	na	na	na	2.0 E-2	1.8 E-2	7.9 E-2	1.4 E-2	7.5 E-2
Total PENTA CDD	na	na	na	na	na	4.7 E-2	4.2 E-2	1.8 E-1	3.4 E-2	1.8 E-1
Total HEXA CDD	na	na	na	na	na	5.1 E-2	4.6 E-2	2.0 E-1	3.7 E-2	1.9 E-1
Total HEPTA CDD	na	na	na	na	na	1.6 E-1	1.4 E-1	6.2 E-1	1.1 E-1	5.9 E-1
Total OCTA CDD	na	na	na	na	na	1.2 E+0	1.1 E+0	4.8 E+0	8.8 E-1	4.6 E+0
2,3,7,8-TCDF	na	na	na	na	na	1.2 E-2	1.1 E-2	4.6 E-2	8.5 E-3	4.4 E-2
Total TETRA CDF	na	na	na	na	na	2.6 E-1	2.4 E-1	1.0 E+0	1.9 E-1	9.8 E-1
Total PENTA CDF	na	na	na	na	na	3.5 E-1	3.2 E-1	1.4 E+0	2.6 E-1	1.3 E+0
Total HEXA CDF	na	na	na	na	na	3.8 E-1	3.5 E-1	1.5 E+0	2.8 E-1	1.4 E+0
Total HEPTA CDF	na	na	na	na	na	8.9 E-1	8.0 E-1	3.5 E+0	6.4 E-1	3.3 E+0
Total OCTA CDF	na	na	na	na	na	1.0 E+0	9.3 E-1	4.1 E+0	7.4 E-1	3.9 E+0
HAZARD INDICES:	**6.6 E-2**	**1.1 E+0**	**2.3 E-1**	**3.4 E-1**	**1.6 E-1**	**1.8 E+2**	**1.4 E+3**	**6.9 E+2**	**1.2 E+3**	**6.6 E+2**

na = not available

Shaded numbers exceed hazard quotient of one.

TABLE 5-26

HAZARD QUOTIENTS AND INDICES FROM INGESTION OF SITE-WIDE SOILS

(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Antimony	8.8 E-3	2.4 E-1	2.6 E-2	1.5 E-2	1.6 E-3	8.3 E-3	2.3 E-1	2.4 E-2	1.4 E-2	1.5 E-3
Cadmium	2.2 E-3	5.9 E-3	6.4 E-3	3.7 E-4	4.0 E-4	1.2 E-3	3.3 E-3	3.6 E-3	2.1 E-4	2.3 E-4
Chromium	2.4 E-3	1.7 E-2	7.1 E-3	1.0 E-3	4.5 E-4	2.3 E-3	1.5 E-2	6.6 E-3	9.6 E-4	4.2 E-4
Copper	na	na	na	na	na	na	na	na	na	na
Lead	na	na	na	na	na	na	na	na	na	na
Silver	4.7 E-4	1.3 E-2	1.4 E-3	8.0 E-4	8.7 E-5	3.3 E-4	8.9 E-3	9.6 E-4	5.6 E-4	6.1 E-5
Zinc	7.0 E-4	1.9 E-2	2.0 E-3	1.2 E-3	1.3 E-4	4.7 E-4	1.3 E-2	1.4 E-3	8.0 E-4	8.7 E-5
Cyanide	2.3 E-5	6.3 E-4	6.8 E-5	4.0 E-5	4.3 E-6	1.9 E-5	5.0 E-4	5.4 E-5	3.2 E-5	3.4 E-6
Methylene Chloride	2.4 E-7	6.5 E-6	7.1 E-7	4.1 E-7	4.4 E-8	2.0 E-6	5.5 E-5	6.0 E-6	3.5 E-6	3.8 E-7
Acetone	1.1 E-7	3.1 E-7	3.3 E-7	1.9 E-8	2.1 E-8	1.3 E-6	3.5 E-6	3.7 E-6	2.2 E-7	2.3 E-7
2-Butanone	1.4 E-7	3.8 E-7	4.1 E-7	2.4 E-8	2.6 E-8	4.4 E-7	1.2 E-6	1.3 E-6	7.5 E-8	8.1 E-8
Benzene	na	na	na	na	na	na	na	na	na	na
Tetrachloroethene	4.1 E-7	1.1 E-6	1.2 E-6	7.0 E-8	7.6 E-8	1.9 E-5	5.1 E-5	5.5 E-5	3.2 E-6	3.5 E-6
Toluene	1.1 E-8	3.0 E-8	3.2 E-8	1.8 E-9	2.0 E-9	1.6 E-7	4.4 E-7	4.7 E-7	2.7 E-8	3.0 E-8
Chlorobenzene	4.9 E-8	1.3 E-7	1.4 E-7	8.3 E-9	9.0 E-9	4.9 E-8	1.3 E-7	1.4 E-7	8.3 E-9	9.0 E-9
Ethylbenzene	4.9 E-9	1.3 E-8	1.4 E-8	8.3 E-10	9.0 E-10	9.8 E-9	2.6 E-8	2.9 E-8	1.7 E-9	1.8 E-9
Xylene (total)	1.4 E-9	2.0 E-8	4.2 E-9	1.2 E-9	2.7 E-10	3.9 E-9	5.3 E-8	1.1 E-8	3.3 E-9	7.2 E-10
4-Methylphenol	1.4 E-6	3.7 E-6	4.0 E-6	2.3 E-7	2.5 E-7	1.4 E-6	3.7 E-6	4.0 E-6	2.3 E-7	2.5 E-7
Naphthalene	na	na	na	na	na	2.7 E-5	7.3 E-5	7.9 E-5	4.6 E-6	5.0 E-6
2-Methylnaphthalene	na	na	na	na	na	na	na	na	na	na
Diethylphthalate	na	na	na	na	na	4.8 E-8	1.3 E-7	1.4 E-7	8.1 E-9	8.8 E-9
Phenanthrene	1.4 E-4	3.8 E-4	4.1 E-4	2.4 E-5	2.6 E-5	8.5 E-5	2.3 E-4	2.5 E-4	1.4 E-5	1.6 E-5
Anthracene	5.5 E-7	1.5 E-6	1.6 E-6	9.4 E-8	1.0 E-7	5.5 E-7	1.5 E-6	1.6 E-6	9.4 E-8	1.0 E-7
Di-n-Butylphthalate	2.4 E-6	6.5 E-6	7.0 E-6	4.1 E-7	4.4 E-7	2.2 E-6	6.0 E-6	6.4 E-6	3.7 E-7	4.0 E-7
Fluoranthene	1.7 E-5	4.6 E-5	5.0 E-5	2.9 E-6	3.1 E-6	1.1 E-5	2.9 E-5	3.1 E-5	1.8 E-6	1.9 E-6
Pyrene	2.2 E-5	6.1 E-5	6.6 E-5	3.8 E-6	4.1 E-6	1.4 E-5	3.7 E-5	4.0 E-5	2.3 E-6	2.5 E-6
Butylbenzylphthalate	2.5 E-6	6.7 E-6	7.2 E-6	4.2 E-7	4.6 E-7	1.6 E-6	4.2 E-6	4.6 E-6	2.6 E-7	2.9 E-7
Benzo(a)Anthracene	na	na	na	na	na	na	na	na	na	na
Chrysene	na	na	na	na	na	na	na	na	na	na
bis(2-Ethylhexyl)Phthalate	3.7 E-5	1.0 E-3	1.1 E-4	6.3 E-5	6.9 E-6	2.3 E-5	6.1 E-4	6.6 E-5	3.8 E-5	4.2 E-6

TABLE 5-26

HAZARD QUOTIENTS AND INDICES FROM INGESTION OF SITE-WIDE SOILS

(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Di-n-Octyl Phthalate	1.4 E-5	3.9 E-4	4.2 E-5	2.4 E-5	2.6 E-6	1.1 E-5	3.0 E-4	3.2 E-5	1.9 E-5	2.0 E-6
Benzo(b)Fluoranthene	na	na	na	na	na	na	na	na	na	na
Benzo(k)Fluoranthene	na	na	na	na	na	na	na	na	na	na
Benzo(a)Pyrene	na	na	na	na	na	na	na	na	na	na
Indeno(1,2,3-cd)Pyrene	na	na	na	na	na	na	na	na	na	na
Benzo(g,h,i)Perylene	6.7 E-5	1.8 E-4	2.0 E-4	1.1 E-5	1.2 E-5	5.6 E-5	1.5 E-4	1.6 E-4	9.4 E-6	1.0 E-5
4,4'-DDE	na	na	na	na	na	na	na	na	na	na
Endrin	3.1 E-4	5.1 E-3	9.1 E-4	3.2 E-4	5.7 E-5	9.4 E-5	1.5 E-3	2.7 E-4	9.6 E-5	1.7 E-5
4,4'-DDD	na	na	na	na	na	na	na	na	na	na
4,4'-DDT	1.3 E-5	3.4 E-4	3.7 E-5	2.2 E-5	2.3 E-6	2.5 E-5	6.7 E-4	7.2 E-5	4.2 E-5	4.5 E-6
Aroclor-1254	4.8 E+0	1.3 E+1	1.4 E+1	8.1 E-1	8.8 E-1	1.5 E-1	4.0 E-1	4.3 E-1	2.5 E-2	2.7 E-2
Hexachlorobenzene	1.4 E-2	3.8 E-1	4.1 E-2	2.4 E-2	2.6 E-3	1.4 E-2	3.8 E-1	4.1 E-2	2.4 E-2	2.6 E-3
Hexachlorobutadiene	1.0 E-6	2.7 E-5	2.9 E-6	1.7 E-6	1.8 E-7	1.0 E-6	2.7 E-5	2.9 E-6	1.7 E-6	1.8 E-7
Heptachloronorborene	na	na	na	na	na	na	na	na	na	na
Total HEPTA CDD	1.0 E-1	2.7 E-1	2.9 E-1	1.7 E-2	1.8 E-2	3.3 E-3	9.0 E-3	9.8 E-3	5.7 E-4	6.1 E-4
Total OCTA CDD	9.4 E-2	2.5 E-1	2.7 E-1	1.6 E-2	1.7 E-2	6.1 E-4	1.7 E-3	1.8 E-3	1.0 E-4	1.1 E-4
2,3,7,8-TCDD	na	na	na	na	na	3.9 E-3	1.1 E-2	1.1 E-2	6.6 E-4	7.2 E-4
Total TETRA CDF	na	na	na	na	na	3.9 E-3	1.1 E-2	1.1 E-2	6.6 E-4	7.2 E-4
HAZARD INDICES:	**5.0 E+0**	**1.4 E+1**	**1.5 E+1**	**8.9 E-1**	**9.2 E-1**	**1.9 E-1**	**1.1 E+0**	**5.4 E-1**	**6.8 E-2**	**3.4 E-2**

na = not available

Shaded numbers exceed hazard quotient of one.

TABLE 5-27

HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH SITE-WIDE SOILS

(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Antimony	1.2 E-2	8.9 E-2	4.7 E-2	8.9 E-2	4.7 E-2	1.1 E-2	8.4 E-2	4.4 E-2	8.4 E-2	4.4 E-2
Cadmium	2.9 E-3	2.2 E-3	1.2 E-2	2.2 E-3	1.2 E-2	1.6 E-3	1.2 E-3	6.5 E-3	1.2 E-3	6.5 E-3
Chromium	3.2 E-3	6.2 E-3	1.3 E-2	6.2 E-3	1.3 E-2	3.0 E-3	5.7 E-3	1.2 E-2	5.7 E-3	1.2 E-2
Copper	na	na	na	na	na	na	na	na	na	na
Lead	na	na	na	na	na	na	na	na	na	na
Silver	6.2 E-4	4.7 E-3	2.5 E-3	4.7 E-3	2.5 E-3	4.3 E-4	3.3 E-3	1.8 E-3	3.3 E-3	1.8 E-3
Zinc	9.2 E-4	7.0 E-3	3.7 E-3	7.0 E-3	3.7 E-3	6.2 E-4	4.7 E-3	2.5 E-3	4.7 E-3	2.5 E-3
Cyanide	3.1 E-5	2.4 E-4	1.2 E-4	2.4 E-4	1.2 E-4	2.5 E-5	1.9 E-4	9.9 E-5	1.9 E-4	9.9 E-5
Methylene Chloride	8.0 E-6	6.1 E-5	3.2 E-5	6.1 E-5	3.2 E-5	6.7 E-5	5.2 E-4	2.7 E-4	5.2 E-4	2.7 E-4
Acetone	3.7 E-6	2.9 E-6	1.5 E-5	2.9 E-6	1.5 E-5	4.2 E-5	3.2 E-5	1.7 E-4	3.2 E-5	1.7 E-4
2-Butanone	4.7 E-6	3.6 E-6	1.9 E-5	3.6 E-6	1.9 E-5	1.4 E-5	1.1 E-5	5.8 E-5	1.1 E-5	5.8 E-5
Benzene	na	na	na	na	na	na	na	na	na	na
Tetrachloroethene	1.4 E-5	1.0 E-5	5.5 E-5	1.0 E-5	5.5 E-5	6.2 E-4	4.8 E-4	2.5 E-3	4.8 E-4	2.5 E-3
Toluene	3.6 E-7	2.8 E-7	1.4 E-6	2.8 E-7	1.4 E-6	5.3 E-6	4.1 E-6	2.1 E-5	4.1 E-6	2.1 E-5
Chlorobenzene	1.6 E-6	1.2 E-6	6.5 E-6	1.2 E-6	6.5 E-6	1.6 E-6	1.2 E-6	6.5 E-6	1.2 E-6	6.5 E-6
Ethylbenzene	1.6 E-7	1.2 E-7	6.5 E-7	1.2 E-7	6.5 E-7	3.2 E-7	2.5 E-7	1.3 E-6	2.5 E-7	1.3 E-6
Xylene (total)	4.8 E-8	1.8 E-7	1.9 E-7	1.8 E-7	1.9 E-7	1.3 E-7	4.9 E-7	5.2 E-7	4.9 E-7	5.2 E-7
4-Methylphenol	1.8 E-5	1.4 E-5	7.3 E-5	1.4 E-5	7.3 E-5	1.8 E-5	1.4 E-5	7.3 E-5	1.4 E-5	7.3 E-5
Naphthalene	na	na	na	na	na	3.5 E-4	2.7 E-4	1.4 E-3	2.7 E-4	1.4 E-3
2-Methylnaphthalene	na	na	na	na	na	na	na	na	na	na
Diethylphthalate	na	na	na	na	na	6.3 E-7	4.8 E-7	2.5 E-6	4.8 E-7	2.5 E-6
Phenanthrene	1.8 E-3	1.4 E-3	7.4 E-3	1.4 E-3	7.4 E-3	1.1 E-3	8.6 E-4	4.5 E-3	8.6 E-4	4.5 E-3
Anthracene	7.3 E-6	5.6 E-6	2.9 E-5	5.6 E-6	2.9 E-5	7.3 E-6	5.6 E-6	2.9 E-5	5.6 E-6	2.9 E-5
Di-n-Butylphthalate	3.2 E-5	2.4 E-5	1.3 E-4	2.4 E-5	1.3 E-4	2.9 E-5	2.2 E-5	1.2 E-4	2.2 E-5	1.2 E-4
Fluoranthene	2.2 E-4	1.7 E-4	9.1 E-4	1.7 E-4	9.1 E-4	1.4 E-4	1.1 E-4	5.6 E-4	1.1 E-4	5.6 E-4
Pyrene	3.0 E-4	2.3 E-4	1.2 E-3	2.3 E-4	1.2 E-3	1.8 E-4	1.4 E-4	7.3 E-4	1.4 E-4	7.3 E-4
Butylbenzylphthalate	3.3 E-5	2.5 E-5	1.3 E-4	2.5 E-5	1.3 E-4	2.1 E-5	1.6 E-5	8.3 E-5	1.6 E-5	8.3 E-5
Benzo(a)Anthracene	na	na	na	na	na	na	na	na	na	na
Chrysene	na	na	na	na	na	na	na	na	na	na
bis(2-Ethylhexyl)Phthalate	4.9 E-4	3.8 E-3	2.0 E-3	3.8 E-3	2.0 E-3	3.0 E-4	2.3 E-3	1.2 E-3	2.3 E-3	1.2 E-3

TABLE 5-27

HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH SITE-WIDE SOILS

(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Di-n-Octyl Phthalate	1.9 E-4	1.5 E-3	7.6 E-4	1.5 E-3	7.6 E-4	1.5 E-4	1.1 E-3	5.9 E-4	1.1 E-3	5.9 E-4
Benzo(b)Fluoranthene	na	na	na	na	na	na	na	na	na	na
Benzo(k)Fluoranthene	na	na	na	na	na	na	na	na	na	na
Benzo(a)Pyrene	na	na	na	na	na	na	na	na	na	na
Indeno(1,2,3-cd)Pyrene	na	na	na	na	na	na	na	na	na	na
Benzo(g,h,i)Perylene	8.8 E-4	6.8 E-4	3.6 E-3	6.8 E-4	3.6 E-3	7.3 E-4	5.6 E-4	3.0 E-3	5.6 E-4	3.0 E-3
4,4'-DDE	na	na	na	na	na	na	na	na	na	na
Endrin	4.1 E-3	1.9 E-2	1.7 E-2	1.9 E-2	1.7 E-2	1.2 E-3	5.7 E-3	5.0 E-3	5.7 E-3	5.0 E-3
4,4'-DDD	na	na	na	na	na	na	na	na	na	na
4,4'-DDT	1.7 E-4	1.3 E-3	6.8 E-4	1.3 E-3	6.8 E-4	3.2 E-4	2.5 E-3	1.3 E-3	2.5 E-3	1.3 E-3
Aroclor-1254	6.3 E+1	4.8 E+1	2.5 E+2	4.8 E+1	2.5 E+2	1.9 E+0	1.5 E+0	7.8 E+0	1.5 E+0	7.8 E+0
Hexachlorobenzene	1.9 E-1	1.4 E+0	7.5 E-1	1.4 E+0	7.5 E-1	1.9 E-1	1.4 E+0	7.5 E-1	1.4 E+0	7.5 E-1
Hexachlorobutadiene	1.3 E-5	1.0 E-4	5.3 E-5	1.0 E-4	5.3 E-5	1.3 E-5	1.0 E-4	5.3 E-5	1.0 E-4	5.3 E-5
Heptachloronorborene	na	na	na	na	na	na	na	na	na	na
Total HEPTA CDD	1.3 E+0	1.0 E+0	5.3 E+0	1.0 E+0	5.3 E+0	4.4 E-2	3.4 E-2	1.8 E-1	3.4 E-2	1.8 E-1
Total OCTA CDD	1.2 E+0	9.5 E-1	5.0 E+0	9.5 E-1	5.0 E+0	8.1 E-3	6.2 E-3	3.3 E-2	6.2 E-3	3.3 E-2
2,3,7,8-TCDD	na	na	na	na	na	5.2 E-2	4.0 E-2	2.1 E-1	4.0 E-2	2.1 E-1
Total TETRA CDF	na	na	na	na	na	5.2 E-2	4.0 E-2	2.1 E-1	4.0 E-2	2.1 E-1
HAZARD INDICES:	**6.6 E+1**	**5.2 E+1**	**2.7 E+2**	**5.2 E+1**	**2.7 E+2**	**2.3 E+0**	**3.1 E+0**	**9.3 E+0**	**3.1 E+0**	**9.3 E+0**

na = not available

Shaded numbers exceed hazard quotient of one.

TABLE 5-28

HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF SITE-WIDE SOILS

(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Antimony	2.0 E-2	3.3 E-1	7.3 E-2	1.0 E-1	4.8 E-2	1.9 E-2	3.1 E-1	6.9 E-2	9.8 E-2	4.6 E-2
Cadmium	5.0 E-3	8.1 E-3	1.8 E-2	2.6 E-3	1.2 E-2	2.8 E-3	4.6 E-3	1.0 E-2	1.4 E-3	6.7 E-3
Chromium	5.7 E-3	2.3 E-2	2.0 E-2	7.2 E-3	1.3 E-2	5.3 E-3	2.1 E-2	1.9 E-2	6.7 E-3	1.2 E-2
Copper	na	na	na	na	na	na	na	na	na	na
Lead	na	na	na	na	na	na	na	na	na	na
Silver	1.1 E-3	1.7 E-2	3.9 E-3	5.5 E-3	2.6 E-3	7.6 E-4	1.2 E-2	2.7 E-3	3.9 E-3	1.8 E-3
Zinc	1.6 E-3	2.6 E-2	5.7 E-3	8.2 E-3	3.8 E-3	1.1 E-3	1.7 E-2	3.9 E-3	5.5 E-3	2.6 E-3
Cyanide	5.4 E-5	8.7 E-4	1.9 E-4	2.8 E-4	1.3 E-4	4.3 E-5	6.9 E-4	1.5 E-4	2.2 E-4	1.0 E-4
Methylene Chloride	8.2 E-6	6.8 E-5	3.3 E-5	6.1 E-5	3.2 E-5	6.9 E-5	5.7 E-4	2.8 E-4	5.2 E-4	2.7 E-4
Acetone	3.8 E-6	3.2 E-6	1.5 E-5	2.9 E-6	1.5 E-5	4.3 E-5	3.6 E-5	1.7 E-4	3.2 E-5	1.7 E-4
2-Butanone	4.8 E-6	3.9 E-6	1.9 E-5	3.6 E-6	1.9 E-5	1.5 E-5	1.2 E-5	6.0 E-5	1.1 E-5	5.9 E-5
Benzene	na	na	na	na	na	na	na	na	na	na
Tetrachloroethene	1.4 E-5	1.1 E-5	5.6 E-5	1.0 E-5	5.5 E-5	6.4 E-4	5.3 E-4	2.6 E-3	4.8 E-4	2.5 E-3
Toluene	3.7 E-7	3.0 E-7	1.5 E-6	2.8 E-7	1.5 E-6	5.5 E-6	4.5 E-6	2.2 E-5	4.1 E-6	2.1 E-5
Chlorobenzene	1.7 E-6	1.4 E-6	6.6 E-6	1.2 E-6	6.5 E-6	1.7 E-6	1.4 E-6	6.6 E-6	1.2 E-6	6.5 E-6
Ethylbenzene	1.7 E-7	1.4 E-7	6.6 E-7	1.2 E-7	6.5 E-7	3.3 E-7	2.7 E-7	1.3 E-6	2.5 E-7	1.3 E-6
Xylene (total)	4.9 E-8	2.0 E-7	2.0 E-7	1.8 E-7	1.9 E-7	1.3 E-7	5.5 E-7	5.3 E-7	5.0 E-7	5.2 E-7
4-Methylphenol	1.9 E-5	1.8 E-5	7.7 E-5	1.4 E-5	7.3 E-5	1.9 E-5	1.8 E-5	7.7 E-5	1.4 E-5	7.3 E-5
Naphthalene	na	na	na	na	na	3.8 E-4	3.4 E-4	1.5 E-3	2.8 E-4	1.4 E-3
2-Methylnaphthalene	na	na	na	na	na	na	na	na	na	na
Diethylphthalate	na	na	na	na	na	6.8 E-7	6.1 E-7	2.7 E-6	4.9 E-7	2.5 E-6
Phenanthrene	2.0 E-3	1.8 E-3	7.8 E-3	1.4 E-3	7.4 E-3	1.2 E-3	1.1 E-3	4.8 E-3	8.7 E-4	4.5 E-3
Anthracene	7.9 E-6	7.1 E-6	3.1 E-5	5.7 E-6	3.0 E-5	7.9 E-6	7.1 E-6	3.1 E-5	5.7 E-6	3.0 E-5
Di-n-Butylphthalate	3.4 E-5	3.1 E-5	1.3 E-4	2.5 E-5	1.3 E-4	3.1 E-5	2.8 E-5	1.2 E-4	2.3 E-5	1.2 E-4
Fluoranthene	2.4 E-4	2.2 E-4	9.5 E-4	1.7 E-4	9.1 E-4	1.5 E-4	1.4 E-4	5.9 E-4	1.1 E-4	5.6 E-4
Pyrene	3.2 E-4	2.9 E-4	1.3 E-3	2.3 E-4	1.2 E-3	2.0 E-4	1.8 E-4	7.7 E-4	1.4 E-4	7.4 E-4
Butylbenzylphthalate	3.5 E-5	3.2 E-5	1.4 E-4	2.5 E-5	1.3 E-4	2.2 E-5	2.0 E-5	8.7 E-5	1.6 E-5	8.3 E-5
Benzo(a)Anthracene	na	na	na	na	na	na	na	na	na	na
Chrysene	na	na	na	na	na	na	na	na	na	na
bis(2-Ethylhexyl)Phthalate	5.3 E-4	4.8 E-3	2.1 E-3	3.8 E-3	2.0 E-3	3.2 E-4	2.9 E-3	1.3 E-3	2.3 E-3	1.2 E-3

TABLE 5-28

HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF SITE-WIDE SOILS

(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Di-n-Octyl Phthalate	2.0 E-4	1.8 E-3	8.1 E-4	1.5 E-3	7.7 E-4	1.6 E-4	1.4 E-3	6.2 E-4	1.1 E-3	5.9 E-4
Benzo(b)Fluoranthene	na	na	na	na	na	na	na	na	na	na
Benzo(k)Fluoranthene	na	na	na	na	na	na	na	na	na	na
Benzo(a)Pyrene	na	na	na	na	na	na	na	na	na	na
Indeno(1,2,3-cd)Pyrene	na	na	na	na	na	na	na	na	na	na
Benzo(g,h,i)Perylene	9.5 E-4	8.6 E-4	3.8 E-3	6.9 E-4	3.6 E-3	7.9 E-4	7.1 E-4	3.1 E-3	5.7 E-4	3.0 E-3
4,4'-DDE	na	na	na	na	na	na	na	na	na	na
Endrin	4.4 E-3	2.4 E-2	1.7 E-2	1.9 E-2	1.7 E-2	1.3 E-3	7.2 E-3	5.3 E-3	5.8 E-3	5.0 E-3
4,4'-DDD	na	na	na	na	na	na	na	na	na	na
4,4'-DDT	1.8 E-4	1.6 E-3	7.1 E-4	1.3 E-3	6.8 E-4	3.5 E-4	3.1 E-3	1.4 E-3	2.5 E-3	1.3 E-3
Aroclor-1254	6.8 E+1	6.1 E+1	2.7 E+2	4.9 E+1	2.6 E+2	2.1 E+0	1.9 E+0	8.2 E+0	1.5 E+0	7.8 E+0
Hexachlorobenzene	2.0 E-1	1.8 E+0	7.9 E-1	1.4 E+0	7.5 E-1	2.0 E-1	1.8 E+0	7.9 E-1	1.4 E+0	7.5 E-1
Hexachlorobutadiene	1.4 E-5	1.3 E-4	5.6 E-5	1.0 E-4	5.3 E-5	1.4 E-5	1.3 E-4	5.6 E-5	1.0 E-4	5.3 E-5
Heptachloronorborene	na	na	na	na	na	na	na	na	na	na
Total HEPTA CDD	1.4 E+0	1.3 E+0	5.6 E+0	1.0 E+0	5.3 E+0	4.7 E-2	4.3 E-2	1.9 E-1	3.4 E-2	1.8 E-1
Total OCTA CDD	1.3 E+0	1.2 E+0	5.3 E+0	9.6 E-1	5.0 E+0	8.7 E-3	7.9 E-3	3.4 E-2	6.3 E-3	3.3 E-2
2,3,7,8-TCDD	na	na	na	na	na	5.5 E-2	5.0 E-2	2.2 E-1	4.0 E-2	2.1 E-1
Total TETRA CDF	na	na	na	na	na	5.5 E-2	5.0 E-2	2.2 E-1	4.0 E-2	2.1 E-1
HAZARD INDICES:	**7.1 E+1**	**6.6 E+1**	**2.8 E+2**	**5.3 E+1**	**2.7 E+2**	**2.5 E+0**	**4.2 E+0**	**9.8 E+0**	**3.2 E+0**	**9.3 E+0**

na = not available

Shaded numbers exceed hazard quotient of one.

TABLE 5-29
HAZARD QUOTIENTS AND INDICES FROM INGESTION OF GROUND WATER
(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	na	na	na	ne	ne	na	na	na	ne	ne
Arsenic	na	na	na	ne	ne	6.0 E-1	4.1 E+0	1.7 E+0	ne	ne
Barium	1.7 E-2	1.6 E-1	4.9 E-2	ne	ne	8.3 E-1	7.9 E+0	2.4 E+0	ne	ne
Cadmium	4.2 E-2	2.8 E-2	1.2 E-1	ne	ne	1.3 E+0	8.5 E-1	3.7 E+0	ne	ne
Chromium	na	na	na	ne	ne	2.7 E-1	4.5 E-1	7.8 E-1	ne	ne
Cobalt	na	na	na	ne	ne	3.0 E+2	2.1 E+2	8.9 E+2	ne	ne
Copper	na	na	na	ne	ne	na	na	na	ne	ne
Lead	na	na	na	ne	ne	na	na	na	ne	ne
Manganese	6.6 E-2	8.9 E-2	1.9 E-1	ne	ne	1.8 E+0	2.4 E+0	5.1 E+0	ne	ne
Nickel	na	na	na	ne	ne	2.0 E-1	1.4 E+0	5.9 E-1	ne	ne
Vanadium	na	na	na	ne	ne	1.9 E-1	1.3 E+0	5.5 E-1	ne	ne
Zinc	6.5 E-2	4.4 E-1	1.9 E-1	ne	ne	6.5 E-2	4.4 E-1	1.9 E-1	ne	ne
Cyanide	na	na	na	ne	ne	1.1 E-2	7.8 E-2	3.4 E-2	ne	ne
Vinyl Chloride	na	na	na	ne	ne	na	na	na	ne	ne
Chloroethane	na	na	na	ne	ne	na	na	na	ne	ne
Methylene Chloride	na	na	na	ne	ne	2.3 E-3	1.5 E-2	6.7 E-3	ne	ne
Acetone	na	na	na	ne	ne	5.8 E-1	3.9 E-1	1.7 E+0	ne	ne
1,1-Dichloroethane	na	na	na	ne	ne	8.0 E-3	5.4 E-3	2.3 E-2	ne	ne
1,2-Dichloroethene	na	na	na	ne	ne	4.4 E+0	3.0 E+0	1.3 E+1	ne	ne
Chloroform	7.8 E-3	5.3 E-2	2.3 E-2	ne	ne	8.3 E-2	5.6 E-1	2.4 E-1	ne	ne
1,2-Dichloroethane	na	na	na	ne	ne	na	na	na	ne	ne
2-Butanone	na	na	na	ne	ne	7.0 E-3	4.8 E-3	2.1 E-2	ne	ne
1,1,1-Trichloroethane	na	na	na	ne	ne	1.3 E-3	8.8 E-4	3.8 E-3	ne	ne
Carbon Tetrachloride	na	na	na	ne	ne	9.4 E-2	6.3 E-2	2.7 E-1	ne	ne
1,2-Dichloropropane	na	na	na	ne	ne	4.0 E-2	2.7 E-2	1.2 E-1	ne	ne
Trichloroethene	na	na	na	ne	ne	9.5 E-2	6.4 E-2	2.8 E-1	ne	ne
1,1,2-Trichloroethane	na	na	na	ne	ne	1.3 E-1	9.1 E-2	3.9 E-1	ne	ne
Benzene	na	na	na	ne	ne	na	na	na	ne	ne
Tetrachloroethene	na	na	na	ne	ne	2.0 E-2	1.3 E-2	5.7 E-2	ne	ne
1,1,2,2-Tetrachloroethane	na	na	na	ne	ne	na	na	na	ne	ne
Toluene	na	na	na	ne	ne	1.5 E-1	1.0 E-1	4.4 E-1	ne	ne
Chlorobenzene	na	na	na	ne	ne	1.3 E-2	8.9 E-3	3.9 E-2	ne	ne

TABLE 5-29
HAZARD QUOTIENTS AND INDICES FROM INGESTION OF GROUND WATER
(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Ethylbenzene	na	na	na	ne	ne	7.8 E-3	5.3 E-3	2.3 E-2	ne	ne
Xylene (total)	na	na	na	ne	ne	8.8 E-4	3.0 E-3	2.6 E-3	ne	ne
Phenol	na	na	na	ne	ne	1.1 E-2	7.4 E-2	3.2 E-2	ne	ne
bis(2-Chloroethyl)Ether	na	na	na	ne	ne	na	na	na	ne	ne
1,4-Dichlorobenzene	na	na	na	ne	ne	na	na	na	ne	ne
Benzyl Alcohol	na	na	na	ne	ne	3.3 E-5	6.6 E-5	9.5 E-5	ne	ne
1,2-Dichlorobenzene	na	na	na	ne	ne	6.5 E-4	4.4 E-4	1.9 E-3	ne	ne
2-Methylphenol	na	na	na	ne	ne	8.8 E-2	6.0 E-2	2.6 E-1	ne	ne
4-Methylphenol	na	na	na	ne	ne	6.8 E-2	4.6 E-2	2.0 E-1	ne	ne
Naphthalene	1.8 E-3	1.2 E-3	5.2 E-3	ne	ne	1.6 E-1	1.1 E-1	4.6 E-1	ne	ne
2-Methylnaphthalene	na	na	na	ne	ne	na	na	na	ne	ne
Pentachlorophenol	na	na	na	ne	ne	8.5 E-2	5.7 E-1	2.5 E-1	ne	ne
Di-n-Butylphthalate	na	na	na	ne	ne	2.9 E-4	2.0 E-4	8.6 E-4	ne	ne
bis(2-Ethylhexyl)Phthalate	na	na	na	ne	ne	5.9 E-3	4.0 E-2	1.7 E-2	ne	ne
Aldrin	na	na	na	ne	ne	1.6 E-1	1.1 E+0	4.8 E-1	ne	ne
Dieldrin	na	na	na	ne	ne	2.5 E-2	1.7 E-1	7.4 E-2	ne	ne
4,4'-DDT	1.8 E-3	1.2 E-2	5.1 E-3	ne	ne	1.8 E-3	1.2 E-2	5.1 E-3	ne	ne
Aroclor-1254	2.0 E-2	1.3 E-2	5.7 E-2	ne	ne	2.0 E-2	1.3 E-2	5.7 E-2	ne	ne
Hexachlorobenzene	na	na	na	ne	ne	2.9 E-3	2.0 E-2	8.6 E-3	ne	ne
Hexachlorobutadiene	na	na	na	ne	ne	4.3 E-4	2.9 E-3	1.2 E-3	ne	ne
Heptachloronorborene	na	na	na	ne	ne	na	na	na	ne	ne
HAZARD INDICES:	**2.2 E-1**	**8.0 E-1**	**6.4 E-1**	**ne**	**ne**	**3.1 E+2**	**2.3 E+2**	**9.2 E+2**	**ne**	**ne**

na = not available ne = no exposure Shaded numbers exceed hazard quotient of one.

TABLE 5-30
HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH GROUND WATER VIA SHOWERING
(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	ne	ne	ne	na	na	ne	ne
Arsenic	ne	na	na	ne	ne	ne	8.9 E-3	5.1 E-3	ne	ne
Barium	ne	3.5 E-4	1.4 E-4	ne	ne	ne	1.7 E-2	7.1 E-3	ne	ne
Cadmium	ne	6.2 E-5	3.6 E-4	ne	ne	ne	1.9 E-3	1.1 E-2	ne	ne
Chromium	ne	na	na	ne	ne	ne	1.4 E-3	3.2 E-3	ne	ne
Cobalt	ne	na	na	ne	ne	ne	4.5 E-1	2.6 E+0	ne	ne
Copper	ne	na	na	ne	ne	ne	na	na	ne	ne
Lead	ne	na	na	ne	ne	ne	na	na	ne	ne
Manganese	ne	1.9 E-4	5.6 E-4	ne	ne	ne	5.2 E-3	1.5 E-2	ne	ne
Nickel	ne	na	na	ne	ne	ne	3.0 E-3	1.7 E-3	ne	ne
Vanadium	ne	na	na	ne	ne	ne	2.8 E-3	1.6 E-3	ne	ne
Zinc	ne	9.6 E-4	5.5 E-4	ne	ne	ne	9.6 E-4	5.5 E-4	ne	ne
Cyanide	ne	na	na	ne	ne	ne	1.7 E-4	9.8 E-5	ne	ne
Vinyl Chloride	ne	na	na	ne	ne	ne	na	na	ne	ne
Chloroethane	ne	na	na	ne	ne	ne	na	na	ne	ne
Methylene Chloride	ne	na	na	ne	ne	ne	2.3 E-2	1.3 E-2	ne	ne
Acetone	ne	na	na	ne	ne	ne	5.7 E-1	3.3 E+0	ne	ne
1,1-Dichloroethane	ne	na	na	ne	ne	ne	8.0 E-3	4.6 E-2	ne	ne
1,2-Dichloroethene	ne	na	na	ne	ne	ne	4.4 E+0	2.5 E+1	ne	ne
Chloroform	ne	7.8 E-2	4.5 E-2	ne	ne	ne	8.3 E-1	4.8 E-1	ne	ne
1,2-Dichloroethane	ne	na	na	ne	ne	ne	na	na	ne	ne
2-Butanone	ne	na	na	ne	ne	ne	3.5 E-5	2.0 E-4	ne	ne
1,1,1-Trichloroethane	ne	na	na	ne	ne	ne	1.3 E-3	7.5 E-3	ne	ne
Carbon Tetrachloride	ne	na	na	ne	ne	ne	9.3 E-2	5.4 E-1	ne	ne
1,2-Dichloropropane	ne	na	na	ne	ne	ne	4.0 E-2	2.3 E-1	ne	ne
Trichloroethene	ne	na	na	ne	ne	ne	9.4 E-2	5.4 E-1	ne	ne
1,1,2-Trichloroethane	ne	na	na	ne	ne	ne	1.3 E-1	7.7 E-1	ne	ne
Benzene	ne	na	na	ne	ne	ne	na	na	ne	ne
Tetrachloroethene	ne	na	na	ne	ne	ne	1.9 E-2	1.1 E-1	ne	ne
1,1,2,2-Tetrachloroethane	ne	na	na	ne	ne	ne	na	na	ne	ne
Toluene	ne	na	na	ne	ne	ne	1.5 E-1	8.7 E-1	ne	ne
Chlorobenzene	ne	na	na	ne	ne	ne	1.3 E-2	7.6 E-2	ne	ne

TABLE 5-30
HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH GROUND WATER VIA SHOWERING
(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Ethylbenzene	ne	na	na	ne	ne	ne	7.7 E-4	4.4 E-3	ne	ne
Xylene (total)	ne	na	na	ne	ne	ne	4.3 E-4	5.0 E-4	ne	ne
Phenol	ne	na	na	ne	ne	ne	1.6 E-4	9.3 E-5	ne	ne
bis(2-Chloroethyl)Ether	ne	na	na	ne	ne	ne	na	na	ne	ne
1,4-Dichlorobenzene	ne	na	na	ne	ne	ne	na	na	ne	ne
Benzyl Alcohol	ne	na	na	ne	ne	ne	1.4 E-7	2.8 E-7	ne	ne
1,2-Dichlorobenzene	ne	na	na	ne	ne	ne	9.6 E-7	5.5 E-6	ne	ne
2-Methylphenol	ne	na	na	ne	ne	ne	1.3 E-4	7.5 E-4	ne	ne
4-Methylphenol	ne	na	na	ne	ne	ne	1.0 E-4	5.8 E-4	ne	ne
Naphthalene	ne	2.6 E-6	1.5 E-5	ne	ne	ne	2.3 E-4	1.3 E-3	ne	ne
2-Methylnaphthalene	ne	na	na	ne	ne	ne	na	na	ne	ne
Pentachlorophenol	ne	na	na	ne	ne	ne	1.3 E-3	7.2 E-4	ne	ne
Di-n-Butylphthalate	ne	na	na	ne	ne	ne	4.3 E-7	2.5 E-6	ne	ne
bis(2-Ethylhexyl)Phthalate	ne	na	na	ne	ne	ne	8.7 E-5	5.0 E-5	ne	ne
Aldrin	ne	na	na	ne	ne	ne	2.4 E-3	1.4 E-3	ne	ne
Dieldrin	ne	na	na	ne	ne	ne	3.8 E-4	2.2 E-4	ne	ne
4,4'-DDT	ne	2.6 E-5	1.5 E-5	ne	ne	ne	2.6 E-5	1.5 E-5	ne	ne
Aroclor-1254	ne	2.9 E-5	1.7 E-4	ne	ne	ne	2.9 E-5	1.7 E-4	ne	ne
Hexachlorobenzene	ne	na	na	ne	ne	ne	4.6 E-6	2.7 E-6	ne	ne
Hexachlorobutadiene	ne	na	na	ne	ne	ne	6.3 E-6	3.6 E-6	ne	ne
Heptachloronorborene	ne	na	na	ne	ne	ne	na	na	ne	ne
HAZARD INDICES:	**ne**	**8.0 E-2**	**4.7 E-2**	**ne**	**ne**	**ne**	**6.9 E+0**	**3.5 E+1**	**ne**	**ne**

na = not available ne = no exposure *Shaded numbers exceed hazard quotient of one.*

TABLE 5-31
HAZARD QUOTIENTS AND INDICES FROM INHALATION OF GROUND WATER VIA SHOWERING
(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	ne	ne	ne	na	na	ne	ne
Arsenic	ne	na	na	ne	ne	ne	na	na	ne	ne
Barium	ne	na	na	ne	ne	ne	na	na	ne	ne
Cadmium	ne	na	na	ne	ne	ne	na	na	ne	ne
Chromium	ne	na	na	ne	ne	ne	na	na	ne	ne
Cobalt	ne	na	na	ne	ne	ne	na	na	ne	ne
Copper	ne	na	na	ne	ne	ne	na	na	ne	ne
Lead	ne	na	na	ne	ne	ne	na	na	ne	ne
Manganese	ne	na	na	ne	ne	ne	na	na	ne	ne
Nickel	ne	na	na	ne	ne	ne	na	na	ne	ne
Vanadium	ne	na	na	ne	ne	ne	na	na	ne	ne
Zinc	ne	na	na	ne	ne	ne	na	na	ne	ne
Cyanide	ne	na	na	ne	ne	ne	na	na	ne	ne
Vinyl Chloride	ne	na	na	ne	ne	ne	na	na	ne	ne
Chloroethane	ne	na	na	ne	ne	ne	na	na	ne	ne
Methylene Chloride	ne	na	na	ne	ne	ne	1.6 E-4	3.4 E-5	ne	ne
Acetone	ne	na	na	ne	ne	ne	na	na	ne	ne
1,1-Dichloroethane	ne	na	na	ne	ne	ne	3.0 E-4	6.5 E-4	ne	ne
1,2-Dichloroethene	ne	na	na	ne	ne	ne	na	na	ne	ne
Chloroform	ne	na	na	ne	ne	ne	na	na	ne	ne
1,2-Dichloroethane	ne	na	na	ne	ne	ne	na	na	ne	ne
2-Butanone	ne	na	na	ne	ne	ne	1.0 E-4	2.2 E-4	ne	ne
1,1,1-Trichloroethane	ne	na	na	ne	ne	ne	1.3 E-5	2.7 E-5	ne	ne
Carbon Tetrachloride	ne	na	na	ne	ne	ne	na	na	ne	ne
1,2-Dichloropropane	ne	na	na	ne	ne	ne	na	na	ne	ne
Trichloroethene	ne	na	na	ne	ne	ne	na	na	ne	ne
1,1,2-Trichloroethane	ne	na	na	ne	ne	ne	na	na	ne	ne
Benzene	ne	na	na	ne	ne	ne	na	na	ne	ne
Tetrachloroethene	ne	na	na	ne	ne	ne	na	na	ne	ne
1,1,2,2-Tetrachloroethane	ne	na	na	ne	ne	ne	na	na	ne	ne
Toluene	ne	na	na	ne	ne	ne	4.4 E-3	9.4 E-4	ne	ne
Chlorobenzene	ne	na	na	ne	ne	ne	1.7 E-4	3.8 E-4	ne	ne

TABLE 5-31
HAZARD QUOTIENTS AND INDICES FROM INHALATION OF GROUND WATER VIA SHOWERING
(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Ethylbenzene	ne	na	na	ne	ne	ne	8.5 E-5	1.8 E-5	ne	ne
Xylene (total)	ne	na	na	ne	ne	ne	5.9 E-4	1.3 E-4	ne	ne
Phenol	ne	na	na	ne	ne	ne	na	na	ne	ne
bis(2-Chloroethyl)Ether	ne	na	na	ne	ne	ne	na	na	ne	ne
1,4-Dichlorobenzene	ne	na	na	ne	ne	ne	3.8 E-6	8.2 E-7	ne	ne
Benzyl Alcohol	ne	na	na	ne	ne	ne	na	na	ne	ne
1,2-Dichlorobenzene	ne	na	na	ne	ne	ne	5.8 E-7	1.2 E-6	ne	ne
2-Methylphenol	ne	na	na	ne	ne	ne	na	na	ne	ne
4-Methylphenol	ne	na	na	ne	ne	ne	na	na	ne	ne
Naphthalene	ne	na	na	ne	ne	ne	na	na	ne	ne
2-Methylnaphthalene	ne	na	na	ne	ne	ne	na	na	ne	ne
Pentachlorophenol	ne	na	na	ne	ne	ne	na	na	ne	ne
Di-n-Butylphthalate	ne	na	na	ne	ne	ne	na	na	ne	ne
bis(2-Ethylhexyl)Phthalate	ne	na	na	ne	ne	ne	na	na	ne	ne
Aldrin	ne	na	na	ne	ne	ne	na	na	ne	ne
Dieldrin	ne	na	na	ne	ne	ne	na	na	ne	ne
4,4'-DDT	ne	na	na	ne	ne	ne	na	na	ne	ne
Aroclor-1254	ne	na	na	ne	ne	ne	na	na	ne	ne
Hexachlorobenzene	ne	na	na	ne	ne	ne	na	na	ne	ne
Hexachlorobutadiene	ne	na	na	ne	ne	ne	na	na	ne	ne
Heptachloronorborene	ne	na	na	ne	ne	ne	na	na	ne	ne
HAZARD INDICES:	**ne**	**na**	**na**	**ne**	**ne**	**ne**	**5.8 E-3**	**2.4 E-3**	**ne**	**ne**

na = not available

ne = no exposure

TABLE 5-32
HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF GROUND WATER
(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	na	na	na	ne	ne	na	na	na	ne	ne
Arsenic	na	na	na	ne	ne	6.0 E-1	4.1 E+0	1.8 E+0	ne	ne
Barium	1.7 E-2	1.6 E-1	4.9 E-2	ne	ne	8.3 E-1	7.9 E+0	2.4 E+0	ne	ne
Cadmium	4.2 E-2	2.8 E-2	1.2 E-1	ne	ne	1.3 E+0	8.5 E-1	3.7 E+0	ne	ne
Chromium	na	na	na	ne	ne	2.7 E-1	4.6 E-1	7.9 E-1	ne	ne
Cobalt	na	na	na	ne	ne	3.0 E+2	2.1 E+2	8.9 E+2	ne	ne
Copper	na	na	na	ne	ne	na	na	na	ne	ne
Lead	na	na	na	ne	ne	na	na	na	ne	ne
Manganese	6.6 E-2	8.9 E-2	1.9 E-1	ne	ne	1.8 E+0	2.4 E+0	5.2 E+0	ne	ne
Nickel	na	na	na	ne	ne	2.0 E-1	1.4 E+0	5.9 E-1	ne	ne
Vanadium	na	na	na	ne	ne	1.9 E-1	1.3 E+0	5.5 E-1	ne	ne
Zinc	6.5 E-2	4.4 E-1	1.9 E-1	ne	ne	6.5 E-2	4.4 E-1	1.9 E-1	ne	ne
Cyanide	na	na	na	ne	ne	1.1 E-2	7.8 E-2	3.4 E-2	ne	ne
Vinyl Chloride	na	na	na	ne	ne	na	na	na	ne	ne
Chloroethane	na	na	na	ne	ne	na	na	na	ne	ne
Methylene Chloride	na	na	na	ne	ne	2.3 E-3	3.8 E-2	2.0 E-2	ne	ne
Acetone	na	na	na	ne	ne	5.8 E-1	9.7 E-1	5.0 E+0	ne	ne
1,1-Dichloroethane	na	na	na	ne	ne	8.0 E-3	1.4 E-2	7.0 E-2	ne	ne
1,2-Dichloroethene	na	na	na	ne	ne	4.4 E+0	7.4 E+0	3.8 E+1	ne	ne
Chloroform	7.8 E-3	1.3 E-1	6.8 E-2	ne	ne	8.3 E-2	1.4 E+0	7.2 E-1	ne	ne
1,2-Dichloroethane	na	na	na	ne	ne	na	na	na	ne	ne
2-Butanone	na	na	na	ne	ne	7.0 E-3	4.9 E-3	2.1 E-2	ne	ne
1,1,1-Trichloroethane	na	na	na	ne	ne	1.3 E-3	2.2 E-3	1.1 E-2	ne	ne
Carbon Tetrachloride	na	na	na	ne	ne	9.4 E-2	1.6 E-1	8.1 E-1	ne	ne
1,2-Dichloropropane	na	na	na	ne	ne	4.0 E-2	6.7 E-2	3.5 E-1	ne	ne
Trichloroethene	na	na	na	ne	ne	9.5 E-2	1.6 E-1	8.2 E-1	ne	ne
1,1,2-Trichloroethane	na	na	na	ne	ne	1.3 E-1	2.2 E-1	1.2 E+0	ne	ne
Benzene	na	na	na	ne	ne	na	na	na	ne	ne
Tetrachloroethene	na	na	na	ne	ne	2.0 E-2	3.3 E-2	1.7 E-1	ne	ne
1,1,2,2-Tetrachloroethane	na	na	na	ne	ne	na	na	na	ne	ne
Toluene	na	na	na	ne	ne	1.5 E-1	2.6 E-1	1.3 E+0	ne	ne
Chlorobenzene	na	na	na	ne	ne	1.3 E-2	2.2 E-2	1.1 E-1	ne	ne

TABLE 5-32
HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF GROUND WATER
(unitless)

Chemical	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Ethylbenzene	na	na	na	ne	ne	7.8 E-3	6.2 E-3	2.7 E-2	ne	ne
Xylene (total)	na	na	na	ne	ne	8.8 E-4	4.0 E-3	3.2 E-3	ne	ne
Phenol	na	na	na	ne	ne	1.1 E-2	7.4 E-2	3.2 E-2	ne	ne
bis(2-Chloroethyl)Ether	na	na	na	ne	ne	na	na	na	ne	ne
1,4-Dichlorobenzene	na	na	na	ne	ne	na	3.8 E-6	8.2 E-7	ne	ne
Benzyl Alcohol	na	na	na	ne	ne	3.3 E-5	6.6 E-5	9.6 E-5	ne	ne
1,2-Dichlorobenzene	na	na	na	ne	ne	6.5 E-4	4.4 E-4	1.9 E-3	ne	ne
2-Methylphenol	na	na	na	ne	ne	8.8 E-2	6.0 E-2	2.6 E-1	ne	ne
4-Methylphenol	na	na	na	ne	ne	6.8 E-2	4.6 E-2	2.0 E-1	ne	ne
Naphthalene	1.8 E-3	1.2 E-3	5.2 E-3	ne	ne	1.6 E-1	1.1 E-1	4.6 E-1	ne	ne
2-Methylnaphthalene	na	na	na	ne	ne	na	na	na	ne	ne
Pentachlorophenol	na	na	na	ne	ne	8.5 E-2	5.8 E-1	2.5 E-1	ne	ne
Di-n-Butylphthalate	na	na	na	ne	ne	2.9 E-4	2.0 E-4	8.6 E-4	ne	ne
bis(2-Ethylhexyl)Phthalate	na	na	na	ne	ne	5.9 E-3	4.0 E-2	1.7 E-2	ne	ne
Aldrin	na	na	na	ne	ne	1.6 E-1	1.1 E+0	4.8 E-1	ne	ne
Dieldrin	na	na	na	ne	ne	2.5 E-2	1.7 E-1	7.5 E-2	ne	ne
4,4'-DDT	1.8 E-3	1.2 E-2	5.2 E-3	ne	ne	1.8 E-3	1.2 E-2	5.2 E-3	ne	ne
Aroclor-1254	2.0 E-2	1.3 E-2	5.7 E-2	ne	ne	2.0 E-2	1.3 E-2	5.7 E-2	ne	ne
Hexachlorobenzene	na	na	na	ne	ne	2.9 E-3	2.0 E-2	8.6 E-3	ne	ne
Hexachlorobutadiene	na	na	na	ne	ne	4.3 E-4	2.9 E-3	1.2 E-3	ne	ne
Heptachloronorborene	na	na	na	ne	ne	na	na	na	ne	ne
HAZARD INDICES:	**2.2 E-1**	**8.8 E-1**	**6.9 E-1**	**ne**	**ne**	**3.1 E+2**	**2.4 E+2**	**9.5 E+2**	**ne**	**ne**

na = not available ne = no exposure Shaded numbers exceed hazard quotient of one.

TABLE 5-33
HAZARD QUOTIENTS AND INDICES FROM INGESTION OF CREEK SURFACE WATER
(unitless)

Chemical	Mill Creek - Current					Mill Creek - Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Arsenic	ne	na	na	na	na	ne	1.1 E-4	2.3 E-5	1.1 E-4	2.3 E-5
Barium	ne	2.1 E-4	3.2 E-5	2.1 E-4	3.2 E-5	ne	1.8 E-3	2.9 E-4	1.8 E-3	2.9 E-4
Cadmium	ne	na	na	na	na	ne	2.8 E-5	6.0 E-5	2.8 E-5	6.0 E-5
Chromium	ne	na	na	na	na	ne	3.1 E-7	2.7 E-7	3.1 E-7	2.7 E-7
Cobalt	ne	9.2 E-3	2.0 E-2	9.2 E-3	2.0 E-2	ne	7.7 E-5	1.7 E-4	7.7 E-5	1.7 E-4
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Manganese	ne	na	na	na	na	ne	2.9 E-6	3.1 E-6	2.9 E-6	3.1 E-6
Nickel	ne	6.4 E-5	1.4 E-5	6.4 E-5	1.4 E-5	ne	8.8 E-5	1.9 E-5	8.8 E-5	1.9 E-5
Vanadium	ne	1.2 E-4	2.5 E-5	1.2 E-4	2.5 E-5	ne	3.2 E-4	6.8 E-5	3.2 E-4	6.8 E-5
Zinc	ne	na	na	na	na	ne	4.4 E-5	9.5 E-6	4.4 E-5	9.5 E-6
Cyanide	ne	na	na	na	na	ne	1.0 E-6	2.1 E-7	1.0 E-6	2.1 E-7
Vinyl Chloride	ne	na	na	na	na	ne	na	na	na	na
Chloroethane	ne	na	na	na	na	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na	ne	1.4 E-7	3.0 E-8	1.4 E-7	3.0 E-8
Acetone	ne	na	na	na	na	ne	4.9 E-8	1.0 E-7	4.9 E-8	1.0 E-7
Carbon Disulfide	ne	5.0 E-7	1.1 E-7	5.0 E-7	1.1 E-7	ne	na	na	na	na
1,1-Dichloroethane	ne	na	na	na	na	ne	1.4 E-7	3.0 E-7	1.4 E-7	3.0 E-7
1,2-Dichloroethene	ne	na	na	na	na	ne	6.0 E-7	1.3 E-6	6.0 E-7	1.3 E-6
Chloroform	ne	na	na	na	na	ne	3.6 E-3	7.8 E-4	3.6 E-3	7.8 E-4
1,2-Dichloroethane	ne	na	na	na	na	ne	na	na	na	na
2-Butanone	ne	na	na	na	na	ne	5.1 E-8	1.1 E-7	5.1 E-8	1.1 E-7
1,1,1-Trichloroethane	ne	na	na	na	na	ne	2.2 E-5	4.8 E-5	2.2 E-5	4.8 E-5
Carbon Tetrachloride	ne	na	na	na	na	ne	2.5 E-3	5.4 E-3	2.5 E-3	5.4 E-3
1,2-Dichloropropane	ne	na	na	na	na	ne	3.6 E-4	7.7 E-4	3.6 E-4	7.7 E-4
Trichloroethene	ne	na	na	na	na	ne	7.3 E-4	1.6 E-3	7.3 E-4	1.6 E-3
1,1,2-Trichloroethane	ne	na	na	na	na	ne	7.9 E-3	1.7 E-2	7.9 E-3	1.7 E-2
Benzene	ne	na	na	na	na	ne	na	na	na	na
Tetrachloroethene	ne	na	na	na	na	ne	5.8 E-5	1.3 E-4	5.8 E-5	1.3 E-4
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	na	na	na	na
Toluene	ne	na	na	na	na	ne	3.0 E-3	6.4 E-3	3.0 E-3	6.4 E-3

TABLE 5-33
HAZARD QUOTIENTS AND INDICES FROM INGESTION OF CREEK SURFACE WATER
(unitless)

Chemical	Mill Creek - Current					Mill Creek - Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Chlorobenzene	ne	na	na	na	na	ne	1.1 E-5	2.4 E-5	1.1 E-5	2.4 E-5
Ethylbenzene	ne	na	na	na	na	ne	4.3 E-6	9.2 E-6	4.3 E-6	9.2 E-6
Xylene (total)	ne	1.2 E-7	5.3 E-8	1.2 E-7	5.3 E-8	ne	8.9 E-6	3.9 E-6	8.9 E-6	3.9 E-6
Phenol	ne	2.1 E-6	4.6 E-7	2.1 E-6	4.6 E-7	ne	1.5 E-4	3.3 E-5	1.5 E-4	3.3 E-5
bis(2-Chloroethyl)Ether	ne	na	na	na	na	ne	na	na	na	na
1,4-Dichlorobenzene	ne	na	na	na	na	ne	na	na	na	na
Benzyl Alcohol	ne	na	na	na	na	ne	3.9 E-5	2.8 E-5	3.9 E-5	2.8 E-5
1,2-Dichlorobenzene	ne	na	na	na	na	ne	3.9 E-7	8.4 E-7	3.9 E-7	8.4 E-7
2-Methylphenol	ne	na	na	na	na	ne	1.1 E-5	2.4 E-5	1.1 E-5	2.4 E-5
bis(2-Chloroisopropyl)Ether	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	1.7 E-5	3.6 E-5	1.7 E-5	3.6 E-5
Naphthalene	ne	na	na	na	na	ne	1.2 E-4	2.6 E-4	1.2 E-4	2.6 E-4
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Dimethyl Phthalate	ne	na	na	na	na	ne	na	na	na	na
Diethylphthalate	ne	8.3 E-8	1.8 E-7	8.3 E-8	1.8 E-7	ne	na	na	na	na
Pentachlorophenol	ne	na	na	na	na	ne	1.0 E-5	2.2 E-6	1.0 E-5	2.2 E-6
Di-n-Butylphthalate	ne	1.7 E-6	3.6 E-6	1.7 E-6	3.6 E-6	ne	6.1 E-8	1.3 E-7	6.1 E-8	1.3 E-7
Pyrene	ne	na	na	na	na	ne	na	na	na	na
Butylbenzylphthalate	ne	na	na	na	na	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	9.5 E-5	2.0 E-5	9.5 E-5	2.0 E-5	ne	4.7 E-6	1.0 E-6	4.7 E-6	1.0 E-6
Di-n-Octyl Phthalate	ne	3.5 E-5	7.7 E-6	3.5 E-5	7.7 E-6	ne	na	na	na	na
Aldrin	ne	na	na	na	na	ne	6.6 E-3	1.4 E-3	6.6 E-3	1.4 E-3
Dieldrin	ne	na	na	na	na	ne	1.8 E-3	3.9 E-4	1.8 E-3	3.9 E-4
4,4'-DDT	ne	na	na	na	na	ne	5.3 E-6	1.1 E-6	5.3 E-6	1.1 E-6
Aroclor-1254	ne	na	na	na	na	ne	2.1 E-6	4.5 E-6	2.1 E-6	4.5 E-6
Hexachlorobenzene	ne	na	na	na	na	ne	2.8 E-2	6.0 E-3	2.8 E-2	6.0 E-3
Hexachlorobutadiene	ne	na	na	na	na	ne	2.2 E-4	4.6 E-5	2.2 E-4	4.6 E-5
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
HAZARD INDICES:	**ne**	**9.8 E-3**	**2.0 E-2**	**9.8 E-3**	**2.0 E-2**	**ne**	**5.7 E-2**	**4.1 E-2**	**5.7 E-2**	**4.1 E-2**

na = not available ne = no exposure

TABLE 5-33
HAZARD QUOTIENTS AND INDICES FROM INGESTION OF CREEK SURFACE WATER
(unitless)

Chemical	Skinner Creek - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na
Arsenic	ne	na	na	na	na
Barium	ne	na	na	na	na
Cadmium	ne	na	na	na	na
Chromium	ne	na	na	na	na
Cobalt	ne	na	na	na	na
Copper	ne	na	na	na	na
Lead	ne	na	na	na	na
Manganese	ne	2.3 E-5	2.4 E-5	2.3 E-5	2.4 E-5
Nickel	ne	na	na	na	na
Vanadium	ne	na	na	na	na
Zinc	ne	na	na	na	na
Cyanide	ne	na	na	na	na
Vinyl Chloride	ne	na	na	na	na
Chloroethane	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na
Acetone	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na
1,1-Dichloroethane	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na
Chloroform	ne	na	na	na	na
1,2-Dichloroethane	ne	na	na	na	na
2-Butanone	ne	na	na	na	na
1,1,1-Trichloroethane	ne	na	na	na	na
Carbon Tetrachloride	ne	na	na	na	na
1,2-Dichloropropane	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na
1,1,2-Trichloroethane	ne	na	na	na	na
Benzene	ne	na	na	na	na
Tetrachloroethene	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na
Toluene	ne	na	na	na	na

TABLE 5-33
HAZARD QUOTIENTS AND INDICES FROM INGESTION OF CREEK SURFACE WATER
(unitless)

Chemical	Skinner Creek - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Chlorobenzene	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na
Phenol	ne	8.3 E-7	1.8 E-7	8.3 E-7	1.8 E-7
bis(2-Chloroethyl)Ether	ne	na	na	na	na
1,4-Dichlorobenzene	ne	na	na	na	na
Benzyl Alcohol	ne	na	na	na	na
1,2-Dichlorobenzene	ne	na	na	na	na
2-Methylphenol	ne	na	na	na	na
bis(2-Chloroisopropyl)Ether	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na
Naphthalene	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na
Dimethyl Phthalate	ne	na	na	na	na
Diethylphthalate	ne	6.2 E-8	1.3 E-7	6.2 E-8	1.3 E-7
Pentachlorophenol	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na
Pyrene	ne	na	na	na	na
Butylbenzylphthalate	ne	2.5 E-7	5.3 E-7	2.5 E-7	5.3 E-7
bis(2-Ethylhexyl)Phthalate	ne	3.9 E-4	8.4 E-5	3.9 E-4	8.4 E-5
Di-n-Octyl Phthalate	ne	3.0 E-5	6.4 E-6	3.0 E-5	6.4 E-6
Aldrin	ne	na	na	na	na
Dieldrin	ne	na	na	na	na
4,4'-DDT	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na
Hexachlorobenzene	ne	na	na	na	na
Hexachlorobutadiene	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na
HAZARD INDICES:	**ne**	**4.4 E-4**	**1.2 E-4**	**4.4 E-4**	**1.2 E-4**

na = not available

ne = no exposure

TABLE 5-34
HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH CREEK SURFACE WATER
(unitless)

Chemical	Mill Creek - Current					Mill Creek - Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Arsenic	ne	na	na	na	na	ne	2.3 E-5	1.3 E-5	2.3 E-5	1.3 E-5
Barium	ne	4.5 E-5	1.9 E-5	4.5 E-5	1.9 E-5	ne	4.0 E-4	1.7 E-4	4.0 E-4	1.7 E-4
Cadmium	ne	na	na	na	na	ne	6.1 E-6	3.5 E-5	6.1 E-6	3.5 E-5
Chromium	ne	na	na	na	na	ne	9.4 E-8	2.2 E-7	9.4 E-8	2.2 E-7
Cobalt	ne	2.0 E-3	1.2 E-2	2.0 E-3	1.2 E-2	ne	1.7 E-5	9.7 E-5	1.7 E-5	9.7 E-5
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Manganese	ne	na	na	na	na	ne	6.2 E-7	1.8 E-6	6.2 E-7	1.8 E-6
Nickel	ne	1.4 E-5	8.1 E-6	1.4 E-5	8.1 E-6	ne	1.9 E-5	1.1 E-5	1.9 E-5	1.1 E-5
Vanadium	ne	2.6 E-5	1.5 E-5	2.6 E-5	1.5 E-5	ne	6.9 E-5	4.0 E-5	6.9 E-5	4.0 E-5
Zinc	ne	na	na	na	na	ne	9.6 E-6	5.5 E-6	9.6 E-6	5.5 E-6
Cyanide	ne	na	na	na	na	ne	2.2 E-7	1.2 E-7	2.2 E-7	1.2 E-7
Vinyl Chloride	ne	na	na	na	na	ne	na	na	na	na
Chloroethane	ne	na	na	na	na	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na	ne	2.1 E-5	1.2 E-5	2.1 E-5	1.2 E-5
Acetone	ne	na	na	na	na	ne	7.1 E-6	4.1 E-5	7.1 E-6	4.1 E-5
Carbon Disulfide	ne	7.3 E-5	4.2 E-5	7.3 E-5	4.2 E-5	ne	na	na	na	na
1,1-Dichloroethane	ne	na	na	na	na	ne	2.1 E-5	1.2 E-4	2.1 E-5	1.2 E-4
1,2-Dichloroethene	ne	na	na	na	na	ne	8.8 E-5	5.1 E-4	8.8 E-5	5.1 E-4
Chloroform	ne	na	na	na	na	ne	5.3 E-1	3.0 E-1	5.3 E-1	3.0 E-1
1,2-Dichloroethane	ne	na	na	na	na	ne	na	na	na	na
2-Butanone	ne	na	na	na	na	ne	3.7 E-8	2.1 E-7	3.7 E-8	2.1 E-7
1,1,1-Trichloroethane	ne	na	na	na	na	ne	3.2 E-3	1.9 E-2	3.2 E-3	1.9 E-2
Carbon Tetrachloride	ne	na	na	na	na	ne	3.7 E-1	2.1 E+0	3.7 E-1	2.1 E+0
1,2-Dichloropropane	ne	na	na	na	na	ne	5.2 E-2	3.0 E-1	5.2 E-2	3.0 E-1
Trichloroethene	ne	na	na	na	na	ne	1.1 E-1	6.1 E-1	1.1 E-1	6.1 E-1
1,1,2-Trichloroethane	ne	na	na	na	na	ne	1.2 E+0	6.7 E+0	1.2 E+0	6.7 E+0
Benzene	ne	na	na	na	na	ne	na	na	na	na
Tetrachloroethene	ne	na	na	na	na	ne	8.5 E-3	4.9 E-2	8.5 E-3	4.9 E-2
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	na	na	na	na
Toluene	ne	na	na	na	na	ne	4.4 E-1	2.5 E+0	4.4 E-1	2.5 E+0

TABLE 5-34
HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH CREEK SURFACE WATER
(unitless)

Chemical	Mill Creek - Current					Mill Creek - Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Chlorobenzene	ne	na	na	na	na	ne	1.6 E-3	9.2 E-3	1.6 E-3	9.2 E-3
Ethylbenzene	ne	na	na	na	na	ne	6.2 E-5	3.6 E-4	6.2 E-5	3.6 E-4
Xylene (total)	ne	1.8 E-6	2.1 E-6	1.8 E-6	2.1 E-6	ne	1.3 E-4	1.5 E-4	1.3 E-4	1.5 E-4
Phenol	ne	4.6 E-7	2.7 E-7	4.6 E-7	2.7 E-7	ne	3.3 E-5	1.9 E-5	3.3 E-5	1.9 E-5
bis(2-Chloroethyl)Ether	ne	na	na	na	na	ne	na	na	na	na
1,4-Dichlorobenzene	ne	na	na	na	na	ne	na	na	na	na
Benzyl Alcohol	ne	na	na	na	na	ne	8.5 E-6	1.6 E-5	8.5 E-6	1.6 E-5
1,2-Dichlorobenzene	ne	na	na	na	na	ne	8.5 E-8	4.9 E-7	8.5 E-8	4.9 E-7
2-Methylphenol	ne	na	na	na	na	ne	2.5 E-6	1.4 E-5	2.5 E-6	1.4 E-5
bis(2-Chloroisopropyl)Ether	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	3.7 E-6	2.1 E-5	3.7 E-6	2.1 E-5
Naphthalene	ne	na	na	na	na	ne	2.6 E-5	1.5 E-4	2.6 E-5	1.5 E-4
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Dimethyl Phthalate	ne	na	na	na	na	ne	na	na	na	na
Diethylphthalate	ne	1.8 E-8	1.0 E-7	1.8 E-8	1.0 E-7	ne	na	na	na	na
Pentachlorophenol	ne	na	na	na	na	ne	2.2 E-6	1.3 E-6	2.2 E-6	1.3 E-6
Di-n-Butylphthalate	ne	3.6 E-7	2.1 E-6	3.6 E-7	2.1 E-6	ne	1.3 E-8	7.7 E-8	1.3 E-8	7.7 E-8
Pyrene	ne	na	na	na	na	ne	na	na	na	na
Butylbenzylphthalate	ne	na	na	na	na	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	2.1 E-5	1.2 E-5	2.1 E-5	1.2 E-5	ne	1.0 E-6	5.9 E-7	1.0 E-6	5.9 E-7
Di-n-Octyl Phthalate	ne	7.8 E-6	4.5 E-6	7.8 E-6	4.5 E-6	ne	na	na	na	na
Aldrin	ne	na	na	na	na	ne	1.5 E-3	8.3 E-4	1.5 E-3	8.3 E-4
Dieldrin	ne	na	na	na	na	ne	4.0 E-4	2.3 E-4	4.0 E-4	2.3 E-4
4,4'-DDT	ne	na	na	na	na	ne	1.2 E-6	6.6 E-7	1.2 E-6	6.6 E-7
Aroclor-1254	ne	na	na	na	na	ne	4.5 E-7	2.6 E-6	4.5 E-7	2.6 E-6
Hexachlorobenzene	ne	na	na	na	na	ne	6.4 E-4	3.7 E-4	6.4 E-4	3.7 E-4
Hexachlorobutadiene	ne	na	na	na	na	ne	4.7 E-5	2.7 E-5	4.7 E-5	2.7 E-5
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
HAZARD INDICES:	**ne**	**2.2 E-3**	**1.2 E-2**	**2.2 E-3**	**1.2 E-2**	**ne**	**2.7 E+0**	**1.3 E+1**	**2.7 E+0**	**1.3 E+1**

na = not available ne = no exposure Shaded numbers exceed hazard quotient of one.

TABLE 5-34
HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH CREEK SURFACE WATER
(unitless)

Chemical	Skinner Creek - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na
Arsenic	ne	na	na	na	na
Barium	ne	na	na	na	na
Cadmium	ne	na	na	na	na
Chromium	ne	na	na	na	na
Cobalt	ne	na	na	na	na
Copper	ne	na	na	na	na
Lead	ne	na	na	na	na
Manganese	ne	4.9 E-6	1.4 E-5	4.9 E-6	1.4 E-5
Nickel	ne	na	na	na	na
Vanadium	ne	na	na	na	na
Zinc	ne	na	na	na	na
Cyanide	ne	na	na	na	na
Vinyl Chloride	ne	na	na	na	na
Chloroethane	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na
Acetone	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na
1,1-Dichloroethane	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na
Chloroform	ne	na	na	na	na
1,2-Dichloroethane	ne	na	na	na	na
2-Butanone	ne	na	na	na	na
1,1,1-Trichloroethane	ne	na	na	na	na
Carbon Tetrachloride	ne	na	na	na	na
1,2-Dichloropropane	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na
1,1,2-Trichloroethane	ne	na	na	na	na
Benzene	ne	na	na	na	na
Tetrachloroethene	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na
Toluene	ne	na	na	na	na

TABLE 5-34
HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH CREEK SURFACE WATER
(unitless)

Chemical	Skinner Creek - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Chlorobenzene	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na
Phenol	ne	1.8 E-7	1.0 E-7	1.8 E-7	1.0 E-7
bis(2-Chloroethyl)Ether	ne	na	na	na	na
1,4-Dichlorobenzene	ne	na	na	na	na
Benzyl Alcohol	ne	na	na	na	na
1,2-Dichlorobenzene	ne	na	na	na	na
2-Methylphenol	ne	na	na	na	na
bis(2-Chloroisopropyl)Ether	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na
Naphthalene	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na
Dimethyl Phthalate	ne	na	na	na	na
Diethylphthalate	ne	1.4 E-8	7.8 E-8	1.4 E-8	7.8 E-8
Pentachlorophenol	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na
Pyrene	ne	na	na	na	na
Butylbenzylphthalate	ne	5.4 E-8	3.1 E-7	5.4 E-8	3.1 E-7
bis(2-Ethylhexyl)Phthalate	ne	8.5 E-5	4.9 E-5	8.5 E-5	4.9 E-5
Di-n-Octyl Phthalate	ne	6.5 E-6	3.7 E-6	6.5 E-6	3.7 E-6
Aldrin	ne	na	na	na	na
Dieldrin	ne	na	na	na	na
4,4'-DDT	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na
Hexachlorobenzene	ne	na	na	na	na
Hexachlorobutadiene	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na
HAZARD INDICES:	**ne**	**9.6 E-5**	**6.7 E-5**	**9.6 E-5**	**6.7 E-5**

na = not available ne = no exposure

TABLE 5-35
HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF CREEK SURFACE WATER
(unitless)

Chemical	Mill Creek - Current					Mill Creek - Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Arsenic	ne	na	na	na	na	ne	1.3 E-4	3.6 E-5	1.3 E-4	3.6 E-5
Barium	ne	2.5 E-4	5.1 E-5	2.5 E-4	5.1 E-5	ne	2.3 E-3	4.5 E-4	2.3 E-3	4.5 E-4
Cadmium	ne	na	na	na	na	ne	3.4 E-5	9.5 E-5	3.4 E-5	9.5 E-5
Chromium	ne	na	na	na	na	ne	4.0 E-7	4.8 E-7	4.0 E-7	4.8 E-7
Cobalt	ne	1.1 E-2	3.2 E-2	1.1 E-2	3.2 E-2	ne	9.4 E-5	2.6 E-4	9.4 E-5	2.6 E-4
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Manganese	ne	na	na	na	na	ne	3.5 E-6	4.9 E-6	3.5 E-6	4.9 E-6
Nickel	ne	7.8 E-5	2.2 E-5	7.8 E-5	2.2 E-5	ne	1.1 E-4	3.0 E-5	1.1 E-4	3.0 E-5
Vanadium	ne	1.4 E-4	4.0 E-5	1.4 E-4	4.0 E-5	ne	3.9 E-4	1.1 E-4	3.9 E-4	1.1 E-4
Zinc	ne	na	na	na	na	ne	5.3 E-5	1.5 E-5	5.3 E-5	1.5 E-5
Cyanide	ne	na	na	na	na	ne	1.2 E-6	3.4 E-7	1.2 E-6	3.4 E-7
Vinyl Chloride	ne	na	na	na	na	ne	na	na	na	na
Chloroethane	ne	na	na	na	na	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na	ne	2.1 E-5	1.2 E-5	2.1 E-5	1.2 E-5
Acetone	ne	na	na	na	na	ne	7.2 E-6	4.1 E-5	7.2 E-6	4.1 E-5
Carbon Disulfide	ne	7.3 E-5	4.2 E-5	7.3 E-5	4.2 E-5	ne	na	na	na	na
1,1-Dichloroethane	ne	na	na	na	na	ne	2.1 E-5	1.2 E-4	2.1 E-5	1.2 E-4
1,2-Dichloroethene	ne	na	na	na	na	ne	8.9 E-5	5.1 E-4	8.9 E-5	5.1 E-4
Chloroform	ne	na	na	na	na	ne	5.3 E-1	3.0 E-1	5.3 E-1	3.0 E-1
1,2-Dichloroethane	ne	na	na	na	na	ne	na	na	na	na
2-Butanone	ne	na	na	na	na	ne	8.7 E-8	3.2 E-7	8.7 E-8	3.2 E-7
1,1,1-Trichloroethane	ne	na	na	na	na	ne	3.3 E-3	1.9 E-2	3.3 E-3	1.9 E-2
Carbon Tetrachloride	ne	na	na	na	na	ne	3.7 E-1	2.1 E+0	3.7 E-1	2.1 E+0
1,2-Dichloropropane	ne	na	na	na	na	ne	5.3 E-2	3.0 E-1	5.3 E-2	3.0 E-1
Trichloroethene	ne	na	na	na	na	ne	1.1 E-1	6.1 E-1	1.1 E-1	6.1 E-1
1,1,2-Trichloroethane	ne	na	na	na	na	ne	1.2 E+0	6.7 E+0	1.2 E+0	6.7 E+0
Benzene	ne	na	na	na	na	ne	na	na	na	na
Tetrachloroethene	ne	na	na	na	na	ne	8.6 E-3	4.9 E-2	8.6 E-3	4.9 E-2
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	na	na	na	na
Toluene	ne	na	na	na	na	ne	4.4 E-1	2.5 E+0	4.4 E-1	2.5 E+0

TABLE 5-35
HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF CREEK SURFACE WATER
(unitless)

Chemical	Mill Creek - Current					Mill Creek - Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Chlorobenzene	ne	na	na	na	na	ne	1.6 E-3	9.2 E-3	1.6 E-3	9.2 E-3
Ethylbenzene	ne	na	na	na	na	ne	6.7 E-5	3.7 E-4	6.7 E-5	3.7 E-4
Xylene (total)	ne	1.9 E-6	2.1 E-6	1.9 E-6	2.1 E-6	ne	1.4 E-4	1.5 E-4	1.4 E-4	1.5 E-4
Phenol	ne	2.6 E-6	7.3 E-7	2.6 E-6	7.3 E-7	ne	1.9 E-4	5.2 E-5	1.9 E-4	5.2 E-5
bis(2-Chloroethyl)Ether	ne	na	na	na	na	ne	na	na	na	na
1,4-Dichlorobenzene	ne	na	na	na	na	ne	na	na	na	na
Benzyl Alcohol	ne	na	na	na	na	ne	4.7 E-5	4.4 E-5	4.7 E-5	4.4 E-5
1,2-Dichlorobenzene	ne	na	na	na	na	ne	4.7 E-7	1.3 E-6	4.7 E-7	1.3 E-6
2-Methylphenol	ne	na	na	na	na	ne	1.4 E-5	3.9 E-5	1.4 E-5	3.9 E-5
bis(2-Chloroisopropyl)Ether	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	2.1 E-5	5.7 E-5	2.1 E-5	5.7 E-5
Naphthalene	ne	na	na	na	na	ne	1.4 E-4	4.1 E-4	1.4 E-4	4.1 E-4
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Dimethyl Phthalate	ne	na	na	na	na	ne	na	na	na	na
Diethylphthalate	ne	1.0 E-7	2.8 E-7	1.0 E-7	2.8 E-7	ne	na	na	na	na
Pentachlorophenol	ne	na	na	na	na	ne	1.2 E-5	3.5 E-6	1.2 E-5	3.5 E-6
Di-n-Butylphthalate	ne	2.0 E-6	5.6 E-6	2.0 E-6	5.6 E-6	ne	7.4 E-8	2.1 E-7	7.4 E-8	2.1 E-7
Pyrene	ne	na	na	na	na	ne	na	na	na	na
Butylbenzylphthalate	ne	na	na	na	na	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	1.2 E-4	3.2 E-5	1.2 E-4	3.2 E-5	ne	5.7 E-6	1.6 E-6	5.7 E-6	1.6 E-6
Di-n-Octyl Phthalate	ne	4.3 E-5	1.2 E-5	4.3 E-5	1.2 E-5	ne	na	na	na	na
Aldrin	ne	na	na	na	na	ne	8.1 E-3	2.3 E-3	8.1 E-3	2.3 E-3
Dieldrin	ne	na	na	na	na	ne	2.2 E-3	6.2 E-4	2.2 E-3	6.2 E-4
4,4'-DDT	ne	na	na	na	na	ne	6.4 E-6	1.8 E-6	6.4 E-6	1.8 E-6
Aroclor-1254	ne	na	na	na	na	ne	2.5 E-6	7.1 E-6	2.5 E-6	7.1 E-6
Hexachlorobenzene	ne	na	na	na	na	ne	2.8 E-2	6.3 E-3	2.8 E-2	6.3 E-3
Hexachlorobutadiene	ne	na	na	na	na	ne	2.6 E-4	7.3 E-5	2.6 E-4	7.3 E-5
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
HAZARD INDICES:	ne	1.2 E-2	3.2 E-2	1.2 E-2	3.2 E-2	ne	2.7 E+0	1.3 E+1	2.7 E+0	1.3 E+1

na = not available ne = no exposure Shaded numbers exceed hazard quotient of one.

TABLE 5-35
HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF CREEK SURFACE WATER
(unitless)

Chemical	Skinner Creek - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na
Arsenic	ne	na	na	na	na
Barium	ne	na	na	na	na
Cadmium	ne	na	na	na	na
Chromium	ne	na	na	na	na
Cobalt	ne	na	na	na	na
Copper	ne	na	na	na	na
Lead	ne	na	na	na	na
Manganese	ne	2.8 E-5	3.9 E-5	2.8 E-5	3.9 E-5
Nickel	ne	na	na	na	na
Vanadium	ne	na	na	na	na
Zinc	ne	na	na	na	na
Cyanide	ne	na	na	na	na
Vinyl Chloride	ne	na	na	na	na
Chloroethane	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na
Acetone	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na
1,1-Dichloroethane	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na
Chloroform	ne	na	na	na	na
1,2-Dichloroethane	ne	na	na	na	na
2-Butanone	ne	na	na	na	na
1,1,1-Trichloroethane	ne	na	na	na	na
Carbon Tetrachloride	ne	na	na	na	na
1,2-Dichloropropane	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na
1,1,2-Trichloroethane	ne	na	na	na	na
Benzene	ne	na	na	na	na
Tetrachloroethene	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na
Toluene	ne	na	na	na	na

TABLE 5-35
HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF CREEK SURFACE WATER
(unitless)

Chemical	Skinner Creek - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Chlorobenzene	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na
Phenol	ne	1.0 E-6	2.8 E-7	1.0 E-6	2.8 E-7
bis(2-Chloroethyl)Ether	ne	na	na	na	na
1,4-Dichlorobenzene	ne	na	na	na	na
Benzyl Alcohol	ne	na	na	na	na
1,2-Dichlorobenzene	ne	na	na	na	na
2-Methylphenol	ne	na	na	na	na
bis(2-Chloroisopropyl)Ether	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na
Naphthalene	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na
Dimethyl Phthalate	ne	na	na	na	na
Diethylphthalate	ne	7.5 E-8	2.1 E-7	7.5 E-8	2.1 E-7
Pentachlorophenol	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na
Pyrene	ne	na	na	na	na
Butylbenzylphthalate	ne	3.0 E-7	8.5 E-7	3.0 E-7	8.5 E-7
bis(2-Ethylhexyl)Phthalate	ne	4.7 E-4	1.3 E-4	4.7 E-4	1.3 E-4
Di-n-Octyl Phthalate	ne	3.6 E-5	1.0 E-5	3.6 E-5	1.0 E-5
Aldrin	ne	na	na	na	na
Dieldrin	ne	na	na	na	na
4,4'-DDT	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na
Hexachlorobenzene	ne	na	na	na	na
Hexachlorobutadiene	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na
HAZARD INDICES:	**ne**	**5.4 E-4**	**1.8 E-4**	**5.4 E-4**	**1.8 E-4**

na = not available ne = no exposure

TABLE 5-36
HAZARD QUOTIENTS AND INDICES FROM INGESTION OF POND SURFACE WATER
(unitless)

Chemical	Diving Pond - Current & Future					Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Arsenic	ne	na	na	na	na	ne	na	na	na	na
Barium	ne	na	na	na	na	ne	1.3 E-4	2.0 E-5	1.3 E-4	2.0 E-5
Cadmium	ne	1.9 E-4	4.1 E-4	1.9 E-4	4.1 E-4	ne	na	na	na	na
Chromium	ne	na	na	na	na	ne	na	na	na	na
Cobalt	ne	na	na	na	na	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Manganese	ne	na	na	na	na	ne	na	na	na	na
Nickel	ne	6.9 E-5	1.5 E-5	6.9 E-5	1.5 E-5	ne	na	na	na	na
Vanadium	ne	2.3 E-4	5.0 E-5	2.3 E-4	5.0 E-5	ne	2.5 E-4	5.3 E-5	2.5 E-4	5.3 E-5
Zinc	ne	na	na	na	na	ne	na	na	na	na
Cyanide	ne	na	na	na	na	ne	na	na	na	na
Vinyl Chloride	ne	na	na	na	na	ne	na	na	na	na
Chloroethane	ne	na	na	na	na	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na	ne	na	na	na	na
Acetone	ne	na	na	na	na	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na	ne	na	na	na	na
1,1-Dichloroethane	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
Chloroform	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethane	ne	na	na	na	na	ne	na	na	na	na
2-Butanone	ne	na	na	na	na	ne	na	na	na	na
1,1,1-Trichloroethane	ne	na	na	na	na	ne	na	na	na	na
Carbon Tetrachloride	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloropropane	ne	na	na	na	na	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na	ne	na	na	na	na
1,1,2-Trichloroethane	ne	na	na	na	na	ne	na	na	na	na
Benzene	ne	na	na	na	na	ne	na	na	na	na
Tetrachloroethene	ne	na	na	na	na	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	na	na	na	na
Toluene	ne	na	na	na	na	ne	na	na	na	na

TABLE 5-36
HAZARD QUOTIENTS AND INDICES FROM INGESTION OF POND SURFACE WATER
(unitless)

Chemical	Diving Pond - Current & Future					Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Chlorobenzene	ne	na	na	na	na	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na	ne	na	na	na	na
Phenol	ne	6.1 E-7	1.3 E-7	6.1 E-7	1.3 E-7	ne	2.8 E-7	5.9 E-8	2.8 E-7	5.9 E-8
bis(2-Chloroethyl)Ether	ne	na	na	na	na	ne	na	na	na	na
1,4-Dichlorobenzene	ne	na	na	na	na	ne	na	na	na	na
Benzyl Alcohol	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichlorobenzene	ne	na	na	na	na	ne	na	na	na	na
2-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
bis(2-Chloroisopropyl)Ether	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
Naphthalene	ne	na	na	na	na	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Dimethyl Phthalate	ne	na	na	na	na	ne	1.7 E-7	3.6 E-8	1.7 E-7	3.6 E-8
Diethylphthalate	ne	na	na	na	na	ne	4.1 E-8	8.9 E-8	4.1 E-8	8.9 E-8
Pentachlorophenol	ne	na	na	na	na	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na	ne	na	na	na	na
Pyrene	ne	na	na	na	na	ne	na	na	na	na
Butylbenzylphthalate	ne	na	na	na	na	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	3.4 E-4	7.3 E-5	3.4 E-4	7.3 E-5	ne	na	na	na	na
Di-n-Octyl Phthalate	ne	na	na	na	na	ne	na	na	na	na
Aldrin	ne	na	na	na	na	ne	na	na	na	na
Dieldrin	ne	na	na	na	na	ne	na	na	na	na
4,4'-DDT	ne	na	na	na	na	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na	ne	na	na	na	na
Hexachlorobenzene	ne	6.8 E-6	1.5 E-6	6.8 E-6	1.5 E-6	ne	na	na	na	na
Hexachlorobutadiene	ne	6.6 E-7	1.4 E-7	6.6 E-7	1.4 E-7	ne	9.1 E-7	2.0 E-7	9.1 E-7	2.0 E-7
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
HAZARD INDICES:	**ne**	**8.4 E-4**	**5.5 E-4**	**8.4 E-4**	**5.5 E-4**	**ne**	**3.8 E-4**	**7.4 E-5**	**3.8 E-4**	**7.4 E-5**

na = not available *ne = no exposure*

TABLE 5-37
HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH POND SURFACE WATER
(unitless)

Chemical	Diving Pond - Current & Future					Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Arsenic	ne	na	na	na	na	ne	na	na	na	na
Barium	ne	na	na	na	na	ne	2.9 E-5	1.2 E-5	2.9 E-5	1.2 E-5
Cadmium	ne	4.2 E-5	2.4 E-4	4.2 E-5	2.4 E-4	ne	na	na	na	na
Chromium	ne	na	na	na	na	ne	na	na	na	na
Cobalt	ne	na	na	na	na	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Manganese	ne	na	na	na	na	ne	na	na	na	na
Nickel	ne	1.5 E-5	8.7 E-6	1.5 E-5	8.7 E-6	ne	na	na	na	na
Vanadium	ne	5.1 E-5	2.9 E-5	5.1 E-5	2.9 E-5	ne	5.4 E-5	3.1 E-5	5.4 E-5	3.1 E-5
Zinc	ne	na	na	na	na	ne	na	na	na	na
Cyanide	ne	na	na	na	na	ne	na	na	na	na
Vinyl Chloride	ne	na	na	na	na	ne	na	na	na	na
Chloroethane	ne	na	na	na	na	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na	ne	na	na	na	na
Acetone	ne	na	na	na	na	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na	ne	na	na	na	na
1,1-Dichloroethane	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
Chloroform	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethane	ne	na	na	na	na	ne	na	na	na	na
2-Butanone	ne	na	na	na	na	ne	na	na	na	na
1,1,1-Trichloroethane	ne	na	na	na	na	ne	na	na	na	na
Carbon Tetrachloride	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloropropane	ne	na	na	na	na	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na	ne	na	na	na	na
1,1,2-Trichloroethane	ne	na	na	na	na	ne	na	na	na	na
Benzene	ne	na	na	na	na	ne	na	na	na	na
Tetrachloroethene	ne	na	na	na	na	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	na	na	na	na
Toluene	ne	na	na	na	na	ne	na	na	na	na

TABLE 5-37
HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH POND SURFACE WATER
(unitless)

Chemical	Diving Pond - Current & Future					Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Chlorobenzene	ne	na	na	na	na	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na	ne	na	na	na	na
Phenol	ne	1.3 E-7	7.6 E-8	1.3 E-7	7.6 E-8	ne	6.0 E-8	3.5 E-8	6.0 E-8	3.5 E-8
bis(2-Chloroethyl)Ether	ne	na	na	na	na	ne	na	na	na	na
1,4-Dichlorobenzene	ne	na	na	na	na	ne	na	na	na	na
Benzyl Alcohol	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichlorobenzene	ne	na	na	na	na	ne	na	na	na	na
2-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
bis(2-Chloroisopropyl)Ether	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
Naphthalene	ne	na	na	na	na	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Dimethyl Phthalate	ne	na	na	na	na	ne	3.6 E-8	2.1 E-8	3.6 E-8	2.1 E-8
Diethylphthalate	ne	na	na	na	na	ne	9.0 E-9	5.2 E-8	9.0 E-9	5.2 E-8
Pentachlorophenol	ne	na	na	na	na	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na	ne	na	na	na	na
Pyrene	ne	na	na	na	na	ne	na	na	na	na
Butylbenzylphthalate	ne	na	na	na	na	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	7.4 E-5	4.2 E-5	7.4 E-5	4.2 E-5	ne	na	na	na	na
Di-n-Octyl Phthalate	ne	na	na	na	na	ne	na	na	na	na
Aldrin	ne	na	na	na	na	ne	na	na	na	na
Dieldrin	ne	na	na	na	na	ne	na	na	na	na
4,4'-DDT	ne	na	na	na	na	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na	ne	na	na	na	na
Hexachlorobenzene	ne	1.6 E-7	9.1 E-8	1.6 E-7	9.1 E-8	ne	na	na	na	na
Hexachlorobutadiene	ne	1.4 E-7	8.3 E-8	1.4 E-7	8.3 E-8	ne	2.0 E-7	1.1 E-7	2.0 E-7	1.1 E-7
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
HAZARD INDICES:	**ne**	**1.8 E-4**	**3.2 E-4**	**1.8 E-4**	**3.2 E-4**	**ne**	**8.3 E-5**	**4.3 E-5**	**8.3 E-5**	**4.3 E-5**

na = not available ne = no exposure

TABLE 5-38
HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF POND SURFACE WATER
(unitless)

Chemical	Diving Pond - Current & Future					Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Arsenic	ne	na	na	na	na	ne	na	na	na	na
Barium	ne	na	na	na	na	ne	1.6 E-4	3.2 E-5	1.6 E-4	3.2 E-5
Cadmium	ne	2.3 E-4	6.5 E-4	2.3 E-4	6.5 E-4	ne	na	na	na	na
Chromium	ne	na	na	na	na	ne	na	na	na	na
Cobalt	ne	na	na	na	na	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Manganese	ne	na	na	na	na	ne	na	na	na	na
Nickel	ne	8.4 E-5	2.4 E-5	8.4 E-5	2.4 E-5	ne	na	na	na	na
Vanadium	ne	2.8 E-4	8.0 E-5	2.8 E-4	8.0 E-5	ne	3.0 E-4	8.4 E-5	3.0 E-4	8.4 E-5
Zinc	ne	na	na	na	na	ne	na	na	na	na
Cyanide	ne	na	na	na	na	ne	na	na	na	na
Vinyl Chloride	ne	na	na	na	na	ne	na	na	na	na
Chloroethane	ne	na	na	na	na	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na	ne	na	na	na	na
Acetone	ne	na	na	na	na	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na	ne	na	na	na	na
1,1-Dichloroethane	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
Chloroform	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethane	ne	na	na	na	na	ne	na	na	na	na
2-Butanone	ne	na	na	na	na	ne	na	na	na	na
1,1,1-Trichloroethane	ne	na	na	na	na	ne	na	na	na	na
Carbon Tetrachloride	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloropropane	ne	na	na	na	na	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na	ne	na	na	na	na
1,1,2-Trichloroethane	ne	na	na	na	na	ne	na	na	na	na
Benzene	ne	na	na	na	na	ne	na	na	na	na
Tetrachloroethene	ne	na	na	na	na	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	na	na	na	na
Toluene	ne	na	na	na	na	ne	na	na	na	na

TABLE 5-38
HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF POND SURFACE WATER
(unitless)

Chemical	Diving Pond - Current & Future					Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Chlorobenzene	ne	na	na	na	na	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na	ne	na	na	na	na
Phenol	ne	7.4 E-7	2.1 E-7	7.4 E-7	2.1 E-7	ne	3.4 E-7	9.4 E-8	3.4 E-7	9.4 E-8
bis(2-Chloroethyl)Ether	ne	na	na	na	na	ne	na	na	na	na
1,4-Dichlorobenzene	ne	na	na	na	na	ne	na	na	na	na
Benzyl Alcohol	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichlorobenzene	ne	na	na	na	na	ne	na	na	na	na
2-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
bis(2-Chloroisopropyl)Ether	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
Naphthalene	ne	na	na	na	na	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Dimethyl Phthalate	ne	na	na	na	na	ne	2.0 E-7	5.6 E-8	2.0 E-7	5.6 E-8
Diethylphthalate	ne	na	na	na	na	ne	5.0 E-8	1.4 E-7	5.0 E-8	1.4 E-7
Pentachlorophenol	ne	na	na	na	na	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na	ne	na	na	na	na
Pyrene	ne	na	na	na	na	ne	na	na	na	na
Butylbenzylphthalate	ne	na	na	na	na	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	4.1 E-4	1.2 E-4	4.1 E-4	1.2 E-4	ne	na	na	na	na
Di-n-Octyl Phthalate	ne	na	na	na	na	ne	na	na	na	na
Aldrin	ne	na	na	na	na	ne	na	na	na	na
Dieldrin	ne	na	na	na	na	ne	na	na	na	na
4,4'-DDT	ne	na	na	na	na	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na	ne	na	na	na	na
Hexachlorobenzene	ne	7.0 E-6	1.6 E-6	7.0 E-6	1.6 E-6	ne	na	na	na	na
Hexachlorobutadiene	ne	8.0 E-7	2.3 E-7	8.0 E-7	2.3 E-7	ne	1.1 E-6	3.1 E-7	1.1 E-6	3.1 E-7
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
HAZARD INDICES:	**ne**	**1.0 E-3**	**8.7 E-4**	**1.0 E-3**	**8.7 E-4**	**ne**	**4.6 E-4**	**1.2 E-4**	**4.6 E-4**	**1.2 E-4**

na = not available ne = no exposure

TABLE 5-39
HAZARD QUOTIENTS AND INDICES FROM INGESTION OF CREEK SEDIMENTS
(unitless)

Chemical	Mill Creek - Current & Future					Skinner Creek - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Barium	ne	na	na	na	na	ne	na	na	na	na
Beryllium	ne	na	na	na	na	ne	na	na	na	na
Chromium	ne	na	na	na	na	ne	na	na	na	na
Cobalt	ne	na	na	na	na	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Mercury	ne	1.2 E-5	1.3 E-6	1.2 E-5	1.3 E-6	ne	na	na	na	na
Nickel	ne	na	na	na	na	ne	na	na	na	na
Thallium	ne	na	na	na	na	ne	na	na	na	na
Tin	ne	na	na	na	na	ne	2.4 E-6	2.6 E-7	2.4 E-6	2.6 E-7
Vanadium	ne	na	na	na	na	ne	1.1 E-4	1.2 E-5	1.1 E-4	1.2 E-5
Zinc	ne	na	na	na	na	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na	ne	na	na	na	na
Acetone	ne	3.5 E-10	3.7 E-10	3.5 E-10	3.7 E-10	ne	8.9 E-10	9.6 E-10	8.9 E-10	9.6 E-10
Carbon Disulfide	ne	3.9 E-10	4.2 E-11	3.9 E-10	4.2 E-11	ne	na	na	na	na
1,1-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na	ne	2.3 E-8	2.5 E-8	2.3 E-8	2.5 E-8
2-Butanone	ne	na	na	na	na	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na	ne	4.5 E-9	4.9 E-9	4.5 E-9	4.9 E-9
Benzene	ne	na	na	na	na	ne	na	na	na	na
4-Methyl-2-Pentanone	ne	8.9 E-11	9.6 E-11	8.9 E-11	9.6 E-11	ne	2.7 E-10	3.0 E-10	2.7 E-10	3.0 E-10
2-Hexanone	ne	na	na	na	na	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na	ne	na	na	na	na
Phenol	ne	6.5 E-9	7.0 E-10	6.5 E-9	7.0 E-10	ne	na	na	na	na
4-Methylphenol	ne	3.9 E-8	4.2 E-8	3.9 E-8	4.2 E-8	ne	1.1 E-9	1.2 E-9	1.1 E-9	1.2 E-9
Nitrobenzene	ne	na	na	na	na	ne	2.3 E-8	2.5 E-8	2.3 E-8	2.5 E-8
Naphthalene	ne	2.7 E-7	2.9 E-7	2.7 E-7	2.9 E-7	ne	4.5 E-8	4.9 E-8	4.5 E-8	4.9 E-8
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthylene	ne	8.4 E-8	9.0 E-8	8.4 E-8	9.0 E-8	ne	na	na	na	na
Acenaphthene	ne	1.6 E-8	1.7 E-8	1.6 E-8	1.7 E-8	ne	6.5 E-9	7.0 E-9	6.5 E-9	7.0 E-9

TABLE 5-39
HAZARD QUOTIENTS AND INDICES FROM INGESTION OF CREEK SEDIMENTS
(unitless)

Chemical	Mill Creek - Current & Future					Skinner Creek - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Dibenzofuran	ne	7.8 E-7	8.4 E-7	7.8 E-7	8.4 E-7	ne	3.6 E-7	3.9 E-7	3.6 E-7	3.9 E-7
Diethylphthalate	ne	1.8 E-10	1.9 E-10	1.8 E-10	1.9 E-10	ne	9.9 E-11	1.1 E-10	9.9 E-11	1.1 E-10
Fluorene	ne	2.7 E-8	2.9 E-8	2.7 E-8	2.9 E-8	ne	1.5 E-8	1.7 E-8	1.5 E-8	1.7 E-8
Phenanthrene	ne	6.6 E-7	7.2 E-7	6.6 E-7	7.2 E-7	ne	1.3 E-6	1.4 E-6	1.3 E-6	1.4 E-6
Anthracene	ne	4.0 E-9	4.3 E-9	4.0 E-9	4.3 E-9	ne	2.9 E-9	3.1 E-9	2.9 E-9	3.1 E-9
Di-n-Butylphthalate	ne	na	na	na	na	ne	4.5 E-9	4.8 E-9	4.5 E-9	4.8 E-9
Fluoranthene	ne	1.0 E-7	1.1 E-7	1.0 E-7	1.1 E-7	ne	1.7 E-7	1.9 E-7	1.7 E-7	1.9 E-7
Pyrene	ne	1.2 E-7	1.3 E-7	1.2 E-7	1.3 E-7	ne	1.4 E-7	1.5 E-7	1.4 E-7	1.5 E-7
Benzo(a)Anthracene	ne	na	na	na	na	ne	na	na	na	na
Chrysene	ne	na	na	na	na	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	2.5 E-7	2.7 E-8	2.5 E-7	2.7 E-8	ne	na	na	na	na
Benzo(b)Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Benzo(k)Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Benzo(a)Pyrene	ne	na	na	na	na	ne	na	na	na	na
Indeno(1,2,3-cd)Pyrene	ne	na	na	na	na	ne	na	na	na	na
Dibenzo(a,h)Anthracene	ne	na	na	na	na	ne	na	na	na	na
Benzo(g,h,i)Perylene	ne	2.7 E-7	2.9 E-7	2.7 E-7	2.9 E-7	ne	1.5 E-7	1.6 E-7	1.5 E-7	1.6 E-7
beta-BHC	ne	na	na	na	na	ne	na	na	na	na
4,4'-DDD	ne	na	na	na	na	ne	na	na	na	na
alpha-Chlordane	ne	2.0 E-6	2.1 E-7	2.0 E-6	2.1 E-7	ne	na	na	na	na
Aroclor-1254	ne	4.5 E-6	4.8 E-6	4.5 E-6	4.8 E-6	ne	na	na	na	na
Aroclor-1260	ne	na	na	na	na	ne	8.3 E-7	9.0 E-7	8.3 E-7	9.0 E-7
Hexachlorobenzene	ne	5.6 E-7	6.0 E-8	5.6 E-7	6.0 E-8	ne	1.0 E-7	1.1 E-8	1.0 E-7	1.1 E-8
Hexachlorocyclopentadiene	ne	na	na	na	na	ne	2.7 E-8	2.9 E-8	2.7 E-8	2.9 E-8
Hexachlorobutadiene	ne	2.7 E-8	2.9 E-9	2.7 E-8	2.9 E-9	ne	3.8 E-7	4.1 E-8	3.8 E-7	4.1 E-8
Octachlorocyclopentene	ne	na	na	na	na	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
Chlordene	ne	9.3 E-7	1.0 E-7	9.3 E-7	1.0 E-7	ne	2.3 E-6	2.5 E-7	2.3 E-6	2.5 E-7
HAZARD INDICES:	**ne**	**2.3 E-5**	**9.1 E-6**	**2.3 E-5**	**9.1 E-6**	**ne**	**1.2 E-4**	**1.6 E-5**	**1.2 E-4**	**1.6 E-5**

ne = no exposure na = not available Shaded numbers exceed hazard quotient of one.

TABLE 5-40
HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH CREEK SEDIMENTS
(unitless)

Chemical	Mill Creek - Current & Future					Skinner Creek - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Barium	ne	na	na	na	na	ne	na	na	na	na
Beryllium	ne	na	na	na	na	ne	na	na	na	na
Chromium	ne	na	na	na	na	ne	na	na	na	na
Cobalt	ne	na	na	na	na	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Mercury	ne	4.1 E-5	2.2 E-5	4.1 E-5	2.2 E-5	ne	na	na	na	na
Nickel	ne	na	na	na	na	ne	na	na	na	na
Thallium	ne	na	na	na	na	ne	na	na	na	na
Tin	ne	na	na	na	na	ne	8.2 E-6	4.3 E-6	8.2 E-6	4.3 E-6
Vanadium	ne	na	na	na	na	ne	3.7 E-4	1.9 E-4	3.7 E-4	1.9 E-4
Zinc	ne	na	na	na	na	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na	ne	na	na	na	na
Acetone	ne	2.9 E-8	1.5 E-7	2.9 E-8	1.5 E-7	ne	7.5 E-8	3.9 E-7	7.5 E-8	3.9 E-7
Carbon Disulfide	ne	3.3 E-8	1.7 E-8	3.3 E-8	1.7 E-8	ne	na	na	na	na
1,1-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na	ne	2.0 E-6	1.0 E-5	2.0 E-6	1.0 E-5
2-Butanone	ne	na	na	na	na	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na	ne	3.8 E-7	2.0 E-6	3.8 E-7	2.0 E-6
Benzene	ne	na	na	na	na	ne	na	na	na	na
4-Methyl-2-Pentanone	ne	7.6 E-9	4.0 E-8	7.6 E-9	4.0 E-8	ne	2.3 E-8	1.2 E-7	2.3 E-8	1.2 E-7
2-Hexanone	ne	na	na	na	na	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na	ne	na	na	na	na
Phenol	ne	2.2 E-7	1.2 E-7	2.2 E-7	1.2 E-7	ne	na	na	na	na
4-Methylphenol	ne	1.3 E-6	7.0 E-6	1.3 E-6	7.0 E-6	ne	3.6 E-8	1.9 E-7	3.6 E-8	1.9 E-7
Nitrobenzene	ne	na	na	na	na	ne	8.0 E-7	4.2 E-6	8.0 E-7	4.2 E-6
Naphthalene	ne	9.0 E-6	4.7 E-5	9.0 E-6	4.7 E-5	ne	1.5 E-6	8.1 E-6	1.5 E-6	8.1 E-6
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthylene	ne	2.8 E-6	1.5 E-5	2.8 E-6	1.5 E-5	ne	na	na	na	na
Acenaphthene	ne	5.3 E-7	2.8 E-6	5.3 E-7	2.8 E-6	ne	2.2 E-7	1.2 E-6	2.2 E-7	1.2 E-6

TABLE 5-40
HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH CREEK SEDIMENTS
(unitless)

Chemical	Mill Creek - Current & Future					Skinner Creek - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Dibenzofuran	ne	2.7 E-5	1.4 E-4	2.7 E-5	1.4 E-4	ne	1.2 E-5	6.5 E-5	1.2 E-5	6.5 E-5
Diethylphthalate	ne	6.1 E-9	3.2 E-8	6.1 E-9	3.2 E-8	ne	3.4 E-9	1.8 E-8	3.4 E-9	1.8 E-8
Fluorene	ne	9.2 E-7	4.9 E-6	9.2 E-7	4.9 E-6	ne	5.2 E-7	2.7 E-6	5.2 E-7	2.7 E-6
Phenanthrene	ne	2.3 E-5	1.2 E-4	2.3 E-5	1.2 E-4	ne	4.3 E-5	2.2 E-4	4.3 E-5	2.2 E-4
Anthracene	ne	1.3 E-7	7.1 E-7	1.3 E-7	7.1 E-7	ne	9.8 E-8	5.1 E-7	9.8 E-8	5.1 E-7
Di-n-Butylphthalate	ne	na	na	na	na	ne	1.5 E-7	8.0 E-7	1.5 E-7	8.0 E-7
Fluoranthene	ne	3.5 E-6	1.8 E-5	3.5 E-6	1.8 E-5	ne	5.9 E-6	3.1 E-5	5.9 E-6	3.1 E-5
Pyrene	ne	4.0 E-6	2.1 E-5	4.0 E-6	2.1 E-5	ne	4.7 E-6	2.5 E-5	4.7 E-6	2.5 E-5
Benzo(a)Anthracene	ne	na	na	na	na	ne	na	na	na	na
Chrysene	ne	na	na	na	na	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	8.5 E-6	4.5 E-6	8.5 E-6	4.5 E-6	ne	na	na	na	na
Benzo(b)Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Benzo(k)Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Benzo(a)Pyrene	ne	na	na	na	na	ne	na	na	na	na
Indeno(1,2,3-cd)Pyrene	ne	na	na	na	na	ne	na	na	na	na
Dibenzo(a,h)Anthracene	ne	na	na	na	na	ne	na	na	na	na
Benzo(g,h,i)Perylene	ne	9.3 E-6	4.9 E-5	9.3 E-6	4.9 E-5	ne	5.0 E-6	2.6 E-5	5.0 E-6	2.6 E-5
beta-BHC	ne	na	na	na	na	ne	na	na	na	na
4,4'-DDD	ne	na	na	na	na	ne	na	na	na	na
alpha-Chlordane	ne	6.6 E-5	3.5 E-5	6.6 E-5	3.5 E-5	ne	na	na	na	na
Aroclor-1254	ne	1.5 E-4	8.0 E-4	1.5 E-4	8.0 E-4	ne	na	na	na	na
Aroclor-1260	ne	na	na	na	na	ne	2.8 E-5	1.5 E-4	2.8 E-5	1.5 E-4
Hexachlorobenzene	ne	1.9 E-5	1.0 E-5	1.9 E-5	1.0 E-5	ne	3.6 E-6	1.9 E-6	3.6 E-6	1.9 E-6
Hexachlorocyclopentadiene	ne	na	na	na	na	ne	9.1 E-7	4.8 E-6	9.1 E-7	4.8 E-6
Hexachlorobutadiene	ne	9.0 E-7	4.7 E-7	9.0 E-7	4.7 E-7	ne	1.3 E-5	6.7 E-6	1.3 E-5	6.7 E-6
Octachlorocyclopentene	ne	na	na	na	na	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
Chlordene	ne	3.2 E-5	1.7 E-5	3.2 E-5	1.7 E-5	ne	7.7 E-5	4.1 E-5	7.7 E-5	4.1 E-5
HAZARD INDICES:	**ne**	**4.0 E-4**	**1.3 E-3**	**4.0 E-4**	**1.3 E-3**	**ne**	**5.8 E-4**	**8.0 E-4**	**5.8 E-4**	**8.0 E-4**

ne = no exposure na = not available Shaded numbers exceed hazard quotient of one.

TABLE 5-41
HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF CREEK SEDIMENTS
(unitless)

Chemical	Mill Creek - Current & Future					Skinner Creek - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Barium	ne	na	na	na	na	ne	na	na	na	na
Beryllium	ne	na	na	na	na	ne	na	na	na	na
Chromium	ne	na	na	na	na	ne	na	na	na	na
Cobalt	ne	na	na	na	na	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Mercury	ne	5.3 E-5	2.3 E-5	5.3 E-5	2.3 E-5	ne	na	na	na	na
Nickel	ne	na	na	na	na	ne	na	na	na	na
Thallium	ne	na	na	na	na	ne	na	na	na	na
Tin	ne	na	na	na	na	ne	1.1 E-5	4.6 E-6	1.1 E-5	4.6 E-6
Vanadium	ne	na	na	na	na	ne	4.8 E-4	2.1 E-4	4.8 E-4	2.1 E-4
Zinc	ne	na	na	na	na	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na	ne	na	na	na	na
Acetone	ne	3.0 E-8	1.6 E-7	3.0 E-8	1.6 E-7	ne	7.6 E-8	4.0 E-7	7.6 E-8	4.0 E-7
Carbon Disulfide	ne	3.4 E-8	1.7 E-8	3.4 E-8	1.7 E-8	ne	na	na	na	na
1,1-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na	ne	2.0 E-6	1.0 E-5	2.0 E-6	1.0 E-5
2-Butanone	ne	na	na	na	na	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na	ne	3.9 E-7	2.0 E-6	3.9 E-7	2.0 E-6
Benzene	ne	na	na	na	na	ne	na	na	na	na
4-Methyl-2-Pentanone	ne	7.7 E-9	4.0 E-8	7.7 E-9	4.0 E-8	ne	2.3 E-8	1.2 E-7	2.3 E-8	1.2 E-7
2-Hexanone	ne	na	na	na	na	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na	ne	na	na	na	na
Phenol	ne	2.3 E-7	1.2 E-7	2.3 E-7	1.2 E-7	ne	na	na	na	na
4-Methylphenol	ne	1.4 E-6	7.1 E-6	1.4 E-6	7.1 E-6	ne	3.7 E-8	1.9 E-7	3.7 E-8	1.9 E-7
Nitrobenzene	ne	na	na	na	na	ne	8.2 E-7	4.2 E-6	8.2 E-7	4.2 E-6
Naphthalene	ne	9.3 E-6	4.8 E-5	9.3 E-6	4.8 E-5	ne	1.6 E-6	8.1 E-6	1.6 E-6	8.1 E-6
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthylene	ne	2.9 E-6	1.5 E-5	2.9 E-6	1.5 E-5	ne	na	na	na	na
Acenaphthene	ne	5.5 E-7	2.8 E-6	5.5 E-7	2.8 E-6	ne	2.3 E-7	1.2 E-6	2.3 E-7	1.2 E-6

TABLE 5-41
HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF CREEK SEDIMENTS
(unitless)

Chemical	Mill Creek - Current & Future					Skinner Creek - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Dibenzofuran	ne	2.7 E-5	1.4 E-4	2.7 E-5	1.4 E-4	ne	1.3 E-5	6.5 E-5	1.3 E-5	6.5 E-5
Diethylphthalate	ne	6.3 E-9	3.2 E-8	6.3 E-9	3.2 E-8	ne	3.5 E-9	1.8 E-8	3.5 E-9	1.8 E-8
Fluorene	ne	9.5 E-7	4.9 E-6	9.5 E-7	4.9 E-6	ne	5.4 E-7	2.8 E-6	5.4 E-7	2.8 E-6
Phenanthrene	ne	2.3 E-5	1.2 E-4	2.3 E-5	1.2 E-4	ne	4.4 E-5	2.3 E-4	4.4 E-5	2.3 E-4
Anthracene	ne	1.4 E-7	7.1 E-7	1.4 E-7	7.1 E-7	ne	1.0 E-7	5.2 E-7	1.0 E-7	5.2 E-7
Di-n-Butylphthalate	ne	na	na	na	na	ne	1.6 E-7	8.0 E-7	1.6 E-7	8.0 E-7
Fluoranthene	ne	3.6 E-6	1.9 E-5	3.6 E-6	1.9 E-5	ne	6.1 E-6	3.1 E-5	6.1 E-6	3.1 E-5
Pyrene	ne	4.1 E-6	2.1 E-5	4.1 E-6	2.1 E-5	ne	4.9 E-6	2.5 E-5	4.9 E-6	2.5 E-5
Benzo(a)Anthracene	ne	na	na	na	na	ne	na	na	na	na
Chrysene	ne	na	na	na	na	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	8.8 E-6	4.5 E-6	8.8 E-6	4.5 E-6	ne	na	na	na	na
Benzo(b)Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Benzo(k)Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Benzo(a)Pyrene	ne	na	na	na	na	ne	na	na	na	na
Indeno(1,2,3-cd)Pyrene	ne	na	na	na	na	ne	na	na	na	na
Dibenzo(a,h)Anthracene	ne	na	na	na	na	ne	na	na	na	na
Benzo(g,h,i)Perylene	ne	9.5 E-6	4.9 E-5	9.5 E-6	4.9 E-5	ne	5.1 E-6	2.6 E-5	5.1 E-6	2.6 E-5
beta-BHC	ne	na	na	na	na	ne	na	na	na	na
4,4'-DDD	ne	na	na	na	na	ne	na	na	na	na
alpha-Chlordane	ne	6.8 E-5	3.5 E-5	6.8 E-5	3.5 E-5	ne	na	na	na	na
Aroclor-1254	ne	1.6 E-4	8.0 E-4	1.6 E-4	8.0 E-4	ne	na	na	na	na
Aroclor-1260	ne	na	na	na	na	ne	2.9 E-5	1.5 E-4	2.9 E-5	1.5 E-4
Hexachlorobenzene	ne	2.0 E-5	1.0 E-5	2.0 E-5	1.0 E-5	ne	3.7 E-6	1.9 E-6	3.7 E-6	1.9 E-6
Hexachlorocyclopentadiene	ne	na	na	na	na	ne	9.3 E-7	4.8 E-6	9.3 E-7	4.8 E-6
Hexachlorobutadiene	ne	9.3 E-7	4.8 E-7	9.3 E-7	4.8 E-7	ne	1.3 E-5	6.8 E-6	1.3 E-5	6.8 E-6
Octachlorocyclopentene	ne	na	na	na	na	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
Chlordene	ne	3.3 E-5	1.7 E-5	3.3 E-5	1.7 E-5	ne	8.0 E-5	4.1 E-5	8.0 E-5	4.1 E-5
HAZARD INDICES:	ne	4.2 E-4	1.3 E-3	4.2 E-4	1.3 E-3	ne	7.0 E-4	8.2 E-4	7.0 E-4	8.2 E-4

ne = no exposure na = not available Shaded numbers exceed hazard quotient of one.

TABLE 5-42
HAZARD QUOTIENTS AND INDICES FROM INGESTION OF POND SEDIMENTS
(unitless)

Chemical	Duck Pond - Current & Future					Diving Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Barium	ne	1.2 E-4	9.0 E-6	1.2 E-4	9.0 E-6	ne	na	na	na	na
Beryllium	ne	na	na	na	na	ne	na	na	na	na
Chromium	ne	4.1 E-5	1.8 E-5	4.1 E-5	1.8 E-5	ne	3.7 E-5	1.6 E-5	3.7 E-5	1.6 E-5
Cobalt	ne	5.2 E-3	5.6 E-3	5.2 E-3	5.6 E-3	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Mercury	ne	na	na	na	na	ne	na	na	na	na
Nickel	ne	3.4 E-5	3.6 E-6	3.4 E-5	3.6 E-6	ne	na	na	na	na
Thallium	ne	2.4 E-5	2.6 E-5	2.4 E-5	2.6 E-5	ne	na	na	na	na
Tin	ne	na	na	na	na	ne	2.2 E-6	2.4 E-7	2.2 E-6	2.4 E-7
Vanadium	ne	2.2 E-4	2.4 E-5	2.2 E-4	2.4 E-5	ne	na	na	na	na
Zinc	ne	na	na	na	na	ne	1.8 E-5	2.0 E-6	1.8 E-5	2.0 E-6
Methylene Chloride	ne	na	na	na	na	ne	na	na	na	na
Acetone	ne	na	na	na	na	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na	ne	na	na	na	na
1,1-Dichloroethene	ne	na	na	na	na	ne	9.3 E-8	1.0 E-8	9.3 E-8	1.0 E-8
1,2-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
2-Butanone	ne	na	na	na	na	ne	6.1 E-10	6.6 E-10	6.1 E-10	6.6 E-10
Trichloroethene	ne	na	na	na	na	ne	6.1 E-10	6.6 E-10	6.1 E-10	6.6 E-10
Benzene	ne	na	na	na	na	ne	na	na	na	na
4-Methyl-2-Pentanone	ne	na	na	na	na	ne	na	na	na	na
2-Hexanone	ne	na	na	na	na	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na	ne	2.1 E-9	2.2 E-9	2.1 E-9	2.2 E-9
Xylene (total)	ne	na	na	na	na	ne	1.8 E-9	3.9 E-10	1.8 E-9	3.9 E-10
Phenol	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
Nitrobenzene	ne	na	na	na	na	ne	na	na	na	na
Naphthalene	ne	na	na	na	na	ne	9.8 E-8	1.1 E-7	9.8 E-8	1.1 E-7
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthylene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthene	ne	na	na	na	na	ne	7.5 E-9	8.0 E-9	7.5 E-9	8.0 E-9

TABLE 5-42
HAZARD QUOTIENTS AND INDICES FROM INGESTION OF POND SEDIMENTS
(unitless)

Chemical	Duck Pond - Current & Future					Diving Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Dibenzofuran	ne	na	na	na	na	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na	ne	na	na	na	na
Fluorene	ne	na	na	na	na	ne	9.8 E-9	1.1 E-8	9.8 E-9	1.1 E-8
Phenanthrene	ne	na	na	na	na	ne	4.1 E-7	4.4 E-7	4.1 E-7	4.4 E-7
Anthracene	ne	na	na	na	na	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na	ne	na	na	na	na
Fluoranthene	ne	na	na	na	na	ne	9.8 E-9	1.1 E-8	9.8 E-9	1.1 E-8
Pyrene	ne	na	na	na	na	ne	4.7 E-8	5.1 E-8	4.7 E-8	5.1 E-8
Benzo(a)Anthracene	ne	na	na	na	na	ne	na	na	na	na
Chrysene	ne	na	na	na	na	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	1.1 E-7	1.2 E-8	1.1 E-7	1.2 E-8	ne	1.9 E-7	2.0 E-8	1.9 E-7	2.0 E-8
Benzo(b)Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Benzo(k)Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Benzo(a)Pyrene	ne	na	na	na	na	ne	na	na	na	na
Indeno(1,2,3-cd)Pyrene	ne	na	na	na	na	ne	na	na	na	na
Dibenzo(a,h)Anthracene	ne	na	na	na	na	ne	na	na	na	na
Benzo(g,h,i)Perylene	ne	na	na	na	na	ne	na	na	na	na
beta-BHC	ne	na	na	na	na	ne	na	na	na	na
4,4'-DDD	ne	na	na	na	na	ne	na	na	na	na
alpha-Chlordane	ne	na	na	na	na	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na	ne	8.1 E-6	8.7 E-6	8.1 E-6	8.7 E-6
Aroclor-1260	ne	na	na	na	na	ne	1.2 E-5	1.3 E-5	1.2 E-5	1.3 E-5
Hexachlorobenzene	ne	1.1 E-7	1.2 E-8	1.1 E-7	1.2 E-8	ne	2.5 E-7	2.7 E-8	2.5 E-7	2.7 E-8
Hexachlorocyclopentadiene	ne	na	na	na	na	ne	na	na	na	na
Hexachlorobutadiene	ne	na	na	na	na	ne	4.8 E-8	5.1 E-9	4.8 E-8	5.1 E-9
Octachlorocyclopentene	ne	na	na	na	na	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
Chlordene	ne	7.5 E-7	8.1 E-8	7.5 E-7	8.1 E-8	ne	na	na	na	na
HAZARD INDICES:	ne	5.7 E-3	5.7 E-3	5.7 E-3	5.7 E-3	ne	8.0 E-5	4.1 E-5	8.0 E-5	4.1 E-5

ne = no exposure na = not available Shaded numbers exceed hazard quotient of one.

TABLE 5-42
HAZARD QUOTIENTS AND INDICES FROM INGESTION OF POND SEDIMENTS
(unitless)

Chemical	Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na
Barium	ne	na	na	na	na
Beryllium	ne	1.3 E-5	1.4 E-6	1.3 E-5	1.4 E-6
Chromium	ne	6.5 E-5	2.8 E-5	6.5 E-5	2.8 E-5
Cobalt	ne	6.0 E-3	6.5 E-3	6.0 E-3	6.5 E-3
Copper	ne	na	na	na	na
Lead	ne	na	na	na	na
Mercury	ne	na	na	na	na
Nickel	ne	5.5 E-5	5.9 E-6	5.5 E-5	5.9 E-6
Thallium	ne	na	na	na	na
Tin	ne	na	na	na	na
Vanadium	ne	2.9 E-4	3.2 E-5	2.9 E-4	3.2 E-5
Zinc	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na
Acetone	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na
1,1-Dichloroethene	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na
2-Butanone	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na
Benzene	ne	na	na	na	na
4-Methyl-2-Pentanone	ne	na	na	na	na
2-Hexanone	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na
Phenol	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na
Nitrobenzene	ne	na	na	na	na
Naphthalene	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na
Acenaphthylene	ne	na	na	na	na
Acenaphthene	ne	na	na	na	na

TABLE 5-42
HAZARD QUOTIENTS AND INDICES FROM INGESTION OF POND SEDIMENTS
(unitless)

Chemical	Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Dibenzofuran	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na
Fluorene	ne	na	na	na	na
Phenanthrene	ne	na	na	na	na
Anthracene	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na
Fluoranthene	ne	na	na	na	na
Pyrene	ne	na	na	na	na
Benzo(a)Anthracene	ne	na	na	na	na
Chrysene	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	3.2 E-7	3.5 E-8	3.2 E-7	3.5 E-8
Benzo(b)Fluoranthene	ne	na	na	na	na
Benzo(k)Fluoranthene	ne	na	na	na	na
Benzo(a)Pyrene	ne	na	na	na	na
Indeno(1,2,3-cd)Pyrene	ne	na	na	na	na
Dibenzo(a,h)Anthracene	ne	na	na	na	na
Benzo(g,h,i)Perylene	ne	na	na	na	na
beta-BHC	ne	na	na	na	na
4,4'-DDD	ne	na	na	na	na
alpha-Chlordane	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na
Aroclor-1260	ne	na	na	na	na
Hexachlorobenzene	ne	na	na	na	na
Hexachlorocyclopentadiene	ne	na	na	na	na
Hexachlorobutadiene	ne	na	na	na	na
Octachlorocyclopentene	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na
Chlordene	ne	na	na	na	na
HAZARD INDICES:	**ne**	**6.5 E-3**	**6.6 E-3**	**6.5 E-3**	**6.6 E-3**

ne = no exposure na = not available Shaded numbers exceed hazard quotient of one.

TABLE 5-43
HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH POND SEDIMENTS
(unitless)

Chemical	Duck Pond - Current & Future					Diving Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Barium	ne	4.0 E-4	1.5 E-4	4.0 E-4	1.5 E-4	ne	na	na	na	na
Beryllium	ne	na	na	na	na	ne	na	na	na	na
Chromium	ne	1.4 E-4	3.0 E-4	1.4 E-4	3.0 E-4	ne	1.3 E-4	2.7 E-4	1.3 E-4	2.7 E-4
Cobalt	ne	1.8 E-2	9.3 E-2	1.8 E-2	9.3 E-2	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Mercury	ne	na	na	na	na	ne	na	na	na	na
Nickel	ne	1.1 E-4	6.0 E-5	1.1 E-4	6.0 E-5	ne	na	na	na	na
Thallium	ne	8.3 E-5	4.3 E-4	8.3 E-5	4.3 E-4	ne	na	na	na	na
Tin	ne	na	na	na	na	ne	7.4 E-6	3.9 E-6	7.4 E-6	3.9 E-6
Vanadium	ne	7.4 E-4	3.9 E-4	7.4 E-4	3.9 E-4	ne	na	na	na	na
Zinc	ne	na	na	na	na	ne	6.2 E-5	3.3 E-5	6.2 E-5	3.3 E-5
Methylene Chloride	ne	na	na	na	na	ne	na	na	na	na
Acetone	ne	na	na	na	na	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na	ne	na	na	na	na
1,1-Dichloroethene	ne	na	na	na	na	ne	7.9 E-6	4.1 E-6	7.9 E-6	4.1 E-6
1,2-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
2-Butanone	ne	na	na	na	na	ne	5.2 E-8	2.7 E-7	5.2 E-8	2.7 E-7
Trichloroethene	ne	na	na	na	na	ne	5.2 E-8	2.7 E-7	5.2 E-8	2.7 E-7
Benzene	ne	na	na	na	na	ne	na	na	na	na
4-Methyl-2-Pentanone	ne	na	na	na	na	ne	na	na	na	na
2-Hexanone	ne	na	na	na	na	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na	ne	1.8 E-7	9.2 E-7	1.8 E-7	9.2 E-7
Xylene (total)	ne	na	na	na	na	ne	1.5 E-7	1.6 E-7	1.5 E-7	1.6 E-7
Phenol	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
Nitrobenzene	ne	na	na	na	na	ne	na	na	na	na
Naphthalene	ne	na	na	na	na	ne	3.3 E-6	1.7 E-5	3.3 E-6	1.7 E-5
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthylene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthene	ne	na	na	na	na	ne	2.5 E-7	1.3 E-6	2.5 E-7	1.3 E-6

TABLE 5-43
HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH POND SEDIMENTS
(unitless)

Chemical	Duck Pond - Current & Future					Diving Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Dibenzofuran	ne	na	na	na	na	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na	ne	na	na	na	na
Fluorene	ne	na	na	na	na	ne	3.3 E-7	1.7 E-6	3.3 E-7	1.7 E-6
Phenanthrene	ne	na	na	na	na	ne	1.4 E-5	7.4 E-5	1.4 E-5	7.4 E-5
Anthracene	ne	na	na	na	na	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na	ne	na	na	na	na
Fluoranthene	ne	na	na	na	na	ne	3.3 E-7	1.7 E-6	3.3 E-7	1.7 E-6
Pyrene	ne	na	na	na	na	ne	1.6 E-6	8.5 E-6	1.6 E-6	8.5 E-6
Benzo(a)Anthracene	ne	na	na	na	na	ne	na	na	na	na
Chrysene	ne	na	na	na	na	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	3.8 E-6	2.0 E-6	3.8 E-6	2.0 E-6	ne	6.4 E-6	3.3 E-6	6.4 E-6	3.3 E-6
Benzo(b)Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Benzo(k)Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Benzo(a)Pyrene	ne	na	na	na	na	ne	na	na	na	na
Indeno(1,2,3-cd)Pyrene	ne	na	na	na	na	ne	na	na	na	na
Dibenzo(a,h)Anthracene	ne	na	na	na	na	ne	na	na	na	na
Benzo(g,h,i)Perylene	ne	na	na	na	na	ne	na	na	na	na
beta-BHC	ne	na	na	na	na	ne	na	na	na	na
4,4'-DDD	ne	na	na	na	na	ne	na	na	na	na
alpha-Chlordane	ne	na	na	na	na	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na	ne	2.7 E-4	1.4 E-3	2.7 E-4	1.4 E-3
Aroclor-1260	ne	na	na	na	na	ne	4.2 E-4	2.2 E-3	4.2 E-4	2.2 E-3
Hexachlorobenzene	ne	3.8 E-6	2.0 E-6	3.8 E-6	2.0 E-6	ne	8.5 E-6	4.5 E-6	8.5 E-6	4.5 E-6
Hexachlorocyclopentadiene	ne	na	na	na	na	ne	na	na	na	na
Hexachlorobutadiene	ne	na	na	na	na	ne	1.6 E-6	8.5 E-7	1.6 E-6	8.5 E-7
Octachlorocyclopentene	ne	na	na	na	na	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
Chlordene	ne	2.5 E-5	1.3 E-5	2.5 E-5	1.3 E-5	ne	na	na	na	na
HAZARD INDICES:	**ne**	**1.9 E-2**	**9.5 E-2**	**1.9 E-2**	**9.5 E-2**	**ne**	**9.3 E-4**	**4.1 E-3**	**9.3 E-4**	**4.1 E-3**

ne = no exposure na = not available Shaded numbers exceed hazard quotient of one.

TABLE 5-43
HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH POND SEDIMENTS
(unitless)

Chemical	Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na
Barium	ne	na	na	na	na
Beryllium	ne	4.4 E-5	2.3 E-5	4.4 E-5	2.3 E-5
Chromium	ne	2.2 E-4	4.6 E-4	2.2 E-4	4.6 E-4
Cobalt	ne	2.0 E-2	1.1 E-1	2.0 E-2	1.1 E-1
Copper	ne	na	na	na	na
Lead	ne	na	na	na	na
Mercury	ne	na	na	na	na
Nickel	ne	1.9 E-4	9.8 E-5	1.9 E-4	9.8 E-5
Thallium	ne	na	na	na	na
Tin	ne	na	na	na	na
Vanadium	ne	9.9 E-4	5.2 E-4	9.9 E-4	5.2 E-4
Zinc	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na
Acetone	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na
1,1-Dichloroethene	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na
2-Butanone	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na
Benzene	ne	na	na	na	na
4-Methyl-2-Pentanone	ne	na	na	na	na
2-Hexanone	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na
Phenol	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na
Nitrobenzene	ne	na	na	na	na
Naphthalene	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na
Acenaphthylene	ne	na	na	na	na
Acenaphthene	ne	na	na	na	na

TABLE 5-43
HAZARD QUOTIENTS AND INDICES FROM DERMAL CONTACT WITH POND SEDIMENTS
(unitless)

Chemical	Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Dibenzofuran	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na
Fluorene	ne	na	na	na	na
Phenanthrene	ne	na	na	na	na
Anthracene	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na
Fluoranthene	ne	na	na	na	na
Pyrene	ne	na	na	na	na
Benzo(a)Anthracene	ne	na	na	na	na
Chrysene	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	1.1 E-5	5.8 E-6	1.1 E-5	5.8 E-6
Benzo(b)Fluoranthene	ne	na	na	na	na
Benzo(k)Fluoranthene	ne	na	na	na	na
Benzo(a)Pyrene	ne	na	na	na	na
Indeno(1,2,3-cd)Pyrene	ne	na	na	na	na
Dibenzo(a,h)Anthracene	ne	na	na	na	na
Benzo(g,h,i)Perylene	ne	na	na	na	na
beta-BHC	ne	na	na	na	na
4,4'-DDD	ne	na	na	na	na
alpha-Chlordane	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na
Aroclor-1260	ne	na	na	na	na
Hexachlorobenzene	ne	na	na	na	na
Hexachlorocyclopentadiene	ne	na	na	na	na
Hexachlorobutadiene	ne	na	na	na	na
Octachlorocyclopentene	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na
Chlordene	ne	na	na	na	na
HAZARD INDICES:	**ne**	**2.2 E-2**	**1.1 E-1**	**2.2 E-2**	**1.1 E-1**

ne = no exposure na = not available Shaded numbers exceed hazard quotient of one.

TABLE 5-44
HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF POND SEDIMENTS
(unitless)

Chemical	Duck Pond - Current & Future					Diving Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na	ne	na	na	na	na
Barium	ne	5.1 E-4	1.6 E-4	5.1 E-4	1.6 E-4	ne	na	na	na	na
Beryllium	ne	na	na	na	na	ne	na	na	na	na
Chromium	ne	1.8 E-4	3.1 E-4	1.8 E-4	3.1 E-4	ne	1.6 E-4	2.8 E-4	1.6 E-4	2.8 E-4
Cobalt	ne	2.3 E-2	9.9 E-2	2.3 E-2	9.9 E-2	ne	na	na	na	na
Copper	ne	na	na	na	na	ne	na	na	na	na
Lead	ne	na	na	na	na	ne	na	na	na	na
Mercury	ne	na	na	na	na	ne	na	na	na	na
Nickel	ne	1.5 E-4	6.3 E-5	1.5 E-4	6.3 E-5	ne	na	na	na	na
Thallium	ne	1.1 E-4	4.6 E-4	1.1 E-4	4.6 E-4	ne	na	na	na	na
Tin	ne	na	na	na	na	ne	9.6 E-6	4.1 E-6	9.6 E-6	4.1 E-6
Vanadium	ne	9.6 E-4	4.1 E-4	9.6 E-4	4.1 E-4	ne	na	na	na	na
Zinc	ne	na	na	na	na	ne	8.0 E-5	3.5 E-5	8.0 E-5	3.5 E-5
Methylene Chloride	ne	na	na	na	na	ne	na	na	na	na
Acetone	ne	na	na	na	na	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na	ne	na	na	na	na
1,1-Dichloroethene	ne	na	na	na	na	ne	8.0 E-6	4.1 E-6	8.0 E-6	4.1 E-6
1,2-Dichloroethene	ne	na	na	na	na	ne	na	na	na	na
2-Butanone	ne	na	na	na	na	ne	5.3 E-8	2.7 E-7	5.3 E-8	2.7 E-7
Trichloroethene	ne	na	na	na	na	ne	5.2 E-8	2.7 E-7	5.2 E-8	2.7 E-7
Benzene	ne	na	na	na	na	ne	na	na	na	na
4-Methyl-2-Pentanone	ne	na	na	na	na	ne	na	na	na	na
2-Hexanone	ne	na	na	na	na	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na	ne	1.8 E-7	9.2 E-7	1.8 E-7	9.2 E-7
Xylene (total)	ne	na	na	na	na	ne	1.6 E-7	1.6 E-7	1.6 E-7	1.6 E-7
Phenol	ne	na	na	na	na	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na	ne	na	na	na	na
Nitrobenzene	ne	na	na	na	na	ne	na	na	na	na
Naphthalene	ne	na	na	na	na	ne	3.4 E-6	1.8 E-5	3.4 E-6	1.8 E-5
2-Methylnaphthalene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthylene	ne	na	na	na	na	ne	na	na	na	na
Acenaphthene	ne	na	na	na	na	ne	2.6 E-7	1.3 E-6	2.6 E-7	1.3 E-6

TABLE 5-44
HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF POND SEDIMENTS
(unitless)

Chemical	Duck Pond - Current & Future					Diving Pond - Current & Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Dibenzofuran	ne	na	na	na	na	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na	ne	na	na	na	na
Fluorene	ne	na	na	na	na	ne	3.4 E-7	1.8 E-6	3.4 E-7	1.8 E-6
Phenanthrene	ne	na	na	na	na	ne	1.4 E-5	7.4 E-5	1.4 E-5	7.4 E-5
Anthracene	ne	na	na	na	na	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na	ne	na	na	na	na
Fluoranthene	ne	na	na	na	na	ne	3.4 E-7	1.8 E-6	3.4 E-7	1.8 E-6
Pyrene	ne	na	na	na	na	ne	1.7 E-6	8.5 E-6	1.7 E-6	8.5 E-6
Benzo(a)Anthracene	ne	na	na	na	na	ne	na	na	na	na
Chrysene	ne	na	na	na	na	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	3.9 E-6	2.0 E-6	3.9 E-6	2.0 E-6	ne	6.5 E-6	3.4 E-6	6.5 E-6	3.4 E-6
Benzo(b)Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Benzo(k)Fluoranthene	ne	na	na	na	na	ne	na	na	na	na
Benzo(a)Pyrene	ne	na	na	na	na	ne	na	na	na	na
Indeno(1,2,3-cd)Pyrene	ne	na	na	na	na	ne	na	na	na	na
Dibenzo(a,h)Anthracene	ne	na	na	na	na	ne	na	na	na	na
Benzo(g,h,i)Perylene	ne	na	na	na	na	ne	na	na	na	na
beta-BHC	ne	na	na	na	na	ne	na	na	na	na
4,4'-DDD	ne	na	na	na	na	ne	na	na	na	na
alpha-Chlordane	ne	na	na	na	na	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na	ne	2.8 E-4	1.5 E-3	2.8 E-4	1.5 E-3
Aroclor-1260	ne	na	na	na	na	ne	4.3 E-4	2.2 E-3	4.3 E-4	2.2 E-3
Hexachlorobenzene	ne	3.9 E-6	2.0 E-6	3.9 E-6	2.0 E-6	ne	8.8 E-6	4.5 E-6	8.8 E-6	4.5 E-6
Hexachlorocyclopentadiene	ne	na	na	na	na	ne	na	na	na	na
Hexachlorobutadiene	ne	na	na	na	na	ne	1.7 E-6	8.5 E-7	1.7 E-6	8.5 E-7
Octachlorocyclopentene	ne	na	na	na	na	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na	ne	na	na	na	na
Chlordene	ne	2.6 E-5	1.3 E-5	2.6 E-5	1.3 E-5	ne	na	na	na	na
HAZARD INDICES:	ne	2.5 E-2	1.0 E-1	2.5 E-2	1.0 E-1	ne	1.0 E-3	4.1 E-3	1.0 E-3	4.1 E-3

ne = no exposure na = not available Shaded numbers exceed hazard quotient of one.

TABLE 5-44
HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF POND SEDIMENTS
(unitless)

Chemical	Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Aluminum	ne	na	na	na	na
Barium	ne	na	na	na	na
Beryllium	ne	5.6 E-5	2.4 E-5	5.6 E-5	2.4 E-5
Chromium	ne	2.8 E-4	4.9 E-4	2.8 E-4	4.9 E-4
Cobalt	ne	2.6 E-2	1.1 E-1	2.6 E-2	1.1 E-1
Copper	ne	na	na	na	na
Lead	ne	na	na	na	na
Mercury	ne	na	na	na	na
Nickel	ne	2.4 E-4	1.0 E-4	2.4 E-4	1.0 E-4
Thallium	ne	na	na	na	na
Tin	ne	na	na	na	na
Vanadium	ne	1.3 E-3	5.5 E-4	1.3 E-3	5.5 E-4
Zinc	ne	na	na	na	na
Methylene Chloride	ne	na	na	na	na
Acetone	ne	na	na	na	na
Carbon Disulfide	ne	na	na	na	na
1,1-Dichloroethene	ne	na	na	na	na
1,2-Dichloroethene	ne	na	na	na	na
2-Butanone	ne	na	na	na	na
Trichloroethene	ne	na	na	na	na
Benzene	ne	na	na	na	na
4-Methyl-2-Pentanone	ne	na	na	na	na
2-Hexanone	ne	na	na	na	na
1,1,2,2-Tetrachloroethane	ne	na	na	na	na
Ethylbenzene	ne	na	na	na	na
Xylene (total)	ne	na	na	na	na
Phenol	ne	na	na	na	na
4-Methylphenol	ne	na	na	na	na
Nitrobenzene	ne	na	na	na	na
Naphthalene	ne	na	na	na	na
2-Methylnaphthalene	ne	na	na	na	na
Acenaphthylene	ne	na	na	na	na
Acenaphthene	ne	na	na	na	na

TABLE 5-44
HAZARD QUOTIENTS AND INDICES FROM TOTAL INTAKE OF POND SEDIMENTS
(unitless)

Chemical	Trilobite Pond - Current & Future				
	Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult
Dibenzofuran	ne	na	na	na	na
Diethylphthalate	ne	na	na	na	na
Fluorene	ne	na	na	na	na
Phenanthrene	ne	na	na	na	na
Anthracene	ne	na	na	na	na
Di-n-Butylphthalate	ne	na	na	na	na
Fluoranthene	ne	na	na	na	na
Pyrene	ne	na	na	na	na
Benzo(a)Anthracene	ne	na	na	na	na
Chrysene	ne	na	na	na	na
bis(2-Ethylhexyl)Phthalate	ne	1.1 E-5	5.8 E-6	1.1 E-5	5.8 E-6
Benzo(b)Fluoranthene	ne	na	na	na	na
Benzo(k)Fluoranthene	ne	na	na	na	na
Benzo(a)Pyrene	ne	na	na	na	na
Indeno(1,2,3-cd)Pyrene	ne	na	na	na	na
Dibenzo(a,h)Anthracene	ne	na	na	na	na
Benzo(g,h,i)Perylene	ne	na	na	na	na
beta-BHC	ne	na	na	na	na
4,4'-DDD	ne	na	na	na	na
alpha-Chlordane	ne	na	na	na	na
Aroclor-1254	ne	na	na	na	na
Aroclor-1260	ne	na	na	na	na
Hexachlorobenzene	ne	na	na	na	na
Hexachlorocyclopentadiene	ne	na	na	na	na
Hexachlorobutadiene	ne	na	na	na	na
Octachlorocyclopentene	ne	na	na	na	na
Heptachloronorborene	ne	na	na	na	na
Chlordene	ne	na	na	na	na
HAZARD INDICES:	**ne**	**2.8 E-2**	**1.2 E-1**	**2.8 E-2**	**1.2 E-1**

ne = no exposure na = not available Shaded numbers exceed hazard quotient of one.

TABLE 5-45
SUMMARY OF CARCINOGENIC RISKS FOR ALL EXPOSURE ROUTES AND EXPOSED POPULATIONS

Environmental Areas	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Waste Lagoon*	1.1 E-8	1.3 E-8	2.8 E-8	1.0 E-8	2.6 E-8	1.8 E-2	2.1 E-2	4.6 E-2	1.7 E-2	4.4 E-2
Site-Wide Soils	3.6 E-2	4.1 E-2	9.1 E-2	3.3 E-2	8.6 E-2	1.5 E-3	1.7 E-3	3.7 E-3	1.4 E-3	3.5 E-3
Ground Water	na	9.9 E-6	2.1 E-5	ne	ne	na	8.3 E-3	1.9 E-2	ne	ne
Mill Creek Surface Water	ne	2.8 E-9	3.9 E-9	2.8 E-9	3.9 E-9	ne	6.9 E-4	2.0 E-3	6.9 E-4	2.0 E-3
Skinner Creek Surface Water	ne	1.1 E-8	1.6 E-8	1.1 E-8	1.6 E-8	ne	1.1 E-8	1.6 E-8	1.1 E-8	1.6 E-8
Diving Pond Surface Water	ne	1.1 E-8	1.5 E-8	1.1 E-8	1.5 E-8	ne	1.1 E-8	1.5 E-8	1.1 E-8	1.5 E-8
Trilobite Pond Surface Water	ne	1.5 E-11	2.1 E-11	1.5 E-11	2.1 E-11	ne	1.5 E-11	2.1 E-11	1.5 E-11	2.1 E-11
Mill Creek Sediments	ne	4.3 E-6	1.1 E-5	4.3 E-6	1.1 E-5	ne	4.3 E-6	1.1 E-5	4.3 E-6	1.1 E-5
Skinner Creek Sediments	ne	2.9 E-6	7.4 E-6	2.9 E-6	7.4 E-6	ne	2.9 E-6	7.4 E-6	2.9 E-6	7.4 E-6
Duck Pond Sediments	ne	5.2 E-10	1.3 E-9	5.2 E-10	1.3 E-9	ne	5.2 E-10	1.3 E-9	5.2 E-10	1.3 E-9
Diving Pond Sediments	ne	8.6 E-7	2.2 E-6	8.6 E-7	2.2 E-6	ne	8.6 E-7	2.2 E-6	8.6 E-7	2.2 E-6
Trilobite Pond Sediments	ne	1.0 E-7	2.2 E-7	1.0 E-7	2.2 E-7	ne	1.0 E-7	2.2 E-7	1.0 E-7	2.2 E-7
Total:**	**3.6 E-2**	**4.1 E-2**	**9.1 E-2**	**3.3 E-2**	**8.6 E-2**	**2.0 E-2**	**3.1 E-2**	**7.0 E-2**	**1.9 E-2**	**4.9 E-2**
Total without residential development in Waste Lagoon area:						**1.5 E-3**	**1.1 E-2**	**2.5 E-2**	**2.1 E-3**	**5.5 E-3**

* Future exposure assumes residential development in the waste lagoon area. Future equals Current with no residential development in this area.

** These totals assume future residential development in the waste lagoon area.

Shaded values exceed 10^-6 cancer risk

ne = no exposure na = not applicable

TABLE 5-46
SUMMARY OF HAZARD INDICES FOR ALL EXPOSURE ROUTES AND EXPOSED POPULATIONS

Environmental Areas	Current					Future				
	Occupational	Residential		Recreational		Occupational	Residential		Recreational	
	Adult	Child	Adult	Child	Adult	Adult	Child	Adult	Child	Adult
Waste Lagoon*	6.6 E-2	1.1 E+0	2.3 E-1	3.4 E-1	1.6 E-1	1.8 E+2	1.4 E+3	6.9 E+2	1.2 E+3	6.6 E+2
Site-Wide Soils	7.1 E+1	6.6 E+1	2.8 E+2	5.3 E+1	2.7 E+2	2.5 E+0	4.2 E+0	9.8 E+0	3.2 E+0	9.3 E+0
Ground Water	2.2 E-1	8.8 E-1	6.9 E-1	ne	ne	3.1 E+2	2.4 E+2	9.5 E+2	ne	ne
Mill Creek Surface Water	ne	1.2 E-2	3.2 E-2	1.2 E-2	3.2 E-2	ne	2.7 E+0	1.3 E+1	2.7 E+0	1.3 E+1
Skinner Creek Surface Water	ne	5.4 E-4	1.8 E-4	5.4 E-4	1.8 E-4	ne	5.4 E-4	1.8 E-4	5.4 E-4	1.8 E-4
Diving Pond Surface Water	ne	1.0 E-3	8.7 E-4	1.0 E-3	8.7 E-4	ne	1.0 E-3	8.7 E-4	1.0 E-3	8.7 E-4
Trilobite Pond Surface Water	ne	4.6 E-4	1.2 E-4	4.6 E-4	1.2 E-4	ne	4.6 E-4	1.2 E-4	4.6 E-4	1.2 E-4
Mill Creek Sediments	ne	4.2 E-4	1.3 E-3	4.2 E-4	1.3 E-3	ne	4.2 E-4	1.3 E-3	4.2 E-4	1.3 E-3
Skinner Creek Sediments	ne	7.0 E-4	8.2 E-4	7.0 E-4	8.2 E-4	ne	7.0 E-4	8.2 E-4	7.0 E-4	8.2 E-4
Duck Pond Sediments	ne	2.5 E-2	1.0 E-1	2.5 E-2	1.0 E-1	ne	2.5 E-2	1.0 E-1	2.5 E-2	1.0 E-1
Diving Pond Sediments	ne	1.0 E-3	4.1 E-3	1.0 E-3	4.1 E-3	ne	1.0 E-3	4.1 E-3	1.0 E-3	4.1 E-3
Trilobite Pond Sediments	ne	2.8 E-2	1.2 E-1	2.8 E-2	1.2 E-1	ne	2.8 E-2	1.2 E-1	2.8 E-2	1.2 E-1
Total:**	**7.1 E+1**	**6.8 E+1**	**2.8 E+2**	**5.3 E+1**	**2.7 E+2**	**4.9 E+2**	**1.7 E+3**	**1.7 E+3**	**1.2 E+3**	**6.8 E+2**
Total without residential development in Waste Lagoon area:						**3.2 E+2**	**2.5 E+2**	**9.8 E+2**	**6.3 E+0**	**2.2 E+1**

* Future exposure assumes residential development in the waste lagoon area. Future equals Current with no residential development in this area.

** These totals assume future residential development in the waste lagoon area.

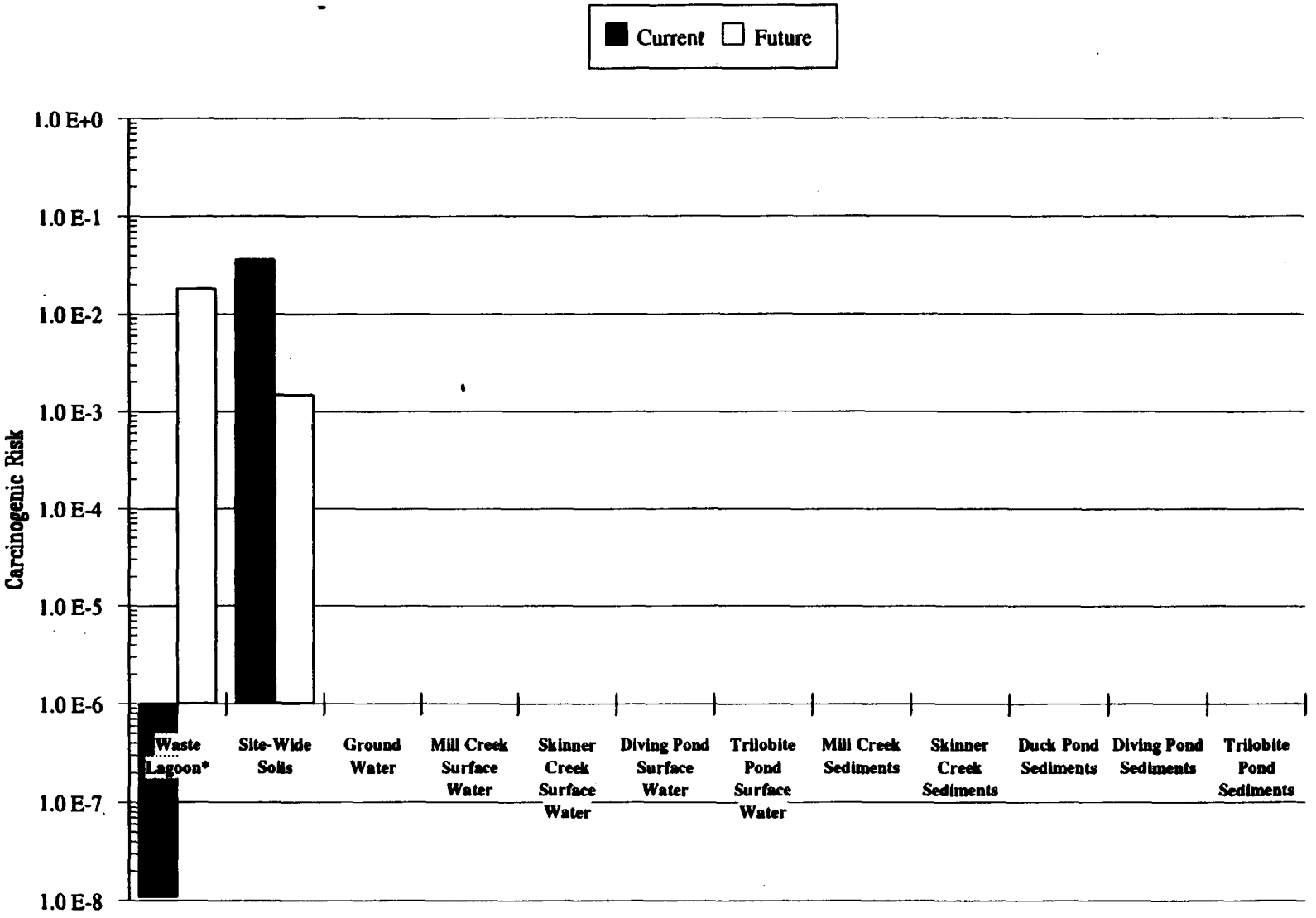
Shaded values exceed a hazard index of one.

ne = no exposure

Figures

FIGURE 7

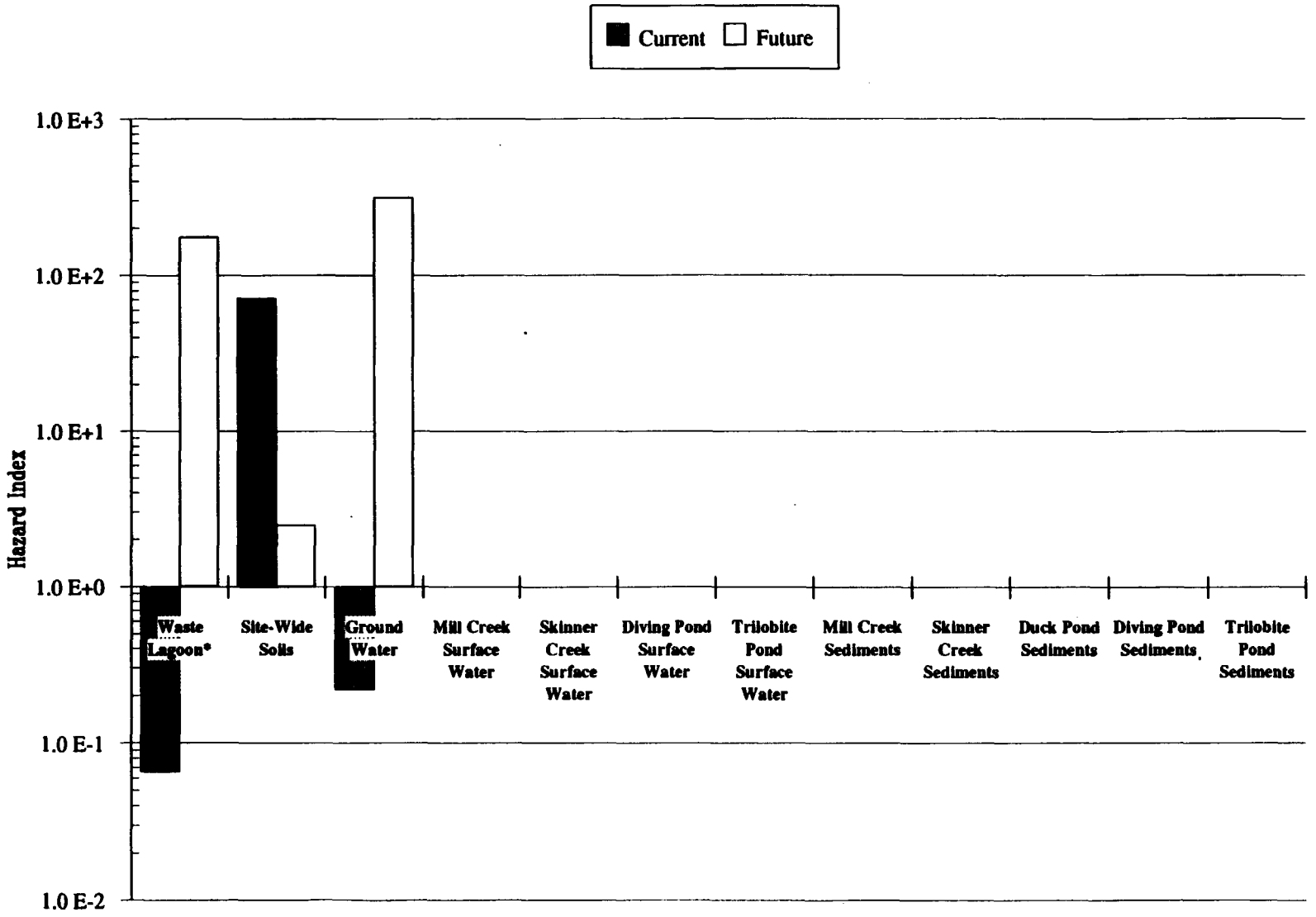
CARCINOGENIC RISK FOR OCCUPATIONAL ADULT



* Future exposure assumes residential development in the waste lagoon area. Future equals Current with no residential development in this area.

FIGURE 8

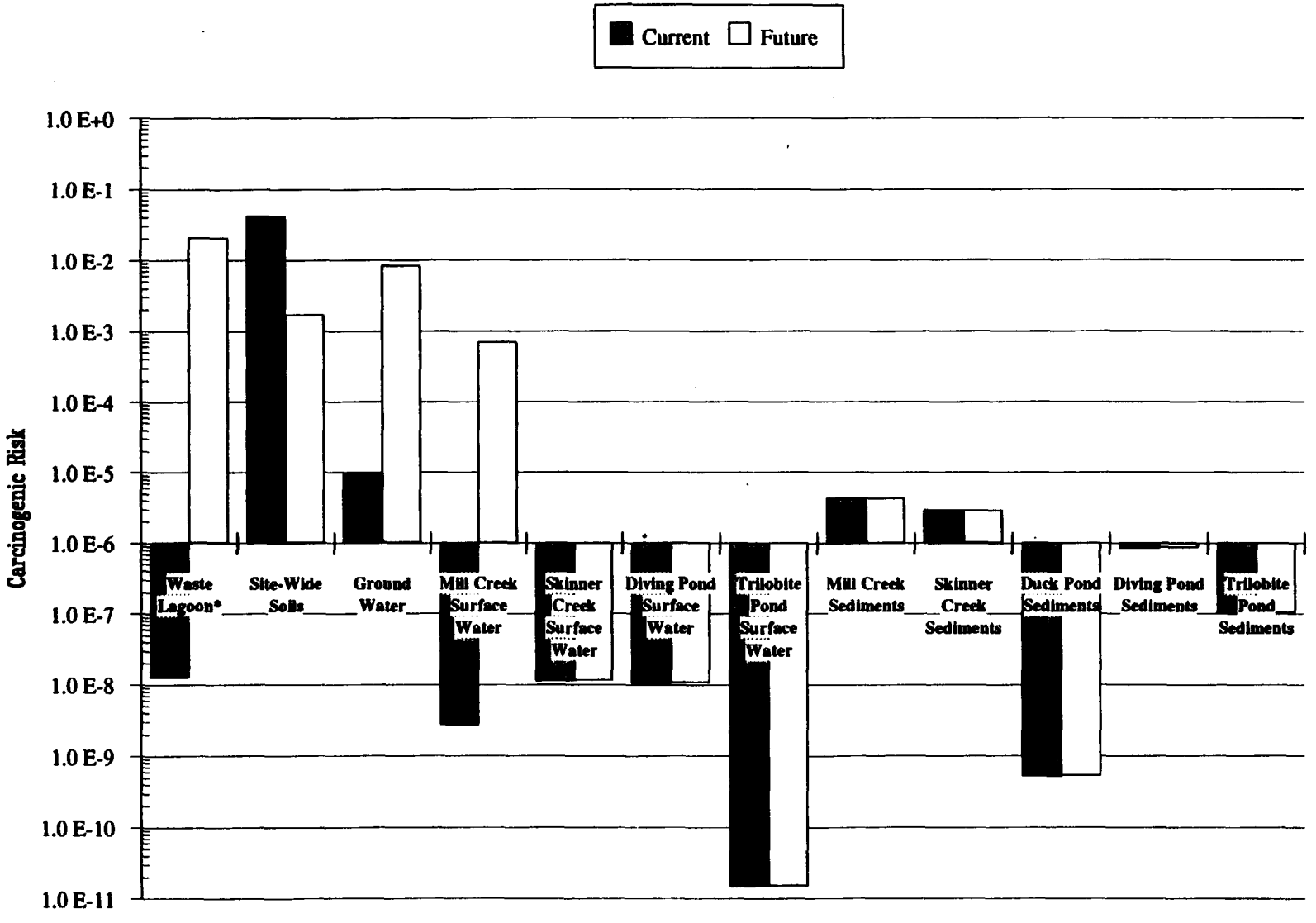
HAZARD INDICES FOR OCCUPATIONAL ADULT



* Future exposure assumes residential development in the waste lagoon area. Future equals Current with no residential development in this area.

FIGURE 9

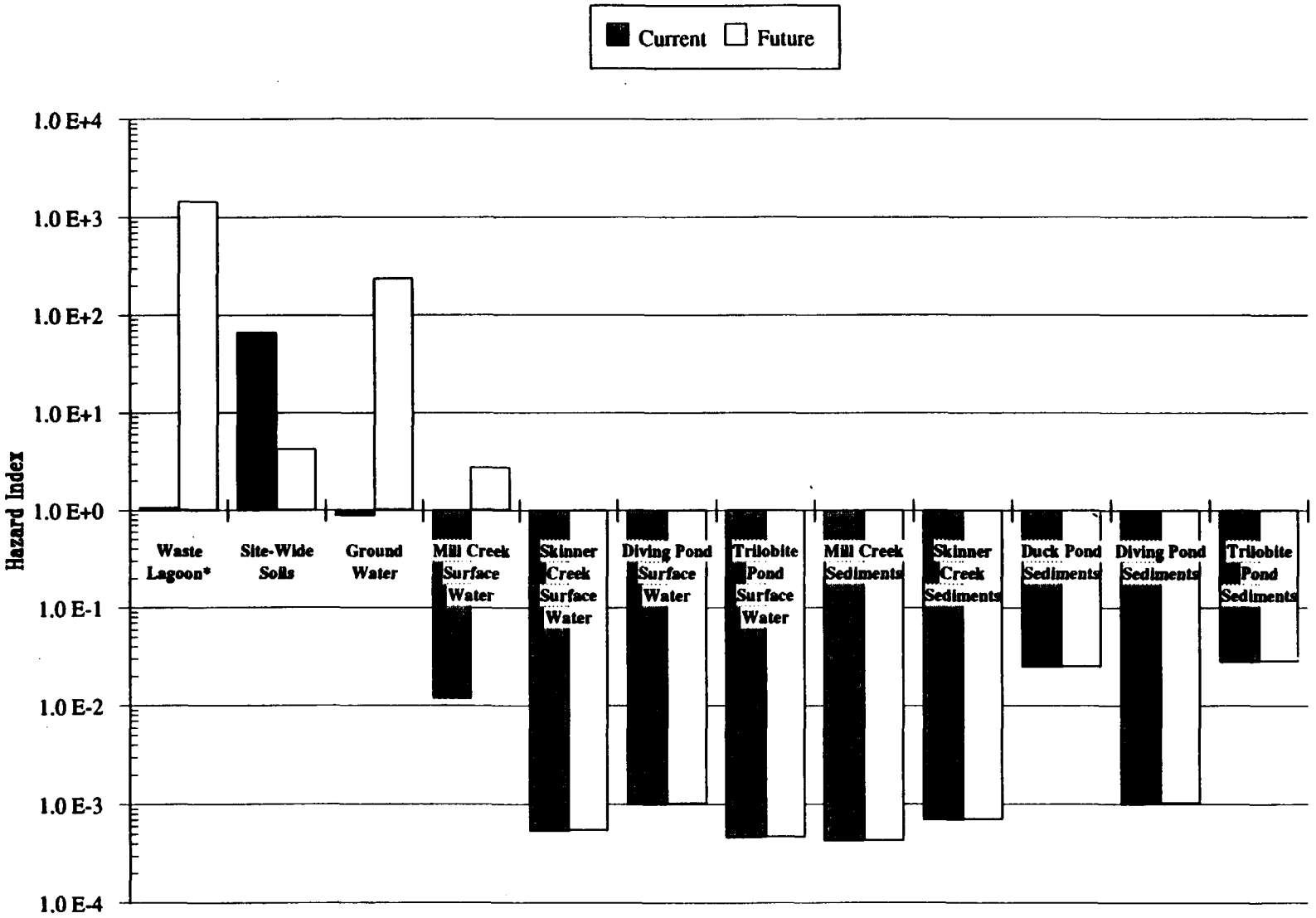
CARCINOGENIC RISK FOR RESIDENTIAL CHILD



* Future exposure assumes residential development in the waste lagoon area. Future equals Current with no residential development in this area.

FIGURE 10

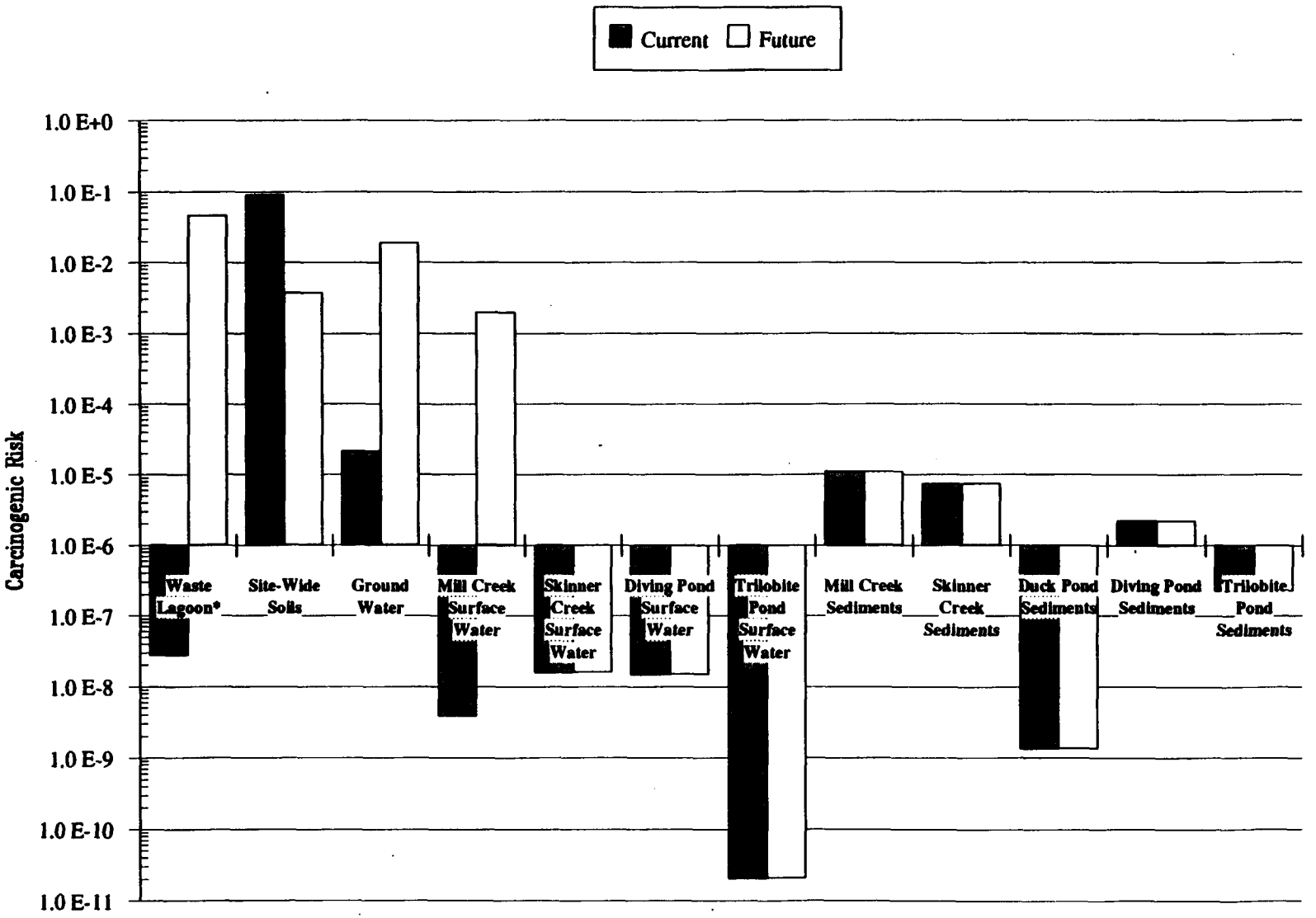
HAZARD INDICES FOR RESIDENTIAL CHILD



* Future exposure assumes residential development in the waste lagoon area. Future equals Current with no residential development in this area.

FIGURE 11

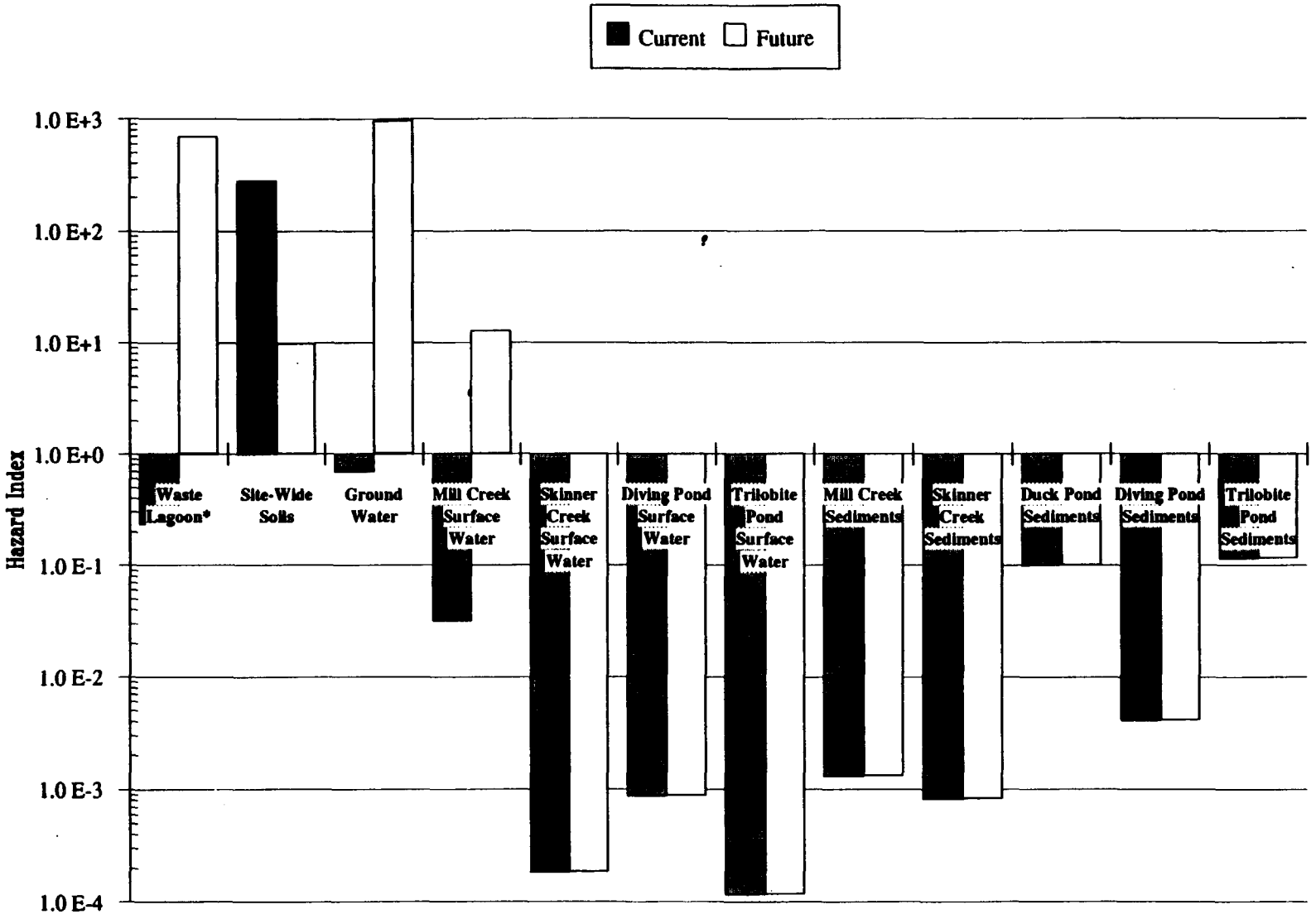
CARCINOGENIC RISK FOR RESIDENTIAL ADULT



* Future exposure assumes residential development in the waste lagoon area. Future equals Current with no residential development in this area.

FIGURE 12

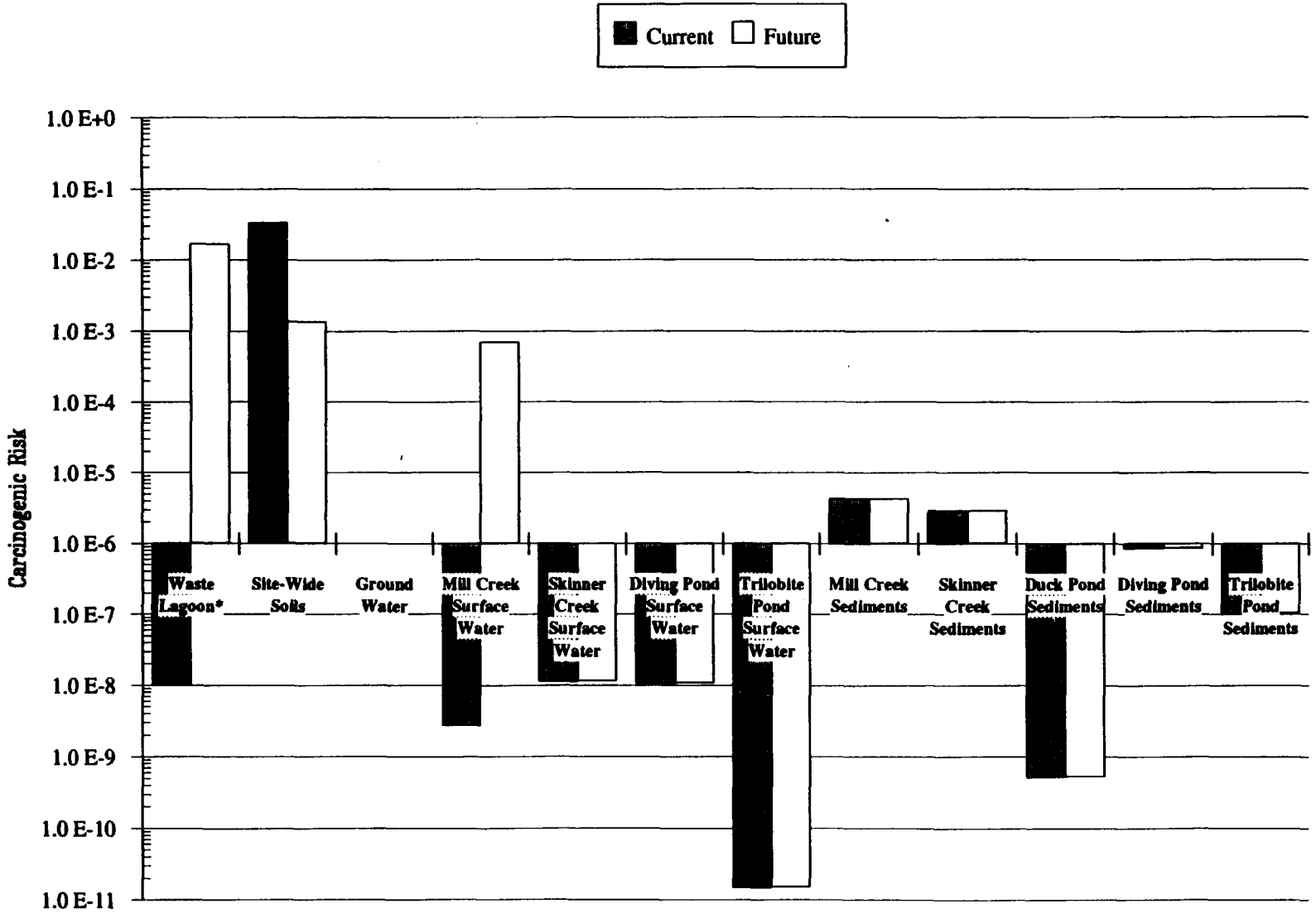
HAZARD INDICES FOR RESIDENTIAL ADULT



* Future exposure assumes residential development in the waste lagoon area. Future equals Current with no residential development in this area.

FIGURE 13

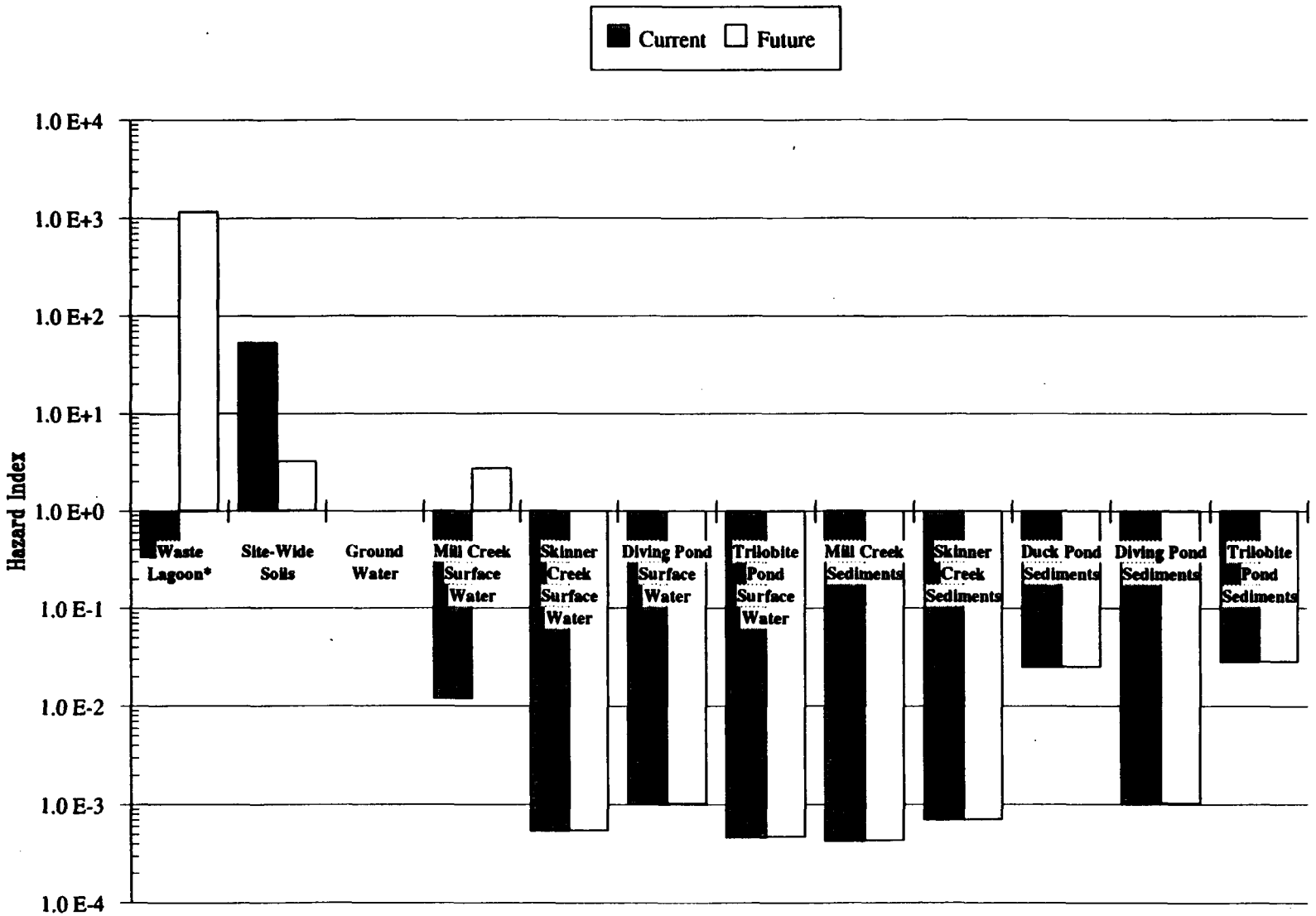
CARCINOGENIC RISK FOR RECREATIONAL CHILD



* Future exposure assumes residential development in the waste lagoon area. Future equals Current with no residential development in this area.

FIGURE 14

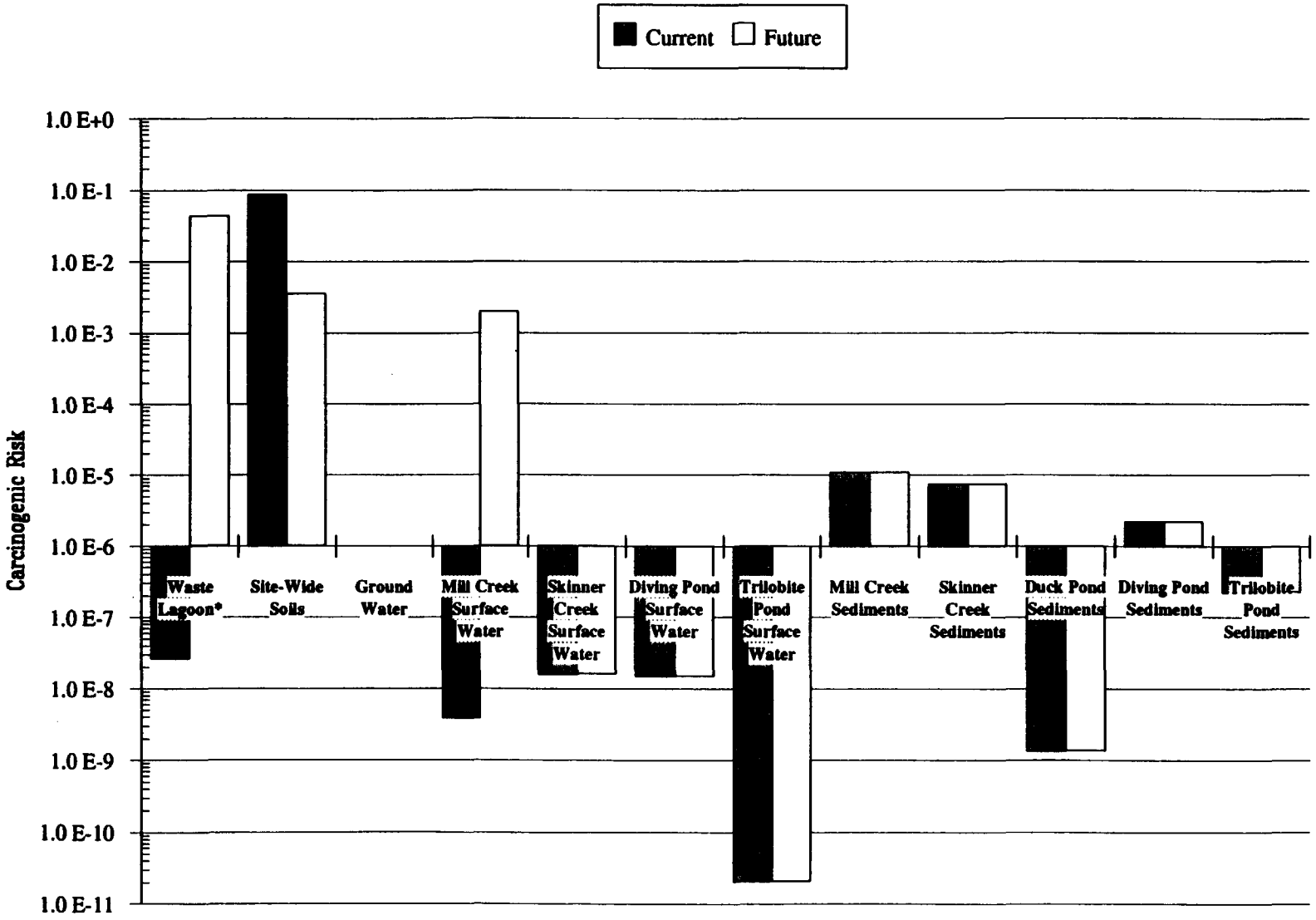
HAZARD INDICES FOR RECREATIONAL CHILD



* Future exposure assumes residential development in the waste lagoon area. Future equals Current with no residential development in this area.

FIGURE 15

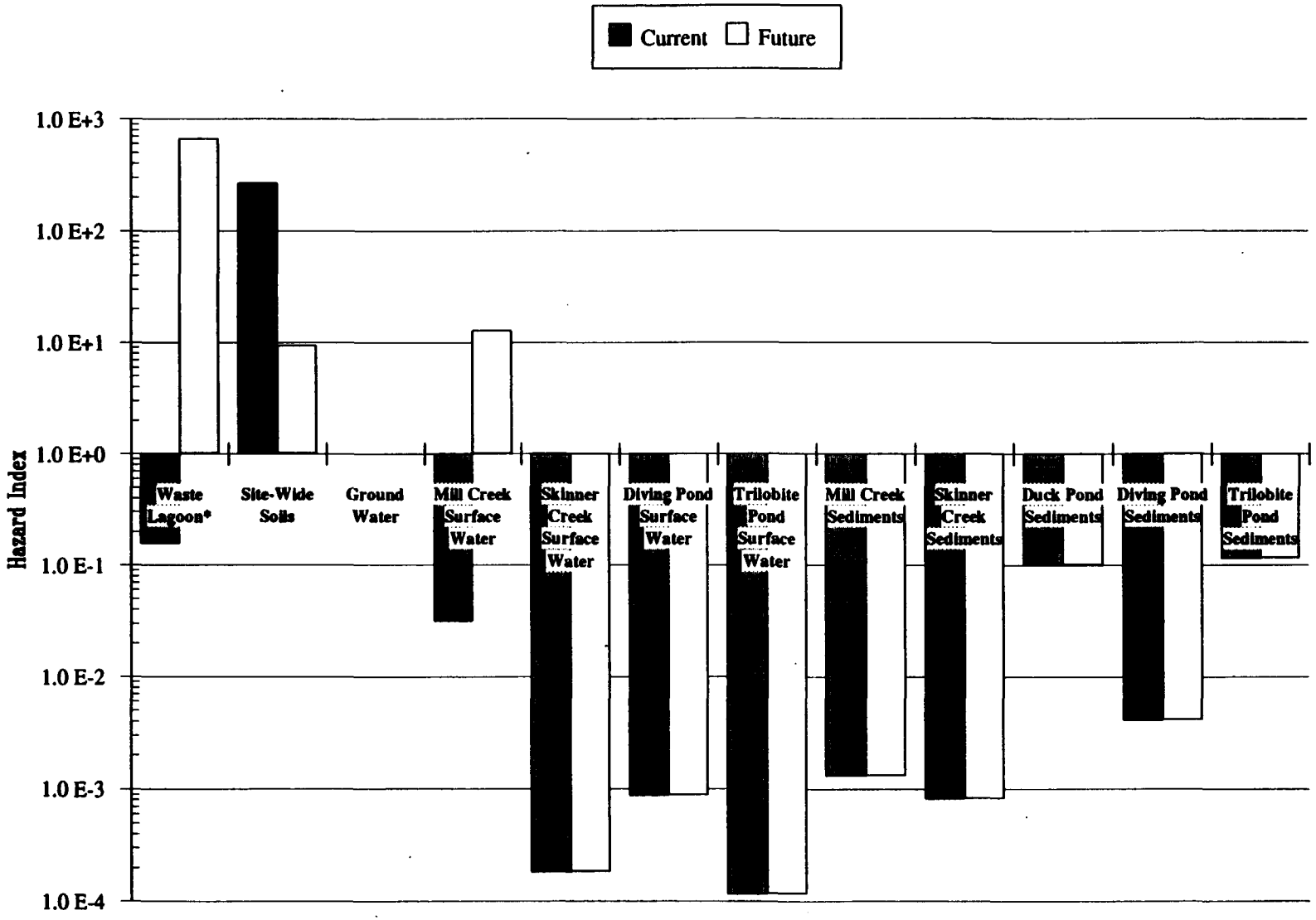
CARCINOGENIC RISK FOR RECREATIONAL ADULT



* Future exposure assumes residential development in the waste lagoon area. Future equals Current with no residential development in this area.

FIGURE 16

HAZARD INDICES FOR RECREATIONAL ADULT



* Future exposure assumes residential development in the waste lagoon area. Future equals Current with no residential development in this area.

6.0 ENVIRONMENTAL IMPACTS ON THE EAST FORK OF MILL CREEK

The Phase I remedial investigation (WESTON, 1988) included sampling of benthic macroinvertibrates and fish in the East Fork of Mill Creek and benthic macroinvertibrates in Skinner Creek. The Phase II remedial investigation (WWES, April, 1991) included analysis of surface water samples from the East Fork of Mill Creek and from Skinner Creek. Potential future concentrations of chemicals of concern that could occur in the East Fork of Mill Creek were estimated in Appendix I. This information was used to evaluate the existing and potential future environmental impacts of the Buried Lagoon area on the East Fork of Mill Creek. (These studies were planned and conducted in accordance with approved work plans before recent guidance documents on ecological assessment of hazardous waste sites became available.)

6.1 BENTHIC MACROINVERTIBRATE SAMPLING

WESTON (1988) reported the results of the benthic macroinvertIbrate survey as follows:

> A comparison of the macroinvertibrate faunas [sic] of Skinner and East Fork Mill Creeks showed similar species richness, 26 and 29 species, respectively, but notably different species composition. Eleven of the 26 species (42%) found in Skinner Creek were not found in East Fork Mill Creek; conversely, 12 of the 29 species (or 41%) found in East Fork Mill Creek were not found in Skinner Creek. The majority of the macroinvertibrate fauna in both creeks are benthic (bottom dwellers), and consequently, highly substrate-dependent. Thus, faunal differences appear to be attributable to habitat differences. Obvious physical differences between the two creeks, such as bottom material, bank type and stream cover, are due in large part to channelization of the East Fork Mill Creek in 1980.
>
> Analyses of the diversity of the quantitative and qualitative samples from Skinner Creek revealed conflicting results. The qualitative samples indicated a stable fauna while the quantitative sample produced a low diversity index, indicative of a stressed assemblage. The quantitative sample was obtained using a Surber sampler which collects all macroinvertibrates from one square foot of substrate. The qualitative sample is obtained by collecting macroinvertibrates from throughout the creek, in all available habitats. Quantitative samples are useful when comparing the abundance of organisms in different parts of a creek or creeks, especially and only if several samples are taken. Since only single Surber samples were taken from Skinner Creek and the three sections of East Fork Mill Creek, the qualitative samples probably present a more accurate picture of the diversity of each creek locality.
>
> Comparisons between the upstream, on-site, and downstream stations on East Fork Mill Creek indicated that the most diverse macroinvertibrate assemblage occurred above the site (d = 3.3). Further downstream, on the

Skinner site, diversity was lower (d = 2.8), and downstream from the site, diversity was lower still (d = 1.0).

Comparisons between the physical characteristics of East Fork Mill Creek upstream, on-site, and downstream ... reveal a more homogeneous mix of bottom material and bank-type occurred above site [sic]. As noted before, macroinvertibrates, especially benthic macroinvertibrates, are highly substrate dependent. Higher diversity values in East Fork Mill Creek upstream may be attributable to habitat and not water quality.

6.2 FISH SURVEY

WESTON (1988) reported the results of the fish survey:

In all, 195 fish representing ten species were collected from East Fork Mill Creek. Minnows (Cyprinidae) clearly dominated the fauna. Green sunfish, Lepomis cyanellus, were the only game fish present; however, individuals were greater than two inches total length. Numerous wire mesh fish traps, used to collect small fish for sale by the Skinner family, were noted in the stretch of East Fork Mill Creek from the mouth of Skinner Creek to the Penn Central railroad crossing.

Although no threatened or endangered species were collected, the southern redbelly dace, Phoxinus erythrogaster, within the boundary of the Skinner site, is notable. The southern redbelly dace has been extirpated from innumerable brooks and from large sections of Ohio, of which Franklin County, is an example (Trautman 1981).[1] Clear and shaded waters, usually spring fed with good water quality, and overhung banks are the prime habitat for this species.

Channelization, in combination with tree removal along banks, is also a major factor limiting the distribution and abundance of southern redbelly dace in Ohio (White, *et al* 1975).[2] The persistence of this species on the Skinner site following stream channelization indicates that good water quality was probably maintained; however, since intensive collecting efforts produced only a single specimen, the status of this species and apparent water quality in East Fork Mill Creek is uncertain.

No fish were seen in or collected from Skinner creek. The absence of fish in Skinner Creek was attributed by WESTON (1988) to the small size of the creek. Dump Creek, which is much smaller than Skinner Creek, presumably also lacks a fish population.

---

1 This citation was not completely referenced in the WESTON report.

2 This citation was not completely referenced in the WESTON report.

Table 6-1
Comparison of Regulatory Standards with Current and Estimated Future Concentrations of Chemicals of Concern in the East Fork of Mill Creek
Skinner Landfill
(Units in mg/L)

Chemicals of Concern	Potential ARAR's		Chemical Concentrations	
	CWA Water Quality Criteria Freshwater Acute/Chronic	Ohio EPA	Current Concentrations	Estimated Future Concentrations
INORGANICS				
Aluminum				0.000499
Arsenic		0.05 (a) -0.19(b)		0.000637
Barium		1.0 (a)	0.062943	0.560226
Cadmium	0.0039+/0.0011+ (c)	0.0056+(b)		0.000843
Chromium	0.016/0.011 (c)(Hexavalent)	0.05 (a)- 0.011(b)		0.000037
Cobalt			0.0056	0.000047
Copper	0.018+/0.012+ (c)	0.018+ (b)		0.001674
Cyanide	0.022/0.0052 (c)	0.012 (b)		0.000121
Lead	0.082/0.0032 (c)	0.05 (a)- 0.13+(b)		0.007374
Manganese				0.008663
Nickel	1.8/0.096 (c)	1.6+(b)	0.0078	0.010629
Vanadium			0.004974	0.013406
Zinc	0.095+/0.086+ (d)	1.2+ (b)		0.053103
VOLATILES				
Acetone				0.000294
Benzene	5.3/ none (c)	0.005 (e)		0.210011
2-Butanone		0.0071 (b)		0.000153
Carbon Disulfide			0.0003	
Carbon Tetrachloride	35.2/none (c)	0.005 (e)- 0.044 (b)		0.105884
Chlorobenzene		0.026 (b)		0.013208
Chloroethane				0.000512
Chloroform	28.9/1.24 (c)	0.079 (b)		0.217884
1,1-Dichloroethane				0.000853
1,2-Dichloroethane		0.005 (e)		0.001105
1,2-Dichloroethene(cis)				0.000364
1,2-Dichloroethene (trans)				0.000364
1,2-Dichloropropane				1.936721
Ethylbenzene	32/none (c)	0.062 (b)		0.025886
Methylene Chloride				0.000051
1,1,2,2-Tetrachloroethane	9.32/2.4 (c)	0.107 (b)		0.320055
Tetrachloroethene				0.035121
Toluene	17.5/none (c)	1.7 (b)		36.022959
1,1,1-Trichloroethane	18/ none(c)	0.2 (e)-0.088 (b)		0.120403
1,1,2-Trichloroethane	18/9.4 (c)	0.418 (b)		1.919426
Trichloroethene	45/21.9 (c)	0.005 (e)		0.32279
Vinyl Chloride		0.002 (e)-5.25 (b)		0.000202
Xylene (total)			0.003	0.216792
SEMI-VOLATILES				
Benzyl Alcohol				0.235583
bis(2-Chloroethyl)Ether		0.0136 (b)		0.061548
bis(2-ethylhexyl)Phthalate		0.049 (b)	0.011484	0.000572
1,2-Dichlorobenzene	1.12/0.763 (c)	0.011 (b)		0.002111
1,4-Dichlorobenzene	1.12/0.763 (c)	0.075 (e)-0.043 (b)		0.003247
Diethylphthalate		0.12 (b)	0.004	
Di-n-Butylphthalate		0.19 (b)	0.01	0.00037

6.3 CURRENT AND ESTIMATED FUTURE CONCENTRATIONS OF CHEMICALS OF CONCERN IN THE EAST FORK OF MILL CREEK

This section compares the current and estimated future concentrations of chemicals of potential concern in the East Fork of Mill Creek with Water Quality Criteria developed in accordance with the Clean Water Act and Ohio Environmental Protection Agency water quality standards. These criteria and standards are presented and discussed in "Alternatives Array Document" (WWES, 1991b).

The current concentrations of chemicals of concern that were measured in the East Fork of Mill Creek and Skinner Creek are discussed in Section 3.5.3 and are presented in Table 3-9. The estimated future concentrations of chemicals of concern in the East Fork of Mill Creek are also presented in Table 3-9. The derivation of the loads of chemicals to the creek is presented in Appendix I and the derivation of estimated future concentrations in the creek is presented in Appendix F. The current concentrations in the creek are the upper 95% confidence limit of the arithmetic mean of the analytical data for the creek (assuming the data have a log-normal distribution). The estimated future concentrations in the creek are based on the upper 95% confidence limit of the arithmetic mean of the analytical data for ground water that is expected to flow into the creek in the future (also assuming the data have a log-normal distribution).

Table 6-1 compares the state standards and federal criteria with the existing and estimated future concentrations of chemicals in the East Fork of Mill Creek. As presented on Table 6-1, none of the detected chemicals of concern exceed the current federal and state standards. The federal standards are exceeded by the estimated future concentrations of lead, toluene, 4,4'-DDT, dieldrin and hexachlorobenzene. Ohio EPA standards are exceeded by the estimated future concentrations of benzene, carbon tetrachloride, chloroform, 1,1,2,2-tetrachloroethane, toluene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethene, bis(2-chloroethyl) ether, phenol, aldrin, dieldrin, and Aroclor 1254.

Table 6-1
Comparison of Regulatory Standards with Current and Estimated Future Concentrations of Chemicals of Concern in the East Fork of Mill Creek
Skinner Landfill
(Units in mg/L)

Chemicals of Concern	Potential ARAR's		Chemical Concentrations	
	CWA Water Quality Criteria Freshwater Acute/Chronic	Ohio EPA	Current Concentrations	Estimated Future Concentrations
Di-n-Octyl Phthalate			0.0043	
2-Methylnaphthalene				0.004644
2-Methylphenol				0.034251
4-Methylphenol				0.051014
Naphthalene	2.3/0.62 (c)	0.044 (b)		0.028772
Pentachlorophenol	0.055/0.0032 (c)	0.066*		0.001851
Phenol		0.37 (b)	0.007729	0.552873
PESTICIDES				
Aldrin	0.003/none (c)	0.00001 (b)		0.001207
4,4'-DDT	0.0011/0.000001 (c)			0.000016
Dieldrin	0.0025/1.9x10-6 (c)	8.6x10-7 (b)		0.000552
Hexachlorobenzene	0.006/0.00368 (f)			0.13408
Hexachlorobutadiene	0.09/0.0093 (c)	0.5 (b)		0.002604
1,2,3,4,5,7,7-Heptachoronorborene				0.013683
Aroclor 1254	0.002/0.000014 (c)	7.9x10-7 (b)		0.000013

SOURCES:
Methods for estimation of future concentrations presented in Appendices F and I.
(a) OAC 3745-81-11
(b) OAC 3745-1 - Mill and Skinner Creeks are Warmwater Habitats.
(c) Water Quality Criteria USEPA (September 2, 1986)
(d) 52 Fed. Reg. 6213 (March 2, 1987)
(e) OAC 3745-81-11
(f) 55 Fed. Reg. 19986 (May 14,1990)
+ Hardness dependent criteria. Hardness of 100mg/l CaCO3 assumed.
* pH-dependent criteria. Average measured pH (8.32) used.
Shaded values exceed either federal or state standards.

7.0 SUMMARY

The Skinner Landfill accepted a variety of wastes since 1934 and was placed on the U.S. EPA National Priority List (NPL) in 1982. The Skinner Landfill was closed in the fall of 1990.

7.1 CHEMICALS OF POTENTIAL CONCERN

The wastes disposed of at the site included municipal trash, chemical waste, debris and metal scraps. Chemicals of potential concern were identified based on sampling of soil, ground water and surface water at the site and at background locations. The site history, analytical methods, quantitation limits, data qualifiers, concentrations in blanks, and background concentrations were evaluated as described in the Superfund Human Health Evaluation Manual (U. S. EPA, 1989a). The summary of chemicals identified as chemicals of potential concern based on this evaluation are listed in Table 2-9.

7.2 EXPOSURE ASSESSMENT

Wastes were disposed of in abandoned gravel excavations and soils. The potential migration pathways are leaching of chemicals of concern from soils to ground water, movement of contaminated ground water to surface water and sediments, and volatilization of chemicals to air. No air monitoring or modeling was performed due to the low levels of volatile chemicals found in surface or near-surface soils.

Potential routes of exposure include ingestion of and direct contact with impacted soils, ingestion of impacted ground water, dermal contact with ground water, inhalation of chemicals that volatilize from ground water to air during showering, and ingestion of and direct contact with surface water and sediments. Inhalation of fugitive dust and volatile chemicals is also a potential exposure route but was not evaluated quantitatively because emissions from surface soil would likely be low, and because budgetary constraints limited the scope of the investigation. Tables 3-1 and 3-2 present the potential exposure routes for the current and future populations, respectively. The exposure points are the site and nearby residences.

The current potentially exposed populations are occupational workers at the site, residents living on and near the site, and persons who may recreate in the area. The primary future potentially exposed population is residential, as it was assumed that the site could be developed for residential purposes with the exception of the waste lagoon

area. The future use scenario developed for the site also includes recreational populations. The residential and recreational populations include subpopulations of adults and children; the occupational population consists only of adults.

Exposure concentrations were based on measured concentrations of chemicals of concern in the soil, ground water, and surface water. Tables 3-4 through 3-9 present the concentrations of chemicals of concern used in the risk assessment.

The upper 95% confidence limit of the arithmetic mean of surficial soil concentrations of chemicals of concern were used to estimate the current exposure of all populations. The upper 95% confidence limit of the arithmetic mean of overall soil concentrations of chemicals of concern were used to estimate the future exposure of all populations. Maximum ground water concentrations and the upper 95% confidence limit of the arithmetic mean of surface water and sediment concentrations of chemicals of concern were used to estimate the exposure of all current and future populations.

Intake equations from the Human Health Evaluation Manual (U.S. EPA, 1989a) were used to estimate potential chemical intakes by the exposed populations. Standard exposure assumptions, conservative estimates, and best professional judgement were used to estimate parameters used in these equations. Table 3-10 presents the values of parameters used in the intake equations.

Three classes of compounds were grouped and evaluated using toxicity information for one of the known constituents. These classes include the dibenzo-p-dioxins and dibenzofurans; several carcinogenic polynuclear aromatic hydrocarbons, and PCB Aroclors 1254 and 1260. The dioxins and dibenzofurans were evaluated using a toxicity equivalency factor developed by Bellin and Barnes (1989) which allows for the expression of each compound as an equivalent of 2,3,7,8-TCDD. The PAHs, many of which have no toxicological information, were evaluated using toxicity information for benzo(a)pyrene, a known human carcinogen. Two PCB Aroclors (1254 and 1260) were grouped together and evaluated using toxicity information on PCBs obtained from the U.S. EPA IRIS database. Additionally, toxicity information for chlordane was used for alpha- and gamma-chlordane.

7.3 TOXICITY ASSESSMENT

The Toxicity Assessment identified the available toxicity values for each chemical of concern, including chronic and sub-chronic reference doses and slope factors. The IRIS

database (U.S. EPA, 1989b) and the Health Effects Assessment Summary Tables (HEAST; U.S. EPA, 1990) were consulted for information. The scientific literature was searched to obtain information to estimate toxicity values for some contaminants. Four contaminants did not have toxicity values available and literature searches did not locate toxicological data appropriate for use in estimating reference doses or slope factors. The reference doses and carcinogenic slope factors for the contaminants used in the assessment are presented in Tables 4-1, 4-2, and 4-3.

7.4 RISK CHARACTERIZATION

Intakes for each chemical of concern were evaluated for each current and potential future exposure pathway. For carcinogens, intakes were compared with a one-in-one million risk level; for non-carcinogens, intakes were compared with reference doses. Carcinogenic slope factors and hazard indices were calculated for each exposed population under each exposure scenario.

Cancer risks from various exposure pathways were assumed to be additive. Table 5-45 summarizes the cancer risks for multiple pathway exposures. The total carcinogenic risks for current occupational and residential adults are 3.6×10^{-2} and 9.1×10^{-2}, respectively. For future occupational and residential adults, the total carcinogenic risks are 2.0×10^{-2} and 7.0×10^{-2}, respectively (assuming residential development will occur in the waste lagoon area in the future). The total cancer risk for current recreational adults is 8.6×10^{-2}; for future recreational adults, the total cancer risk is 7.0×10^{-2}. Each of these risks are greater than one-in-one-million.

The estimated cancer risk for current residential children is 4.1×10^{-2}; for current recreational children, the estimated cancer risk is 3.3×10^{-2}. For future residential children, the total estimated cancer risk is 3.1×10^{-2} (assuming residential development in the waste lagoon); assuming residential development does not occur in the waste lagoon area, the estimated cancer risk for future residential children is 1.1×10^{-2}. The estimated risks for future recreational children are 1.9×10^{-2}, assuming future residential developement of the waste lagoon area, and 2.1×10^{-3} assuming no future residential development.

The hazard indices were assumed to be additive. If the total hazard index for an exposed individual or group exceeds one, there may be non-cancer health effects. Table 5-46 summarizes the hazard indices and presents the total hazard index for each population.

The total hazard index for a current occupational worker (adult) is 7.1×10^1; for future occupational adults, the hazard index is 4.9×10^2 (assuming residential development in the waste lagoon area). For residential child populations, the total hazard index for current exposures is 6.8×10^1 and for future exposures, 1.7×10^3. For residential adults, the total hazard index for current exposures is 2.8×10^2, and for future exposures, 1.7×10^3. The hazard indices for recreational populations also exceed one for both current and potential future exposures. For current recreational children, the hazard index is 5.3×10^1; for future exposures, the hazard index is 1.2×10^3. For current recreational adults, the hazard index is 2.7×10^2; for future exposures, and the hazard index is 6.8×10^2.

These indices assume future residential development in the waste lagoon area. The total hazard indices, assuming no residential development in the waste lagoon, are slightly lower (as shown in Table 5-46). However, they still exceed one. While several conservative assumptions have been employed in developing these indices, as discussed in the uncertainty analysis in Section 5.4, they do suggest that both current and future exposures to chemicals of concern at the Skinner site may result in excess non-cancer risks to all populations.

Figures 7 through 16 summarize excess cancer risks (exceeding one-in-one-million) and hazard indices greater than one for each potentially exposed current and future population. The greatest cancer risks are associated with current exposures to pit site-wide soils and future exposures to waste lagoon and site-wide soils, ground water, and Mill Creek surface water. Similarly, the greatest potential non-carcinogenic health effects would result from exposures to site-wide soils, ground water (current and future), and Mill Creek surface water and sediments.

Cancer risks - current:
Site wide soils

Cancer Risks - future
Waste lagoon
Site wide soils
ground water
Mill Creek surface water

non ca - current
Site wide soils
ground water
Mill Creek S.W. + sediments

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Appendix A

APPENDIX A-1

SUMMARY OF CHEMICALS ANALYZED IN WASTE LAGOON AREA

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Aluminum	64 / 64	100.%	2560 - 225000	7600 - 14600
* Antimony	15 / 64	23.4%	3.4 - 23	- - -
Arsenic	62 / 64	96.9%	2 - 100	2.9 - 11
Barium	64 / 64	100.%	10.4 - 2900	49.6 - 172
Beryllium	38 / 64	59.4%	0.24 - 2.7	0.34 - 1
* Cadmium	6 / 64	9.4%	1.1 - 56.9	- - -
Calcium	63 / 64	98.4%	845 - 263000	3230 - 110000
Chromium	34 / 64	53.1%	9.6 - 1650	11 - 17
Cobalt	58 / 64	90.6%	2 - 22.3	7.4 - 12.1
Copper	46 / 64	71.9%	6.3 - 566	16 - 24
Iron	64 / 64	100.%	6450 - 54700	17300 - 25700
* Lead	50 / 64	78.1%	6.7 - 4360	10.7 - 42
Magnesium	63 / 64	98.4%	226 - 61100	1620 - 30500
Manganese	64 / 64	100.%	43 - 2430	542 - 2570
Mercury	3 / 64	4.7%	0.82 - 5.3	0.14 - 0.23
Nickel	52 / 64	81.3%	4.9 - 130	12 - 25
Potassium	61 / 61	100.%	197 - 6820	1020 - 3040
Selenium	3 / 62	4.8%	1.1 - 9.3	- - -
`ilver	9 / 62	14.5%	0.72 - 13	- - -
ɔodium	41 / 64	64.1%	152 - 6080	439 - 29600
* Thallium	10 / 62	16.1%	0.24 - 1	- - -
* Tin	2 / 2	100.%	155 - 408	- - -
Vanadium	64 / 64	100.%	3.9 - 54.1	18 - 26
Zinc	58 / 64	90.6%	18 - 826	42.8 - 116
* Cyanide	4 / 64	6.3%	2.6 - 43.6	- - -
Chloromethane	0 / 65	0%	- - -	- - -
Bromomethane	0 / 65	0%	- - -	- - -
Vinyl Chloride	0 / 65	0%	- - -	- - -
Chloroethane	0 / 65	0%	- - -	- - -
* Methylene Chloride	7 / 67	10.4%	0.0064 - 5.3	0.0019 - 0.0019
* Acetone	10 / 67	14.9%	0.014 - 140	- - -
Carbon Disulfide	0 / 67	0%	- - -	0.01 - 0.01
1,1-Dichloroethene	0 / 65	0%	- - -	- - -
1,1-Dichloroethane	0 / 65	0%	- - -	- - -
1,2-Dichloroethene	1 / 65	1.5%	0.002 - 0.002	- - -
* Chloroform	5 / 65	7.7%	0.02 - 33	- - -
* 1,2-Dichloroethane	16 / 65	24.6%	0.003 - 210	- - -
* 2-Butanone	3 / 67	4.5%	0.24 - 39	- - -
* 1,1,1-Trichloroethane	4 / 67	6.%	0.026 - 63	0.009 - 0.025
* Carbon Tetrachloride	4 / 65	6.2%	0.041 - 160	- - -
Vinyl Acetate	0 / 65	0%	- - -	- - -
Bromodichloromethane	0 / 65	0%	- - -	- - -
,2-Dichloropropane	15 / 65	23.1%	0.14 - 340	- - -
cis-1,3-Dichloropropene	0 / 65	0%	- - -	- - -

APPENDIX A-1

SUMMARY OF CHEMICALS ANALYZED IN WASTE LAGOON AREA

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
* Trichloroethene	9 / 65	13.8%	0.006 - 140	- - -
Dibromochloromethane	0 / 65	0%	- - -	- - -
* 1,1,2-Trichloroethane	17 / 65	26.2%	0.073 - 370	- - -
* Benzene	13 / 67	19.4%	0.007 - 60	- - -
trans-1,3-Dichloropropene	0 / 65	0%	- - -	- - -
Bromoform	0 / 65	0%	- - -	- - -
4-Methyl-2-Pentanone	0 / 65	0%	- - -	- - -
2-Hexanone	0 / 65	0%	- - -	- - -
* Tetrachloroethene	8 / 67	11.9%	0.049 - 44	- - -
* 1,1,2,2-Tetrachloroethane	6 / 65	9.2%	0.04 - 130	- - -
* Toluene	50 / 67	74.6%	0.001 - 31000	0.012 - 2.5
* Chlorobenzene	3 / 65	4.6%	5 - 15	- - -
* Ethylbenzene	29 / 65	44.6%	0.0008 - 98	- - -
Styrene	3 / 65	4.6%	0.41 - 25	- - -
* Xylene (total)	33 / 65	50.8%	0.001 - 200	- - -
* Phenol	13 / 72	18.1%	0.48 - 26	- - -
* bis(2-Chloroethyl)Ether	8 / 72	11.1%	0.22 - 21	- - -
2-Chlorophenol	0 / 72	0%	- - -	- - -
',3-Dichlorobenzene	12 / 72	16.7%	0.043 - 230	- - -
.,4-Dichlorobenzene	11 / 72	15.3%	0.13 - 180	- - -
* Benzyl Alcohol	7 / 72	9.7%	0.94 - 9.2	- - -
* 1,2-Dichlorobenzene	9 / 72	12.5%	0.43 - 94	- - -
* 2-Methylphenol	9 / 72	12.5%	0.17 - 7.8	- - -
bis(2-Chloroisopropyl)Ether	0 / 72	0%	- - -	- - -
* 4-Methylphenol	9 / 72	12.5%	0.57 - 26	- - -
N-Nitroso-Di-n-Propylamine	1 / 72	1.4%	0.54 - 0.54	- - -
* Hexachloroethane	4 / 72	5.6%	0.69 - 19	- - -
Nitrobenzene	2 / 72	2.8%	0.34 - 23	- - -
Isophorone	0 / 72	0%	- - -	- - -
2-Nitrophenol	0 / 72	0%	- - -	- - -
2,4-Dimethylphenol	3 / 72	4.2%	0.19 - 1.8	- - -
* Benzoic Acid	19 / 72	26.4%	1.6 - 1100	- - -
bis(2-Chloroethoxy)Methane	0 / 72	0%	- - -	- - -
2,4-Dichlorophenol	0 / 72	0%	- - -	- - -
1,2,4-Trichlorobenzene	2 / 72	2.8%	0.3 - 1.5	- - -
* Naphthalene	33 / 72	45.8%	0.11 - 610	- - -
4-Chloroaniline	0 / 72	0%	- - -	- - -
4-Chloro-3-Methylphenol	0 / 72	0%	- - -	- - -
* 2-Methylnaphthalene	31 / 72	43.1%	0.036 - 220	- - -
2,4,6-Trichlorophenol	0 / 72	0%	- - -	- - -
2,4,5-Trichlorophenol	0 / 72	0%	- - -	- - -
2-Chloronaphthalene	0 / 72	0%	- - -	- - -
-Nitroaniline	0 / 72	0%	- - -	- - -
* Dimethyl Phthalate	5 / 72	6.9%	0.12 - 67	- - -

APPENDIX A-1

SUMMARY OF CHEMICALS ANALYZED IN WASTE LAGOON AREA

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
* Acenaphthylene	6 / 73	8.2%	1 - 41	- - -
2,6-Dinitrotoluene	0 / 72	0%	- - -	- - -
3-Nitroaniline	0 / 72	0%	- - -	- - -
* Acenaphthene	11 / 72	15.3%	0.035 - 7.9	- - -
2,4-Dinitrophenol	0 / 72	0%	- - -	- - -
4-Nitrophenol	1 / 72	1.4%	1.5 - 1.5	- - -
* Dibenzofuran	8 / 72	11.1%	0.079 - 7	- - -
2,4-Dinitrotoluene	0 / 72	0%	- - -	- - -
Diethylphthalate	0 / 72	0%	- - -	- - -
4-Chlorophenyl-phenylether	0 / 72	0%	- - -	- - -
* Fluorene	14 / 72	19.4%	0.067 - 34	- - -
4-Nitroaniline	0 / 72	0%	- - -	- - -
4,6-Dinitro-2-Methylphenol	0 / 72	0%	- - -	- - -
N-Nitrosodiphenylamine	0 / 72	0%	- - -	0.11 - 0.11
4-Bromophenyl-phenylether	0 / 72	0%	- - -	- - -
Pentachlorophenol	0 / 72	0%	- - -	- - -
* Phenanthrene	28 / 73	38.4%	0.058 - 110	0.05 - 0.21
* Anthracene	9 / 73	12.3%	0.19 - 84	- - -
Di-n-Butylphthalate	12 / 73	16.4%	0.052 - 15	0.073 - 0.073
Fluoranthene	18 / 73	24.7%	0.049 - 31	0.06 - 0.39
* Pyrene	16 / 73	21.9%	0.12 - 48	0.07 - 0.45
* Butylbenzylphthalate	13 / 73	17.8%	0.063 - 25	- - -
3,3'-Dichlorobenzidine	0 / 72	0%	- - -	- - -
* Benzo(a)Anthracene	10 / 73	13.7%	0.43 - 15	0.04 - 0.25
* Chrysene	10 / 73	13.7%	0.56 - 17	0.06 - 0.33
* bis(2-Ethylhexyl)Phthalate	23 / 73	31.5%	0.053 - 150	0.091 - 0.091
* Di-n-Octyl Phthalate	5 / 73	6.8%	3.9 - 10	- - -
* Benzo(b)Fluoranthene	8 / 73	11.%	0.55 - 7	0.1 - 0.6
* Benzo(k)Fluoranthene	7 / 73	9.6%	0.29 - 5	- - -
* Benzo(a)Pyrene	8 / 72	11.1%	0.38 - 10	- - -
* Indeno(1,2,3-cd)Pyrene	6 / 72	8.3%	0.2 - 3.4	0.12 - 0.37
Dibenzo(a,h)Anthracene	1 / 72	1.4%	0.77 - 0.77	- - -
* Benzo(g,h,i)Perylene	5 / 73	6.8%	0.16 - 4.1	0.51 - 0.51
alpha-BHC	0 / 66	0%	- - -	- - -
* beta-BHC	2 / 66	3.%	0.0077 - 0.0096	- - -
delta-BHC	0 / 66	0%	- - -	- - -
gamma-BHC (Lindane)	0 / 66	0%	- - -	- - -
* Heptachlor	15 / 66	22.7%	0.0082 - 52	- - -
* Aldrin	3 / 66	4.5%	0.64 - 11	- - -
Heptachlor epoxide	0 / 66	0%	- - -	- - -
Endosulfan I	0 / 66	0%	- - -	- - -
* Dieldrin	2 / 66	3.%	1.7 - 1.9	- - -
4,4'-DDE	0 / 66	0%	- - -	- - -
Endrin	0 / 66	0%	- - -	- - -

APPENDIX A-1

SUMMARY OF CHEMICALS ANALYZED IN WASTE LAGOON AREA

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Endosulfan II	0 / 66	0%	- - -	- - -
* 4,4'-DDD	1 / 66	1.5%	0.079 - 0.079	- - -
Endosulfan sulfate	0 / 66	0%	- - -	- - -
* 4,4'-DDT	1 / 66	1.5%	0.055 - 0.055	- - -
Methoxychlor	0 / 66	0%	- - -	- - -
* Endrin ketone	7 / 66	10.6%	0.045 - 84	- - -
alpha-Chlordane	1 / 66	1.5%	8.7 - 8.7	- - -
* gamma-Chlordane	5 / 66	7.6%	1.8 - 44	- - -
Toxaphene	0 / 66	0%	- - -	- - -
Aroclor-1016	0 / 66	0%	- - -	- - -
Aroclor-1221	0 / 66	0%	- - -	- - -
Aroclor-1232	0 / 66	0%	- - -	- - -
Aroclor-1242	0 / 66	0%	- - -	- - -
* Aroclor-1248	2 / 66	3.%	0.55 - 0.78	- - -
Aroclor-1254	0 / 66	0%	- - -	- - -
* Aroclor-1260	2 / 66	3.%	0.46 - 1.2	- - -
* Hexachlorobenzene	87 / 157	55.4%	0.00093 - 1800	0.000225 - 0.0038
* Hexachlorocylopentadiene	27 / 158	17.1%	0.17 - 4300	0.0175 - 0.355
Hexachlorobutadiene	42 / 156	26.9%	0.0012 - 260	0.00055 - 0.035
Octachlorocyclopentene	23 / 76	30.3%	0.83 - 23000	0.00405 - 0.013
* Heptachloronorborene	47 / 83	56.6%	0.0015 - 2500	0.0017 - 0.019
* Chlordene	49 / 82	59.8%	0.0011 - 1200	0.000485 - 0.0016
* 2,3,7,8-TCDD	2 / 63	3.2%	0.0000276 - 0.0000294	- - -
* Total TETRA CDD	3 / 63	4.8%	0.0000276 - 0.0001402	- - -
* Total PENTA CDD	6 / 63	9.5%	0.0000008 - 0.0001727	- - -
* Total HEXA CDD	4 / 63	6.3%	0.0000196 - 0.0001891	- - -
* Total HEPTA CDD	4 / 63	6.3%	0.000105 - 0.000309	- - -
* Total OCTA CDD	1 / 63	1.6%	0.003165 - 0.003165	- - -
* 2,3,7,8-TCDF	3 / 62	4.8%	0.0000096 - 0.000022	- - -
* Total TETRA CDF	12 / 62	19.4%	0.0000074 - 0.0023047	- - -
* Total PENTA CDF	10 / 63	15.9%	0.0000103 - 0.0021574	- - -
* Total HEXA CDF	6 / 63	9.5%	0.0000717 - 0.0054693	- - -
* Total HEPTA CDF	8 / 62	12.9%	0.000104 - 0.003731	- - -
* Total OCTA CDD	8 / 63	12.7%	0.000019 - 0.015109	- - -

- - - Not Detected

* Identified as a Chemical of Concern in this Area of Concern

APPENDIX A-2

SUMMARY OF CHEMICALS ANALYZED IN SITE-WIDE SOILS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Deletions	Range of Detected Concentrations	Range of Background Concentrations
Aluminum	46 / 46	100.%	2450 - 18100	7600 - 14600
* Antimony	9 / 46	19.6%	4.9 - 14.9	- - -
Arsenic	37 / 46	80.4%	3.3 - 15	2.9 - 11
Barium	45 / 46	97.8%	7 - 460	49.6 - 172
Beryllium	27 / 46	58.7%	0.33 - 2.3	0.34 - 1
* Cadmium	7 / 46	15.2%	0.54 - 11	- - -
Calcium	46 / 46	100.%	5320 - 210000	3230 - 110000
* Chromium	44 / 46	95.7%	6.7 - 97	11 - 17
Cobalt	42 / 46	91.3%	3.1 - 21.2	7.4 - 12.1
* Copper	34 / 46	73.9%	12 - 574	16 - 24
Iron	46 / 46	100.%	6980 - 61600	17300 - 25700
* Lead	46 / 46	100.%	3.7 - 1030	10.7 - 42
Magnesium	46 / 46	100.%	2250 - 63200	1620 - 30500
Manganese	46 / 46	100.%	337 - 3630	542 - 2570
Mercury	9 / 46	19.6%	0.1 - 1	0.14 - 0.23
Nickel	31 / 46	67.4%	7.9 - 86	12 - 25
Potassium	46 / 46	100.%	584 - 3070	1020 - 3040
Selenium	1 / 46	2.2%	0.24 - 0.24	- - -
* Silver	9 / 46	19.6%	0.54 - 4.3	- - -
Sodium	29 / 46	63.%	86.8 - 2540	439 - 29600
Thallium	7 / 46	15.2%	0.26 - 0.48	- - -
Tin	1 / 20	5.%	14 - 14	- - -
Vanadium	46 / 46	100.%	8 - 47.1	18 - 26
* Zinc	45 / 46	97.8%	36.2 - 10200	42.8 - 116
* Cyanide	3 / 46	6.5%	0.84 - 1.8	- - -
Chloromethane	0 / 47	0%	- - -	- - -
Bromomethane	0 / 47	0%	- - -	- - -
Vinyl Chloride	0 / 47	0%	- - -	- - -
Chloroethane	0 / 47	0%	- - -	- - -
* Methylene Chloride	10 / 47	21.3%	0.0014 - 7.9	0.0019 - 0.0019
* Acetone	9 / 47	19.1%	0.0089 - 34	- - -
Carbon Disulfide	0 / 47	0%	- - -	0.01 - 0.01
1,1-Dichloroethene	0 / 47	0%	- - -	- - -
1,1-Dichloroethane	0 / 47	0%	- - -	- - -
1,2-Dichloroethene	0 / 47	0%	- - -	- - -
Chloroform	1 / 47	2.1%	0.003 - 0.003	- - -
1,2-Dichloroethane	0 / 47	0%	- - -	- - -
* 2-Butanone	2 / 47	4.3%	0.031 - 0.045	- - -
1,1,1-Trichloroethane	1 / 47	2.1%	0.0049 - 0.0049	0.009 - 0.025
Carbon Tetrachloride	0 / 47	0%	- - -	- - -
Vinyl Acetate	0 / 47	0%	- - -	- - -
Bromodichloromethane	0 / 47	0%	- - -	- - -
1,2-Dichloropropane	0 / 47	0%	- - -	- - -
cis-1,3-Dichloropropene	0 / 47	0%	- - -	- - -
Trichloroethene	0 / 47	0%	- - -	- - -

APPENDIX A-2

SUMMARY OF CHEMICALS ANALYZED IN SITE-WIDE SOILS

Units in mg/Kg

	Compound Name	# of Detections	Percentage of Deletions	Range of Detected Concentrations	Range of Background Concentrations
	Dibromochloromethane	0 / 47	0%	- - -	- - -
	1,1,2-Trichloroethane	0 / 47	0%	- - -	- - -
*	Benzene	4 / 47	8.5%	0.00049 - 0.0022	- - -
	trans-1,3-Dichloropropene	0 / 47	0%	- - -	- - -
	Bromoform	0 / 47	0%	- - -	- - -
	4-Methyl-2-Pentanone	0 / 47	0%	- - -	- - -
	2-Hexanone	0 / 47	0%	- - -	- - -
*	Tetrachloroethene	6 / 47	12.8%	0.0021 - 2.7	- - -
	1,1,2,2-Tetrachloroethane	0 / 47	0%	- - -	- - -
*	Toluene	16 / 47	34.%	0.001 - 0.36	0.012 - 2.5
*	Chlorobenzene	1 / 47	2.1%	0.002 - 0.002	- - -
*	Ethylbenzene	4 / 47	8.5%	0.001 - 0.002	- - -
	Styrene	0 / 47	0%	- - -	- - -
*	Xylene (total)	10 / 47	21.3%	0.001 - 0.016	- - -
	Phenol	0 / 45	0%	- - -	- - -
	bis(2-Chloroethyl)Ether	0 / 45	0%	- - -	- - -
	2-Chlorophenol	0 / 45	0%	- - -	- - -
	1,3-Dichlorobenzene	0 / 45	0%	- - -	- - -
	1,4-Dichlorobenzene	0 / 45	0%	- - -	- - -
	Benzyl Alcohol	0 / 45	0%	- - -	- - -
	1,2-Dichlorobenzene	0 / 45	0%	- - -	- - -
	2-Methylphenol	0 / 45	0%	- - -	- - -
	bis(2-Chloroisopropyl)Ether	0 / 45	0%	- - -	- - -
*	4-Methylphenol	2 / 45	4.4%	0.11 - 0.14	- - -
	N-Nitroso-Di-n-Propylamine	0 / 45	0%	- - -	- - -
	Hexachloroethane	0 / 45	0%	- - -	- - -
	Nitrobenzene	0 / 45	0%	- - -	- - -
	Isophorone	1 / 45	2.2%	0.21 - 0.21	- - -
	2-Nitrophenol	0 / 45	0%	- - -	- - -
	2,4-Dimethylphenol	0 / 45	0%	- - -	- - -
	Benzoic Acid	2 / 45	4.4%	0.1 - 0.19	- - -
	bis(2-Chloroethoxy)Methane	0 / 45	0%	- - -	- - -
	2,4-Dichlorophenol	0 / 45	0%	- - -	- - -
	1,2,4-Trichlorobenzene	0 / 45	0%	- - -	- - -
*	Naphthalene	1 / 45	2.2%	0.22 - 0.22	- - -
	4-Chloroaniline	0 / 45	0%	- - -	- - -
	4-Chloro-3-Methylphenol	0 / 45	0%	- - -	- - -
*	2-Methylnaphthalene	1 / 45	2.2%	0.064 - 0.064	- - -
	2,4,6-Trichlorophenol	0 / 45	0%	- - -	- - -
	2,4,5-Trichlorophenol	0 / 45	0%	- - -	- - -
	2-Chloronaphthalene	0 / 45	0%	- - -	- - -
	2-Nitroaniline	0 / 45	0%	- - -	- - -
	Dimethyl Phthalate	0 / 45	0%	- - -	- - -
	Acenaphthylene	1 / 45	2.2%	0.94 - 0.94	- - -
	2,6-Dinitrotoluene	0 / 39	0%	- - -	- - -

APPENDIX A-2

SUMMARY OF CHEMICALS ANALYZED IN SITE-WIDE SOILS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Deletions	Range of Detected Concentrations	Range of Background Concentrations
3-Nitroaniline	0 / 45	0%	- - -	- - -
Acenaphthene	0 / 45	0%	- - -	- - -
2,4-Dinitrophenol	0 / 45	0%	- - -	- - -
4-Nitrophenol	0 / 45	0%	- - -	- - -
Dibenzofuran	0 / 45	0%	- - -	- - -
2,4-Dinitrotoluene	0 / 45	0%	- - -	- - -
* Diethylphthalate	1 / 45	2.2%	0.078 - 0.078	- - -
4-Chlorophenyl-phenylether	0 / 45	0%	- - -	- - -
Fluorene	0 / 45	0%	- - -	- - -
4-Nitroaniline	0 / 45	0%	- - -	- - -
4,6-Dinitro-2-Methylphenol	0 / 45	0%	- - -	- - -
N-Nitrosodiphenylamine	0 / 45	0%	- - -	0.11 - 0.11
4-Bromophenyl-phenylether	0 / 45	0%	- - -	- - -
Pentachlorophenol	0 / 45	0%	- - -	- - -
* Phenanthrene	11 / 45	24.4%	0.085 - 4.2	0.05 - 0.21
* Anthracene	3 / 45	6.7%	0.092 - 0.34	- - -
* Di-n-Butylphthalate	8 / 45	17.8%	0.055 - 0.49	0.073 - 0.073
* Fluoranthene	15 / 45	33.3%	0.12 - 7.9	0.06 - 0.39
* Pyrene	15 / 45	33.3%	0.13 - 8.5	0.07 - 0.45
* Butylbenzylphthalate	4 / 45	8.9%	0.43 - 7	- - -
3,3'-Dichlorobenzidine	0 / 45	0%	- - -	- - -
* Benzo(a)Anthracene	11 / 45	24.4%	0.069 - 4.34	0.04 - 0.25
* Chrysene	15 / 45	33.3%	0.06 - 5.56	0.06 - 0.33
* bis(2-Ethylhexyl)Phthalate	16 / 45	35.6%	0.045 - 12	0.091 - 0.091
* Di-n-Octyl Phthalate	2 / 45	4.4%	0.07 - 0.96	- - -
* Benzo(b)Fluoranthene	8 / 45	17.8%	0.22 - 6.17	0.1 - 0.6
* Benzo(k)Fluoranthene	5 / 45	11.1%	0.05 - 0.76	- - -
* Benzo(a)Pyrene	6 / 45	13.3%	0.062 - 5.6	- - -
* Indeno(1,2,3-cd)Pyrene	5 / 45	11.1%	0.29 - 1.5	0.12 - 0.37
Dibenzo(a,h)Anthracene	1 / 45	2.2%	0.41 - 0.41	- - -
* Benzo(g,h,i)Perylene	5 / 45	11.1%	0.31 - 1.7	0.51 - 0.51
alpha-BHC	0 / 29	0%	- - -	- - -
beta-BHC	0 / 29	0%	- - -	- - -
delta-BHC	0 / 29	0%	- - -	- - -
gamma-BHC (Lindane)	0 / 29	0%	- - -	- - -
Heptachlor	0 / 29	0%	- - -	- - -
Aldrin	0 / 29	0%	- - -	- - -
Heptachlor epoxide	0 / 29	0%	- - -	- - -
Endosulfan I	0 / 29	0%	- - -	- - -
Dieldrin	0 / 29	0%	- - -	- - -
* 4,4'-DDE	1 / 29	3.4%	0.044 - 0.044	- - -
* Endrin	2 / 29	6.9%	0.61 - 0.65	- - -
Endosulfan II	0 / 29	0%	- - -	- - -
* 4,4'-DDD	2 / 29	6.9%	0.01 - 0.11	- - -
Endosulfan sulfate	0 / 29	0%	- - -	- - -

APPENDIX A-2

SUMMARY OF CHEMICALS ANALYZED IN SITE-WIDE SOILS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Deletions	Range of Detected Concentrations	Range of Background Concentrations
* 4,4'-DDT	2 / 29	6.9%	0.013 - 0.097	- - -
Methoxychlor	0 / 29	0%	- - -	- - -
Endrin ketone	0 / 29	0%	- - -	- - -
alpha-Chlordane	0 / 29	0%	- - -	- - -
gamma-Chlordane	0 / 29	0%	- - -	- - -
Toxaphene	0 / 29	0%	- - -	- - -
Aroclor-1016	0 / 29	0%	- - -	- - -
Aroclor-1221	0 / 29	0%	- - -	- - -
Aroclor-1232	0 / 29	0%	- - -	- - -
Aroclor-1242	0 / 29	0%	- - -	- - -
Aroclor-1248	0 / 29	0%	- - -	- - -
* Aroclor-1254	7 / 29	24.1%	0.14 - 980	- - -
Aroclor-1260	0 / 29	0%	- - -	- - -
* Hexachlorobenzene	6 / 71	8.5%	0.073 - 23	0.0038 - 0.0038
Hexachlorocylopentadiene	0 / 71	0%	- - -	0.04 - 0.047
* Hexachlorobutadiene	2 / 71	2.8%	0.0017 - 0.0041	0.0066 - 0.035
Octachlorocyclopentene	0 / 26	0%	- - -	0.013 - 0.013
* Heptachloronorborene	3 / 26	11.5%	0.0011 - 0.0027	0.0017 - 0.019
Chlordene	1 / 26	3.8%	0.0011 - 0.0011	0.0016 - 0.0016
2,3,7,8-TCDD	0 / 8	0%	- - -	- - -
Total TETRA CDD	0 / 8	0%	- - -	- - -
Total PENTA CDD	0 / 8	0%	- - -	- - -
Total HEXA CDD	0 / 8	0%	- - -	- - -
* Total HEPTA CDD	2 / 8	25.%	0.000001 - 0.000205	- - -
* Total OCTA CDD	1 / 8	12.5%	0.000192 - 0.000192	- - -
* 2,3,7,8-TCDF	1 / 8	12.5%	0.000008 - 0.000008	- - -
* Total TETRA CDF	1 / 8	12.5%	0.000008 - 0.000008	- - -
Total PENTA CDF	0 / 8	0%	- - -	- - -
Total HEXA CDF	0 / 8	0%	- - -	- - -
Total HEPTA CDF	0 / 8	0%	- - -	- - -
Total OCTA CDD	0 / 8	0%	- - -	- - -

- - - Not Detected

* Identified as a Chemical of Concern in this Area of Concern

APPENDIX A-3
SUMMARY OF CHEMICALS ANALYZED IN GROUND WATER
Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
* Aluminum	30 / 94	31.9%	0.017 - 55.6	0.034 - 0.034
Antimony	0 / 42	0%	- - -	- - -
* Arsenic	25 / 89	28.1%	0.002 - 0.0612	- - -
* Barium	83 / 94	88.3%	0.003 - 5.95	0.03 - 0.626
Beryllium	1 / 89	1.1%	0.0039 - 0.0039	0.0039 - 0.0039
* Cadmium	6 / 42	14.3%	0.00053 - 0.064	- - -
Calcium	90 / 92	97.8%	0.041 - 482	88 - 183
* Chromium	27 / 94	28.7%	0.004 - 0.137	0.01 - 0.01
* Cobalt	17 / 86	19.8%	0.003 - 0.31	0.0061 - 0.0061
* Copper	52 / 94	55.3%	0.002 - 0.163	0.0042 - 0.013
Iron	63 / 94	67.%	0.019 - 135	0.009 - 0.018
* Lead	23 / 89	25.8%	0.00282 - 0.54	- - -
Magnesium	87 / 92	94.6%	0.28 - 143	30.4 - 59.6
* Manganese	85 / 94	90.4%	0.0104 - 18	0.021 - 0.712
Mercury	8 / 89	9.%	0.0002 - 0.0029	- - -
* Nickel	26 / 89	29.2%	0.009 - 0.41	0.01 - 0.01
Potassium	82 / 92	89.1%	0.154 - 101	2.18 - 22.6
Selenium	2 / 89	2.2%	0.011 - 0.015	- - -
Silver	2 / 42	4.8%	0.012 - 0.03	- - -
Sodium	86 / 92	93.5%	2.89 - 348	5.76 - 790
Thallium	0 / 42	0%	- - -	- - -
Tin	0 / 8	0%	- - -	- - -
* Vanadium	25 / 83	30.1%	0.0021 - 0.135	0.0057 - 0.0124
* Zinc	52 / 94	55.3%	0.001 - 1.33	0.016 - 0.016
* Cyanide	2 / 89	2.2%	0.011 - 0.0235	- - -
Chloromethane	0 / 53	0%	- - -	- - -
Bromomethane	0 / 33	0%	- - -	- - -
* Vinyl Chloride	4 / 69	5.8%	0.004 - 0.048	- - -
* Chloroethane	5 / 69	7.2%	0.017 - 0.052	- - -
* Methylene Chloride	7 / 94	7.4%	0.003 - 0.014	- - -
* Acetone	13 / 89	14.6%	0.002 - 5.9	- - -
Carbon Disulfide	1 / 33	3.%	0.035 - 0.035	- - -
1,1-Dichloroethene	0 / 33	0%	- - -	- - -
* 1,1-Dichloroethane	4 / 69	5.8%	0.001 - 0.082	- - -
* 1,2-Dichloroethene	8 / 89	9.%	0.005 - 4.5	- - -
* Chloroform	4 / 74	5.4%	0.001 - 0.085	- - -
* 1,2-Dichloroethane	7 / 53	13.2%	0.005 - 0.18	- - -
* 2-Butanone	3 / 89	3.4%	0.006 - 0.036	- - -
* 1,1,1-Trichloroethane	3 / 89	3.4%	0.0026 - 0.012	- - -
* Carbon Tetrachloride	2 / 80	2.5%	0.003 - 0.0067	- - -
Vinyl Acetate	0 / 33	0%	- - -	- - -
Bromodichloromethane	1 / 38	2.6%	0.005 - 0.005	- - -
* 1,2-Dichloropropane	3 / 33	9.1%	0.021 - 0.37	- - -
cis-1,3-Dichloropropene	0 / 33	0%	- - -	- - -

APPENDIX A-3
SUMMARY OF CHEMICALS ANALYZED IN GROUND WATER

Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
* Trichloroethene	2 / 33	6.1%	0.002 - 0.071	- - -
Dibromochloromethane	0 / 33	0%	- - -	- - -
* 1,1,2-Trichloroethane	1 / 33	3.%	0.055 - 0.055	- - -
* Benzene	17 / 89	19.1%	0.001 - 20	- - -
trans-1,3-Dichloropropene	0 / 33	0%	- - -	- - -
Bromoform	0 / 53	0%	- - -	- - -
4-Methyl-2-Pentanone	0 / 33	0%	- -	- -
2-Hexanone	0 / 53	0%	- -	- -
* Tetrachloroethene	5 / 89	5.6%	0.001 0.02	- -
* 1,1,2,2-Tetrachloroethane	1 / 33	3.%	0.006 0.006	- -
* Toluene	9 / 94	9.6%	0.0013 3.1	- -
* Chlorobenzene	6 / 89	6.7%	0.001 0.027	- -
* Ethylbenzene	6 / 89	6.7%	0.005 0.08	- -
Styrene	0 / 33	0%	- -	- -
* Xylene (total)	3 / 89	3.4%	0.034 0.18	- -
* Phenol	6 / 88	6.8%	0.002 - 0.67	- - -
* bis(2-Chloroethyl)Ether	9 / 83	10.8%	0.001 - 0.24	- - -
2-Chlorophenol	1 / 33	3.%	0.001 - 0.001	- - -
1,3-Dichlorobenzene	1 / 33	3.%	0.013 - 0.013	- - -
* 1,4-Dichlorobenzene	6 / 83	7.2%	0.0035 - 0.011	- - -
* Benzyl Alcohol	1 / 53	1.9%	0.001 - 0.001	- - -
* 1,2-Dichlorobenzene	1 / 33	3.%	0.006 - 0.006	- - -
* 2-Methylphenol	1 / 53	1.9%	0.45 - 0.45	- - -
bis(2-Chloroisopropyl)Ether	2 / 63	3.2%	0.0018 - 0.002	- - -
* 4-Methylphenol	2 / 88	2.3%	0.14 - 0.35	- - -
N-Nitroso-Di-n-Propylamine	0 / 33	0%	- - -	- - -
Hexachloroethane	0 / 33	0%	- - -	- - -
Nitrobenzene	0 / 33	0%	- - -	- - -
Isophorone	0 / 53	0%	- - -	- - -
2-Nitrophenol	0 / 33	0%	- - -	- - -
2,4-Dimethylphenol	0 / 33	0%	- - -	- - -
Benzoic Acid	4 / 88	4.5%	0.005 - 2.8	- - -
bis(2-Chloroethoxy)Methane	0 / 33	0%	- - -	- - -
2,4-Dichlorophenol	0 / 33	0%	- - -	- - -
1,2,4-Trichlorobenzene	0 / 33	0%	- - -	- - -
* Naphthalene	11 / 83	13.3%	0.00073 - 0.064	- - -
4-Chloroaniline	2 / 63	3.2%	0.007 - 0.046	- - -
4-Chloro-3-Methylphenol	0 / 53	0%	- - -	- - -
* 2-Methylnaphthalene	1 / 63	1.6%	0.003 - 0.003	- - -
2,4,6-Trichlorophenol	0 / 33	0%	- - -	- - -
2,4,5-Trichlorophenol	0 / 33	0%	- - -	- - -
2-Chloronaphthalene	0 / 33	0%	- - -	- - -
2-Nitroaniline	0 / 33	0%	- - -	- - -
Dimethyl Phthalate	0 / 53	0%	- - -	- - -

APPENDIX A-3
SUMMARY OF CHEMICALS ANALYZED IN GROUND WATER
Units in mg/L

	Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
	Acenaphthylene	0 / 33	0%	- - -	- - -
	2,6-Dinitrotoluene	0 / 33	0%	- - -	- - -
	3-Nitroaniline	0 / 33	0%	- - -	- - -
	Acenaphthene	0 / 33	0%	- - -	- - -
	2,4-Dinitrophenol	0 / 53	0%	- - -	- - -
	4-Nitrophenol	0 / 53	0%	- - -	- - -
	Dibenzofuran	0 / 33	0%	- - -	- - -
	2,4-Dinitrotoluene	0 / 53	0%	- - -	- - -
	Diethylphthalate	2 / 63	3.2%	0.003 - 0.038	- - -
	4-Chlorophenyl-phenylether	0 / 33	0%	- - -	- - -
	Fluorene	0 / 33	0%	- - -	- - -
	4-Nitroaniline	0 / 33	0%	- - -	- - -
	4,6-Dinitro-2-Methylphenol	0 / 33	0%	- - -	- - -
	N-Nitrosodiphenylamine(1)	1 / 63	1.6%	0.0012 - 0.0012	- - -
	4-Bromophenyl-phenylether	0 / 33	0%	- - -	- - -
*	Pentachlorophenol	6 / 63	9.5%	0.015 - 0.26	- - -
	Phenanthrene	1 / 33	3.%	0.011 - 0.011	- - -
	Anthracene	0 / 33	0%	- - -	- - -
*	Di-n-Butylphthalate	7 / 83	8.4%	0.00061 - 0.003	- - -
	Fluoranthene	0 / 38	0%	- - -	- - -
	Pyrene	0 / 38	0%	- - -	- - -
	Butylbenzylphthalate	1 / 63	1.6%	0.004 - 0.004	- - -
	3,3'-Dichlorobenzidine	0 / 33	0%	- - -	- - -
	Benzo(a)Anthracene	0 / 33	0%	- - -	- - -
	Chrysene	0 / 33	0%	- - -	- - -
*	bis(2-Ethylhexyl)Phthalate	7 / 83	8.4%	0.001 - 0.012	- - -
	Di-n-Octyl Phthalate	0 / 33	0%	- - -	- - -
	Benzo(b)Fluoranthene	0 / 33	0%	- - -	- - -
	Benzo(k)Fluoranthene	0 / 33	0%	- - -	- - -
	Benzo(a)Pyrene	0 / 33	0%	- - -	- - -
	Indeno(1,2,3-cd)Pyrene	0 / 33	0%	- - -	- - -
	Dibenzo(a,h)Anthracene	0 / 33	0%	- - -	- - -
	Benzo(g,h,i)Perylene	0 / 33	0%	- - -	- - -
	alpha-BHC	0 / 54	0%	- - -	- - -
	beta-BHC	0 / 59	0%	- - -	- - -
	delta-BHC	0 / 59	0%	- - -	- - -
	gamma-BHC (Lindane)	0 / 59	0%	- - -	- - -
	Heptachlor	0 / 59	0%	- - -	- - -
*	Aldrin	1 / 54	1.9%	0.0005 - 0.0005	- - -
	Heptachlor epoxide	4 / 59	6.8%	0.00006 - 0.00006	- - -
	Endosulfan I	4 / 59	6.8%	0.00004 - 0.00004	- - -
*	Dieldrin	1 / 65	1.5%	0.00013 - 0.00013	- - -
	4,4'-DDE	0 / 54	0%	- - -	- - -
	Endrin	0 / 54	0%	- - -	- - -

APPENDIX A-3
SUMMARY OF CHEMICALS ANALYZED IN GROUND WATER
Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Endosulfan II	0 / 54	0%	- - -	- - -
4,4'-DDD	0 / 54	0%	- - -	- - -
Endosulfan sulfate	0 / 54	0%	- - -	- - -
* 4,4'-DDT	2 / 59	3.4%	0.00006 - 0.00009	- - -
Methoxychlor	0 / 59	0%	- - -	- - -
Endrin ketone	0 / 54	0%	- - -	- - -
alpha-Chlordane	0 / 53	0%	- - -	- - -
gamma-Chlordane	0 / 53	0%	- - -	- - -
Toxaphene	0 / 54	0%	- - -	- - -
Aroclor-1016	0 / 54	0%	- - -	- - -
Aroclor-1221	0 / 54	0%	- - -	- - -
Aroclor-1232	0 / 54	0%	- - -	- - -
Aroclor-1242	0 / 54	0%	- - -	- - -
Aroclor-1248	0 / 54	0%	- - -	- - -
* Aroclor-1254	2 / 59	3.4%	0.0002 - 0.0002	- - -
Aroclor-1260	0 / 54	0%	- - -	- - -
* Hexachlorobenzene	10 / 116	8.6%	0.00002 - 0.00024	- - -
Hexachlorocylopentadiene	3 / 118	2.5%	0.00004 - 0.000065	- - -
* Hexachlorobutadiene	3 / 104	2.9%	0.000015 - 0.000087	- - -
Octachlorocyclopentene	0 / 52	0%	- - -	- - -
* Heptachloronorborene	3 / 52	5.8%	0.000052 - 0.00011	- - -
Chlordene	1 / 33	3.%	0.000057 - 0.000057	- - -

- - - Not Detected

* Identified as a Chemical of Concern in this Area of Concern

APPENDIX A-4
SUMMARY OF CHEMICALS ANALYZED IN MILL CREEK SURFACE WATER
Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Aluminum	0 / 15	0%	- - -	- - -
Antimony	0 / 12	0%	- - -	0.0228 - 0.0228
Arsenic	0 / 15	0%	- - -	- - -
* Barium	12 / 15	80.0%	0.0412 - 0.0683	0.0324 - 0.044
Beryllium	0 / 15	0%	- - -	- - -
Cadmium	1 / 12	8.3%	0.0031 - 0.0031	0.0037 - 0.0037
Calcium	12 / 15	80.0%	85.9 - 104	10.3 - 88.1
Chromium	1 / 15	6.7%	0.012 - 0.012	- - -
* Cobalt	1 / 12	8.3%	0.0056 - 0.0056	- - -
Copper	0 / 15	0%	- - -	0.007 - 0.007
Iron	6 / 15	40.0%	0.138 - 0.425	0.161 - 0.616
Lead	2 / 15	13.3%	0.0012 - 0.0013	0.0014 - 0.0014
Magnesium	12 / 15	80.0%	23.3 - 29.3	25.9 - 29.3
Manganese	7 / 15	46.7%	0.0058 - 0.0133	0.0038 - 0.0184
Mercury	1 / 15	6.7%	0.0003 - 0.0003	- - -
* Nickel	1 / 15	6.7%	0.0078 - 0.0078	- - -
Potassium	15 / 15	100.0%	2.18 - 4.28	1.36 - 3.92
Selenium	1 / 12	8.3%	0.0012 - 0.0012	- - -
Silver	3 / 15	20.0%	0.0032 - 0.0044	- - -
Sodium	15 / 15	100.0%	17.2 - 28.1	19.2 - 24.9
Thallium	0 / 12	0%	- - -	0.0014 - 0.0014
Tin	0 / 3	0%	- - -	- - -
* Vanadium	1 / 12	8.3%	0.0098 - 0.0098	- - -
Zinc	1 / 15	6.7%	0.022 - 0.022	0.0072 - 0.0072
Cyanide	0 / 12	0%	- - -	- - -
Chloromethane	0 / 13	0%	- - -	- - -
Bromomethane	0 / 13	0%	- - -	- - -
Vinyl Chloride	0 / 13	0%	- - -	- - -
Chloroethane	0 / 16	0%	- - -	- - -
Methylene Chloride	0 / 16	0%	- - -	- - -
Acetone	0 / 16	0%	- - -	- - -
* Carbon Disulfide	1 / 16	6.3%	0.0003 - 0.0003	- - -
1,1-Dichloroethene	0 / 13	0%	- - -	- - -
1,1-Dichloroethane	0 / 16	0%	- - -	- - -
1,2-Dichloroethene	0 / 16	0%	- - -	- - -
Chloroform	0 / 16	0%	- - -	- - -
1,2-Dichloroethane	0 / 13	0%	- - -	- - -
2-Butanone	0 / 16	0%	- - -	- - -
1,1,1-Trichloroethane	0 / 16	0%	- - -	- - -
Carbon Tetrachloride	0 / 13	0%	- - -	- - -
Vinyl Acetate	0 / 13	0%	- - -	- - -
Bromodichloromethane	0 / 16	0%	- - -	- - -
1,2-Dichloropropane	0 / 13	0%	- - -	- - -
cis-1,3-Dichloropropene	0 / 13	0%	- - -	- - -

APPENDIX A-4
SUMMARY OF CHEMICALS ANALYZED IN MILL CREEK SURFACE WATER
Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Trichloroethene	0 / 13	0%	- - -	- - -
Dibromochloromethane	0 / 16	0%	- - -	- - -
1,1,2-Trichloroethane	0 / 13	0%	- - -	- - -
Benzene	0 / 16	0%	- - -	- - -
trans-1,3-Dichloropropene	0 / 13	0%	- - -	- - -
Bromoform	0 / 16	0%	- - -	- - -
4-Methyl-2-Pentanone	0 / 16	0%	- - -	- - -
2-Hexanone	0 / 13	0%	- - -	- - -
Tetrachloroethene	0 / 13	0%	- - -	- - -
1,1,2,2-Tetrachloroethane	0 / 13	0%	- - -	- - -
Toluene	0 / 16	0%	- - -	- - -
Chlorobenzene	0 / 13	0%	- - -	- - -
Ethylbenzene	0 / 13	0%	- - -	- - -
Styrene	0 / 13	0%	- - -	- - -
* Xylene (total)	1 / 13	7.7%	0.003 - 0.003	- - -
* Phenol	3 / 16	18.8%	0.0006 - 0.0089	0.0000005 - 0.0000032
bis(2-Chloroethyl)Ether	0 / 16	0%	- - -	- - -
2-Chlorophenol	0 / 13	0%	- - -	- - -
1,3-Dichlorobenzene	0 / 13	0%	- - -	- - -
1,4-Dichlorobenzene	0 / 13	0%	- - -	- - -
Benzyl Alcohol	0 / 13	0%	- - -	- - -
1,2-Dichlorobenzene	0 / 13	0%	- - -	- - -
2-Methylphenol	0 / 13	0%	- - -	- - -
bis(2-Chloroisopropyl)Ether	0 / 13	0%	- - -	- - -
4-Methylphenol	0 / 13	0%	- - -	- - -
N-Nitroso-Di-n-Propylamine	0 / 13	0%	- - -	- - -
Hexachloroethane	0 / 13	0%	- - -	- - -
Nitrobenzene	0 / 13	0%	- - -	- - -
Isophorone	0 / 13	0%	- - -	- - -
2-Nitrophenol	0 / 13	0%	- - -	- - -
2,4-Dimethylphenol	0 / 13	0%	- - -	- - -
Benzoic Acid	0 / 13	0%	- - -	- - -
bis(2-Chloroethoxy)Methane	0 / 13	0%	- - -	- - -
2,4-Dichlorophenol	0 / 13	0%	- - -	- - -
1,2,4-Trichlorobenzene	0 / 13	0%	- - -	- - -
Naphthalene	0 / 13	0%	- - -	- - -
4-Chloroaniline	0 / 13	0%	- - -	- - -
4-Chloro-3-Methylphenol	0 / 13	0%	- - -	- - -
2-Methylnaphthalene	0 / 13	0%	- - -	- - -
2,4,6-Trichlorophenol	0 / 13	0%	- - -	- - -
2,4,5-Trichlorophenol	0 / 13	0%	- - -	- - -
2-Chloronaphthalene	0 / 13	0%	- - -	- - -
2-Nitroaniline	0 / 13	0%	- - -	- - -
Dimethyl Phthalate	0 / 13	0%	- - -	- - -

APPENDIX A-4
SUMMARY OF CHEMICALS ANALYZED IN MILL CREEK SURFACE WATER
Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Acenaphthylene	0 / 13	0%	- - -	- - -
2,6-Dinitrotoluene	0 / 13	0%	- - -	- - -
3-Nitroaniline	0 / 13	0%	- - -	- - -
Acenaphthene	0 / 13	0%	- - -	- - -
2,4-Dinitrophenol	0 / 13	0%	- - -	- - -
4-Nitrophenol	0 / 13	0%	- - -	- - -
Dibenzofuran	0 / 13	0%	- - -	- - -
2,4-Dinitrotoluene	0 / 13	0%	- - -	- - -
* Diethylphthalate	2 / 13	15.4%	0.002 - 0.004	- - -
4-Chlorophenyl-phenylether	0 / 13	0%	- - -	- - -
Fluorene	0 / 13	0%	- - -	- - -
4-Nitroaniline	0 / 13	0%	- - -	- - -
4,6-Dinitro-2-Methylphenol	0 / 13	0%	- - -	- - -
N-Nitrosodiphenylamine	0 / 13	0%	- - -	- - -
4-Bromophenyl-phenylether	0 / 13	0%	- - -	- - -
Pentachlorophenol	0 / 13	0%	- - -	- - -
Phenanthrene	0 / 13	0%	- - -	- - -
Anthracene	0 / 13	0%	- - -	- - -
* Di-n-Butylphthalate	7 / 16	43.8%	0.0001 - 0.01	0.0001 - 0.013
Fluoranthene	0 / 13	0%	- - -	- - -
Pyrene	0 / 13	0%	- - -	- - -
Butylbenzylphthalate	0 / 16	0%	- - -	0.0001 - 0.0001
3,3'-Dichlorobenzidine	0 / 13	0%	- - -	- - -
Benzo(a)Anthracene	0 / 13	0%	- - -	- - -
Chrysene	0 / 13	0%	- - -	- - -
* bis(2-Ethylhexyl)Phthalate	1 / 16	6.3%	0.0816 - 0.0816	- - -
* Di-n-Octyl Phthalate	1 / 16	6.3%	0.0043 - 0.0043	- - -
Benzo(b)Fluoranthene	0 / 13	0%	- - -	- - -
Benzo(k)Fluoranthene	0 / 13	0%	- - -	- - -
Benzo(a)Pyrene	0 / 13	0%	- - -	- - -
Indeno(1,2,3-cd)Pyrene	0 / 13	0%	- - -	- - -
Dibenzo(a,h)Anthracene	0 / 13	0%	- - -	- - -
Benzo(g,h,i)Perylene	0 / 13	0%	- - -	- - -
alpha-BHC	0 / 13	0%	- - -	- - -
beta-BHC	0 / 13	0%	- - -	- - -
delta-BHC	0 / 13	0%	- - -	- - -
gamma-BHC (Lindane)	0 / 13	0%	- - -	- - -
Heptachlor	0 / 13	0%	- - -	- - -
Aldrin	0 / 13	0%	- - -	- - -
Heptachlor epoxide	0 / 13	0%	- - -	- - -
Endosulfan I	0 / 13	0%	- - -	- - -
Dieldrin	0 / 13	0%	- - -	- - -
4,4'-DDE	0 / 13	0%	- - -	- - -
Endrin	0 / 13	0%	- - -	- - -

APPENDIX A-4
SUMMARY OF CHEMICALS ANALYZED IN MILL CREEK SURFACE WATER
Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Endosulfan II	0 / 13	0%	- - -	- - -
4,4'-DDD	0 / 13	0%	- - -	- - -
Endosulfan sulfate	0 / 13	0%	- - -	- - -
4,4'-DDT	0 / 13	0%	- - -	- - -
Methoxychlor	0 / 13	0%	- - -	- - -
Endrin ketone	0 / 13	0%	- - -	- - -
alpha-Chlordane	0 / 13	0%	- - -	- - -
gamma-Chlordane	0 / 13	0%	- - -	- - -
Toxaphene	0 / 13	0%	- - -	- - -
Aroclor-1016	0 / 13	0%	- - -	- - -
Aroclor-1221	0 / 13	0%	- - -	- - -
Aroclor-1232	0 / 13	0%	- - -	- - -
Aroclor-1242	0 / 13	0%	- - -	- - -
Aroclor-1248	0 / 13	0%	- - -	- - -
Aroclor-1254	0 / 13	0%	- - -	- - -
Aroclor-1260	0 / 13	0%	- - -	- - -
Hexachlorobenzene	0 / 26	0.%	- - -	0.000023 - 0.000023
Hexachlorocylopentadiene	0 / 26	0.%	- - -	- - -
Hexachlorobutadiene	0 / 26	0.%	- - -	- - -
Octachlorocyclopentene	0 / 13	0.%	- - -	- - -
Heptachloronorborene	0 / 13	0.%	- - -	- - -
Chlordene	0 / 13	0.%	- - -	- - -

- - - Not Detected
* Identified as a Chemical of Concern in this Area of Concern

APPENDIX A-5

SUMMARY OF CHEMICALS ANALYZED IN SKINNER CREEK SURFACE WATER

Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Aluminum	0 / 11	0%	- - -	- - -
Antimony	2 / 8	25.%	0.022 - 0.0269	0.032 - 0.032
Arsenic	0 / 11	0%	- - -	- - -
Barium	8 / 11	72.7%	0.0329 - 0.0362	0.0336 - 0.0336
Beryllium	0 / 11	0%	- - -	- - -
Cadmium	2 / 8	25.%	0.0031 - 0.0048	0.0059 - 0.0059
Calcium	8 / 11	72.7%	118 - 129	131 - 131
Chromium	0 / 11	0%	- - -	- - -
Cobalt	0 / 8	0%	- - -	- - -
Copper	0 / 11	0%	- - -	- - -
Iron	2 / 11	18.2%	0.196 - 0.264	- - -
Lead	1 / 11	9.1%	0.001 - 0.001	- - -
Magnesium	8 / 11	72.7%	25.5 - 29.2	29.6 - 29.6
* Manganese	8 / 11	72.7%	0.0163 - 0.0715	0.0094 - 0.0094
Mercury	0 / 11	0%	- - -	- - -
Nickel	2 / 11	18.2%	0.0098 - 0.0106	0.0075 - 0.0075
Potassium	11 / 11	100.%	2.22 - 3.48	2.62 - 2.62
Selenium	0 / 8	0%	- - -	- - -
Silver	0 / 11	0%	- - -	0.0032 - 0.0032
Sodium	11 / 11	100.%	41.1 - 51.3	51.5 - 51.5
Thallium	0 / 8	0%	- - -	- - -
Tin	0 / 3	0%	- - -	- - -
Vanadium	3 / 8	37.5%	0.0014 - 0.0098	0.0091 - 0.0091
Zinc	0 / 11	0%	- - -	- - -
Cyanide	0 / 8	0%	- - -	- - -
Chloromethane	0 / 8	0%	- - -	- - -
Bromomethane	0 / 8	0%	- - -	- - -
Vinyl Chloride	0 / 8	0%	- - -	- - -
Chloroethane	0 / 11	0%	- - -	- - -
Methylene Chloride	0 / 11	0%	- - -	- - -
Acetone	0 / 11	0%	- - -	- - -
Carbon Disulfide	0 / 11	0%	- - -	- - -
1,1-Dichloroethene	0 / 8	0%	- - -	- - -
1,1-Dichloroethane	0 / 11	0%	- - -	- - -
1,2-Dichloroethene	0 / 11	0%	- - -	- - -
Chloroform	0 / 11	0%	- - -	- - -
1,2-Dichloroethane	0 / 8	0%	- - -	- - -
2-Butanone	0 / 11	0%	- - -	- - -
1,1,1-Trichloroethane	0 / 11	0%	- - -	- - -
Carbon Tetrachloride	0 / 8	0%	- - -	- - -
Vinyl Acetate	0 / 8	0%	- - -	- - -
Bromodichloromethane	0 / 11	0%	- - -	- - -
1,2-Dichloropropane	0 / 8	0%	- - -	- - -
cis-1,3-Dichloropropene	0 / 8	0%	- - -	- - -

APPENDIX A-5

SUMMARY OF CHEMICALS ANALYZED IN SKINNER CREEK SURFACE WATER

Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Trichloroethene	0 / 8	0%	- - -	- - -
Dibromochloromethane	0 / 11	0%	- - -	- - -
1,1,2-Trichloroethane	0 / 8	0%	- - -	- - -
Benzene	0 / 11	0%	- - -	- - -
trans-1,3-Dichloropropene	0 / 8	0%	- - -	- - -
Bromoform	0 / 11	0%	- - -	- - -
4-Methyl-2-Pentanone	0 / 11	0%	- - -	- - -
2-Hexanone	0 / 8	0%	- - -	- - -
Tetrachloroethene	0 / 8	0%	- - -	- - -
1,1,2,2-Tetrachloroethane	0 / 8	0%	- - -	- - -
Toluene	0 / 11	0%	- - -	- - -
Chlorobenzene	0 / 8	0%	- - -	- - -
Ethylbenzene	0 / 8	0%	- - -	- - -
Styrene	0 / 8	0%	- - -	- - -
Xylene (total)	0 / 8	0%	- - -	- - -
* Phenol	1 / 11	9.1%	0.003 - 0.003	- - -
bis(2-Chloroethyl)Ether	0 / 11	0%	- - -	- - -
2-Chlorophenol	0 / 8	0%	- - -	- - -
1,3-Dichlorobenzene	0 / 8	0%	- - -	- - -
1,4-Dichlorobenzene	0 / 8	0%	- - -	- - -
Benzyl Alcohol	0 / 8	0%	- - -	- - -
1,2-Dichlorobenzene	0 / 8	0%	- - -	- - -
2-Methylphenol	0 / 8	0%	- - -	- - -
bis(2-Chloroisopropyl)Ether	0 / 8	0%	- - -	- - -
4-Methylphenol	0 / 8	0%	- - -	- - -
N-Nitroso-Di-n-Propylamine	0 / 8	0%	- - -	- - -
Hexachloroethane	0 / 8	0%	- - -	- - -
Nitrobenzene	0 / 8	0%	- - -	- - -
Isophorone	0 / 8	0%	- - -	- - -
2-Nitrophenol	0 / 8	0%	- - -	- - -
2,4-Dimethylphenol	0 / 8	0%	- - -	- - -
Benzoic Acid	0 / 8	0%	- - -	- - -
bis(2-Chloroethoxy)Methane	0 / 8	0%	- - -	- - -
2,4-Dichlorophenol	0 / 8	0%	- - -	- - -
1,2,4-Trichlorobenzene	0 / 8	0%	- - -	- - -
Naphthalene	0 / 8	0%	- - -	- - -
4-Chloroaniline	0 / 8	0%	- - -	- - -
4-Chloro-3-Methylphenol	0 / 8	0%	- - -	- - -
2-Methylnaphthalene	0 / 8	0%	- - -	- - -
2,4,6-Trichlorophenol	0 / 8	0%	- - -	- - -
2,4,5-Trichlorophenol	0 / 8	0%	- - -	- - -
2-Chloronaphthalene	0 / 8	0%	- - -	- - -
2-Nitroaniline	0 / 8	0%	- - -	- - -
Dimethyl Phthalate	0 / 8	0%	- - -	- - -

APPENDIX A-5

SUMMARY OF CHEMICALS ANALYZED IN SKINNER CREEK SURFACE WATER

Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Acenaphthylene	0 / 8	0%	- - -	- - -
2,6-Dinitrotoluene	0 / 8	0%	- - -	- - -
3-Nitroaniline	0 / 8	0%	- - -	- - -
Acenaphthene	0 / 8	0%	- - -	- - -
2,4-Dinitrophenol	0 / 8	0%	- - -	- - -
4-Nitrophenol	0 / 8	0%	- - -	- - -
Dibenzofuran	0 / 8	0%	- - -	- - -
2,4-Dinitrotoluene	0 / 8	0%	- - -	- - -
* Diethylphthalate	2 / 8	25.%	0.001 - 0.003	- - -
4-Chlorophenyl-phenylether	0 / 8	0%	- - -	- - -
Fluorene	0 / 8	0%	- - -	- - -
4-Nitroaniline	0 / 8	0%	- - -	- - -
4,6-Dinitro-2-Methylphenol	0 / 8	0%	- - -	- - -
N-Nitrosodiphenylamine	0 / 8	0%	- - -	- - -
4-Bromophenyl-phenylether	0 / 8	0%	- - -	- - -
Pentachlorophenol	0 / 8	0%	- - -	- - -
Phenanthrene	0 / 8	0%	- - -	- - -
Anthracene	0 / 8	0%	- - -	- - -
Di-n-Butylphthalate	0 / 11	0%	- - -	- - -
Fluoranthene	0 / 8	0%	- - -	- - -
Pyrene	0 / 8	0%	- - -	- - -
* Butylbenzylphthalate	1 / 11	9.1%	0.003 - 0.003	- - -
3,3'-Dichlorobenzidine	0 / 8	0%	- - -	- - -
Benzo(a)Anthracene	0 / 8	0%	- - -	- - -
Chrysene	0 / 8	0%	- - -	- - -
* bis(2-Ethylhexyl)Phthalate	1 / 11	9.1%	0.1319 - 0.1319	- - -
* Di-n-Octyl Phthalate	1 / 11	9.1%	0.0036 - 0.0036	- - -
Benzo(b)Fluoranthene	0 / 8	0%	- - -	- - -
Benzo(k)Fluoranthene	0 / 8	0%	- - -	- - -
Benzo(a)Pyrene	0 / 8	0%	- - -	- - -
Indeno(1,2,3-cd)Pyrene	0 / 8	0%	- - -	- - -
Dibenzo(a,h)Anthracene	0 / 8	0%	- - -	- - -
Benzo(g,h,i)Perylene	0 / 8	0%	- - -	- - -
alpha-BHC	0 / 7	0%	- - -	- - -
beta-BHC	0 / 7	0%	- - -	- - -
delta-BHC	0 / 7	0%	- - -	- - -
gamma-BHC (Lindane)	0 / 7	0%	- - -	- - -
Heptachlor	0 / 7	0%	- - -	- - -
Aldrin	0 / 7	0%	- - -	- - -
Heptachlor epoxide	0 / 7	0%	- - -	- - -
Endosulfan I	0 / 7	0%	- - -	- - -
Dieldrin	0 / 7	0%	- - -	- - -
4,4'-DDE	0 / 7	0%	- - -	- - -
Endrin	0 / 7	0%	- - -	- - -

APPENDIX A-5

SUMMARY OF CHEMICALS ANALYZED IN SKINNER CREEK SURFACE WATER

Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Endosulfan II	0 / 7	0%	- - -	- - -
4,4'-DDD	0 / 7	0%	- - -	- - -
Endosulfan sulfate	0 / 7	0%	- - -	- - -
4,4'-DDT	0 / 7	0%	- - -	- - -
Methoxychlor	0 / 7	0%	- - -	- - -
Endrin ketone	0 / 7	0%	- - -	- - -
alpha-Chlordane	0 / 7	0%	- - -	- - -
gamma-Chlordane	0 / 7	0%	- - -	- - -
Toxaphene	0 / 7	0%	- - -	- - -
Aroclor-1016	0 / 7	0%	- - -	- - -
Aroclor-1221	0 / 7	0%	- - -	- - -
Aroclor-1232	0 / 7	0%	- - -	- - -
Aroclor-1242	0 / 7	0%	- - -	- - -
Aroclor-1248	0 / 7	0%	- - -	- - -
Aroclor-1254	0 / 7	0%	- - -	- - -
Aroclor-1260	0 / 7	0%	- - -	- - -
Hexachlorobenzene	0 / 16	0.%	- - -	- - -
Hexachlorocylopentadiene	0 / 16	0.%	- - -	- - -
Hexachlorobutadiene	0 / 16	0.%	- - -	- - -
Octachlorocyclopentene	0 / 8	0.%	- - -	- - -
Heptachloronorborene	0 / 8	0.%	- - -	0.00015 - 0.00015
Chlordene	0 / 8	0.%	- - -	- - -

- - - Not Detected

* Identified as a Chemical of Concern in this Area of Concern

APPENDIX A-6

SUMMARY OF CHEMICALS ANALYZED IN DUMP CREEK SURFACE WATER

Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Aluminum	3 / 5	60.%	0.867 - 3.33	27.7 - 27.7
Antimony	0 / 3	0%	- - -	- - -
Arsenic	0 / 5	0%	- - -	- - -
Barium	3 / 5	60.%	0.0445 - 0.0522	0.174 - 0.174
Beryllium	0 / 5	0%	- - -	- - -
Cadmium	1 / 3	33.3%	0.003 - 0.003	- - -
Calcium	3 / 5	60.%	99.6 - 161	118 - 118
Chromium	0 / 5	0%	- - -	- - -
Cobalt	0 / 3	0%	- - -	0.0164 - 0.0164
Copper	1 / 5	20.%	0.0031 - 0.0031	- - -
Iron	4 / 5	80.%	0.741 - 4.7	39.7 - 39.7
Lead	1 / 5	20.%	0.0092 - 0.0092	0.0336 - 0.0336
Magnesium	3 / 5	60.%	18.5 - 35.4	30 - 30
Manganese	3 / 5	60.%	0.0288 - 0.565	1.02 - 1.02
Mercury	0 / 5	0%	- - -	- - -
Nickel	1 / 5	20.%	0.012 - 0.012	0.0391 - 0.0391
Potassium	5 / 5	100.%	1.56 - 6.92	5.46 - 5.46
Selenium	0 / 3	0%	- - -	- - -
Silver	0 / 5	0%	- - -	- - -
Sodium	5 / 5	100.%	4.62 - 26.3	7.82 - 7.82
Thallium	0 / 3	0%	- - -	- - -
Tin	0 / 2	0%	- - -	- - -
Vanadium	1 / 3	33.3%	0.0056 - 0.0056	0.0489 - 0.0489
Zinc	2 / 5	40.%	0.012 - 0.045	0.163 - 0.163
Cyanide	0 / 3	0%	- - -	- - -
Chloromethane	0 / 4	0%	- - -	- - -
Bromomethane	0 / 4	0%	- - -	- - -
Vinyl Chloride	0 / 4	0%	- - -	- - -
Chloroethane	0 / 6	0%	- - -	- - -
Methylene Chloride	0 / 6	0%	- - -	- - -
Acetone	0 / 6	0%	- - -	- - -
Carbon Disulfide	0 / 6	0%	- - -	- - -
1,1-Dichloroethene	0 / 4	0%	- - -	- - -
1,1-Dichloroethane	0 / 6	0%	- - -	- - -
1,2-Dichloroethene	0 / 6	0%	- - -	- - -
Chloroform	0 / 6	0%	- - -	- - -
1,2-Dichloroethane	0 / 4	0%	- - -	- - -
2-Butanone	0 / 6	0%	- - -	- - -
1,1,1-Trichloroethane	0 / 6	0%	- - -	- - -
Carbon Tetrachloride	0 / 4	0%	- - -	- - -
Vinyl Acetate	0 / 4	0%	- - -	- - -
Bromodichloromethane	0 / 6	0%	- - -	- - -
1,2-Dichloropropane	0 / 4	0%	- - -	- - -
cis-1,3-Dichloropropene	0 / 4	0%	- - -	- - -

APPENDIX A-6

SUMMARY OF CHEMICALS ANALYZED IN DUMP CREEK SURFACE WATER

Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Trichloroethene	0 / 4	0%	- - -	- - -
Dibromochloromethane	0 / 6	0%	- - -	- - -
1,1,2-Trichloroethane	0 / 4	0%	- - -	- - -
Benzene	0 / 6	0%	- - -	- - -
trans-1,3-Dichloropropene	0 / 4	0%	- - -	- - -
Bromoform	0 / 6	0%	- - -	- - -
4-Methyl-2-Pentanone	0 / 6	0%	- - -	- - -
2-Hexanone	0 / 4	0%	- - -	- - -
Tetrachloroethene	0 / 4	0%	- - -	- - -
1,1,2,2-Tetrachloroethane	0 / 4	0%	- - -	- - -
Toluene	0 / 6	0%	- - -	- - -
Chlorobenzene	0 / 4	0%	- - -	- - -
Ethylbenzene	0 / 4	0%	- - -	- - -
Styrene	0 / 4	0%	- - -	- - -
Xylene (total)	0 / 4	0%	- - -	- - -
Phenol	0 / 3	0%	- - -	- - -
bis(2-Chloroethyl)Ether	0 / 3	0%	- - -	- - -
2-Chlorophenol	0 / 3	0%	- - -	- - -
1,3-Dichlorobenzene	0 / 3	0%	- - -	- - -
1,4-Dichlorobenzene	0 / 3	0%	- - -	- - -
Benzyl Alcohol	0 / 3	0%	- - -	- - -
1,2-Dichlorobenzene	0 / 3	0%	- - -	- - -
2-Methylphenol	0 / 3	0%	- - -	- - -
* bis(2-Chloroisopropyl)Ether	1 / 3	33.3%	0.003 - 0.003	- - -
4-Methylphenol	0 / 3	0%	- - -	- - -
N-Nitroso-Di-n-Propylamine	0 / 3	0%	- - -	- - -
Hexachloroethane	0 / 3	0%	- - -	- - -
Nitrobenzene	0 / 3	0%	- - -	- - -
Isophorone	0 / 3	0%	- - -	- - -
2-Nitrophenol	0 / 3	0%	- - -	- - -
2,4-Dimethylphenol	0 / 3	0%	- - -	- - -
Benzoic Acid	0 / 3	0%	- - -	- - -
bis(2-Chloroethoxy)Methane	0 / 3	0%	- - -	- - -
2,4-Dichlorophenol	0 / 3	0%	- - -	- - -
1,2,4-Trichlorobenzene	0 / 3	0%	- - -	- - -
Naphthalene	0 / 3	0%	- - -	- - -
4-Chloroaniline	0 / 3	0%	- - -	- - -
4-Chloro-3-Methylphenol	0 / 3	0%	- - -	- - -
2-Methylnaphthalene	0 / 3	0%	- - -	- - -
2,4,6-Trichlorophenol	0 / 3	0%	- - -	- - -
2,4,5-Trichlorophenol	0 / 3	0%	- - -	- - -
2-Chloronaphthalene	0 / 3	0%	- - -	- - -
2-Nitroaniline	0 / 3	0%	- - -	- - -
Dimethyl Phthalate	0 / 3	0%	- - -	- - -

APPENDIX A-6

SUMMARY OF CHEMICALS ANALYZED IN DUMP CREEK SURFACE WATER

Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Acenaphthylene	0 / 3	0%	- - -	- - -
2,6-Dinitrotoluene	0 / 3	0%	- - -	- - -
3-Nitroaniline	0 / 3	0%	- - -	- - -
Acenaphthene	0 / 3	0%	- - -	- - -
2,4-Dinitrophenol	0 / 3	0%	- - -	- - -
4-Nitrophenol	0 / 3	0%	- - -	- - -
Dibenzofuran	0 / 3	0%	- - -	- - -
2,4-Dinitrotoluene	0 / 3	0%	- - -	- - -
Diethylphthalate	0 / 3	0%	- - -	- - -
4-Chlorophenyl-phenylether	0 / 3	0%	- - -	- - -
Fluorene	0 / 3	0%	- - -	- - -
4-Nitroaniline	0 / 3	0%	- - -	- - -
4,6-Dinitro-2-Methylphenol	0 / 3	0%	- - -	- - -
N-Nitrosodiphenylamine	0 / 3	0%	- - -	- - -
4-Bromophenyl-phenylether	0 / 3	0%	- - -	- - -
Pentachlorophenol	0 / 3	0%	- - -	- - -
Phenanthrene	0 / 3	0%	- - -	- - -
Anthracene	0 / 3	0%	- - -	- - -
Di-n-Butylphthalate	0 / 3	0%	- - -	- - -
Fluoranthene	0 / 3	0%	- - -	- - -
* Pyrene	1 / 3	33.3%	0.001 - 0.001	- - -
Butylbenzylphthalate	0 / 3	0%	- - -	- - -
3,3'-Dichlorobenzidine	0 / 3	0%	- - -	- - -
Benzo(a)Anthracene	0 / 3	0%	- - -	- - -
Chrysene	0 / 3	0%	- - -	- - -
bis(2-Ethylhexyl)Phthalate	0 / 3	0%	- - -	- - -
Di-n-Octyl Phthalate	0 / 3	0%	- - -	- - -
Benzo(b)Fluoranthene	0 / 3	0%	- - -	- - -
Benzo(k)Fluoranthene	0 / 3	0%	- - -	- - -
Benzo(a)Pyrene	0 / 3	0%	- - -	- - -
Indeno(1,2,3-cd)Pyrene	0 / 3	0%	- - -	- - -
Dibenzo(a,h)Anthracene	0 / 3	0%	- - -	- - -
Benzo(g,h,i)Perylene	0 / 3	0%	- - -	- - -
alpha-BHC	0 / 3	0%	- - -	- - -
beta-BHC	0 / 3	0%	- - -	- - -
delta-BHC	0 / 3	0%	- - -	- - -
gamma-BHC (Lindane)	0 / 3	0%	- - -	- - -
Heptachlor	0 / 3	0%	- - -	- - -
Aldrin	0 / 3	0%	- - -	- - -
Heptachlor epoxide	0 / 3	0%	- - -	- - -
Endosulfan I	0 / 3	0%	- - -	- - -
Dieldrin	0 / 3	0%	- - -	- - -
4,4'-DDE	0 / 3	0%	- - -	- - -
Endrin	0 / 3	0%	- - -	- - -

APPENDIX A-6

SUMMARY OF CHEMICALS ANALYZED IN DUMP CREEK SURFACE WATER

Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Endosulfan II	0 / 3	0%	- - -	- - -
4,4'-DDD	0 / 3	0%	- - -	- - -
Endosulfan sulfate	0 / 3	0%	- - -	- - -
4,4'-DDT	0 / 3	0%	- - -	- - -
Methoxychlor	0 / 3	0%	- - -	- - -
Endrin ketone	0 / 3	0%	- - -	- - -
alpha-Chlordane	0 / 3	0%	- - -	- - -
gamma-Chlordane	0 / 3	0%	- - -	- - -
Toxaphene	0 / 3	0%	- - -	- - -
Aroclor-1016	0 / 3	0%	- - -	- - -
Aroclor-1221	0 / 3	0%	- - -	- - -
Aroclor-1232	0 / 3	0%	- - -	- - -
Aroclor-1242	0 / 3	0%	- - -	- - -
Aroclor-1248	0 / 3	0%	- - -	- - -
Aroclor-1254	0 / 3	0%	- - -	- - -
Aroclor-1260	0 / 3	0%	- - -	- - -
Hexachlorobenzene	0 / 6	0.%	- - -	- - -
Hexachlorocylopentadiene	0 / 6	0.%	- - -	- - -
Hexachlorobutadiene	0 / 6	0.%	- - -	- - -
Octachlorocyclopentene	0 / 3	0.%	- - -	- - -
Heptachloronorborene	0 / 3	0.%	- - -	- - -
Chlordene	0 /*3	0.%	- - -	- - -

- - - Not Detected

* Identified as a Chemical of Concern in this Area of Concern

APPENDIX A-7

SUMMARY OF CHEMICALS ANALYZED IN DIVING POND SURFACE WATER

Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Aluminum	0 / 5	0%	- - -	0.758 - 0.758
Antimony	2 / 4	50.%	0.0253 - 0.0535	- - -
Arsenic	0 / 5	0%	- - -	- - -
Barium	0 / 5	0%	- - -	- - -
Beryllium	0 / 5	0%	- - -	- - -
* Cadmium	4 / 4	100.%	0.0037 - 0.0058	- - -
Calcium	4 / 5	80.%	23.8 - 24.9	22.7 - 24
Chromium	0 / 5	0%	- - -	- - -
Cobalt	0 / 4	0%	- - -	- - -
Copper	0 / 5	0%	- - -	- - -
Iron	4 / 5	80.%	0.179 - 0.263	0.523 - 1.06
Lead	0 / 5	0%	- - -	- - -
Magnesium	4 / 5	80.%	13.9 - 14.2	4.08 - 4.35
Manganese	4 / 5	80.%	0.0287 - 0.0536	0.0623 - 0.144
Mercury	0 / 5	0%	- - -	- - -
* Nickel	4 / 5	80.%	0.0059 - 0.0084	- - -
Potassium	4 / 5	80.%	1.15 - 1.28	2.18 - 2.81
Selenium	0 / 4	0%	- - -	0.001 - 0.001
Silver	0 / 5	0%	- - -	- - -
Sodium	4 / 5	80.%	1.61 - 1.73	1.53 - 1.78
Thallium	0 / 4	0%	- - -	- - -
Tin	0 / 1	0%	- - -	- - -
* Vanadium	4 / 4	100.%	0.0072 - 0.0099	- - -
Zinc	0 / 5	0%	- - -	- - -
Cyanide	0 / 4	0%	- - -	- - -
Chloromethane	0 / 4	0%	- - -	- - -
Bromomethane	0 / 4	0%	- - -	- - -
Vinyl Chloride	0 / 4	0%	- - -	- - -
Chloroethane	0 / 5	0%	- - -	- - -
Methylene Chloride	0 / 5	0%	- - -	- - -
Acetone	0 / 5	0%	- - -	- - -
Carbon Disulfide	0 / 5	0%	- - -	- - -
1,1-Dichloroethene	0 / 4	0%	- - -	- - -
1,1-Dichloroethane	0 / 5	0%	- - -	- - -
1,2-Dichloroethene	0 / 5	0%	- - -	- - -
Chloroform	0 / 5	0%	- - -	- - -
1,2-Dichloroethane	0 / 4	0%	- - -	- - -
2-Butanone	0 / 5	0%	- - -	- - -
1,1,1-Trichloroethane	0 / 5	0%	- - -	- - -
Carbon Tetrachloride	0 / 4	0%	- - -	- - -
Vinyl Acetate	0 / 4	0%	- - -	- - -
Bromodichloromethane	0 / 5	0%	- - -	- - -
1,2-Dichloropropane	0 / 4	0%	- - -	- - -
cis-1,3-Dichloropropene	0 / 4	0%	- - -	- - -

APPENDIX A-7

SUMMARY OF CHEMICALS ANALYZED IN DIVING POND SURFACE WATER

Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Trichloroethene	0 / 4	0%	- - -	- - -
Dibromochloromethane	0 / 5	0%	- - -	- - -
1,1,2-Trichloroethane	0 / 4	0%	- - -	- - -
Benzene	0 / 5	0%	- - -	- - -
trans-1,3-Dichloropropene	0 / 4	0%	- - -	- - -
Bromoform	0 / 5	0%	- - -	- - -
4-Methyl-2-Pentanone	0 / 5	0%	- - -	- - -
2-Hexanone	0 / 4	0%	- - -	- - -
Tetrachloroethene	0 / 4	0%	- - -	- - -
1,1,2,2-Tetrachloroethane	0 / 4	0%	- - -	- - -
Toluene	0 / 5	0%	- - -	- - -
Chlorobenzene	0 / 4	0%	- - -	- - -
Ethylbenzene	0 / 4	0%	- - -	- - -
Styrene	0 / 4	0%	- - -	- - -
Xylene (total)	0 / 4	0%	- - -	- - -
* Phenol	1 / 5	20.%	0.0022 - 0.0022	- - -
bis(2-Chloroethyl)Ether	0 / 5	0%	- - -	- - -
2-Chlorophenol	0 / 4	0%	- - -	- - -
1,3-Dichlorobenzene	0 / 4	0%	- - -	- - -
1,4-Dichlorobenzene	0 / 4	0%	- - -	- - -
Benzyl Alcohol	0 / 4	0%	- - -	- - -
1,2-Dichlorobenzene	0 / 4	0%	- - -	- - -
2-Methylphenol	0 / 4	0%	- - -	- - -
bis(2-Chloroisopropyl)Ether	0 / 4	0%	- - -	- - -
4-Methylphenol	0 / 4	0%	- - -	- - -
N-Nitroso-Di-n-Propylamine	0 / 4	0%	- - -	- - -
Hexachloroethane	0 / 4	0%	- - -	- - -
Nitrobenzene	0 / 4	0%	- - -	- - -
Isophorone	0 / 4	0%	- - -	- - -
2-Nitrophenol	0 / 4	0%	- - -	- - -
2,4-Dimethylphenol	0 / 4	0%	- - -	- - -
Benzoic Acid	0 / 4	0%	- - -	- - -
bis(2-Chloroethoxy)Methane	0 / 4	0%	- - -	- - -
2,4-Dichlorophenol	0 / 4	0%	- - -	- - -
1,2,4-Trichlorobenzene	0 / 4	0%	- - -	- - -
Naphthalene	0 / 4	0%	- - -	- - -
4-Chloroaniline	0 / 4	0%	- - -	- - -
4-Chloro-3-Methylphenol	0 / 4	0%	- - -	- - -
2-Methylnaphthalene	0 / 4	0%	- - -	- - -
2,4,6-Trichlorophenol	0 / 4	0%	- - -	- - -
2,4,5-Trichlorophenol	0 / 4	0%	- - -	- - -
2-Chloronaphthalene	0 / 4	0%	- - -	- - -
2-Nitroaniline	0 / 4	0%	- - -	- - -
Dimethyl Phthalate	0 / 4	0%	- - -	- - -

APPENDIX A-7

SUMMARY OF CHEMICALS ANALYZED IN DIVING POND SURFACE WATER

Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Acenaphthylene	0 / 4	0%	- - -	- - -
2,6-Dinitrotoluene	0 / 4	0%	- - -	- - -
3-Nitroaniline	0 / 4	0%	- - -	- - -
Acenaphthene	0 / 4	0%	- - -	- - -
2,4-Dinitrophenol	0 / 4	0%	- - -	- - -
4-Nitrophenol	0 / 4	0%	- - -	- - -
Dibenzofuran	0 / 4	0%	- - -	- - -
2,4-Dinitrotoluene	0 / 4	0%	- - -	- - -
Diethylphthalate	0 / 4	0%	- - -	- - -
4-Chlorophenyl-phenylether	0 / 4	0%	- - -	- - -
Fluorene	0 / 4	0%	- - -	- - -
4-Nitroaniline	0 / 4	0%	- - -	- - -
4,6-Dinitro-2-Methylphenol	0 / 4	0%	- - -	- - -
N-Nitrosodiphenylamine	0 / 4	0%	- - -	- - -
4-Bromophenyl-phenylether	0 / 4	0%	- - -	- - -
Pentachlorophenol	0 / 4	0%	- - -	- - -
Phenanthrene	0 / 4	0%	- - -	- - -
Anthracene	0 / 4	0%	- - -	- - -
Di-n-Butylphthalate	0 / 5	0%	- - -	- - -
Fluoranthene	0 / 4	0%	- - -	- - -
Pyrene	0 / 4	0%	- - -	- - -
Butylbenzylphthalate	0 / 5	0%	- - -	- - -
3,3'-Dichlorobenzidine	0 / 4	0%	- - -	- - -
Benzo(a)Anthracene	0 / 4	0%	- - -	- - -
Chrysene	0 / 4	0%	- - -	- - -
* bis(2-Ethylhexyl)Phthalate	1 / 5	20.%	0.0409 - 0.0409	- - -
Di-n-Octyl Phthalate	0 / 5	0%	- - -	- - -
Benzo(b)Fluoranthene	0 / 4	0%	- - -	- - -
Benzo(k)Fluoranthene	0 / 4	0%	- - -	- - -
Benzo(a)Pyrene	0 / 4	0%	- - -	- - -
Indeno(1,2,3-cd)Pyrene	0 / 4	0%	- - -	- - -
Dibenzo(a,h)Anthracene	0 / 4	0%	- - -	- - -
Benzo(g,h,i)Perylene	0 / 4	0%	- - -	- - -
alpha-BHC	0 / 4	0%	- - -	- - -
beta-BHC	0 / 4	0%	- - -	- - -
delta-BHC	0 / 4	0%	- - -	- - -
gamma-BHC (Lindane)	0 / 4	0%	- - -	- - -
Heptachlor	0 / 4	0%	- - -	- - -
Aldrin	0 / 4	0%	- - -	- - -
Heptachlor epoxide	0 / 4	0%	- - -	- - -
Endosulfan I	0 / 4	0%	- - -	- - -
Dieldrin	0 / 4	0%	- - -	- - -
4,4'-DDE	0 / 4	0%	- - -	- - -
Endrin	0 / 4	0%	- - -	- - -

APPENDIX A-7

SUMMARY OF CHEMICALS ANALYZED IN DIVING POND SURFACE WATER

Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Endosulfan II	0 / 4	0%	- - -	- - -
4,4'-DDD	0 / 4	0%	- - -	- - -
Endosulfan sulfate	0 / 4	0%	- - -	- - -
4,4'-DDT	0 / 4	0%	- - -	- - -
Methoxychlor	0 / 4	0%	- - -	- - -
Endrin ketone	0 / 4	0%	- - -	- - -
alpha-Chlordane	0 / 4	0%	- - -	- - -
gamma-Chlordane	0 / 4	0%	- - -	- - -
Toxaphene	0 / 4	0%	- - -	- - -
Aroclor-1016	0 / 4	0%	- - -	- - -
Aroclor-1221	0 / 4	0%	- - -	- - -
Aroclor-1232	0 / 4	0%	- - -	- - -
Aroclor-1242	0 / 4	0%	- - -	- - -
Aroclor-1248	0 / 4	0%	- - -	- - -
Aroclor-1254	0 / 4	0%	- - -	- - -
Aroclor-1260	0 / 4	0%	- - -	- - -
* Hexachlorobenzene	1 / 8	12.5%	0.000033 - 0.000033	- - -
Hexachlorocylopentadiene	0 / 8	0%	- - -	- - -
* Hexachlorobutadiene	1 / 8	12.5%	0.000008 - 0.000008	- - -
Octachlorocyclopentene	0 / 4	0%	- - -	- - -
1,2,3,4,5,7,7-Heptachloronorbon	0 / 4	0%	- - -	- - -
Chlordene	0 / 4	0%	- - -	- - -

- - - Not Detected

* Identified as a Chemical of Concern in this Area of Concern

APPENDIX A-8

SUMMARY OF CHEMICALS ANALYZED IN TRILOBITE POND SURFACE WATER

Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
* Aluminum	6 / 6	100.0%	1.02 - 4.61	0.758 - 0.758
Antimony	0 / 6	0%	- - -	- - -
Arsenic	0 / 6	0%	- - -	- - -
* Barium	6 / 6	100.0%	0.0311 - 0.0438	- - -
Beryllium	0 / 6	0%	- - -	- - -
Cadmium	2 / 6	33.3%	0.0039 - 0.0047	- - -
Calcium	6 / 6	100.0%	80.9 - 84.3	22.7 - 24
Chromium	0 / 6	0%	- - -	- - -
Cobalt	0 / 6	0%	- - -	- - -
Copper	0 / 6	0%	- - -	- - -
Iron	6 / 6	100.0%	0.622 - 2.88	0.523 - 1.06
Lead	0 / 6	0%	- - -	- - -
Magnesium	6 / 6	100.0%	24.5 - 25.4	4.08 - 4.35
Manganese	6 / 6	100.0%	0.018 - 0.0447	0.0623 - 0.144
Mercury	0 / 6	0%	- - -	- - -
Nickel	0 / 6	0%	- - -	- - -
Potassium	6 / 6	100.0%	2.7 - 4.39	2.18 - 2.81
Selenium	0 / 6	0%	- - -	0.001 - 0.001
Silver	0 / 6	0%	- - -	- - -
Sodium	6 / 6	100.0%	14 - 15.1	1.53 - 1.78
Thallium	0 / 6	0%	- - -	- - -
* Vanadium	5 / 6	83.3%	0.006 - 0.0104	- - -
Zinc	0 / 6	0%	- - -	- - -
Cyanide	0 / 6	0%	- - -	- - -
Chloromethane	0 / 6	0%	- - -	- - -
Bromomethane	0 / 6	0%	- - -	- - -
Vinyl Chloride	0 / 6	0%	- - -	- - -
Chloroethane	0 / 6	0%	- - -	- - -
Methylene Chloride	0 / 6	0%	- - -	- - -
Acetone	0 / 6	0%	- - -	- - -
Carbon Disulfide	0 / 6	0%	- - -	- - -
1,1-Dichloroethene	0 / 6	0%	- - -	- - -
1,1-Dichloroethane	0 / 6	0%	- - -	- - -
1,2-Dichloroethene	0 / 6	0%	- - -	- - -
Chloroform	0 / 6	0%	- - -	- - -
1,2-Dichloroethane	0 / 6	0%	- - -	- - -
2-Butanone	0 / 6	0%	- - -	- - -
1,1,1-Trichloroethane	0 / 6	0%	- - -	- - -
Carbon Tetrachloride	0 / 6	0%	- - -	- - -
Vinyl Acetate	0 / 6	0%	- - -	- - -
Bromodichloromethane	0 / 6	0%	- - -	- - -
1,2-Dichloropropane	0 / 6	0%	- - -	- - -
cis-1,3-Dichloropropene	0 / 6	0%	- - -	- - -
Trichloroethene	0 / 6	0%	- - -	- - -

APPENDIX A-8

SUMMARY OF CHEMICALS ANALYZED IN TRILOBITE POND SURFACE WATER

Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Dibromochloromethane	0 / 6	0%	- - -	- - -
1,1,2-Trichloroethane	0 / 6	0%	- - -	- - -
Benzene	0 / 6	0%	- - -	- - -
trans-1,3-Dichloropropene	0 / 6	0%	- - -	- - -
Bromoform	0 / 6	0%	- - -	- - -
4-Methyl-2-Pentanone	0 / 6	0%	- - -	- - -
2-Hexanone	0 / 6	0%	- - -	- - -
Tetrachloroethene	0 / 6	0%	- - -	- - -
1,1,2,2-Tetrachloroethane	0 / 6	0%	- - -	- - -
Toluene	0 / 6	0%	- - -	- - -
Chlorobenzene	0 / 6	0%	- - -	- - -
Ethylbenzene	0 / 6	0%	- - -	- - -
Styrene	0 / 6	0%	- - -	- - -
Xylene (total)	0 / 6	0%	- - -	- - -
* Phenol	1 / 6	16.7%	0.001 - 0.001	- - -
bis(2-Chloroethyl)Ether	0 / 6	0%	- - -	- - -
2-Chlorophenol	0 / 6	0%	- - -	- - -
1,3-Dichlorobenzene	0 / 6	0%	- - -	- - -
1,4-Dichlorobenzene	0 / 6	0%	- - -	- - -
Benzyl Alcohol	0 / 6	0%	- - -	- - -
1,2-Dichlorobenzene	0 / 6	0%	- - -	- - -
2-Methylphenol	0 / 6	0%	- - -	- - -
bis(2-Chloroisopropyl)Ether	0 / 6	0%	- - -	- - -
4-Methylphenol	0 / 6	0%	- - -	- - -
N-Nitroso-Di-n-Propylamine	0 / 6	0%	- - -	- - -
Hexachloroethane	0 / 6	0%	- - -	- - -
Nitrobenzene	0 / 6	0%	- - -	- - -
Isophorone	0 / 6	0%	- - -	- - -
2-Nitrophenol	0 / 6	0%	- - -	- - -
2,4-Dimethylphenol	0 / 6	0%	- - -	- - -
Benzoic Acid	0 / 6	0%	- - -	- - -
bis(2-Chloroethoxy)Methane	0 / 6	0%	- - -	- - -
2,4-Dichlorophenol	0 / 6	0%	- - -	- - -
1,2,4-Trichlorobenzene	0 / 6	0%	- - -	- - -
Naphthalene	0 / 6	0%	- - -	- - -
4-Chloroaniline	0 / 6	0%	- - -	- - -
4-Chloro-3-Methylphenol	0 / 6	0%	- - -	- - -
2-Methylnaphthalene	0 / 6	0%	- - -	- - -
2,4,6-Trichlorophenol	0 / 6	0%	- - -	- - -
2,4,5-Trichlorophenol	0 / 6	0%	- - -	- - -
2-Chloronaphthalene	0 / 6	0%	- - -	- - -
2-Nitroaniline	0 / 6	0%	- - -	- - -
* Dimethyl Phthalate	1 / 6	16.7%	0.001 - 0.001	- - -
Acenaphthylene	0 / 6	0%	- - -	- - -

APPENDIX A-8

SUMMARY OF CHEMICALS ANALYZED IN TRILOBITE POND SURFACE WATER

Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
2,6-Dinitrotoluene	0 / 6	0%	- - -	- - -
3-Nitroaniline	0 / 6	0%	- - -	- - -
Acenaphthene	0 / 6	0%	- - -	- - -
2,4-Dinitrophenol	0 / 6	0%	- - -	- - -
4-Nitrophenol	0 / 6	0%	- - -	- - -
Dibenzofuran	0 / 6	0%	- - -	- - -
2,4-Dinitrotoluene	0 / 6	0%	- - -	- - -
* Diethylphthalate	2 / 6	33.3%	0.001 - 0.002	- - -
4-Chlorophenyl-phenylether	0 / 6	0%	- - -	- - -
Fluorene	0 / 6	0%	- - -	- - -
4-Nitroaniline	0 / 6	0%	- - -	- - -
4,6-Dinitro-2-Methylphenol	0 / 6	0%	- - -	- - -
N-Nitrosodiphenylamine	0 / 6	0%	- - -	- - -
4-Bromophenyl-phenylether	0 / 6	0%	- - -	- - -
Pentachlorophenol	0 / 6	0%	- - -	- - -
Phenanthrene	0 / 6	0%	- - -	- - -
Anthracene	0 / 6	0%	- - -	- - -
Di-n-Butylphthalate	0 / 6	0%	- - -	- - -
Fluoranthene	0 / 6	0%	- - -	- - -
Pyrene	0 / 6	0%	- - -	- - -
Butylbenzylphthalate	0 / 6	0%	- - -	- - -
3,3'-Dichlorobenzidine	0 / 6	0%	- - -	- - -
Benzo(a)Anthracene	0 / 6	0%	- - -	- - -
Chrysene	0 / 6	0%	- - -	- - -
bis(2-Ethylhexyl)Phthalate	0 / 6	0%	- - -	- - -
Di-n-Octyl Phthalate	0 / 6	0%	- - -	- - -
Benzo(b)Fluoranthene	0 / 6	0%	- - -	- - -
Benzo(k)Fluoranthene	0 / 6	0%	- - -	- - -
Benzo(a)Pyrene	0 / 6	0%	- - -	- - -
Indeno(1,2,3-cd)Pyrene	0 / 6	0%	- - -	- - -
Dibenzo(a,h)Anthracene	0 / 6	0%	- - -	- - -
Benzo(g,h,i)Perylene	0 / 6	0%	- - -	- - -
alpha-BHC	0 / 6	0%	- - -	- - -
beta-BHC	0 / 6	0%	- - -	- - -
delta-BHC	0 / 6	0%	- - -	- - -
gamma-BHC (Lindane)	0 / 6	0%	- - -	- - -
Heptachlor	0 / 6	0%	- - -	- - -
Aldrin	0 / 6	0%	- - -	- - -
Heptachlor epoxide	0 / 6	0%	- - -	- - -
Endosulfan I	0 / 6	0%	- - -	- - -
Dieldrin	0 / 6	0%	- - -	- - -
4,4'-DDE	0 / 6	0%	- - -	- - -
Endrin	0 / 6	0%	- - -	- - -
Endosulfan II	0 / 6	0%	- - -	- - -

APPENDIX A-8

SUMMARY OF CHEMICALS ANALYZED IN TRILOBITE POND SURFACE WATER

Units in mg/L

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
4,4'-DDD	0 / 6	0%	- - -	- - -
Endosulfan sulfate	0 / 6	0%	- - -	- - -
4,4'-DDT	0 / 6	0%	- - -	- - -
Methoxychlor	0 / 6	0%	- - -	- - -
Endrin ketone	0 / 6	0%	- - -	- - -
alpha-Chlordane	0 / 6	0%	- - -	- - -
gamma-Chlordane	0 / 6	0%	- - -	- - -
Toxaphene	0 / 6	0%	- - -	- - -
Aroclor-1016	0 / 6	0%	- - -	- - -
Aroclor-1221	0 / 6	0%	- - -	- - -
Aroclor-1232	0 / 6	0%	- - -	- - -
Aroclor-1242	0 / 6	0%	- - -	- - -
Aroclor-1248	0 / 6	0%	- - -	- - -
Aroclor-1254	0 / 6	0%	- - -	- - -
Aroclor-1260	0 / 6	0%	- - -	- - -
Hexachlorobenzene	0 / 12	0.%	- - -	- - -
Hexachlorocylopentadiene	0 / 12	0.%	- - -	- - -
* Hexachlorobutadiene	3 / 12	25.%	0.0000029 - 0.000011	- - -
Octachlorocyclopentene	0 / 6	0.%	- - -	- - -
Heptachloronorborene	0 / 6	0.%	- - -	- - -
Chlordene	0 / 6	0.%	- - -	- - -

- - - Not Detected

* Identified as a Chemical of Concern in this Area of Concern

APPENDIX A-9
SUMMARY OF CHEMICALS ANALYZED IN MILL CREEK SEDIMENTS
Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Aluminum	16 / 16	100.%	2990 - 12600	4870 - 10500
Antimony	6 / 16	37.5%	4.4 - 46	3.9 - 49
Arsenic	15 / 16	93.8%	4 - 3090	2.7 - 9.1
Barium	16 / 16	100.%	35 - 268	36 - 76.2
Beryllium	10 / 16	62.5%	0.28 - 0.74	0.42 - 1.1
Cadmium	2 / 16	12.5%	4 - 4	1.9 - 4.6
Calcium	16 / 16	100.%	16100 - 242000	80700 - 163000
Chromium	14 / 16	87.5%	9.3 - 20	7.9 - 14
Cobalt	13 / 16	81.3%	5.5 - 22	5.6 - 14
Copper	6 / 16	37.5%	12 - 21	11 - 14
Iron	16 / 16	100.%	9250 - 29800	12100 - 18600
* Lead	16 / 16	100.%	10 - 43	7 - 18.3
Magnesium	16 / 16	100.%	9020 - 38000	14300 - 29700
Manganese	16 / 16	100.%	631 - 3520	694 - 1200
* Mercury	8 / 12	66.7%	0.12 - 0.13	- - -
Nickel	16 / 16	100.%	8.9 - 34	10.6 - 22
Potassium	13 / 16	81.3%	730 - 2230	1300 - 2500
Selenium	3 / 12	25.%	9.7 - 15.8	- - -
Silver	1 / 12	8.3%	1.4 - 1.4	- - -
Sodium	4 / 16	25.%	158 - 250	177 - 226
Thallium	4 / 12	33.3%	0.27 - 0.47	0.29 - 0.36
Tin	4 / 4	100.%	32 - 66	38 - 38
Vanadium	14 / 16	87.5%	8.2 - 23.5	12.8 - 35.5
Zinc	16 / 16	100.%	26.1 - 172	30.2 - 49.1
Cyanide	0 / 12	0%	- - -	- - -
Chloromethane	0 / 12	0%	- - -	- - -
Bromomethane	0 / 12	0%	- - -	- - -
Vinyl Chloride	0 / 12	0%	- - -	- - -
Chloroethane	0 / 12	0%	- - -	- - -
Methylene Chloride	0 / 16	0%	- - -	- - -
* Acetone	2 / 16	12.5%	0.007 - 0.016	0.036 - 0.11
* Carbon Disulfide	3 / 16	18.8%	0.0009 - 0.0014	0.0004 - 0.0004
1,1-Dichloroethene	0 / 16	0%	- - -	- - -
1,1-Dichloroethane	0 / 12	0%	- - -	- - -
1,2-Dichloroethene	0 / 12	0%	- - -	0.004 - 0.004
Chloroform	0 / 12	0%	- - -	- - -
1,2-Dichloroethane	0 / 12	0%	- - -	- - -
2-Butanone	0 / 12	0%	- - -	- - -
1,1,1-Trichloroethane	0 / 16	0%	- - -	- - -
Carbon Tetrachloride	0 / 12	0%	- - -	- - -
Vinyl Acetate	0 / 12	0%	- - -	- - -
Bromodichloromethane	0 / 12	0%	- - -	- - -
1,2-Dichloropropane	0 / 12	0%	- - -	- - -
cis-1,3-Dichloropropene	0 / 12	0%	- - -	- - -

APPENDIX A-9
SUMMARY OF CHEMICALS ANALYZED IN MILL CREEK SEDIMENTS
Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Trichloroethene	0 / 16	0%	- - -	- - -
Dibromochloromethane	0 / 12	0%	- - -	- - -
1,1,2-Trichloroethane	0 / 12	0%	- - -	- - -
Benzene	0 / 16	0%	- - -	- - -
trans-1,3-Dichloropropene	0 / 12	0%	- - -	- - -
Bromoform	0 / 12	0%	- - -	- - -
* 4-Methyl-2-Pentanone	3 / 16	18.8%	0.0013 - 0.0016	0.0011 - 0.0011
2-Hexanone	0 / 16	0%	- - -	- - -
Tetrachloroethene	0 / 12	0%	- - -	- - -
1,1,2,2-Tetrachloroethane	0 / 16	0%	- - -	- - -
Toluene	0 / 12	0%	- - -	- - -
Chlorobenzene	0 / 12	0%	- - -	- - -
Ethylbenzene	0 / 16	0%	- - -	- - -
Styrene	0 / 12	0%	- - -	- - -
Xylene (total)	0 / 16	0%	- - -	- - -
* Phenol	4 / 17	23.5%	0.055 - 0.1397	0.0456 - 0.0456
bis(2-Chloroethyl)Ether	0 / 13	0%	- - -	- - -
2-Chlorophenol	0 / 13	0%	- - -	- - -
1,3-Dichlorobenzene	0 / 13	0%	- - -	- - -
1,4-Dichlorobenzene	0 / 13	0%	- - -	- - -
Benzyl Alcohol	0 / 13	0%	- - -	- - -
1,2-Dichlorobenzene	0 / 13	0%	- - -	- - -
2-Methylphenol	0 / 13	0%	- - -	- - -
bis(2-Chloroisopropyl)Ether	0 / 13	0%	- - -	- - -
* 4-Methylphenol	4 / 17	23.5%	0.0165 - 1.5542	0.0147 - 0.2765
N-Nitroso-Di-n-Propylamine	0 / 13	0%	- - -	- - -
Hexachloroethane	0 / 13	0%	- - -	- - -
Nitrobenzene	0 / 17	0%	- - -	- - -
Isophorone	0 / 17	0%	- - -	0.0082 - 0.0082
2-Nitrophenol	0 / 13	0%	- - -	- - -
2,4-Dimethylphenol	0 / 13	0%	- - -	- - -
Benzoic Acid	0 / 13	0%	- - -	- - -
bis(2-Chloroethoxy)Methane	0 / 13	0%	- - -	- - -
2,4-Dichlorophenol	0 / 13	0%	- - -	- - -
1,2,4-Trichlorobenzene	0 / 13	0%	- - -	- - -
* Naphthalene	2 / 17	11.8%	0.022 - 0.38	0.0129 - 0.0129
4-Chloroaniline	0 / 13	0%	- - -	- - -
4-Chloro-3-Methylphenol	0 / 13	0%	- - -	- - -
* 2-Methylnaphthalene	4 / 17	23.5%	0.002 - 0.045	0.0087 - 0.0087
2,4,6-Trichlorophenol	0 / 13	0%	- - -	- - -
2,4,5-Trichlorophenol	0 / 13	0%	- - -	- - -
2-Chloronaphthalene	0 / 13	0%	- - -	- - -
2-Nitroaniline	0 / 13	0%	- - -	- - -
Dimethyl Phthalate	0 / 13	0%	- - -	- - -

APPENDIX A-9
SUMMARY OF CHEMICALS ANALYZED IN MILL CREEK SEDIMENTS
Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
* Acenaphthylene	3 / 17	17.6%	0.0184 - 0.12	- - -
2,6-Dinitrotoluene	0 / 13	0%	- - -	- - -
3-Nitroaniline	0 / 13	0%	- - -	- - -
* Acenaphthene	1 / 17	5.9%	0.4 - 0.4	0.0513 - 0.0513
2,4-Dinitrophenol	0 / 13	0%	- - -	- - -
4-Nitrophenol	0 / 13	0%	- - -	- - -
* Dibenzofuran	3 / 17	17.6%	0.042 - 0.28	0.0251 - 0.0251
2,4-Dinitrotoluene	0 / 13	0%	- - -	- - -
* Diethylphthalate	4 / 17	23.5%	0.0335 - 0.0517	0.0281 - 0.0291
4-Chlorophenyl-phenylether	0 / 13	0%	- - -	- - -
* Fluorene	8 / 17	47.1%	0.0271 - 0.39	0.0544 - 0.0544
4-Nitroaniline	0 / 13	0%	- - -	- - -
4,6-Dinitro-2-Methylphenol	0 / 13	0%	- - -	- - -
N-Nitrosodiphenylamine	0 / 17	0%	- - -	0.0024 - 0.0024
4-Bromophenyl-phenylether	0 / 13	0%	- - -	- - -
Pentachlorophenol	0 / 13	0%	- - -	- - -
* Phenanthrene	14 / 17	82.4%	0.0905 - 2.9	0.1 - 0.4439
* Anthracene	10 / 17	58.8%	0.047 - 0.58	0.0903 - 0.0903
Di-n-Butylphthalate	0 / 13	0%	- - -	- - -
* Fluoranthene	16 / 17	94.1%	0.11 - 3.3	0.12 - 0.6068
* Pyrene	14 / 17	82.4%	0.089 - 3.2	0.13 - 0.4613
Butylbenzylphthalate	0 / 17	0%	- - -	0.0517 - 0.0517
3,3'-Dichlorobenzidine	0 / 13	0%	- - -	- - -
* Benzo(a)Anthracene	14 / 17	82.4%	0.0476 - 1.6	0.093 - 0.2552
* Chrysene	13 / 17	76.5%	0.0602 - 1.9	0.089 - 0.2764
* bis(2-Ethylhexyl)Phthalate	7 / 17	41.2%	0.043 - 0.18	0.23 - 0.23
Di-n-Octyl Phthalate	0 / 13	0%	- - -	0.15 - 0.15
* Benzo(b)Fluoranthene	15 / 17	88.2%	0.0366 - 1.7	0.11 - 0.2269
* Benzo(k)Fluoranthene	13 / 17	76.5%	0.0375 - 1.2	0.1794 - 0.1794
* Benzo(a)Pyrene	12 / 17	70.6%	0.069 - 1.4	0.4644 - 0.4644
* Indeno(1,2,3-cd)Pyrene	10 / 17	58.8%	0.099 - 0.61	0.1244 - 0.1244
* Dibenzo(a,h)Anthracene	3 / 17	17.6%	0.055 - 0.13	0.0327 - 0.0327
* Benzo(g,h,i)Perylene	11 / 17	64.7%	0.078 - 0.51	0.1435 - 0.1435
alpha-BHC	0 / 13	0%	- - -	- - -
* beta-BHC	1 / 13	7.7%	0.028 - 0.028	- - -
delta-BHC	0 / 13	0%	- - -	- - -
gamma-BHC (Lindane)	0 / 13	0%	- - -	- - -
Heptachlor	0 / 13	0%	- - -	- - -
Aldrin	0 / 13	0%	- - -	- - -
Heptachlor epoxide	0 / 13	0%	- - -	- - -
Endosulfan I	0 / 13	0%	- - -	- - -
Dieldrin	0 / 13	0%	- - -	- - -
4,4'-DDE	0 / 13	0%	- - -	- - -
Endrin	0 / 13	0%	- - -	- - -

APPENDIX A-9
SUMMARY OF CHEMICALS ANALYZED IN MILL CREEK SEDIMENTS
Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Endosulfan II	0 / 13	0%	- - -	- - -
* 4,4'-DDD	1 / 13	7.7%	0.0038 - 0.0038	- - -
Endosulfan sulfate	0 / 13	0%	- - -	- - -
4,4'-DDT	0 / 13	0%	- - -	- - -
Methoxychlor	0 / 13	0%	- - -	- - -
Endrin ketone	0 / 13	0%	- - -	- - -
* alpha-Chlordane	1 / 13	7.7%	0.0042 - 0.0042	- - -
gamma-Chlordane	0 / 13	0%	- - -	- - -
Toxaphene	0 / 13	0%	- - -	- - -
Aroclor-1016	0 / 13	0%	- - -	- - -
Aroclor-1221	0 / 13	0%	- - -	- - -
Aroclor-1232	0 / 13	0%	- - -	- - -
Aroclor-1242	0 / 13	0%	- - -	- - -
Aroclor-1248	0 / 13	0%	- - -	- - -
* Aroclor-1254	1 / 13	7.7%	0.16 - 0.16	- - -
Aroclor-1260	0 / 13	0%	- - -	- - -
* Hexachlorobenzene	9 / 25	36.%	0.0029 - 0.016	0.0045 - 0.0045
Hexachlorocylopentadiene	0 / 25	0%	- - -	0.044 - 0.069
* Hexachlorobutadiene	1 / 25	4.%	0.0019 - 0.0019	0.0018 - 0.12
* Octachlorocyclopentene	1 / 12	8.3%	0.012 - 0.012	0.0015 - 0.014
Heptachloronorborene	0 / 12	0%	- - -	0.0013 - 0.026
* Chlordene	5 / 12	41.7%	0.0013 - 0.0034	0.0034 - 0.006

- - - Not Detected

* Identified as a Chemical of Concern in this Area of Concern

APPENDIX A-10

SUMMARY OF CHEMICALS ANALYZED IN SKINNER CREEK SEDIMENTS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
* Aluminum	10 / 10	100.%	8860 - 15900	8070 - 9040
Antimony	2 / 10	20.%	42 - 46	- - -
Arsenic	10 / 10	100.%	6.9 - 18.2	7.2 - 8.8
Barium	10 / 10	100.%	83 - 156	69.9 - 93
Beryllium	7 / 10	70.%	0.31 - 0.81	0.7 - 0.7
Cadmium	3 / 10	30.%	0.31 - 4	- - -
Calcium	10 / 10	100.%	22300 - 107000	61600 - 89300
Chromium	10 / 10	100.%	11.1 - 20	13 - 16.8
Cobalt	10 / 10	100.%	9.8 - 23	7.5 - 11
Copper	5 / 10	50.%	17 - 20	19 - 19
Iron	10 / 10	100.%	18700 - 25700	19900 - 21500
* Lead	10 / 10	100.%	21 - 139	30.2 - 32
Magnesium	10 / 10	100.%	5050 - 18700	6040 - 6920
Manganese	10 / 10	100.%	803 - 2370	1230 - 1810
Mercury	0 / 7	0%	- - -	- - -
Nickel	10 / 10	100.%	17.2 - 50.5	22 - 25.1
Potassium	8 / 10	80.%	1500 - 2840	1090 - 1620
Selenium	0 / 7	0%	- - -	- - -
Silver	0 / 7	0%	- - -	- - -
Sodium	3 / 10	30.%	213 - 259	- - -
Thallium	0 / 7	0%	- - -	- - -
* Tin	2 / 3	66.7%	40 - 52	- - -
* Vanadium	9 / 10	90.%	18 - 32.3	20 - 20.5
Zinc	10 / 10	100.%	50.7 - 88	74 - 109
Cyanide	0 / 7	0%	- - -	- - -
Chloromethane	0 / 7	0%	- - -	- - -
Bromomethane	0 / 7	0%	- - -	- - -
Vinyl Chloride	0 / 7	0%	- - -	- - -
Chloroethane	0 / 7	0%	- - -	- - -
Methylene Chloride	0 / 10	0%	- - -	- - -
* Acetone	2 / 10	20.%	0.023 - 0.062	- - -
Carbon Disulfide	0 / 10	0%	- - -	- - -
1,1-Dichloroethene	0 / 10	0%	- - -	- - -
1,1-Dichloroethane	0 / 7	0%	- - -	- - -
* 1,2-Dichloroethene	1 / 7	14.3%	0.083 - 0.083	- - -
Chloroform	0 / 7	0%	- - -	- - -
1,2-Dichloroethane	0 / 7	0%	- - -	- - -
2-Butanone	0 / 7	0%	- - -	- - -
1,1,1-Trichloroethane	0 / 10	0%	- - -	0.01 - 0.01
Carbon Tetrachloride	0 / 7	0%	- - -	- - -
Vinyl Acetate	0 / 7	0%	- - -	- - -
Bromodichloromethane	0 / 7	0%	- - -	- - -
1,2-Dichloropropane	0 / 7	0%	- - -	- - -
cis-1,3-Dichloropropene	0 / 7	0%	- - -	- - -

APPENDIX A-10

SUMMARY OF CHEMICALS ANALYZED IN SKINNER CREEK SEDIMENTS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
* Trichloroethene	1 / 10	10.%	0.02 - 0.02	- - -
Dibromochloromethane	0 / 7	0%	- - -	- - -
1,1,2-Trichloroethane	0 / 7	0%	- - -	- - -
Benzene	0 / 10	0%	- - -	- - -
trans-1,3-Dichloropropene	0 / 7	0%	- - -	- - -
Bromoform	0 / 7	0%	- - -	- - -
* 4-Methyl-2-Pentanone	1 / 10	10.%	0.0049 - 0.0049	- - -
* 2-Hexanone	1 / 10	10.%	0.0051 - 0.0051	- - -
Tetrachloroethene	0 / 7	0%	- - -	- - -
* 1,1,2,2-Tetrachloroethane	1 / 10	10.%	0.002 - 0.002	- - -
Toluene	0 / 7	0%	- - -	- - -
Chlorobenzene	0 / 7	0%	- - -	- - -
Ethylbenzene	0 / 10	0%	- - -	- - -
Styrene	0 / 7	0%	- - -	- - -
Xylene (total)	0 / 10	0%	- - -	- - -
Phenol	0 / 10	0%	- - -	- - -
bis(2-Chloroethyl)Ether	0 / 7	0%	- - -	- - -
2-Chlorophenol	0 / 7	0%	- - -	- - -
1,3-Dichlorobenzene	0 / 7	0%	- - -	- - -
1,4-Dichlorobenzene	0 / 7	0%	- - -	- - -
Benzyl Alcohol	0 / 7	0%	- - -	- - -
1,2-Dichlorobenzene	0 / 7	0%	- - -	- - -
2-Methylphenol	0 / 7	0%	- - -	- - -
bis(2-Chloroisopropyl)Ether	0 / 7	0%	- - -	- - -
* 4-Methylphenol	3 / 10	30.%	0.0105 - 0.0191	- - -
N-Nitroso-Di-n-Propylamine	0 / 7	0%	- - -	- - -
Hexachloroethane	0 / 7	0%	- - -	- - -
* Nitrobenzene	1 / 10	10.%	0.0042 - 0.0042	- - -
Isophorone	0 / 10	0%	- - -	- - -
2-Nitrophenol	0 / 7	0%	- - -	- - -
2,4-Dimethylphenol	0 / 7	0%	- - -	- - -
Benzoic Acid	0 / 7	0%	- - -	- - -
bis(2-Chloroethoxy)Methane	0 / 7	0%	- - -	- - -
2,4-Dichlorophenol	0 / 7	0%	- - -	- - -
1,2,4-Trichlorobenzene	0 / 7	0%	- - -	- - -
* Naphthalene	2 / 10	20.%	0.0166 - 0.0648	- - -
4-Chloroaniline	0 / 7	0%	- - -	- - -
4-Chloro-3-Methylphenol	0 / 7	0%	- - -	- - -
* 2-Methylnaphthalene	2 / 10	20.%	0.0235 - 0.1007	- - -
2,4,6-Trichlorophenol	0 / 7	0%	- - -	- - -
2,4,5-Trichlorophenol	0 / 7	0%	- - -	- - -
2-Chloronaphthalene	0 / 7	0%	- - -	- - -
2-Nitroaniline	0 / 7	0%	- - -	- - -
Dimethyl Phthalate	0 / 7	0%	- - -	- - -

APPENDIX A-10

SUMMARY OF CHEMICALS ANALYZED IN SKINNER CREEK SEDIMENTS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Acenaphthylene	0 / 10	0%	- - -	- - -
2,6-Dinitrotoluene	0 / 7	0%	- - -	- - -
3-Nitroaniline	0 / 7	0%	- - -	- - -
* Acenaphthene	1 / 10	10.%	0.14 - 0.14	- - -
2,4-Dinitrophenol	0 / 7	0%	- - -	- - -
4-Nitrophenol	0 / 7	0%	- - -	- - -
* Dibenzofuran	3 / 10	30.%	0.0073 - 0.13	- - -
2,4-Dinitrotoluene	0 / 7	0%	- - -	- - -
* Diethylphthalate	3 / 10	30.%	0.021 - 0.0283	- - -
4-Chlorophenyl-phenylether	0 / 7	0%	- - -	- - -
* Fluorene	3 / 10	30.%	0.008 - 0.22	- - -
4-Nitroaniline	0 / 7	0%	- - -	- - -
4,6-Dinitro-2-Methylphenol	0 / 7	0%	- - -	- - -
N-Nitrosodiphenylamine	0 / 10	0%	- - -	- - -
4-Bromophenyl-phenylether	0 / 7	0%	- - -	- - -
Pentachlorophenol	0 / 7	0%	- - -	- - -
* Phenanthrene	5 / 10	50.%	0.0151 - 1.8	0.3 - 0.3
* Anthracene	3 / 10	30.%	0.014 - 0.31	0.12 - 0.12
* Di-n-Butylphthalate	5 / 7	71.4%	0.073 - 0.16	- - -
* Fluoranthene	8 / 10	80.%	0.0313 - 2.5	1 - 1
* Pyrene	8 / 10	80.%	0.0217 - 1.5	0.73 - 0.73
Butylbenzylphthalate	0 / 10	0%	- - -	- - -
3,3'-Dichlorobenzidine	0 / 7	0%	- - -	- - -
* Benzo(a)Anthracene	4 / 10	40.%	0.0876 - 0.68	0.46 - 0.46
* Chrysene	6 / 10	60.%	0.056 - 0.69	0.43 - 0.43
bis(2-Ethylhexyl)Phthalate	0 / 10	0%	- - -	- - -
Di-n-Octyl Phthalate	0 / 7	0%	- - -	- - -
* Benzo(b)Fluoranthene	5 / 10	50.%	0.0116 - 0.51	0.37 - 0.37
* Benzo(k)Fluoranthene	5 / 10	50.%	0.0146 - 0.51	0.35 - 0.35
* Benzo(a)Pyrene	4 / 10	40.%	0.0084 - 0.33	0.28 - 0.28
* Indeno(1,2,3-cd)Pyrene	2 / 10	20.%	0.0394 - 0.26	0.19 - 0.19
Dibenzo(a,h)Anthracene	0 / 10	0%	- - -	0.068 - 0.068
* Benzo(g,h,i)Perylene	3 / 10	30.%	0.048 - 0.21	- - -
alpha-BHC	0 / 7	0%	- - -	- - -
beta-BHC	0 / 7	0%	- - -	- - -
delta-BHC	0 / 7	0%	- - -	- - -
gamma-BHC (Lindane)	0 / 7	0%	- - -	- - -
Heptachlor	0 / 7	0%	- - -	- - -
Aldrin	0 / 7	0%	- - -	- - -
Heptachlor epoxide	0 / 7	0%	- - -	- - -
Endosulfan I	0 / 7	0%	- - -	- - -
Dieldrin	0 / 7	0%	- - -	- - -
4,4'-DDE	0 / 7	0%	- - -	- - -
Endrin	0 / 7	0%	- - -	- - -

APPENDIX A-10

SUMMARY OF CHEMICALS ANALYZED IN SKINNER CREEK SEDIMENTS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Endosulfan II	0 / 7	0%	- - -	- - -
4,4'-DDD	0 / 7	0%	- - -	- - -
Endosulfan sulfate	0 / 7	0%	- - -	- - -
4,4'-DDT	0 / 7	0%	- - -	- - -
Methoxychlor	0 / 7	0%	- - -	- - -
Endrin ketone	0 / 7	0%	- - -	- - -
alpha-Chlordane	0 / 7	0%	- - -	- - -
gamma-Chlordane	0 / 7	0%	- - -	- - -
Toxaphene	0 / 7	0%	- - -	- - -
Aroclor-1016	0 / 7	0%	- - -	- - -
Aroclor-1221	0 / 7	0%	- - -	- - -
Aroclor-1232	0 / 7	0%	- - -	- - -
Aroclor-1242	0 / 7	0%	- - -	- - -
Aroclor-1248	0 / 7	0%	- - -	- - -
Aroclor-1254	0 / 7	0%	- - -	- - -
* Aroclor-1260	2 / 9	22.2%	0.01143 - 0.02985	- - -
* Hexachlorobenzene	2 / 14	14.3%	0.003 - 0.003	- - -
* Hexachlorocylopentadiene	3 / 14	21.4%	0.052 - 0.067	- - -
* Hexachlorobutadiene	6 / 14	42.9%	0.0021 - 0.027	0.0067 - 0.0067
Octachlorocyclopentene	0 / 7	0%	- - -	- - -
* Heptachloronorborene	3 / 7	42.9%	0.0012 - 0.029	0.0014 - 0.0014
* Chlordene	4 / 7	57.1%	0.0013 - 0.0049	- - -

- - - Not Detected

* Identified as a Chemical of Concern in this Area of Concern

APPENDIX A-11

SUMMARY OF CHEMICALS ANALYZED IN DUMP CREEK SEDIMENTS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Aluminum	5 / 5	100.%	8540 - 14100	13600 - 13600
Antimony	0 / 5	0%	- - -	- - -
Arsenic	4 / 5	80.%	6.7 - 10	6.5 - 6.5
Barium	5 / 5	100.%	56.5 - 108	189 - 189
Beryllium	4 / 5	80.%	0.39 - 0.83	0.41 - 0.41
Cadmium	3 / 5	60.%	0.84 - 1.3	0.96 - 0.96
Calcium	5 / 5	100.%	9240 - 34000	16400 - 16400
Chromium	5 / 5	100.%	10.1 - 18.4	19.4 - 19.4
Cobalt	5 / 5	100.%	6.2 - 17	22.6 - 22.6
Copper	5 / 5	100.%	17.5 - 30	18.8 - 18.8
Iron	5 / 5	100.%	16700 - 25100	27800 - 27800
Lead	5 / 5	100.%	15.9 - 194	23.6 - 23.6
Magnesium	5 / 5	100.%	2980 - 9810	4440 - 4440
Manganese	5 / 5	100.%	704 - 1910	3250 - 3250
Mercury	0 / 3	0%	- - -	- - -
Nickel	5 / 5	100.%	12.9 - 22	22.4 - 22.4
Potassium	5 / 5	100.%	1360 - 1720	1740 - 1740
Selenium	0 / 3	0%	- - -	- - -
Silver	0 / 3	0%	- - -	- - -
Sodium	0 / 5	0%	- - -	- - -
Thallium	2 / 3	66.7%	0.34 - 0.59	- - -
* Tin	1 / 2	50.%	37 - 37	- - -
Vanadium	5 / 5	100.%	19.9 - 29.5	31.6 - 31.6
Zinc	5 / 5	100.%	46.1 - 114	56.2 - 56.2
Cyanide	0 / 3	0%	- - -	- - -
Chloromethane	0 / 3	0%	- - -	- - -
Bromomethane	0 / 3	0%	- - -	- - -
Vinyl Chloride	0 / 3	0%	- - -	- - -
Chloroethane	0 / 3	0%	- - -	- - -
* Methylene Chloride	1 / 5	20.%	0.968 - 0.968	- - -
* Acetone	3 / 5	60.%	0.074 - 0.31	0.023 - 0.023
Carbon Disulfide	0 / 5	0%	- - -	- - -
1,1-Dichloroethene	0 / 5	0%	- - -	- - -
1,1-Dichloroethane	0 / 3	0%	- - -	- - -
1,2-Dichloroethene	0 / 3	0%	- - -	- - -
Chloroform	0 / 3	0%	- - -	- - -
1,2-Dichloroethane	0 / 3	0%	- - -	- - -
2-Butanone	0 / 3	0%	- - -	- - -
1,1,1-Trichloroethane	0 / 5	0%	- - -	- - -
Carbon Tetrachloride	0 / 3	0%	- - -	- - -
Vinyl Acetate	0 / 3	0%	- - -	- - -
Bromodichloromethane	0 / 3	0%	- - -	- - -
1,2-Dichloropropane	0 / 3	0%	- - -	- - -
cis-1,3-Dichloropropene	0 / 3	0%	- - -	- - -

APPENDIX A-11

SUMMARY OF CHEMICALS ANALYZED IN DUMP CREEK SEDIMENTS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Trichloroethene	0 / 5	0%	- - -	- - -
Dibromochloromethane	0 / 3	0%	- - -	- - -
1,1,2-Trichloroethane	0 / 3	0%	- - -	- - -
Benzene	0 / 5	0%	- - -	- - -
trans-1,3-Dichloropropene	0 / 3	0%	- - -	- - -
Bromoform	0 / 3	0%	- - -	- - -
4-Methyl-2-Pentanone	0 / 5	0%	- - -	- - -
2-Hexanone	0 / 5	0%	- - -	- - -
Tetrachloroethene	0 / 3	0%	- - -	- - -
1,1,2,2-Tetrachloroethane	0 / 5	0%	- - -	- - -
Toluene	0 / 3	0%	- - -	0.009 - 0.009
Chlorobenzene	0 / 3	0%	- - -	- - -
Ethylbenzene	0 / 5	0%	- - -	- - -
Styrene	0 / 3	0%	- - -	- - -
Xylene (total)	0 / 5	0%	- - -	- - -
Phenol	0 / 5	0%	- - -	- - -
bis(2-Chloroethyl)Ether	0 / 3	0%	- - -	- - -
2-Chlorophenol	0 / 3	0%	- - -	- - -
1,3-Dichlorobenzene	0 / 3	0%	- - -	- - -
1,4-Dichlorobenzene	0 / 3	0%	- - -	- - -
Benzyl Alcohol	0 / 3	0%	- - -	- - -
1,2-Dichlorobenzene	0 / 3	0%	- - -	- - -
2-Methylphenol	0 / 3	0%	- - -	- - -
bis(2-Chloroisopropyl)Ether	0 / 3	0%	- - -	- - -
4-Methylphenol	0 / 5	0%	- - -	- - -
N-Nitroso-Di-n-Propylamine	0 / 3	0%	- - -	- - -
Hexachloroethane	0 / 3	0%	- - -	- - -
Nitrobenzene	0 / 5	0%	- - -	- - -
Isophorone	0 / 5	0%	- - -	- - -
2-Nitrophenol	0 / 3	0%	- - -	- - -
2,4-Dimethylphenol	0 / 3	0%	- - -	- - -
Benzoic Acid	0 / 3	0%	- - -	- - -
bis(2-Chloroethoxy)Methane	0 / 3	0%	- - -	- - -
2,4-Dichlorophenol	0 / 3	0%	- - -	- - -
1,2,4-Trichlorobenzene	0 / 3	0%	- - -	- - -
* Naphthalene	1 / 5	20.%	0.18 - 0.18	- - -
4-Chloroaniline	0 / 3	0%	- - -	- - -
4-Chloro-3-Methylphenol	0 / 3	0%	- - -	- - -
* 2-Methylnaphthalene	2 / 5	40.%	0.12 - 0.16	- - -
2,4,6-Trichlorophenol	0 / 3	0%	- - -	- - -
2,4,5-Trichlorophenol	0 / 3	0%	- - -	- - -
2-Chloronaphthalene	0 / 3	0%	- - -	- - -
2-Nitroaniline	0 / 3	0%	- - -	- - -
Dimethyl Phthalate	0 / 3	0%	- - -	- - -

APPENDIX A-11

SUMMARY OF CHEMICALS ANALYZED IN DUMP CREEK SEDIMENTS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Acenaphthylene	0 / 5	0%	- - -	- - -
2,6-Dinitrotoluene	0 / 3	0%	- - -	- - -
3-Nitroaniline	0 / 3	0%	- - -	- - -
Acenaphthene	0 / 5	0%	- - -	- - -
2,4-Dinitrophenol	0 / 3	0%	- - -	- - -
4-Nitrophenol	0 / 3	0%	- - -	- - -
* Dibenzofuran	1 / 5	20.%	0.15 - 0.15	- - -
2,4-Dinitrotoluene	0 / 3	0%	- - -	- - -
Diethylphthalate	0 / 5	0%	- - -	- - -
4-Chlorophenyl-phenylether	0 / 3	0%	- - -	- - -
* Fluorene	1 / 5	20.%	0.22 - 0.22	- - -
4-Nitroaniline	0 / 3	0%	- - -	- - -
4,6-Dinitro-2-Methylphenol	0 / 3	0%	- - -	- - -
N-Nitrosodiphenylamine	0 / 5	0%	- - -	- - -
4-Bromophenyl-phenylether	0 / 3	0%	- - -	- - -
Pentachlorophenol	0 / 3	0%	- - -	- - -
* Phenanthrene	3 / 5	60.%	0.152 - 2	- - -
* Anthracene	1 / 5	20.%	0.51 - 0.51	- - -
* Di-n-Butylphthalate	1 / 3	33.3%	0.071 - 0.071	- - -
* Fluoranthene	4 / 5	80.%	0.13 - 1.9	- - -
* Pyrene	4 / 5	80.%	0.134 - 1.9	- - -
Butylbenzylphthalate	0 / 5	0%	- - -	- - -
3,3'-Dichlorobenzidine	0 / 3	0%	- - -	- - -
* Benzo(a)Anthracene	2 / 5	40.%	0.124 - 0.83	- - -
* Chrysene	3 / 5	60.%	0.12 - 0.88	- - -
* bis(2-Ethylhexyl)Phthalate	3 / 5	60.%	0.033 - 0.57	- - -
Di-n-Octyl Phthalate	0 / 3	0%	- - -	- - -
* Benzo(b)Fluoranthene	4 / 5	80.%	0.103 - 1.1	- - -
* Benzo(k)Fluoranthene	3 / 5	60.%	0.079 - 0.16	- - -
* Benzo(a)Pyrene	3 / 5	60.%	0.125 - 0.74	- - -
* Indeno(1,2,3-cd)Pyrene	1 / 5	20.%	0.059 - 0.059	- - -
Dibenzo(a,h)Anthracene	0 / 5	0%	- - -	- - -
* Benzo(g,h,i)Perylene	1 / 5	20.%	0.055 - 0.055	- - -
alpha-BHC	0 / 3	0%	- - -	- - -
beta-BHC	0 / 3	0%	- - -	- - -
delta-BHC	0 / 3	0%	- - -	- - -
gamma-BHC (Lindane)	0 / 3	0%	- - -	- - -
Heptachlor	0 / 3	0%	- - -	- - -
Aldrin	0 / 3	0%	- - -	- - -
Heptachlor epoxide	0 / 3	0%	- - -	- - -
Endosulfan I	0 / 3	0%	- - -	- - -
Dieldrin	0 / 3	0%	- - -	- - -
4,4'-DDE	0 / 3	0%	- - -	- - -
Endrin	0 / 3	0%	- - -	- - -

APPENDIX A-11

SUMMARY OF CHEMICALS ANALYZED IN DUMP CREEK SEDIMENTS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Endosulfan II	0 / 3	0%	- - -	- - -
4,4'-DDD	0 / 3	0%	- - -	- - -
Endosulfan sulfate	0 / 3	0%	- - -	- - -
4,4'-DDT	0 / 3	0%	- - -	- - -
Methoxychlor	0 / 3	0%	- - -	- - -
Endrin ketone	0 / 3	0%	- - -	- - -
alpha-Chlordane	0 / 3	0%	- - -	- - -
gamma-Chlordane	0 / 3	0%	- - -	- - -
Toxaphene	0 / 3	0%	- - -	- - -
Aroclor-1016	0 / 3	0%	- - -	- - -
Aroclor-1221	0 / 3	0%	- - -	- - -
Aroclor-1232	0 / 3	0%	- - -	- - -
Aroclor-1242	0 / 3	0%	- - -	- - -
Aroclor-1248	0 / 3	0%	- - -	- - -
Aroclor-1254	0 / 3	0%	- - -	- - -
Aroclor-1260	0 / 3	0%	- - -	- - -
Hexachlorobenzene	0 / 6	0%	- - -	- - -
Hexachlorocylopentadiene	0 / 6	0%	- - -	- - -
* Hexachlorobutadiene	1 / 6	16.7%	0.0025 - 0.0025	- - -
Octachlorocyclopentene	0 / 3	0%	- - -	- - -
Heptachloronorborene	0 / 3	0%	- - -	- - -
Chlordene	0 / 3	0%	- - -	- - -

- - - Not Detected

* Identified as a Chemical of Concern in this Area of Concern

APPENDIX A-12

SUMMARY OF CHEMICALS ANALYZED IN DUCK POND SEDIMENTS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
* Aluminum	3 / 3	100.%	18600 - 24900	7600 - 14600
Antimony	0 / 3	0%	- - -	- - -
Arsenic	3 / 3	100.%	6.6 - 9.2	2.9 - 11
* Barium	3 / 3	100.%	136 - 209	49.6 - 172
Beryllium	3 / 3	100.%	0.64 - 0.9	0.34 - 1
Cadmium	0 / 3	0%	- - -	- - -
Calcium	2 / 3	66.7%	4750 - 7180	3230 - 110000
* Chromium	3 / 3	100.%	21.3 - 29.7	11 - 17
* Cobalt	3 / 3	100.%	15.7 - 18.7	7.4 - 12.1
* Copper	3 / 3	100.%	21.1 - 29.3	16 - 24
Iron	3 / 3	100.%	22800 - 26900	17300 - 25700
Lead	3 / 3	100.%	25.1 - 37.7	10.7 - 42
Magnesium	3 / 3	100.%	2810 - 3580	1620 - 30500
Manganese	3 / 3	100.%	922 - 2830	542 - 2570
Mercury	0 / 3	0%	- - -	0.14 - 0.23
* Nickel	3 / 3	100.%	19.9 - 24	12 - 25
Potassium	3 / 3	100.%	2030 - 3160	1020 - 3040
Selenium	0 / 3	0%	- - -	- - -
Silver	0 / 3	0%	- - -	- - -
Sodium	0 / 3	0%	- - -	439 - 29600
* Thallium	3 / 3	100.%	0.42 - 0.61	- - -
* Vanadium	3 / 3	100.%	38.7 - 54.6	18 - 26
Zinc	3 / 3	100.%	68.1 - 89.2	42.8 - 116
Cyanide	0 / 3	0%	- - -	- - -
Chloromethane	0 / 3	0%	- - -	- - -
Bromomethane	0 / 3	0%	- - -	- - -
Vinyl Chloride	0 / 3	0%	- - -	- - -
Chloroethane	0 / 3	0%	- - -	- - -
Methylene Chloride	0 / 3	0%	- - -	0.0019 - 0.0019
Acetone	0 / 3	0%	- - -	- - -
Carbon Disulfide	0 / 3	0%	- - -	0.01 - 0.01
1,1-Dichloroethene	0 / 3	0%	- - -	- - -
1,1-Dichloroethane	0 / 3	0%	- - -	- - -
1,2-Dichloroethene	0 / 3	0%	- - -	- - -
Chloroform	0 / 3	0%	- - -	- - -
1,2-Dichloroethane	0 / 3	0%	- - -	- - -
2-Butanone	0 / 3	0%	- - -	- - -
1,1,1-Trichloroethane	0 / 3	0%	- - -	0.009 - 0.025
Carbon Tetrachloride	0 / 3	0%	- - -	- - -
Vinyl Acetate	0 / 3	0%	- - -	- - -
Bromodichloromethane	0 / 3	0%	- - -	- - -
1,2-Dichloropropane	0 / 3	0%	- - -	- - -
cis-1,3-Dichloropropene	0 / 3	0%	- - -	- - -
Trichloroethene	0 / 3	0%	- - -	- - -

APPENDIX A-12

SUMMARY OF CHEMICALS ANALYZED IN DUCK POND SEDIMENTS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Dibromochloromethane	0 / 3	0%	- - -	- - -
1,1,2-Trichloroethane	0 / 3	0%	- - -	- - -
Benzene	0 / 3	0%	- - -	- - -
trans-1,3-Dichloropropene	0 / 3	0%	- - -	- - -
Bromoform	0 / 3	0%	- - -	- - -
4-Methyl-2-Pentanone	0 / 3	0%	- - -	- - -
2-Hexanone	0 / 3	0%	- - -	- - -
Tetrachloroethene	0 / 3	0%	- - -	- - -
1,1,2,2-Tetrachloroethane	0 / 3	0%	- - -	- - -
Toluene	0 / 3	0%	- - -	0.012 - 2.5
Chlorobenzene	0 / 3	0%	- - -	- - -
Ethylbenzene	0 / 3	0%	- - -	- - -
Styrene	0 / 3	0%	- - -	- - -
Xylene (total)	0 / 3	0%	- - -	- - -
Phenol	0 / 3	0%	- - -	- - -
bis(2-Chloroethyl)Ether	0 / 3	0%	- - -	- - -
2-Chlorophenol	0 / 3	0%	- - -	- - -
1,3-Dichlorobenzene	0 / 3	0%	- - -	- - -
1,4-Dichlorobenzene	0 / 3	0%	- - -	- - -
Benzyl Alcohol	0 / 3	0%	- - -	- - -
1,2-Dichlorobenzene	0 / 3	0%	- - -	- - -
2-Methylphenol	0 / 3	0%	- - -	- - -
bis(2-Chloroisopropyl)Ether	0 / 3	0%	- - -	- - -
4-Methylphenol	0 / 3	0%	- - -	- - -
N-Nitroso-Di-n-Propylamine	0 / 3	0%	- - -	- - -
Hexachloroethane	0 / 3	0%	- - -	- - -
Nitrobenzene	0 / 3	0%	- - -	- - -
Isophorone	0 / 3	0%	- - -	- - -
2-Nitrophenol	0 / 3	0%	- - -	- - -
2,4-Dimethylphenol	0 / 3	0%	- - -	- - -
Benzoic Acid	0 / 3	0%	- - -	- - -
bis(2-Chloroethoxy)Methane	0 / 3	0%	- - -	- - -
2,4-Dichlorophenol	0 / 3	0%	- - -	- - -
1,2,4-Trichlorobenzene	0 / 3	0%	- - -	- - -
Naphthalene	0 / 3	0%	- - -	- - -
4-Chloroaniline	0 / 3	0%	- - -	- - -
4-Chloro-3-Methylphenol	0 / 3	0%	- - -	- - -
2-Methylnaphthalene	0 / 3	0%	- - -	- - -
2,4,6-Trichlorophenol	0 / 3	0%	- - -	- - -
2,4,5-Trichlorophenol	0 / 3	0%	- - -	- - -
2-Chloronaphthalene	0 / 3	0%	- - -	- - -
2-Nitroaniline	0 / 3	0%	- - -	- - -
Dimethyl Phthalate	0 / 3	0%	- - -	- - -
Acenaphthylene	0 / 3	0%	- - -	- - -

APPENDIX A-12

SUMMARY OF CHEMICALS ANALYZED IN DUCK POND SEDIMENTS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
2,6-Dinitrotoluene	0 / 3	0%	- - -	- - -
3-Nitroaniline	0 / 3	0%	- - -	- - -
Acenaphthene	0 / 3	0%	- - -	- - -
2,4-Dinitrophenol	0 / 3	0%	- - -	- - -
4-Nitrophenol	0 / 3	0%	- - -	- - -
Dibenzofuran	0 / 3	0%	- - -	- - -
2,4-Dinitrotoluene	0 / 3	0%	- - -	- - -
Diethylphthalate	0 / 3	0%	- - -	- - -
4-Chlorophenyl-phenylether	0 / 3	0%	- - -	- - -
Fluorene	0 / 3	0%	- - -	- - -
4-Nitroaniline	0 / 3	0%	- - -	- - -
4,6-Dinitro-2-Methylphenol	0 / 3	0%	- - -	- - -
N-Nitrosodiphenylamine	0 / 3	0%	- - -	0.11 - 0.11
4-Bromophenyl-phenylether	0 / 3	0%	- - -	- - -
Pentachlorophenol	0 / 3	0%	- - -	- - -
Phenanthrene	0 / 3	0%	- - -	0.05 - 0.21
Anthracene	0 / 3	0%	- - -	- - -
Di-n-Butylphthalate	0 / 3	0%	- - -	0.073 - 0.073
Fluoranthene	0 / 3	0%	- - -	0.06 - 0.39
Pyrene	0 / 3	0%	- - -	0.07 - 0.45
Butylbenzylphthalate	0 / 3	0%	- - -	- - -
3,3'-Dichlorobenzidine	0 / 3	0%	- - -	- - -
Benzo(a)Anthracene	0 / 3	0%	- - -	0.04 - 0.25
Chrysene	0 / 3	0%	- - -	0.06 - 0.33
* bis(2-Ethylhexyl)Phthalate	1 / 3	33.3%	0.08 - 0.08	0.091 - 0.091
Di-n-Octyl Phthalate	0 / 3	0%	- - -	- - -
Benzo(b)Fluoranthene	0 / 3	0%	- - -	0.1 - 0.6
Benzo(k)Fluoranthene	0 / 3	0%	- - -	- - -
Benzo(a)Pyrene	0 / 3	0%	- - -	- - -
Indeno(1,2,3-cd)Pyrene	0 / 3	0%	- - -	0.12 - 0.37
Dibenzo(a,h)Anthracene	0 / 3	0%	- - -	- - -
Benzo(g,h,i)Perylene	0 / 3	0%	- - -	0.51 - 0.51
alpha-BHC	0 / 3	0%	- - -	- - -
beta-BHC	0 / 3	0%	- - -	- - -
delta-BHC	0 / 3	0%	- - -	- - -
gamma-BHC (Lindane)	0 / 3	0%	- - -	- - -
Heptachlor	0 / 3	0%	- - -	- - -
Aldrin	0 / 3	0%	- - -	- - -
Heptachlor epoxide	0 / 3	0%	- - -	- - -
Endosulfan I	0 / 3	0%	- - -	- - -
Dieldrin	0 / 3	0%	- - -	- - -
4,4'-DDE	0 / 3	0%	- - -	- - -
Endrin	0 / 3	0%	- - -	- - -
Endosulfan II	0 / 3	0%	- - -	- - -

APPENDIX A-12

SUMMARY OF CHEMICALS ANALYZED IN DUCK POND SEDIMENTS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
4,4'-DDD	0 / 3	0%	- - -	- - -
Endosulfan sulfate	0 / 3	0%	- - -	- - -
4,4'-DDT	0 / 3	0%	- - -	- - -
Methoxychlor	0 / 3	0%	- - -	- - -
Endrin ketone	0 / 3	0%	- - -	- - -
alpha-Chlordane	0 / 3	0%	- - -	- - -
gamma-Chlordane	0 / 3	0%	- - -	- - -
Toxaphene	0 / 3	0%	- - -	- - -
Aroclor-1016	0 / 3	0%	- - -	- - -
Aroclor-1221	0 / 3	0%	- - -	- - -
Aroclor-1232	0 / 3	0%	- - -	- - -
Aroclor-1242	0 / 3	0%	- - -	- - -
Aroclor-1248	0 / 3	0%	- - -	- - -
Aroclor-1254	0 / 3	0%	- - -	- - -
Aroclor-1260	0 / 3	0%	- - -	- - -
* Hexachlorobenzene	1 / 6	16.7%	0.0032 - 0.0032	0.0038 - 0.0038
Hexachlorocylopentadiene	0 / 6	0%	- - -	0.04 - 0.047
Hexachlorobutadiene	0 / 6	0%	- - -	0.0066 - 0.035
Octachlorocyclopentene	0 / 2	0%	- - -	0.013 - 0.013
* Heptachloronorborene	2 / 3	66.7%	0.0017 - 0.0025	0.0017 - 0.019
* Chlordene	1 / 3	33.3%	0.00161 - 0.00161	0.0016 - 0.0016

- - - Not Detected

* Identified as a Chemical of Concern in this Area of Concern

APPENDIX A-13

SUMMARY OF CHEMICALS ANALYZED IN DIVING POND SEDIMENTS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
* Aluminum	5 / 5	100.%	13300 - 15300	7600 - 14600
Antimony	1 / 5	20.%	53 - 53	- - -
Arsenic	5 / 5	100.%	2.2 - 23.8	2.9 - 11
Barium	5 / 5	100.%	48.2 - 60.7	49.6 - 172
Beryllium	4 / 5	80.%	0.77 - 0.92	0.34 - 1
Cadmium	1 / 5	20.%	4 - 4	- - -
Calcium	5 / 5	100.%	70000 - 99500	3230 - 110000
* Chromium	5 / 5	100.%	17.8 - 26.8	11 - 17
Cobalt	5 / 5	100.%	6.4 - 24	7.4 - 12.1
Copper	3 / 5	60.%	16.9 - 24	16 - 24
Iron	5 / 5	100.%	25300 - 33400	17300 - 25700
* Lead	5 / 5	100.%	196 - 511	10.7 - 42
Magnesium	5 / 5	100.%	10300 - 16200	1620 - 30500
Manganese	5 / 5	100.%	470 - 724	542 - 2570
Mercury	0 / 4	0%	- - -	0.14 - 0.23
Nickel	5 / 5	100.%	14.4 - 35	12 - 25
Potassium	5 / 5	100.%	2450 - 3560	1020 - 3040
Selenium	0 / 4	0%	- - -	- - -
Silver	0 / 4	0%	- - -	- - -
Sodium	1 / 5	20.%	247 - 247	439 - 29600
Thallium	0 / 4	0%	- - -	- - -
* Tin	1 / 1	100.%	47 - 47	- - -
Vanadium	5 / 5	100.%	21.7 - 24.5	18 - 26
* Zinc	5 / 5	100.%	80.7 - 131	42.8 - 116
Cyanide	0 / 4	0%	- - -	- - -
Chloromethane	0 / 4	0%	- - -	- - -
Bromomethane	0 / 4	0%	- - -	- - -
Vinyl Chloride	0 / 4	0%	- - -	- - -
Chloroethane	0 / 4	0%	- - -	- - -
Methylene Chloride	0 / 5	0%	- - -	0.0019 - 0.0019
Acetone	0 / 5	0%	- - -	- - -
Carbon Disulfide	0 / 5	0%	- - -	0.01 - 0.01
* 1,1-Dichloroethene	1 / 5	20.%	0.0299 - 0.0299	- - -
1,1-Dichloroethane	0 / 4	0%	- - -	- - -
1,2-Dichloroethene	0 / 4	0%	- - -	- - -
Chloroform	0 / 4	0%	- - -	- - -
1,2-Dichloroethane	0 / 4	0%	- - -	- - -
* 2-Butanone	2 / 4	50.%	0.005 - 0.011	- - -
1,1,1-Trichloroethane	0 / 5	0%	- - -	0.009 - 0.025
Carbon Tetrachloride	0 / 4	0%	- - -	- - -
Vinyl Acetate	0 / 4	0%	- - -	- - -
Bromodichloromethane	0 / 4	0%	- - -	- - -
1,2-Dichloropropane	0 / 4	0%	- - -	- - -
cis-1,3-Dichloropropene	0 / 4	0%	- - -	- - -

APPENDIX A-13

SUMMARY OF CHEMICALS ANALYZED IN DIVING POND SEDIMENTS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
* Trichloroethene	1 / 5	20.%	0.0016 - 0.0016	- - -
Dibromochloromethane	0 / 4	0%	- - -	- - -
1,1,2-Trichloroethane	0 / 4	0%	- - -	- - -
* Benzene	1 / 5	20.%	0.0403 - 0.0403	- - -
trans-1,3-Dichloropropene	0 / 4	0%	- - -	- - -
Bromoform	0 / 4	0%	- - -	- - -
4-Methyl-2-Pentanone	0 / 5	0%	- - -	- - -
2-Hexanone	0 / 5	0%	- - -	- - -
Tetrachloroethene	0 / 4	0%	- - -	- - -
1,1,2,2-Tetrachloroethane	0 / 5	0%	- - -	- - -
Toluene	0 / 4	0%	- - -	0.012 - 2.5
Chlorobenzene	0 / 4	0%	- - -	- - -
* Ethylbenzene	1 / 5	20.%	0.074 - 0.074	- - -
Styrene	0 / 4	0%	- - -	- - -
* Xylene (total)	4 / 5	80.%	0.008 - 0.261	- - -
Phenol	0 / 7	0%	- - -	- - -
bis(2-Chloroethyl)Ether	0 / 6	0%	- - -	- - -
2-Chlorophenol	0 / 6	0%	- - -	- - -
1,3-Dichlorobenzene	0 / 6	0%	- - -	- - -
1,4-Dichlorobenzene	0 / 6	0%	- - -	- - -
Benzyl Alcohol	0 / 6	0%	- - -	- - -
1,2-Dichlorobenzene	0 / 6	0%	- - -	- - -
2-Methylphenol	0 / 6	0%	- - -	- - -
bis(2-Chloroisopropyl)Ether	0 / 6	0%	- - -	- - -
4-Methylphenol	0 / 7	0%	- - -	- - -
N-Nitroso-Di-n-Propylamine	0 / 6	0%	- - -	- - -
Hexachloroethane	0 / 6	0%	- - -	- - -
Nitrobenzene	0 / 7	0%	- - -	- - -
Isophorone	0 / 7	0%	- - -	- - -
2-Nitrophenol	0 / 6	0%	- - -	- - -
2,4-Dimethylphenol	0 / 6	0%	- - -	- - -
Benzoic Acid	0 / 6	0%	- - -	- - -
bis(2-Chloroethoxy)Methane	0 / 6	0%	- - -	- - -
2,4-Dichlorophenol	0 / 6	0%	- - -	- - -
1,2,4-Trichlorobenzene	0 / 6	0%	- - -	- - -
* Naphthalene	2 / 7	28.6%	0.1341 - 0.14	- - -
4-Chloroaniline	0 / 6	0%	- - -	- - -
4-Chloro-3-Methylphenol	0 / 6	0%	- - -	- - -
* 2-Methylnaphthalene	5 / 7	71.4%	0.18 - 0.49	- - -
2,4,6-Trichlorophenol	0 / 6	0%	- - -	- - -
2,4,5-Trichlorophenol	0 / 6	0%	- - -	- - -
2-Chloronaphthalene	0 / 6	0%	- - -	- - -
2-Nitroaniline	0 / 6	0%	- - -	- - -
Dimethyl Phthalate	0 / 6	0%	- - -	- - -

APPENDIX A-13

SUMMARY OF CHEMICALS ANALYZED IN DIVING POND SEDIMENTS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Acenaphthylene	0 / 7	0%	- - -	- - -
2,6-Dinitrotoluene	0 / 6	0%	- - -	- - -
3-Nitroaniline	0 / 6	0%	- - -	- - -
* Acenaphthene	2 / 7	28.6%	0.13 - 0.16	- - -
2,4-Dinitrophenol	0 / 6	0%	- - -	- - -
4-Nitrophenol	0 / 6	0%	- - -	- - -
Dibenzofuran	0 / 7	0%	- - -	- - -
2,4-Dinitrotoluene	0 / 6	0%	- - -	- - -
Diethylphthalate	0 / 7	0%	- - -	- - -
4-Chlorophenyl-phenylether	0 / 6	0%	- - -	- - -
* Fluorene	3 / 7	42.9%	0.1 - 0.14	- - -
4-Nitroaniline	0 / 6	0%	- - -	- - -
4,6-Dinitro-2-Methylphenol	0 / 6	0%	- - -	- - -
N-Nitrosodiphenylamine(1)	0 / 7	0%	- - -	0.11 - 0.11
4-Bromophenyl-phenylether	0 / 6	0%	- - -	- - -
Pentachlorophenol	0 / 6	0%	- - -	- - -
* Phenanthrene	6 / 7	85.7%	0.12 - 0.59	0.05 - 0.21
Anthracene	0 / 7	0%	- - -	- - -
Di-n-Butylphthalate	0 / 6	0%	- - -	0.073 - 0.073
* Fluoranthene	4 / 7	57.1%	0.12 - 0.14	0.06 - 0.39
* Pyrene	7 / 7	100.%	0.18 - 0.6907	0.07 - 0.45
Butylbenzylphthalate	0 / 7	0%	- - -	- - -
3,3'-Dichlorobenzidine	0 / 6	0%	- - -	- - -
* Benzo(a)Anthracene	2 / 7	28.6%	0.099 - 0.1	0.04 - 0.25
* Chrysene	2 / 7	28.6%	0.11 - 0.14	0.06 - 0.33
* bis(2-Ethylhexyl)Phthalate	1 / 7	14.3%	0.1341 - 0.1341	0.091 - 0.091
Di-n-Octyl Phthalate	0 / 6	0%	- - -	- - -
* Benzo(b)Fluoranthene	2 / 7	28.6%	0.1341 - 0.16	0.1 - 0.6
Benzo(k)Fluoranthene	0 / 7	0%	- - -	- - -
Benzo(a)Pyrene	0 / 7	0%	- - -	- - -
Indeno(1,2,3-cd)Pyrene	0 / 7	0%	- - -	0.12 - 0.37
Dibenzo(a,h)Anthracene	0 / 7	0%	- - -	- - -
Benzo(g,h,i)Perylene	0 / 7	0%	- - -	0.51 - 0.51
alpha-BHC	0 / 4	0%	- - -	- - -
beta-BHC	0 / 4	0%	- - -	- - -
delta-BHC	0 / 4	0%	- - -	- - -
gamma-BHC (Lindane)	0 / 4	0%	- - -	- - -
Heptachlor	0 / 4	0%	- - -	- - -
Aldrin	0 / 4	0%	- - -	- - -
Heptachlor epoxide	0 / 4	0%	- - -	- - -
Endosulfan I	0 / 4	0%	- - -	- - -
Dieldrin	0 / 4	0%	- - -	- - -
4,4'-DDE	0 / 4	0%	- - -	- - -
Endrin	0 / 4	0%	- - -	- - -

APPENDIX A-13

SUMMARY OF CHEMICALS ANALYZED IN DIVING POND SEDIMENTS

Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Endosulfan II	0 / 4	0%	- - -	- - -
4,4'-DDD	0 / 4	0%	- - -	- - -
Endosulfan sulfate	0 / 4	0%	- - -	- - -
4,4'-DDT	0 / 4	0%	- - -	- - -
Methoxychlor	0 / 4	0%	- - -	- - -
Endrin ketone	0 / 4	0%	- - -	- - -
alpha-Chlordane	0 / 4	0%	- - -	- - -
gamma-Chlordane	0 / 4	0%	- - -	- - -
Toxaphene	0 / 4	0%	- - -	- - -
Aroclor-1016	0 / 4	0%	- - -	- - -
Aroclor-1221	0 / 4	0%	- - -	- - -
Aroclor-1232	0 / 4	0%	- - -	- - -
Aroclor-1242	0 / 4	0%	- - -	- - -
Aroclor-1248	0 / 4	0%	- - -	- - -
* Aroclor-1254	4 / 4	100.%	0.2 - 0.29	- - -
* Aroclor-1260	5 / 5	100.%	0.25 - 0.44219	- - -
* Hexachlorobenzene	2 / 10	20.%	0.0049 - 0.0072	0.0038 - 0.0038
Hexachlorocylopentadiene	0 / 10	0%	- - -	0.04 - 0.047
* Hexachlorobutadiene	2 / 10	20.%	0.0023 - 0.0034	0.0066 - 0.035
Octachlorocyclopentene	0 / 4	0%	- - -	0.013 - 0.013
* Heptachloronorborene	2 / 4	50.%	0.0027 - 0.0037	0.0017 - 0.019
Chlordene	0 / 4	0%	- - -	0.0016 - 0.0016

- - - Not Detected

* Identified as a Chemical of Concern in this Area of Concern

APPENDIX A-14
SUMMARY OF CHEMICALS ANALYZED IN TRILOBITE POND SEDIMENTS
Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
* Aluminum	3 / 3	100.%	32300 - 42700	7600 - 14600
Antimony	0 / 3	0%	- - -	- - -
Arsenic	3 / 3	100.%	4.2 - 5.9	2.9 - 11
Barium	3 / 3	100.%	86.3 - 137	49.6 - 172
* Beryllium	3 / 3	100.%	1.6 - 2.3	0.34 - 1
Cadmium	0 / 3	0%	- - -	- - -
Calcium	3 / 3	100.%	41900 - 48400	3230 - 110000
* Chromium	3 / 3	100.%	37.8 - 46.4	11 - 17
* Cobalt	3 / 3	100.%	19.4 - 21.6	7.4 - 12.1
* Copper	3 / 3	100.%	18.6 - 22.7	16 - 24
Iron	3 / 3	100.%	34900 - 39000	17300 - 25700
Lead	3 / 3	100.%	10.4 - 13.9	10.7 - 42
Magnesium	3 / 3	100.%	13600 - 16200	1620 - 30500
Manganese	3 / 3	100.%	564 - 636	542 - 2570
Mercury	0 / 3	0%	- - -	0.14 - 0.23
* Nickel	3 / 3	100.%	34.1 - 39.3	12 - 25
Potassium	3 / 3	100.%	10600 - 16000	1020 - 3040
Selenium	0 / 3	0%	- - -	- - -
Silver	0 / 3	0%	- - -	- - -
Sodium	0 / 3	0%	- - -	439 - 29600
Thallium	0 / 3	0%	- - -	- - -
* Vanadium	3 / 3	100.%	56.1 - 73.3	18 - 26
Zinc	3 / 3	100.%	72.3 - 91.7	42.8 - 116
Cyanide	0 / 3	0%	- - -	- - -
Chloromethane	0 / 3	0%	- - -	- - -
Bromomethane	0 / 3	0%	- - -	- - -
Vinyl Chloride	0 / 3	0%	- - -	- - -
Chloroethane	0 / 3	0%	- - -	- - -
Methylene Chloride	0 / 3	0%	- - -	0.0019 - 0.0019
Acetone	0 / 3	0%	- - -	- - -
Carbon Disulfide	0 / 3	0%	- - -	0.01 - 0.01
1,1-Dichloroethene	0 / 3	0%	- - -	- - -
1,1-Dichloroethane	0 / 3	0%	- - -	- - -
1,2-Dichloroethene	0 / 3	0%	- - -	- - -
Chloroform	0 / 3	0%	- - -	- - -
1,2-Dichloroethane	0 / 3	0%	- - -	- - -
2-Butanone	0 / 3	0%	- - -	- - -
1,1,1-Trichloroethane	0 / 3	0%	- - -	0.009 - 0.025
Carbon Tetrachloride	0 / 3	0%	- - -	- - -
Vinyl Acetate	0 / 3	0%	- - -	- - -
Bromodichloromethane	0 / 3	0%	- - -	- - -
1,2-Dichloropropane	0 / 3	0%	- - -	- - -
cis-1,3-Dichloropropene	0 / 3	0%	- - -	- - -
Trichloroethene	0 / 3	0%	- - -	- - -

APPENDIX A-14
SUMMARY OF CHEMICALS ANALYZED IN TRILOBITE POND SEDIMENTS
Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
Dibromochloromethane	0 / 3	0%	- - -	- - -
1,1,2-Trichloroethane	0 / 3	0%	- - -	- - -
Benzene	0 / 3	0%	- - -	- - -
trans-1,3-Dichloropropene	0 / 3	0%	- - -	- - -
Bromoform	0 / 3	0%	- - -	- - -
4-Methyl-2-Pentanone	0 / 3	0%	- - -	- - -
2-Hexanone	0 / 3	0%	- - -	- - -
Tetrachloroethene	0 / 3	0%	- - -	- - -
1,1,2,2-Tetrachloroethane	0 / 3	0%	- - -	- - -
Toluene	0 / 3	0%	- - -	0.012 - 2.5
Chlorobenzene	0 / 3	0%	- - -	- - -
Ethylbenzene	0 / 3	0%	- - -	- - -
Styrene	0 / 3	0%	- - -	- - -
Xylene (total)	0 / 3	0%	- - -	- - -
Phenol	0 / 6	0%	- - -	- - -
bis(2-Chloroethyl)Ether	0 / 6	0%	- - -	- - -
2-Chlorophenol	0 / 6	0%	- - -	- - -
1,3-Dichlorobenzene	0 / 6	0%	- - -	- - -
1,4-Dichlorobenzene	0 / 6	0%	- - -	- - -
Benzyl Alcohol	0 / 6	0%	- - -	- - -
1,2-Dichlorobenzene	0 / 6	0%	- - -	- - -
2-Methylphenol	0 / 6	0%	- - -	- - -
bis(2-Chloroisopropyl)Ether	0 / 6	0%	- - -	- - -
4-Methylphenol	0 / 6	0%	- - -	- - -
N-Nitroso-Di-n-Propylamine	0 / 6	0%	- - -	- - -
Hexachloroethane	0 / 6	0%	- - -	- - -
Nitrobenzene	0 / 6	0%	- - -	- - -
Isophorone	0 / 6	0%	- - -	- - -
2-Nitrophenol	0 / 6	0%	- - -	- - -
2,4-Dimethylphenol	0 / 6	0%	- - -	- - -
Benzoic Acid	0 / 6	0%	- - -	- - -
bis(2-Chloroethoxy)Methane	0 / 6	0%	- - -	- - -
2,4-Dichlorophenol	0 / 6	0%	- - -	- - -
1,2,4-Trichlorobenzene	0 / 6	0%	- - -	- - -
Naphthalene	0 / 6	0%	- - -	- - -
4-Chloroaniline	0 / 6	0%	- - -	- - -
4-Chloro-3-Methylphenol	0 / 6	0%	- - -	- - -
2-Methylnaphthalene	0 / 6	0%	- - -	- - -
2,4,6-Trichlorophenol	0 / 6	0%	- - -	- - -
2,4,5-Trichlorophenol	0 / 6	0%	- - -	- - -
2-Chloronaphthalene	0 / 6	0%	- - -	- - -
2-Nitroaniline	0 / 6	0%	- - -	- - -
Dimethyl Phthalate	0 / 6	0%	- - -	- - -
Acenaphthylene	0 / 6	0%	- - -	- - -

APPENDIX A-14
SUMMARY OF CHEMICALS ANALYZED IN TRILOBITE POND SEDIMENTS
Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
2,6-Dinitrotoluene	0 / 6	0%	- - -	- - -
3-Nitroaniline	0 / 6	0%	- - -	- - -
Acenaphthene	0 / 6	0%	- - -	- - -
2,4-Dinitrophenol	0 / 6	0%	- - -	- - -
4-Nitrophenol	0 / 6	0%	- - -	- - -
Dibenzofuran	0 / 6	0%	- - -	- - -
2,4-Dinitrotoluene	0 / 6	0%	- - -	- - -
Diethylphthalate	0 / 6	0%	- - -	- - -
4-Chlorophenyl-phenylether	0 / 6	0%	- - -	- - -
Fluorene	0 / 6	0%	- - -	- - -
4-Nitroaniline	0 / 6	0%	- - -	- - -
4,6-Dinitro-2-Methylphenol	0 / 6	0%	- - -	- - -
N-Nitrosodiphenylamine	0 / 6	0%	- - -	0.11 - 0.11
4-Bromophenyl-phenylether	0 / 6	0%	- - -	- - -
Pentachlorophenol	0 / 6	0%	- - -	- - -
Phenanthrene	0 / 6	0%	- - -	0.05 - 0.21
Anthracene	0 / 6	0%	- - -	- - -
Di-n-Butylphthalate	0 / 6	0%	- - -	0.073 - 0.073
Fluoranthene	0 / 6	0%	- - -	0.06 - 0.39
Pyrene	0 / 6	0%	- - -	0.07 - 0.45
Butylbenzylphthalate	0 / 6	0%	- - -	- - -
3,3'-Dichlorobenzidine	0 / 6	0%	- - -	- - -
Benzo(a)Anthracene	0 / 6	0%	- - -	0.04 - 0.25
Chrysene	0 / 6	0%	- - -	0.06 - 0.33
* bis(2-Ethylhexyl)Phthalate	1 / 6	16.7%	0.26 - 0.26	0.091 - 0.091
Di-n-Octyl Phthalate	0 / 6	0%	- - -	- - -
Benzo(b)Fluoranthene	0 / 6	0%	- - -	0.1 - 0.6
Benzo(k)Fluoranthene	0 / 6	0%	- - -	- - -
Benzo(a)Pyrene	0 / 6	0%	- - -	- - -
Indeno(1,2,3-cd)Pyrene	0 / 6	0%	- - -	0.12 - 0.37
Dibenzo(a,h)Anthracene	0 / 6	0%	- - -	- - -
Benzo(g,h,i)Perylene	0 / 6	0%	- - -	0.51 - 0.51
alpha-BHC	0 / 3	0%	- - -	- - -
beta-BHC	0 / 3	0%	- - -	- - -
delta-BHC	0 / 3	0%	- - -	- - -
gamma-BHC (Lindane)	0 / 3	0%	- - -	- - -
Heptachlor	0 / 3	0%	- - -	- - -
Aldrin	0 / 3	0%	- - -	- - -
Heptachlor epoxide	0 / 3	0%	- - -	- - -
Endosulfan I	0 / 3	0%	- - -	- - -
Dieldrin	0 / 3	0%	- - -	- - -
4,4'-DDE	0 / 3	0%	- - -	- - -
Endrin	0 / 3	0%	- - -	- - -
Endosulfan II	0 / 3	0%	- - -	- - -

APPENDIX A-14
SUMMARY OF CHEMICALS ANALYZED IN TRILOBITE POND SEDIMENTS
Units in mg/Kg

Compound Name	# of Detections	Percentage of Detections	Range of Detected Concentrations	Range of Background Concentrations
4,4'-DDD	0 / 3	0%	- - -	- - -
Endosulfan sulfate	0 / 3	0%	- - -	- - -
4,4'-DDT	0 / 3	0%	- - -	- - -
Methoxychlor	0 / 3	0%	- - -	- - -
Endrin ketone	0 / 3	0%	- - -	- - -
alpha-Chlordane	0 / 3	0%	- - -	- - -
gamma-Chlordane	0 / 3	0%	- - -	- - -
Toxaphene	0 / 3	0%	- - -	- - -
Aroclor-1016	0 / 3	0%	- - -	- - -
Aroclor-1221	0 / 3	0%	- - -	- - -
Aroclor-1232	0 / 3	0%	- - -	- - -
Aroclor-1242	0 / 3	0%	- - -	- - -
Aroclor-1248	0 / 3	0%	- - -	- - -
Aroclor-1254	0 / 3	0%	- - -	- - -
Aroclor-1260	0 / 3	0%	- - -	- - -
Hexachlorobenzene	0 / 9	0%	- - -	0.0038 - 0.0038
Hexachlorocylopentadiene	0 / 9	0%	- - -	0.04 - 0.047
Hexachlorobutadiene	0 / 9	0%	- - -	0.0066 - 0.035
Octachlorocyclopentene	0 / 3	0%	- - -	0.013 - 0.013
* Heptachloronorborene	1 / 3	33.3%	0.0017 - 0.0017	0.0017 - 0.019
Chlordene	0 / 3	0%	- - -	0.0016 - 0.0016

- - - Not Detected

* Identified as a Chemical of Concern in this Area of Concern

Appendix B

APPENDIX B

CALCULATION OF TOXICITY REFERENCE VALUES

1.0 INTRODUCTION

The Human Health Evaluation Manual (U.S. EPA, 1989, page 5-7) recommends that the following points be considered before eliminating chemicals from consideration in the risk assessment:

- The sample quantitation limit (SQL) of a chemical may be greater than corresponding standards, criteria, or concentrations derived from toxicity reference values; and
- A particular SQL may be significantly higher than positively detected values in other samples in the data set.

This Appendix presents methods for calculating "toxicity reference values" for soil, ground water, and surface water. The Human Health Evaluation Manual and other agency guidance do not present a method. The methods presented here are consistent with equations presented in the Human Health Evaluation Manual, standard exposure assumptions, and toxicity values from IRIS and the Health Effects Assessment Summary Tables.

2.0 METHODS

2.1 SOILS

Equation 1 accounts for intake via soil or sediment ingestion and dermal contact by adults. The equation was derived by combining equations presented in Exhibits 6-14 and 6-15 of the Human Health Evaluation Manual and solving for a toxicity reference value (i.e., a "safe" soil concentration based on the chronic reference dose or slope factor).

2.1.1 NON-CARCINOGENS IN SOIL

$$TRV(soil)_i = \frac{IS_i \times BW}{CF \times (IR \times FI + SA \times AF \times ABS)} \qquad \text{(Equation 1)}$$

where: $TRV(soil)_i$ = Toxicity reference concentration for soil (mg/kg) for chemical i;

IS_i = Total intake of soil equal to chronic reference dose for chemical i (mg/kg/day);
BW = Body Weight (70 kg);
CF = Conversion Factor (10^{-6} kg/mg);
IR = Ingestion Rate (100 mg/day)
FI = Fraction ingested from contaminated source (1);
SA = Skin Surface Area (18,150 cm^2/event);
AF = Soil to Skin Adherence Factor (2.77 mg/cm^2); and
ABS = Absorption Factor.

Absorption factors recommended by Ryan, *et al*, (1987) were used. These factors are 1% for inorganics, 10% for semi-volatile organics, and 25% for volatile organic compounds.

2.1.2 CARCINOGENS IN SOIL

Equation 1 was used to calculate the TRV for carcinogens in soil. The intake (IS_i) was set to the intake that would result in an increased incremental cancer risk of 1:1,000,000 based on the slope factor for chemical i. This was calculated by:

$$IS_i = \frac{10^{-6}}{SF_i(mg/kg/day)^{-1}} \qquad \text{(Equation 2)}$$

where: SF_i = Slope factor for carcinogen i.

2.2 GROUND WATER

Equation 3 accounts for intake via ingestion of ground water by adults. This equation was derived from the equation presented in Exhibit 6-11 of the Human Health Evaluation Manual by solving for a toxicity reference value (i.e., a "safe" ground water concentration based on the chronic reference dose or slope factor).

2.2.1 NON-CARCINOGENS IN GROUND WATER

$$TRV\ (gw)_i = \frac{IGW_i \times BW}{IR} \qquad \text{(Equation 3)}$$

where: $TRV\ (gw)_i$ = Toxicity reference concentration for chemical i in ground water (mg/l);
IGW_i = Intake of ground water equal to chronic reference dose for chemical i (mg/kg/day);
BW = Body weight (70 kg); and
IR = Ingestion rate (2 liters/day).

2.2.2 CARCINOGENS IN GROUND WATER

Equation 3 was used to calculate the TRV for carcinogens in ground water. The intake (IGW_i) was set to the intake that would result in an increased incremental cancer risk of 1:1,000,000 based on the slope factor for chemical i. This was calculated by:

$$IGW_i = \frac{10^{-6}}{SF_i(mg/kg/day)^{-1}} \qquad \text{(Equation 4)}$$

where: SF_i = Slope factor for carcinogen i.

2.3 SURFACE WATER

Equation 5 accounts for intake via surface water ingestion and dermal contact by adults. This equation was derived by combining equations presented in Exhibits 6-12 and 6-13 of the Human Health Evaluation Manual and solving for a toxicity reference value (i.e., a "safe" surface water concentration based on the chronic reference dose or slope factor).

2.3.1 NON-CARCINOGENS IN SURFACE WATER

$$TRV(sw)_i = \frac{ISW_i \times BW}{ETx(CR + (SA \times PC \times CF))} \qquad \text{(Equation 5)}$$

where:
- $TRV(sw)_i$ = Toxicity reference value for chemical i in surface water (mg/l);
- ISW_i = Intake of chemical i equal to chronic reference dose in surface water (mg/kg/day);
- BW = Body Weight (70 kg);
- CR = Contact Rate (0.050 liters/hour);
- ET = Exposure Time (2.6 hours/event);
- SA = Skin Surface Area (18,150 cm^2);
- PC = Chemical Specific Dermal Permeability Constant; and
- CF = Conversion Factor (1 liter/1,000 cm^3).

The following permeability coefficients were used:

Chromium	2.1×10^{-3} cm/hr (Baranowska-Dutkiewicz, 1981);
Benzene	1.11×10^{-1} cm/hr (Blank and McAuliffe, 1985);
Toluene	1.01 cm/hr (Baranowska-Dutkiewicz, 1982); and
Methyl Ethyl Ketone	5.0×10^{-3} cm/hr (Blank, *et al*, 1967).
Ethylbenzene	0.1 cm/hour (Dutkiewciz and Tyras, 1967);

Hexachlorobenzene	1.6×10^{-4} (Vanderslice, 1989); and
Xylene	0.1 (Vanderslice, 1989).

The permeability coefficient for toluene was used for volatile chemicals not listed above. The permeability coefficient for water (1.5×10^{-3} cm/hr; Bronaugh, *et al*, 1986) was used for inorganic and semi-volatile chemicals other than those listed above.

2.3.2 Carcinogens in Surface Water

Equation 5 was used to calculate the TRV for carcinogens in surface water. The intake (ISW_i) was set to the intake that would result in an increased incremental cancer risk of 1:1,000,000 based on the slope factor for chemical i. This was calculated by:

$$ISW_i = \frac{10^{-6}}{SF_i(mg/kg/day)^{-1}} \qquad \text{(Equation 6)}$$

where: SF_i = Slope factor for carcinogen i.

3.0 RESULTS

Table B-1 presents the calculated toxicity reference values for chemicals on the Target Analyte List, the Target Compound List, and the Special Analytical Services additional pesticide, dioxin, and dibenzofuran lists for which a chronic reference dose and/or a slope factor was available. Individual toxicity reference values are presented for soil and sediments, surface water, and ground water. The chronic reference doses and slope factors used in the calculation of the toxicity reference values were obtained from the Health Effects Assessment Summary Tables (First Quarter, 1991). The values presented are calculated using the lower of the intakes based on the chronic reference dose or slope factor for a chemical if both are available.

Chemicals with contract required quantitation limits that exceed these toxicity reference values are indicated in Table B-1 and are discussed in the text (see Section 2.2.1.2).

4.0 REFERENCES

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TABLE B-1
COMPARISON OF CONTRACT REQUIRED QUANTITATION LIMITS TO TOXICITY REFERENCE VALUES

Compound	Soils and Sediments		Surface Water		Ground Water		
	TRVs (mg/Kg)	CRQLs (mg/Kg)	TRVs (mg/L)	CRQLs (mg/L)	TRVs (mg/L)	Residential Well CRQLs (mg/L)	Monitoring Well CRQLs (mg/L)
TARGET ANALYTE LIST							
Aluminum	NC	4.00E+01	NC	2.00E-01	NC	1.00E-01	2.00E-01
Antimony	4.65E+01	1.20E+01	1.39E-01	6.00E-02	1.40E-02	2.00E-03	6.00E-02
Arsenic	6.64E-02	2.00E+00	1.99E-04	1.00E-02	2.00E-05	2.00E-03	1.00E-02
Barium	8.13E+03	4.00E+01	2.44E+01	2.00E-01	2.45E+00	5.00E-02	2.00E-01
Beryllium	2.70E-02	1.00E+00	8.11E-05	5.00E-03	8.14E-06	5.00E-03	5.00E-03
Cadmium	5.81E+01	1.00E+00	1.74E-01	5.00E-03	1.75E-02	2.00E-04	5.00E-03
Calcium	NC	1.00E+03	NC	5.00E+00	NC	1.00E+00	5.00E+00
Chromium	5.81E+02	2.00E+00	1.53E+00	1.00E-02	1.75E-01	1.00E-02	1.00E-02
Cobalt	1.16E+00	1.00E+01	3.49E-03	5.00E-02	3.50E-04	1.00E-02	5.00E-02
Copper	NC	5.00E+00	NC	2.50E-02	NC	1.00E-02	2.50E-02
Iron	NC	2.00E+01	NC	1.00E-01	NC	1.00E-01	1.00E-01
Lead	NC	1.00E+00	NC	5.00E-03	NC	2.00E-03	5.00E-03
Magnesium	NC	1.00E+03	NC	5.00E+00	NC	1.00E+00	5.00E+00
Manganese	1.16E+04	3.00E+00	3.49E+01	1.50E-02	3.50E+00	1.00E-02	1.50E-02
Mercury	3.48E+01	4.00E-02	1.05E-01	2.00E-04	1.05E-02	2.00E-04	2.00E-04
Nickel	2.32E+03	8.00E+00	6.97E+00	4.00E-02	7.00E-01	2.00E-02	4.00E-02
Potassium	NC	1.00E+03	NC	5.00E+00	NC	2.00E+00	5.00E+00
Selenium	3.48E+02	1.00E+00	1.05E+00	5.00E-03	1.05E-01	2.00E-03	5.00E-03
Silver	3.48E+02	2.00E+00	1.05E+00	1.00E-02	1.05E-01	5.00E-03	1.00E-02
Sodium	NC	1.00E+03	NC	5.00E+00	NC	1.00E+00	5.00E+00
Thallium	8.13E+00	2.00E+00	2.44E-02	1.00E-02	2.45E-03	2.00E-03	1.00E-02
Tin	6.97E+04	NA	2.09E+02	NA	2.10E+01	NA	NA
Vanadium	8.13E+02	1.00E+01	2.44E+00	5.00E-02	2.45E-01	1.00E-02	5.00E-02
Zinc	2.32E+04	4.00E+00	6.97E+01	2.00E-02	7.00E+00	2.00E-02	2.00E-02
Cyanide	2.32E+03	2.00E+00	6.97E+00	1.00E-02	7.00E-01	5.00E-03	1.00E-02
TARGET COMPOUND LIST							
Volatiles							
Chloromethane	4.25E-01	1.00E-02	1.13E-04	1.00E-02	2.69E-03	1.00E-02	1.00E-02
Bromomethane	7.74E+00	1.00E-02	2.05E-03	1.00E-02	4.90E-02	1.00E-02	1.00E-02
Vinyl Chloride	2.91E-03	1.00E-02	7.71E-07	1.00E-02	1.84E-05	1.50E-03	1.00E-02
Chloroethane	NC	1.00E-02	NC	1.00E-02	NC	1.50E-03	1.00E-02
Methylene Chloride	7.37E-01	5.00E-03	1.95E-04	5.00E-03	4.67E-03	1.00E-03	5.00E-03
Acetone	5.53E+02	1.00E-02	1.46E-01	1.00E-02	3.50E+00	7.50E-02	1.00E-02
Carbon Disulfide	5.53E+02	5.00E-03	1.46E-01	5.00E-03	3.50E+00	3.00E-03	5.00E-03
1,1-Dichloroethene	9.21E-03	5.00E-03	2.44E-06	5.00E-03	5.83E-05	1.50E-03	5.00E-03
1,1-Dichloroethane	5.53E+02	5.00E-03	1.46E-01	5.00E-03	3.50E+00	1.50E-03	5.00E-03
1,2-Dichloroethene	5.53E+01	5.00E-03	1.46E-02	5.00E-03	3.50E-01	1.50E-03	5.00E-03
Chloroform	9.06E-01	5.00E-03	2.40E-04	5.00E-03	5.74E-03	1.50E-03	5.00E-03
1,2-Dichloroethane	6.07E-02	5.00E-03	1.61E-05	5.00E-03	3.85E-04	1.50E-03	5.00E-03
2-Butanone	2.76E+02	1.00E-02	9.56E+00	1.00E-02	1.75E+00	5.00E-02	1.00E-02
1,1,1-Trichloroethane	4.97E+02	5.00E-03	1.32E-01	5.00E-03	3.15E+00	1.50E-03	5.00E-03
Carbon Tetrachloride	4.25E-02	5.00E-03	1.13E-05	5.00E-03	2.69E-04	1.50E-03	5.00E-03
Vinyl Acetate	5.53E+03	1.00E-02	1.46E+00	1.00E-02	3.50E+01	1.50E-02	1.00E-02
Bromodichloromethane	4.25E-02	5.00E-03	1.13E-05	5.00E-03	2.69E-04	1.50E-03	5.00E-03
1,2-Dichloropropane	8.13E-02	5.00E-03	2.15E-05	5.00E-03	5.15E-04	1.50E-03	5.00E-03

TABLE B-1
COMPARISON OF CONTRACT REQUIRED QUANTITATION LIMITS TO TOXICITY REFERENCE VALUES

	Soils and Sediments		Surface Water		Ground Water		
Compound	TRVs (mg/Kg)	CRQLs (mg/Kg)	TRVs (mg/L)	CRQLs (mg/L)	TRVs (mg/L)	Residential Well CRQLs (mg/L)	Monitoring Well CRQLs (mg/L)
cis-1,3-Dichloropropene	3.07E-02	5.00E-03	8.14E-06	5.00E-03	1.94E-04	2.00E-03	5.00E-03
Trichloroethene	5.02E-01	5.00E-03	1.33E-04	5.00E-03	3.18E-03	1.50E-03	5.00E-03
Dibromochloromethane	6.58E-02	5.00E-03	1.74E-05	5.00E-03	4.17E-04	1.50E-03	5.00E-03
1,1,2-Trichloroethane	9.69E-02	5.00E-03	2.57E-05	5.00E-03	6.14E-04	1.50E-03	5.00E-03
Benzene	1.91E-01	5.00E-03	4.50E-04	5.00E-03	1.21E-03	1.50E-03	5.00E-03
trans-1,3-Dichloropropene	3.07E-02	5.00E-03	8.14E-06	5.00E-03	1.94E-04	1.00E-03	5.00E-03
Bromoform	6.99E-01	5.00E-03	1.85E-04	5.00E-03	4.43E-03	1.50E-03	5.00E-03
4-Methyl-2-Pentanone	2.76E+02	1.00E-02	7.32E-02	1.00E-02	1.75E+00	3.00E-03	1.00E-02
2-Hexanone	NC	1.00E-02	NC	1.00E-02	NC	5.00E-02	1.00E-02
Tetrachloroethene	1.08E-01	5.00E-03	2.87E-05	5.00E-03	6.86E-04	1.50E-03	5.00E-03
1,1,2,2-Tetrachloroethane	2.76E-02	5.00E-03	7.32E-06	5.00E-03	1.75E-04	1.50E-03	5.00E-03
Toluene	1.11E+03	5.00E-03	2.93E-01	5.00E-03	7.00E+00	1.50E-03	5.00E-03
Chlorobenzene	1.11E+02	5.00E-03	2.93E-02	5.00E-03	7.00E-01	1.50E-03	5.00E-03
Ethylbenzene	5.53E+02	5.00E-03	1.44E+00	5.00E-03	3.50E+00	1.50E-03	5.00E-03
Styrene	1.84E-01	5.00E-03	4.88E-05	5.00E-03	1.17E-03	1.00E-03	5.00E-03
Xylene (total)	1.11E+04	5.00E-03	2.89E+01	5.00E-03	7.00E+01	NA	5.00E-03
Semi-Volatiles							
Phenol	8.19E+03	3.30E-01	2.09E+02	1.00E-02	2.10E+01	2.00E-03	1.00E-02
bis(2-Chloroethyl)Ether	1.24E-02	3.30E-01	3.17E-04	1.00E-02	3.18E-05	1.50E-03	1.00E-02
2-Chlorophenol	6.83E+01	3.30E-01	1.74E+00	1.00E-02	1.75E-01	2.00E-03	1.00E-02
1,3-Dichlorobenzene	1.22E+03	3.30E-01	3.10E+01	1.00E-02	3.12E+00	2.00E-03	1.00E-02
1,4-Dichlorobenzene	5.69E-01	3.30E-01	1.45E-02	1.00E-02	1.46E-03	2.00E-03	1.00E-02
Benzyl Alcohol	4.10E+03	3.30E-01	1.05E+02	1.00E-02	1.05E+01	2.00E-03	1.00E-02
1,2-Dichlorobenzene	1.23E+03	3.30E-01	3.14E+01	1.00E-02	3.15E+00	2.50E-03	1.00E-02
2-Methylphenol	6.83E+02	3.30E-01	1.74E+01	1.00E-02	1.75E+00	1.00E-03	1.00E-02
bis(2-Chloroisopropyl)Ether	5.46E+02	3.30E-01	1.39E+01	1.00E-02	1.40E+00	2.50E-03	1.00E-02
4-Methylphenol	6.83E+02	3.30E-01	1.74E+01	1.00E-02	1.75E+00	1.00E-03	1.00E-02
N-Nitroso-Di-n-Propylamine	1.95E-03	3.30E-01	4.98E-05	1.00E-02	5.00E-06	1.50E-03	1.00E-02
Hexachloroethane	9.75E-01	3.30E-01	2.49E-02	1.00E-02	2.50E-03	2.00E-03	1.00E-02
Nitrobenzene	6.83E+00	3.30E-01	1.74E-01	1.00E-02	1.75E-02	2.50E-03	1.00E-02
Isophorone	3.33E+00	3.30E-01	8.50E-02	1.00E-02	8.54E-03	2.50E-03	1.00E-02
2-Nitrophenol	NC	3.30E-01	NC	1.00E-02	NC	2.00E-03	1.00E-02
2,4-Dimethylphenol	2.73E+02	3.30E-01	6.97E+00	1.00E-02	7.00E-01	2.00E-03	1.00E-02
Benzoic Acid	5.46E+04	1.60E+00	1.39E+03	5.00E-02	1.40E+02	3.00E-02	5.00E-02
bis(2-Chloroethoxy)Methane	NC	3.30E-01	NC	1.00E-02	NC	2.50E-03	1.00E-02
2,4-Dichlorophenol	4.10E+01	3.30E-01	1.05E+00	1.00E-02	1.05E-01	2.00E-03	1.00E-02
1,2,4-Trichlorobenzene	1.79E+01	3.30E-01	4.57E-01	1.00E-02	4.59E-02	2.00E-03	1.00E-02
Naphthalene	5.46E+01	3.30E-01	1.39E+00	1.00E-02	1.40E-01	2.00E-03	1.00E-02
4-Chloroaniline	5.46E+01	3.30E-01	1.39E+00	1.00E-02	1.40E-01	2.00E-03	1.00E-02
4-Chloro-3-Methylphenol	2.73E+04	3.30E-01	6.97E+02	1.00E-02	7.00E+01	1.50E-03	1.00E-02
2-Methylnaphthalene	NC	3.30E-01	NC	1.00E-02	NC	2.00E-03	1.00E-02
2,4,6-Trichlorophenol	1.24E+00	3.30E-01	3.17E-02	1.00E-02	3.18E-03	1.50E-03	1.00E-02
2,4,5-Trichlorophenol	1.37E+03	1.60E+00	3.49E+01	5.00E-02	3.50E+00	1.50E-03	5.00E-02
2-Chloronaphthalene	NC	3.30E-01	NC	1.00E-02	NC	1.50E-03	1.00E-02
2-Nitroaniline	NC	1.60E+00	NC	5.00E-02	NC	NA	5.00E-02

TABLE B-1
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	Soils and Sediments		Surface Water		Ground Water		
Compound	TRVs (mg/Kg)	CRQLs (mg/Kg)	TRVs (mg/L)	CRQLs (mg/L)	TRVs (mg/L)	Residential Well CRQLs (mg/L)	Monitoring Well CRQLs (mg/L)
Dimethyl Phthalate	1.37E+04	3.30E-01	3.49E+02	1.00E-02	3.50E+01	1.50E-03	1.00E-02
Acenaphthylene	5.46E+01	3.30E-01	1.39E+00	1.00E-02	1.40E-01	1.50E-03	1.00E-02
2,6-Dinitrotoluene	2.01E-02	3.30E-01	5.13E-04	1.00E-02	5.15E-05	1.00E-03	1.00E-02
3-Nitroaniline	NC	1.60E+00	NC	5.00E-02	NC	2.50E-03	5.00E-02
Acenaphthene	8.19E+02	3.30E-01	2.09E+01	1.00E-02	2.10E+00	1.50E-03	1.00E-02
2,4-Dinitrophenol	2.73E+01	1.60E+00	6.97E-01	5.00E-02	7.00E-02	1.50E-02	5.00E-02
4-Nitrophenol	NC	1.60E+00	NC	5.00E-02	NC	3.00E-03	5.00E-02
Dibenzofuran	1.37E+01	3.30E-01	3.49E-01	1.00E-02	3.50E-02	1.00E-03	1.00E-02
2,4-Dinitrotoluene	2.01E-02	3.30E-01	5.13E-04	1.00E-02	5.15E-05	1.00E-03	1.00E-02
Diethylphthalate	1.09E+04	3.30E-01	2.79E+02	1.00E-02	2.80E+01	1.00E-03	1.00E-02
4-Chlorophenyl-phenylether	NC	3.30E-01	NC	1.00E-02	NC	1.00E-03	1.00E-02
Fluorene	5.46E+02	3.30E-01	1.39E+01	1.00E-02	1.40E+00	1.00E-03	1.00E-02
4-Nitroaniline	NC	1.60E+00	NC	5.00E-02	NC	3.00E-03	5.00E-02
4,6-Dinitro-2-Methylphenol	NC	1.60E+00	NC	5.00E-02	NC	1.50E-02	5.00E-02
N-Nitrosodiphenylamine	2.79E+00	3.30E-01	7.11E-02	1.00E-02	7.14E-03	1.50E-03	1.00E-02
4-Bromophenyl-phenylether	NC	3.30E-01	NC	1.00E-02	NC	1.50E-03	1.00E-02
Pentachlorophenol	1.14E-01	1.60E+00	2.91E-03	5.00E-02	2.92E-04	2.00E-03	5.00E-02
Phenanthrene	5.46E+01	3.30E-01	1.39E+00	1.00E-02	1.40E-01	1.00E-03	1.00E-02
Anthracene	4.10E+03	3.30E-01	1.05E+02	1.00E-02	1.05E+01	2.50E-03	1.00E-02
Di-n-Butylphthalate	1.37E+03	3.30E-01	3.49E+01	1.00E-02	3.50E+00	2.00E-03	1.00E-02
Fluoranthene	5.46E+02	3.30E-01	1.39E+01	1.00E-02	1.40E+00	1.50E-03	1.00E-02
Pyrene	4.10E+02	3.30E-01	1.05E+01	1.00E-02	1.05E+00	1.50E-03	1.00E-02
Butylbenzylphthalate	2.73E+03	3.30E-01	6.97E+01	1.00E-02	7.00E+00	3.50E-03	1.00E-02
3,3'-Dichlorobenzidine	3.03E-02	6.60E-01	7.75E-04	2.00E-02	7.78E-05	NA	2.00E-02
Benzo(a)Anthracene (1)	1.19E-03	3.30E-01	3.03E-05	1.00E-02	3.04E-06	1.50E-03	1.00E-02
Chrysene (1)	1.19E-03	3.30E-01	3.03E-05	1.00E-02	3.04E-06		1.00E-02
bis(2-Ethylhexyl)Phthalate	9.75E-01	3.30E-01	2.49E-02	1.00E-02	2.50E-03	1.00E-03	1.00E-02
Di-n-Octyl Phthalate	2.73E+02	3.30E-01	6.97E+00	1.00E-02	7.00E-01	1.50E-03	1.00E-02
Benzo(b)Fluoranthene (2)	1.19E-03	3.30E-01	3.03E-05	1.00E-02	3.04E-06	1.50E-03	1.00E-02
Benzo(k)Fluoranthene (2)	1.19E-03	3.30E-01	3.03E-05	1.00E-02	3.04E-06		1.00E-02
Benzo(a)Pyrene	1.19E-03	1.00E-01	3.03E-05	1.00E-02	3.04E-06	2.00E-03	1.00E-02
Indeno(1,2,3-cd)Pyrene	1.19E-03	3.30E-01	3.03E-05	1.00E-02	3.04E-06	3.50E-03	1.00E-02
Dibenzo(a,h)Anthracene	1.19E-03	3.30E-01	3.03E-05	1.00E-02	3.04E-06	2.50E-03	1.00E-02
Benzo(g,h,i)Perylene	5.46E+01	3.30E-01	1.39E+00	1.00E-02	1.40E-01	4.00E-03	1.00E-02
Pesticides							
alpha-BHC	2.17E-03	8.00E-03	5.53E-05	5.00E-05	5.56E-06	1.00E-05	5.00E-05
beta-BHC	7.58E-03	8.00E-03	1.94E-04	5.00E-05	1.94E-05	5.00E-06	5.00E-05
delta-BHC	NC	8.00E-03	NC	5.00E-05	NC	5.00E-06	5.00E-05
gamma-BHC (Lindane)	1.05E-02	8.00E-03	2.68E-04	5.00E-05	2.69E-05	5.00E-06	5.00E-05
Heptachlor	3.03E-03	8.00E-03	7.75E-05	5.00E-05	7.78E-06	3.00E-05	5.00E-05
Aldrin	8.03E-04	8.00E-03	2.05E-05	5.00E-05	2.06E-06	5.00E-06	5.00E-05
Heptachlor epoxide	1.50E-03	8.00E-03	3.83E-05	5.00E-05	3.85E-06	5.00E-06	5.00E-05
Endosulfan I	6.83E-01	8.00E-03	1.74E-02	5.00E-05	1.75E-03	1.00E-05	5.00E-05
Dieldrin	8.53E-04	1.60E-02	2.18E-05	1.00E-04	2.19E-06	1.00E-05	1.00E-04
4,4'-DDE	4.02E-02	1.60E-02	1.03E-03	1.00E-04	1.03E-04	5.00E-06	1.00E-04

TABLE B-1
COMPARISON OF CONTRACT REQUIRED QUANTITATION LIMITS TO TOXICITY REFERENCE VALUES

Compound	Soils and Sediments		Surface Water		Ground Water		
	TRVs (mg/Kg)	CRQLs (mg/Kg)	TRVs (mg/L)	CRQLs (mg/L)	TRVs (mg/L)	Residential Well CRQLs (mg/L)	Monitoring Well CRQLs (mg/L)
Endrin	4.10E+00	1.60E-02	1.05E-01	1.00E-04	1.05E-02	1.00E-05	1.00E-04
Endosulfan II	6.83E-01	1.60E-02	1.74E-02	1.00E-04	1.75E-03	1.00E-05	1.00E-04
4,4'-DDD	5.69E-02	1.60E-02	1.45E-03	1.00E-04	1.46E-04	2.00E-05	1.00E-04
Endosulfan sulfate	NC	1.60E-02	NC	1.00E-04	NC	1.00E-04	1.00E-04
4,4'-DDT	4.02E-02	1.60E-02	1.03E-03	1.00E-04	1.03E-04	2.00E-05	1.00E-04
Methoxychlor	6.83E+01	8.00E-02	1.74E+00	5.00E-04	1.75E-01	2.00E-05	5.00E-04
Endrin ketone	NC	1.60E-02	NC	1.00E-04	NC	3.00E-05	1.00E-04
alpha-Chlordane	1.05E-02	NA	2.68E-04	NA	2.69E-05	NA	NA
gamma-Chlordane	1.05E-02	NA	2.68E-04	NA	2.69E-05	NA	NA
Toxaphene	1.24E-02	1.60E-01	3.17E-04	1.00E-03	3.18E-05	2.50E-04	1.00E-03
Aroclor-1016	1.77E-03	8.00E-02	4.53E-05	5.00E-04	4.55E-06	1.00E-04	5.00E-04
Aroclor-1221	1.77E-03	8.00E-02	4.53E-05	5.00E-04	4.55E-06	1.00E-04	5.00E-04
Aroclor-1232	1.77E-03	8.00E-02	4.53E-05	5.00E-04	4.55E-06	1.00E-04	5.00E-04
Aroclor-1242	1.77E-03	8.00E-02	4.53E-05	5.00E-04	4.55E-06	1.00E-04	5.00E-04
Aroclor-1248	1.77E-03	8.00E-02	4.53E-05	5.00E-04	4.55E-06	1.00E-04	5.00E-04
Aroclor-1254	1.77E-03	1.60E-01	4.53E-05	1.00E-03	4.55E-06	1.00E-04	1.00E-03
Aroclor-1260	1.77E-03	1.60E-01	4.53E-05	1.00E-03	4.55E-06	1.00E-04	1.00E-03
SPECIAL ANALYTICAL SERVICES							
Alternate Pesticides							
Hexachlorobenzene	8.53E-03	3.30E-03	3.18E-04	1.00E-04	2.19E-05	5.00E-05	1.00E-04
Hexachlorocylopentadiene	9.56E+01	3.30E-03	2.44E+00	2.00E-04	2.45E-01	1.00E-04	2.00E-04
Hexachlorobutadiene	1.75E-01	3.30E-03	4.47E-03	1.00E-04	4.49E-04	5.00E-05	1.00E-04
Octachlorocyclopentene	NC	1.60E-03	NC	5.00E-05	NC	2.00E-05	5.00E-05
1,2,3,4,5,7,7-Heptachloronorborene	NC	1.60E-03	NC	5.00E-05	NC	2.00E-05	5.00E-05
Chlordene	8.19E-01	3.30E-03	2.09E-02	1.00E-04	2.10E-03	5.00E-05	1.00E-04
Dioxins and Dibenzofurans							
2,3,7,8-TCDD	9.10E-08	5.00E-06	2.32E-09	--	2.33E-10	--	--
Total TETRA CDD	NC	NA	NC	--	NC	--	--
Total PENTA CDD	NC	2.00E-05	NC	--	NC	--	--
Total HEXA CDD	NC	2.00E-05	NC	--	NC	--	--
Total HEPTA CDD	NC	2.00E-05	NC	--	NC	--	--
Total OCTA CDD	NC	5.00E-05	NC	--	NC	--	--
2,3,7,8-TCDF	NC	NA	NC	--	NC	--	--
Total TETRA CDF	NC	NA	NC	--	NC	--	--
Total PENTA CDF	NC	NA	NC	--	NC	--	--
Total HEXA CDF	NC	NA	NC	--	NC	--	--
Total HEPTA CDF	NC	NA	NC	--	NC	--	--
Total OCTA CDF	NC	5.00E-05	NC	--	NC	--	--

NA = Not available
NC = Not calculated - toxicity values not available
- - = Not applicable
(1) These parameters reported as a total for residential well ground water analysis.
(2) These parameters reported as a total for residential well ground water analysis.
Shaded CRQLs exceed the toxicity reference concentration for the respective medium.

Appendix C

APPENDIX C

ESTIMATES OF RISKS ASSOCIATED WITH EXPOSURES TO MIXTURES OF CHLORINATED DIBENZO-P-DIOXINS AND DIBENZOFURANS (CDD'S AND CDF'S)

Bellin and Barnes (1987) present a method for estimating risks associated with exposures to mixtures of chlorinated dibenzo-p-dioxins and dibenzofurans. Information on the concentrations of CDD and CDF homologes and/or congeners present was obtained as part of the remedial investigation. The significance of the exposure to each of the CDD's and CDF's is expressed as an equivalent amount of 2,3,7,8-tetrachlorodibenzodioxin (2,3,7,8-TCDD) by multiplying the concentration with the corresponding "Toxicity Equivalence Factor" (TEF). The TEFs are based on available toxcity data and structure-activity relationships. Combining this information with toxicity information on 2,3,7,8-TCDD, and assuming additivity of effects, the risks associated with the mixture of CDD's and CDF's can be estimated if the exposure is known.

The 2,3,7,8-TCDD equivalent concentration of a mixture of CDD's and CDF's may be calculated with the following equation:

$$\text{2,3,7,8-TCDD equivalents} = \sum_{i=1}^{n} TEF_i \times C_i$$

where

TEF_i = Toxicity Equivalency Factor for CDD/CDF congener i; and
C = Concentration of CDD/CDF congener i.

The updated TEF's (Barnes, et al, 1989) are presented on the following page.

Exposures to the 2,3,7,8-TCDD equivalent concentration in each appropriate medium are estimated in the Exposure Assessment (Section 3.0). Risks associated with the intakes of the 2,3,7,8-TCDD equivalent concentrations are evaluated in the Risk Evaluation (Section 4.0).

References:

Barnes, Donald G., Frederick W. Kutz, and David P. Bottimore, 1989. 1989 Update to the Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-Dioxins and -Dibenzofurans (CDDs and CDFs). Risk Assessment Forum, U.S. Environmental Protection Agency, Washington, DC 20460, EPA/625/3-89/016.

Bellin, Judith S. and Donald G. Barnes, 1986. Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Difenzo-p-Dioxins and -Dibenzofurans (CDEDs and CDFs). Risk Assessment Forum, U.S. Environmental Protection Agency, Washington, DC 20460. EPA/625/3-89/016.

TOXICITY EQUIVALENCY FACTORS

Compound	1-TEFs/89
Mono-, DI-, and TriCDDs	0
2,3,7,8-TCDD	1
Other TCDDs	0
2,3,7,8-PeCDD	0.5
Other PECDDs	0
2378-HxCDDs	0.1
Other HxCDDs	0
2,3,7,8-HpCDD	0.01
Other HpCDDs	0
OCDD	0.001
Mono-, Di-, and TriCDFs	0
2,3,7,8-TCDF	0.1
Other TCDFs	0
1,2,3,7,8-PeCDF	0.05
2,3,4,7,8-PeCDF	0.5
Other PeCDFs	0
2378-HxCDFs	0.1
Other HxCDFs	0
2378-HpCDFs	0.01
Other HpCDFs	0
OCDF	0.001

Source: Barnes, *et al*, 1989.

Appendix D

APPENDIX D

CALCULATION OF UPPER 95% CONFIDENCE LIMITS FOR ARITHMETIC MEAN CONCENTRATIONS

The exposure concentration for each chemical of concern within each area of concern identified in the risk assessment is the upper 95% confidence limit on the arithmetic mean chemical concentration. This method is suggested in the Human Health Evaluation Manual (U.S. EPA, 1989, p. 6-19) for quantification of exposure from soils, surface water, and sediments. A minimum of three samples is required to calculate the upper confidence limit. If fewer than three samples are available, the maximum observed concentration was used to quantify exposure. Because exposure from ground water occurs at a single point (from a single well), the use of spatial averaging is not appropriate. Therefore, exposure concentrations for ground water were set to the maximum detected concentration.

The upper confidence limit provides a conservative estimate of the average chemical concentration for use in the intake equations. In some instances, however, this value may exceed the maximum observed concentration. High variability in observed concentrations or a particularly low number of concentrations on which to base the calculation can result in a relatively high upper confidence limit. Therefore, if the upper confidence limit exceeds the maximum observed concentration, the maximum observed concentration will be used to quantify exposure.

A lognormal distribution of the data is assumed for the calculation of the confidence limit. Pollution data sets typically are skewed (asymmetric) so that the symmetric normal distribution is not always a suitable model for estimating mean concentrations (Gilbert, 1987). The procedure presented by Gilbert (1987, Chapter 13) was used to calculate the upper 95% confidence limit assuming a lognormal distribution of the data:

Step 1. Transform each datum to find y_i by taking the natural logarithm (ln) of the observed concentration

$$y_i = \ln(x_i),$$

where each x_i is one of i = 1 to n observed concentrations for a particular chemical.

Step 2. Calculate

$$y. = \sum_{i=1}^{n} (y_i)/n$$

$$s_y^2 = \sum_{i=1}^{n} (y_i - y.)^2/(n-1)$$

where y. and s_y^2 are the arithmetic mean and variance of the transformed values (Step 1) and n is the total number of observed concentrations for a particular chemical within an area of concern.

Step 3. Calculate the upper 95% confidence limit for the arithmetic mean concentration as

$$UL_{0.95} = \exp[\, y. + 0.5s_y^2 + s_y H_{0.95}/(n-1)^{0.5}\,]$$

where $H_{0.95}$ is obtained from Table A-12 in Gilbert (1987). The value of $H_{0.95}$ depends on the calculated values of s_y, n and the chosen level of confidence (95%).

Step 4. Values of $H_{0.95}$ may be required for values of s_y and n not given in Table A-12. If this is the case, values of $H_{0.95}$ are calculated using cubic interpolation (four-point Langrangian interpolation) as suggested by Gilbert (1987). The Lagrange interpolating polynomial presented in Burden and Faires (1985) is used as follows to complete one-way interpolation for values of n or values of s_y not presented on the table:

Calculate

$$P(x) = f(x_0)L_{d,0}(x) + f(x_1)L_{d,1}(x) + f(x_2)L_{d,2}(x) + f(x_3)L_{d,3}(x)$$

where

x = the original value given for n which is not included on the table (or the original calculated value of s_y which is not included on the table);
P(x) = the resulting interpolated value of $H_{0.95}$ given x;
d = 3, the degree of the interpolating polynomial;
x_k = distinct values of n or s_y given on Table A-12 of Gilbert (1987) where k= 0, 1, 2, or 3; and

$f(x_k)$ = the value of $H_{0.95}$ given for each value of n over which to be interpolated and a fixed value of s_y given on the table (or the value of $H_{0.95}$ given for each value of s_y over which to be interpolated and a fixed value of n given on the table).

Values of $L_{d,k}(x)$ for k = 0, 1, 2, and 3 will be calculated as

$$L_{d,k}(x) = \frac{[(x - x_0)(x - x_1)...(x - x_{k-1})(x - x_{k+1})...(x - x_d)]}{[(x_k - x_0)(x_k - x_1)...(x_k - x_{k-1})(x_k - x_{k+1})...(x_k - x_d)]}$$

The values of x_k used for the interpolation are chosen as the two tabulated values which are less than the value of x and the two tabulated values greater than x. If there is only one tabulated value less than or greater than x, values of x_k will be chosen as the one less than x and the three greater than x or as the three less than x and the one greater than x.

If x is either less than or greater than all of the tabulated values of x_k, the maximum observed concentration will be used in place of the upper 95% confidence limit for quantifying exposure.

If two-way cubic interpolation is required (e.g., neither the original value given for n nor the original calculated value of s_y is included on the table), the procedure documented above is completed initially across the four values of n given on the table surrounding the original value of n for which interpolation is required. This interpolation across values of n is completed for each of the four values of s_y given on the table surrounding the value of s_y for which interpolation is required. The results of these four interpolations are the values of P(x) (interpolated values of $H_{0.95}$) corresponding to the original value given for n for each of the four values of s_y. The last interpolation is across these values of s_y surrounding the original value calculated for s_y to find the value of P(x) corresponding to original values given for both n and s_y.

References

Burden, R. L., and Faires, J. D., 1985. *Numerical Analysis* (Third Edition). PWS Publishers, Boston, MA

Gilbert, R. O., 1987. *Statistical Methods for Environmental Pollution Monitoring*. Van Nostrand Reinhold, New York, NY

U. S. Environmental Protection Agency. 1989. Risk Assessment Guidance for Superfund. Volume 1. Human Health Evaluation Manual. EPA/540/1-89/002.

Appendix E

APPENDIX E
VOLATILIZATION FROM SHOWERING

Ground water impacted with organic chemicals may be used domestically. One of the potential routes of exposure to the organic chemicals is through the inhalation of volatilized contaminants from ground water during showering. This model utilizes pure component vapor pressures and Raoult's Law to estimate concentrations of organic chemicals in air due to volatilization from showering. Although Henry's Law may be more applicable for this model, Henry's Law data are generally not readily available for dilute contaminant/water mixtures at elevated temperatures. The following defines the assumptions, equations and variables used in this model:

Basis for Modelling (Association of Ground Water Scientists and Engineers, 1989):

Water Flow Rate:	10 L/minute
Water Temperature:	120° F
Duration of Shower:	12 minutes
Time in Bathroom After Shower:	10 minutes
Shower Stall Volume:	3 m^3
Bathroom Volume:	10 m^3
Bathroom Temperature Prior to Shower:	70° F
Area for Shower/Bathroom Air Exchange:	1.5 m^2
Mean Distance for Diffusion:	2 m

Assumptions:

1) Air within shower stall is at equilibrium (maximum) contaminant concentration throughout entire shower (i.e. time to reach equilibrium is negligible).

2) Air exchange between shower stall and remainder of bathroom occurs due to initial expansion of air in stall followed by equimolal counter-diffusion.

3) No air exchange occurs between the bathroom and its surroundings.

4) Water/contaminant solution behaves as an ideal solution (i.e. Raoult's Law can be applied).

Equations for Model:

Mole fraction of constituent i (contaminant) in the aqueous phase is determined from the following equation:

$$x_i = (c_i)\ (1.802 \times 10^{-5})/(MW_i) \quad (1)$$

Where: x_i = Mole Fraction of constituent i in aqueous phase (unitless);
c_i = Concentration of constituent i in aqueous phase (mg/L); and
MW_i = Molecular weight of constituent i (g/gmole).

Pure component vapor pressures are determined from the Antoine equation:

$$\ln(P^*_i/\text{mmHg}) = A_i - B_i/(T + C_i) \quad (2)$$

Where: P^*_i = Vapor Pressure of constituent i (mmHg);
A_i, B_i, C_i = Antoine Equations Coefficients for Constituent i (unitless); and
T = Absolute Temperature (K).

Antoine equation coefficients are available from Reid, et al, 1977 (pp. 630-665).

Temperature is assumed to be constant at 120° F (49°C), so equation (2) reduces to:

$$\ln(P^*_i/\text{mmHg}) = A_i - B_i/(322 + C_i) \quad (3)$$

Equilibrium (shower) vapor concentration of constituent i is estimated from Raoult's Law:

$$y_i = (P^*_i)\ (x_i)/(P_T) \quad (4)$$

Where: y_i = Mole fraction of constituent i in the vapor phase (unitless);
x_i = Mole fraction of constituent i in aqueous phase (unitless); and
P_T = Total Pressure (mmHg).

Equilibrium vapor concentration of constituent i is then converted to more appropriate units according to the following equation:

$$(c_i)_v = (37{,}800)(MW_i)(y_i) \quad (5)$$

Where: $(c_i)_v$ = Concentration of constituent i in the vapor phase (mg/m^3).

Transport of constituent i out of the shower stall due to expansion of air is estimated from Charles' Law:

$$V_2 = (V_1)\,(T_2/T_1) \quad (6)$$

Where: V = Volume of Gas/Vapor (m^3);
T_1 - Initial Temperature (K); and
T_2 = Final Temperature (K).

In this case, the mass of constituent i leaving the shower due to air expansion is given by:

$$(m_i)_{ex} = (0.283)\,(c_i)_v \quad (7)$$

Where: $(m_i)_{ex}$ = Mass of constituent i leaving the shower due to air expansion (mg).

The diffusion coefficient for constituent i in air is estimated from the method of Fuller, Schettler and Giddings (Reid, et al, 1977):

$$D_{i/Air} = (10^{-7})\,(T)^{1.75}\,[(MW_i + 29)/(MW_i)(29)]/(P)\,[(\Sigma v_i)^{1/3} + 2.6]^{1/2} \quad (8)$$

Where: $D_{i/Air}$ = Constituent i/air diffusion coefficient (m^2/sec);
MW_i = Molecular weight of constituent i (g/gmole); and
Σv_i = Summation of molecular diffusion volumes for constituent i (unitless).

Molecular Diffusion volumes are available from Reid, et al, 1977 (p. 554).

For the conditions specified for the model, equation (8) reduces to:

$$D_{i/Air} = (2.26 \times 10^{-3})\,[(MW_i + 29)/(MW_i)(29)]/[(\Sigma v_i)^{1/3} + 2.6]^{1/2} \quad (9)$$

Diffusion of constituent i from the shower stall into the bathroom is estimated from Fick's Law:

$$J_{i/Air} = (D_{i/Air})\,(dc_i/dz) \quad (10)$$

Where: $J_{i/Air}$ = Mass flux of constituent i [mg i/(s m^2)];
c_i = Concentration of i in vapor (mg/m^3); and
z = Mean Distance for diffusion (m).

The total mass of constituent i which flows into the bathroom is given by:

$$(m_i)_{df} = (540)\ (D_{i/Air})\ (c_i)_v \quad (11)$$

Where: $(m_i)_{df}$ = Mass of constituent i leaving shower stall due to diffusion (mg).

The final concentration of constituent i in air has been estimated assuming instantaneous complete mixing of the bathroom contents. Final concentration of constituent i in the bathroom air is calculated as follows:

$$(c_i)_f = [(3)\ (c_i)_v + (m_i)_{ex} + (m_i)_{df}]/10 \quad (12)$$

Where: $(c_i)_f$ = Final concentration of constituent i in bathroom (mg/m^3).

Overall exposure to volatilized constituent i can then be estimated at 12 minutes of exposure at $(c_i)_v$ followed by 10 minutes of exposure at $(c_i)_f$. A weighted average exposure concentration $(C_i)_{sa}$ may be calculated by:

$$(c_i)_{sa} = [(12)\ (c_i)_v + (10)\ (c_i)_f]/22 \quad (13)$$

References:

Association of Ground Water Scientists and Engineers, 1989. Risk Assessment for the Ground Water Scientist Conference Proceedings, November 28-30, 1989, Dan Diego, California. National Water Well Association, 6375 Riverside Dr., Dublin, OH 43017.

Reid, Prausnitz, and Sherwood, 1977. The Properties of Gases and Liquids, 3rd edition., McGraw Hill.

SUMMARY OF MODEL CALCULATIONS

Mole fraction of constituent i (contaminant) in the aqueous phase is determined from equation (1):

$$x_i = (c_i)\ (1.802 \times 10^{-5})/(MW_i) \quad (1)$$

Pure component vapor pressure of i is determined from equation (3):

$$\ln(P^*_i/\text{mmHg}) = A_i - B_i/(322 + C_i) \quad (3)$$

Equilibrium (shower) vapor mole fraction and concentration of constituent i is estimated from equations (4) and (5):

$$y_i = (P^*_i)\ (x_i)/(P_T) \quad (4)$$

$$(c_i)_v = (37{,}800)(MW_i)(y_i) \quad (5)$$

The mass of constituent i leaving the shower due to air expansion is estimated from equation (7):

$$(m_i)_{ex} = (0.283)\ (c_i)_v \quad (7)$$

Mass of constituent i leaving the shower due to diffusion is estimated from equations (9) and (11):

$$D_{i/Air} = (2.26 \times 10^{-3})\ [(MW_i + 29)/(MW_i)(29)]/[(\Sigma v_i)^{1/3} + 2.6]^{1/2} \quad (9)$$

$$(m_i)_{df} = (540)\ (D_{i/Air})\ (c_i)_v \quad (11)$$

Final concentration of constituent i in the bathroom air is calculated from equation (12):

$$(c_i)_f = [(3)\ (c_i)_v + (m_i)_{ex} + (m_i)_{df}]/10 \quad (12)$$

A weighted average exposure concentration is calculated from equation (13):

$$(c_i)_{sa} = [(12)\ (c_i)_v + (10)\ (c_i)_f]/22 \quad (13)$$

Appendix F

APPENDIX F

STREAM DILUTION MODEL

This model estimates the long-term average concentrations of chemicals in mixing zones of streams receiving an effluent or ground water discharage that contains the chemicals.

By mass balance:

$$CeQe = (Cm - Cb) \times (Qm + Qe), \qquad \text{(Equation 1)}$$

where:

Ce = Concentration of chemical in effluent or ground water;
Qe = Effluent flow;
Cm = Concentration of chemical in the mixing zone;
Cb = Background concentration of chemical; and
Qm = Flow of stream in the mixing zone.

Equation 1 may be rearranged to solve for Cm, the stream concentration in the mixing zone:

$$Cm = \frac{(CeQe)}{(Qm + Q_c)} + C_b \qquad \text{(Equation 2)}$$

If the background concentrations are zero or very low and the effluent flow is small in relation to the total flow (which is usually the case for ground water inflow), equation 2 can be simplified to:

$$Cm = \frac{(CeQe)}{(Qm)} \qquad \text{(Equation 3)}$$

The annual average stream flow should be used to assess human health when exposure may occur throughout most of the year. An estimate of low flow, such as the 7Q10 or 95% exceedance flow should be used to estimate extreme concentrations. The upper 95% confidence limit of the arithmatic mean of the ground water concentrations, or the maximum concentration for each chemical (whichever is less) should be used for the effluent concentration.

Appendix G

EQUATION 1

INGESTION OF CHEMICALS IN SOIL

Equation:

$$\text{Intake (mg/kg/day)} = \frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

Where:

CS	=	Chemical Concentration in Soil (mg/kg)
IR	=	Ingestion Rate (mg soil/day)
CF	=	Conversion Factor (10^{-6} kg/mg)
FI	=	Fraction Ingested from Contaminated Source (unitless)
EF	=	Exposure Frequency (days/year)
ED	=	Exposure Duration (years)
BW	=	Body Weight (kg)
AT	=	Averaging Time (period over which exposure is averaged -- days)

Source: U.S. Environmental Protection Agency 1989. Risk Assessment Guidance for Superfund Volume 1. Human Health Evaluation Manual. Office of Emergency and Remedial Response, Washington, DC 20460. EPA/540/1-89.002.

EQUATION 2

DERMAL CONTACT WITH CHEMICALS IN SOIL

Equation:

$$\text{Absorbed Dose (mg/kg/day)} = \frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Where:

CS	=	Chemical Concentration in Soil (mg/kg)
CF	=	Conversion Factor (10^{-6} kg/mg)
SA	=	Skin Surface Area Available for Contact (cm^2/event)
AF	=	Soil to Skin Adherence Factor (mg/cm^2)
ABS	=	Absorption Factor (unitless)
EF	=	Exposure Frequency (events/year)
ED	=	Exposure Duration (years)
BW	=	Body Weight (kg)
AT	=	Averaging Time (period over which exposure is averaged -- days)

Source: U.S. Environmental Protection Agency 1989. Risk Assessment Guidance for Superfund Volume 1. Human Health Evaluation Manual. Office of Emergency and Remedial Response, Washington, DC 20460. EPA/540/1-89.002.

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EQUATION 3

INGESTION OF CHEMICALS IN DRINKING WATER

Equation:

$$\text{Intake (mg/kg/day)} = \frac{CW \times IR \times EF \times ED}{BW \times AT}$$

Where:

CW	=	Chemical Concentration in Water (mg/liter)
IR	=	Ingestion Rate (liters/day)
EF	=	Exposure Frequency (days/year)
ED	=	Exposure Duration (years)
BW	=	Body Weight (kg)
AT	=	Averaging Time (period over which exposure is averaged -- days)

Source: U.S. Environmental Protection Agency 1989. Risk Assessment Guidance for Superfund Volume 1. Human Health Evaluation Manual. Office of Emergency and Remedial Response, Washington, DC 20460. EPA/540/1-89.002.

EQUATION 4

DERMAL CONTACT WITH CHEMICALS IN WATER

Equation:

$$\text{Intake (mg/kg-day)} = \frac{CW \times SA \times PC \times ET \times EF \times ED \times CF}{BW \times AT}$$

Where:

CW	=	Chemical Concentration in Water (mg/liter)
SA	=	Skin Surface Area Available for Contact (cm^2)
PC	=	Chemical-specific Dermal Permeability Constant (cm/hr)
ET	=	Exposure Time (hours/day)
EF	=	Exposure Frequency (days/year)
ED	=	Exposure Duration (years)
CF	=	Volumetric Conversion Factor for Water (1 liter/cm^3)
BW	=	Body Weight (kg)
AT	=	Averaging Time (period over which exposure is averaged -- days)

Source: U.S. Environmental Protection Agency 1989. Risk Assessment Guidance for Superfund Volume 1. Human Health Evaluation Manual. Office of Emergency and Remedial Response, Washington, DC 20460. EPA/540/1-89.002.

EQUATION 5

INHALATION OF AIRBORNE (VAPOR PHASE) CHEMICALS

Equation:

$$\text{Intake (mg/kg-day)} = \frac{CA \times IR \times ET \times EF \times ED}{BW \times AT}$$

Where:

CA	=	Contaminant Concentration in Air (mg/m^3)
IR	=	Inhalation Rate (m^3/hour)
ET	=	Exposure Time (hours/event)
EF	=	Exposure Frequency (days/year)
ED	=	Exposure Duration (years)
BW	=	Body Weight (kg)
AT	=	Averaging Time (period over which exposure is averaged -- days)

Source: U.S. Environmental Protection Agency 1989. Risk Assessment Guidance for Superfund Volume 1. Human Health Evaluation Manual. Office of Emergency and Remedial Response, Washington, DC 20460. EPA/540/1-89.002.

EQUATION 6

INGESTION OF CHEMICALS IN SURFACE WATER WHILE SWIMMING

Equation:

$$\text{Intake (mg/kg-day)} = \frac{CW \times CR \times ET \times EF \times ED}{BW \times AT}$$

Where:

CW	=	Chemical Concentration in Water (mg/liter)
CR	=	Contact Rate (liters/hour)
ET	=	Exposure Time (hours/event)
EF	=	Exposure Frequency (events/year)
ED	=	Exposure Duration (years)
BW	=	Body Weight (kg)
AT	=	Averaging Time (period over which exposure is averaged -- days)

Source: U.S. Environmental Protection Agency 1989. Risk Assessment Guidance for Superfund Volume 1. Human Health Evaluation Manual. Office of Emergency and Remedial Response, Washington, DC 20460. EPA/540/1-89.002.

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EQUATION 7

LINEAR LOW-DOSE CANCER RISK EQUATION

Equation:	Risk = CDI x SF

Where:

Risk = probability of an individual developing cancer (unitless)

CDI = Chronic Daily Intake averaged over 70 years (mg/kg/day)

SF = slope factor $(mg/kg/day)^{-1}$

Source: U.S. EPA. 1989. Risk Assessment Guidance for Superfund. Volume 1. Human Health Evaluation Manual. Office of Emergency and Remedial Response. Washington, D.C. 20460. EPA/540/1-89/002.

EQUATION 8

NON-CANCER HAZARD QUOTIENT

Equation:	Non-Cancer Hazard Quotient = E/RfD

Where:

E = exposure level (or intake);

RfD = reference dose; and

E and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or shorter-term).

Source: U.S. EPA. 1989. Risk Assessment Guidance for Superfund. Volume 1. Human Health Evaluation Manual. Office of Emergency and Remedial Response. Washington, D.C. 20460. EPA/540/1-89/002.

EQUATION 9

CANCER RISK EQUATION FOR MULTIPLE SUBSTANCES

Equation: Total Cancer Risk = $\sum Risk_i$

Where:

Total Cancer Risk = the total cancer risk expressed as a unitless probability; and

$Risk_i$ = the risk estimate for the i^{th} substance.

Source: U.S. EPA. 1989. Risk Assessment Guidance for Superfund. Volume 1. Human Health Evaluation Manual. Office of Emergency and Remedial Response. Washington, D.C. 20460. EPA/540/1-89/002.

EQUATION 10

NON-CANCER HAZARD INDEX

Equation: Hazard Index = $E_1/RfD_1 + E_2/RfD_2 + \cdots + E_i/RfD_i$

Where:

E_i = Exposure level (or intake) for the i^{th} toxicant;

RfD_i = Reference Dose for the i^{th} toxicant; and

E and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or shorter-term).

Source: U.S. EPA. 1989. Risk Assessment Guidance for Superfund. Volume 1. Human Health Evaluation Manual. Office of Emergency and Remedial Response. Washington, D.C. 20460. EPA/540/1-89/002.

EQUATION 11

CANCER RISK EQUATION FOR MULTIPLE PATHWAYS

Equation:

Total Exposure Cancer Risk =

Risk (exposure pathway 1) +
Risk (exposure pathway 2) +....+
Risk (exposure pathway i)

Source: U.S. EPA. 1989. Risk Assessment Guidance for Superfund. Volume 1. Human Health Evaluation Manual. Office of Emergency and Remedial Response. Washington, D.C. 20460. EPA/540/1-89/002.

EQUATION 12

TOTAL HAZARD INDEX EQUATION FOR MULTIPLE PATHWAYS

Equation:

Total Exposure Hazard Index =
Hazard Index (exposure pathway 1) +
Hazard Index (exposure pathway 2) +···+
Hazard Index (exposure pathway i)

Source: U.S. EPA. 1989. Risk Assessment Guidance for Superfund. Volume 1. Human Health Evaluation Manual. Office of Emergency and Remedial Response. Washington, D.C. 20460. EPA/540/1-89/002.

Appendix H

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL CRITERIA AND ASSESSMENT OFFICE
CINCINNATI, OHIO 45268

July 6, 1990

Kathy Wurthle
Michigan State Bureau of
Environmental Protection
3855 Queen Oaks Drive
Chelsea, MI 48118

RE: Carcinogenic Assessment for Chloroethane

Dear Ms. Wurthle:

In response to your request for information regarding the cancer classification and slope factor for chloroethane, I am paraphrasing information received from Charles Ris, Deputy Director of the Human Health Assessment Group.

An 8/87 HEA document on chloroethane (or ethylene chloride) presents a Group D classification since there was no epidemiology or bioassay data available. This document also notes that NTP was completing an inhalation bioassay, and that this data would be valuable when available.

The NTP study has since been released (Technical Report #346, October, 1988). The report concludes that in the 2-year inhalation bioassay there was equivocal evidence of carcinogenic activity in F344 male rats, (benign and malignant epithelial neoplasms of the skin), equivocal evidence in the female rat (three uncommon malignant astrocytomas of the brain), inadequate testing of the male B6C3F1 mouse (because of reduced survival), and clear evidence in the female (carcinomas of the uterus and marginally increased incidence of increased hepatocellular neoplasms).

It is noted that since this new data has not yet been evaluated by OHEA there is no revised weight-of-evidence classification or slope factor estimates available for chloroethane. Dr. Ris concludes his memo by stating that "Clearly the data should be reassessed. It is fairly clear that the classification would be at least a "C" and it is quite possible that a "B2" would be strongly considered. Such a reassessment is not on the near term work agenda".

If I can provide any further clarification or assistance, feel free to contact me at 513-569-7300, or Charlie Ris at 202-382-5898.

Sincerely yours,

Pei-Fung Hurst, Ph.D.
Coordinator
Superfund Health Risk Technology Support Center

cc: C. DeRosa (ECAO-Cin)
C. Ris (RD-689)
B. Means (OS-230)
T. O'Bryan (OS-230)
W.B. Peirano (ECAO-Cin)
L. Valcovic (RD-689)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL CRITERIA AND ASSESSMENT OFFICE
CINCINNATI, OHIO 45268

DEC 0 3 1990

Subject: Carcinogenic Information for PAHs (Skinner Landfill/West Chester, Ohio)

From: Pei-Fung Hurst
Coordinator
Superfund Health Risk Technology Support Center
Chemical Mixtures Assessment Branch

To: Fred Bartman
U.S. EPA
Region V

Thru: W. Bruce Peirano
Acting Chief
Chemical Mixtures Assessment Branch

This memo is in response to a request by your contractor, Karen Hathaway of WW Engineering and Science, for the recommended slope factors for PAHs. The only PAH that we have information pertaining to the slope factors is benzo[a]pyrene.

Oral Slope Factor

Benzo[a]pyrene has been classified as a B2 carcinogen, however, there is no oral slope factor on IRIS. The Ambient Water Quality Criteria document (U.S. EPA, 1980) and Health Effects Assessment document (U.S. EPA, 1984) derived an oral slope factor of 11.5 $(mg/kg/day)^{-1}$ using a linearized multistage procedure. This value could be adopted as an interim value for the risk assessment of superfund sites.

Inhalation Slope Factor

The inhalation slope factor for benzo[a]pyrene is not on IRIS. As a conservative assumption, it is appropriate to use the inhalation slope factor of 6.1 $(mg/kg/day)^{-1}$ that was derived for

benzo[a]pyrene in a Health Effects Assessment document (U.S. EPA, 1984).

Interim approach

Note that OERR is working on a draft approach for risk assessment for PAHs at the superfund sites. ECAO-Cin has been involved in the development of an ODW document for PAHs and is currently working on a Technical Support Document for PAHs. The toxicity equivalency factors for PAHs have been discussed in both the draft ODW document and the Technical support Document for PAHs. However, presently there is no Agency position on this issue. Therefore, it is our recommendation that the slope factors for benzo[a]pyrene be adopted as the default values for PAHs with B2 classification.

Please feel free to contact me at FTS 684-7300 (513-569-7300) if you need further assistance.

cc: C. DeRosa (ECAO - Cin)
K. Hathaway (WW Engineering and Science)
B. Means (OS - 230)
T. O'Bryan (OS - 230)
P. VanLeeuwen (Region V)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL CRITERIA AND ASSESSMENT OFFICE
CINCINNATI, OHIO 45268

March 13, 1991

Subject: Toxicity Information and Methodology Review (Skinner Landfill/West Chester, Ohio)

From: Pei-Fung Hurst
Coordinator
Superfund Health Risk Technology Support Center
Chemical Mixtures Assessment Branch

To: Fred Bartman
U.S. EPA
Region V

Thru: W. Bruce Peirano
Acting Chief
Chemical Mixtures Assessment Branch

This memo is in response to a request from your contractor, Carrie Lehmann of WW Engineering and Science, for review of toxicity values proposed for use at the Skinner Landfill.

Attached please find a draft evaluation of the toxicity values proposed by WW Engineering and Science. Please note that ECAO is in the process of preparing response concerning toxicity assessment of lead and carcinogenicity of chlorodane and we will provide further information as it becomes available.

Please feel free to contact me at FTS 684-7300 (513-569-7300) if I can be of further assistance.

Attachment

cc: C. DeRosa (ECAO-Cin)
J. Dinan (OS-230)
C. Lehmann (WW Engineering and Science)
B. Means (OS-230)
P. VanLeeuwen (Region V)

TOXICITY VALUE REVIEW FOR SKINNER LANDFILL

I. EVALUATION OF CRITERIA DERIVED BY WWES

COBALT

The oral RfD of 0.0028 mg/kg/day for cobalt derived by WWES based on a LOAEL of 200 mg/L cobalt chloride in a 1-month drinking water study in mice (Domingo, 1989) was determined to be unacceptable. The effect that defined the LOAEL was not reported and it was not clear whether the dose of 200 mg/L had been adjusted for the amount of cobalt in the test sample. The Domingo (1989) paper, however, is a review, which reported the results of the study by Domingo et al. (1984). The Domingo et al. (1984) study used rats, not mice, as reported by WWES. Consequently, the RfD calculation is not correct because default values for mice were used in the estimation of dose.

The most important reason that this oral RfD is not acceptable, however, is that the effects reported in the Domingo et al. (1984) study do not reflect the most sensitive endpoint for cobalt toxicity. Since cobalt is a sensitizer, the most sensitive endpoint is the elicitation of an allergic response (dermatitis). An interim oral RfD of 1E-5 mg Co/kg/day was derived by the Environmental Criteria and Assessment Office (ECAO). This oral RfD was based on a LOAEL for elicitation of an allergic response in sensitized humans orally challenged with 1 mg cobalt as cobalt sulfate once per week for 3 weeks (Veien et al., 1987). This LOAEL was divided by a human body weight of 70 kg to yield a LOAEL of 0.014 mg cobalt/kg, which was then divided by an uncertainty factor of 1000 (10 for the use of a LOAEL, 10 for the use of an acute study and 10 to protect sensitive individuals). An interim oral RfD of 1E-5 mg Co/kg/day resulted.

It is concluded, therefore, that the oral RfD for cobalt derived by WWES is not acceptable and that the interim value of 1E-5 mg Co/kg/day, derived by ECAO, may be used.

ENDRIN KETONE

WWES derived an oral RfD for endrin ketone based the results of a 15-day feeding study in mice (Young et al., 1986). A complete citation for the Young et al. (1986) study was not provided, and no citation was located for Young et al. (1986) study in mice. A citation for a 15 day feeding study in rats (Young and Mehendale, 1986), however, was located. An abstract of the Young and Mehendale (1986) study reported that a slight elevation in SGPT levels was observed in Sprague-Dawley rats fed a diet containing 5 ppm endrin ketone for 15 days.

No Agency documents on endrin ketone were located (U.S. EPA,

1990a). If the toxicity database for endrin ketone contains only this acute study (Young and Mehendale, 1986), basing the RfD on this study would not conform with U.S. EPA guidelines for the derivation of an oral RfD (U.S. EPA, 1989a). The minimum database for the derivation of an oral RfD is a single, well-conducted subchronic study.

ALUMINUM

WWES derived an oral RfD for aluminum from a rodent oral LD_{50} of 770 mg/kg/day. An uncertainty factor of 1E+6 (10,000 acute to chronic application factor and 100 for individual and species differences) was applied to the LD_{50} to yield an oral RfD of 8E-4 mg/kg/day.

The U.S. EPA (1989a) has established guidelines for deriving oral RfDs. The approach taken by WWES does not conform to these guidelines. The minimum allowable database is a single, well-conducted, subchronic mammalian study (U.S. EPA, 1989a). In addition, the use of frank effects, such as lethality, as the basis for an RfD is discouraged because these endpoints are expected to be far removed from the experimental threshold region for adverse effect. Lastly, the U.S. EPA (1989a) does not recommend the use of an uncertainty factor greater than 10,000.

The Agency has prepared a HEA (U.S. EPA, 1987a) and a Drinking Water Criteria Document (U.S. EPA, 1984a) on aluminum. In addition, ATSDR has recently prepared a toxicological profile for aluminum (ATSDR, 1990a). The HEA (U.S. EPA, 1987a) and toxicological profile (ATSDR, 1990a) stated that there is insufficient data for the derivation of an oral RfD and MRL, respectively, for aluminum. Due to time constraints, a literature search and an evaluation of the database for aluminum was not performed. In summary, no noncancer toxicity value can be recommended for aluminum at this time.

PHENANTHRENE and 2-METHYLNAPHTHALENE

WWES derived oral RfDs for phenanthrene and 2-methylnaphthalene. Each RfD was derived from acute oral LD_{50} data to which uncertainty factors of 1E+6 were applied. WWES's approach does not conform to EPA guidelines for RfD derivation. The Agency considers a single, well-conducted, subchronic mammalian study to form the minimum data base for estimating an RfD (U.S. EPA, 1989a).

ECAO has previously considered the derivation of an oral RfD for 2-methylnaphthalene. The Statement of Research Needs on 2-Methylnaphthalene (U.S. EPA, 1989c) and the ATSDR Toxicological Profile on naphthalene and 2-methylnaphthalene (ATSDR, 1989a) were reviewed. It was concluded that data are inadequate for derivation

of an oral RfD for 2-methylnaphthalene. Additionally, available information comparing the toxicology and metabolism of 2-methylnaphthalene with that of naphthalene is sufficient to suggest that the health effects and the metabolism of these compounds may differ significantly. Therefore the use of the oral RfD for naphthalene as an analogous RfD for 2-methylnaphthalene is scientifically questionable.

The HEEP for Phenanthrene (U.S. EPA, 1987b) reviewed the data base for phenanthrene and concluded that available data were insufficient to derive an oral RfD for phenanthrene. According to IRIS (U.S. EPA, 1991), phenanthrene is a PAH that is classified as a Group D carcinogen (not classifiable as to human carcinogenicity) due to the lack of human data and inadequate data from animal bioassays.

GAMMA-CHLORDANE

WWES adopted for gamma chlordane the verified oral RfD for chlordane of 6E-5 mg/kg/day (U.S. EPA, 1991), because of the structural similarity of the chemicals.

Technical chlordane is a mixture composed of at least 50 compounds (ATSDR, 1989b). IARC (1979) reports that the technical mixture consists of 24% trans-chlordane, 19% cis-chlordane, 21.5% chlordane isomers, 10% heptachlor and several other structurally related chemicals. IARC (1979) notes that trans-chlordane is also known as gamma-chlordane and that cis-chlordane is also known as alpha-chlordane. NIOSH (1991), however, lists two synonyms and two CAS numbers for trans-chlordane: (1) beta-chlordane (CAS No. 5103-74-2), and (2) gamma-chlordane (CAS No. 5564-34-7). U.S. EPA (1988b) presents a CAS No. of 5103-71-9 for alpha-chlordane [consistent with NIOSH (1991)] and a CAS No. of 5103-74-2 for gamma-chlordane [consistent with NIOSH (1991)]. If WWES followed the U.S. EPA (1988b) guidelines in their work at the Skinner Landfill, it can be assumed that the chemical they identified as gamma-chlordane is that identified by NIOSH (1991) as CAS No. 5103-74-2.

Of the major components of chlordane, an oral RfD is available only for heptachlor. Data regarding the chronic toxicity of the other major components of chlordane were not located in the literature reviewed (ATSDR, 1989b; U.S. EPA, 1987c, 1988c). The RfD for heptachlor, 5E-4 mg/kg/day (U.S. EPA, 1990c), is about an order of magnitude larger than the RfD for chlordane of 6E-5 mg/kg/day, although oral data in mice indicate that heptachlor [LD_{50} = 68 mg/kg (Sax, 1984)] may be more acutely toxic than gamma-chlordane [LD_{50} = 275 mg/kg (NIOSH, 1991). The approach taken by WWES, to adopt the RfD for chlordane as the RfD for gamma-chlordane, appears to be reasonably defensible. It does, however, overlook the possibility that the chronic toxicity of gamma-

chlordane may be greater than that of the chlordane mixture. Oral LD_{50} data, however, do not suggest that gamma-chlordane is more acutely toxic than cis-chlordane or the chlordane mixture (NIOSH, 1991). Because of the uncertainty regarding the relative chronic toxicity of gamma-chlordane and the chlordane mixture, confidence in the RfD for gamma-chlordane is very low.

CHROMIUM (TOTAL)

WWES found no toxicity values (RfDs or slope factors) for total chromium in IRIS or HEAST. WWES, therefore, used the oral RfD for chromium(VI), the most toxic compound in the total chromium, in their evaluation of total chromium. No slope factor for oral exposure to chromium was used because chromium(VI) is not carcinogenic by ingestion, and the EPA has not calculated a slope factor for oral exposure to chromium. Chromium(VI) is carcinogenic by the inhalation route, but WWES did not use inhalation slope factor for chromium(VI) because the inhalation pathway had not been quantified in their assessment.

In order to assess the appropriateness of WWES's use of the RfD for chromium(VI) as a toxicity value for total chromium, the following documents were consulted: IRIS for chromium(VI) and chromium(III) (U.S. EPA, 1991), the ATSDR Toxicological Profile for Chromium (ATSDR, 1989c), the HAD for Chromium (U.S. EPA, (1984b) and the HAD Addendum (U.S. EPA, 1987d), the DWCD for Chromium (U.S. EPA, 1985a), the AWQCD for Chromium (U.S. EPA, (1980a), the HEA for Trivalent Chromium (U.S. EPA, 1984c), and the HEA for Hexavalent Chromium (U.S. EPA 1984d).

IRIS indicated that the verified oral RfD for chromium(VI) is 5E-3 mg/kg/day based on a NOAEL of 2.4 mg Cr(VI)/kg/day as potassium chromate in a rat 1-year drinking water study by MacKenzie et al. (1958) and an uncertainty factor of 500, (10 for interspecies variability, 10 for intraspecies variability, and 5 to compensate for less-than-lifetime exposure). Confidence in the study, the database, and the RfD is low. IRIS indicated that the verified oral RfD for chromium(III) is 1 mg/kg/day based on a NOEL 1468 mg/kg/day in a rat subchronic feeding study by Ivankovic and Preussmann (1975) and using an uncertainty factor of 1000. Confidence in the study, the database, and the RfD is low.

In both of these studies (MacKenzie et al. 1958; Ivankovic and Preussmann, 1975), no effects were seen at the highest doses administered. Therefore, it is not possible to state based on the chronic studies that chromium(VI) is more toxic than chromium (III). Review of the U.S. EPA and ATSDR documents, however, reveals that the hexavalent form is generally more toxic than the trivalent form based on acute and subchronic oral studies. Both chromium(VI) and chromium(III) in inorganic forms are poorly

absorbed from the gastrointestinal tract, but the absorption of chromium(VI) is somewhat higher than chromium(III). The poor gastrointestinal absorption in part accounts for the relatively low order of toxicity after ingestion of either form of chromium. Chromium(VI) more readily traverses biological membranes than does chromium(III), which accounts for the greater toxicity of the hexavalent form. However, chromium(VI) is reduced intracellularly to chromium(III). Therefore, any toxicity value calculated for chromium(VI) will be protective for chromium(III). U.S. EPA (1985a, 1991) based the Health Advisories for total chromium on the NOAEL for chromium(VI). Therefore, basing an oral RfD for total chromium on the RfD for chromium(VI) appears to be appropriate.

It should be noted that chromium(III) is considered to be an essential nutrient for maintaining normal glucose, cholesterol, and fat metabolism. The estimated safe and adequate daily dietary recommendation for intake of chromium by adults is 50-200 µg/day (0.0007-0.003 mg/kg/day assuming an average human body weight of 70 kg) (NRC, 1980). This range of estimated safe and adequate daily intakes is based on the absence of signs of chromium deficiency in the U.S. population consuming 60 µg/day (0.0009 mg/kg/day). Therefore, use of the RfD for chromium(VI) of 0.005 mg/kg/day for total chromium is not too conservative relative to the safe and adequate daily dietary intake for chromium(III).

Review of IRIS for chromium(VI) and chromium(III) reveals that WWES was correct regarding the absence of oral slope factors for chromium. Chromium has not been demonstrated to be carcinogenic following oral exposure, and the U.S. EPA did not use the inhalation slope factor for chromium as the basis for an oral slope factor.

1,2-DICHLOROETHENE

WWES found no toxicity values (RfDs or slope factors) for total 1,2-dichloroethene in IRIS or HEAST. WWES, therefore, used the oral RfD for trans-1,2-dichloroethene, the more toxic isomer in total 1,2-dichloroethene. Because of the lack of evidence for carcinogenicity, no slope factors for 1,2-dichloroethene were calculated.

In order to assess the appropriateness of WWES's use of the RfD for trans-1,2-dichloroethene as a toxicity value for total 1,2-dichloroethene, the following documents were consulted: IRIS for trans-1,2-dichloroethene and cis-1,2-dichloroethene (U.S. EPA 1991a), the HEA for cis-1,2-Dichloroethene (U.S. EPA, 1984e), the HEA for trans-1,2-Dichloroethene (U.S. EPA 1984f), the HEED for cis-1,2-Dichloroethene (U.S. EPA, 1990d), the Health Advisory Documents for cis-1,2-Dichloroethylene (U.S. EPA 1987e) and trans-1,2-Dichloroethylene (U.S. EPA 1987f), the HEEP for Dichloroethenes (U.S. EPA 1986), the Quarterly Status Report of the CRAVE and RfD/RfC Work Groups, dated January, 1991 (U.S. EPA, 1991b,c), and

the Toxicological Profile for 1,2-Dichloroethene (ATSDR, 1990b).

IRIS indicated that the verified oral RfD for trans-1,2-dichloroethene is 2E-2 mg/kg/day, based on a NOAEL of 17 mg/kg/day in a 90-day mouse drinking water study by Barnes et al. (1985). At a higher dose (175 mg/kg/day) serum alkaline phosphatase was increased in male mice. The RfD/RfC Work Group indicates that a chronic oral RfD of 1E-2 mg/kg/day for cis-1,2-dichloroethene was verified, but this value is not yet available on IRIS.

According to U.S. EPA (1986, 1990d), and ATSDR (1990b), toxicokinetic data for cis- and trans-1,2-dichloroethene indicate that the metabolism is similar, involving the formation of an epoxide intermediate, and that the toxic effects are similar. Therefore, basing the RfD for total 1,2-dichloroethene on the RfD for cis- or trans-1,2-dichloroethene, whichever is more conservative, appears to be appropriate. The interim oral RfD of 1E-2 mg/kg/day, derived for cis-1,2-dichloroethene can be adopted as the default RfD for total 1,2-dichloroethene because it is a more conservative estimate than that for trans-1,2-dichloroethene.

Review of IRIS for cis- and trans-1,2-dichloroethene reveals that WWES was correct regarding the absence of oral slope factors. Neither cis- nor trans-1,2-dichloroethene has not been evaluated for carcinogenicity.

CHLORDENE

According to the ATSDR Toxicological Profile for Chlordane (ATSDR, 1989b), technical grade chlordane is a complex mixture of at least 50 compounds, and the alpha, beta and gamma isomers of chlordene are major constituents of the mixture. WWES adopted chlordane's RfD (6E-5 mg/kg/day) as the RfD for gamma-chlordane, another major component of chlordane. WWES's approach for gamma-chlordane is discussed in more detail on page 9. Using the same reasoning for chlordene as for gamma-chlordane, chlordane's RfD (6E-5 mg/kg/day) may also be adopted as the oral RfD for chlordene. Confidence in this RfD would be equally as low as for gamma-chlordane's proposed RfD.

WWES also stated (page 64 of submitted request) that they were unable to locate a slope factor for chlordene and (apparently) did not adopt for chlordene the slope factor for chlordane. ECAO concurs with this judgment as explained on page 6 regarding an oral slope factor for gamma-chlordane.

II. REVIEW OF AVAILABLE TOXICITY INFORMATION

CHLOROETHANE

An inhalation RfC of 1E+1 mg/m^3 for chloroethane was verified

at the December, 1990 meeting of the RfD/RfC Work Group. ECAO is in the process of deriving an interim oral RfD based on the available inhalation data.

1,2,3,4,5,7,7-HEPTACHLORONORBORENE and OCTACHLOROCYCLOPENTENE

These compounds have some structural similarities to components of the complex mixture, chlordane. However, review of the ATSDR Toxicological Profile for Chlordane (ATSDR, 1989b) and two references cited therein (Miyasaki et al., 1985 and Parlar et al., 1979), did not confirm that they are components in chlordane. Because of the lack of toxicological information for these compounds, it is recommended that quantitative evaluation for them not be conducted.

WWES stated (top of page 60) that "Reference doses (RfD) were not estimated for chemicals of concern that are carcinogens but had no oral reference dose...available on either the IRIS or HEAST (because)...slope factors are generally much more conservative than the non-carcinogenic toxicity values..." A list of such chemicals was presented (page 60). This approach is incompatible with RAGS (U.S. EPA, 1989b), which clearly states that RfDs should be sought for chemicals that are carcinogens. These chemicals and RfDs located for them are listed below:

WWES also stated (page 64) that they were unable to locate a slope factor for 1,2,3,4,5,7,7-heptachloronorborene and octachlorocyclopentene and (apparently) did not adopt for these compounds the slope factor for chlordane. ECAO concurs with this judgment as explained above regarding an oral slope factor for gamma-chlordane.

AROCLOR-1254 and AROCLOR-1260

An oral RfD for Aroclor 1016 (41.5% average chlorine by weight) is under review by the RfD/RfC Work Group. RfDs for Aroclor 1254 (54% chlorine), Aroclor 1260 (60% chlorine) or other PCB mixtures have not been verified and are not under review or discussion by EPA.

It is reasonable to presume that the RfD for Aroclor 1016 that is under review is the same as that derived in the Drinking Water Criteria Document (DWCD) for PCBs and used as the basis for the Longer-Term Health Advisories (Has) for Aroclor 1016 (U.S. EPA, 1988d). This RfD, 0.0001 mg/kg/day, was derived from a NOAEL of 0.01 mg/kg/day for chronic oral exposure to Aroclor 1016 in Rhesus monkeys (Barsotti and Van Miller, 1984). The monkeys were fed Aroclor 1016 for 7 months prior to mating continuing through mating, pregnancy and lactation, and the critical effect was decreased birth weight. Recent data, however, suggest that oral doses of Aroclor 1254 which are lower than the 0.01 mg/kg/day NOAEL for Aroclor 1016 might be immunotoxic. Immunological evaluation of

Rhesus monkeys that were administered 0, 0.005, 0.02, 0.04 or 0.08 mg Aroclor 1254/kg/day by gavage for at least 23 months showed a significant (all doses) and dose-related decrease in antibody levels (IgG and IgM) in response to sheep red blood cells (SRBC) 7, 14 and 21 days after immunization (Tryphonas et al., 1989). The implications of these observations for human health, however, are unclear.

The most appropriate basis for a chronic oral RfD for Aroclor 1248 and Aroclor 1254 appear to be the monkey developmental toxicity and immunological effects data, respectively. However, since the PCBs to which people may be environmentally exposed are likely to be different from the original PCB mixture due to changes in congener and impurity composition resulting from environmental and/or biological transformation, it appears that current data are inadequate to differentiate between the toxicity of different PCB mixtures with any reasonable degree of confidence. Therefore, it seems most appropriate, for the purpose of health effects evaluation, to assume that effects resulting from exposure to a specific PCB mixture are representative of effects that may be produced by other PCB mixtures. Using this approach, the RfD based on the Aroclor 1016 developmental toxicity data, or possibly a lower RfD based on the Aroclor 1254 immunological effects data, can be used for Aroclor 1260 and all other PCB mixtures. This approach is essentially the same as that used by EPA to evaluate the carcinogenicity of PCBs (i.e., a slope factor based on Aroclor 1260 is used for all PCBs).

WWES stated (page 62) that they adopted for Aroclor-1254 the slope factor on IRIS (U.S. EPA, 1991) for Aroclor-1260. As stated above, this approach is consistent with Agency policy.

BENZENE

No oral RfD was located in the HEAST (U.S. EPA, 1990c) nor in other Agency documents listed in CARA (U.S. EPA, 1990a) nor has one been verified. Data were insufficient for estimation of a chronic oral MRL for benzene (ATSDR, 1989d).

ACENAPHTHYLENE, BENZO(a)ANTHRACENE, BENZO(b)FLUORANTHENE, BENZO(k)FLUORANTHENE, BENZO(g,h,i)PERYLENE, BENZO(a)PYRENE, CHRYSENE, INDENO(1,2,3-cd)PYRENE

According to HEAST (U.S. EPA, 1990c) and IRIS (U.S. EPA, 1991) each of these PAHs, with the exception of acenaphthylene and benzo(g,h,i)perylene, is classified U.S. EPA Group B2 carcinogens (probable human carcinogen), but slope factors have not been verified by CRAVE. Acenaphthylene and benzo(g,h,i)perylene both have been classified in Group D (not classifiable as to human carcinogenicity) due to the absence of human data and inadequate data from animal bioassays. Oral RfDs for any of these compounds are not found in HEAST or IRIS. As discussed previously for

phenanthrene, the interim Superfund policy is to use the interim oral RfD for naphthalene (4E-3 mg/kg/day), a PAH classified in Group D, for all other Group D PAHs that do not have verified RfDs. Thus, the oral RfD for naphthalene (4E-3 mg/kg/day) may be adopted as an interim value for the RfD for acenaphthylene and for benzo(g,h,i)perylene.

BIS(2-CHLOROETHYL) ETHER

No oral RfD was located in the HEAST (U.S. EPA, 1990c) nor in other Agency documents listed in CARA (U.S. EPA, 1990a), nor has one been verified. ATSDR has concluded that data were insufficient for estimation of a chronic oral minimal risk level (MRL) for bis(2-chloroethyl) ether (ATSDR, 1989e).

DDD, DDE

Toxicity values are not available for DDD and DDE in IRIS (U.S. EPA, 1991) nor HEAST (U.S. EPA, 1990c). Although there are demonstrated similarities among the chemical structures and carcinogenicities of DDT, DDD and DDE, evidence is available to suggest that the noncarcinogenic toxicology and pharmacokinetic behavior of the three compounds may not be identical. Derivations of RfDs for DDD and DDE by analogy to DDT, therefore, are not recommended.

1,3-DICHLOROBENZENE

In the derivation of an ambient water quality criterion, U.S. EPA (1980b) adopted an ADI (RfD) of 0.94 mg/day for 1,2- and 1,4-dichlorobenzene, based on subchronic gavage studies in rats (Hollingsworth et al., 1956, 1958), as being sufficiently protective for the 1,3-isomer as well. A subsequent Agency evaluation of the health effects of the dichlorobenzenes, however, concluded that it was not appropriate to base a criterion for the 1,3-isomer on analogy to other dichlorobenzene isomers (U.S. EPA, 1985b). More recently, however, U.S.EPA (1987g) derived an RfD of 0.089 mg/kg/day for 1,2-dichlorobenzene from subchronic gavage studies using rats and mice (Battelle-Columbus, 1978a,b). U.S. EPA (1987g) recommended that the RfD for 1,2-dichlorobenzene could also serve as the RfD for the 1,3-isomer, because of similarities in the properties of the two isomers. The RfD of 0.089 mg/kg/day derived by U.S. EPA (1987g) is recommended for 1,3-dichlorobenzene pending verification by the RfD/RfC Work Group.

1,2-DICHLOROETHANE

No oral RfD was located in the HEAST (U.S. EPA, 1990c) nor has one been verified. ATSDR has concluded that data were insufficient for derivation of a chronic oral MRL for this chemical (ATSDR, 1989f)

1,2-DICHLOROPROPANE

No oral RfD was located in the HEAST (U.S. EPA, 1990c) nor has one been verified. ATSDR (1989g) derived an MRL of 0.09 mg/kg/day from a LOAEL for liver effects in mice of 125 mg/kg/day in a chronic NTP (1986) gavage study. An MRL is sufficiently similar in concept to an RfD that it may be used as an interim toxicity value for Superfund assessments.

2,3,7,8-TCDD AND ITS CONGENERS

It is presumed that this chemical designation refers to 2,3,7,8-TCDD and other congeners of polychlorinated dibenzo-p-dioxin and was not intended to be restricted only to other tetrachlorinated congeners. U.S. EPA (1984g, 1985c, 1987h) derived an ADI (RfD) of 1 pg/kg/day based on a LOAEL of 0.001 ug/kg/day associated with reproductive effects in a three-generation reproduction study in rats (Murray et al., 1979). This value is not verified and is not under review by the RfD/RfC Work Group. The same value (1 pg/kg/day) was adopted by ATSDR (1989h) as the oral MRL for chronic exposure. The ADI or MRL of 1 pg/kg/day can be used as the interim toxicity value for the noncancer effects of exposure to 2,3,7,8-TCDD.

Noncancer toxicity values were not located for other

polychlorinated dibenzo-p-dioxin congeners, nor has the toxicity of the other congeners been studied nearly as extensively as 2,3,7,8-TCDD. U.S. EPA (1985d), however, noted that 2,3,7,8-TCDD appeared to be the most toxic congener, based on LD_{50} values. In view of this, it may be reasonable to adopt the noncancer toxicity value of 1 pg/kg/day for the other polychlorinated dibenzo-p-dioxin congeners. Confidence in this extrapolation is very low, however, because the relative chronic toxic potency of the polychlorinated dibenzo-p-dioxin congeners is unknown.

1,1,2,2-TETRACHLOROETHANE

An oral RfD for 1,1,2,2-tetrachloroethane is currently under review by the RfD/RfC Work Group. ATSDR (1989i) concluded that data were insufficient for estimation of an oral MRL for chronic exposure to this chemical.

TRICHLOROETHYLENE

An oral RfD for trichloroethylene is currently under review by the RfD/RfC Work Group. U.S. EPA (1987i) derived an RfD of 0.00735 mg/kg/day from a LOAEL in a 14-week inhalation study using rats, in which the total absorbed dose was estimated at 7.35 mg/kg/day (Kimmerle and Eben, 1973). ATSDR concluded that data were insufficient for estimation of an oral MRL for chronic exposure to this chemical (ATSDR, 1989j).

DIBENZOFURANS

WWES stated (middle of page 60 of submitted request) that "...IRIS...for dibenzofuran indicates that a toxic equivalency value may be assigned and ...dibenzofuran evaluated with the chlorinated dibenzofurans." WWES also stated that estimation of an RfD for dibenzofuran was not pursued, because a slope factor for carcinogenicity would yield a more conservative risk assessment. IRIS (U.S. EPA, 1991), however, clearly states that the biological activity of the chlorinated dibenzofurans is dependent on the number and position of chlorine substituents. U.S. EPA (1991a) assigned a toxicity equivalency factor to dibenzofuran of 0, and verified dibenzofuran as an EPA Group D compound.

Therefore, it is necessary that an RfD be sought for dibenzofuran. An interim oral RfD of 1E-3 mg/kg/day has been derived by ECAO. This value is calculated based on a LOAEL of 12.5 mg/kg/day, observed in a 200-day feeding study, for body length and organ weight effects in rats, and an uncertainty factor of 10,000 (10 for interspecies extrapolation, 10 for intraspecies extrapolation, 10 for extrapolating from a subchronic study and 10 for using a LOAEL rather than a NOAEL).

WWES stated (page 62 of submitted request) that toxicity

equivalency factors were calculated for chlorinated dibenzo-p-dioxins and dibenzofurans, and that the slope factor for 2,3,7,8-TCDD was "used for these chemicals as a group." Insufficient data were presented by WWES to permit evaluation of the slope factors for members of these classes.

PAHs

WWES stated (page 62 of submitted request) that there were no slope factors for acenaphthylene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(g,h,i)fluoranthene, chrysene and indeno(1,2,3-cd)pyrene, and that the slope factor for benzo(a)pyrene was used to calculate the risk for these chemicals because of similarities in structure and properties. As discussed above, acenaphthylene is classified as a Group D compound; therefore, a slope factor is not derived for this compound. The other compounds, with the exception of benzo(g,h,i)fluoranthene, are verified Group B2 compounds. [It is possible that WWES intended benzo(g,h,i)perylene instead of benzo(g,h,i)fluoranthene; the former compound is verified a Group B2 compound.] An interim oral slope factor for benzo(a)pyrene of 11.53E+0 $(mg/kg/day)^{-1}$ was presented in U.S. EPA (1980c) and U.S. EPA (1984h).

III. CHEMICALS FOR WHICH SLOPE FACTORS ARE UNAVAILABLE

WWES stated (bottom of page 62, continued on page 63 of the submitted request) that a number of chemicals (listed on page 63 of the submitted request) were EPA Group D compounds. This was verified using the HEAST (U.S. EPA, 1990c), except for naphthalene, which was verified using IRIS (U.S. EPA, 1991). WWES also stated (page 63) that butyl benzyl phthalate, o-cresol and p-cresol are EPA Group C compounds without available slope factors. This was verified using the HEAST (U.S. EPA, 1990c). WWES also stated that slope factors were not available for pentachlorophenol and pyrene. The HEAST (U.S. EPA, 1990c), however, presents a verified (not yet on IRIS) oral slope factor for pentachlorophenol of 1.2E-1 $(mg/kg/day)^{-1}$. Pyrene, however, is a verified Group D compound (U.S. EPA, 1990c) for which a slope factor would not be available.

LEAD

WWES stated (page 63 of the submitted request) that the EPA is not recommending a slope factor for lead. This was confirmed using the HEAST (U.S. EPA, 1990c); lead is verified as Group B2 carcinogen.

CHLOROETHANE

WWES stated (page 63 and again on page 64 of the submitted request) that a cancer slope factor was unavailable for chloroethane. This was confirmed by examining a recent HA document

(U.S. EPA, 1987k) and a HEA (U.S. EPA, 19871).

CADMIUM AND CHROMIUM (ORAL)

WWES stated (bottom of page 63) that cadmium and chromium(VI) are carcinogens by inhalation and not ingestion, and, therefore, that no oral slope factors were established for these metals. This approach is also presented in the HEAST (U.S. EPA, 1990c).

IV. CHEMICALS FOR WHICH THERE IS NO EVIDENCE OF CARCINOGENICITY

On the top of page 64 of the submitted request, WWES listed several chemicals for which slope factors were not estimated because it was concluded by WWES that there is no evidence of carcinogenicity for these chemicals. Outlined below is a summary of the status of carcinogenic assessment, including references when applicable, for each chemical.

ACENAPHTHENE

No evidence of carcinogenicity (U.S. EPA, 1987m).

ACETONE

CRAVE-verified as an EPA Group D carcinogen, i.e., not classifiable as to human carcinogenicity. Cancer slope factors are not derived for Group D substances (U.S. EPA, 1990c).

ANTHRACENE

CRAVE-verified as an EPA Group D carcinogen, i.e., not classifiable as to human carcinogenicity. Cancer slope factors are not derived for Group D substances (U.S. EPA, 1990c).

ANTIMONY

There is some evidence of carcinogenicity via inhalation, but no evidence of carcinogenicity by the oral route (U.S. EPA, 1990c).

ALUMINUM

Aluminum potassium sulfate was negative for carcinogenicity in a drinking water study in rats and mice (Schroeder and Mitchener, 1975a,b).

BENZYL ALCOHOL

Benzyl alcohol was negative for carcinogenicity in an NTP (1988) gavage study in rats and mice (U.S. EPA, 1989d).

BARIUM

Barium acetate was negative for carcinogenicity in a drinking water study in rats and mice (Schroeder and Mitchener, 1975a,b).

COBALT

A recent review of the toxicological literature on cobalt revealed no substantial evidence for the carcinogenicity of cobalt.

1,2-DICHLOROETHENE (1,2-DICHLOROETHYLENE)

The cis-isomer is verified as an EPA Group D compound, i.e., not classifiable as to human carcinogenicity. Cancer slope factors are not derived for Group D substances (U.S. EPA, 1990C). There is no evidence of carcinogenicity for the trans-isomer (U.S. EPA, 1984j).

DI-n-OCTYL PHTHALATE

No evidence of carcinogenicity (U.S. EPA, 1987o).

ENDRIN KETONE

No ECAO documents regarding endrin ketone were located.

2-METHYLNAPHTHALENE

A Statement of Research Needs (U.S. EPA, 1989c) revealed no evidence for carcinogenicity of 2-methylnaphthalene.

4-METHYL-2-PENTANONE

4-methyl-2-pentanone is a synonym for methyl isobutyl ketone. There is no evidence for carcinogenicity for methyl isobutyl ketone (U.S. EPA, 1987p).

NICKEL

Nickel refinery dust and nickel subsulfide are classified as EPA Group A carcinogens for the inhalation route, but there is no evidence of carcinogenicity by the oral route (ATSDR, 1988; U.S. EPA, 1990c).

TIN

NTP (1982) investigated the carcinogenicity of stannous chloride in the diet fed to rats and mice and concluded that the compound was not carcinogenic in either species in this study.

VANADIUM

No evidence of carcinogenicity (U.S. EPA, 1987r).

ZINC

Zinc and compounds are verified as EPA Group D chemicals, i.e., not classifiable as to human carcinogenicity. Cancer slope factors are not derived for Group D substances (U.S. EPA, 1990c); cancer slope factors are not derived for Group D substances.

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Appendix I

APPENDIX I

ESTIMATION OF POTENTIAL FUTURE CHEMICAL LOADING TO EAST FORK MILL CREEK FROM GROUND WATER DISCHARGE

An estimate of potential future chemical loading from the buried lagoon to the East Fork Mill Creek through ground water discharge and leachate seeps was calculated. The discharge rate of ground water into the creek was estimated by assuming Darcian ground water flow conditions and complete discharge of ground water flowing through the unconsolidated sediments in the direction of the creek. The discharge rate was estimated by:

$$Q = k \times (dH/dL) \times A \qquad (1)$$

where:
- Q = Discharge rate (gallons/day);
- K = Geometric mean of hydraulic conductivity (gpd/ft^2);
- dH/dL = Hydraulic gradient (unitless); and
- A = Cross sectional area (ft^2).

The estimate of the concentrations of the chemicals of potential concern in ground water was based on two criteria: the leaching potential of the chemical from contaminated soils or the upper 95% confidence limit of the arithmetic mean of measured chemical concentrations in ground water [assuming log normal distribution of the detected chemicals] monitoring wells along the perimeter of the buried waste lagoon.

Calculations performed to estimate the leaching potential of the chemicals from the soils and waste beneath the buried waste lagoon are described below. The calculation method assumes that equilibrium conditions will be reached between contaminated soils and ground water. Water/organic carbon partition coefficients (Koc) were obtained from Determining Soil Response Action Levels Based on Potential Contaminant Migration to Ground Water: A Compendium of Examples (U.S. EPA, October 1989) or estimated from octanol/water partition coefficients (Kow) obtained from literature. In instances where neither Koc or Kow values were available, Koc values were estimated from the solubility of the chemical.

Where Koc values were not directly available from literature, octanol/water partition coefficients were used to estimate Koc values according to the following equation (Lyman, et al., 1990):

$$\log(Koc) = [(0.937) \times \log(Kow)] - 0.006 \qquad (2)$$

Where: Koc = organic carbon/water partition coefficient (ug contaminant/g organic carbon)/(ug contaminant/ml solution) and

Kow = octanol/water partition coefficient (unitless)

Koc values were then used to estimate soil/water partition coefficients (Kd) according to the following equation:

$$Kd = (Koc) \times (Coc) \quad (3)$$

Where: Kd = soil/water partition coefficient (ug contaminant/g soil)/(ug contaminant/ml solution) and

Coc = mass fraction of organic carbon in soils.

Values of Coc were determined for soils from the buried lagoon area from analytical work performed during the Phase II RI. Analysis of twenty-three (23) samples from the buried lagoon area yielded an average fixed carbon content of 3.58%.

Information presented in Evaluating Cover Systems for Solid and Hazardous Waste (U.S. EPA, September 1982) predicts an organic carbon content of approximately 4% in the soils, almost identical to the measured concentration.

Values of Kd were then used to relate soil concentrations to ground water concentrations according to the following equation:

$$Cw = (Cs)/(Kd) \quad (4)$$

Where: Cw = Potential future ground water concentration (mg/kg).

Cs = 95% confidence interval assuming log normal distribution of the buried waste lagoon (WL) analyses conducted during the Phase II RI (mg/l).

In instances where the upper 95% confidence limit of the mean value exceeded the maximum concentration detected in buried waste lagoon soil samples, the maximum concentration detected was used as Cs. The resulting Cw values where then used to approximate the potential future concentration of the chemicals of concern in ground water. These concentrations were assumed to be present in the ground water along the East Fork Mill Creek ground water discharge boundary. It was assumed there was no attenuation within the aquifer between the buried waste lagoon and the creek.

This calculation methodology was not used if Kd values were less than 1. These chemicals are highly soluble and mobile and it was assumed that they would be better represented by using an average (upper 95% confidence limit of the arithmetic mean assuming log normal distribution) concentration detected in ground water monitoring wells along the downgradient perimeter of the buried lagoon. The monitoring wells used in this calculation for chemicals with Kd less than 1 were: GW19, GW20, GW10, GW06, GW07, B-5, and B-8.

The potential future loading to East Fork Mill Creek was estimated by:

$$Cd\ (mg/day) = Cw\ (mg/l) \times Q\ (gal/day) \times 3.78532\ (l/gal) \qquad (5)$$

where: Cd = potential chemical loading via ground water discharge to the East Fork Mill Creek

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