Screening For Environmental Concerns At Sites With Contaminated Soil and Groundwater

Volume 2: Background Documentation For The Development of Tier 1 Environmental Screening Levels

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VOLUME 2: BACKGROUND DOCUMENTATION FOR THE DEVELOPMENT OF TIER 1 SOIL AND GROUNDWATER SCREENING LEVELS

APPENDICES

GLOSSARY OF TERMS

AWQC: Aquatic Water Quality Criteria
CCC: Criterion for Continuous Concentration
CCM: Criterion for Maximum Concentration
CTR: California Toxics Rule
DHS Department of Health Services
EPA: Environmental Protection Agency
ESL: Environmental Screening Level (formerly "RBSL")
FVC: Final Chronic Value
HH: Human Health-consumption of aquatic organisms
LOEL: Lowest-Observed-Effects Level
MADEP: Massachusetts Department of Environmental Protection
MCL: Maximum Concentration Level
MOEE: Ontario Ministry of Environment and Energy
MTBE: Methyl tert-Butyl Ethylene
PCE: Tetrachloroethylene
PRG: Preliminary Remediation Goals
RBSL: Risk-Based Screening Level
RWQCB: Regional Water Quality Control Board
TPH: Total Petroleum Hydrocarbons
USEPA: U.S. Environmental Protection Agency
USDOE: U.S. Department of Energy

APPENDIX 1

DEVELOPMENT OF TIER 1 LOOKUP TABLES

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APPENDIX 1
DEVELOPMENT OF TIER 1 LOOKUP TABLES

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Development of Tier 1 Lookup Tables

1.1 Introduction

Compilation and presentation of the environmental screening levels (ESLs) presented in this document is modeled after similar documents published by the Ontario Ministry of Environment and Energy (MOEE 1996), the Massachusetts Department of Environmental Protection (MADEP 1994) and the Netherlands (Vetger 1993). Screening levels for the following environmental concerns are presented (refer also to Figure 1):

Groundwater:
- Protection of human health
  - Current or potential drinking water resource;
  - Emission of subsurface vapors to building interiors;
- Protection of aquatic habitats (discharges to surface water);
- Protection against nuisance concerns (odors, etc.) and general resource degradation.

Soil:
- Protection of human health
  - Direct/indirect exposure with impacted soil (ingestion, dermal absorption, inhalation of vapors and dust in outdoor air);
  - Emission of subsurface vapors to building interiors;
- Protection of groundwater quality (leaching of chemicals from soil);
- Protection of terrestrial (nonhuman) habitats;
- Protection against nuisance concerns (odors, etc.) and general resource degradation.

Shallow Soil Gas:
- Protection of human health
  - Emission of subsurface vapors to building interiors.

For use in this document, the term "soil" refers to any unconsolidated material found in the subsurface, including actual soil, saprolite, sediment, fill material, etc. Screening levels for each concern are organized as follows:

[1]BENEFICIAL USE OF THREATENED GROUNDWATER	[2]LOCATION OF IMPACTED SOIL	
	Shallow Soil (≤ 3m bgs)	**[3]Deep Soil (> 3m bgs)**
Current or Potential Source of Drinking Water	Soil: Tables A-1, A-2 Soil Gas: Table E-3 Water: Table F-1	Soil: Tables C-1, C-2 Water: Table F-1
NOT a Current or Potential Source of Drinking Water	Soil: Tables B-1, B-2 Soil Gas: Table E-3 Water: Table F-2	Soil: Tables D-1, D-2 Water: Table F-2

bgs: below ground surface
1. Shallow-most saturated zone beneath the subject site and deeper zones as appropriate.
2. Depth to top of impacted soil from ground surface (3 meters = 10 feet).
3. Application of Deep Soil ESLs to soils <3m deep may require institutional controls (see text).

The A through D series tables summarize individual screening levels complied for soil under unrestricted (A-1, B-1, C-1, D-1) and commercial/industrial (A-2, B-2, C-2, D-2) land use scenarios. The Table E series summarizes screening levels complied specifically for indoor-air impact concerns. Screening levels for groundwater and surface water are summarized in the Table F series. Tables G through L provide supporting screening levels and other information for the earlier tables.

A discussion of screening levels compiled for surface water and groundwater is provided in Chapter 2. A detailed discussion of screening levels compiled for soil is provided in Chapter 3. Chapter 4 discusses screening levels compiled for indoor air and related screening levels for shallow soil gas. Screening levels developed for Total Petroleum Hydrocarbon (TPH) are discussed in Chapter 5. Other issues pertinent to the lookup tables are discussed in Chapter 6.

1.2 Example Selection of Tier 1 ESLs for Tetrachloroethylene (PCE)

Figure 2 illustrates the selection of final Tier 1 soil and groundwater ESLs for the chemical tetrachloroethylene (PCE). The example assumes impacts to shallow soils (≤3 meters below ground surface) under an unrestricted (e.g., residential) land-use scenario. Groundwater immediately underlying the site is assumed to be a potential source of drinking water. This scenario places the site under Table A-1 of the Tier 1 lookup tables (refer to Section 1.1).

The Tier 1 ESL for PCE in shallow soil is selected as the lowest of the individual screening levels for Direct Exposure (0.48 mg/kg), Indoor-Air Impacts (0.09 mg/kg), Terrestrial Biota concerns (60 mg/kg), Ceiling Level (370 mg/kg) and Groundwater

Protection (leaching concerns, (0.70 mg/kg)). The final soil ESL for PCE is the lowest of the individual screening levels, or 0.09 mg/kg.

The process for selection of a Tier 1 PCE ESL in groundwater is similar (refer to Figure 2). Individual screening levels for Drinking Water (5.0 ug/L), Indoor Air (130 ug/L), Discharge to Surface Water (120 ug/L) and Ceiling Level (170 ug/L) concerns are compared and the lowest of these is selected for inclusion in the Tier 1 lookup tables. In this example, the groundwater screening level for drinking water concerns drives potential risks and is selected as the Tier 1 ESL (5.0 ug/L). Note that two screening levels are presented in the lookup tables for indoor air concerns (Table E-1b), one for high-permeability vadose-zone soils (130 ug/L) and one for low-permeability soils (520 ug/L). Only the screening level for sites with high-permeability vadose-zone soils is carried through for inclusion in the summary lookup tables, however (refer to Tables F-1 and F-2).

Selection of ESLs for PCE in deep soils is similar. For deep soils, however, potential impacts to terrestrial biota are not considered, the direct-exposure screening level is modified to reflect a less stringent, construction/trench worker exposure scenario, and the ceiling level is generally somewhat less stringent. Screening levels for groundwater protection concerns remain the same.

The process described above was carried out for each of the 100+ chemicals included in the Tier 1 lookup tables under each combination of groundwater beneficial use, soil depth and land use. The results are summarized in Tables A through D (soil) and Table F (groundwater) of this appendix. As can be seen from a review of these tables, the selection of final, Tier 1 ESLs for highly mobile or highly toxic chemicals is typically driven by groundwater protection or indoor-air impact concerns (e.g., see selection process for benzene or vinyl chloride ESLs in Table A-1). Final ESLs for chemicals that are relatively immobile in soils but highly toxic are typically driven by direct-exposure concerns (e.g., see selection process for PCBs in Table A-1). In contrast, selection of ESLs for heavy metals that are relatively non-toxic to humans is typically driven by ecological concerns or ceiling levels for general resource degradation (e.g., see selection process for copper ESL in Table A-1). For chemicals that have particularly strong odors, selection of ESLs may be driven in part by nuisance concerns or "ceiling levels" (e.g., see Total Petroleum Hydrocarbons (TPH) in Table B-1). The consideration of ceiling levels becomes especially important in the selection of ESLs for relatively immobile chemicals in isolated, deep soils (e.g., refer to Table C-1).

1.3 Cumulative Risk

Additive risk due to the potential presence of multiple chemicals with similar target health effects is addressed under Tier 1 through use of conservative exposure assumptions (exposure frequency and duration, ingestion and inhalation rates, etc.) and target risk levels. Exposure assumptions used to develop direct-exposure and indoor-air

screening levels are primarily based on parameter values presented in USEPA risk assessment guidance for Superfund sites (refer to USEPA 2002a). Alternative, and in some cases less conservative, exposure assumptions are presented in the USEPA technical document *Exposure Factors Handbook* (USEPA 1997), among other examples. For example, recommended inhalation rates for residents are 11.3 m3/day for women and 15.2 m^3/day for men, in comparison to the value of 20 m^3/day used to develop the direct-exposure screening levels presented in this appendix (Section 2.2). The average time (50th percentile) spent at one residence is also stated to be 9.0 years, in contrast to the more conservative exposure duration used of 30 years. The average occupational tenure is similarly stated to be 6.6 years, in contrast to the occupational exposure duration used of 25 years. While the more conservative exposure assumptions are still generally recommended for use in site-specific risk assessments, the variance in the assumptions helps to demonstrate the overall conservative nature of the models referenced in this document.

For carcinogens, the human health screening levels presented are based on a target excess cancer risk of 10^{-6}. This represents the upper end (most stringent) of the potentially acceptable range of 10^{-4} to 10^{-6} recommended by the USEPA (USEPA 1989a,b). As stated in the National Contingency Plan, however, "The 10^{-6} level shall be used as the point of departure for determining remediation goals..." (USEPA 1994). Remediation or risk management is rarely warranted at sites where the estimated cancer risk does not exceed 10^{-6}. Remediation or risk management is almost always warranted at sites where the estimated cancer risk exceeds 10^{-4}. For sites where the estimated risk is between 10^{-4} and 10^{-6}, the need for active remediation or risk management is evaluated on a site-specific basis (i.e., risks within this range are "potentially acceptable", depending on site-specific considerations).

The use of alternative exposure assumptions in a more "detailed" risk assessment could result in an increase of direct-exposure screening levels by a factor of three or more while still meeting a target excess cancer risk of 10^{-6}. Based on above discussion and the conservative nature of the human exposure models in general, the direct-exposure screening levels presented in this appendix and the soil ESLs in general are considered to be adequate for use at sites where up to three carcinogenic chemicals of concern have been identified. Additional evaluation may be required for sites where more than three carcinogens are identified.

A cumulative, target Hazard Index of 1.0 is typically used in human health risk assessments for evaluation of noncarcinogenic risks. The USEPA Preliminary Remediation Goals (PRGs) for soil were developed based on a chemical-specific, target Hazard Quotient of 1.0. To account for potential cumulative effects, the PRGs were adjusted to a target Hazard Quotient of 0.2 for use in the ESL lookup tables (see Section 2.2 and Tables K-1 and K-2). This adjustment reflects an assumption that up to five chemicals with the same chronic health effects may be present at a given site. A similar target Hazard Quotient was used by the Massachusetts DEP (MADEP 1994) and Ontario MOEE (MOEE 1996) to develop screening levels for direct-exposure concerns.

Additional evaluation may be required for sites where more than five chemicals with similar noncarcinogenic health effects are present. For reference, a compilation of chronic health effects for the chemicals listed in the ESLs is provided in Table L of this appendix.

The direct-exposure screening levels not address potential synergistic effects (e.g., 1+1=3). Conservative target risk goals (e.g., target excess cancer risk of 10^{-6}) and exposure parameters are used to indirectly take into account this potential issue. Methods to quantitatively assess synergistic effects have not been developed.

2

Groundwater And Surface Water Screening Levels

2.1 Introduction

Screening levels for groundwater and surface water are summarized in the "F" series of tables at the end of this appendix. A discuss of individual concerns considered in the screening levels is provided in this Chapter and summarized below. For the purpose of developing Tier 1 screening levels, it is assumed that all groundwater could at some point in time potentially discharge to a body of surface water. Discharge could occur through natural processes (e.g., natural discharge of groundwater to a stream, river, lake, wetland, bay, etc. via springs) or through human activities (e.g., pumping and discharge of groundwater at remediation or construction dewatering projects).

The final groundwater ESL for sites that threaten drinking water resources reflects the lowest of a chemicals screening level for drinking water toxicity, aquatic habitat protection (discharges to surface water), indoor-air impacts (volatile chemicals only) and a "ceiling level" for tastes & odors or other nuisance concerns (Table F-1a). The final groundwater ESL for sites that do not threaten drinking water resources (Table F-1b) reflects the lowest of a chemicals screening level for the same set of environmental concerns with the exception of the drinking water component and an alternative ceiling level.

Screening levels for surface water were compiled in a similar manner with the exception that impacts to indoor air were not considered. For freshwater surface water bodies, the final ESL reflects the lowest of a chemicals screening level for drinking water toxicity, aquatic habitat protection (discharges to surface water) and nuisance concerns (Table F-2a). For marine surface water bodies, the final ESL reflects the lowest of a chemicals screening level for aquatic habitat protection (discharges to surface water) and nuisance concerns (Table F-2b). For estuarine systems, the lowest of the screening levels for freshwater and marine surface water bodies were selected (Table F-2c).

As discussed below, groundwater screening levels for potential discharges to aquatic habitats only consider goals for chronic surface water quality goals. Aquatic habitat goals for surface water consider an additional goal/standard for the potential bioaccumulation of contaminants in aquatic organisms and subsequent consumption of the organisms by humans. Use of the bioaccumulation goals as additional screening levels for groundwater should be evaluated on a site-by-site basis.

2.2 Screening Levels for Drinking Water (Toxicity)

A summary of drinking water standards and guidelines used in this document is provided in Table F-3. The Central Valley Water Board technical document *A Compilation of Water Quality Goals* (RWQCBCV 2000 and updates) was used as the primary reference. Screening levels for drinking water intended to address human toxicity were generally selected based on the following order of preference:

- California DHS Primary Maximum Contaminant Level (MCL);
- CalEPA OEHHA Public Health Goal;
- California DHS Action Level based on toxicity;
- Risk-based goal calculated using California DHS model.

(Note that the above order of preference may differ in other regions of California.)

California or USEPA primary MCLs for drinking water are available for most chemicals listed in the lookup tables. Although numerous factors are taken into account in development of primary MCLs (toxicity, detection limits, attainability, etc.), these standards are primarily intended to address toxicity to humans in drinking water supplies and are used for this purpose in this document.

For chemicals where Primary MCLs have not been promulgated, toxicity-based Public Health Goals (PHGs) published by the California Office of Environmental Health Hazard Assessment (OEHHA) were referred to. If a PHG was not available, toxicity-based Action Levels published by the California Department of Health Services (CalDHS) were used. In cases where MCLs, PHGs of Action Levels were not available, separate risk-based goals were calculated using the CalDHS model as presented in the Central Valley Water Board technical document referenced above (equations also presented in Appendix 2 of this document). Risk-based goals for noncarcinogenic effects take precedence over goals for carcinogenic effects if lower. Drinking water goals intended to address taste and odor concerns (e.g., Secondary MCLs) take precedence over toxicity-based goals if lower (discussed under ceiling levels for groundwater, Section 3.4).

For comparison purposes, tapwater "Preliminary Remediation Goals" prepared by USEPA Region IX are presented in Table F-6. Goals for carcinogens were adjusted to CalEPA cancer potency factors when available. For volatile chemicals, the tapwater

goals take into account uptake via inhalation of vapors during showering and other activities in addition to toxicity via normal ingestion of drinking water. Goals for nonvolatile chemicals are based on ingestion only. Equations for the USEPA Region IX tapwater goals are included in Appendix 2.

2.3 Screening Levels for Aquatic Habitat Protection

2.3.1 Surface Water Aquatic Habitat Goals

A summary of aquatic habitat goals considered for use in this document is provided in Tables F-4a through F-4d. Separate goals were compiled for freshwater, marine and estuarine habitats. Locally, the areas south of the Dumbarton Bridge and east of the Richmond-San Rafael Bridge to the upstream extent of tidal influences are considered to be estuarine. Tidally influenced portions of creeks, rivers and streams flowing into the Bay between these areas should also be considered to be estuarine in screening level assessments. Final goals were selected based on the following order of preference and availability:

- CTR CCC;
- USEPA CCC;
- Lowest of USEPA Ecotox AWQC and FVC Threshold Value (or Tier II value if no AWQC or FVC) or 50% USEPA Chronic LOEL;
- USDOE Chronic PRG;
- 50% MOEE Chronic AWQC or LOEL;
- 10% CTR CMC
- 10% USEPA CMC (or 10% Acute LOEL if no CMC);
- 10% MOEE Acute AWQC or LOEL;
- Other aquatic water quality criteria (e.g., 5% LC 50);
- Drinking water screening level.

abbreviations:
AWQC: Aquatic Water Quality Criteria
CCC: Criterion for Continuous Concentration
CCM: Criterion for Maximum Concentration
CTR: California Toxics Rule (as presented in RWQCBCV 2000 and USEPA 2000b)
EPA: Environmental Protection Agency
FVC: Final Chronic Value
LC50: Lethal Concentration (50th percentile)
MOEE: Ontario Ministry of Environment and Energy

PRG: Preliminary Remediation Goals
USEPA: U.S. Environmental Protection Agency
USDOE: U.S. Department of Energy (chronic values only)

Goals provided in each reference are generally based on dissolved-phase concentrations of the chemicals in water. Goals for arsenic, selenium and chromium VI are, however, based on total concentrations.

Chronic freshwater goals were used as screening levels for saltwater ("marine") if chronic goals for the latter were not available, and vise versa. Acute goals were substituted in a similar manner. Other exceptions to the prioritization scheme include the use of chemical-specific USDOE PRGs in place of USEPA chronic LOELs when the LOEL was developed for a general group of compounds rather than a specific chemical (e.g., halomethanes). In addition, surface water goals for mercury are based on the San Francisco Bay Basin Water Quality Control Plan (Basin Plan, RWQCBSF 1995). Surface water goals for selenium are based on the National Toxics Rule (USEPA 1992).

The primary sources of data for chronic and acute surface water criteria specific to California were the *Region 2 Basin Plan* (RWQCBSF 1995), the California Toxics Rule as promulgated in *40 CFR Part 131: Water Quality Standards, Establishment of Numerical Criteria for Priority Toxic Pollutants for the State of California* (USEPA 2000b) and the California EPA technical document *A Compilation of Water Quality Goals* (RWQCBCV 2000). Other sources referenced to include the following: USEPA's *Water Quality Criteria Summary Concentrations* (USEPA 1996b), USEPA's *Ecotox Thresholds* (USEPA 1996c), USEPA's *National Recommended Water Quality Criteria* (USEPA 2002b), U.S. Department of Energy's *Preliminary Remediation Goals for Ecological Endpoints* (USDOE 1997), and Ontario MOEE's Rational For The Development and Application of Generic Soil, Groundwater and Sediment Criteria (MOEE 1996). (Note that the US Fish and Wildlife Service issues on opinion that the CTR standards for selenium, mercury, PCP and cadmium may not be protective of some endangered and threatened species (USFWS 2000). Responsible parties for sites where surface water is or could be impacted by these chemicals should review updated goals for these chemicals as available.)

For chemicals where chronic, No Adverse Effect Level goals or the equivalent were not available, alternative goals were selected and modified as noted (refer also to Table F-4a). Modification factors in general followed recommendations and methods provided in the USEPA Great Lakes water quality initiative guidance (USEPA 1995).

Surface water standards for potential bioaccumulation of chemicals in aquatic organisms and subsequent human consumption of these organisms are presented in Table F-4d. Both California and Federal standards are given.

2.3.2 Groundwater Screening Levels for Aquatic Habitat Impacts

For the purposes of this document, and based on the natural setting of the San Francisco Bay area, it is assumed that groundwater could discharge into an estuary environment. As such, goals for aquatic habitat protection are based on the lowest of the goals for marine versus freshwater environments. For settings where this is not appropriate, target surface water goals and correlative groundwater goals can be adjusted on a site-specific basis.

Dilution of groundwater upon discharge to surface water was not considered in the selection of groundwater screening levels for aquatic habitat protection. Benthic organisms were assumed to be exposed to the full concentration of chemicals in impacted groundwater prior to mixing of the groundwater with surface water. Potential dilution of groundwater upon discharge to surface water or in groundwater "mixing zones" adjacent to shorelines areas was therefore not appropriate for development of conservative screening levels. Adjustment of the final groundwater screening levels with respect to potential dilution may, however, be appropriate on a site-specific basis (e.g., no significant benthic habitat present, see Volume 1, Section 3.0).

The USEPA Ecotox goal for barium (3.9 ug/L) was not considered as a screening level for groundwater due to low confidence in the goal and comparison to reported natural background concentrations of this metal in Bay area groundwater (up to >100 ug/L). Background concentrations of boron, copper, lead, mercury, selenium, thallium and zinc have also been reported in excess of the groundwater screening levels presented in Tables F-1 and F-2. This issue is being further evaluated by the RWQCB.

Surface water standards for potential bioaccumulation of chemicals in aquatic organisms and subsequent human consumption of these organisms were not considered in the selection of groundwater screening levels for potential aquatic habitat impacts. Use of these standards would be excessively conservative at the large number of relatively small sites overseen by the RWQCB. Consideration of the standards may be appropriate for sites where the discharge of large plumes of impacted groundwater threatens long-term impacts to important aquatic habitats. This should be evaluated on a site-by-site basis.

2.4 Groundwater Screening Levels for Potential Indoor-Air Impacts

2.4.1 Indoor Air Impact Model Parameters

Groundwater screening levels intended to address the intrusion of vapors into buildings and subsequent impact on indoor-air quality are summarized in Table E-1a and included in Tables F-1 and F-2. Correlative soil gas screening levels and indoor air screening levels are presented in Tables E-2 and E-3, respectively, and discussed in Chapter 4.

The screening levels were generated using a computer spreadsheet model published by the U.S Environmental Protection Agency (available online, USEPA 2000a and updates). The spreadsheet is based on a model presented in the document *Heuristic Model for Predicting the Intrusion Rate of Contaminant Vapors Into Buildings* (Johnson and Ettinger, 1991). The model considers both diffusive and convective flow of subsurface vapors into buildings. Summary text from the guidance document accompanying the spreadsheet is provided in Appendix 3, as is a sensitivity evaluation of the Johnson and Ettinger model. Example printouts of the model as used to calculate screening levels for this document are included in Appendix 4. Input parameter values used in the models are noted in the examples (front pages). Default parameters values presented in the spreadsheet technical document were generally selected for use.

Human exposure assumptions were set equal to assumptions used in the USEPA Region IX PRGs. Default, USEPA toxicity factors included in the original spreadsheet were replaced with California EPA factors as available (see Appendix 4, last page of first example). As done in the soil direct-exposure models, screening levels were calculated using a target risk of $1x10^{-6}$ for chemicals with carcinogenic health effects and a target hazard quotient of 0.2 for chemicals with noncarcinogenic health effects. Again for consistency purposes, default physio-chemical constants included in the spreadsheet were replaced with constants used in the USEPA PRGs models if different.

All groundwater was assumed to potentially flow offsite and pass under residential areas. Final screening levels are therefore based on a residential land use exposure scenario. Groundwater screening levels for commercial/industrial areas are included in Table E-1a for reference but were not carried on for use in subsequent lookup tables.

Default building characteristics presented in the spreadsheet guidance were used in the models. The thickness of the building floor was assumed to be 15 cm. For both residential land use and commercial/industrial exposure scenarios, the models assume a small (9.6m x 9.6m square), one-story building situated on mono-slab concrete base. This may be overly conservative for commercial/industrial sites with existing, larger buildings but is considered to be protective of future redevelopment of such sites. A default value of 1mm was used for the assumed perimeter crack width. For screening level evaluation of larger buildings, an assumed crack spacing of 10m is recommended.

The model also assumes that potential convective flow from the subsurface into buildings (i.e., flow driven by air pressures that are lower inside the building than in the vadose zone) is not short circuited by open crawl spaces or other building designs that negate differences between indoor and subsurface air pressures. Default indoor-air exchange rates of one-time per hour for residences and two-times per hour for commercial/industrial buildings are based on a comparison of risk assessment guidance published by the City of Oakland (Oakland 2000) and comments received during a 2003 peer review of the December 2001 edition of the screening levels document (RWQCBSF 2003).

The depth from the ground surface to the top of impacted groundwater was assumed to be 3.0 meters. A value of 2.0 meters is close the minimum thickness allowed for modeling of vapor transport through the lower soil unit under the low/moderate permeability vadose-zone soil profile due to capillary fringe height constraints.

The Johnson and Ettinger model is highly sensitive to the permeability of vadose-zone soil that soil gas must migrate through before being emitted at the ground surface. Screening levels generated for sites characterized by fine-grained, vadose-zone soils (clays and silts) of low permeability can be several orders of magnitude less stringent (i.e., higher) than those calculated for more permeable, coarse-grained soils. For this reason, screening levels were developed for both soil types. In Table E-1a, the first screening level presented is intended for use at sites with vadose-zone soils of highly to moderately permeability. The second screening level is intended for use at sites with lower permeability soils in the vadose zone.

For the purposes of this document, the high-permeability vadose-zone soil profile is modeled as one meter of coarse-grained, dry, sandy soil (S) overlying two meters of somewhat more moist clayey loam (CL, 1/3 sand, 1/3 silt, 1/3 clay). This is considered to be representative of the majority of sites in the Bay area. The low permeability soil profile is modeled as one meter of loamy sand loam (LS) overlying two meters of silt (SI). "Sand" is defined as material that is equal to or greater than 0.075 mm in diameter (i.e., will not pass through a U.S. Standard 200 mesh sieve). Silt and clay are defined as material that is less than 0.075 mm in diameter (i.e., will pass through a U.S. Standard 200 mesh sieve). These definitions are consistent with default parameter values for soil types presented in the USEPA model (USEPA 2000a).

Input soil parameter values for total porosity, water-filled porosity and fraction organic carbon for the upper portion of the soil profiles were set equal to values used by USEPA Region IX in development of the PRGs (USEPA 2002a). Soil moisture was assumed to be somewhat higher for the lower soil units than the upper units, at 0.30 (vs 0.15), consistent with the default recommended in the USEPA Johnson and Ettinger model guidance document. Default values presented in the spreadsheet were used for remaining soil properties. For site-specific assessments, soil moisture data should be collected within five feet of the groundwater surface and well above the capillary fringe zone.

Default soil vapor permeability values for the selected soil types were used in the models. For site-specific estimation of this parameter, the use of rigorous, in-situ methods intended for the design of soil vapor extraction systems is recommended. Secondary porosity and permeability in fine-grained soils can be significantly enhanced by plant roots, desiccation cracks, disturbance during redevelopment, faulting, etc. Reliance on a small number of borings or laboratory analysis could significantly underestimate the actual vapor permeability of the site and in turn underestimate the risk of potential impacts to indoor air.

Note that when using the spreadsheet to back calculate a groundwater screening level from an input target risk, the values appearing in the spreadsheet for "Csource" (concentration in soil gas) and "Cbuilding" (concentration in indoor air) are based on a theoretical initial soil concentration of 1E-06 g/g or 1,000 micrograms per kilogram and are not directly related to the modeled screening level. The values presented do not represent actual modeled concentrations and should be ignored.

2.4.2 Background and Use of Johnson and Ettinger Model

2.4.2.1 Background

The Johnson and Ettinger model was originally developed to predict impacts to indoor air due to the subsurface emission of naturally occurring radon gas (Johnson and Ettinger, 1991). Pertinent sections of the guidance document published with the model are presented in Appendix 4. Based on concerns over the conservativeness of the model and a lack of field validation studies, the USEPA initially declined to promote use of the model to develop generic screening levels (USEPA 1996a). They instead suggested that the model should be used in conjunction with soil gas data to evaluate potential indoor air impacts. In 1997, however, the USEPA published a user's guide to the Johnson and Ettinger model and included a spreadsheet. The 2000 updates to the model allowed direct input of soil gas data (USEPA 2000a, including 2001 update of spreadsheet).

The USEPA version of the Johnson and Ettinger considers both diffusive and convective flow of soil gas into buildings. Diffusive flow occurs as soil gas migrates from areas of higher concentration to areas of lower concentration. Wind effects and indoor heating can cause a decrease in air pressure inside a building and lead to upward, convective flow of subsurface vapors through cracks and gaps in the building floor. As described in the USEPA guidance document, effective convective flow of subsurface vapors into buildings is expected to be limited to deep soils within the "immediate" area of the building.

2.4.2.2 Adjustment of Screening Levels

Field studies at sites impacted by volatile chemicals have clearly documented impacts to indoor air due to the intrusion of subsurface vapors, particularly for sites where soil or groundwater has been impacted by chlorinated volatile organic compounds. One example is the report *An Evaluation of Vapor Intrusion Into Buildings Through A Study of Field Data* prepared by staff of the Massachusetts DEP (Fitzpatrick and Fitzgerald 1997). Results of the Massachusetts DEP study suggest that the Johnson and Ettinger model may over-predict the concentration of chlorinated, volatile chemicals in soil gas by an order of magnitude or more with respect to the measured concentration of the chemical in groundwater, although in some cases the model appeared to be slightly under conservative. More significantly, the Massachusetts DEP field study indicated that the Johnson and Ettinger model over-predicted the soil gas concentration of petroleum-based volatile organic compounds (e.g., benzene) in the vadose zone by up to three or more

orders of magnitude. This was interpreted to reflect substantial, natural biodegradation of the vapor-phase of these chemicals in the subsurface. This in turn causes the models to over predict impacts to indoor air by several orders of magnitude and makes use of the model for this group of chemicals questionable, particularly in the absence of field-based soil gas data.

To account for the potentially over conservative nature of the Johnson and Ettinger model for nonchlorinated volatile chemicals, screening levels generated by the model were adjusted upwards by a factor of ten (refer to Table E-1a). As discussed below, the use of soil gas data in combination with groundwater studies may be most appropriate for evaluating sites where a more detailed evaluation of this issue is warranted. Evaluation of this issue is ongoing.

2.5 Surface Water and Groundwater Ceiling Levels

Ceiling levels selected for surface water and groundwater are summarized in the Table I series. Ceiling levels for surface water and groundwater that is considered to be a current or potential source of drinking water are based on the lowest of the chemicals taste and odor threshold (e.g., Secondary MCLs), one-half the solubility and a maximum of 50000 ug/L for any chemical based on general resource degradation concerns (Tables I-1 and I-3, after MADEP 1994). Taste and odor thresholds for drinking water were selected in the following order of preference and availability:

- California Department of Health Services (DHS) Secondary MCLs;
- USEPA Secondary MCLs;
- California DHS taste and Odor Action Levels;
- Taste and odor levels developed by Amoore and Hautala (as presented in RWQCBCV 2000);
- Odor thresholds presented in Massachusetts DEP (MADEP 1994) and Ontario MOEE (MOEE 1996) guidance documents.

With the exception of the MADEP and MOEE odor thresholds, data for each of the listed sources are summarized in the document *A Compilation of Water Quality Goals* (RWQCBCV 2000 and updates).

Ceiling levels for surface water and groundwater that is NOT considered to be a current or potential source of drinking water were selected in a similar manner with the exception that the drinking water taste and odor thresholds were replaced with general nuisance thresholds (Tables I-2 and I-4). Nuisance thresholds are intended to reflect the concentration at which a chemical in water poses unacceptable odor problems. Thresholds presented in the Massachusetts DEP and Ontario MOEE guidance documents were used as the primary sources of data. Taste and odor levels developed by Amoore

and Hautala (in RWQCBCV 2000) were referred to for chemicals that lack odor thresholds in the Ontario guidance, although taste considerations for drinking water could cause these criteria to be overly stringent. It is apparent, however, that similar sources were used to develop both the Ontario MOEE and the Amoore and Hautala databases (compare Tables I-1 and I-2). In keeping with the Ontario and Massachusetts guidance documents, a ten-fold dilution/attenuation of chemical concentrations in groundwater upon discharge to surface water was assumed (non-drinking water resources, nuisance thresholds only). The nuisance threshold for MTBE presented in Table I-2 is based on average, upper range at which most subjects in a USEPA study could smell MTBE in water (180 ug/L), as summarized in the public health goals document for MTBE prepared by Cal EPA (CalEPA 1999a). This was selected as a nuisance screening level for MTBE in surface water. Assuming a dilution factor of ten yields the odor threshold of 1,800 ug/L for groundwater.

2.6 Other Groundwater Screening Levels

Additional screening levels for groundwater provided in the California EPA technical document *A Compilation of Water Quality Goals* include USEPA and National Academy of Sciences "Suggested No-Adverse-Response (SNARL)" goals for toxicity other than cancer risk and "Agricultural Water Quality" goals developed by the United Nations (RWQCBCV 2000). The SNARL goals largely duplicate risk-based screening levels for drinking water presented in Table F-3. Agricultural Water Quality goals for 12 metals are provided in Table F-5. These goals were not considered in the final lookup tables but may need to be considered on a site-specific basis. The agricultural goals are higher than screening levels for both drinking water and surface water protection for seven of the 12 metals listed. Agricultural goals for copper, cobalt, selenium and zinc are higher than goals for aquatic habitat protection but are lower than goals for drinking water (i.e., drinking water goals may not be adequately protective for irrigation use). The agricultural goal for molybdenum is lower than both the drinking water goal and the surface water goal for this metal.

3

Soil Screening Levels

3.1 Introduction - Shallow Versus Deep Soils

A depth of three meters (approximately 10 feet) is used to delineate between shallow, "surface" soils where regular exposure to residents and/or workers is assumed and deeper, "subsurface" soils where only periodic contact during construction and utility maintenance work is assumed (refer also to Section 2.4 of Volume 1). A depth of three meters is consistent with guidance presented in the CalEPA document *Supplemental Guidance For Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities* (CalEPA 1996). This is regarded as the maximum, likely depth that impacted soil could at some point in the future be excavated and left exposed at the surface. The potential for deeper soils to be brought to the surface during large-scale redevelopment activities should be evaluated on a site-by-site basis.

Environmental concerns specifically considered for shallow versus deep soil ESLs are summarized in Table 3-1. For shallow soils, the final ESL represents the lowest of a chemicals screening level for ecotoxicity, human direct-exposure (residential and commercial/industrial land use), indoor-air impact, leaching and the chemicals maximum ceiling level (nuisance concerns etc.). For deep soils, the final ESL represents the lowest of a chemicals screening level for human direct-exposure (trench/construction worker exposure), indoor-air impact, leaching and an alternative ceiling level. Screening levels for terrestrial biota concerns are not considered for deep soils.

Final ESLs for relatively non-mobile chemicals are generally less stringent for deep soils in comparison to shallow soils (e.g., compare final ESLs for polychlorinated biphenyls in Tables A-1 and C-1). A few exceptions are noted in Section 2.2. For chemicals that are highly mobile in the subsurface and easily leached from soil or emitted as vapors to the ground surface, groundwater protection and indoor-air impact concerns usually drive risk regardless of the depth of the impacted soil (e.g., chlorinated solvents). Final shallow and deep soil ESLs for these chemicals are therefore identical (e.g., compare benzene and vinyl chloride ESLs in Tables A-1 and C-1).

3.2 Soil Screening Levels for Direct-Exposure Concerns

3.2.1 Shallow Soils

Screening levels for human health/direct-exposure concerns for shallow soils are summarized in Tables K-1 (residential land use exposure scenario) and K-2 (commercial/industrial exposure scenario). The screening levels are based primarily on *Preliminary Remediation Goals* ("PRGs") developed by the U.S. Environmental Protection Agency (USEPA) Region IX (USEPA 2002a). Equations used by USEPA Region IX to calculate the direct-exposure screening levels are presented in Appendix 2. The PRGs are intended to be protective of residents and workers who may be exposed to chemicals in shallow soils on regular basis via incidental ingestion, dermal absorption, and inhalation of vapors and particulate matter. The PRGs are calculated based on a target risk of $1x10^{-6}$ (one-in-a-million) for chemicals with carcinogenic health effects and a target Hazard Quotient of 1.0 for chemicals with noncarcinogenic health effects.

For use in this document, the USEPA PRGs for carcinogens were adjusted to reflect California EPA cancer potency factors where available (CalEPA 2003, refer to Table J of this appendix). An exception was the recognition of updated, USEPA cancer slope factors for polychlorinated biphenyls (see Table J). A target excess cancer risk of 10^{-6} was retained.

As discussed in Section 1.3, the USEPA PRGs for noncarcinogens were divided by a factor of five in order to take into account possible cumulative health effects at sites where multiple chemicals are present (see Tables K-1 and K-2). This reflects a target Hazard Quotient of 0.2 and assumes that up to five chemicals with the same chronic target health effects may be present. Screening levels for noncarcinogens based a target Hazard Quotient of 1.0 are also presented in the noted tables. California EPA has not developed alternative toxicity factors for noncarcinogens.

3.2.2 Deep Soils

Direct-exposure screening levels for deep soils are summarized in Table K-3 (construction/utility workers exposure scenario). Only construction workers and utility trench workers are assumed to come into periodic contact with contaminants in deep soils. Exposure assumptions selected for this scenario are based on guidance presented in the USEPA *Exposure Factor handbook* (USEPA 1997), trench-worker risk assessment guidance developed by the Massachusetts Department of Environmental Protection (MADEP 1994), general direct-exposure assumptions included in the USEPA Region IX PRG document, and professional judgment (see Appendix 2, Table 1). As done was done for shallow soils, screening levels were calculated using a target risk of $1x10^{-6}$ for chemicals with carcinogenic health effects and a target Hazard Quotient of 0.2 for chemicals with noncarcinogenic health effects. A more detailed summary of exposure assumptions and selected parameter values is included in Appendix 2.

In general, direct-exposure soil screening levels generated for the residential land use exposure scenario are more stringent (lower) than screening levels developed for the commercial/industrial and construction/trench worker exposure scenarios. This is due to the increasingly shorter assumed exposure duration (years) and frequency (days per year) for the latter two scenarios and the assumption that children will not be regularly present under these scenarios (see Appendix 2). Exceptions include direct-exposure screening levels developed for barium, beryllium, chromium VI, cobalt, 1,2 dichlorobenzene, mercury, nickel and styrene under the construction/trench worker scenario. Screening levels for these chemicals are more stringent under the construction/trench worker exposure scenario than under the commercial/industrial exposure scenario (see Table K-2). For chromium VI, cobalt and mercury, the construction/trench worker screening levels are also lower than the residential land use screening levels (see Table K-1). This is due to the combined high oral and/or inhalation toxicity of these chemicals and the assumed higher soil ingestion rate and higher level of air-born dust under the construction/trench worker exposure scenario. As noted in Tables K-1 and K-2, commercial/industrial and residential land use direct-exposure screening levels for these chemicals were replaced with construction/trench worker screening levels for use in the lookup tables if less stringent.

3.2.3 Lead

A direct-exposure screening level for lead of 255 mg/kg is presented in Tables A-1 and B-1 for residential land use. This screening level is published in the Department of Toxic Substances Control (DTSC) document *Interim Guidance for Evaluating Lead-Based Paint and Asbestos Containing Materials at Proposed School Sites* (CalEPA 2001) and was developed through us of the DTSC LeadSpread model. The screening level is based on a target maximum allowable level of lead in blood of 10 ug/dl. Children are assumed to be exposed to the impacted soil seven days a week. The model also incorporates concurrent exposure to lead in air at an ambient concentration of 0.0028 ug/m^3 and in drinking water at a concentration of 15 ug/L (Primary MCL). The screening level does not take into account potential uptake of lead in home-grown produce, although this can be incorporated into the DTSC Leadspread model. Additional information is provided in the referenced document. The DTSC screening level is presented as an California-specific alternative to the less conservative, USEPA screening level of lead in residential soils of 400 mg/kg (USEPA 2002a).

3.2.4 Background Metal Concentrations

Ambient background concentrations of arsenic in Bay area soils typically exceed risk-based screening levels for direct-exposure concerns. For example, the risk-based screening level for arsenic in residential soils is 0.39 mg/kg (refer to Table K-1). The Lawrence Berkeley National Laboratory report *Background Distributions of Metals in the Soil at LBNL* (LBNL, 2002) presents a range of mean concentrations of arsenic in soil samples from the property of 0.30 mg/kg to 42 mg/kg, however, with an arithmetic mean of 5.5 mg/kg. Soils tested at the site span a range of geologic environments. Based on an

informal review of environmental reports submitted to the RWQCB, a range of 5 mg/kg to 20 mg/kg is typical for much of the Bay area. Concentrations of arsenic in soil tend to be higher in soils associated with silicic volcanic rocks and hydrothermally altered rocks.

As a provisional measure, the mean concentration of arsenic presented in the LBNL report of 5.5 mg/kg was substituted for toxicity-based, direct-exposure screening levels presented in the Table K series of this appendix (Refer to the Table A-D series). At sites where this value is exceeded, additional review of background concentrations of arsenic should be carried out. (see also Figure 4 of Volume 1 for information on the evaluation of site-specific arsenic data.)

Previous editions of this document included soil (and groundwater) screening levels for total chromium, as well as screening levels for Cr VI and CR III. The species Cr III is most predominant in nature. Toxicity-based screening levels for total chromium were based on an assumed 1:6 ratio of Cr VI (highly toxic) to Cr III (minimally toxic), after methods presented in the USEPA Region IX Preliminary Remediation Goals (USEPA 2002). This approach has been discontinued and been replaced with reference to a typical background concentration of total chromium in Bay area soils.

The LBNL report referenced above presents a range of mean concentrations of total chromium in soil samples from the property of 1.7 mg/kg to 144 mg/kg, with an arithmetic mean of 58 mg/kg. This is considered typical for the Bay area in general. The concentration of total chromium in soils overlying mafic and ultramafic rocks in the Bay area can, however, be significantly higher and potentially over 1,000 mg/kg. As a provisional measure, the LBNL arithmetic mean concentration of 58 mg/kg was selected as a screening level for total chromium in soil in the lookup tables (refer to the Table A-D series). Where this value is exceeded, additional review of background total chromium concentrations should be carried out. If reported levels of total chromium appear to exceed anticipated background concentrations, then soil samples should be tested for Cr VI and Cr III and the data compared to screening levels for these specific species of chromium.

3.3 Soil Screening Levels for Potential Indoor Air Impacts

Soil screening levels for the evaluation of potential indoor-air impact concerns are presented in Table E-1a and referenced in the Table A-D series. As discussed in Chapter 4, the use of soil gas data and screening levels to evaluate this concern is preferred.

A spreadsheet included with guidance published by the U.S. Environmental Protection Agency (USEPA 2000a and updates) was used to generate soil screening levels for potential indoor-air impact concerns. A summary of these screening levels is provided in Table E-1b. Correlative soil gas screening levels are provided in Table E-2. Target indoor air goals are provided in Table E-3.

The spreadsheet is based on a model presented in the document *Heuristic Model for Predicting the Intrusion Rate of Contaminant Vapors Into Buildings* (Johnson and Ettinger, 1991). The model considers both diffusive and convective flow of subsurface vapors into buildings. Summary text from the guidance document accompanying the spreadsheet is provided in Appendix 3, as is a sensitivity evaluation of the Johnson and Ettinger model. Example printouts of the model as used to calculate screening levels for this document are included in Appendix 4. A more detailed discussion of models is provided in Section 2.3 for correlative groundwater screening levels.

Input parameter values used in the soil models are noted in the example spreadsheets in Appendix 4 (see front pages). Parameter values assumed for, building characteristics and human exposure were consistent with values used in the soil indoor-air models. The aerial extent of impacted soil is assumed to be equal to the footprint of the building. The thickness of impacted soil was assumed to be 200 cm (approximately 6 feet). The soil type was assumed to be a highly permeable sand (intrinsic permeability = 1.0E-07 cm^2). This generated a soil vapor flow rate into the building of 67 cm^3/second or 4 liters/minute. The base of the floor was assumed to immediately over impacted soil (depth to top of soil equals thickness of floor). The model is not significantly sensitive to the input "Depth To Top of Contamination" for impacted soil situated within a few meters of the ground surface.

For nonchlorinated VOCs, field experience suggests that the Johnson and Ettinger model typically overestimates in vapor-phase concentrations of these chemicals by an order of magnitude or more, due in part to high rates of natural biodegradation. Evaluation of this issue is ongoing. To address this in the lookup tables, soil screening levels generated with the model were adjusted upwards by a factor of ten (see Table E-1b). Collection of soil gas data and concurrent use of soil gas screening levels for indoor-air impact concerns is strongly recommended for sites where this pathway may be of significant concern.

The spreadsheet calculates the theoretical emission rate of a chemical at the ground surface based on the properties of the chemical and the soil type. For highly volatile chemicals (e.g., vinyl chloride), however, an unrealistic mass of the chemical per unit area would have to be present at depth to maintain the theoretical emission rates over the assumed exposure duration. To compensate, the model spreadsheet calculates a second, a mass-balanced emission rate by dividing the total mass of the chemical in the soil per unit area by the input exposure duration. This conservatively assumes that the entire mass of the chemical directly beneath the building will ultimately be emitted into the building over the assumed exposure duration. For chemicals where the mass-balanced vapor emission rate is lower than the theoretical emission rate, the mass-balanced emission rate is used to generate a screening level (or calculate risk).

For chemicals that are liquids under ambient conditions, upper limits on screening levels are set at the given chemicals theoretical soil saturation limit. This conforms to assumptions used in the USEPA Region IX PRGs (USEPA 2002a).

The same set of screening levels developed for shallow soils were applied to deep soils (see Tables C and D of this appendix). While conservative, the parameter for depth to impacted soil does not significantly control calculated screening levels for soils within five to ten meters of the ground surface. The need to re-evaluate the use of these screening levels should be made on a site-by-site basis.

3.4 Soil Screening Levels for Groundwater Protection

Soil screening levels for groundwater protection concerns are summarized in Table G and included in summary lookup tables for both shallow and deep soils (refer to Tables A through D of this appendix). These screening levels are intended to address potential leaching of chemicals from vadose-zone soils and subsequent impact on groundwater. The soil screening levels are back calculated based on target groundwater screening levels. Target groundwater screening levels are summarized in the Table F series and discussed in Chapter 2.

The majority of the screening levels were calculated based on an empirical equation presented in guidance published by the Massachusetts DEP (MADEP 1994):

$$DAF = (6207 \times H) + (0.166 \times Koc)$$

$$C_{soil} = DAF \times C_{gw} \times 0.001 \text{ mg/ug}$$

where: DAF = SESOIL-based dilution/attenuation factor;
H = Henry's Law Constant (atm-m3/mol);
Koc = organic carbon partition coefficient (ug/cm^3);
C_{soil} = leaching based soil concentration (mg/kg);
C_{gw} = target groundwater screening level (ug/L).

The algorithm was developed using a combination of the computer applications SESOIL and AT123D to model leaching of chemicals from the vadose zone and subsequent migration of the leachate to groundwater, respectively. The algorithm was originally developed by the state of Oregon (Anderson 1992), slightly modified for use by the Massachusetts DEP (MADEP 1994) and then incorporated into the Ontario MOEE lookup table guidance (MOEE 1996).

The SESOIL computer application models the generation and downward migration of leachate in the vadose zone. The AT123D application models the mixing of leachate with groundwater immediately below the impacted area. A detailed discussion of the derivation and application of the SESOIL/AT123D algorithm as modified by the Massachusetts DEP and adopted for use by the Ontario MOEE is provided in Appendix 5. The algorithm is based on a three-meter thick vadose zone characterized by one meter of impacted soil sandwiched between two one-meter thick layers of clean soil. The lower layer immediately overlies groundwater. All vadose-zone soil is conservatively assumed to be very permeable sand that freely allows the migration of leachate to groundwater.

The organic carbon content of the soil is assumed to be 0.1%. (Note that this is more conservative than the 0.6% organic carbon content assumed in the direct-exposure models.) Mixing with groundwater is modeled over a ten-meter by ten-meter area. Use of a thicker assumed sequence of impacted soil would not significantly alter the results of the model given the assumed one-meter depth to groundwater.

Annual rainfall is assumed to be 1,100 mm (approximately 43 inches). A total of 720 mm (28 inches) of the total rainfall is assumed to infiltrate the ground surface and reach groundwater (very conservative for most parts of the San Francisco Bay area). Biodegradation during migration of leachate to groundwater is not considered. This could cause the model to be especially over conservative for non-chlorinated, petroleum compounds. The model does, however, allow for resorption and revolatilization of chemicals from the leachate during migration based on the physio-chemical properties of the chemical and the assumed soil properties. Groundwater is assumed to flow at a moderate rate of approximately 73 meters (240 feet) per year. The concentration of a chemical in leachate is assumed to be further reduced upon mixing of the leachate with groundwater (dilution factor approximately 3).

For moderately volatile and sorptive chemicals (e.g., benzene), screening levels developed using the SESOIL-derived algorithm are similar to screening levels generated using the full SESOIL application under a scenario where impacted soil is within a few meters of groundwater (e.g., HIDOH 1995, carried out by the principal editor of this document). Comparison to screening levels developed by full but still conservative use of SESOIL suggests, however, that the simplified algorithm may be excessively conservative in the following cases:

- Leaching of highly volatile chemicals (e.g., vinyl chloride);
- Leaching of highly sorptive chemicals (e.g., polynuclear aromatic hydrocarbons);
- Leaching of highly biodegradable chemicals (e.g., common petroleum compounds);
- Sites where the depth to groundwater is greater than ten meters below the base of the impacted soil.

The depth-to-groundwater factor is particularly important for chemicals that exhibit one or more of the above noted characteristics. As the distance between the base of impacted soil and the top of groundwater increases, there is additional time and area for chemicals to volatilize out of the leachate, resorb to soil particles or degrade by naturally occurring biological processes. Site-specific evaluation of the potential for leaching of chemicals from soil may be warranted in such cases (including more rigorous modeling, laboratory leaching tests, groundwater monitoring, etc.).

SESOIL modeling carried out by the Hawai'i Department of Health (HIDOH 1995) suggests that chemicals with sorption coefficients greater than 30,000 cm^3/g will be essentially immobile in the surface under normal soil conditions and not likely to impact

groundwater. The SESOIL models were run conservatively assuming an annual rainfall of 400 cm/year (158 inches/year), an infiltration rate of 144 cm/year (57 inches/year) and very permeable soil overlying fractured bedrock.

Based on modeling studies as well as field experience in general, screening levels for chemicals with sorption coefficients greater than 30,000 cm^3/g were set at the theoretical soil saturation level for that chemical if higher than the screening level generated by use of the SESOIL algorithm (refer to Table G). The equation and assumptions used to calculate the saturation levels is presented and discussed in Appendix 2. Exceptions to this approach were the chemicals pentachlorophenol and bis(2-ethylhexyl)phthalate, both of which have a solubility significantly higher than the remainder of the highly sorptive chemicals (see Table J). Leaching based screening levels for these chemicals were developed using only the SESOIL algorithm described above (see Table G).

The majority of PCBs releases identified in the Bay Area are related to 1242 to 1260 range Arochlors. The default koc of 33,000 cm3/g presented in Table J was considered to be adequately conservative for this range and used in the leaching model. For less chlorinated PCB mixtures, a site-specific evaluation of potential leaching concerns and even possible vapor emission concerns is required.

Leaching based screening levels were generated only for chemicals considered to be significantly soluble and mobile in groundwater under normal, ambient conditions (e.g., pH 5.0 to 9.0 and normal redox conditions). Leaching based soil screening levels were not developed for metals. Leaching of metals from soil is highly dependent on the species of the metal present and the geochemical nature of the soil. At sites where physio-chemical conditions may promote enhanced leaching of metals and other chemicals from soils or waste piles (e.g., mining related wastes), the use of laboratory-based leaching tests is recommended (refer to Section 3.3.3 in Volume 1).

Leaching based soil screening levels were developed for perchlorate (ClO4). Perchlorate, a salt, is not significantly sorptive, volatile or biodegradable under normal conditions. Use of the SESOIL/AT123D algorithm was therefore not considered appropriate. As an alternative, a simple, chemical partitioning model presented in the USEPA Soil Screening Level Guidance document was referred to (USEPA 1996a):

$$Csoil = Cwater \times \left((Koc \times foc) + \left(\frac{\theta w + (\theta a \times H')}{\rho b} \right) \right) \times DAF$$

where: C_{soil} = Soil screening level for leaching concerns;
C_{water} = Target dissolved-phase concentration of chemical;
Koc = Sorption coefficient;
foc = fraction organic carbon in soil;
$Theta_w$ = water-filled porosity;

$Theta_a$ = air-filled porosity;
H' = Dimensionless Henry's Number constant;
p_b = Soil bulk density;
DAF = Dilution/Attenuation Factor

This model can be used to backcalculate the total soil concentration of a chemical based on a target dissolved-phase concentration of the chemical in the soil (i.e., concentration in leachate). For perchlorate, koc and H' are presumed to be zero and the equation reduces to:

$$Csoil = Cwater \times \left(\frac{\theta w}{\rho b}\right) \times DAF$$

The default water-filled porosity in the models is 0.15 and the default soil bulk density is 1.5. Based on groundwater screening levels for perchlorate of 3.6 ug/L for drinking water resources and 600 ug/L for non-drinking water resources (refer to Tables F-1a and F-1b), leaching based soil screening levels of 0.00036 mg/kg and 0.06 mg/kg are generated, respectively. A dilution/attenuation factor of 20 was incorporated to account for mixing of leachate with groundwater (USEPA 1996a). This yielded final soil screening levels for leaching concerns for perclorate of 0.007 mg/kg and 1.2 mg/kg (refer to Table G). Laboratory-based tests are recommended for more site-specific analysis of potential leaching of perchlorate from soil.

3.5 Soil Screening Levels for Terrestrial Habitats

Soil screening levels for the protection of terrestrial flora and fauna are included in summary ESL tables for shallow soils in both the "Residential" and "Commercial/Industrial Only" land-use scenarios (Tables A-1, A-2, B-1 and B-2 of this appendix). The screening levels were taken directly from guidance developed by the Ontario Ministry of Environment and Energy (MOEE 1996). The MOEE guidance is primarily a compilation of criteria published by environmental agencies in Canada and elsewhere and is an update to previous guidance (e.g., MOEE 1991; CCME 1994). Ecological effects-based soil values developed by the Dutch government (Vegter 1993; van den Berg 1993) were in particular reviewed for inclusion in the MOEE guidance. Earlier versions of the Canadian and Dutch guidance are presented in the U. S. Fish and Wildlife Service document *Evaluation of Soil Contamination* (USFWS 1990). Pertinent sections from the MOEE guidance are presented in Appendix 6. Screening levels were available for heavy metals and some high-molecular-weight organic compounds and pesticides.

Soil screening levels for terrestrial ecological concerns can be highly specific to the species of fauna or flora potentially impacted as well as the specific form of the metal present and the geochemistry of the soil. The Ontario MOEE intended use of the

screening levels over a broad range of land-use scenarios, including residential land use, agricultural and parkland. For the purposes of consideration in the Tier 1 lookup tables, however, the screening levels are considered to be adequate only for general screening purposes in and around developed, urban areas.

The screening levels are not intended for use in areas where a significant risk to endangered or threatened species may exist or where there is a potentially significant threat to terrestrial ecological receptors that extends beyond the general boundary of a subject site. This could include sites that are adjacent to wetlands, streams, rivers, lakes, ponds or marine shoreline or sites that otherwise contain or border areas where protected or endangered species may be present. Potential impacts to sediment are also not addressed. The need for a detailed risk assessment should be evaluated on a site-by-site basis for areas where significant ecological concerns may exist. Notification to the Natural Resource Trustee Agencies (including the state Department of Toxics Substances Control and Department of Fish and Game and the federal Fish and Wildlife Service, Department of the Interior and National Oceanic and Atmospheric Administration) may also be required, particularly if the release of a hazardous substance may impact bodies of surface water.

3.6 Soil Ceiling Levels

Ceiling levels presented in each of the ESL summary tables for soil are intended to be protective against odor and other nuisance and aesthetic concerns, as well as restrict the presence of potentially mobile, free product and limit the overall degradation of soil quality (i.e., "gross contamination"). The selection of soil ceiling levels was based on methods originally published by the Massachusetts DEP (MADEP 1994) and also used by the Ontario MOEE (MOEE 1996), as described in the Table H series of this appendix.

Odor Thresholds presented in the Table H series are intended to represent the concentration of a chemical in air at which 50% of the population can detect a chemical odor. An "Odor Index" for a chemical is calculated by dividing the chemicals vapor pressure (in Torr, at 20-30 degrees Celsius) by its odor threshold (in ppm-volume, see Tables H-2 and H-3). This provides a relative ranking of chemicals for potential nuisance concerns. As summarized in H-2 (shallow soils) and H-3 (deep soils), ceiling levels were then selected based a comparison of a chemicals vapor pressure and odor index to a table of generic screening levels (Tables H-1). For chemicals that are liquids under ambient conditions, the final ceiling level was selected as the lowest of the generic level from Table H-1 and the chemicals theoretical saturation level in soil (see Appendix 2). This was intended to prevent the presence of mobile, free product in the subsurface.

TABLE 3-1. ENVIRONMENTAL CONCERNS CONSIDERED IN SOIL ESLs.

Category	Human Health (Direct-Exposure)	Human Health (Indoor-Air Impact)	*Groundwater Protection (Drinking Water Resource Threatened)	*Groundwater Protection (Drinking Water Resource NOT Threatened)	Ecological Concerns (Terrestrial Receptors)	Ceiling Values
Table A						
Residential Land Use	X	X	X	X	X	X
Commercial/Industrial Land Use Only	X	X	X	X	X	X
Table B						
Residential Land Use	X	X		X	X	X
Commercial/Industrial Land Use Only	X	X		X	X	X
Table C						
Residential Land Use	X	X	X	X		X
Commercial/Industrial Land Use Only	X	X	X	X		X
Table D						
Residential Land Use	X	X		X		X
Commercial/Industrial Land Use Only	X	X		X		X

*Groundwater protection concerns not related to drinking water include discharge to surface water, indoor-air impacts, and ceiling levels (nuisance concerns, etc.).
Table A - Shallow Soils Overlying Drinking Water Resource
Table B - Shallow Soils NOT Overlying Drinking Water Resource
Table C - Deep Soils Overlying Drinking Water Resource
Table D - Deep Soils NOT Overlying Drinking Water Resource

4

Indoor Air and Soil Gas Screening Levels

4.1 Introduction

The USEPA spreadsheet version of the Johnson & Ettinger model for soil gas intrusion into buildings (Version 1.0, USEPA 2000a) was used to develop indoor air and soil gas screening levels for volatile chemicals. Example printouts of the model are included in Appendix 4. The model can be condensed into three simple steps: 1) calculation of a target indoor-air goal based on input exposure assumptions and chemical toxicity factors; 2) calculation of soil gas-to-indoor air attenuation factors based on a comparison of vapor flow rates into a building and air flow rates through the building and 3) calculation of a soil gas screening level. A summary of these steps is provided below. A more detailed discussion of the model is provided in Appendix 3.

4.2 Indoor Air Screening Levels

Indoor air screening levels were calculated using the following equation incorporated in the model:

Carcinogens:

$$Cia = \left(\frac{TR \times ATc \times 365\ days/yr}{URF \times EF \times ED} \right)$$

Noncarcinogens:

$$Cia = \left(\frac{THQ \times ATnc \times 365\ days/yr}{\left(\frac{1}{RfC}\right) \times EF \times ED} \right)$$

where:

Cia = Target indoor air concentration;

TR = Target risk (carcinogens);

THQ = Target hazard quotient (noncarcinogens);

ATc = Averaging time for carcinogens;

ATnc = Averaging time for noncarcinogens;

URF = Unit risk factor for carcinogens (carcinogens);

RfC = Reference concentration (noncarcinogens);

EF = Exposure frequency;

ED = Exposure duration.

A summary of the indoor-air goals calculated is provided in Table E-3. For carcinogenic effects, the target excess cancer risk was set at 10^{-6}. For noncarcinogenic effects, the target hazard quotient was set at 0.2 (refer also to Section 1.3). Inhalation toxicity factors for volatile chemicals are summarized in Appendix 4 (VLOOKUP worksheet). Input exposure assumptions were identical to those assumed for direct-exposure models (refer to summary in Appendix 2 and DATAENTER worksheets in Appendix 4).

4.3 Soil Gas Screening Levels

Building design parameter values used in the groundwater and soil vapor-emission models were retained for use in the soil gas model (one story, $100m^2$ foundation area; refer to Section 2.4 and DATAENTER worksheets in Appendix 4). The spreadsheet models the intrusion of soil gas situated immediately beneath the slab-on-grade foundation into the overlying building ("Soil Gas Sampling Depth Below Grade" = 15 cm). Soil underlying the building was assumed to be a very permeable fill material. Default parameter values for a "sand" soil type were used in the model.

Based on the input building characteristics and soil type, a vapor emission rate of 67 cm^3/sec was generated (Qsoil, equivalent to 4.0 liters/minute). Indoor-air exchange rates of 1.0 times-per-hour and 2.0 times-per-hour were assumed for residences and commercial/industrial buildings, respectively. Given the assumed dimensions of 10m x 10m x 2.44 m for the modeled buildings, indoor-air "flow rates" of approximately 4,000 L/minute for residences and 8,000 L/minute for commercial/industrial buildings were generated.

Calculation of a soil gas-to-indoor air attenuation factor (AF) essentially reduces to:

$$AF = \left(\frac{\text{vapor intrusion rate}}{\text{vapor intrusion rate} + \text{indoor air flow rate}} \right).$$

For residences, a soil gas-to-indoor air attenuation factor of approximately 0.001 (1/1000) was calculated. For commercial/industrial buildings, a soil gas-to-indoor air attenuation factor of approximately 0.0005 (1/2000) was calculated. The shallow, assumed depth to soil gas and predominance of advective flow over diffusive flow effectively negates small differences in the fate and transport of individual chemicals. This allows the calculated attenuation factors to be used in a generic fashion for all volatile chemicals. Soil-gas screening levels (C_{sg}) are subsequently calculated as:

$$Csg = \left(\frac{\text{Indoor Air Goal}}{\text{AF}} \right).$$

A summary of soil-gas screening levels for volatile chemicals is provided in Tables E-2.

Note that soil-gas screening levels do not take into account the actual mass of the chemical present and could be overly conservative for the evaluation of long-term impacts to indoor air. At sites where a limited amount of impacted soil or groundwater is present, the concentration of the chemical in soil gas can be expected to decrease over time as the supply of the chemical is depleted. This would lead to steadily decreasing impacts to indoor air. Thus, while impacts to indoor air may initially exceed target goals, average, long-term impacts could conceivably fall below these goals.

This issue should be evaluated on a site-by-site basis as needed. As a conservative measure, and for the purpose of this screening levels document, it is recommended that indoor-air goals be used as "not-to-exceed" criteria and adjustment of models and soil gas to address potential mass-balance not be carried out in the absence of strong site data. This issue is currently under reviewed. Additional information will be incorporated into the ESL document as available.

5

Soil And Groundwater Screening Levels For TPH

5.1 Introduction

The selection of Total Petroleum Hydrocarbons (TPH) soil and groundwater screening levels for use in this document is described below. As discussed in the Volume 1, the use of ESLs as final "cleanup levels" for petroleum-related compounds that are known to be highly biodegradable may be unnecessarily conservative. This is especially true for leaching based soil screening levels for TPH and petroleum-related compounds. Final cleanup levels should be evaluated on a site-specific basis and in conjunction with guidance from the overseeing regulatory agency.

Petroleum is a complex mixture of hundreds of different compounds composed of hydrogen and carbon (i.e., "hydrocarbon" compounds). For the purposes of this document, petroleum mixtures are subdivided into "gasolines", "middles distillates" and "residual fuels", following the methodology used by the American Petroleum Institute (API 1994). **Gasolines** are defined as petroleum mixtures characterized by a predominance of branched alkanes and aromatic hydrocarbons with carbon ranges of C6 to C12 and lesser amounts of straight-chain alkanes, alkenes and cycloalkanes of the same carbon range. **Middle distillates** (e.g., kerosene, diesel fuel, home heating fuel, jet fuel, etc.) are characterized by a wider variety of straight, branched and cyclic alkanes, polynuclear aromatic hydrocarbons (PAHs, especially naphthalenes an methyl naphthalenes) and heterocyclic compounds with carbon ranges of approximately C9 to C25. **Residual fuels** (e.g., fuel oil Nos. 4, 5, and 6, lubricating oils, "waste oils", asphalts, etc.) are characterized complex, polar PAHs, naphthenoaromatics, asphaltenes and other high-molecular-weight, saturated hydrocarbon compounds with carbon ranges that in general fall between C24 and C40.

Laboratory analysis for TPH as gasolines and middle distillates is commonly carried out using EPA Method 8015 (or equivalent) modified for "gasoline-range" organics ("Volatile Fuel Hydrocarbons") and "diesel-range" organics ("Extractable Fuel

Hydrocarbons"), respectively. Analysis for TPH as residual fuels up to the C40 carbon range can generally be carried out by gas chromatograph methods (e.g., Method 8015 modified for "motor oil" and "waste oil" range organics) but can also include the use of infrared or gravimetric methods. More detailed information on analytical methods for TPH and other chemicals can be obtained from environmental laboratories or the overseeing regulatory agency.

Laboratory measurement and assessment of each individual compound within a petroleum mixture is technically complex and generally not feasible or appropriate under most circumstances. More importantly, data regarding the physio-chemical and toxicity characteristics of the majority of petroleum compounds are lacking. Impacts to soil and water from petroleum mixtures are instead evaluated in terms of both TPH and well characterized "indicator chemicals" (e.g., benzene, toluene, ethylbenzene, xylenes and targeted PAHs). Indicator chemicals typically recommended for petroleum mixtures include (after CalEPA 1996):

Monocyclic Aromatic Compounds (primarily gasolines and middle distillates)

- benzene
- ethylbenzene
- toluene
- xylene

Fuel additives (primarily gasolines)

- MTBE
- other oxygenates as necessary

Polycyclic Aromatic Compounds (primarily middle distillates and residual fuels)

- methylnaphthalene (1- and 2-)
- acenaphthene
- acenaphthylene
- anthracene
- benzo(a)anthracene
- benzo(b)fluoranthene
- benzo(g,h,i)perylene
- benzo(a)pyrene
- benzo(k)fluoranthene
- chrysene
- dibenzo(a,h)anthracene
- fluoranthene
- fluorene
- indeno(1,2,3)pyrene
- naphthalene
- phenanthrene
- pyrene

The TPH ESLs should be used in conjunction with ESLs for these chemicals. Note that volatile chemicals such as butylbenzene, isopropyl benzene, isopropyl toluene and trimethylbenzenes are often reported in analyses of gasoline and other light-end

petroleum products. These chemicals are collectively addressed under screening levels for "TPH" and generally do not need to be evaluated separately.

Soil and groundwater impacted by releases of waste oil may also require testing for heavy metals and chemicals such as chlorinated solvents and PCBs. Screening levels for these chemicals are included in the lookup tables.

5.2 TPH Screening Levels For Groundwater

Regulatory drinking water standards for TPH and petroleum in general have not been developed. For the purposes of this document, the TPH-diesel taste and odor threshold of 100 ug/L referenced in the technical document *A Compilation of Water Quality Goals* (RWQCBCV 2000) was used as the drinking water screening level for all categories of TPH (see Table F-3). Screening levels for benzene and related light-weight hydrocarbon compounds are considered to provide adequate additional protection of drinking water concerns for gasoline-impacted groundwater when used in conjunction with the TPH screening level of 100 ug/L. For the protection of aquatic life, a screening level of 500 ug/L was selected for TPH-gasoline in freshwater and 3,700 ug/L in saltwater (see Table F-4b). A single screening level of 640 ug/L was selected for TPH-diesel and TPH-residual fuels in both freshwater and saltwater. The freshwater screening level for TPH-gasoline is based on a summary of available eco-toxicity data compiled for use at the Presidio of San Francisco under Board Order 96-070 (RWQCBSF 1998b, Montgomery Watson 1999). The TPH-gasoline criteria for saltwater and the TPH criteria for diesel and residual fuels in general are based on screening levels developed for use at the San Francisco Airport under Regional Water Board Order No. 99-045 (RWQCBSF 1999a).

The groundwater ceiling level of 5,000 ug/L for TPH (all categories) noted in Table I was taken directly from Massachusetts DEP risk assessment guidance (MADEP 1997a,b). This also corresponds with the approximate solubility of diesel fuel and light motor oil in fresh water (ATSDR 2001a) and is intended to address potential nuisance issues (sheens, odors, etc.) if discharged to surface water, as required under the Basin Plan (RWQCBSF 1995). The solubility of gasoline in freshwater is approximately 150,000 ug/L. A ceiling level of 5,000 ug/L should therefore protect against the presence of a sheen in the absence of heavier range petroleum compounds.

5.3 TPH Screening Levels For Soil

5.3.1 TPH (gasolines, middle distillates)

Soil screening levels for lighter fractions of petroleum (gasolines, middle distillates) were selected based on a "surrogate" approach developed by the Massachusetts Department of Environmental Protection (Hutchinson et. al 1996; MADEP 1997a,b). The Massachusetts approach is similar to guidance developed by the Total Petroleum Hydrocarbon Working Group (TPHCWG 1998).

Massachusetts used six distinct groups of petroleum hydrocarbon compounds with similar carbon makeups and similar physio-chemical and toxicity characteristics to collectively describe the spectrum of all possible petroleum product mixtures (referred to as "carbon ranges"). For example, petroleum-related aromatic compound with five to 22 carbon atoms are grouped in the C11-C22 aromatic carbon range. Surrogate toxicity factors and physio-chemical constants were chosen for each carbon range group. These constants were then used to develop environmental soil and groundwater screening levels for each carbon range in the same manner as done for individual chemicals (see Section 2.0).

Due to the relatively high mobility of compounds included within the C11-C22 aromatics range fraction and the general predominance of these compounds in lighter-weight fuels, Massachusetts elected to use toxicity factors and physio-chemical constants for this carbon range as a "surrogate" for TPH in general. The same approach was adopted for use in this document. This could be potentially under conservative for gasoline-range mixtures with a predominance of more lighter and more mobile compounds. The use of conservative target indicator compounds (e.g., BTEX) in conjunction with the TPH screening level is assumed to adequately address this issue, however.

Massachusetts selected an oral and inhalation reference dose (RfD) of 0.03 mg/kg-d for the C11-C22 aromatics fraction, based on comparison to the Massachusetts RfD for pyrene. An RfD of 0.03 mg/kg-d is also used in the USEPA PRGs for pyrene (see table J). The TPH Working Group selected a slightly less conservative oral RfD of 0.04 mg/kg-d and inhalation RfD of 0.06 mg/kg-d (based on Reference Concentration of 0.20 mg/m^3) for the same carbon range group (THPWG 1998). In this document, the MADEP and USEPA RfD for pyrene of 0.03 mg/kg-d was used to generate direct-exposure soil screening levels for TPH under residential land use, occupational and construction/trench worker exposure scenarios (rounded to 500 mg/kg, 6,100 mg/kg and 22,000 mg/kg, respectively; refer to Tables K-1, K-2 and K-3). The screening levels are based on a target hazard quotient of 0.2 (see Section 2.2).

Massachusetts developed generic physio-chemical constants for the C11-C22 aromatics carbon range fraction based on a review of compounds included within this fraction. These constants were adopted in this document to develop a soil leaching screening level for TPH as gasolines and middle distillates (see Table G). The TPH soil screening level calculated for protection of drinking water (rounded to 100 mg/kg) is coincidental with screening levels presented in other technical documents prepared by local regulatory agencies (RWQCBSF 1990; RWQCBLA 1996). Similarly, the soil screening level calculated for protection of surface water habitats (rounded to 400 mg/kg (gasolines) and 500 mg/kg (middle distillates)) is coincidental with the screening level developed for use in the Board Order for the San Francisco Airport (RWQCB 1999a).

Ceiling levels developed by Massachusetts for TPH as gasoline and diesel (latter included under "middle distillates") were modified for use in this document (MADEP 1997a,b, refer to Table H). For shallow soils, ceiling levels of 100 mg/kg and 500 mg/kg were

selected for residential land-use scenarios, respectively, while 500 mg/kg and 1,000 mg/kg were selected for industrial land-use. This is primarily based on odor and general nuisance concerns. For deep soils, a ceiling level of 5,000 mg/kg was retained (primarily intended to prevent the presence of significant, potentially mobile free product).

5.3.2 TPH (residual fuels)

Direct-exposure screening levels developed for TPH as gasoline and as middle distillates were retained for use with TPH as residual fuels (refer to Table K-1). Following Massachusetts DEP guidance (MADEP 1997a,b), ceiling levels of 500 mg/kg and 2,500 mg/kg were selected for residential and commercial/industrial shallow soils, respectively. The Massachusetts DEP ceiling level of 5,000 mg/kg was used for deep soils.

The Massachusetts DEP did not develop specific screening levels for leaching of heavy hydrocarbons from soil (refer to C19-C36 carbon range summary in Appendix 7). Residual fuels are by definition characterized by a predominance hydrocarbon compounds with carbon ranges greater than C24. These compounds are considered to be substantially less mobile in the subsurface that hydrocarbon compounds that make up the lighter-weight petroleum mixtures. For TPH that is characterized by a predominance of C23-C32 carbon range compounds, the Los Angeles Regional Water Board proposes a screening level of 1,000 mg/kg for protection of drinking water resources (RWQCBLA 1996). This screening level was adopted for use in this document (refer to Table G). The target TPH screening level for groundwater was not specifically stated but is presumably 100 ug/L or less.

The Los Angeles Regional Water Board did not present a similar screening level for potential leaching of TPH from soil and subsequent discharge of impacted groundwater to a body of surface water. Although conservative, the Los Angeles TPH soil leaching screening level 1,000 mg/kg was retained for this purpose (see Table G, refer also to Section 3.2).

6

Other Issues

6.1 Laboratory Reporting Levels and Background Concentrations

Laboratory method reporting limits and background concentrations of chemicals were not directly considered in development of the lookup tables. As discussed in Volume 1 of this document, however, reporting limits approved by the overseeing regulatory agency should be used in place of the ESLs presented in this document when higher. An ESL should similarly be replaced with the natural background concentration of the chemical if the background value is higher.

Arsenic and chromium are often naturally present in Bay area soils at levels above toxicity-based screening levels. Based on a review of soil data for the Bay area (e.g., LBNL 2002 and numerous site investigation reports), median background concentrations for these chemicals were selected to be 5.5 mg/kg and 58 mg/kg, resepctively, for use in this document. Final soil screening levels for these metals are based on the assumed background concentrations if lower then the risk-based screening level (refer to Tables A-D). A more detailed evaluation of background concentrations of metals in Bay area soil will be included in future updates of this document. Suggestions for the evaluation of arsenic in soil are provided in Section 2.8 and Figure 4 of Volume 1.

6.2 Reporting of Soil Data

Soil data are calculated by dividing the mass of the chemical of concern detected in the soil by the total weight of the soil. The weight of a soil sample can be measured on either a dry-weight basis (i.e., excluding the weight of water in the soil sample) or a wet-weight basis (i.e., including the weight of water in the soil sample). For a typical soil sample, the inclusion of soil moisture in calculation of chemical concentrations can effectively reduce the reported concentrations by 10-20% or greater, simply because the measured total weight of the sample is greater.

From a site-investigation and risk assessment-standpoint, a difference in the reported concentration of a chemical of 10-20% is not necessarily significant. **For consistency**

and for comparison to soil ESLs presented in this document, however, soil data should be reported on dry-weight basis. This is in part because soil ingestion rates assumed in direct-exposure models (see Appendices 1 and 2) are based on dry-weight studies (USEPA 1997). Comparison of wet-weight data to direct-exposure screening level would technically require adjustment of the direct-exposure screening levels to reflect wet weight-based soil ingestion rates. A site-specific consideration of wet-weight soil data will be dependent on assumptions in the model(s) being used to evaluate risk or generate environmental screening levels. Existing wet-weight soil data may not necessarily need to be adjusted prior to comparison to the ESLs unless the introduced bias is considered to be a potentially significant factor at the site. (Note that sediment data should also be reported on a dry-weight basis.)

6.3 Additional Soil Parameters

For surface soils, screening levels are also presented for Electrical Conductivity and Sodium Absorption Ratio (after MOEE 1996). Both parameters are intended primarily for evaluation of soils impacted by brines (e.g., from oil and gas field discharges). The Sodium Absorption Ratio reflects the amount of sodium present in the soil with respect to other major cations. An overabundance of sodium can inhibit plant uptake of nutrients, reduce soil cohesion and cause excessive erosion of topsoil. The electrical conductivity of a soil reflects the total concentration of soluble salts in the soil solution. A high concentration of salts can have a significant influence on osmotic processes involved in plant growth. (NOTE: The Electrical Conductivity screening levels assumes a fixed 2:1 water:soil solution in the laboratory method. The USEPA Laboratory Method 120.1(Mod) normally calls for a 1:1 dilution ratio. The laboratory should be notified of the need for a 2:1 dilution ratio prior to analysis.)

6.4 Degradation to Daughter Products

Consideration of the degradation of a chemical to more toxic daughter products, such as the breakdown of tetrachloroethylene to vinyl chloride, is an important part of site investigations. Tier 1 lookup tables generated by some regulatory agencies incorporate a very conservative assumption that the entire mass of a parent chemical will be eventually be transformed to the daughter product at the same initial concentration (e.g., MADEP 1994, MOEE 1996). They in turn reduce the initially derived screening levels for these parent compounds to reflect the screening levels for the more toxic daughter product, without taking into account issues such as the lower molecular weights (and lower ultimate masses) of the daughter products. While the need to monitor for degradation byproducts is well founded, it is felt that the above approach is overly conservative in most cases and not reflective of naturally occurring conditions. In the case of tetrachlorethylene, for example, degradation to vinyl chloride and further degradation of vinyl chloride to non-toxic ethene gas (and ultimately carbon dioxide and water) can be expected to be a steady-state process at sites where degradation is occurring, removing a portion of the vinyl chloride as it is generated. At most release sites this process has already been initiated, and the already conservative screening levels for individual,

primary compounds are considered to be adequately protective of human health and the environment. The need to reconsider this assumption should be evaluated on a site-by-site basis.

This issue is currently be evaluated in more detail. It should be pointed out that at some sites degradation of chlorinated solvents in groundwater is minimal (e.g., PCE) but levels of daughter products in soil gas are very elevated (e.g., vinyl chloride). This emphasizes the need to collect soil gas data at sites where vapor intrusion is of potential concern.

7

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FIGURES

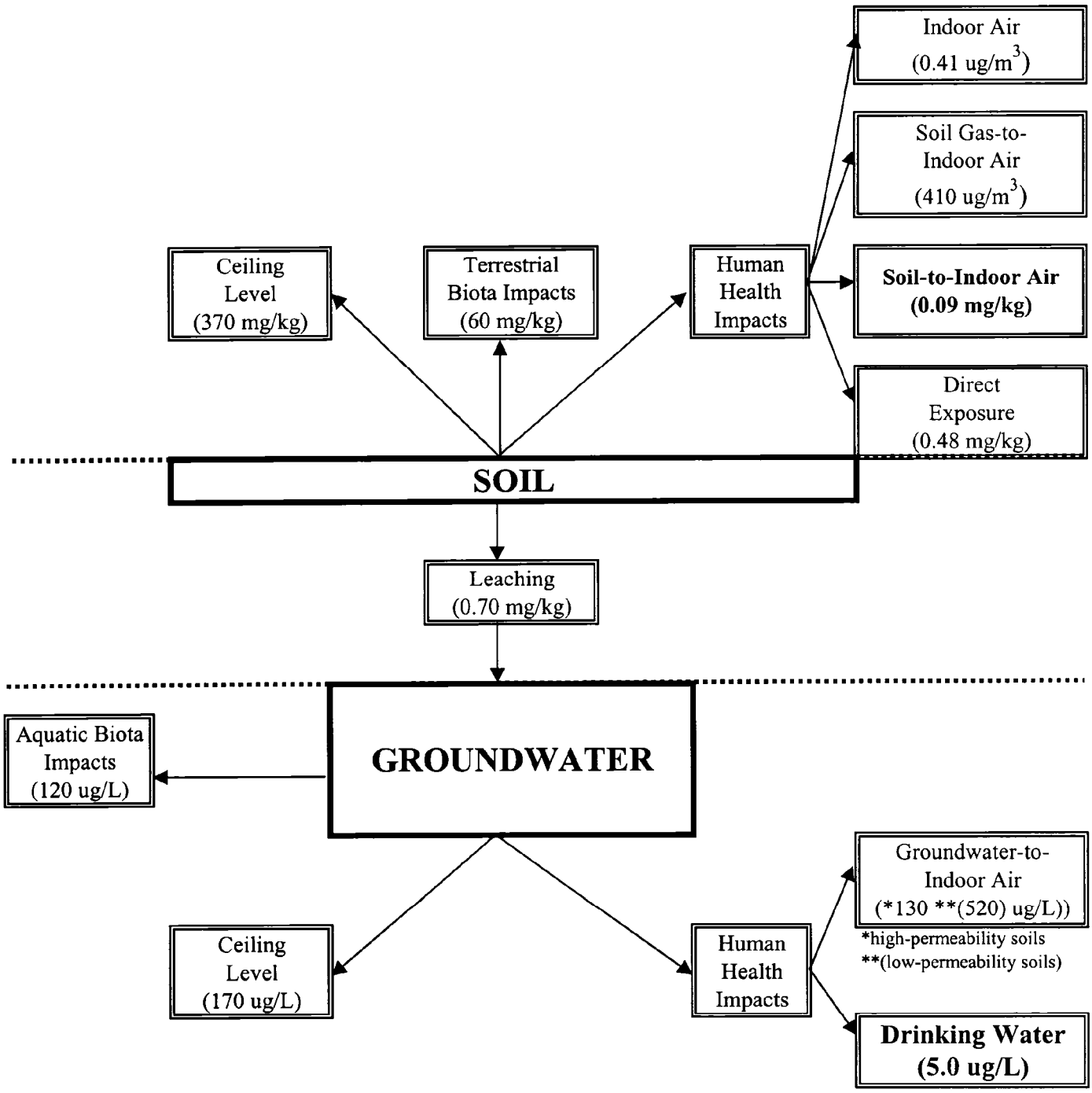

Figure 2. Summary of individual screening levels used to select final, Tier 1 ESLs for tetrachloroethylene in soils situated within ten feet of the ground surface and in groundwater that is a current or potential source of drinking water, based on a residential land-use scenario. Final ESLs presented in Volume 1 summary tables are the lowest of the individual screening levels. Potential impact to indoor air drives selection of the final soil ESL (0.09 mg/kg). For groundwater, drinking water toxicity concerns drive selection of final ESL (5.0 ug/L). Groundwater-to-indoor air screening levels for low-permeability soils not shown in summary lookup tables (refer to Table E-1a).

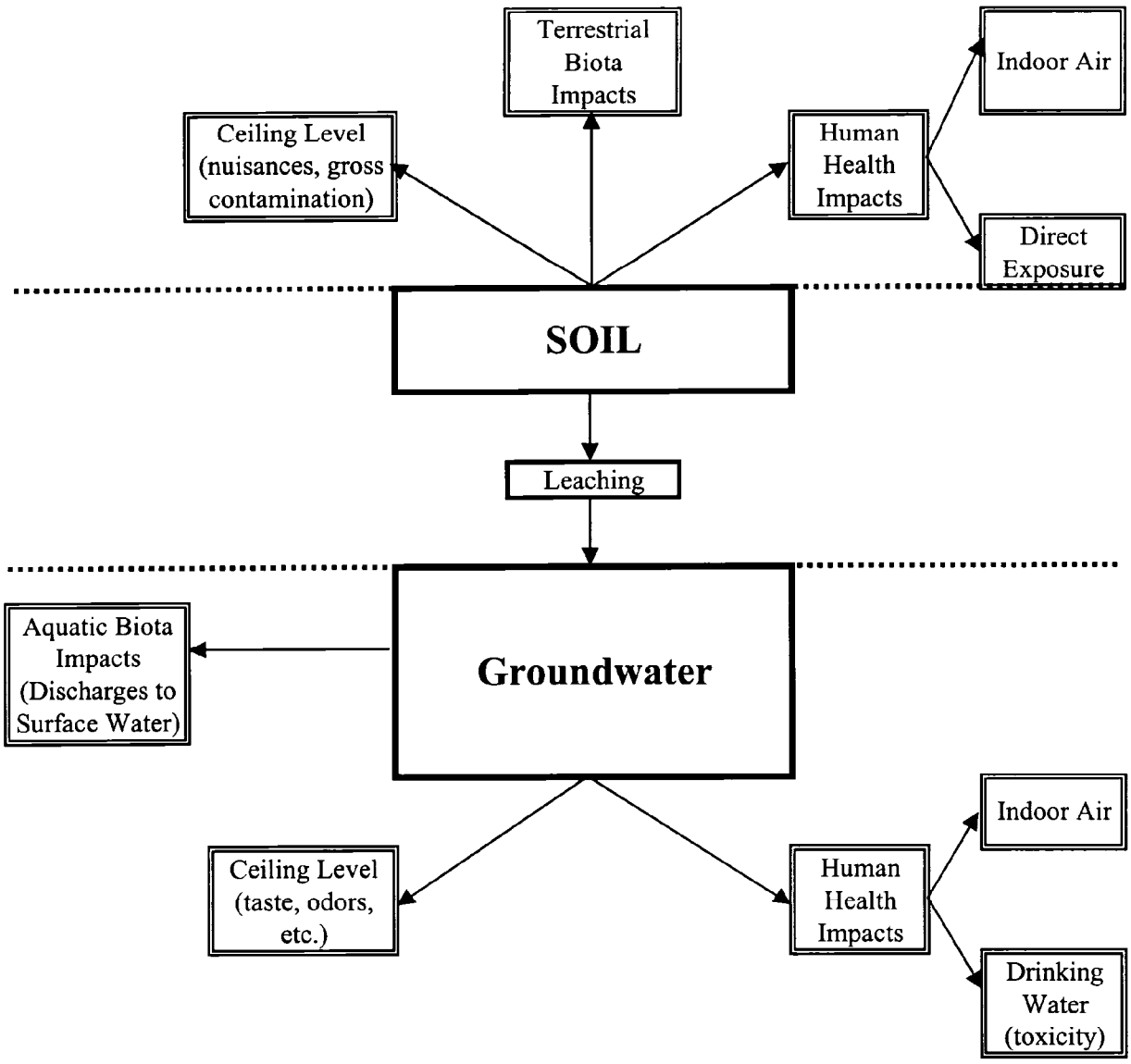

Figure 1. Summary of human health and environmental concerns considered in screening levels. Additional site-specific considerations include groundwater beneficial use, depth to impacted soil, soil type and land use. This figure is intended for Tier 1 and Tier 2 assessments only. Evaluation of environmental concerns not shown requires site-specific assessment.

TABLES

TABLES

TABLE A-1. [1]SHALLOW SOIL SCREENING LEVELS (≤ 3m bgs)
[2]RESIDENTIAL LAND USE
(potentially impacted groundwater IS a current or potential drinking water resource)

	[2]RESIDENTIAL LAND USE (mg/kg)							
				Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Urban Area Ecotoxicity Criteria	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-2		Value	Basis	Table K-1	Table E-1b	Table G
ACENAPHTHENE	1.6E+01	1.0E+03	-			7.3E+02	1.3E+02	1.6E+01
ACENAPHTHYLENE	1.3E+01	5.0E+02	-	5.5E+02	Fluorene	5.5E+02	(NV: Use soil gas)	1.3E+01
ACETONE	2.4E-01	5.0E+02	-			3.1E+02	1.6E+02	2.4E-01
ALDRIN	2.9E-02	1.0E+03	3.5E-01			2.9E-02		5.0E+00
ANTHRACENE	2.8E+00	5.0E+02	4.0E+01			4.4E+03	6.1E+00	2.8E+00
ANTIMONY	6.3E+00	1.0E+03	2.0E+01			6.3E+00		
ARSENIC	5.5E+00	1.0E+03	2.0E+01	5.5	Background	5.5E+00		
BARIUM	7.5E+02	1.0E+03	7.5E+02			1.1E+03		
BENZENE	4.4E-02	5.0E+02	2.5E+01			1.8E-01	1.8E-01	4.4E-02
BENZO(a)ANTHRACENE	3.8E-01	5.0E+02	4.0E+01			3.8E-01		1.2E+01
BENZO(b)FLUORANTHENE	3.8E-01	5.0E+02	-			3.8E-01		4.6E+01
BENZO(k)FLUORANTHENE	3.8E-01	5.0E+02	4.0E+01			3.8E-01		2.7E+00
BENZO(g,h,i)PERYLENE	2.7E+01	5.0E+02	4.0E+01	4.6E+02	Fluoranthene	4.6E+02		2.7E+01
BENZO(a)PYRENE	3.8E-02	5.0E+02	4.0E+01			3.8E-02		1.3E+02
BERYLLIUM	4.0E+00	1.0E+03	4.0E+00			3.1E+01		
BIPHENYL, 1,1-	6.5E-01	5.0E+02	-			6.0E+02	(NV: Use soil gas)	6.5E-01
BIS(2-CHLOROETHYL)ETHER	1.8E-04	5.0E+02	-			9.5E-02	4.0E-03	1.8E-04
BIS(2-CHLOROISOPROPYL)ETHER	5.4E-03	5.0E+02	-			2.9E+00	(NV: Use soil gas)	5.4E-03
BIS(2-ETHYLHEXYL)PHTHALATE	6.6E+01	5.0E+02	-			1.6E+02		6.6E+01
BORON	1.6E+00	no criteria	1.6E+00			2.4E+03		
BROMODICHLOROMETHANE	1.2E-02	1.0E+03	-			3.9E-01	1.2E-02	1.9E+00
BROMOFORM	2.2E+00	5.0E+02	-			6.1E+01		2.2E+00
BROMOMETHANE	2.2E-01	5.0E+02	-			7.6E-01	2.2E-01	3.9E-01
CADMIUM	1.7E+00	1.0E+03	1.2E+01			1.7E+00		
CARBON TETRACHLORIDE	1.2E-02	5.0E+02	-			9.0E-02	1.2E-02	1.1E-01
CHLORDANE	4.4E-01	1.0E+03	-			4.4E-01		1.5E+01
CHLOROANILINE, p-	5.3E-02	1.0E+03	-			4.9E+01		5.3E-02
CHLOROBENZENE	1.5E+00	5.0E+02	3.0E+01			3.0E+01	2.7E+00	1.5E+00
CHLOROETHANE	6.3E-01	5.0E+02	-			3.0E+00	6.3E-01	8.5E-01
CHLOROFORM	9.8E-02	5.0E+02	-			7.0E-01	9.8E-02	2.9E+00
CHLOROMETHANE	2.9E-01	1.0E+02	-			1.2E+00	2.9E-01	4.2E-01
CHLOROPHENOL, 2-	1.2E-02	1.0E+02	1.0E+01			1.3E+01	8.8E-01	1.2E-02
CHROMIUM (Total)	5.8E+01	1.0E+03		58	Background	5.8E+01		
CHROMIUM III	7.5E+02	1.0E+03	7.5E+02			2.3E+04		
CHROMIUM VI	1.8E+00	1.0E+03	8.0E+00			1.8E+00		
CHRYSENE	3.8E+00	1.0E+03	4.0E+01			3.8E+00		1.9E+01
COBALT	4.0E+01	1.0E+03	4.0E+01			9.4E+01		
COPPER	2.3E+02	1.0E+03	2.3E+02			6.3E+02		

TABLE A-1. [1]SHALLOW SOIL SCREENING LEVELS (≤ 3m bgs)
[2]RESIDENTIAL LAND USE
(potentially impacted groundwater IS a current or potential drinking water resource)

	[4]RESIDENTIAL LAND USE (mg/kg)							
				Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Urban Area	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-2	Ecotoxicity Criteria	Value	Basis	Table K-1	Table E-1b	Table G
CYANIDE (Free)	1.0E+02	1.0E+02	-			2.4E+02		1.2E+04
DIBENZO(a,h)ANTHTRACENE	1.1E-01	5.0E+02	-			1.1E-01		9.9E+00
DIBROMOCHLOROMETHANE	1.9E-02	1.0E+02	-			9.8E-01	1.9E-02	8.3E+00
1,2-DIBROMO-3-CHLOROPROPANE	1.1E-03	5.0E+02	-			1.9E-02	(NV: Use soil gas)	1.1E-03
DIBROMOETHANE, 1,2-	3.3E-04	5.0E+02	-			1.0E-01	7.3E-03	3.3E-04
DICHLOROBENZENE, 1,2-	1.1E+00	3.7E+02	3.0E+01			2.2E+02	8.9E+00	1.1E+00
DICHLOROBENZENE, 1,3-	7.2E-01	1.0E+02	3.0E+01			3.2E+00	(NV: Use soil gas)	7.2E-01
DICHLOROBENZENE, 1,4-	4.7E-02	5.0E+02	3.0E+01			2.1E+00	4.7E-02	5.9E-01
DICHLOROBENZIDINE, 3,3-	7.7E-03	5.0E+02	-			4.0E-01		7.7E-03
DICHLORODIPHENYLDICHLOROETHANE (DDD)	2.4E+00	5.0E+02	-			2.4E+00		7.5E+02
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	1.7E+00	5.0E+02	4.0E+00			1.7E+00		1.1E+03
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	1.7E+00	1.0E+03	4.0E+00			1.7E+00		4.3E+00
DICHLOROETHANE, 1,1-	2.0E-01	5.0E+02	-			2.8E+00	3.3E-01	2.0E-01
DICHLOROETHANE, 1,2-	4.5E-03	5.0E+02	6.0E+01			3.5E-01	2.5E-02	4.5E-03
DICHLOROETHYLENE, 1,1-	1.0E+00	5.0E+02	-			2.4E+01	8.9E+00	1.0E+00
DICHLOROETHYLENE, Cis 1,2-	1.9E-01	1.0E+02	-			8.5E+00	1.6E+00	1.9E-01
DICHLOROETHYLENE, Trans 1,2-	6.7E-01	5.0E+02	-			1.4E+01	3.1E+00	6.7E-01
DICHLOROPHENOL, 2,4-	3.0E-01	5.0E+02	1.0E+01			3.7E+01		3.0E-01
DICHLOROPROPANE, 1,2-	5.2E-02	1.0E+02	-			6.4E-01	5.2E-02	1.2E-01
DICHLOROPROPENE, 1,3-	3.3E-02	5.0E+02	-			2.2E-01	3.3E-02	5.9E-02
DIELDRIN	2.3E-03	1.0E+03	4.0E+00			3.0E-02		2.3E-03
DIETHYLPHTHALATE	3.5E-02	5.0E+02	-			9.8E+03		3.5E-02
DIMETHYLPHTHALATE	3.5E-02	5.0E+02	-			1.2E+05		3.5E-02
DIMETHYLPHENOL, 2,4-	6.7E-01	1.0E+02	-			1.4E+02	1.4E+02	6.7E-01
DINITROPHENOL, 2,4-	4.0E-02	5.0E+02	-			2.4E+01		4.0E-02
DINITROTOLUENE, 2,4-	8.5E-04	5.0E+02	-			1.6E+00		8.5E-04
1,4 DIOXANE	1.8E-03	5.0E+02	-			1.8E+01		1.8E-03
DIOXIN (2,3,7,8-TCDD)	4.5E-06	no criteria	-			4.5E-06		
ENDOSULFAN	4.6E-03	5.0E+02	-			7.3E+01		4.6E-03
ENDRIN	6.5E-04	5.0E+02	6.0E-02			3.7E+00		6.5E-04
ETHYLBENZENE	3.3E+00	2.3E+02	-			8.7E+00	4.7E+00	3.3E+00
FLUORANTHENE	4.0E+01	5.0E+02	4.0E+01			4.6E+02		6.0E+01
FLUORENE	8.9E+00	5.0E+02	-			5.5E+02	1.6E+02	8.9E+00
HEPTACHLOR	1.4E-02	1.0E+03	-			1.2E-01		1.4E-02
HEPTACHLOR EPOXIDE	1.5E-02	1.0E+03	-			8.8E-02		1.5E-02
HEXACHLOROBENZENE	2.7E-01	5.0E+02	3.0E+01			2.7E-01		7.9E+02
HEXACHLOROBUTADIENE	1.0E+00	5.0E+02	-			3.7E+00		1.0E+00
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	4.9E-02	5.0E+02	2.0E+00			5.2E-01		4.9E-02

TABLE A-1. [1]SHALLOW SOIL SCREENING LEVELS (<_3m bgs)
[2]RESIDENTIAL LAND USE
(potentially impacted groundwater IS a current or potential drinking water resource)

	[2]RESIDENTIAL LAND USE (mg/kg)							
				Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Urban Area	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-2	Ecotoxicity Criteria	Value	Basis	Table K-1	Table E-1b	Table G
HEXACHLOROETHANE	2.4E+00	5.0E+02	-			1.2E+01		2.4E+00
INDENO(1,2,3-cd)PYRENE	3.8E-01	5.0E+02	4.0E+01			3.8E-01		7.7E+00
LEAD	2.0E+02	1.0E+03	2.0E+02			2.55E+02		
MERCURY	2.5E+00	5.0E+02	1.0E+01			2.5E+00		
METHOXYCHLOR	1.9E+01	5.0E+02	-			6.1E+01		1.9E+01
METHYLENE CHLORIDE	7.7E-02	5.0E+02	-			4.3E+00	5.2E-01	7.7E-02
METHYL ETHYL KETONE	3.9E+00	5.0E+02	-			1.5E+03	9.9E+02	3.9E+00
METHYL ISOBUTYL KETONE	2.8E+00	1.0E+02	-			1.6E+02	1.3E+02	2.8E+00
METHYL MERCURY	1.2E+00	1.0E+02	1.0E+01			1.2E+00		
METHYLNAPHTHALENE (total 1- & 2-)	2.5E-01	5.0E+02	-			2.9E+02	1.1E+02	2.5E-01
METHYL TERT BUTYL ETHER	2.3E-02	1.0E+02	-			3.1E+01	2.0E+00	2.3E-02
MOLYBDENUM	4.0E+01	1.0E+03	4.0E+01			7.8E+01		
NAPHTHALENE	4.2E+00	5.0E+02	4.0E+01			1.1E+01	4.5E+00	4.2E+00
NICKEL	1.5E+02	1.0E+03	1.5E+02			3.1E+02		
PENTACHLOROPHENOL	4.4E+00	5.0E+02	5.0E+00			4.4E+00		5.3E+00
PERCHLORATE	7.0E-03	1.0E+03	-			1.6E+00		7.0E-03
PHENANTHRENE	1.1E+01	5.0E+02	4.0E+01	5.5E+02	Fluorene	5.5E+02	(NV: Use soil gas)	1.1E+01
PHENOL	7.6E-02	5.0E+02	4.0E+01			7.3E+03		7.6E-02
POLYCHLORINATED BIPHENYLS (PCBs)	2.2E-01	5.0E+02	-			2.2E-01		6.3E+00
PYRENE	8.5E+01	5.0E+02	-			4.6E+02	8.5E+01	8.5E+01
SELENIUM	1.0E+01	1.0E+03	1.0E+01			7.8E+01		
SILVER	2.0E+01	1.0E+03	2.0E+01			7.8E+01		
STYRENE	1.5E+00	5.0E+02	-			8.7E+02	4.5E+02	1.5E+00
tert-BUTYL ALCOHOL	7.3E-02	1.0E+02	-			2.1E+02	(NV: Use soil gas)	7.3E-02
TETRACHLOROETHANE, 1,1,1,2-	2.4E-02	1.0E+02	-			3.1E+00	(NV: Use soil gas)	2.4E-02
TETRACHLOROETHANE, 1,1,2,2-	9.0E-03	5.0E+02	-			3.9E-01	9.0E-03	1.8E-02
TETRACHLOROETHYLENE	8.8E-02	3.7E+02	-			4.8E-01	8.8E-02	7.0E-01
THALLIUM	1.0E+00	1.0E+03	-			1.0E+00		
TOLUENE	2.9E+00	5.0E+02	-			1.3E+02	1.8E+02	2.9E+00
TOXAPHENE	4.2E-04	5.0E+02	-			4.0E-01		4.2E-04
TPH (gasolines)	1.0E+02	1.0E+02	-	5.0E+02	pyrene	5.0E+02	(NV: Use soil gas)	1.0E+02
TPH (middle distillates)	1.0E+02	5.0E+02	-	5.0E+02	pyrene	5.0E+02	(NV: Use soil gas)	1.0E+02
TPH (residual fuels)	5.0E+02	5.0E+02	-	5.0E+02	pyrene	5.0E+02		1.0E+03
TRICHLOROBENZENE, 1,2,4-	7.6E+00	5.0E+02	3.0E+01			1.3E+02	2.3E+01	7.6E+00
TRICHLOROETHANE, 1,1,1-	7.8E+00	5.0E+02	-			4.3E+01	9.8E+01	7.8E+00
TRICHLOROETHANE, 1,1,2-	3.3E-02	1.0E+02	-			7.0E-01	3.3E-02	7.0E-02
TRICHLOROETHYLENE	2.6E-01	5.0E+02	6.0E+01			2.9E+00	2.6E-01	4.6E-01
TRICHLOROPHENOL, 2,4,5-	1.8E-01	1.0E+02	1.0E+01			5.0E+02	2.4E+01	1.8E-01

TABLE A-1. [1]SHALLOW SOIL SCREENING LEVELS (≤ 3m bgs)
[2]RESIDENTIAL LAND USE
(potentially impacted groundwater IS a current or potential drinking water resource)

	[4]RESIDENTIAL LAND USE (mg/kg)							
				Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Urban Area	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-2	Ecotoxicity Criteria	Value	Basis	Table K-1	Table E-1b	Table G
TRICHLORCPHENOL, 2,4,6-	1.7E-01	5.0E+02	1.0E+01			6.9E+00		1.7E-01
VANADIUM	1.1E+02	1.0E+03	2.0E+02			1.1E+02		
VINYL CHLORIDE	6.7E-03	5.0E+02	6.0E+01			2.5E-02	6.7E-03	8.5E-02
XYLENES	1.5E+00	2.1E+02	-		m-xylenes	5.4E+01	4.5E+01	1.5E+00
ZINC	6.0E+02	1.0E+03	6.0E+02			4.7E+03		
Electrical Conductivity (mS/cm, USEPA Method 120.1 MOD)	2.0	-	-			-	-	-
Sodium Adsorption Ratio	5.0	-	-			-	-	-

Notes:

1. Shallow soils defined as soils situated <3 meters below ground surface.

2. "Residential Land Use" screening levels generally considered adequate for other sensitive uses (e.g., day-care centers, hospitals, etc.).

Final Environmental Screening Level is lowest of ceiling value (nuisance concerns etc.), ecotoxicity, direct-exposure, indoor-air impact, and leaching screening levels.

Assumes soil pH 5.0 to 9.0.

Soil data should be reported on dry-weight basis (see Section 6.2).

TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.

Background As and total Cr based on mean soil values presented in LBNL 2002 (refer to Section 3.2.4 and Volume 1, Figure 4).

TABLE A-2. [1]SHALLOW SOIL SCREENING LEVELS (<3m bgs)
COMMERCIAL / INDUSTRIAL LAND USE
(potentially impacted groundwater IS a current or potential drinking water resource)

	COMMERCIAL / INDUSTRIAL LAND USE (mg/kg)							
				Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Urban Area Ecotoxicity Criteria	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-3		Value	Basis	Table K-2	Table E-1b	Table G
ACENAPHTHENE	1.6E+01	2.5E+03	-			5.6E+03	1.3E+02	1.6E+01
ACENAPHTHYLENE	1.3E+01	1.0E+03	-	5.2E+03	Fluorene	5.2E+03	(NV: Use soil gas)	1.3E+01
ACETONE	2.4E-01	1.0E+03	-			1.2E+03	3.6E+02	2.4E-01
ALDRIN	1.0E-01	2.5E+03	3.5E-01			1.0E-01		5.0E+00
ANTHRACENE	2.8E+00	1.0E+03	4.0E+01			4.8E+04	6.1E+00	2.8E+00
ANTIMONY	4.0E+01	2.5E+03	4.0E+01			8.2E+01		
ARSENIC	5.5E+00	2.5E+03	4.0E+01	5.5E+00	Background	5.5E+00		
BARIUM	1.5E+03	2.5E+03	1.5E+03			2.5E+03		
BENZENE	4.4E-02	1.0E+03	2.5E+01			3.8E-01	5.0E-01	4.4E-02
BENZO(a)ANTHRACENE	1.3E+00	1.0E+03	4.0E+01			1.3E+00		1.2E+01
BENZO(b)FLUORANTHENE	1.3E+00	1.0E+03	-			1.3E+00		4.6E+01
BENZO(k)FLUORANTHENE	1.3E+00	1.0E+03	4.0E+01			1.3E+00		2.7E+00
BENZO(g,h,i)PERYLENE	2.7E+01	1.0E+03	4.0E+01			4.4E+03		2.7E+01
BENZO(a)PYRENE	1.3E-01	1.0E+03	4.0E+01			1.3E-01		1.3E+02
BERYLLIUM	8.0E+00	2.5E+03	8.0E+00			9.8E+01		
BIPHENYL, 1,1-	6.5E-01	1.0E+03	-			4.6E+03	(NV: Use soil gas)	6.5E-01
BIS(2-CHLOROETHYL)ETHER	1.8E-04	1.0E+03	-			2.5E-01	1.3E-02	1.8E-04
BIS(2-CHLOROISOPROPYL)ETHER	5.4E-03	7.9E+02	-			7.3E+00	(NV: Use soil gas)	5.4E-03
BIS(2-ETHYLHEXYL)PHTHALATE	6.6E+01	1.0E+03	-			5.7E+02		6.6E+01
BORON	2.0E+00	no critiera	2.0E+00			2.5E+04		
BROMODICHLOROMETHANE	3.9E-02	2.5E+03	-			8.6E-01	3.9E-02	1.9E+00
BROMOFORM	2.2E+00	1.0E+03	-			2.2E+02		2.2E+00
BROMOMETHANE	3.9E-01	1.0E+03	-			2.5E+00	5.1E-01	3.9E-01
CADMIUM	7.4E+00	2.5E+03	1.2E+01			7.4E+00		
CARBON TETRACHLORIDE	3.5E-02	9.8E+02	-			1.9E-01	3.5E-02	1.1E-01
CHLORDANE	1.7E+00	2.5E+03	-			1.7E+00		1.5E+01
CHLOROANILINE, p-	5.3E-02	2.5E+03	-			4.9E+02		5.3E-02
CHLOROBENZENE	1.5E+00	6.8E+02	3.0E+01			1.0E+02	6.2E+00	1.5E+00
CHLOROETHANE	8.5E-01	1.0E+03	-			6.4E+00	1.8E+00	8.5E-01
CHLOROFORM	2.7E-01	1.0E+03	-			1.9E+00	2.7E-01	2.9E+00
CHLOROMETHANE	4.2E-01	5.0E+02	-			2.6E+00	8.1E-01	4.2E-01
CHLOROPHENOL, 2-	1.2E-02	5.0E+02	1.0E+01			4.7E+01	2.4E+00	1.2E-02
CHROMIUM (Total)	5.8E+01	2.5E+03		58	Background	5.8E+01		
CHROMIUM III	7.5E+02	2.5E+03	7.5E+02			3.1E+05		
CHROMIUM VI	1.8E+00	2.5E+03	8.0E+00			1.8E+00		
CHRYSENE	1.3E+01	2.5E+03	4.0E+01			1.3E+01		1.9E+01

TABLE A-2. [1]SHALLOW SOIL SCREENING LEVELS (<3m bgs)
COMMERCIAL / INDUSTRIAL LAND USE
(potentially impacted groundwater IS a current or potential drinking water resource)

	COMMERCIAL / INDUSTRIAL LAND USE (mg/kg)							
				Human Health				Groundwater Protection (Soil Leaching)
				Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Ceiling Value (Odors, etc.) Table H-3	Urban Area Ecotoxicity Criteria	Value	Basis	Table K-2	Table E-1b	Table G
COBALT	8.0E+01	2.5E+03	8.0E+01			9.4E+01		
COPPER	2.3E+02	2.5E+03	2.3E+02			8.2E+03		
CYANIDE (Free)	5.0E+02	5.0E+02	-			2.5E+03		1.2E+04
DIBENZO(a,h)ANTHTRACENE	3.8E-01	1.0E+03	-			3.8E-01		9.9E+00
DIBROMOCHLOROMETHANE	5.8E-02	5.0E+02	-			2.3E+00	5.8E-02	8.3E+00
1,2-DIBROMO-3-CHLOROPROPANE	1.1E-03	1.0E+03	-			4.5E-02	(NV: Use soil gas)	1.1E-03
DIBROMOETHANE, 1,2-	3.3E-04	1.0E+03	-			3.1E-01	2.1E-02	3.3E-04
DICHLOROBENZENE, 1,2-	1.1E+00	3.7E+02	3.0E+01			6.0E+02	2.1E+01	1.1E+00
DICHLOROBENZENE, 1,3-	7.2E-01	3.8E+02	3.0E+01			1.2E+01	(NV: Use soil gas)	7.2E-01
DICHLOROBENZENE, 1,4-	1.3E-01	1.0E+03	3.0E+01			4.5E+00	1.3E-01	5.9E-01
DICHLOROBENZIDINE, 3,3-	7.7E-03	1.0E+03	-			1.4E+00		7.7E-03
DICHLORODIPHENYLDICHLOROETHANE (DDD)	1.0E+01	1.0E+03	-			1.0E+01		7.5E+02
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	4.0E+00	1.0E+03	4.0E+00			7.0E+00		1.1E+03
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	4.0E+00	2.5E+03	4.0E+00			7.0E+00		4.3E+00
DICHLOROETHANE, 1,1-	2.0E-01	1.0E+03	-			5.9E+00	9.1E-01	2.0E-01
DICHLOROETHANE, 1,2-	4.5E-03	1.0E+03	6.0E+01			7.6E-01	6.9E-02	4.5E-03
DICHLOROETHYLENE, 1,1-	1.0E+00	1.0E+03	-			8.2E+01	2.1E+01	1.0E+00
DICHLOROETHYLENE, Cis 1,2-	1.9E-01	5.0E+02	-			2.9E+01	3.6E+00	1.9E-01
DICHLOROETHYLENE, Trans 1,2-	6.7E-01	1.0E+03	-			4.6E+01	7.3E+00	6.7E-01
DICHLOROPHENOL, 2,4-	3.0E-01	1.0E+03	1.0E+01			3.7E+02		3.0E-01
DICHLOROPROPANE, 1,2-	1.2E-01	5.0E+02	-			1.4E+00	1.5E-01	1.2E-01
DICHLOROPROPENE, 1,3-	5.9E-02	1.0E+03	-			4.7E-01	9.1E-02	5.9E-02
DIELDRIN	2.3E-03	2.5E+03	4.0E+00			1.1E-01		2.3E-03
DIETHYLPHTHALATE	3.5E-02	1.0E+03	-			9.8E+04		3.5E-02
DIMETHYLPHTHALATE	3.5E-02	1.0E+03	-			1.2E+06		3.5E-02
DIMETHYLPHENOL, 2,4-	6.7E-01	5.0E+02	-			7.1E+02	3.7E+02	6.7E-01
DINITROPHENOL, 2,4-	4.0E-02	1.0E+03	-			2.5E+02		4.0E-02
DINITROTOLUENE, 2,4-	8.5E-04	1.0E+03	-			5.6E+00		8.5E-04
1,4 DIOXANE	1.8E-03	1.0E+03	-			6.4E+01		1.8E-03
DIOXIN (2,3,7,8-TCDD)	1.8E-05	no criteria	-			1.8E-05		
ENDOSULFAN	4.6E-03	1.0E+03	-			7.4E+02		4.6E-03
ENDRIN	6.5E-04	1.0E+03	6.0E-02			3.7E+01		6.5E-04
ETHYLBENZENE	3.3E+00	2.3E+02	-			1.9E+01	1.3E+01	3.3E+00
FLUORANTHENE	4.0E+01	1.0E+03	4.0E+01			4.4E+03		6.0E+01
FLUORENE	8.9E+00	1.0E+03	-			5.2E+03	1.6E+02	8.9E+00
HEPTACHLOR	1.4E-02	2.5E+03	-			4.2E-01		1.4E-02

TABLE A-2. [1]SHALLOW SOIL SCREENING LEVELS (<3m bgs)
COMMERCIAL / INDUSTRIAL LAND USE
(potentially impacted groundwater IS a current or potential drinking water resource)

	COMMERCIAL / INDUSTRIAL LAND USE (mg/kg)							
				Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Urban Area	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-3	Ecotoxicity Criteria	Value	Basis	Table K-2	Table E-1b	Table G
HEPTACHLOR EPOXIDE	1.5E-02	2.5E+03	-			3.1E-01		1.5E-02
HEXACHLOROBENZENE	9.6E-01	1.0E+03	3.0E+01			9.6E-01		7.9E+02
HEXACHLOROBUTADIENE	1.0E+00	1.0E+03	-			2.2E+01		1.0E+00
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	4.9E-02	1.0E+03	2.0E+00			2.1E+00		4.9E-02
HEXACHLOROETHANE	2.4E+00	1.0E+03	-			4.4E+01		2.4E+00
INDENO(1,2,3-cd)PYRENE	1.3E+00	1.0E+03	4.0E+01			1.3E+00		7.7E+00
LEAD	7.5E+02	2.5E+03	-			7.5E+02		
MERCURY	1.0E+01	1.0E+03	1.0E+01			3.3E+01		
METHOXYCHLOR	1.9E+01	1.0E+03	-			6.2E+02		1.9E+01
METHYLENE CHLORIDE	7.7E-02	1.0E+03	-			9.5E+00	1.5E+00	7.7E-02
METHYL ETHYL KETONE	3.9E+00	1.0E+03	-			5.4E+03	2.7E+03	3.9E+00
METHYL ISOBUTYL KETONE	2.8E+00	5.0E+02	-			5.6E+02	3.5E+02	2.8E+00
METHYL MERCURY	1.0E+01	5.0E+02	1.0E+01			1.2E+01		
METHYLNAPHTHALENE (total 1- & 2-)	2.5E-01	1.0E+03	-			1.4E+03	1.1E+02	2.5E-01
METHYL TERT BUTYL ETHER	2.3E-02	5.0E+02	-			7.0E+01	5.6E+00	2.3E-02
MOLYBDENUM	4.0E+01	2.5E+03	4.0E+01			1.0E+03		
NAPHTHALENE	4.2E+00	1.0E+03	4.0E+01			3.7E+01	1.2E+01	4.2E+00
NICKEL	1.5E+02	2.5E+03	1.5E+02			1.0E+03		
PENTACHLOROPHENOL	5.0E+00	1.0E+03	5.0E+00			1.3E+01		5.3E+00
PERCHLORATE	7.0E-03	2.5E+03	-			2.0E+01		7.0E-03
PHENANTHRENE	1.1E+01	1.0E+03	4.0E+01	5.2E+03	Fluorene	5.2E+03	(NV: Use soil gas)	1.1E+01
PHENOL	7.6E-02	1.0E+03	4.0E+01			7.4E+04		7.6E-02
POLYCHLORINATED BIPHENYLS (PCBs)	7.4E-01	1.0E+03	-			7.4E-01		6.3E+00
PYRENE	8.5E+01	1.0E+03	-			5.8E+03	8.5E+01	8.5E+01
SELENIUM	1.0E+01	2.5E+03	1.0E+01			1.0E+03		
SILVER	4.0E+01	2.5E+03	4.0E+01			1.0E+03		
STYRENE	1.5E+00	1.0E+03	-			1.5E+03	1.0E+03	1.5E+00
tert-BUTYL ALCOHOL	7.3E-02	5.0E+02	-			9.5E+02	(NV: Use soil gas)	7.3E-02
TETRACHLOROETHANE, 1,1,1,2-	2.4E-02	5.0E+02	-			7.2E+00	(NV: Use soil gas)	2.4E-02
TETRACHLOROETHANE, 1,1,2,2-	1.8E-02	1.0E+03	-			9.1E-01	2.5E-02	1.8E-02
TETRACHLOROETHYLENE	2.5E-01	3.7E+02	-			1.3E+00	2.5E-01	7.0E-01
THALLIUM	1.3E+01	2.5E+03	-			1.3E+01		
TOLUENE	2.9E+00	5.2E+02	-			4.4E+02	4.2E+02	2.9E+00
TOXAPHENE	4.2E-04	1.0E+03	-			1.4E+00		4.2E-04
TPH (gasolines)	1.0E+02	5.0E+02	-	5.8E+03	pyrene	5.8E+03	(NV: Use soil gas)	1.0E+02
TPH (middle distillates)	1.0E+02	1.0E+03	-	5.8E+03	pyrene	5.8E+03	(NV: Use soil gas)	1.0E+02

TABLE A-2. [1]SHALLOW SOIL SCREENING LEVELS (<3m bgs)
COMMERCIAL / INDUSTRIAL LAND USE
(potentially impacted groundwater IS a current or potential drinking water resource)

	COMMERCIAL / INDUSTRIAL LAND USE (mg/kg)							
				Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Urban Area	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-3	Ecotoxicity Criteria	Value	Basis	Table K-2	Table E-1b	Table G
TPH (residual fuels)	1.0E+03	2.5E+03	-	5.8E+03	pyrene	5.8E+03		1.0E+03
TRICHLOROBENZENE, 1,2,4-	7.6E+00	1.0E+03	3.0E+01			7.9E+02	6.1E+01	7.6E+00
TRICHLOROETHANE, 1,1,1-	7.8E+00	1.0E+03	-			1.4E+02	2.3E+02	7.8E+00
TRICHLOROETHANE, 1,1,2-	7.0E-02	5.0E+02	-			1.5E+00	9.1E-02	7.0E-02
TRICHLOROETHYLENE	4.6E-01	8.2E+02	6.0E+01			6.4E+00	7.3E-01	4.6E-01
TRICHLOROPHENOL, 2,4,5-	1.8E-01	5.0E+02	1.0E+01			2.2E+03	6.3E+01	1.8E-01
TRICHLOROPHENOL, 2,4,6-	1.7E-01	1.0E+03	1.0E+01			2.5E+01		1.7E-01
VANADIUM	2.0E+02	2.5E+03	2.0E+02			1.4E+03		
VINYL CHLORIDE	1.9E-02	1.0E+03	6.0E+01			5.4E-02	1.9E-02	8.5E-02
XYLENES	1.5E+00	2.1E+02	-			1.8E+02	1.0E+02	1.5E+00
ZINC	6.0E+02	2.5E+03	6.0E+02			6.1E+04		
Electrical Conductivity (mS/cm, USEPA Method 120.1 MOD)	4.0	-	-			-	-	-
Sodium Adsorption Ratio	12	-	-			-	-	-

Notes:

1. Shallow soils defined as soils situated <3 meters below ground surface.

Final Environmental Screening Level is lowest of ceiling value (nuisance concerns etc.), ecotoxicity, direct-exposure, indoor-air impact, and leaching screening levels.

Assumes soil pH 5.0 to 9.0.

Soil data should be reported on dry-weight basis (see Section 6.2).

TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.

Background As and total Cr based on mean soil values presented in LBNL 2002 (refer to Section 3.2.4 and Volume 1, Figure 4).

TABLE B-1. [1]SHALLOW SOIL SCREENING LEVELS (<3m bgs)
[2]RESIDENTIAL LAND USE
(potentially impacted groundwater IS NOT a current or potential drinking water resource)

	[2]RESIDENTIAL LAND USE (mg/kg)							
				Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Urban Area	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	NON-Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-2	Ecotoxicity Criteria	Value	Basis	Table K-1	Table E-1b	Table G
ACENAPHTHENE	1.9E+01	1.0E+03	-			7.3E+02	1.3E+02	1.9E+01
ACENAPHTHYLENE	1.3E+01	5.0E+02	-	5.5E+02	Fluorene	5.5E+02	(NV: Use soil gas)	1.3E+01
ACETONE	5.0E-01	5.0E+02	-			3.1E+02	1.6E+02	5.0E-01
ALDRIN	2.9E-02	1.0E+03	3.5E-01			2.9E-02		5.0E+00
ANTHRACENE	2.8E+00	5.0E+02	4.0E+01			4.4E+03	6.1E+00	2.8E+00
ANTIMONY	6.3E+00	1.0E+03	2.0E+01			6.3E+00		
ARSENIC	5.5E+00	1.0E+03	2.0E+01	5.5E+00	Background	5.5E+00		
BARIUM	7.5E+02	1.0E+03	7.5E+02			1.1E+03		
BENZENE	1.8E-01	5.0E+02	2.5E+01			1.8E-01	1.8E-01	2.0E+00
BENZO(a)ANTHRACENE	3.8E-01	5.0E+02	4.0E+01			3.8E-01		1.2E+01
BENZO(b)FLUORANTHENE	3.8E-01	5.0E+02	-			3.8E-01		4.6E+01
BENZO(k)FLUORANTHENE	3.8E-01	5.0E+02	4.0E+01			3.8E-01		3.7E+01
BENZO(g,h,i)PERYLENE	2.7E+01	5.0E+02	4.0E+01			4.6E+02		2.7E+01
BENZO(a)PYRENE	3.8E-02	5.0E+02	4.0E+01			3.8E-02		1.3E+02
BERYLLIUM	4.0E+00	1.0E+03	4.0E+00			3.1E+01		
BIPHENYL, 1,1-	6.5E+00	5.0E+02	-			6.0E+02	(NV: Use soil gas)	6.5E+00
BIS(2-CHLOROETHYL)ETHER	4.0E-03	5.0E+02	-			9.5E-02	4.0E-03	7.8E-01
BIS(2-CHLOROISOPROPYL)ETHER	6.6E-01	5.0E+02	-			2.9E+00	(NV: Use soil gas)	6.6E-01
BIS(2-ETHYLHEXYL)PHTHALATE	1.6E+02	5.0E+02	-			1.6E+02		5.3E+02
BORON	1.6E+00	no criteria	1.6E+00			2.4E+03		
BROMODICHLOROMETHANE	1.2E-02	1.0E+03	-			3.9E-01	1.2E-02	3.0E+00
BROMOFORM	6.1E+01	5.0E+02	-			6.1E+01		6.9E+01
BROMOMETHANE	2.2E-01	5.0E+02	-			7.6E-01	2.2E-01	6.4E+00
CADMIUM	1.7E+00	1.0E+03	1.2E+01			1.7E+00		
CARBON TETRACHLORIDE	1.2E-02	5.0E+02	-			9.0E-02	1.2E-02	2.1E+00
CHLORDANE	4.4E-01	1.0E+03	-			4.4E-01		1.5E+01
CHLOROANILINE, p-	5.3E-02	1.0E+03	-			4.9E+01		5.3E-02
CHLOROBENZENE	1.5E+00	5.0E+02	3.0E+01			3.0E+01	2.7E+00	1.5E+00
CHLOROETHANE	6.3E-01	5.0E+02	-			3.0E+00	6.3E-01	8.5E-01
CHLOROFORM	9.8E-02	5.0E+02	-			7.0E-01	9.8E-02	1.0E+01
CHLOROMETHANE	2.9E-01	1.0E+02	-			1.2E+00	2.9E-01	2.6E+01
CHLOROPHENOL, 2-	1.2E-01	1.0E+02	1.0E+01			1.3E+01	8.8E-01	1.2E-01
CHROMIUM (Total)	5.8E+01	1.0E+03		58	Background	5.8E+01		
CHROMIUM III	7.5E+02	1.0E+03	7.5E+02			2.3E+04		
CHROMIUM VI	1.8E+00	1.0E+03	8.0E+00			1.8E+00		
CHRYSENE	3.8E+00	1.0E+03	4.0E+01			3.8E+00		2.3E+01
COBALT	4.0E+01	1.0E+03	4.0E+01			9.4E+01		
COPPER	2.3E+02	1.0E+03	2.3E+02			6.3E+02		

TABLE B-1. [1]SHALLOW SOIL SCREENING LEVELS (<3m bgs)
[2]RESIDENTIAL LAND USE
(potentially impacted groundwater IS NOT a current or potential drinking water resource)

	[2]RESIDENTIAL LAND USE (mg/kg)							
				Human Health				Groundwater Protection (Soil Leaching)
				Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	NON-Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Ceiling Value (Odors, etc.) Table H-2	Urban Area Ecotoxicity Criteria	Value	Basis	Table K-1	Table E-1b	Table G
CYANIDE (Free)	1.0E+02	1.0E+02	-			2.4E+02		1.2E+04
DIBENZO(a,h)ANTHTRACENE	1.1E-01	5.0E+02	-			1.1E-01		1.4E+02
DIBROMOCHLOROMETHANE	1.9E-02	1.0E+02	-			9.8E-01	1.9E-02	1.5E+01
1,2-DIBROMO-3-CHLOROPROPANE	1.1E-03	5.0E+02	-			1.9E-02	(NV: Use soil gas)	1.1E-03
DIBROMOETHANE, 1,2-	7.3E-03	5.0E+02	-			1.0E-01	7.3E-03	1.1E+00
DICHLOROBENZENE, 1,2-	1.6E+00	3.7E+02	3.0E+01			2.2E+02	8.9E+00	1.6E+00
DICHLOROBENZENE, 1,3-	3.2E+00	1.0E+02	3.0E+01			3.2E+00	(NV: Use soil gas)	7.4E+00
DICHLOROBENZENE, 1,4-	4.7E-02	5.0E+02	3.0E+01			2.1E+00	4.7E-02	1.8E+00
DICHLOROBENZIDINE, 3,3-	4.0E-01	5.0E+02	-			4.0E-01		6.6E+01
DICHLORODIPHENYLDICHLOROETHANE (DDD)	2.4E+00	5.0E+02	-			2.4E+00		7.5E+02
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	1.7E+00	5.0E+02	4.0E+00			1.7E+00		1.1E+03
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	1.7E+00	1.0E+03	4.0E+00			1.7E+00		4.3E+00
DICHLOROETHANE, 1,1-	3.3E-01	5.0E+02	-			2.8E+00	3.3E-01	1.9E+00
DICHLOROETHANE, 1,2-	2.5E-02	5.0E+02	6.0E+01			3.5E-01	2.5E-02	1.8E+00
DICHLOROETHYLENE, 1,1-	4.3E+00	5.0E+02	-			2.4E+01	8.9E+00	4.3E+00
DICHLOROETHYLENE, Cis 1,2-	1.6E+00	1.0E+02	-			8.5E+00	1.6E+00	1.8E+01
DICHLOROETHYLENE, Trans 1,2-	3.1E+00	5.0E+02	-			1.4E+01	3.1E+00	3.9E+01
DICHLOROPHENOL, 2,4-	3.0E+00	5.0E+02	1.0E+01			3.7E+01		3.0E+00
DICHLOROPROPANE, 1,2-	5.2E-02	1.0E+02	-			6.4E-01	5.2E-02	2.5E+00
DICHLOROPROPENE, 1,3-	3.3E-02	5.0E+02	-			2.2E-01	3.3E-02	5.8E+00
DIELDRIN	2.3E-03	1.0E+03	4.0E+00			3.0E-02		2.3E-03
DIETHYLPHTHALATE	3.5E-02	5.0E+02	-			9.8E+03		3.5E-02
DIMETHYLPHTHALATE	3.5E-02	5.0E+02	-			1.2E+05		3.5E-02
DIMETHYLPHENOL, 2,4-	7.4E-01	1.0E+02	-			1.4E+02	1.4E+02	7.4E-01
DINITROPHENOL, 2,4-	2.1E-01	5.0E+02	-			2.4E+01		2.1E-01
DINITROTOLUENE, 2,4-	8.6E-01	5.0E+02	-			1.6E+00		8.6E-01
1,4 DIOXANE	1.8E+01	5.0E+02	-			1.8E+01		3.0E+01
DIOXIN (2,3,7,8-TCDD)	4.5E-06	no criteria	-			4.5E-06		
ENDOSULFAN	4.6E-03	5.0E+02	-			7.3E+01		4.6E-03
ENDRIN	6.5E-04	5.0E+02	6.0E-02			3.7E+00		6.5E-04
ETHYLBENZENE	4.7E+00	2.3E+02	-			8.7E+00	4.7E+00	3.2E+01
FLUORANTHENE	4.0E+01	5.0E+02	4.0E+01			4.6E+02		6.0E+01
FLUORENE	8.9E+00	5.0E+02	-			5.5E+02	1.6E+02	8.9E+00
HEPTACHLOR	1.4E-02	1.0E+03	-			1.2E-01		1.4E-02
HEPTACHLOR EPOXIDE	1.5E-02	1.0E+03	-			8.8E-02		1.5E-02
HEXACHLOROBENZENE	2.7E-01	5.0E+02	3.0E+01			2.7E-01		7.9E+02
HEXACHLOROBUTADIENE	3.7E+00	5.0E+02	-			3.7E+00		2.3E+01
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	4.9E-02	5.0E+02	2.0E+00			5.2E-01		4.9E-02

TABLE B-1. [1]SHALLOW SOIL SCREENING LEVELS (<3m bgs)
[2]RESIDENTIAL LAND USE
(potentially impacted groundwater IS NOT a current or potential drinking water resource)

	[4]RESIDENTIAL LAND USE (mg/kg)							
				Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Urban Area	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	NON-Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-2	Ecotoxicity Criteria	Value	Basis	Table K-1	Table E-1b	Table G
HEXACHLOROETHANE	1.2E+01	5.0E+02	-			1.2E+01		4.1E+01
INDENO(1,2,3-cd)PYRENE	3.8E-01	5.0E+02	4.0E+01			3.8E-01		7.7E+00
LEAD	2.0E+02	1.0E+03	2.0E+02			2.55E+02		
MERCURY	2.5E+00	5.0E+02	1.0E+01			2.5E+00		
METHOXYCHLOR	1.9E+01	5.0E+02	-			6.1E+01		1.9E+01
METHYLENE CHLORIDE	5.2E-01	5.0E+02	-			4.3E+00	5.2E-01	3.4E+01
METHYL ETHYL KETONE	1.3E+01	5.0E+02	-			1.5E+03	9.9E+02	1.3E+01
METHYL ISOBUTYL KETONE	3.9E+00	1.0E+02	-			1.6E+02	1.3E+02	3.9E+00
METHYL MERCURY	1.2E+00	1.0E+02	1.0E+01			1.2E+00		
METHYLNAPHTHALENE (total 1- & 2-)	2.5E-01	5.0E+02	-			2.9E+02	1.1E+02	2.5E-01
METHYL TERT BUTYL ETHER	2.0E+00	1.0E+02	-			3.1E+01	2.0E+00	8.4E+00
MOLYBDENUM	4.0E+01	1.0E+03	4.0E+01			7.8E+01		
NAPHTHALENE	4.5E+00	5.0E+02	4.0E+01			1.1E+01	4.5E+00	4.8E+00
NICKEL	1.5E+02	1.0E+03	1.5E+02			3.1E+02		
PENTACHLOROPHENOL	4.4E+00	5.0E+02	5.0E+00			4.4E+00		4.2E+01
PERCHLORATE	1.2E+00	1.0E+03	-			1.6E+00		1.2E+00
PHENANTHRENE	1.1E+01	5.0E+02	4.0E+01	5.5E+02	Fluorene	5.5E+02	(NV: Use soil gas)	1.1E+01
PHENOL	1.9E+01	5.0E+02	4.0E+01			7.3E+03		1.9E+01
POLYCHLORINATED BIPHENYLS (PCBs)	2.2E-01	5.0E+02	-			2.2E-01		6.3E+00
PYRENE	8.5E+01	5.0E+02	-			4.6E+02	8.5E+01	8.5E+01
SELENIUM	1.0E+01	1.0E+03	1.0E+01			7.8E+01		
SILVER	2.0E+01	1.0E+03	2.0E+01			7.8E+01		
STYRENE	1.5E+01	5.0E+02	-			8.7E+02	4.5E+02	1.5E+01
tert-BUTYL ALCOHOL	1.0E+02	1.0E+02	-			2.1E+02	(NV: Use soil gas)	1.1E+02
TETRACHLOROETHANE, 1,1,1,2-	3.1E+00	1.0E+02	-			3.1E+00	(NV: Use soil gas)	1.6E+01
TETRACHLOROETHANE, 1,1,2,2-	9.0E-03	5.0E+02	-			3.9E-01	9.0E-03	3.4E+00
TETRACHLOROETHYLENE	8.8E-02	3.7E+02	-			4.8E-01	8.8E-02	1.7E+01
THALLIUM	1.0E+00	1.0E+03	-			1.0E+00		
TOLUENE	9.3E+00	5.0E+02	-			1.3E+02	1.8E+02	9.3E+00
TOXAPHENE	4.2E-04	5.0E+02	-			4.0E-01		4.2E-04
TPH (gasolines)	1.0E+02	1.0E+02	-	5.0E+02	pyrene	5.0E+02	(NV: Use soil gas)	4.0E+02
TPH (middle distillates)	5.0E+02	5.0E+02	-	5.0E+02	pyrene	5.0E+02	(NV: Use soil gas)	5.0E+02
TPH (residual fuels)	5.0E+02	5.0E+02	-	5.0E+02	pyrene	5.0E+02		1.0E+03
TRICHLOROBENZENE, 1,2,4-	7.6E+00	5.0E+02	3.0E+01			1.3E+02	2.3E+01	7.6E+00
TRICHLOROETHANE, 1,1,1-	7.8E+00	5.0E+02	-			4.3E+01	9.8E+01	7.8E+00
TRICHLOROETHANE, 1,1,2-	3.3E-02	1.0E+02	-			7.0E-01	3.3E-02	4.9E+00
TRICHLOROETHYLENE	2.6E-01	5.0E+02	6.0E+01			2.9E+00	2.6E-01	3.3E+01
TRICHLOROPHENOL, 2,4,5-	1.8E-01	1.0E+02	1.0E+01			5.0E+02	2.4E+01	1.8E-01

TABLE B-1. [1]SHALLOW SOIL SCREENING LEVELS (<3m bgs)
[2]RESIDENTIAL LAND USE
(potentially impacted groundwater IS NOT a current or potential drinking water resource)

	[4]RESIDENTIAL LAND USE (mg/kg)							
				Human Health				Groundwater Protection (Soil Leaching)
				Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	NON-Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Ceiling Value (Odors, etc.) Table H-2	Urban Area Ecotoxicity Criteria	Value	Basis	Table K-1	Table E-1b	Table G
TRICHLOROPHENOL, 2,4,6-	6.9E+00	5.0E+02	1.0E+01			6.9E+00		1.6E+02
VANADIUM	1.1E+02	1.0E+03	2.0E+02			1.1E+02		
VINYL CHLORIDE	6.7E-03	5.0E+02	6.0E+01			2.5E-02	6.7E-03	6.8E-01
XYLENES	1.5E+00	2.1E+02	-		m-xylene RfDs	5.4E+01	4.5E+01	1.5E+00
ZINC	6.0E+02	1.0E+03	6.0E+02			4.7E+03		
Electrical Conductivity (mS/cm, USEPA Method 120.1 MOD)	2.0	-	-			-	-	-
Sodium Adsorption Ratio	5.0	-	-			-	-	-

Notes:

1. Shallow soils defined as soils situated <3 meters below ground surface.

2. Sensitive land use based on residential land-use and exposure scenarios (see Chapter 1).

Final Environmental Screening Level is lowest of ceiling value (nuisance concerns etc.), ecotoxicity, direct-exposure, indoor-air impact, and leaching screening levels.

Assumes soil pH 5.0 to 9.0.

Soil data should be reported on dry-weight basis (see Section 6.2).

TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.

Background As and total Cr based on mean soil values presented in LBNL 2002 (refer to Section 3.2.4 and Volume 1, Figure 4).

TABLE B-2. [1]SHALLOW SOIL SCREENING LEVELS (<3m bgs)
COMMERCIAL / INDUSTRIAL LAND USE
(potentially impacted groundwater IS NOT a current or potential drinking water resource)

	COMMERCIAL / INDUSTRIAL LAND USE (mg/kg)							
				Human Health				Groundwater Protection (Soil Leaching)
				Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	NON-Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Ceiling Value (Odors, etc.) Table H-2	Urban Area Ecotoxicity Criteria	Value	Basis	Table K-2	Table E-1b	Table G
ACENAPHTHENE	1.9E+01	2.5E+03	-			5.8E+03	1.3E+02	1.9E+01
ACENAPHTHYLENE	1.3E+01	1.0E+03	-	5.2E+03	Fluorene	5.2E+03	(NV: Use soil gas)	1.3E+01
ACETONE	5.0E-01	1.0E+03	-			1.2E+03	3.6E+02	5.0E-01
ALDRIN	1.0E-01	2.5E+03	3.5E-01			1.0E-01		5.0E+00
ANTHRACENE	2.8E+00	1.0E+03	4.0E+01			4.8E+04	6.1E+00	2.8E+00
ANTIMONY	4.0E+01	2.5E+03	4.0E+01			8.2E+01		
ARSENIC	5.5E+00	2.5E+03	4.0E+01	5.5E+00	Background	5.5E+00		
BARIUM	1.5E+03	2.5E+03	1.5E+03			2.5E+03		
BENZENE	3.8E-01	1.0E+03	2.5E+01			3.8E-01	5.0E-01	2.0E+00
BENZO(a)ANTHRACENE	1.3E+00	1.0E+03	4.0E+01			1.3E+00		1.2E+01
BENZO(b)FLUORANTHENE	1.3E+00	1.0E+03	-			1.3E+00		4.6E+01
BENZO(k)FLUORANTHENE	1.3E+00	1.0E+03	4.0E+01			1.3E+00		3.7E+01
BENZO(g,h,i)PERYLENE	2.7E+01	1.0E+03	4.0E+01			4.4E+03		2.7E+01
BENZO(e)PYRENE	1.3E-01	1.0E+03	4.0E+01			1.3E-01		1.3E+02
BERYLLIUM	8.0E+00	2.5E+03	8.0E+00			9.8E+01		
BIPHENYL, 1,1-	6.5E+00	1.0E+03	-			4.6E+03	(NV: Use soil gas)	6.5E+00
BIS(2-CHLOROETHYL)ETHER	1.3E-02	1.0E+03	-			2.5E-01	1.3E-02	7.8E-01
BIS(2-CHLOROISOPROPYL)ETHER	6.6E-01	7.9E+02	-			7.3E+00	(NV: Use soil gas)	6.6E-01
BIS(2-ETHYLHEXYL)PHTHALATE	5.3E+02	1.0E+03	-			5.7E+02		5.3E+02
BORON	2.0E+00	no critiera	2.0E+00			2.5E+04		
BROMODICHLOROMETHANE	3.9E-02	2.5E+03	-			8.6E-01	3.9E-02	3.0E+00
BROMOFORM	6.9E+01	1.0E+03	-			2.2E+02		6.9E+01
BROMOMETHANE	5.1E-01	1.0E+03	-			2.5E+00	5.1E-01	6.4E+00
CADMIUM	7.4E+00	2.5E+03	1.2E+01			7.4E+00		
CARBON TETRACHLORIDE	3.5E-02	9.8E+02	-			1.9E-01	3.5E-02	2.1E+00
CHLORDANE	1.7E+00	2.5E+03	-			1.7E+00		1.5E+01
CHLOROANILINE, p-	5.3E-02	2.5E+03	-			4.9E+02		5.3E-02
CHLOROBENZENE	1.5E+00	6.8E+02	3.0E+01			1.0E+02	6.2E+00	1.5E+00
CHLOROETHANE	8.5E-01	1.0E+03	-			6.4E+00	1.8E+00	8.5E-01
CHLOROFORM	2.7E-01	1.0E+03	-			1.9E+00	2.7E-01	1.0E+01
CHLOROMETHANE	8.1E-01	5.0E+02	-			2.6E+00	8.1E-01	2.6E+01
CHLOROPHENOL, 2-	1.2E-01	5.0E+02	1.0E+01			4.7E+01	2.4E+00	1.2E-01
CHROMIUM (Total)	5.8E+01	2.5E+03		58	Background	5.8E+01		
CHROMIUM III	7.5E+02	2.5E+03	7.5E+02			3.1E+05		
CHROMIUM VI	1.8E+00	2.5E+03	8.0E+00			1.8E+00		
CHRYSENE	1.3E+01	2.5E+03	4.0E+01			1.3E+01		2.3E+01

TABLE B-2. [1]SHALLOW SOIL SCREENING LEVELS (<3m bgs)
COMMERCIAL / INDUSTRIAL LAND USE
(potentially impacted groundwater IS NOT a current or potential drinking water resource)

	COMMERCIAL / INDUSTRIAL LAND USE (mg/kg)							
				Human Health				Groundwater Protection (Soil Leaching)
				Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	NON-Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Ceiling Value (Odors, etc.) Table H-2	Urban Area Ecotoxicity Criteria	Value	Basis	Table K-2	Table E-1b	Table G
COBALT	8.0E+01	2.5E+03	8.0E+01			9.4E+01		
COPPER	2.3E+02	2.5E+03	2.3E+02			8.2E+03		
CYANIDE (Free)	5.0E+02	5.0E+02	-			2.5E+03		1.2E+04
DIBENZO(a,h)ANTHTRACENE	3.8E-01	1.0E+03	-			3.8E-01		1.4E+02
DIBROMOCHLOROMETHANE	5.8E-02	5.0E+02	-			2.3E+00	5.8E-02	1.5E+01
1,2-DIBROMO-3-CHLOROPROPANE	1.1E-03	1.0E+03	-			4.5E-02	(NV: Use soil gas)	1.1E-03
DIBROMOETHANE, 1,2-	2.1E-02	1.0E+03	-			3.1E-01	2.1E-02	1.1E+00
DICHLOROBENZENE, 1,2-	1.6E+00	3.7E+02	3.0E+01			6.0E+02	2.1E+01	1.6E+00
DICHLOROBENZENE, 1,3-	7.4E+00	3.8E+02	3.0E+01			1.2E+01	(NV: Use soil gas)	7.4E+00
DICHLOROBENZENE, 1,4-	1.3E-01	1.0E+03	3.0E+01			4.5E+00	1.3E-01	1.8E+00
DICHLOROBENZIDINE, 3,3-	1.4E+00	1.0E+03	-			1.4E+00		6.6E+01
DICHLORODIPHENYLDICHLOROETHANE (DDD)	1.0E+01	1.0E+03	-			1.0E+01		7.5E+02
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	4.0E+00	1.0E+03	4.0E+00			7.0E+00		1.1E+03
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	4.0E+00	2.5E+03	4.0E+00			7.0E+00		4.3E+00
DICHLOROETHANE, 1,1-	9.1E-01	1.0E+03	-			5.9E+00	9.1E-01	1.9E+00
DICHLOROETHANE, 1,2-	6.9E-02	1.0E+03	6.0E+01			7.6E-01	6.9E-02	1.8E+00
DICHLOROETHYLENE, 1,1-	4.3E+00	1.0E+03	-			8.2E+01	2.1E+01	4.3E+00
DICHLOROETHYLENE, Cis 1,2-	3.6E+00	5.0E+02	-			2.9E+01	3.6E+00	1.8E+01
DICHLOROETHYLENE, Trans 1,2-	7.3E+00	1.0E+03	-			4.6E+01	7.3E+00	3.9E+01
DICHLOROPHENOL, 2,4-	3.0E+00	1.0E+03	1.0E+01			3.7E+02		3.0E+00
DICHLOROPROPANE, 1,2-	1.5E-01	5.0E+02	-			1.4E+00	1.5E-01	2.5E+00
DICHLOROPROPENE, 1,3-	9.1E-02	1.0E+03	-			4.7E-01	9.1E-02	5.8E+00
DIELDRIN	2.3E-03	2.5E+03	4.0E+00			1.1E-01		2.3E-03
DIETHYLPHTHALATE	3.5E-02	1.0E+03	-			9.8E+04		3.5E-02
DIMETHYLPHTHALATE	3.5E-02	1.0E+03	-			1.2E+06		3.5E-02
DIMETHYLPHENOL, 2,4-	7.4E-01	5.0E+02	-			7.1E+02	3.7E+02	7.4E-01
DINITROPHENOL, 2,4-	2.1E-01	1.0E+03	-			2.5E+02		2.1E-01
DINITROTOLUENE, 2,4-	8.6E-01	1.0E+03	-			5.6E+00		8.6E-01
1,4 DIOXANE	3.0E+01	1.0E+03	-			6.4E+01		3.0E+01
DIOXIN (2,3,7,8-TCDD)	1.8E-05	no criteria	-			1.8E-05		
ENDOSULFAN	4.6E-03	1.0E+03	-			7.4E+02		4.6E-03
ENDRIN	6.5E-04	1.0E+03	6.0E-02			3.7E+01		6.5E-04
ETHYLBENZENE	1.3E+01	2.3E+02	-			1.9E+01	1.3E+01	3.2E+01
FLUORANTHENE	4.0E+01	1.0E+03	4.0E+01			4.4E+03		6.0E+01
FLUORENE	8.9E+00	1.0E+03	-			5.2E+03	1.6E+02	8.9E+00
HEPTACHLOR	1.4E-02	2.5E+03	-			4.2E-01		1.4E-02

TABLE B-2. [1]SHALLOW SOIL SCREENING LEVELS (<3m bgs)
COMMERCIAL / INDUSTRIAL LAND USE
(potentially impacted groundwater IS NOT a current or potential drinking water resource)

	COMMERCIAL / INDUSTRIAL LAND USE (mg/kg)							
				Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)		Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	NON-Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-2	Urban Area Ecotoxicity Criteria	Value	Basis	Table K-2	Table E-1b	Table G
HEPTACHLOR EPOXIDE	1.5E-02	2.5E+03	-			3.1E-01		1.5E-02
HEXACHLOROBENZENE	9.6E-01	1.0E+03	3.0E+01			9.6E-01		7.9E+02
HEXACHLOROBUTADIENE	2.2E+01	1.0E+03	-			2.2E+01		2.3E+01
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	4.9E-02	1.0E+03	2.0E+00			2.1E+00		4.9E-02
HEXACHLOROETHANE	4.1E+01	1.0E+03	-			4.4E+01		4.1E+01
INDENO(1,2,3-cd)PYRENE	1.3E+00	1.0E+03	4.0E+01			1.3E+00		7.7E+00
LEAD	7.5E+02	2.5E+03	-			7.5E+02		
MERCURY	1.0E+01	1.0E+03	1.0E+01			3.3E+01		
METHOXYCHLOR	1.9E+01	1.0E+03	-			6.2E+02		1.9E+01
METHYLENE CHLORIDE	1.5E+00	1.0E+03	-			9.5E+00	1.5E+00	3.4E+01
METHYL ETHYL KETONE	1.3E+01	1.0E+03	-			5.4E+03	2.7E+03	1.3E+01
METHYL ISOBUTYL KETONE	3.9E+00	5.0E+02	-			5.6E+02	3.5E+02	3.9E+00
METHYL MERCURY	1.0E+01	5.0E+02	1.0E+01			1.2E+01		
METHYLNAPHTHALENE (total 1- & 2-)	2.5E-01	1.0E+03	-			1.4E+03	1.1E+02	2.5E-01
METHYL TERT BUTYL ETHER	5.6E+00	5.0E+02	-			7.0E+01	5.6E+00	8.4E+00
MOLYBDENUM	4.0E+01	2.5E+03	4.0E+01			1.0E+03		
NAPHTHALENE	4.8E+00	1.0E+03	4.0E+01			3.7E+01	1.2E+01	4.8E+00
NICKEL	1.5E+02	2.5E+03	1.5E+02			1.0E+03		
PENTACHLOROPHENOL	5.0E+00	1.0E+03	5.0E+00			1.3E+01		4.2E+01
PERCHLORATE	1.2E+00	2.5E+03	-			2.0E+01		1.2E+00
PHENANTHRENE	1.1E+01	1.0E+03	4.0E+01	5.2E+03	Fluorene	5.2E+03	(NV: Use soil gas)	1.1E+01
PHENOL	1.9E+01	1.0E+03	4.0E+01			7.4E+04		1.9E+01
POLYCHLORINATED BIPHENYLS (PCBs)	7.4E-01	1.0E+03	-			7.4E-01		6.3E+00
PYRENE	8.5E+01	1.0E+03	-			5.8E+03	8.5E+01	8.5E+01
SELENIUM	1.0E+01	2.5E+03	1.0E+01			1.0E+03		
SILVER	4.0E+01	2.5E+03	4.0E+01			1.0E+03		
STYRENE	1.5E+01	1.0E+03	-			1.5E+03	1.0E+03	1.5E+01
tert-BUTYL ALCOHOL	1.1E+02	5.0E+02	-			9.5E+02	(NV: Use soil gas)	1.1E+02
TETRACHLOROETHANE, 1,1,1,2-	7.2E+00	5.0E+02	-			7.2E+00	(NV: Use soil gas)	1.6E+01
TETRACHLOROETHANE, 1,1,2,2-	2.5E-02	1.0E+03	-			9.1E-01	2.5E-02	3.4E+00
TETRACHLOROETHYLENE	2.5E-01	3.7E+02	-			1.3E+00	2.5E-01	1.7E+01
THALLIUM	1.3E+01	2.5E+03	-			1.3E+01		
TOLUENE	9.3E+00	5.2E+02	-			4.4E+02	4.2E+02	9.3E+00
TOXAPHENE	4.2E-04	1.0E+03	-			1.4E+00		4.2E-04
TPH (gasolines)	4.0E+02	5.0E+02	-	5.8E+03	pyrene	5.8E+03	(NV: Use soil gas)	4.0E+02
TPH (middle distillates)	5.0E+02	1.0E+03	-	5.8E+03	pyrene	5.8E+03	(NV: Use soil gas)	5.0E+02

TABLE B-2. [1]SHALLOW SOIL SCREENING LEVELS (<3m bgs)
COMMERCIAL / INDUSTRIAL LAND USE
(potentially impacted groundwater IS NOT a current or potential drinking water resource)

	COMMERCIAL / INDUSTRIAL LAND USE (mg/kg)							
				Human Health				Groundwater Protection (Soil Leaching)
				Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	NON-Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Ceiling Value (Odors, etc.) Table H-2	Urban Area Ecotoxicity Criteria	Value	Basis	Table K-2	Table E-1b	Table G
TPH (residual fuels)	1.0E+03	2.5E+03	-	5.8E+03	pyrene	5.8E+03		1.0E+03
TRICHLOROBENZENE, 1,2,4-	7.6E+00	1.0E+03	3.0E+01			7.9E+02	6.1E+01	7.6E+00
TRICHLOROETHANE, 1,1,1-	7.8E+00	1.0E+03	-			1.4E+02	2.3E+02	7.8E+00
TRICHLOROETHANE, 1,1,2-	9.1E-02	5.0E+02	-			1.5E+00	9.1E-02	4.9E+00
TRICHLOROETHYLENE	7.3E-01	8.2E+02	6.0E+01			6.4E+00	7.3E-01	3.3E+01
TRICHLOROPHENOL, 2,4,5-	1.8E-01	5.0E+02	1.0E+01			2.2E+03	6.3E+01	1.8E-01
TRICHLOROPHENOL, 2,4,6-	1.0E+01	1.0E+03	1.0E+01			2.5E+01		1.6E+02
VANADIUM	2.0E+02	2.5E+03	2.0E+02			1.4E+03		
VINYL CHLORIDE	1.9E-02	1.0E+03	6.0E+01			5.4E-02	1.9E-02	6.8E-01
XYLENES	1.5E+00	2.1E+02	-			1.8E+02	1.0E+02	1.5E+00
ZINC	6.0E+02	2.5E+03	6.0E+02			6.1E+04		
Electrical Conductivity (mS/cm, USEPA Method 120.1 MOD)	4.0	-	-			-	-	-
Sodium Adsorption Ratio	12	-	-			-	-	-

Notes:

1. Shallow soils defined as soils situated <3 meters below ground surface.

Final Environmental Screening Level is lowest of ceiling value (nuisance concerns etc.), ecotoxicity, direct-exposure, indoor-air impact, and leaching screening levels.

Assumes soil pH 5.0 to 9.0.

Soil data should be reported on dry-weight basis (see Section 6.2).

TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.

Background As and total Cr based on mean soil values presented in LBNL 2002 (refer to Section 3.2.4 and Volume 1, Figure 4).

TABLE C-1. [1]DEEP SOIL SCREENING LEVELS (>3m bgs)
[2]RESIDENTIAL LAND USE
(potentially impacted groundwater IS a current or potential drinking water resource)

CHEMICAL PARAMETER	[2]RESIDENTIAL LAND USE (mg/kg)							
			Human Health					Groundwater Protection (Soil Leaching)
			Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts		
	Final ESL	Ceiling Value (Odors, etc.)	Value	Basis	Table K-3	Table E-1b		Drinking Water Resource
		Table H-3						Table G
ACENAPHTHENE	1.6E+01	2.5E+03			3.5E+04	1.3E+02		1.6E+01
ACENAPHTHYLENE	1.3E+01	1.0E+03	2.6E+04	Fluorene	2.6E+04	(NV: Use soil gas)		1.3E+01
ACETONE	2.4E-01	1.0E+03			1.3E+04	1.6E+02		2.4E-01
ALDRIN	1.2E+00	2.5E+03			1.2E+00			5.0E+00
ANTHRACENE	2.6E+00	1.0E+03			2.1E+05	6.1E+00		2.8E+00
ANTIMONY	3.1E+02	2.5E+03			3.1E+02			
ARSENIC	1.6E+01	2.5E+03			1.6E+01			
BARIUM	2.5E+03	2.5E+03			2.5E+03			
BENZENE	4.4E-02	1.0E+03			1.7E+01	1.8E-01		4.4E-02
BENZO(a)ANTHRACENE	1.2E+01	1.0E+03			1.5E+01			1.2E+01
BENZO(b)FLUORANTHENE	1.5E+01	1.0E+03			1.5E+01			4.6E+01
BENZO(k)FLUORANTHENE	2.7E+00	1.0E+03			1.5E+01			2.7E+00
BENZO(g,h,i)PERYLENE	2.7E+01	1.0E+03			1.4E+04			2.7E+01
BENZO(a)PYRENE	1.5E+00	1.0E+03			1.5E+00			1.3E+02
BERYLLIUM	9.8E+01	1.0E+03			9.8E+01			
BIPHENYL, 1,1-	6.5E-01	2.5E+03			2.8E+04	(NV: Use soil gas)		6.5E-01
BIS(2-CHLOROETHYL)ETHER	1.8E-04	1.0E+03			7.4E+00	4.0E-03		1.8E-04
BIS(2-CHLOROISOPROPYL)ETHER	5.4E-03	1.0E+03			2.3E+02	(NV: Use soil gas)		5.4E-03
BIS(2-ETHYLHEXYL)PHTHALATE	6.6E+01	7.9E+02			6.4E+03			6.6E+01
BORON	4.6E+04	1.0E+03			4.6E+04			
BROMODICHLOROMETHANE	1.2E-02	no criteria			3.5E+01	1.2E-02		1.9E+00
BROMOFORM	2.2E+00	2.5E+03			2.6E+03			2.2E+00
BROMOMETHANE	2.2E-01	1.0E+03			3.1E+01	2.2E-01		3.9E-01
CADMIUM	3.8E+01	1.0E+03			3.8E+01			
CARBON TETRACHLORIDE	1.2E-02	2.5E+03			8.4E+00	1.2E-02		1.1E-01
CHLORDANE	1.5E+01	9.8E+02			2.1E+01			1.5E+01
CHLOROANILINE, p-	5.3E-02	2.5E+03			1.6E+03			5.3E-02
CHLOROBENZENE	1.5E+00	2.5E+03			6.8E+02	2.7E+00		1.5E+00
CHLOROETHANE	6.3E-01	6.8E+02			2.8E+02	6.3E-01		8.5E-01
CHLOROFORM	9.8E-02	1.0E+03			2.9E+01	9.8E-02		2.9E+00
CHLOROMETHANE	2.9E-01	1.0E+03			1.1E+02	2.9E-01		4.2E-01
CHLOROPHENOL, 2-	1.2E-02	5.0E+02			5.3E+02	8.8E-01		1.2E-02
CHROMIUM (Total)	5.8E+01	5.0E+02			5.8E+01			
CHROMIUM III	2.5E+03	2.5E+03	58	Background	1.2E+06			
CHROMIUM VI	1.8E+00	2.5E+03			1.8E+00			
CHRYSENE	1.9E+01	2.5E+03			1.5E+02			
COBALT	9.4E+01	2.5E+03			9.4E+01			1.9E+01
COPPER	2.5E+03	2.5E+03			3.1E+04			

TABLE C-1. [1]DEEP SOIL SCREENING LEVELS (>3m bgs)
[2]RESIDENTIAL LAND USE
(potentially impacted groundwater IS a current or potential drinking water resource)

	[2]RESIDENTIAL LAND USE (mg/kg)						
			Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-3	Value	Basis	Table K-3	Table E-1b	Table G
CYANIDE (Free)	5.0E+02	5.0E+02			8.2E+03		1.2E+04
DIBENZO(a,h)ANTHTRACENE	4.3E+00	1.0E+03			4.3E+00		9.9E+00
DIBROMOCHLOROMETHANE	1.9E-02	5.0E+02			8.6E+01	1.9E-02	8.3E+00
1,2-DIBROMO-3-CHLOROPROPANE	1.1E-03	1.0E+03			1.6E+00	(NV: Use soil gas)	1.1E-03
DIBROMOETHANE, 1,2-	3.3E-04	1.0E+03			5.8E+00	7.3E-03	3.3E-04
DICHLOROBENZENE, 1,2-	1.1E+00	3.7E+02			6.0E+02	8.9E+00	1.1E+00
DICHLOROBENZENE, 1,3-	7.2E-01	3.8E+02			1.3E+02	(NV: Use soil gas)	7.2E-01
DICHLOROBENZENE, 1,4-	4.7E-02	1.0E+03			2.0E+02	4.7E-02	5.9E-01
DICHLOROBENZIDINE, 3,3-	7.7E-03	1.0E+03			1.7E+01		7.7E-03
DICHLORODIPHENYLDICHLOROETHANE (DDD)	1.2E+02	1.0E+03			1.2E+02		7.5E+02
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	8.7E+01	1.0E+03			8.7E+01		1.1E+03
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	4.3E+00	2.5E+03			8.7E+01		4.3E+00
DICHLOROETHANE, 1,1-	2.0E-01	1.0E+03			2.6E+02	3.3E-01	2.0E-01
DICHLOROETHANE, 1,2-	4.5E-03	1.0E+03			3.3E+01	2.5E-02	4.5E-03
DICHLOROETHYLENE, 1,1-	1.0E+00	1.0E+03			1.0E+03	8.9E+00	1.0E+00
DICHLOROETHYLENE, Cis 1,2-	1.9E-01	5.0E+02			3.5E+02	1.6E+00	1.9E-01
DICHLOROETHYLENE, Trans 1,2-	6.7E-01	1.0E+03			5.7E+02	3.1E+00	6.7E-01
DICHLOROPHENOL, 2,4-	3.0E-01	1.0E+03			1.2E+03		3.0E-01
DICHLOROPROPANE, 1,2-	5.2E-02	5.0E+02			4.7E+01	5.2E-02	1.2E-01
DICHLOROPROPENE, 1,3-	3.3E-02	1.0E+03			2.0E+01	3.3E-02	5.9E-02
DIELDRIN	2.3E-03	2.5E+03			1.2E+00		2.3E-03
DIETHYLPHTHALATE	3.5E-02	1.0E+03			3.2E+05		3.5E-02
DIMETHYLPHTHALATE	3.5E-02	1.0E+03			4.0E+06		3.5E-02
DIMETHYLPHENOL, 2,4-	6.7E-01	5.0E+02			4.9E+03	1.4E+02	6.7E-01
DINITROPHENOL, 2,4-	4.0E-02	1.0E+03			8.0E+02		4.0E-02
DINITROTOLUENE, 2,4-	8.5E-04	1.0E+03			6.4E+01		8.5E-04
1,4 DIOXANE	1.8E-03	1.0E+03			7.4E+02		1.8E-03
DIOXIN (2,3,7,8-TCDD)	2.3E-04	no criteria			2.3E-04		
ENDOSULFAN	4.6E-03	1.0E+03			2.4E+03		4.6E-03
ENDRIN	6.5E-04	1.0E+03			1.2E+02		6.5E-04
ETHYLBENZENE	3.3E+00	2.3E+02			4.0E+02	4.7E+00	3.3E+00
FLUORANTHENE	6.0E+01	1.0E+03			1.4E+04		6.0E+01
FLUORENE	8.9E+00	1.0E+03			2.6E+04	1.6E+02	8.9E+00
HEPTACHLOR	1.4E-02	2.5E+03			4.9E+00		1.4E-02
HEPTACHLOR EPOXIDE	1.5E-02	2.5E+03			3.6E+00		1.5E-02
HEXACHLOROBENZENE	1.1E+01	1.0E+03			1.1E+01		7.9E+02
HEXACHLOROBUTADIENE	1.0E+00	1.0E+03			1.2E+02		1.0E+00
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	4.9E-02	1.0E+03			2.5E+01		4.9E-02

TABLE C-1. [1]DEEP SOIL SCREENING LEVELS (>3m bgs)
[2]RESIDENTIAL LAND USE
(potentially impacted groundwater IS a current or potential drinking water resource)

	[2]RESIDENTIAL LAND USE (mg/kg)						
			Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-3	Value	Basis	Table K-3	Table E-1b	Table G
HEXACHLOROETHANE	2.4E+00	1.0E+03			4.0E+02		2.4E+00
INDENO(1,2,3-cd)PYRENE	7.7E+00	1.0E+03			1.5E+01		7.7E+00
LEAD	7.5E+02	2.5E+03	7.5E+02	occupational	7.5E+02		
MERCURY	1.1E+02	1.0E+03			1.1E+02		
METHOXYCHLOR	1.9E+01	1.0E+03			2.0E+03		1.9E+01
METHYLENE CHLORIDE	7.7E-02	1.0E+03			3.8E+02	5.2E-01	7.7E-02
METHYL ETHYL KETONE	3.9E+00	1.0E+03			3.4E+04	9.9E+02	3.9E+00
METHYL ISOBUTYL KETONE	2.8E+00	5.0E+02			6.5E+03	1.3E+02	2.8E+00
METHYL MERCURY	4.1E+01	5.0E+02			4.1E+01		
METHYLNAPHTHALENE (total 1- & 2-)	2.5E-01	1.0E+03	1.3E+04	Fluorene	1.3E+04	1.1E+02	2.5E-01
METHYL TERT BUTYL ETHER	2.3E-02	5.0E+02			2.8E+03	2.0E+00	2.3E-02
MOLYBDENUM	2.5E+03	2.5E+03			3.9E+03		
NAPHTHALENE	4.2E+00	1.0E+03			4.6E+02	4.5E+00	4.2E+00
NICKEL	1.0E+03	2.5E+03			1.0E+03		
PENTACHLOROPHENOL	5.3E+00	1.0E+03			1.5E+02		5.3E+00
PERCHLORATE	7.0E-03	2.5E+03			7.7E+01		7.0E-03
PHENANTHRENE	1.1E+01	1.0E+03	2.6E+04	Fluorene	2.6E+04	(NV: Use soil gas)	1.1E+01
PHENOL	7.6E-02	1.0E+03			2.4E+05		7.6E-02
POLYCHLORINATED BIPHENYLS (PCBs)	6.3E+00	1.0E+03			6.7E+00		6.3E+00
PYRENE	8.5E+01	1.0E+03			2.3E+04	8.5E+01	8.5E+01
SELENIUM	2.5E+03	2.5E+03			3.9E+03		
SILVER	2.5E+03	2.5E+03			3.9E+03		
STYRENE	1.5E+00	1.0E+03			1.5E+03	4.5E+02	1.5E+00
tert-BUTYL ALCOHOL	7.3E-02	5.0E+02			1.3E+04	(NV: Use soil gas)	7.3E-02
TETRACHLOROETHANE, 1,1,1,2-	2.4E-02	5.0E+02			2.8E+02	(NV: Use soil gas)	2.4E-02
TETRACHLOROETHANE, 1,1,2,2-	9.0E-03	1.0E+03			3.4E+01	9.0E-03	1.8E-02
TETRACHLOROETHYLENE	8.8E-02	3.7E+02			3.7E+01	8.8E-02	7.0E-01
THALLIUM	5.1E+01	2.5E+03			5.1E+01		
TOLUENE	2.9E+00	5.2E+02			6.5E+02	1.8E+02	2.9E+00
TOXAPHENE	4.2E-04	1.0E+03			1.7E+01		4.2E-04
TPH (gasolines)	1.0E+02	5.0E+03	2.3E+04	pyrene	2.3E+04	(NV: Use soil gas)	1.0E+02
TPH (middle distillates)	1.0E+02	5.0E+03	2.3E+04	pyrene	2.3E+04	(NV: Use soil gas)	1.0E+02
TPH (residual fuels)	1.0E+03	5.0E+03	2.3E+04	pyrene	2.3E+04		1.0E+03
TRICHLOROBENZENE, 1,2,4-	7.6E+00	1.0E+03			6.2E+03	2.3E+01	7.6E+00
TRICHLOROETHANE, 1,1,1-	7.8E+00	1.0E+03			1.2E+03	9.8E+01	7.8E+00
TRICHLOROETHANE, 1,1,2-	3.3E-02	5.0E+02			6.3E+01	3.3E-02	7.0E-02
TRICHLOROETHYLENE	2.6E-01	8.2E+02			1.5E+02	2.6E-01	4.6E-01
TRICHLOROPHENOL, 2,4,5-	1.8E-01	5.0E+02			1.9E+04	2.4E+01	1.8E-01

TABLE C-1. [1]DEEP SOIL SCREENING LEVELS (>3m bgs)
[2]RESIDENTIAL LAND USE
(potentially impacted groundwater IS a current or potential drinking water resource)

	[4]RESIDENTIAL LAND USE (mg/kg)						
			Human Health				Groundwater Protection (Soil Leaching)
CHEMICAL PARAMETER	Final ESL	Ceiling Value (Odors, etc.)	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	Drinking Water Resource
		Table H-3	Value	Basis	Table K-3	Table E-1b	Table G
TRICHLOROPHENOL, 2,4,6-	1.7E-01	1.0E+03			2.9E+02		1.7E-01
VANADIUM	2.5E+03	2.5E+03			5.4E+03		
VINYL CHLORIDE	6.7E-03	1.0E+03			2.4E+00	6.7E-03	8.5E-02
XYLENES	1.5E+00	2.1E+02		m-xylene RfDs	4.2E+02	4.5E+01	1.5E+00
ZINC	2.5E+03	2.5E+03			2.3E+05		
Electrical Conductivity (mS/cm, USEPA Method 120.1 MOD)	not applicable	-			-	-	-
Sodium Adsorption Ratio	not applicable	-			-	-	-

Notes:

1. Deep soils defined as soils situated >3 meters below ground surface (or shallower with institutional controls).

2. "Residential Land Use" screening levels generally considered adequate for other sensitive uses (e.g., day-care centers, hospitals, etc.).

Final Environmental Screening Level is lowest of ceiling values (nuisance concerns etc.), direct-exposure, indoor-air impact, and leaching screening levels.

Assumes soil pH 5.0 to 11.

Soil data should be reported on dry-weight basis (see Section 6.2).

TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.

Background total Cr based on mean soil values presented in LBNL 2002 (refer to Section 3.2.4 and Volume 1, Figure 4).

TABLE C-2. [1]DEEP SOIL SCREENING LEVELS (>3m bgs)
COMMERCIAL / INDUSTRIAL LAND USE
(potentially impacted groundwater IS a current or potential drinking water resource)

	COMMERCIAL / INDUSTRIAL LAND USE (mg/kg)						
			Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-3	Value	Basis	Table K-3	Table E-1b	Table G
ACENAPHTHENE	1.6E+01	5.0E+03			3.5E+04	1.3E+02	1.6E+01
ACENAPHTHYLENE	1.3E+01	2.5E+03	2.6E+04	Fluorene	2.6E+04	(NV: Use soil gas)	1.3E+01
ACETONE	2.4E-01	2.5E+03			1.3E+04	3.6E+02	2.4E-01
ALDRIN	1.2E+00	5.0E+03			1.2E+00		5.0E+00
ANTHRACENE	2.8E+00	2.5E+03			2.1E+05	6.1E+00	2.8E+00
ANTIMONY	3.1E+02	5.0E+03			3.1E+02		
ARSENIC	1.6E+01	5.0E+03			1.6E+01		
BARIUM	2.5E+03	5.0E+03			2.5E+03		
BENZENE	4.4E-02	1.1E+03			1.7E+01	5.0E-01	4.4E-02
BENZO(a)ANTHRACENE	1.2E+01	2.5E+03			1.5E+01		1.2E+01
BENZO(b)FLUORANTHENE	1.5E+01	2.5E+03			1.5E+01		4.6E+01
BENZO(k)FLUORANTHENE	2.7E+00	2.5E+03			1.5E+01		2.7E+00
BENZO(g,h,i)PERYLENE	2.7E+01	2.5E+03			1.4E+04		2.7E+01
BENZO(a)PYRENE	1.5E+00	2.5E+03			1.5E+00		1.3E+02
BERYLLIUM	9.8E+01	5.0E+03			9.8E+01		
BIPHENYL, 1,1-	6.5E-01	2.5E+03			2.8E+04	(NV: Use soil gas)	6.5E-01
BIS(2-CHLOROETHYL)ETHER	1.8E-04	2.5E+03			7.4E+00	1.3E-02	1.8E-04
BIS(2-CHLOROISOPROPYL)ETHER	5.4E-03	7.9E+02			2.3E+02	(NV: Use soil gas)	5.4E-03
BIS(2-ETHYLHEXYL)PHTHALATE	6.6E+01	2.5E+03			6.4E+03		6.6E+01
BORON	4.6E+04	no critiera			4.6E+04		
BROMODICHLOROMETHANE	3.9E-02	4.8E+03			3.5E+01	3.9E-02	1.9E+00
BROMOFORM	2.2E+00	2.5E+03			2.6E+03		2.2E+00
BROMOMETHANE	3.9E-01	2.5E+03			3.1E+01	5.1E-01	3.9E-01
CADMIUM	3.8E+01	5.0E+03			3.8E+01		
CARBON TETRACHLORIDE	3.5E-02	9.8E+02			8.4E+00	3.5E-02	1.1E-01
CHLORDANE	1.5E+01	5.0E+03			2.1E+01		1.5E+01
CHLOROANILINE, p-	5.3E-02	5.0E+03			1.6E+03		5.3E-02
CHLOROBENZENE	1.5E+00	6.8E+02			6.8E+02	6.2E+00	1.5E+00
CHLOROETHANE	8.5E-01	2.5E+03			2.8E+02	1.8E+00	8.5E-01
CHLOROFORM	2.7E-01	2.5E+03			2.9E+01	2.7E-01	2.9E+00
CHLOROMETHANE	4.2E-01	1.0E+03			1.1E+02	8.1E-01	4.2E-01
CHLOROPHENOL, 2-	1.2E-02	1.0E+03			5.3E+02	2.4E+00	1.2E-02
CHROMIUM (Total)	5.8E+01	5.0E+03	58	Background	5.8E+01		
CHROMIUM III	5.0E+03	5.0E+03			1.2E+06		
CHROMIUM VI	1.8E+00	5.0E+03			1.8E+00		
CHRYSENE	1.9E+01	5.0E+03			1.5E+02		1.9E+01

TABLE C-2. [1]DEEP SOIL SCREENING LEVELS (>3m bgs)
COMMERCIAL / INDUSTRIAL LAND USE
(potentially impacted groundwater IS a current or potential drinking water resource)

	COMMERCIAL / INDUSTRIAL LAND USE (mg/kg)						
			Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-3	Value	Basis	Table K-3	Table E-1b	Table G
COBALT	9.4E+01	5.0E+03			9.4E+01		
COPPER	5.0E+03	5.0E+03			3.1E+04		
CYANIDE (Free)	1.0E+03	1.0E+03			8.2E+03		1.2E+04
DIBENZO(a,h)ANTHTRACENE	4.3E+00	2.5E+03			4.3E+00		9.9E+00
DIBROMOCHLOROMETHANE	5.8E-02	1.0E+03			8.6E+01	5.8E-02	8.3E+00
1,2-DIBROMO-3-CHLOROPROPANE	1.1E-03	2.5E+03			1.6E+00	(NV: Use soil gas)	1.1E-03
DIBROMOETHANE, 1,2-	3.3E-04	2.5E+03			5.8E+00	2.1E-02	3.3E-04
DICHLOROBENZENE, 1,2-	1.1E+00	3.7E+02			6.0E+02	2.1E+01	1.1E+00
DICHLOROBENZENE, 1,3-	7.2E-01	3.8E+02			1.3E+02	(NV: Use soil gas)	7.2E-01
DICHLOROBENZENE, 1,4-	1.3E-01	2.5E+03			2.0E+02	1.3E-01	5.9E-01
DICHLOROBENZIDINE, 3,3-	7.7E-03	2.5E+03			1.7E+01		7.7E-03
DICHLORODIPHENYLDICHLOROETHANE (DDD)	1.2E+02	2.5E+03			1.2E+02		7.5E+02
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	8.7E+01	2.5E+03			8.7E+01		1.1E+03
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	4.3E+00	5.0E+03			8.7E+01		4.3E+00
DICHLOROETHANE, 1,1-	2.0E-01	2.3E+03			2.6E+02	9.1E-01	2.0E-01
DICHLOROETHANE, 1,2-	4.5E-03	2.5E+03			3.3E+01	6.9E-02	4.5E-03
DICHLOROETHYLENE, 1,1-	1.0E+00	1.6E+03			1.0E+03	2.1E+01	1.0E+00
DICHLOROETHYLENE, Cis 1,2-	1.9E-01	1.0E+03			3.5E+02	3.6E+00	1.9E-01
DICHLOROETHYLENE, Trans 1,2-	6.7E-01	2.5E+03			5.7E+02	7.3E+00	6.7E-01
DICHLOROPHENOL, 2,4-	3.0E-01	2.5E+03			1.2E+03		3.0E-01
DICHLOROPROPANE, 1,2-	1.2E-01	1.0E+03			4.7E+01	1.5E-01	1.2E-01
DICHLOROPROPENE, 1,3-	5.9E-02	1.1E+03			2.0E+01	9.1E-02	5.9E-02
DIELDRIN	2.3E-03	5.0E+03			1.2E+00		2.3E-03
DIETHYLPHTHALATE	3.5E-02	2.5E+03			3.2E+05		3.5E-02
DIMETHYLPHTHALATE	3.5E-02	2.5E+03			4.0E+06		3.5E-02
DIMETHYLPHENOL, 2,4-	6.7E-01	1.0E+03			4.9E+03	3.7E+02	6.7E-01
DINITROPHENOL, 2,4-	4.0E-02	2.5E+03			8.0E+02		4.0E-02
DINITROTOLUENE, 2,4-	8.5E-04	2.5E+03			6.4E+01		8.5E-04
1,4 DIOXANE	1.8E-03	2.5E+03			7.4E+02		1.8E-03
DIOXIN (2,3,7,8-TCDD)	2.3E-04	no criteria			2.3E-04		
ENDOSULFAN	4.6E-03	2.5E+03			2.4E+03		4.6E-03
ENDRIN	6.5E-04	2.5E+03			1.2E+02		6.5E-04
ETHYLBENZENE	3.3E+00	2.3E+02			4.0E+02	1.3E+01	3.3E+00
FLUORANTHENE	6.0E+01	2.5E+03			1.4E+04		6.0E+01
FLUORENE	8.9E+00	2.5E+03			2.6E+04	1.6E+02	8.9E+00
HEPTACHLOR	1.4E-02	5.0E+03			4.9E+00		1.4E-02

TABLE C-2. [1]DEEP SOIL SCREENING LEVELS (>3m bgs)
COMMERCIAL / INDUSTRIAL LAND USE
(potentially impacted groundwater IS a current or potential drinking water resource)

	COMMERCIAL / INDUSTRIAL LAND USE (mg/kg)						
			Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-3	Value	Basis	Table K-3	Table E-1b	Table G
HEPTACHLOR EPOXIDE	1.5E-02	5.0E+03			3.6E+00		1.5E-02
HEXACHLOROBENZENE	1.1E+01	2.5E+03			1.1E+01		7.9E+02
HEXACHLOROBUTADIENE	1.0E+00	2.5E+03			1.2E+02		1.0E+00
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	4.9E-02	2.5E+03			2.5E+01		4.9E-02
HEXACHLOROETHANE	2.4E+00	2.5E+03			4.0E+02		2.4E+00
INDENO(1,2,3-cd)PYRENE	7.7E+00	2.5E+03			1.5E+01		7.7E+00
LEAD	7.5E+02	5.0E+03	7.5E+02	occupational	7.5E+02		
MERCURY	1.1E+02	2.5E+03			1.1E+02		
METHOXYCHLOR	1.9E+01	2.5E+03			2.0E+03		1.9E+01
METHYLENE CHLORIDE	7.7E-02	2.3E+03			3.8E+02	1.5E+00	7.7E-02
METHYL ETHYL KETONE	3.9E+00	2.5E+03			3.4E+04	2.7E+03	3.9E+00
METHYL ISOBUTYL KETONE	2.8E+00	1.0E+03			6.5E+03	3.5E+02	2.8E+00
METHYL MERCURY	4.1E+01	1.0E+03			4.1E+01		
METHYLNAPHTHALENE (total 1- & 2-)	2.5E-01	2.5E+03	1.3E+04	Fluorene	1.3E+04	1.1E+02	2.5E-01
METHYL TERT BUTYL ETHER	2.3E-02	1.0E+03			2.8E+03	5.6E+00	2.3E-02
MOLYBDENUM	3.9E+03	5.0E+03			3.9E+03		
NAPHTHALENE	4.2E+00	2.5E+03			4.6E+02	1.2E+01	4.2E+00
NICKEL	1.0E+03	5.0E+03			1.0E+03		
PENTACHLOROPHENOL	5.3E+00	2.5E+03			1.5E+02		5.3E+00
PERCHLORATE	7.0E-03	5.0E+03			7.7E+01		7.0E-03
PHENANTHRENE	1.1E+01	2.5E+03	2.6E+04	Fluorene	2.6E+04	(NV: Use soil gas)	1.1E+01
PHENOL	7.6E-02	2.5E+03			2.4E+05		7.6E-02
POLYCHLORINATED BIPHENYLS (PCBs)	6.3E+00	2.5E+03			6.7E+00		6.3E+00
PYRENE	8.5E+01	2.5E+03			2.3E+04	8.5E+01	8.5E+01
SELENIUM	3.9E+03	5.0E+03			3.9E+03		
SILVER	3.9E+03	5.0E+03			3.9E+03		
STYRENE	1.5E+00	1.7E+03			1.5E+03	1.0E+03	1.5E+00
tert-BUTYL ALCOHOL	7.3E-02	1.0E+03			1.3E+04	(NV: Use soil gas)	7.3E-02
TETRACHLOROETHANE, 1,1,1,2-	2.4E-02	1.0E+03			2.8E+02	(NV: Use soil gas)	2.4E-02
TETRACHLOROETHANE, 1,1,2,2-	1.8E-02	1.7E+03			3.4E+01	2.5E-02	1.8E-02
TETRACHLOROETHYLENE	2.5E-01	3.7E+02			3.7E+01	2.5E-01	7.0E-01
THALLIUM	5.1E+01	5.0E+03			5.1E+01		
TOLUENE	2.9E+00	5.2E+02			6.5E+02	4.2E+02	2.9E+00
TOXAPHENE	4.2E-04	2.5E+03			1.7E+01		4.2E-04
TPH (gasolines)	1.0E+02	5.0E+03	2.3E+04	pyrene	2.3E+04	(NV: Use soil gas)	1.0E+02
TPH (middle distillates)	1.0E+02	5.0E+03	2.3E+04	pyrene	2.3E+04	(NV: Use soil gas)	1.0E+02

TABLE C-2. [1]DEEP SOIL SCREENING LEVELS (>3m bgs)
COMMERCIAL / INDUSTRIAL LAND USE
(potentially impacted groundwater IS a current or potential drinking water resource)

	COMMERCIAL / INDUSTRIAL LAND USE (mg/kg)						
			Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-3	Value	Basis	Table K-3	Table E-1b	Table G
TPH (residual fuels)	1.0E+03	5.0E+03	2.3E+04	pyrene	2.3E+04		1.0E+03
TRICHLOROBENZENE, 1,2,4-	7.6E+00	2.5E+03			6.2E+03	6.1E+01	7.6E+00
TRICHLOROETHANE, 1,1,1-	7.8E+00	1.4E+03			1.2E+03	2.3E+02	7.8E+00
TRICHLOROETHANE, 1,1,2-	7.0E-02	1.0E+03			6.3E+01	9.1E-02	7.0E-02
TRICHLOROETHYLENE	4.6E-01	8.2E+02			1.5E+02	7.3E-01	4.6E-01
TRICHLOROPHENOL, 2,4,5-	1.8E-01	1.0E+03			1.9E+04	6.3E+01	1.8E-01
TRICHLOROPHENOL, 2,4,6-	1.7E-01	2.5E+03			2.9E+02		1.7E-01
VANADIUM	5.0E+03	5.0E+03			5.4E+03		
VINYL CHLORIDE	1.9E-02	2.5E+03			2.4E+00	1.9E-02	8.5E-02
XYLENES	1.5E+00	2.1E+02		m-xylene RfDs	4.2E+02	1.0E+02	1.5E+00
ZINC	5.0E+03	5.0E+03			2.3E+05		
Electrical Conductivity (mS/cm, USEPA Method 120.1 MOD)	not applicable	-			-	-	-
Sodium Adsorption Ratio	not applicable	-			-	-	-

Notes:

1. Deep soils defined as soils situated >3 meters below ground surface (or shallower with institutional controls).

Final Environmental Screening Level is lowest of ceiling values (nuisance concerns etc.), direct-exposure, indoor-air impact, and leaching screening levels.

Assumes soil pH 5.0 to 11.

Soil data should be reported on dry-weight basis (see Section 6.2).

TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.

Background total Cr based on mean soil values presented in LBNL 2002 (refer to Section 3.2.4 and Volume 1, Figure 4).

TABLE D-1. [1]DEEP SOIL SCREENING LEVELS (>3m bgs)
[2]RESIDENTIAL LAND USE
(potentially impacted groundwater IS NOT a current or potential drinking water resource)

	[4]RESIDENTIAL LAND USE (mg/kg)						
			Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	NON-Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-3	Value	Basis	Table K-3	Table E-1b	Table G
ACENAPHTHENE	1.9E+01	2.5E+03			3.5E+04	1.3E+02	1.9E+01
ACENAPHTHYLENE	1.3E+01	1.0E+03	2.6E+04	Fluorene	2.6E+04	(NV: Use soil gas)	1.3E+01
ACETONE	5.0E-01	1.0E+03			1.3E+04	1.6E+02	5.0E-01
ALDRIN	1.2E+00	2.5E+03			1.2E+00		5.0E+00
ANTHRACENE	2.8E+00	1.0E+03			2.1E+05	6.1E+00	2.8E+00
ANTIMONY	3.1E+02	2.5E+03			3.1E+02		
ARSENIC	1.6E+01	2.5E+03			1.6E+01		
BARIUM	2.5E+03	2.5E+03			2.5E+03		
BENZENE	1.8E-01	1.0E+03			1.7E+01	1.8E-01	2.0E+00
BENZO(a)ANTHRACENE	1.2E+01	1.0E+03			1.5E+01		1.2E+01
BENZO(b)FLUORANTHENE	1.5E+01	1.0E+03			1.5E+01		4.6E+01
BENZO(k)FLUORANTHENE	1.5E+01	1.0E+03			1.5E+01		3.7E+01
BENZO(g,h,i)PERYLENE	2.7E+01	1.0E+03			1.4E+04		2.7E+01
BENZO(a)PYRENE	1.5E+00	1.0E+03			1.5E+00		1.3E+02
BERYLLIUM	9.8E+01	2.5E+03			9.8E+01		
BIPHENYL, 1,1-	6.5E+00	1.0E+03			2.8E+04	(NV: Use soil gas)	6.5E+00
BIS(2-CHLOROETHYL)ETHER	4.0E-03	1.0E+03			7.4E+00	4.0E-03	7.8E-01
BIS(2-CHLOROISOPROPYL)ETHER	6.6E-01	7.9E+02			2.3E+02	(NV: Use soil gas)	6.6E-01
BIS(2-ETHYLHEXYL)PHTHALATE	5.3E+02	1.0E+03			6.4E+03		5.3E+02
BORON	4.6E+04	no criteria			4.6E+04		
BROMODICHLOROMETHANE	1.2E-02	2.5E+03			3.5E+01	1.2E-02	3.0E+00
BROMOFORM	6.9E+01	1.0E+03			2.6E+03		6.9E+01
BROMOMETHANE	2.2E-01	1.0E+03			3.1E+01	2.2E-01	6.4E+00
CADMIUM	3.8E+01	2.5E+03			3.8E+01		
CARBON TETRACHLORIDE	1.2E-02	9.8E+02			8.4E+00	1.2E-02	2.1E+00
CHLORDANE	1.5E+01	2.5E+03			2.1E+01		1.5E+01
CHLOROANILINE, p-	5.3E-02	2.5E+03			1.6E+03		5.3E-02
CHLOROBENZENE	1.5E+00	6.8E+02			6.8E+02	2.7E+00	1.5E+00
CHLOROETHANE	6.3E-01	1.0E+03			2.8E+02	6.3E-01	8.5E-01
CHLOROFORM	9.8E-02	1.0E+03			2.9E+01	9.8E-02	1.0E+01
CHLOROMETHANE	2.9E-01	5.0E+02			1.1E+02	2.9E-01	2.6E+01
CHLOROPHENOL, 2-	1.2E-01	5.0E+02			5.3E+02	8.8E-01	1.2E-01
CHROMIUM (Total)	5.8E+01	2.5E+03	58	Background	5.8E+01		
CHROMIUM III	2.5E+03	2.5E+03			1.2E+06		
CHROMIUM VI	1.8E+00	2.5E+03			1.8E+00		
CHRYSENE	2.3E+01	2.5E+03			1.5E+02		2.3E+01

TABLE D-1. [1]DEEP SOIL SCREENING LEVELS (>3m bgs)
[2]RESIDENTIAL LAND USE
(potentially impacted groundwater IS NOT a current or potential drinking water resource)

	[2]RESIDENTIAL LAND USE (mg/kg)						
			Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	NON-Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-3	Value	Basis	Table K-3	Table E-1b	Table G
COBALT	9.4E+01	2.5E+03			9.4E+01		
COPPER	2.5E+03	2.5E+03			3.1E+04		
CYANIDE (Free)	5.0E+02	5.0E+02			8.2E+03		1.2E+04
DIBENZO(a,h)ANTHTRACENE	4.3E+00	1.0E+03			4.3E+00		1.4E+02
DIBROMOCHLOROMETHANE	1.9E-02	5.0E+02			8.6E+01	1.9E-02	1.5E+01
1,2-DIBROMO-3-CHLOROPROPANE	1.1E-03	1.0E+03			1.6E+00	(NV: Use soil gas)	1.1E-03
DIBROMOETHANE, 1,2-	7.3E-03	1.0E+03			5.8E+00	7.3E-03	1.1E+00
DICHLOROBENZENE, 1,2-	1.6E+00	3.7E+02			6.0E+02	8.9E+00	1.6E+00
DICHLOROBENZENE, 1,3-	7.4E+00	3.8E+02			1.3E+02	(NV: Use soil gas)	7.4E+00
DICHLOROBENZENE, 1,4-	4.7E-02	1.0E+03			2.0E+02	4.7E-02	1.8E+00
DICHLOROBENZIDINE, 3,3-	1.7E+01	1.0E+03			1.7E+01		6.6E+01
DICHLORODIPHENYLDICHLOROETHANE (DDD)	1.2E+02	1.0E+03			1.2E+02		7.5E+02
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	8.7E+01	1.0E+03			8.7E+01		1.1E+03
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	4.3E+00	2.5E+03			8.7E+01		4.3E+00
DICHLOROETHANE, 1,1-	3.3E-01	1.0E+03			2.6E+02	3.3E-01	1.9E+00
DICHLOROETHANE, 1,2-	2.5E-02	1.0E+03			3.3E+01	2.5E-02	1.8E+00
DICHLOROETHYLENE, 1,1-	4.3E+00	1.0E+03			1.0E+03	8.9E+00	4.3E+00
DICHLOROETHYLENE, Cis 1,2-	1.6E+00	5.0E+02			3.5E+02	1.6E+00	1.8E+01
DICHLOROETHYLENE, Trans 1,2-	3.1E+00	1.0E+03			5.7E+02	3.1E+00	3.9E+01
DICHLOROPHENOL, 2,4-	3.0E+00	1.0E+03			1.2E+03		3.0E+00
DICHLOROPROPANE, 1,2-	5.2E-02	5.0E+02			4.7E+01	5.2E-02	2.5E+00
DICHLOROPROPENE, 1,3-	3.3E-02	1.0E+03			2.0E+01	3.3E-02	5.8E+00
DIELDRIN	2.3E-03	2.5E+03			1.2E+00		2.3E-03
DIETHYLPHTHALATE	3.5E-02	1.0E+03			3.2E+05		3.5E-02
DIMETHYLPHTHALATE	3.5E-02	1.0E+03			4.0E+06		3.5E-02
DIMETHYLPHENOL, 2,4-	7.4E-01	5.0E+02			4.9E+03	1.4E+02	7.4E-01
DINITROPHENOL, 2,4-	2.1E-01	1.0E+03			8.0E+02		2.1E-01
DINITROTOLUENE, 2,4-	8.6E-01	1.0E+03			6.4E+01		8.6E-01
1,4 DIOXANE	3.0E+01	1.0E+03			7.4E+02		3.0E+01
DIOXIN (2,3,7,8-TCDD)	2.3E-04	no criteria			2.3E-04		
ENDOSULFAN	4.6E-03	1.0E+03			2.4E+03		4.6E-03
ENDRIN	6.5E-04	1.0E+03			1.2E+02		6.5E-04
ETHYLBENZENE	4.7E+00	2.3E+02			4.0E+02	4.7E+00	3.2E+01
FLUORANTHENE	6.0E+01	1.0E+03			1.4E+04		6.0E+01
FLUORENE	8.9E+00	1.0E+03			2.6E+04	1.6E+02	8.9E+00
HEPTACHLOR	1.4E-02	2.5E+03			4.9E+00		1.4E-02

TABLE D-1. [1]DEEP SOIL SCREENING LEVELS (>3m bgs)
[2]RESIDENTIAL LAND USE
(potentially impacted groundwater IS NOT a current or potential drinking water resource)

	[2]RESIDENTIAL LAND USE (mg/kg)						
			Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	NON-Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-3	Value	Basis	Table K-3	Table E-1b	Table G
HEPTACHLOR EPOXIDE	1.5E-02	2.5E+03			3.6E+00		1.5E-02
HEXACHLOROBENZENE	1.1E+01	1.0E+03			1.1E+01		7.9E+02
HEXACHLOROBUTADIENE	2.3E+01	1.0E+03			1.2E+02		2.3E+01
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	4.9E-02	1.0E+03			2.5E+01		4.9E-02
HEXACHLOROETHANE	4.1E+01	1.0E+03			4.0E+02		4.1E+01
INDENO(1,2,3-cd)PYRENE	7.7E+00	1.0E+03			1.5E+01		7.7E+00
LEAD	7.5E+02	2.5E+03	7.5E+02	occupational	7.5E+02		
MERCURY	1.1E+02	1.0E+03			1.1E+02		
METHOXYCHLOR	1.9E+01	1.0E+03			2.0E+03		1.9E+01
METHYLENE CHLORIDE	5.2E-01	1.0E+03			3.8E+02	5.2E-01	3.4E+01
METHYL ETHYL KETONE	1.3E+01	1.0E+03			3.4E+04	9.9E+02	1.3E+01
METHYL ISOBUTYL KETONE	3.9E+00	5.0E+02			6.5E+03	1.3E+02	3.9E+00
METHYL MERCURY	4.1E+01	5.0E+02			4.1E+01		
METHYLNAPHTHALENE (total 1- & 2-)	2.5E-01	1.0E+03	1.3E+04	Fluorene	1.3E+04	1.1E+02	2.5E-01
METHYL TERT BUTYL ETHER	2.0E+00	5.0E+02			2.8E+03	2.0E+00	8.4E+00
MOLYBDENUM	2.5E+03	2.5E+03			3.9E+03		
NAPHTHALENE	4.5E+00	1.0E+03			4.6E+02	4.5E+00	4.8E+00
NICKEL	1.0E+03	2.5E+03			1.0E+03		
PENTACHLOROPHENOL	4.2E+01	1.0E+03			1.5E+02		4.2E+01
PERCHLORATE	1.2E+00	2.5E+03			7.7E+01		1.2E+00
PHENANTHRENE	1.1E+01	1.0E+03	2.6E+04	Fluorene	2.6E+04	(NV: Use soil gas)	1.1E+01
PHENOL	1.9E+01	1.0E+03			2.4E+05		1.9E+01
POLYCHLORINATED BIPHENYLS (PCBs)	6.3E+00	1.0E+03			6.7E+00		6.3E+00
PYRENE	8.5E+01	1.0E+03			2.3E+04	8.5E+01	8.5E+01
SELENIUM	2.5E+03	2.5E+03			3.9E+03		
SILVER	2.5E+03	2.5E+03			3.9E+03		
STYRENE	1.5E+01	1.0E+03			1.5E+03	4.5E+02	1.5E+01
tert-BUTYL ALCOHOL	1.1E+02	5.0E+02			1.3E+04	(NV: Use soil gas)	1.1E+02
TETRACHLOROETHANE, 1,1,1,2-	1.6E+01	5.0E+02			2.8E+02	(NV: Use soil gas)	1.6E+01
TETRACHLOROETHANE, 1,1,2,2-	9.0E-03	1.0E+03			3.4E+01	9.0E-03	3.4E+00
TETRACHLOROETHYLENE	8.8E-02	3.7E+02			3.7E+01	8.8E-02	1.7E+01
THALLIUM	5.1E+01	2.5E+03			5.1E+01		
TOLUENE	9.3E+00	5.2E+02			6.5E+02	1.8E+02	9.3E+00
TOXAPHENE	4.2E-04	1.0E+03			1.7E+01		4.2E-04
TPH (gasolines)	4.0E+02	5.0E+03	2.3E+04	pyrene	2.3E+04	(NV: Use soil gas)	4.0E+02
TPH (middle distillates)	5.0E+02	5.0E+03	2.3E+04	pyrene	2.3E+04	(NV: Use soil gas)	5.0E+02

TABLE D-1. [1]DEEP SOIL SCREENING LEVELS (>3m bgs)
[2]RESIDENTIAL LAND USE
(potentially impacted groundwater IS NOT a current or potential drinking water resource)

	[2]RESIDENTIAL LAND USE (mg/kg)						
			Human Health				Groundwater Protection (Soil Leaching)
CHEMICAL PARAMETER	Final ESL	Ceiling Value (Odors, etc.)	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	NON-Drinking Water Resource
		Table H-3	Value	Basis	Table K-3	Table E-1b	Table G
TPH (residual fuels)	1.0E+03	5.0E+03	2.3E+04	pyrene	2.3E+04		1.0E+03
TRICHLOROBENZENE, 1,2,4-	7.6E+00	1.0E+03			6.2E+03	2.3E+01	7.6E+00
TRICHLOROETHANE, 1,1,1-	7.8E+00	1.0E+03			1.2E+03	9.8E+01	7.8E+00
TRICHLOROETHANE, 1,1,2-	3.3E-02	5.0E+02			6.3E+01	3.3E-02	4.9E+00
TRICHLOROETHYLENE	2.6E-01	8.2E+02			1.5E+02	2.6E-01	3.3E+01
TRICHLOROPHENOL, 2,4,5-	1.8E-01	5.0E+02			1.9E+04	2.4E+01	1.8E-01
TRICHLOROPHENOL, 2,4,6-	1.6E+02	1.0E+03			2.9E+02		1.6E+02
VANADIUM	2.5E+03	2.5E+03			5.4E+03		
VINYL CHLORIDE	6.7E-03	1.0E+03			2.4E+00	6.7E-03	6.8E-01
XYLENES	1.5E+00	2.1E+02		m-xylene RfDs	4.2E+02	4.5E+01	1.5E+00
ZINC	2.5E+03	2.5E+03			2.3E+05		-
Electrical Conductivity (mS/cm, USEPA Method 120.1 MOD)	not applicable	-			-	-	-
Sodium Adsorption Ratio	not applicable	-			-	-	-

Notes:

1. Deep soils defined as soils situated >3 meters below ground surface (or shallower with institutional controls).

2. "Residential Land Use" screening levels generally considered adequate for other sensitive uses (e.g., day-care centers, hospitals, etc.).

Final Environmental Screening Level is lowest of ceiling values (nuisance concerns etc.), direct-exposure, indoor-air impact, and leaching screening levels.

Assumes soil pH 5.0 to 11.

Soil data should be reported on dry-weight basis (see Section 6.2).

TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.

Background total Cr based on mean soil values presented in LBNL 2002 (refer to Section 3.2.4 and Volume 1, Figure 4).

TABLE D-2. [1]DEEP SOIL SCREENING LEVELS (>3m bgs)
COMMERCIAL / INDUSTRIAL LAND USE
(potentially impacted groundwater IS NOT a current or potential drinking water resource)

	COMMERCIAL / INDUSTRIAL LAND USE (mg/kg)						
			Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	NON-Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-3	Value	Basis	Table K-3	Table E-1b	Table G
ACENAPHTHENE	1.9E+01	5.0E+03			3.5E+04	1.3E+02	1.9E+01
ACENAPHTHYLENE	1.3E+01	2.5E+03	2.6E+04	Fluorene	2.6E+04	(NV: Use soil gas)	1.3E+01
ACETONE	5.0E-01	2.5E+03			1.3E+04	3.6E+02	5.0E-01
ALDRIN	1.2E+00	5.0E+03			1.2E+00		5.0E+00
ANTHRACENE	2.8E+00	2.5E+03			2.1E+05	6.1E+00	2.8E+00
ANTIMONY	3.1E+02	5.0E+03			3.1E+02		
ARSENIC	1.6E+01	5.0E+03			1.6E+01		
BARIUM	2.5E+03	5.0E+03			2.5E+03		
BENZENE	5.0E-01	1.1E+03			1.7E+01	5.0E-01	2.0E+00
BENZO(a)ANTHRACENE	1.2E+01	2.5E+03			1.5E+01		1.2E+01
BENZO(b)FLUORANTHENE	1.5E+01	2.5E+03			1.5E+01		4.6E+01
BENZO(k)FLUORANTHENE	1.5E+01	2.5E+03			1.5E+01		3.7E+01
BENZO(g,h,i)PERYLENE	2.7E+01	2.5E+03			1.4E+04		2.7E+01
BENZO(a)PYRENE	1.5E+00	2.5E+03			1.5E+00		1.3E+02
BERYLLIUM	9.8E+01	5.0E+03			9.8E+01		
BIPHENYL, 1,1-	6.5E+00	2.5E+03			2.8E+04	(NV: Use soil gas)	6.5E+00
BIS(2-CHLOROETHYL)ETHER	1.3E-02	2.5E+03			7.4E+00	1.3E-02	7.8E-01
BIS(2-CHLOROISOPROPYL)ETHER	6.6E-01	7.9E+02			2.3E+02	(NV: Use soil gas)	6.6E-01
BIS(2-ETHYLHEXYL)PHTHALATE	5.3E+02	2.5E+03			6.4E+03		5.3E+02
BORON	4.6E+04	no crtiera			4.6E+04		
BROMODICHLOROMETHANE	3.9E-02	4.8E+03			3.5E+01	3.9E-02	3.0E+00
BROMOFORM	6.9E+01	2.5E+03			2.6E+03		6.9E+01
BROMOMETHANE	5.1E-01	2.5E+03			3.1E+01	5.1E-01	6.4E+00
CADMIUM	3.8E+01	5.0E+03			3.8E+01		
CARBON TETRACHLORIDE	3.5E-02	9.8E+02			8.4E+00	3.5E-02	2.1E+00
CHLORDANE	1.5E+01	5.0E+03			2.1E+01		1.5E+01
CHLOROANILINE, p-	5.3E-02	5.0E+03			1.6E+03		5.3E-02
CHLOROBENZENE	1.5E+00	6.8E+02			6.8E+02	6.2E+00	1.5E+00
CHLOROETHANE	8.5E-01	2.5E+03			2.8E+02	1.8E+00	8.5E-01
CHLOROFORM	2.7E-01	2.5E+03			2.9E+01	2.7E-01	1.0E+01
CHLOROMETHANE	8.1E-01	1.0E+03			1.1E+02	8.1E-01	2.6E+01
CHLOROPHENOL, 2-	1.2E-01	1.0E+03			5.3E+02	2.4E+00	1.2E-01
CHROMIUM (Total)	5.8E+01	5.0E+03	58	Background	5.8E+01		
CHROMIUM III	5.0E+03	5.0E+03			1.2E+06		
CHROMIUM VI	1.8E+00	5.0E+03			1.8E+00		
CHRYSENE	2.3E+01	5.0E+03			1.5E+02		2.3E+01

TABLE D-2. [1]DEEP SOIL SCREENING LEVELS (>3m bgs)
COMMERCIAL / INDUSTRIAL LAND USE
(potentially impacted groundwater IS NOT a current or potential drinking water resource)

	COMMERCIAL / INDUSTRIAL LAND USE (mg/kg)						
			Human Health				Groundwater Protection (Soil Leaching)
CHEMICAL PARAMETER	Final ESL	Ceiling Value (Odors, etc.)	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	NON-Drinking Water Resource
		Table H-3	Value	Basis	Table K-3	Table E-1b	Table G
COBALT	9.4E+01	5.0E+03			9.4E+01		
COPPER	5.0E+03	5.0E+03			3.1E+04		
CYANIDE (Free)	1.0E+03	1.0E+03			8.2E+03		1.2E+04
DIBENZO(a,h)ANTHTRACENE	4.3E+00	2.5E+03			4.3E+00		1.4E+02
DIBROMOCHLOROMETHANE	5.8E-02	1.0E+03			8.6E+01	5.8E-02	1.5E+01
1,2-DIBROMO-3-CHLOROPROPANE	1.1E-03	2.5E+03			1.6E+00	(NV: Use soil gas)	1.1E-03
DIBROMOETHANE, 1,2-	2.1E-02	2.5E+03			5.8E+00	2.1E-02	1.1E+00
DICHLOROBENZENE, 1,2-	1.6E+00	3.7E+02			6.0E+02	2.1E+01	1.6E+00
DICHLOROBENZENE, 1,3-	7.4E+00	3.8E+02			1.3E+02	(NV: Use soil gas)	7.4E+00
DICHLOROBENZENE, 1,4-	1.3E-01	2.5E+03			2.0E+02	1.3E-01	1.8E+00
DICHLOROBENZIDINE, 3,3-	1.7E+01	2.5E+03			1.7E+01		6.6E+01
DICHLORODIPHENYLDICHLOROETHANE (DDD)	1.2E+02	2.5E+03			1.2E+02		7.5E+02
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	8.7E+01	2.5E+03			8.7E+01		1.1E+03
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	4.3E+00	5.0E+03			8.7E+01		4.3E+00
DICHLOROETHANE, 1,1-	9.1E-01	2.3E+03			2.6E+02	9.1E-01	1.9E+00
DICHLOROETHANE, 1,2-	6.9E-02	2.5E+03			3.3E+01	6.9E-02	1.8E+00
DICHLOROETHYLENE, 1,1-	4.3E+00	1.6E+03			1.0E+03	2.1E+01	4.3E+00
DICHLOROETHYLENE, Cis 1,2-	3.6E+00	1.0E+03			3.5E+02	3.6E+00	1.8E+01
DICHLOROETHYLENE, Trans 1,2-	7.3E+00	2.5E+03			5.7E+02	7.3E+00	3.9E+01
DICHLOROPHENOL, 2,4-	3.0E+00	2.5E+03			1.2E+03		3.0E+00
DICHLOROPROPANE, 1,2-	1.5E-01	1.0E+03			4.7E+01	1.5E-01	2.5E+00
DICHLOROPROPENE, 1,3-	9.1E-02	1.1E+03			2.0E+01	9.1E-02	5.8E+00
DIELDRIN	2.3E-03	5.0E+03			1.2E+00		2.3E-03
DIETHYLPHTHALATE	3.5E-02	2.5E+03			3.2E+05		3.5E-02
DIMETHYLPHTHALATE	3.5E-02	2.5E+03			4.0E+06		3.5E-02
DIMETHYLPHENOL, 2,4-	7.4E-01	1.0E+03			4.9E+03	3.7E+02	7.4E-01
DINITROPHENOL, 2,4-	2.1E-01	2.5E+03			8.0E+02		2.1E-01
DINITROTOLUENE, 2,4-	8.6E-01	2.5E+03			6.4E+01		8.6E-01
1,4 DIOXANE	3.0E+01	2.5E+03			7.4E+02		3.0E+01
DIOXIN (2,3,7,8-TCDD)	2.3E-04	no criteria			2.3E-04		
ENDOSULFAN	4.6E-03	2.5E+03			2.4E+03		4.6E-03
ENDRIN	6.5E-04	2.5E+03			1.2E+02		6.5E-04
ETHYLBENZENE	1.3E+01	2.3E+02			4.0E+02	1.3E+01	3.2E+01
FLUORANTHENE	6.0E+01	2.5E+03			1.4E+04		6.0E+01
FLUORENE	8.9E+00	2.5E+03			2.6E+04	1.6E+02	8.9E+00
HEPTACHLOR	1.4E-02	5.0E+03			4.9E+00		1.4E-02

TABLE D-2. [1]DEEP SOIL SCREENING LEVELS (>3m bgs)
COMMERCIAL / INDUSTRIAL LAND USE
(potentially impacted groundwater IS NOT a current or potential drinking water resource)

	COMMERCIAL / INDUSTRIAL LAND USE (mg/kg)						
			Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	NON-Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-3	Value	Basis	Table K-3	Table E-1b	Table G
HEPTACHLOR EPOXIDE	1.5E-02	5.0E+03			3.6E+00		1.5E-02
HEXACHLOROBENZENE	1.1E+01	2.5E+03			1.1E+01		7.9E+02
HEXACHLOROBUTADIENE	2.3E+01	2.5E+03			1.2E+02		2.3E+01
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	4.9E-02	2.5E+03			2.5E+01		4.9E-02
HEXACHLOROETHANE	4.1E+01	2.5E+03			4.0E+02		4.1E+01
INDENO(1,2,3-cd)PYRENE	7.7E+00	2.5E+03			1.5E+01		7.7E+00
LEAD	7.5E+02	5.0E+03	7.5E+02	occupational	7.5E+02		
MERCURY	1.1E+02	2.5E+03			1.1E+02		
METHOXYCHLOR	1.9E+01	2.5E+03			2.0E+03		1.9E+01
METHYLENE CHLORIDE	1.5E+00	2.3E+03			3.8E+02	1.5E+00	3.4E+01
METHYL ETHYL KETONE	1.3E+01	2.5E+03			3.4E+04	2.7E+03	1.3E+01
METHYL ISOBUTYL KETONE	3.9E+00	1.0E+03			6.5E+03	3.5E+02	3.9E+00
METHYL MERCURY	4.1E+01	1.0E+03			4.1E+01		
METHYLNAPHTHALENE (total 1- & 2-)	2.5E-01	2.5E+03	1.3E+04	Fluorene	1.3E+04	1.1E+02	2.5E-01
METHYL TERT BUTYL ETHER	5.6E+00	1.0E+03			2.8E+03	5.6E+00	8.4E+00
MOLYBDENUM	3.9E+03	5.0E+03			3.9E+03		
NAPHTHALENE	4.8E+00	2.5E+03			4.6E+02	1.2E+01	4.8E+00
NICKEL	1.0E+03	5.0E+03			1.0E+03		
PENTACHLOROPHENOL	4.2E+01	2.5E+03			1.5E+02		4.2E+01
PERCHLORATE	1.2E+00	5.0E+03			7.7E+01		1.2E+00
PHENANTHRENE	1.1E+01	2.5E+03	2.6E+04	Fluorene	2.6E+04	(NV: Use soil gas)	1.1E+01
PHENOL	1.9E+01	2.5E+03			2.4E+05		1.9E+01
POLYCHLORINATED BIPHENYLS (PCBs)	6.3E+00	2.5E+03			6.7E+00		6.3E+00
PYRENE	8.5E+01	2.5E+03			2.3E+04	8.5E+01	8.5E+01
SELENIUM	3.9E+03	5.0E+03			3.9E+03		
SILVER	3.9E+03	5.0E+03			3.9E+03		
STYRENE	1.5E+01	1.7E+03			1.5E+03	1.0E+03	1.5E+01
tert-BUTYL ALCOHOL	1.1E+02	1.0E+03			1.3E+04	(NV: Use soil gas)	1.1E+02
TETRACHLOROETHANE, 1,1,1,2-	1.6E+01	1.0E+03			2.8E+02	(NV: Use soil gas)	1.6E+01
TETRACHLOROETHANE, 1,1,2,2-	2.5E-02	1.7E+03			3.4E+01	2.5E-02	3.4E+00
TETRACHLOROETHYLENE	2.5E-01	3.7E+02			3.7E+01	2.5E-01	1.7E+01
THALLIUM	5.1E+01	5.0E+03			5.1E+01		
TOLUENE	9.3E+00	5.2E+02			6.5E+02	4.2E+02	9.3E+00
TOXAPHENE	4.2E-04	2.5E+03			1.7E+01		4.2E-04
TPH (gasolines)	4.0E+02	5.0E+03	2.3E+04	pyrene	2.3E+04	(NV: Use soil gas)	4.0E+02
TPH (middle distillates)	5.0E+02	5.0E+03	2.3E+04	pyrene	2.3E+04	(NV: Use soil gas)	5.0E+02

TABLE D-2. [1]DEEP SOIL SCREENING LEVELS (>3m bgs)
COMMERCIAL / INDUSTRIAL LAND USE
(potentially impacted groundwater IS NOT a current or potential drinking water resource)

	COMMERCIAL / INDUSTRIAL LAND USE (mg/kg)						
			Human Health				Groundwater Protection (Soil Leaching)
		Ceiling Value (Odors, etc.)	Substitute Direct Exposure		Direct Exposure	Indoor Air Impacts	NON-Drinking Water Resource
CHEMICAL PARAMETER	Final ESL	Table H-3	Value	Basis	Table K-3	Table E-1b	Table G
TPH (residual fuels)	1.0E+03	5.0E+03	2.3E+04	pyrene	2.3E+04		1.0E+03
TRICHLOROBENZENE, 1,2,4-	7.6E+00	2.5E+03			6.2E+03	6.1E+01	7.6E+00
TRICHLOROETHANE, 1,1,1-	7.8E+00	1.4E+03			1.2E+03	2.3E+02	7.8E+00
TRICHLOROETHANE, 1,1,2-	9.1E-02	1.0E+03			6.3E+01	9.1E-02	4.9E+00
TRICHLOROETHYLENE	7.3E-01	8.2E+02			1.5E+02	7.3E-01	3.3E+01
TRICHLOROPHENOL, 2,4,5-	1.8E-01	1.0E+03			1.9E+04	6.3E+01	1.8E-01
TRICHLOROPHENOL, 2,4,6-	1.6E+02	2.5E+03			2.9E+02		1.6E+02
VANADIUM	5.0E+03	5.0E+03			5.4E+03		
VINYL CHLORIDE	1.9E-02	2.5E+03			2.4E+00	1.9E-02	6.8E-01
XYLENES	1.5E+00	2.1E+02		*m*-xylene RfDs	4.2E+02	1.0E+02	1.5E+00
ZINC	5.0E+03	5.0E+03			2.3E+05		
Electrical Conductivity (mS/cm, USEPA Method 120.1 MOD)	not applicable	-			-	-	-
Sodium Adsorption Ratio	not applicable	-			-	-	-

Notes:

1. Deep soils defined as soils situated >3 meters below ground surface (or shallower with institutional controls).

Final Environmental Screening Level is lowest of ceiling values (nuisance concerns etc.), direct-exposure, indoor-air impact, and leaching screening levels.

Assumes soil pH 5.0 to 11.

Soil data should be reported on dry-weight basis (see Section 6.2).

TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.

Background total Cr based on mean soil values presented in LBNL 2002 (refer to Section 3.2.4 and Volume 1, Figure 4).

TABLE E-1a. GROUNDWATER SCREENING LEVELS FOR EVALUATION OF POTENTIAL INDOOR-AIR IMPACTS (volatile chemicals only)

CHEMICAL PARAMETER	Physical State		[1,*] Residential Land Use		Commercial/Industrial Land Use	
			Vadose-Zone Soil Type		Vadose-Zone Soil Type	
			[2] High Permeability	[3] Low/Moderate Permeability	[2] High Permeability	[3] Low/Moderate Permeability
			(ug/L)	(ug/L)	(ug/L)	(ug/L)
#ACENAPHTHENE	V	S	4.2E+03	4.2E+03	4.2E+03	4.2E+03
ACENAPHTHYLENE	V	S	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
#ACETONE	V	L	6.0E+06	7.9E+06	1.6E+07	2.2E+07
ALDRIN	NV	S				
#ANTHRACENE	V	S	4.3E+01	4.3E+01	4.3E+01	4.3E+01
ANTIMONY	NV	S				
ARSENIC	NV	S				
BARIUM	NV	S				
#BENZENE	V	L	5.3E+02	1.9E+03	1.8E+03	6.4E+03
BENZO(a)ANTHRACENE	NV	S				
BENZO(b)FLUORANTHENE	NV	S				
BENZO(k)FLUORANTHENE	NV	S				
BENZO(g,h,i)PERYLENE	NV	S				
BENZO(a)PYRENE	NV	S				
BERYLLIUM	NV	S				
BIPHENYL, 1,1-	V	S	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
BIS(2-CHLOROETHYL)ETHER	V	L	6.3E+01	8.3E+01	2.1E+02	2.8E+02
BIS(2-CHLOROISOPROPYL)ETHER	V	L	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
BIS(2-ETHYLHEXYL)PHTHALATE	NV	S				
BORON	NV	S				
BROMODICHLOROMETHANE	V	L	1.6E+02	3.1E+02	5.4E+02	1.0E+03
BROMOFORM	NV	S				
BROMOMETHANE	V	G	5.8E+02	2.0E+03	1.6E+03	5.7E+03
CADMIUM	NV	S				
CARBON TETRACHLORIDE	V	L	9.5E+00	4.0E+01	3.2E+01	1.4E+02
CHLORDANE	NV	S				
CHLOROANILINE, p-	NV	S				
CHLOROBENZENE	V	L	1.3E+04	4.3E+04	3.8E+04	1.2E+05
CHLOROETHANE	V	G	8.2E+02	3.3E+03	2.7E+03	1.1E+04
CHLOROFORM	V	L	3.4E+02	1.2E+03	1.1E+03	3.9E+03
CHLOROMETHANE	V	G	1.7E+02	7.5E+02	5.8E+02	2.5E+03
CHLOROPHENOL, 2-	V	L	5.5E+03	1.6E+04	1.5E+04	4.6E+04
CHROMIUM (Total)	NV	S				
CHROMIUM III	NV	S				
CHROMIUM VI	NV	S				
CHRYSENE	NV	S				
COBALT	NV	S				
COPPER	NV	S				

TABLE E-1a. GROUNDWATER SCREENING LEVELS FOR EVALUATION OF POTENTIAL INDOOR-AIR IMPACTS (volatile chemicals only)

CHEMICAL PARAMETER	Physical State		[1,4]Residential Land Use		Commercial/Industrial Land Use	
			Vadose-Zone Soil Type		Vadose-Zone Soil Type	
			[2]High Permeability	[3]Low/Moderate Permeability	[2]High Permeability	[3]Low/Moderate Permeability
			(ug/L)	(ug/L)	(ug/L)	(ug/L)
CYANIDE (Free)	NV	S				
DIBENZO(a,h)ANTHTRACENE	NV	S				
DIBROMOCHLOROMETHANE	V	S	1.8E+02	4.2E+02	6.1E+02	1.4E+03
1,2-DIBROMO-3-CHLOROPROPANE	V	L	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
DIBROMOETHANE, 1,2-	V	S	1.6E+02	2.6E+02	5.5E+02	8.6E+02
DICHLOROBENZENE, 1,2-	V	L	7.8E+04	1.6E+05	1.6E+05	1.6E+05
DICHLOROBENZENE, 1,3-	V	L	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
DICHLOROBENZENE, 1,4-	V	S	3.5E+02	1.0E+03	1.2E+03	3.4E+03
DICHLOROBENZIDINE, 3,3-	NV	S				
DICHLORODIPHENYLDICHLOROETHANE (DDD)	NV	S				
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	NV	S				
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	NV	S				
DICHLOROETHANE, 1,1-	V	L	1.0E+03	3.6E+03	3.5E+03	1.2E+04
DICHLOROETHANE, 1,2-	V	L	2.0E+02	5.1E+02	6.9E+02	1.7E+03
DICHLOROETHYLENE, 1,1-	V	L	6.3E+03	2.7E+04	1.8E+04	7.5E+04
DICHLOROETHYLENE, Cis 1,2-	V	L	6.2E+03	2.0E+04	1.7E+04	5.5E+04
DICHLOROETHYLENE, Trans 1,2-	V	L	6.7E+03	2.5E+04	1.9E+04	6.9E+04
DICHLOROPHENOL, 2,4-	NV	S				
DICHLOROPROPANE, 1,2-	V	L	2.9E+02	8.9E+02	9.6E+02	3.0E+03
DICHLOROPROPENE, 1,3-	V	L	4.9E+01	2.0E+02	1.7E+02	6.6E+02
DIELDRIN	NV	S				
DIETHYLPHTHALATE	NV	S				
DIMETHYLPHTHALATE	NV	S				
#DIMETHYLPHENOL, 2,4-	V	S	2.8E+06	4.1E+06	8.0E+06	1.1E+07
DINITROPHENOL, 2,4-	NV	S				
DINITROTOLUENE, 2,4-	NV	S				
1,4 DIOXANE	NV	L				
DIOXIN (2,3,7,8-TCDD)	NV	S				
ENDOSULFAN	NV	S				
ENDRIN	NV	S				
#ETHYLBENZENE	V	L	1.4E+04	5.2E+04	4.7E+04	1.8E+05
FLUORANTHENE	NV	S				
#FLUORENE	V	S	1.9E+03	1.9E+03	1.9E+03	1.9E+03
HEPTACHLOR	NV	S				
HEPTACHLOR EPOXIDE	NV	S				
HEXACHLOROBENZENE	NV	S				
HEXACHLOROBUTADIENE	NV	S				
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	NV	S				

TABLE E-1a. GROUNDWATER SCREENING LEVELS FOR EVALUATION OF POTENTIAL INDOOR-AIR IMPACTS (volatile chemicals only)

CHEMICAL PARAMETER	Physical State		[1] Residential Land Use		Commercial/Industrial Land Use	
			Vadose-Zone Soil Type		Vadose-Zone Soil Type	
			[2] High Permeability	[3] Low/Moderate Permeability	[2] High Permeability	[3] Low/Moderate Permeability
			(ug/L)	(ug/L)	(ug/L)	(ug/L)
HEXACHLOROETHANE	NV	S				
INDENO(1,2,3-cd)PYRENE	NV	S				
LEAD	NV	S				
MERCURY	NV	S				
METHOXYCHLOR	NV	S				
METHYLENE CHLORIDE	V	L	2.4E+03	7.2E+03	8.1E+03	2.4E+04
#METHYL ETHYL KETONE	V	L	5.5E+07	1.2E+08	1.5E+08	3.3E+08
#METHYL ISOBUTYL KETONE	V	L	3.1E+06	4.3E+06	8.7E+06	1.2E+07
METHYL MERCURY	NV	S				
#METHYLNAPHTHALENE (total 1- & 2-)	V	S	2.6E+04	2.6E+04	2.6E+04	2.6E+04
METHYL TERT BUTYL ETHER	V	L	2.4E+04	4.8E+04	8.0E+04	1.6E+05
MOLYBDENUM	NV	S				
#NAPHTHALENE	V	S	2.8E+04	3.1E+04	3.1E+04	3.1E+04
NICKEL	NV	S				
PENTACHLOROPHENOL	NV	S				
PERCHLORATE	NV	S				
PHENANTHRENE	V	S	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
PHENOL	NV	S				
POLYCHLORINATED BIPHENYLS (PCBs)	NV	S				
#PYRENE	V	S	1.4E+02	1.4E+02	1.4E+02	1.4E+02
SELENIUM	NV	S				
SILVER	NV	S				
#STYRENE	V	L	3.1E+05	3.1E+05	3.1E+05	3.1E+05
tert-BUTYL ALCOHOL			(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
TETRACHLOROETHANE, 1,1,1,2-	V	L	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
TETRACHLOROETHANE, 1,1,2,2-	V	L	1.9E+02	3.1E+02	6.3E+02	1.0E+03
TETRACHLOROETHYLENE	V	L	1.3E+02	5.2E+02	4.3E+02	1.7E+03
THALLIUM	NV	S				
#TOLUENE	V	L	5.0E+05	5.3E+05	5.3E+05	5.3E+05
TOXAPHENE	NV	S				
TPH (gasolines)	V	L	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
TPH (middle distillates)	V	L	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
TPH (residual fuels)	NV	L/S				
TRICHLOROBENZENE, 1,2,4-	V	L	1.5E+05	2.6E+05	3.0E+05	3.0E+05
TRICHLOROETHANE, 1,1,1-	V	L	1.3E+05	5.2E+05	3.6E+05	1.3E+06
TRICHLOROETHANE, 1,1,2-	V	L	3.5E+02	8.0E+02	1.2E+03	2.7E+03
TRICHLOROETHYLENE	V	L	5.3E+02	2.1E+03	1.8E+03	6.9E+03
TRICHLOROPHENOL, 2,4,5-	V	S	8.2E+05	8.2E+05	1.2E+06	1.2E+06

TABLE E-1a. GROUNDWATER SCREENING LEVELS FOR EVALUATION OF POTENTIAL INDOOR-AIR IMPACTS (volatile chemicals only)

CHEMICAL PARAMETER	Physical State		[1,4]Residential Land Use		Commercial/Industrial Land Use	
			Vadose-Zone Soil Type		Vadose-Zone Soil Type	
			[2]High Permeability	[3]Low/Moderate Permeability	[2]High Permeability	[3]Low/Moderate Permeability
			(ug/L)	(ug/L)	(ug/L)	(ug/L)
TRICHLOROPHENOL, 2,4,6-	NV	S				
VANADIUM	NV	S				
VINYL CHLORIDE	V	G	4.0E+00	1.7E+01	1.3E+01	5.7E+01
#XYLENES	V	L	1.5E+05	1.6E+05	1.6E+05	1.6E+05
ZINC	NV	S				

Notes:

1. "Residential" screening levels generally considered adequate for other sensitive uses (e.g., day-care centers, hospitals, etc.).
2. High permeability soil model: One meter dry sandy soil (92% sand, 5% silt, 3% clay) over one meter moist clayey loam (33% sand, 34% silt, 33% clay).
3. Low/Moderate permeability soil model: One meter dry loamy sand (83% sand, 11% silt, 6% clay) over one meter moist silt (7% sand, 87% silt, 6% clay).
4. For includion in Tier 1 screening levels, all groundwater assumed to potentially migrate under a residential area. Screening levels for protection of indoor air under a residential exposure scenario carried forward for use at both residential and commercial/industrial sites (see Table F series).

Screening levels calculated using spreadhseet provided with *User's Guide for the Johnson and Ettinger Indoor Air model (1991) for Subsurface Vapor* Intrusion Into Buildings (USEPA 2001). Assumed vadose-zone thickness/depth to groundwater three meters. See Appendix 1 text for model details.
Physical state of chemical at ambient conditions (V - volatile, NV - nonvolatile, S -id, L - liquid, G - gas).
Chemical considered to be "volatile" if Henry's number (atm m3/mole) >0.00001 and molecular weight <200.
Dibromochloromethane, dibromochloropropane and pyrene considered volatile for purposes of modeling (USEPA 2002).
Target cancer risk = 1E-06, Target Hazard Quotient = 0.2
"#": Nonchlorinated VOCs (except MTBE) adjusted upwards by factor of ten to account for assumed biodegradation in vadose-zone prior to emision at surface.
NV: No value. Use soil gas data to evaluate potential indoor-air impact concerns.

TABLE E-1b. SOIL SCREENING LEVELS
FOR EVALUATION OF POTENTIAL INDOOR-AIR IMPACTS
(volatile chemicals only)
(Use with Soil Gas Screening Levels for sites with significant VOC releases)

CHEMICAL PARAMETER	Physical State		Residenital Exposure (mg/kg)	Commercial/Industrial Exposure (mg/kg)
#ACENAPHTHENE	V	S	1.3E+02	1.3E+02
ACENAPHTHYLENE	V	S	(NV: Use soil gas)	(NV: Use soil gas)
#ACETONE	V	L	1.6E+02	3.6E+02
ALDRIN	NV	S		
#ANTHRACENE	V	S	6.1E+00	6.1E+00
ANTIMONY	NV	S		
ARSENIC	NV	S		
BARIUM	NV	S		
#BENZENE	V	L	1.8E-01	5.0E-01
BENZO(a)ANTHRACENE	NV	S		
BENZO(b)FLUORANTHENE	NV	S		
BENZO(k)FLUORANTHENE	NV	S		
BENZO(g,h,i)PERYLENE	NV	S		
BENZO(a)PYRENE	NV	S		
BERYLLIUM	NV	S		
BIPHENYL, 1,1-	V	S	(NV: Use soil gas)	(NV: Use soil gas)
BIS(2-CHLOROETHYL)ETHER	V	L	4.0E-03	1.3E-02
BIS(2-CHLOROISOPROPYL)ETHER	V	L	(NV: Use soil gas)	(NV: Use soil gas)
BIS(2-ETHYLHEXYL)PHTHALATE	NV	S		
BORON	NV	S		
BROMODICHLOROMETHANE	V	L	1.2E-02	3.9E-02
BROMOFORM	NV	S		
BROMOMETHANE	V	G	2.2E-01	5.1E-01
CADMIUM	NV	S		
CARBON TETRACHLORIDE	V	L	1.2E-02	3.5E-02
CHLORDANE	NV	S		
CHLOROANILINE, p-	NV	S		
CHLOROBENZENE	V	L	2.7E+00	6.2E+00
CHLOROETHANE	V	G	6.3E-01	1.8E+00
CHLOROFORM	V	L	9.8E-02	2.7E-01
CHLOROMETHANE	V	G	2.9E-01	8.1E-01
CHLOROPHENOL, 2-	V	L	8.8E-01	2.4E+00
CHROMIUM (Total)	NV	S		
CHROMIUM III	NV	S		
CHROMIUM VI	NV	S		
CHRYSENE	NV	S		
COBALT	NV	S		
COPPER	NV	S		
CYANIDE (Free)	NV	S		
DIBENZO(a,h)ANTHTRACENE	NV	S		
DIBROMOCHLOROMETHANE	V	S	1.9E-02	5.8E-02
1,2-DIBROMO-3-CHLOROPROPANE	V	L	(NV: Use soil gas)	(NV: Use soil gas)
DIBROMOETHANE, 1,2-	V	S	7.3E-03	2.1E-02
DICHLOROBENZENE, 1,2-	V	L	8.9E+00	2.1E+01
DICHLOROBENZENE, 1,3-	V	L	(NV: Use soil gas)	(NV: Use soil gas)
DICHLOROBENZENE, 1,4-	V	S	4.7E-02	1.3E-01
DICHLOROBENZIDINE, 3,3-	NV	S		

TABLE E-1b. SOIL SCREENING LEVELS
FOR EVALUATION OF POTENTIAL INDOOR-AIR IMPACTS
(volatile chemicals only)
(Use with Soil Gas Screening Levels for sites with significant VOC releases)

CHEMICAL PARAMETER	Physical State		Residenital Exposure (mg/kg)	Commercial/Industrial Exposure (mg/kg)
DICHLORODIPHENYLDICHLOROETHANE (DDD)	NV	S		
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	NV	S		
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	NV	S		
DICHLOROETHANE, 1,1-	V	L	3.3E-01	9.1E-01
DICHLOROETHANE, 1,2-	V	L	2.5E-02	6.9E-02
DICHLOROETHYLENE, 1,1-	V	L	8.9E+00	2.1E+01
DICHLOROETHYLENE, Cis 1,2-	V	L	1.6E+00	3.6E+00
DICHLOROETHYLENE, Trans 1,2-	V	L	3.1E+00	7.3E+00
DICHLOROPHENOL, 2,4-	NV	S		
DICHLOROPROPANE, 1,2-	V	L	5.2E-02	1.5E-01
DICHLOROPROPENE, 1,3-	V	L	3.3E-02	9.1E-02
DIELDRIN	NV	S		
DIETHYLPHTHALATE	NV	S		
DIMETHYLPHTHALATE	NV	S		
#DIMETHYLPHENOL, 2,4-	V	S	1.4E+02	3.7E+02
DINITROPHENOL, 2,4-	NV	S		
DINITROTOLUENE, 2,4-	NV	S		
1,4 DIOXANE	NV	L		
DIOXIN (2,3,7,8-TCDD)	NV	S		
ENDOSULFAN	NV	S		
ENDRIN	NV	S		
#ETHYLBENZENE	V	L	4.7E+00	1.3E+01
FLUORANTHENE	NV	S		
#FLUORENE	V	S	1.6E+02	1.6E+02
HEPTACHLOR	NV	S		
HEPTACHLOR EPOXIDE	NV	S		
HEXACHLOROBENZENE	NV	S		
HEXACHLOROBUTADIENE	NV	S		
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	NV	S		
HEXACHLOROETHANE	NV	S		
INDENO(1,2,3-cd)PYRENE	NV	S		
LEAD	NV	S		
MERCURY	NV	S		
METHOXYCHLOR	NV	S		
METHYLENE CHLORIDE	V	L	5.2E-01	1.5E+00
#METHYL ETHYL KETONE	V	L	9.9E+02	2.7E+03
#METHYL ISOBUTYL KETONE	V	L	1.3E+02	3.5E+02
METHYL MERCURY	NV	S		
#METHYLNAPHTHALENE (total 1- & 2-)	V	S	1.1E+02	1.1E+02
METHYL TERT BUTYL ETHER	V	L	2.0E+00	5.6E+00
MOLYBDENUM	NV	S		
#NAPHTHALENE	V	S	4.5E+00	1.2E+01
NICKEL	NV	S		
PENTACHLOROPHENOL	NV	S		
PERCHLORATE	NV	S		
PHENANTHRENE	V	S	(NV: Use soil gas)	(NV: Use soil gas)
PHENOL	NV	S		

TABLE E-1b. SOIL SCREENING LEVELS
FOR EVALUATION OF POTENTIAL INDOOR-AIR IMPACTS
(volatile chemicals only)
(Use with Soil Gas Screening Levels for sites with significant VOC releases)

CHEMICAL PARAMETER	Physical State		Residenital Exposure (mg/kg)	Commercial/Industrial Exposure (mg/kg)
POLYCHLORINATED BIPHENYLS (PCBs)	NV	S		
#PYRENE	V	S	8.5E+01	8.5E+01
SELENIUM	NV	S		
SILVER	NV	S		
#STYRENE	V	L	4.5E+02	1.0E+03
tert-BUTYL ALCOHOL	V	L	(NV: Use soil gas)	(NV: Use soil gas)
TETRACHLOROETHANE, 1,1,1,2-	V	L	(NV: Use soil gas)	(NV: Use soil gas)
TETRACHLOROETHANE, 1,1,2,2-	V	L	9.0E-03	2.5E-02
TETRACHLOROETHYLENE	V	L	8.8E-02	2.5E-01
THALLIUM	NV	S		
#TOLUENE	V	L	1.8E+02	4.2E+02
TOXAPHENE	NV	S		
TPH (gasolines)	V	L	(NV: Use soil gas)	(NV: Use soil gas)
TPH (middle distillates)	V	L	(NV: Use soil gas)	(NV: Use soil gas)
TPH (residual fuels)	NV	L/S		
TRICHLOROBENZENE, 1,2,4-	V	L	2.3E+01	6.1E+01
TRICHLOROETHANE, 1,1,1-	V	L	9.8E+01	2.3E+02
TRICHLOROETHANE, 1,1,2-	V	L	3.3E-02	9.1E-02
TRICHLOROETHYLENE	V	L	2.6E-01	7.3E-01
TRICHLOROPHENOL, 2,4,5-	V	S	2.4E+01	6.3E+01
TRICHLOROPHENOL, 2,4,6-	NV	S		
VANADIUM	NV	S		
VINYL CHLORIDE	V	G	6.7E-03	1.9E-02
#XYLENES	V	L	4.5E+01	1.0E+02
ZINC	NV	S		

Notes:

1. "Residential" screening levels generally considered adequate for other sensitive uses (e.g., day-care centers, hospitals, etc.).

Screening levels calculated using spreadhseet provided with *User's Guide for the Johnson and Ettinger Indoor Air Model (1991) for Subsurface Vapor Intrusion Into Buildings* (USEPA 2000 and updates).
Soil model: Two meters dry sandy soil (92% sand, 5% silt, 3% clay) directly underlying building foundation.
Physical state of chemical at ambient conditions (V - volatile, NV - nonvolatile, S -id, L - liquid, G - gas).
Chemical considered to be "volatile" if Henry's number (atm m3/mole) >0.00001 and molecular weight <200.
Dibromochloromethane, dibromochloropropane and pyrene considered volatile for purposes of modeling (USEPA 2002).
Target cancer risk = 1E-06, Target Hazard Quotient = 0.2
"#": Nonchlorinated VOCs (except MTBE) adjusted upwards by factor of ten to account for assumed biodegradation in vadose-zone prior to emision at surface.
NV: No value. Use soil gas data to evaluate potential indoor-air impact concerns.

TABLE E-2. [1]SHALLOW SOIL GAS SCREENING LEVELS FOR EVALUATION OF POTENTIAL INDOOR-AIR IMPACTS (volatile chemicals only)

CHEMICAL PARAMETER	Physical State		[2]Residential Exposure			Commercial/Industrial Land Use		
			Lowest Residential	Carcinogenic Effects	Noncarcinogenic Effects	Lowest C/I	Carcinogenic Effects	Noncarcinogenic Effects
			(ug/m^3)	(ug/m^3)	(ug/m^3)	(ug/m^3)	(ug/m^3)	(ug/m^3)
ACENAPHTHENE	V	S	4.4E+04		4.4E+04	1.2E+05		1.2E+05
ACENAPHTHYLENE	V	S	2.9E+04		2.9E+04	8.2E+04		8.2E+04
ACETONE	V	L	7.3E+04		7.3E+04	2.0E+05		2.0E+05
ALDRIN	NV	S						
ANTHRACENE	V	S	2.3E+05		2.3E+05	6.4E+05		6.4E+05
ANTIMONY	NV	S						
ARSENIC	NV	S						
BARIUM	NV	S						
BENZENE	V	L	8.4E+01	8.4E+01	1.3E+03	2.8E+02	2.8E+02	3.5E+03
BENZO(a)ANTHRACENE	NV	S						
BENZO(b)FLUORANTHENE	NV	S						
BENZO(k)FLUORANTHENE	NV	S						
BENZO(g,h,i)PERYLENE	NV	S						
BENZO(a)PYRENE	NV	S						
BERYLLIUM	NV	S						
BIPHENYL, 1,1-	V	S	3.7E+04		3.7E+04	1.0E+05		1.0E+05
BIS(2-CHLOROETHYL)ETHER	V	L	3.4E+00	3.4E+00		1.2E+01	1.2E+01	
BIS(2-CHLOROISOPROPYL)ETHER	V	L	2.4E+02	2.4E+02	2.9E+04	8.2E+02	8.2E+02	8.2E+04
BIS(2-ETHYLHEXYL)PHTHALATE	NV	S						
BORON	NV	S						
BROMODICHLOROMETHANE	V	L	6.6E+01	6.6E+01	1.5E+04	2.2E+02	2.2E+02	4.1E+04
BROMOFORM	NV	S						
BROMOMETHANE	V	G	1.0E+03		1.0E+03	2.9E+03		2.9E+03
CADMIUM	NV	S						
CARBON TETRACHLORIDE	V	L	5.1E-01	5.8E+01	5.1E-01	1.4E+00	1.9E+02	1.4E+00
CHLORDANE	NV	S						
CHLOROANILINE, p-	NV	S						
CHLOROBENZENE	V	L	1.3E+04		1.3E+04	3.5E+04		3.5E+04
CHLOROETHANE	V	G	2.9E+03	2.9E+03	2.1E+06	9.9E+03	9.9E+03	5.8E+06
CHLOROFORM	V	L	4.6E+02	4.6E+02	6.3E+02	1.5E+03	1.5E+03	1.8E+03
CHLOROMETHANE	V	G	1.4E+03	1.4E+03	6.3E+04	4.5E+03	4.5E+03	1.8E+05
CHLOROPHENOL, 2-	V	L	3.8E+03		3.8E+03	1.1E+04		1.1E+04
CHROMIUM (Total)	NV	S						
CHROMIUM III	NV	S						
CHROMIUM VI	NV	S						
CHRYSENE	NV	S						
COBALT	NV	S						

TABLE E-2. [1]SHALLOW SOIL GAS SCREENING LEVELS FOR EVALUATION OF POTENTIAL INDOOR-AIR IMPACTS (volatile chemicals only)

CHEMICAL PARAMETER	Physical State		[2]Residential Exposure			Commercial/Industrial Land Use		
			Lowest Residential (ug/m^3)	Carcinogenic Effects (ug/m^3)	Noncarcinogenic Effects (ug/m^3)	Lowest C/I (ug/m^3)	Carcinogenic Effects (ug/m^3)	Noncarcinogenic Effects (ug/m^3)
COPPER	NV	S						
CYANIDE (Free)	NV	S						
DIBENZO(a,h)ANTHTRACENE	NV	S						
DIBROMOCHLOROMETHANE	V	S	9.0E+01	9.0E+01	1.5E+04	3.0E+02	3.0E+02	4.1E+04
1,2-DIBROMO-3-CHLOROPROPANE	V	L	3.5E-04	3.5E-04	4.2E+01	1.2E-03	1.2E-03	1.2E+02
DIBROMOETHANE, 1,2-	V	S	3.4E+01	3.4E+01	4.2E+01	1.2E+02	1.2E+02	1.2E+02
DICHLOROBENZENE, 1,2-	V	L	4.2E+04		4.2E+04	1.2E+05		1.2E+05
DICHLOROBENZENE, 1,3-	V	L	6.7E+02		6.7E+02	1.9E+03		1.9E+03
DICHLOROBENZENE, 1,4-	V	S	2.2E+02	2.2E+02	1.7E+05	7.4E+02	7.4E+02	4.7E+05
DICHLOROBENZIDINE, 3,3-	NV	S						
DICHLORODIPHENYLDICHLOROETHANE (DDD)	NV	S						
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	NV	S						
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	NV	S						
DICHLOROETHANE, 1,1-	V	L	1.5E+03	1.5E+03	1.0E+05	5.1E+03	5.1E+03	2.9E+05
DICHLOROETHANE, 1,2-	V	L	1.2E+02	1.2E+02	1.0E+03	3.9E+02	3.9E+02	2.9E+03
DICHLOROETHYLENE, 1,1-	V	L	4.2E+04		4.2E+04	1.2E+05		1.2E+05
DICHLOROETHYLENE, Cis 1,2-	V	L	7.3E+03		7.3E+03	2.0E+04		2.0E+04
DICHLOROETHYLENE, Trans 1,2-	V	L	1.5E+04		1.5E+04	4.1E+04		4.1E+04
DICHLOROPHENOL, 2,4-	NV	S						
DICHLOROPROPANE, 1,2-	V	L	2.4E+02	2.4E+02	8.3E+02	8.2E+02	8.2E+02	2.3E+03
DICHLOROPROPENE, 1,3-	V	L	1.5E+02	1.5E+02	4.2E+03	5.1E+02	5.1E+02	1.2E+04
DIELDRIN	NV	S						
DIETHYLPHTHALATE	NV	S						
DIMETHYLPHTHALATE	NV	S						
DIMETHYLPHENOL, 2,4-	V	S	1.5E+04		1.5E+04	4.1E+04		4.1E+04
DINITROPHENOL, 2,4-	NV	S						
DINITROTOLUENE, 2,4-	NV	S						
1,4 DIOXANE	NV	L						
DIOXIN (2,3,7,8-TCDD)	NV	S						
ENDOSULFAN	NV	S						
ENDRIN	NV	S						
ETHYLBENZENE	V	L	2.2E+03	2.2E+03	2.1E+05	7.4E+03	7.4E+03	5.8E+05
FLUORANTHENE	NV	S						
FLUORENE	V	S	2.9E+04		2.9E+04	8.2E+04		8.2E+04
HEPTACHLOR	NV	S						
HEPTACHLOR EPOXIDE	NV	S						
HEXACHLOROBENZENE	NV	S						

TABLE E-2. [1]SHALLOW SOIL GAS SCREENING LEVELS FOR EVALUATION OF POTENTIAL INDOOR-AIR IMPACTS (volatile chemicals only)

CHEMICAL PARAMETER	Physical State		[2]Residential Exposure			Commercial/Industrial Land Use		
			Lowest Residential (ug/m^3)	Carcinogenic Effects (ug/m^3)	Noncarcinogenic Effects (ug/m^3)	Lowest C/I (ug/m^3)	Carcinogenic Effects (ug/m^3)	Noncarcinogenic Effects (ug/m^3)
HEXACHLOROBUTADIENE	NV	S						
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	NV	S						
HEXACHLOROETHANE	NV	S						
INDENO(1,2,3-cd)PYRENE	NV	S						
LEAD	NV	S						
MERCURY	NV	S						
METHOXYCHLOR	NV	S						
METHYLENE CHLORIDE	V	L	2.4E+03	2.4E+03	6.3E+05	8.2E+03	8.2E+03	1.8E+06
METHYL ETHYL KETONE	V	L	2.1E+05		2.1E+05	5.8E+05		5.8E+05
METHYL ISOBUTYL KETONE	V	L	1.7E+04		1.7E+04	4.7E+04		4.7E+04
METHYL MERCURY	NV	S						
METHYLNAPHTHALENE (total 1- & 2-)	V	S	2.9E+04		2.9E+04	8.2E+04		8.2E+04
METHYL TERT BUTYL ETHER	V	L	9.4E+03	9.4E+03	6.3E+05	3.1E+04	3.1E+04	1.8E+06
MOLYBDENUM	NV	S						
NAPHTHALENE	V	S	6.3E+02		6.3E+02	1.8E+03		1.8E+03
NICKEL	NV	S						
PENTACHLOROPHENOL	NV	S						
PERCHLORATE	NV	S						
PHENANTHRENE	V	S	2.9E+04		2.9E+04	8.2E+04		8.2E+04
PHENOL	NV	S						
POLYCHLORINATED BIPHENYLS (PCBs)	NV	S						
PYRENE	V	S	2.3E+04		2.3E+04	6.4E+04		6.4E+04
SELENIUM	NV	S						
SILVER	NV	S						
STYRENE	V	L	2.1E+05		2.1E+05	5.8E+05		5.8E+05
tert-BUTYL ALCOHOL	V	L	2.8E+03	2.8E+03		9.5E+03	9.5E+03	
TETRACHLOROETHANE, 1,1,1,2-	V	L	3.3E+02	3.3E+02	2.3E+04	1.1E+03	1.1E+03	6.4E+04
TETRACHLOROETHANE, 1,1,2,2-	V	L	4.2E+01	4.2E+01	4.4E+01	1.2E+02	1.4E+02	1.2E+02
TETRACHLOROETHYLENE	V	L	4.1E+02	4.1E+02	1.3E+05	1.4E+03	1.4E+03	3.5E+05
THALLIUM	NV	S						
TOLUENE	V	L	8.3E+04		8.3E+04	2.3E+05		2.3E+05
TOXAPHENE	NV	S						
TPH (gasolines)	V	L	1.0E+04		1.0E+04	2.9E+04		2.9E+04
TPH (middle distillates)	V	L	1.0E+04		1.0E+04	2.9E+04		2.9E+04
TPH (residual fuels)	NV	L/S						
TRICHLOROBENZENE, 1,2,4-	V	L	4.2E+04		4.2E+04	1.2E+05		1.2E+05
TRICHLOROETHANE, 1,1,1-	V	L	4.6E+04		4.6E+04	1.3E+05		1.3E+05

TABLE E-2. [1]SHALLOW SOIL GAS SCREENING LEVELS FOR EVALUATION OF POTENTIAL INDOOR-AIR IMPACTS (volatile chemicals only)

CHEMICAL PARAMETER	Physical State		[2]Residential Exposure			Commercial/Industrial Land Use		
			Lowest Residential	Carcinogenic Effects	Noncarcinogenic Effects	Lowest C/I	Carcinogenic Effects	Noncarcinogenic Effects
			(ug/m^3)	(ug/m^3)	(ug/m^3)	(ug/m^3)	(ug/m^3)	(ug/m^3)
TRICHLOROETHANE, 1,1,2-	V	L	1.5E+02	1.5E+02	2.9E+03	5.1E+02	5.1E+02	8.2E+03
TRICHLOROETHYLENE	V	L	1.2E+03	1.2E+03	7.3E+03	4.1E+03	4.1E+03	2.0E+04
TRICHLOROPHENOL, 2,4,5-	V	S	7.3E+04		7.3E+04	2.0E+05		2.0E+05
TRICHLOROPHENOL, 2,4,6-	NV	S						
VANADIUM	NV	S						
VINYL CHLORIDE	V	G	3.1E+01	3.1E+01		1.0E+02	1.0E+02	
XYLENES	V	L	2.1E+04		2.1E+04	5.8E+04		5.8E+04
ZINC	NV	S						

Notes:

1. Shallow soil gas defined as soil gas sample data collected within 1.5 meters (five feet) from a building foundation or the ground surface. Assumes very permeable (e.g., sandy) fill material is present below building foundation or could be present below future buildings following redevelopment. Evaluation of deeper soil gas data (e.g., >1.5m bgs) should be carried out on a site-specific basis.
2. "Residential" screening levels generally considered adequate for other sensitive uses (e.g., day-care centers, hospitals, etc.).

Soil gas screening levels intended to be protective of indoor air quality, calculated for volatile chemicals only.
Physical state of chemical at ambient conditions (V - volatile, NV - nonvolatile, S - solid, L - liquid, G - gas).
Chemical considered to be "volatile" if Henry's number (atm m3/mole) >0.00001 and molecular weight <200 (see Table E-1).
Dibromochloromethane, dibromochloropropane and pyrene considered volatile for purposes of modeling (USEPA 2002).
Target cancer risk = 1E-06, Target Hazard Quotient = 0.2
Residential soil gas:indoor air attenuation factor = 0.001 (1/1000). Commercial/industrial soil gas:indoor air attenuation factor = 0.0005 (1/2000).
Soil gas screening levels do not address mass-balance issues. May be overly conservative for sites with low permeability shallow soils or limited soil impacts and no groundwater source of VOCs.
Indoor-air sampling and/or passive vapor mitigation measures may be prudent for sites where concentrations of chemicals in soil gas approach but do not exceed screening levels.

TABLE E-3. INDOOR AIR SCREENING LEVELS
(volatile chemicals only)

CHEMICAL PARAMETER	Physical State		Health-Based Screening Levels								50% Odor Recognition Threshold (Table H-2) (ug/m³)
			Unit Risk Factor URF (ug/m³)⁻¹	Reference Concentration RfC (ug/m³)	Residential Exposure			Commercial/Industrial Exposure			
					Lowest Residential (ug/m³)	Indoor Air (carcinogens) (ug/m³)	Indoor Air (noncarcinogens) (ug/m³)	Lowest C/I (ug/m³)	Indoor Air (carcinogens) (ug/m³)	Indoor Air (noncarcinogens) (ug/m³)	
ACENAPHTHENE	V	S		2.1E+02	4.4E+01		4.4E+01	6.1E+01		6.1E+01	5.13E+02
ACENAPHTHYLENE	V	S		1.4E+02	2.9E+01		2.9E+01	4.1E+01		4.1E+01	
ACETONE	V	L		3.5E+02	7.3E+01		7.3E+01	1.0E+02		1.0E+02	3.09E+04
ALDRIN	NV	S									
ANTHRACENE	V	S		1.1E+03	2.3E+02		2.3E+02	3.2E+02		3.2E+02	
ANTIMONY	NV	S									
ARSENIC	NV	S									
BARIUM	NV	S									
BENZENE	V	L	2.9E-05	6.0E+00	8.4E-02	8.4E-02	1.3E+00	1.4E-01	1.4E-01	1.8E+00	4.89E+03
BENZO(a)ANTHRACENE	NV	S									
BENZO(b)FLUORANTHENE	NV	S									
BENZO(k)FLUORANTHENE	NV	S									
BENZO(g,h,i)PERYLENE	NV	S									
BENZO(a)PYRENE	NV	S									
BERYLLIUM	NV	S									
BIPHENYL, 1,1-	V	S		1.8E+02	3.7E+01		3.7E+01	5.1E+01		5.1E+01	
BIS(2-CHLOROETHYL)ETHER	V	L	7.1E-04		3.4E-03	3.4E-03		5.8E-03	5.8E-03		2.87E+02
BIS(2-CHLOROISOPROPYL)ETHER	V	L	1.0E-05	1.4E+02	2.4E-01	2.4E-01	2.9E+01	4.1E-01	4.1E-01	4.1E+01	
BIS(2-ETHYLHEXYL)PHTHALATE	NV	S									
BORON	NV	S									
BROMODICHLOROMETHANE	V	L	3.7E-05	7.0E+01	6.6E-02	6.6E-02	1.5E+01	1.1E-01	1.1E-01	2.0E+01	1.10E+07
BROMOFORM	NV	S									
BROMOMETHANE	V	G		4.9E+00	1.0E+00		1.0E+00	1.4E+00		1.4E+00	8.00E+04
CADMIUM	NV	S									
CARBON TETRACHLORIDE	V	L	4.2E-05	2.5E-03	5.1E-04	5.8E-02	5.1E-04	7.2E-04	9.7E-02	7.2E-04	6.30E+04
CHLORDANE	NV	S									
CHLOROANILINE, p-	NV	S									
CHLOROBENZENE	V	L		6.0E+01	1.3E+01		1.3E+01	1.8E+01		1.8E+01	1.00E+03
CHLOROETHANE	V	G	8.3E-07	1.0E+04	2.9E+00	2.9E+00	2.1E+03	4.9E+00	4.9E+00	2.9E+03	3.80E+05
CHLOROFORM	V	L	5.3E-06	3.0E+00	4.6E-01	4.6E-01	6.3E-01	7.7E-01	7.7E-01	8.8E-01	4.22E+05
CHLOROMETHANE	V	G	1.8E-06	3.0E+02	1.4E+00	1.4E+00	6.3E+01	2.3E+00	2.3E+00	8.8E+01	
CHLOROPHENOL, 2-	V	L		1.8E+01	3.8E+00		3.8E+00	5.3E+00		5.3E+00	1.90E+01
CHROMIUM (Total)	NV	S									
CHROMIUM III	NV	S									
CHROMIUM VI	NV	S									
CHRYSENE	NV	S									
COBALT	NV	S									
COPPER	NV	S									
CYANIDE (Free)	NV	S									
DIBENZO(a,h)ANTHTRACENE	NV	S									
DIBROMOCHLOROMETHANE	V	S	2.7E-05	7.0E+01	9.0E-02	9.0E-02	1.5E+01	1.5E-01	1.5E-01	2.0E+01	
1,2-DIBROMO-3-CHLOROPROPANE	V	L	7.0E+00	2.0E-01	3.5E-07	3.5E-07	4.2E-02	5.8E-07	5.8E-07	5.8E-02	

TABLE E-3. INDOOR AIR SCREENING LEVELS
(volatile chemicals only)

CHEMICAL PARAMETER	Physical State		Health-Based Screening Levels								50% Odor Recognition Threshold (Table H-2) (ug/m³)
			Unit Risk Factor URF (ug/m³)⁻¹	Reference Concentration RfC (ug/m³)	Residential Exposure			Commercial/Industrial Exposure			
					Lowest Residential (ug/m³)	Indoor Air (carcinogens) (ug/m³)	Indoor Air (noncarcinogens) (ug/m³)	Lowest C/I (ug/m³)	Indoor Air (carcinogens) (ug/m³)	Indoor Air (noncarcinogens) (ug/m³)	
DIBROMOETHANE, 1,2-	V	S	7.1E-05	2.0E-01	3.4E-02	3.4E-02	4.2E-02	5.8E-02	5.8E-02	5.8E-02	
DICHLOROBENZENE, 1,2-	V	L		2.0E+02	4.2E+01		4.2E+01	5.8E+01		5.8E+01	3.05E+05
DICHLOROBENZENE, 1,3-	V	L		3.2E+00	6.7E-01		6.7E-01	9.3E-01		9.3E-01	
DICHLOROBENZENE, 1,4-	V	S	1.1E-05	8.0E+02	2.2E-01	2.2E-01	1.7E+02	3.7E-01	3.7E-01	2.3E+02	1.10E+03
DICHLOROBENZIDINE, 3,3-	NV	S									
DICHLORODIPHENYLDICHLOROETHANE (DDD)	NV	S									
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	NV	S									
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	NV	S									
DICHLOROETHANE, 1,1-	V	L	1.6E-06	5.0E+02	1.5E+00	1.5E+00	1.0E+02	2.6E+00	2.6E+00	1.5E+02	1.25E+05
DICHLOROETHANE, 1,2-	V	L	2.1E-05	4.9E+00	1.2E-01	1.2E-01	1.0E+00	1.9E-01	1.9E-01	1.4E+00	2.42E+03
DICHLOROETHYLENE, 1,1-	V	L		2.0E+02	4.2E+01		4.2E+01	5.8E+01		5.8E+01	2.00E+06
DICHLOROETHYLENE, Cis 1,2-	V	L		3.5E+01	7.3E+00		7.3E+00	1.0E+01		1.0E+01	
DICHLOROETHYLENE, Trans 1,2-	V	L		7.0E+01	1.5E+01		1.5E+01	2.0E+01		2.0E+01	6.73E+04
DICHLOROPHENOL, 2,4-	NV	S									
DICHLOROPROPANE, 1,2-	V	L	1.0E-05	4.0E+00	2.4E-01	2.4E-01	8.3E-01	4.1E-01	4.1E-01	1.2E+00	1.19E+03
DICHLOROPROPENE, 1,3-	V	L	1.6E-05	2.0E+01	1.5E-01	1.5E-01	4.2E+00	2.6E-01	2.6E-01	5.8E+00	4.16E+03
DIELDRIN	NV	S									
DIETHYLPHTHALATE	NV	S									
DIMETHYLPHTHALATE	NV	S									
DIMETHYLPHENOL, 2,4-	V	S		7.0E+01	1.5E+01		1.5E+01	2.0E+01		2.0E+01	1.00E+00
DINITROPHENOL, 2,4-	NV	S									
DINITROTOLUENE, 2,4-	NV	S									
1,4 DIOXANE	NV	L									
DIOXIN (2,3,7,8-TCDD)	NV	S									
ENDOSULFAN	NV	S									
ENDRIN	NV	S									
ETHYLBENZENE	V	L	1.1E-06	1.0E+03	2.2E+00	2.2E+00	2.1E+02	3.7E+00	3.7E+00	2.9E+02	2.00E+03
FLUORANTHENE	NV	S									
FLUORENE	V	S		1.4E+02	2.9E+01		2.9E+01	4.1E+01		4.1E+01	
HEPTACHLOR	NV	S									
HEPTACHLOR EPOXIDE	NV	S									
HEXACHLOROBENZENE	NV	S									
HEXACHLOROBUTADIENE	NV	S									
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	NV	S									
HEXACHLOROETHANE	NV	S									
INDENO(1,2,3-cd)PYRENE	NV	S									
LEAD	NV	S									
MERCURY	NV	S									
METHOXYCHLOR	NV	S									
METHYLENE CHLORIDE	V	L	1.0E-06	3.0E+03	2.4E+00	2.4E+00	6.3E+02	4.1E+00	4.1E+00	8.8E+02	5.60E+05
METHYL ETHYL KETONE	V	L		1.0E+03	2.1E+02		2.1E+02	2.9E+02		2.9E+02	
METHYL ISOBUTYL KETONE	V	L		8.1E+01	1.7E+01		1.7E+01	2.4E+01		2.4E+01	

TABLE E-3. INDOOR AIR SCREENING LEVELS
(volatile chemicals only)

CHEMICAL PARAMETER	Physical State		Health-Based Screening Levels								50% Odor Recognition Threshold (Table H-2) (ug/m^3)
			Unit Risk Factor URF $(ug/m^3)^{-1}$	Reference Concentration RfC (ug/m^3)	Residential Exposure			Commercial/Industrial Exposure			
					Lowest Residential (ug/m^3)	Indoor Air (carcinogens) (ug/m^3)	Indoor Air (noncarcinogens) (ug/m^3)	Lowest C/I (ug/m^3)	Indoor Air (carcinogens) (ug/m^3)	Indoor Air (noncarcinogens) (ug/m^3)	
METHYL MERCURY	NV	S									
METHYLNAPHTHALENE (total 1- & 2-)	V	S		1.4E+02	2.9E+01		2.9E+01	4.1E+01		4.1E+01	6.80E+01
METHYL TERT BUTYL ETHER	V	L	2.6E-07	3.0E+03	9.4E+00	9.4E+00	6.3E+02	1.6E+01	1.6E+01	8.8E+02	5.30E+02
MOLYBDENUM	NV	S									
NAPHTHALENE	V	S		3.0E+00	6.3E-01		6.3E-01	8.8E-01		8.8E-01	4.40E+02
NICKEL	NV	S									
PENTACHLOROPHENOL	NV	S									
PERCHLORATE	NV	S									
PHENANTHRENE	V	S		1.4E+02	2.9E+01		2.9E+01	4.1E+01		4.1E+01	
PHENOL	NV	S									
POLYCHLORINATED BIPHENYLS (PCBs)	NV	S									
PYRENE	V	S		1.1E+02	2.3E+01		2.3E+01	3.2E+01		3.2E+01	
SELENIUM	NV	S									
SILVER	NV	S									
STYRENE	V	L		1.0E+03	2.1E+02		2.1E+02	2.9E+02		2.9E+02	1.36E+03
tert-BUTYL ALCOHOL	V	L	8.6E-07		2.8E+00	2.8E+00		4.8E+00	4.8E+00		
TETRACHLOROETHANE, 1,1,1,2-	V	L	7.4E-06	1.1E+02	3.3E-01	3.3E-01	2.3E+01	5.5E-01	5.5E-01	3.2E+01	
TETRACHLOROETHANE, 1,1,2,2-	V	L	5.8E-05	2.1E-01	4.2E-02	4.2E-02	4.4E-02	6.1E-02	7.0E-02	6.1E-02	1.05E+04
TETRACHLOROETHYLENE	V	L	5.9E-06	6.0E+02	4.1E-01	4.1E-01	1.3E+02	6.9E-01	6.9E-01	1.8E+02	3.17E+04
THALLIUM	NV	S									
TOLUENE	V	L		4.0E+02	8.3E+01		8.3E+01	1.2E+02		1.2E+02	3.00E+04
TOXAPHENE	NV	S									
TPH (gasolines)	V	L		5.0E+01	1.0E+01		1.0E+01	1.5E+01		1.5E+01	1.00E+02
TPH (middle distillates)	V	L		5.0E+01	1.0E+01		1.0E+01	1.5E+01		1.5E+01	1.00E+03
TPH (residual fuels)	NV	L/S									
TRICHLOROBENZENE, 1,2,4-	V	L		2.0E+02	4.2E+01		4.2E+01	5.8E+01		5.8E+01	2.20E+04
TRICHLOROETHANE, 1,1,1-	V	L		2.2E+02	4.6E+01		4.6E+01	6.4E+01		6.4E+01	6.51E+04
TRICHLOROETHANE, 1,1,2-	V	L	1.6E-05	1.4E+01	1.5E-01	1.5E-01	2.9E+00	2.6E-01	2.6E-01	4.1E+00	
TRICHLOROETHYLENE	V	L	2.0E-06	3.5E+01	1.2E+00	1.2E+00	7.3E+00	2.0E+00	2.0E+00	1.0E+01	1.36E+06
TRICHLOROPHENOL, 2,4,5-	V	S		3.5E+02	7.3E+01		7.3E+01	1.0E+02		1.0E+02	
TRICHLOROPHENOL, 2,4,6-	NV	S									
VANADIUM	NV	S									

TABLE E-3. INDOOR AIR SCREENING LEVELS
(volatile chemicals only)

CHEMICAL PARAMETER	Physical State		Health-Based Screening Levels: Unit Risk Factor URF $(ug/m^3)^{-1}$	Reference Concentration RfC (ug/m^3)	Residential Exposure: Lowest Residential (ug/m^3)	Residential Exposure: Indoor Air (carcinogens) (ug/m^3)	Residential Exposure: Indoor Air (noncarcinogens) (ug/m^3)	Commercial/Industrial Exposure: Lowest C/I (ug/m^3)	Commercial/Industrial Exposure: Indoor Air (carcinogens) (ug/m^3)	Commercial/Industrial Exposure: Indoor Air (noncarcinogens) (ug/m^3)	50% Odor Recognition Threshold (Table H-2) (ug/m^3)
VINYL CHLORIDE	V	G	7.8E-05		3.1E-02	3.1E-02		5.2E-02	5.2E-02		7.71E+05
XYLENES	V	L		1.0E+02	2.1E+01		2.1E+01	2.9E+01		2.9E+01	4.41E+02
ZINC	NV	S									

Notes:

1. "Residential" screening levels generally considered adequate for other sensitive uses (e.g., day-care centers, hospitals, etc.).

Target cancer risk = 1E-06, Target Hazard Quotient = 0.2

Physical state of chemical at ambient conditions (V - volatile, NV - nonvolatile, S - solid, L - liquid, G - gas).

Chemical considered to be "volatile" if Henry's number (atm m3/mole) >0.00001 and molecular weight <200 (see Table E-1).

Dibromochloromethane, dibromochloropropane and pyrene considered volatile for purposes of modeling (USEPA 2002).

Calculated based on spreadhseet provided with User's Guide for the Johnson and Ettinger Indoor Air model (1991) for Subsurface Vapor Intrusion Into Buildings (USEPA 1997) using default input parameter values noted in Appendix 4 (see text for equations).

Indoor air screening levels listed only for volatile chemicals included in database of referenced model spreadsheet (plus MTBE).

URFs from Cal EPA DHS (Cal EPA 2001) where available (marked by "*") or otherwise as presented in referenced spreadhseet (USEPA 2000). RfCs presented in spreadsheet or added as indicated in Appendix 4 (refer to footnotes to VLOOKUP worksheet).

URF for TBA based on conversion of CSF presented in Table J.

50% Odor Recognition Thresholds from Massachusetts Department of Environmental Protection (MADEP, 1994) and ATSDR; included for reference (potential nuisance concerns, see Table H series).

TABLE F-1a. GROUNDWATER SCREENING LEVELS
(groundwater IS a current or potential drinking water resource)
(ug/l)

CHEMICAL PARAMETER	[1]Final Groundwater Screening Level	Basis	Ceiling Value (Taste & odors, etc.) Table I-1	Drinking Water Toxicity Table F-3	Indoor Air Impacts Table E-1a	Aquatic Habitat Goal (chronic) Table F-4a
ACENAPHTHENE	2.0E+01	Ceiling Value	2.0E+01	4.2E+02	4.2E+03	2.3E+01
ACENAPHTHYLENE	3.0E+01	Aquatic Habitat Goal	2.0E+03	2.8E+02	(NV: Use soil gas)	3.0E+01
ACETONE	7.0E+02	Drinking Water Toxicity	2.0E+04	7.0E+02	6.0E+06	1.5E+03
ALDRIN	2.0E-03	Drinking Water Toxicity	8.5E+00	2.0E-03		1.3E-01
ANTHRACENE	7.3E-01	Aquatic Habitat Goal	2.2E+01	2.1E+03	4.3E+01	7.3E-01
ANTIMONY	6.0E+00	Drinking Water Toxicity	5.0E+04	6.0E+00		3.0E+01
ARSENIC	3.6E+01	Aquatic Habitat Goal	5.0E+04	5.0E+01		3.6E+01
BARIUM	1.0E+03	Aquatic Habitat Goal	5.0E+04	1.0E+03		1.0E+03
BENZENE	1.0E+00	Drinking Water Toxicity	1.7E+02	1.0E+00	5.3E+02	4.6E+01
BENZO(a)ANTHRACENE	2.7E-02	Aquatic Habitat Goal	5.0E+00	2.9E-02		2.7E-02
BENZO(b)FLUORANTHENE	2.9E-02	Aquatic Habitat Goal	7.0E+00	2.9E-02		2.9E-02
BENZO(k)FLUORANTHENE	2.9E-02	Drinking Water Toxicity	4.0E-01	2.9E-02		3.7E+00
BENZO(g,h,i)PERYLENE	1.0E-01	Aquatic Habitat Goal	1.3E-01	2.8E+02		1.0E-01
BENZO(a)PYRENE	1.4E-02	Aquatic Habitat Goal	1.9E+00	2.0E-01		1.4E-02
BERYLLIUM	2.7E+00	Aquatic Habitat Goal	5.0E+04	4.0E+00		2.7E+00
BIPHENYL, 1,1-	5.0E-01	Ceiling Value	5.0E-01	3.5E+02	(NV: Use soil gas)	1.4E+01
BIS(2-CHLOROETHYL)ETHER	1.4E-02	Drinking Water Toxicity	3.6E+02	1.4E-02	6.3E+01	6.1E+01
BIS(2-CHLOROISOPROPYL)ETHER	5.0E-01	Drinking Water Toxicity	3.2E+02	5.0E-01	(NV: Use soil gas)	6.1E+01
BIS(2-ETHYLHEXYL)PHTHALATE	4.0E+00	Drinking Water Toxicity	6.5E+02	4.0E+00		3.2E+01
BORON	1.6E+00	Aquatic Habitat Goal	5.0E+04	1.0E+03		1.6E+00
BROMODICHLOROMETHANE	1.0E+02	Drinking Water Toxicity	5.0E+04	1.0E+02	1.6E+02	3.2E+03
BROMOFORM	1.0E+02	Drinking Water Toxicity	5.1E+02	1.0E+02		3.2E+03
BROMOMETHANE	9.8E+00	Drinking Water Toxicity	5.0E+04	9.8E+00	5.8E+02	1.6E+02
CADMIUM	2.2E+00	Aquatic Habitat Goal	5.0E+04	5.0E+00		2.2E+00
CARBON TETRACHLORIDE	5.0E-01	Drinking Water Toxicity	5.2E+02	5.0E-01	9.5E+00	9.8E+00
CHLORDANE	4.0E-03	Aquatic Habitat Goal	2.5E+00	1.0E-01		4.0E-03
CHLOROANILINE, p-	5.0E+00	Aquatic Habitat Goal	5.0E+04	2.8E+01		5.0E+00
CHLOROBENZENE	2.5E+01	Aquatic Habitat Goal	5.0E+01	7.0E+01	1.3E+04	2.5E+01
CHLOROETHANE	1.2E+01	Aquatic Habitat Goal	1.6E+01	1.2E+01	8.2E+02	1.2E+01
CHLOROFORM	1.0E+02	Drinking Water Toxicity	2.4E+03	1.0E+02	3.4E+02	6.2E+02
CHLOROMETHANE	2.7E+00	Drinking Water Toxicity	5.0E+04	2.7E+00	1.7E+02	3.2E+03
CHLOROPHENOL, 2-	1.8E-01	Ceiling Value	1.8E-01	3.5E+01	5.5E+03	4.4E+02
CHROMIUM (Total)	5.0E+01	Drinking Water Toxicity	5.0E+04	5.0E+01		1.8E+02
CHROMIUM III	1.8E+02	Aquatic Habitat Goal	5.0E+04	2.0E+05		1.8E+02
CHROMIUM VI	1.1E+01	Aquatic Habitat Goal	5.0E+04	2.1E+01		1.1E+01
CHRYSENE	2.9E-01	Drinking Water Toxicity	8.0E-01	2.9E-01		3.5E-01
COBALT	3.0E+00	Aquatic Habitat Goal	5.0E+04	1.4E+02		3.0E+00
COPPER	3.1E+00	Aquatic Habitat Goal	1.0E+03	1.3E+03		3.1E+00
CYANIDE (Free)	1.0E+00	Aquatic Habitat Goal	1.7E+02	2.0E+02		1.0E+00

TABLE F-1a. GROUNDWATER SCREENING LEVELS
(groundwater IS a current or potential drinking water resource)
(ug/l)

CHEMICAL PARAMETER	[1]Final Groundwater Screening Level	Basis	Ceiling Value (Taste & odors, etc.) Table I-1	Drinking Water Toxicity Table F-3	Indoor Air Impacts Table E-1a	Aquatic Habitat Goal (chronic) Table F-4a
DIBENZO(a,h)ANTHTRACENE	8.5E-03	Drinking Water Toxicity	2.5E-01	8.5E-03		7.5E+00
DIBROMOCHLOROMETHANE	1.0E+02	Drinking Water Toxicity	5.0E+04	1.0E+02	1.8E+02	3.2E+03
1,2-DIBROMO-3-CHLOROPROPANE	2.0E-01	Aquatic Habitat Goal	1.0E+01	2.0E-01	(NV: Use soil gas)	2.0E-01
DIBROMOETHANE, 1,2-	5.0E-02	Drinking Water Toxicity	5.0E+04	5.0E-02	1.6E+02	1.4E+03
DICHLOROBENZENE, 1,2-	1.0E+01	Ceiling Value	1.0E+01	6.0E+02	7.8E+04	1.4E+01
DICHLOROBENZENE, 1,3-	6.3E+00	Drinking Water Toxicity	5.0E+04	6.3E+00	(NV: Use soil gas)	6.5E+01
DICHLOROBENZENE, 1,4-	5.0E+00	Ceiling Value	5.0E+00	5.0E+00	3.5E+02	1.5E+01
DICHLOROBENZIDINE, 3,3-	2.9E-02	Drinking Water Toxicity	1.6E+03	2.9E-02		2.5E+02
DICHLORODIPHENYLDICHLOROETHANE (DDD)	1.0E-03	Aquatic Habitat Goal	8.0E+01	1.5E-01		1.0E-03
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	1.0E-03	Aquatic Habitat Goal	2.0E+01	1.0E-01		1.0E-03
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	1.0E-03	Aquatic Habitat Goal	1.5E+00	1.0E-01		1.0E-03
DICHLOROETHANE, 1,1-	5.0E+00	Drinking Water Toxicity	5.0E+04	5.0E+00	1.0E+03	4.7E+01
DICHLOROETHANE, 1,2-	5.0E-01	Drinking Water Toxicity	7.0E+03	5.0E-01	2.0E+02	1.0E+04
DICHLOROETHYLENE, 1,1-	6.0E+00	Drinking Water Toxicity	1.5E+03	6.0E+00	6.3E+03	2.5E+01
DICHLOROETHYLENE, Cis 1,2-	6.0E+00	Drinking Water Toxicity	5.0E+04	6.0E+00	6.2E+03	5.9E+02
DICHLOROETHYLENE, Trans 1,2-	1.0E+01	Drinking Water Toxicity	2.6E+02	1.0E+01	6.7E+03	5.9E+02
DICHLOROPHENOL, 2,4-	3.0E-01	Ceiling Value	3.0E-01	2.1E+01		1.8E+02
DICHLOROPROPANE, 1,2-	5.0E+00	Drinking Water Toxicity	1.0E+01	5.0E+00	2.9E+02	1.5E+03
DICHLOROPROPENE, 1,3-	5.0E-01	Drinking Water Toxicity	5.0E+04	5.0E-01	4.9E+01	1.2E+02
DIELDRIN	1.9E-03	Aquatic Habitat Goal	4.1E+01	2.2E-03		1.9E-03
DIETHYLPHTHALATE	1.5E+00	Aquatic Habitat Goal	5.0E+04	5.6E+03		1.5E+00
DIMETHYLPHTHALATE	1.5E+00	Aquatic Habitat Goal	5.0E+04	7.0E+04		1.5E+00
DIMETHYLPHENOL, 2,4-	1.0E+02	Drinking Water Toxicity	4.0E+02	1.0E+02	2.8E+06	1.1E+02
DINITROPHENOL, 2,4-	1.4E+01	Drinking Water Toxicity	5.0E+04	1.4E+01		7.5E+01
DINITROTOLUENE, 2,4-	1.1E-01	Drinking Water Toxicity	5.0E+04	1.1E-01		1.2E+02
1,4 DIOXANE	3.0E+00	Drinking Water Toxicity	5.0E+04	3.0E+00		3.4E+05
DIOXIN (2,3,7,8-TCDD)	5.0E-06	Aquatic Habitat Goal	5.0E+04	3.0E-05		5.0E-06
ENDOSULFAN	8.7E-03	Aquatic Habitat Goal	7.5E+01	4.2E+01		8.7E-03
ENDRIN	2.3E-03	Aquatic Habitat Goal	4.1E+01	2.0E+00		2.3E-03
ETHYLBENZENE	3.0E+01	Ceiling Value	3.0E+01	7.0E+02	1.4E+04	2.9E+02
FLUORANTHENE	8.0E+00	Aquatic Habitat Goal	1.3E+02	2.8E+02		8.0E+00
FLUORENE	3.9E+00	Aquatic Habitat Goal	9.5E+02	2.8E+02	1.9E+03	3.9E+00
HEPTACHLOR	3.8E-03	Aquatic Habitat Goal	2.0E+01	1.0E-02		3.8E-03
HEPTACHLOR EPOXIDE	3.8E-03	Aquatic Habitat Goal	1.8E+02	1.0E-02		3.8E-03
HEXACHLOROBENZENE	1.0E+00	Drinking Water Toxicity	5.5E+01	1.0E+00		3.7E+00
HEXACHLOROBUTADIENE	2.1E-01	Drinking Water Toxicity	6.0E+00	2.1E-01		4.7E+00
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	8.0E-02	Aquatic Habitat Goal	3.5E+03	2.0E-01		8.0E-02
HEXACHLOROETHANE	7.0E-01	Drinking Water Toxicity	1.0E+01	7.0E-01		1.2E+01

TABLE F-1a. GROUNDWATER SCREENING LEVELS
(groundwater IS a current or potential drinking water resource)
(ug/l)

CHEMICAL PARAMETER	[1]Final Groundwater Screening Level	Basis	Ceiling Value (Taste & odors, etc.) Table I-1	Drinking Water Toxicity Table F-3	Indoor Air Impacts Table E-1a	Aquatic Habitat Goal (chronic) Table F-4a
INDENO(1,2,3-*cd*)PYRENE	2.9E-02	Aquatic Habitat Goal	2.7E-01	2.9E-02		2.9E-02
LEAD	2.5E+00	Aquatic Habitat Goal	5.0E+04	1.5E+01		2.5E+00
MERCURY	1.2E-02	Aquatic Habitat Goal	5.0E+04	2.0E+00		1.2E-02
METHOXYCHLOR	1.9E-02	Aquatic Habitat Goal	2.0E+01	4.0E+01		1.9E-02
METHYLENE CHLORIDE	5.0E+00	Drinking Water Toxicity	9.1E+03	5.0E+00	2.4E+03	2.2E+03
METHYL ETHYL KETONE	4.2E+03	Drinking Water Toxicity	8.4E+03	4.2E+03	5.5E+07	1.4E+04
METHYL ISOBUTYL KETONE	1.2E+02	Drinking Water Toxicity	1.3E+03	1.2E+02	3.1E+06	1.7E+02
METHYL MERCURY	3.0E-03	Aquatic Habitat Goal	5.0E+04	7.0E-02		3.0E-03
METHYLNAPHTHALENE (total 1- & 2-)	2.1E+00	Aquatic Habitat Goal	1.0E+01	2.8E+02	2.6E+04	2.1E+00
METHYL TERT BUTYL ETHER	5.0E+00	Ceiling Value	5.0E+00	1.3E+01	2.4E+04	8.0E+03
MOLYBDENUM	3.5E+01	Drinking Water Toxicity	5.0E+04	3.5E+01		2.4E+02
NAPHTHALENE	2.1E+01	Ceiling Value	2.1E+01	1.7E+02	2.8E+04	2.4E+01
NICKEL	8.2E+00	Aquatic Habitat Goal	5.0E+04	1.0E+02		8.2E+00
PENTACHLOROPHENOL	1.0E+00	Drinking Water Toxicity	3.0E+01	1.0E+00		7.9E+00
PERCHLORATE	7.0E-01	Drinking Water Toxicity	5.0E+04	7.0E-01		6.0E+02
PHENANTHRENE	4.6E+00	Aquatic Habitat Goal	4.1E+02	2.8E+02	(NV: Use soil gas)	4.6E+00
PHENOL	5.0E+00	Ceiling Value	5.0E+00	4.2E+03		1.3E+03
POLYCHLORINATED BIPHENYLS (PCBs)	1.4E-02	Aquatic Habitat Goal	1.6E+01	5.0E-01		1.4E-02
PYRENE	2.0E+00	Aquatic Habitat Goal	6.8E+01	2.1E+02	1.4E+02	2.0E+00
SELENIUM	5.0E+00	Aquatic Habitat Goal	5.0E+04	5.0E+01		5.0E+00
SILVER	1.9E-01	Aquatic Habitat Goal	1.0E+02	1.0E+02		1.9E-01
STYRENE	1.0E+01	Ceiling Value	1.0E+01	1.0E+02	3.1E+05	1.0E+02
tert-BUTYL ALCOHOL	1.2E+01	Drinking Water Toxicity	5.0E+04	1.2E+01	(NV: Use soil gas)	1.8E+04
TETRACHLOROETHANE, 1,1,1,2-	1.3E+00	Drinking Water Toxicity	5.0E+04	1.3E+00	(NV: Use soil gas)	9.3E+02
TETRACHLOROETHANE, 1,1,2,2-	1.0E+00	Drinking Water Toxicity	5.0E+02	1.0E+00	1.9E+02	4.2E+02
TETRACHLOROETHYLENE	5.0E+00	Drinking Water Toxicity	1.7E+02	5.0E+00	1.3E+02	1.2E+02
THALLIUM	2.0E+00	Drinking Water Toxicity	5.0E+04	2.0E+00		2.0E+01
TOLUENE	4.0E+01	Ceiling Value	4.0E+01	1.5E+02	5.0E+05	1.3E+02
TOXAPHENE	2.0E-04	Aquatic Habitat Goal	1.4E+02	3.0E+00		2.0E-04
TPH (gasolines)	1.0E+02	Ceiling Value	1.0E+02	2.1E+02	(NV: Use soil gas)	5.0E+02
TPH (middle distillates)	1.0E+02	Ceiling Value	1.0E+02	2.1E+02	(NV: Use soil gas)	6.4E+02
TPH (residual fuels)	1.0E+02	Ceiling Value	1.0E+02	2.1E+02		6.4E+02
TRICHLOROBENZENE, 1,2,4-	2.5E+01	Aquatic Habitat Goal	3.0E+03	7.0E+01	1.5E+05	2.5E+01
TRICHLOROETHANE, 1,1,1-	6.2E+01	Aquatic Habitat Goal	9.7E+02	2.0E+02	1.3E+05	6.2E+01
TRICHLOROETHANE, 1,1,2-	5.0E+00	Drinking Water Toxicity	5.0E+04	5.0E+00	3.5E+02	4.7E+03
TRICHLOROETHYLENE	5.0E+00	Drinking Water Toxicity	3.1E+02	5.0E+00	5.3E+02	3.6E+02
TRICHLOROPHENOL, 2,4,5-	1.1E+01	Aquatic Habitat Goal	2.0E+02	7.0E+02	8.2E+05	1.1E+01
TRICHLOROPHENOL, 2,4,6-	5.0E-01	Drinking Water Toxicity	1.0E+02	5.0E-01		4.9E+02

TABLE F-1a. GROUNDWATER SCREENING LEVELS
(groundwater IS a current or potential drinking water resource)
(ug/l)

CHEMICAL PARAMETER	[1]Final Groundwater Screening Level	Basis	Ceiling Value (Taste & odors, etc.) Table I-1	Drinking Water Toxicity Table F-3	Indoor Air Impacts Table E-1a	Aquatic Habitat Goal (chronic) Table F-4a
VANADIUM	1.5E+01	Drinking Water Toxicity	5.0E+04	1.5E+01		1.9E+01
VINYL CHLORIDE	5.0E-01	Drinking Water Toxicity	3.4E+03	5.0E-01	4.0E+00	7.8E+02
XYLENES	1.3E+01	Aquatic Habitat Goal	2.0E+01	1.8E+03	1.5E+05	1.3E+01
ZINC	8.1E+01	Aquatic Habitat Goal	5.0E+03	5.0E+03		8.1E+01

Notes:

Red: Updated with respect to RBSLs presented in August 2000 RBSL document.

1. Lowest of Ceiling Value, Drinking Water (toxicity) goal, Indoor-Air Impact goal and Aquatic Habitat Goal>Used to develop soil leaching levels for protection of groundwater quality.

NV: No value

TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.

sol - solubility threshold

Ceiling Level: Odor threshold, 1/2 solubility or 50000 ug/L maximum, whichever is lower. Intended to limit general groundwater resource degradation.

Odor-thresholds assume no dilution.

Human Toxicity: Based on primary maximum concentration levels (MCLs) considered protective of human health.

Indoor Air Impact: Addresses potential emission of volatile chemicals from groundwater and subsequent impact on indoor air. Value for very permeable (e.g., coarse-grained soils).

Aquatic Habitat Protection: Addresses potential discharge of groundwater to surface waterbody and subsequent impact on aquatic life; screening levels assume no dilution upon discharge to surface water unless otherwise noted.

Barium, ... surface water goals noted in Table F-4a not considered for groundwater due to low confidence in goals and elevated background water concentrations of these metals in Bay area groundwater.

Method detection limits and background concentrations replace final screening level as appropriate.

TABLE F-1b. GROUNDWATER SCREENING LEVELS
(groundwater IS NOT a current or potential drinking water resource)
(ug/l)

CHEMICAL PARAMETER	[1]Final Groundwater Screening Level	Basis	Groundwater Ceiling Value (odors, etc.) Table I-2	Indoor Air Impacts Table E-1a	Estuary Aquatic Habitat Goal (chronic) Table F-4a
ACENAPHTHENE	2.3E+01	Aquatic Habitat Goal	2.0E+02	4.2E+03	2.3E+01
ACENAPHTHYLENE	3.0E+01	Aquatic Habitat Goal	2.0E+03	(NV: Use soil gas)	3.0E+01
ACETONE	1.5E+03	Aquatic Habitat Goal	5.0E+04	6.0E+06	1.5E+03
ALDRIN	1.3E-01	Aquatic Habitat Goal	8.5E+00		1.3E-01
ANTHRACENE	7.3E-01	Aquatic Habitat Goal	2.2E+01	4.3E+01	7.3E-01
ANTIMONY	3.0E+01	Aquatic Habitat Goal	5.0E+04		3.0E+01
ARSENIC	3.6E+01	Aquatic Habitat Goal	5.0E+04		3.6E+01
BARIUM	1.0E+03	Aquatic Habitat Goal	5.0E+04		1.0E+03
BENZENE	4.6E+01	Aquatic Habitat Goal	2.0E+04	5.3E+02	4.6E+01
BENZO(a)ANTHRACENE	2.7E-02	Aquatic Habitat Goal	5.0E+00		2.7E-02
BENZO(b)FLUORANTHENE	2.9E-02	Aquatic Habitat Goal	7.0E+00		2.9E-02
BENZO(k)FLUORANTHENE	4.0E-01	Ceiling Value	4.0E-01		3.7E+00
BENZO(g,h,i)PERYLENE	1.0E-01	Aquatic Habitat Goal	1.3E-01		1.0E-01
BENZO(a)PYRENE	1.4E-02	Aquatic Habitat Goal	1.9E+00		1.4E-02
BERYLLIUM	2.7E+00	Aquatic Habitat Goal	5.0E+04		2.7E+00
BIPHENYL, 1,1-	5.0E+00	Ceiling Value	5.0E+00	(NV: Use soil gas)	1.4E+01
BIS(2-CHLOROETHYL)ETHER	6.1E+01	Aquatic Habitat Goal	3.6E+03	6.3E+01	6.1E+01
BIS(2-CHLOROISOPROPYL)ETHER	6.1E+01	Aquatic Habitat Goal	3.2E+03	(NV: Use soil gas)	6.1E+01
BIS(2-ETHYLHEXYL)PHTHALATE	3.2E+01	Aquatic Habitat Goal	6.5E+02		3.2E+01
BORON	1.6E+00	Aquatic Habitat Goal	5.0E+04		1.6E+00
BROMODICHLOROMETHANE	1.6E+02	Indoor Air Impacts	5.0E+04	1.6E+02	3.2E+03
BROMOFORM	3.2E+03	Aquatic Habitat Goal	5.1E+03		3.2E+03
BROMOMETHANE	1.6E+02	Aquatic Habitat Goal	5.0E+04	5.8E+02	1.6E+02
CADMIUM	2.2E+00	Aquatic Habitat Goal	5.0E+04		2.2E+00
CARBON TETRACHLORIDE	9.5E+00	Indoor Air Impacts	5.2E+03	9.5E+00	9.8E+00
CHLORDANE	4.0E-03	Aquatic Habitat Goal	2.5E+01		4.0E-03
CHLOROANILINE, p-	5.0E+00	Aquatic Habitat Goal	5.0E+04		5.0E+00
CHLOROBENZENE	2.5E+01	Aquatic Habitat Goal	5.0E+02	1.3E+04	2.5E+01
CHLOROETHANE	1.2E+01	Aquatic Habitat Goal	1.6E+02	8.2E+02	1.2E+01
CHLOROFORM	3.4E+02	Indoor Air Impacts	2.4E+04	3.4E+02	6.2E+02
CHLOROMETHANE	1.7E+02	Indoor Air Impacts	5.0E+04	1.7E+02	3.2E+03
CHLOROPHENOL, 2-	1.8E+00	Ceiling Value	1.8E+00	5.5E+03	4.4E+02
CHROMIUM (Total)	1.8E+02	Aquatic Habitat Goal	5.0E+04		1.8E+02
CHROMIUM III	1.8E+02	Aquatic Habitat Goal	5.0E+04		1.8E+02
CHROMIUM VI	1.1E+01	Aquatic Habitat Goal	5.0E+04		1.1E+01
CHRYSENE	3.5E-01	Aquatic Habitat Goal	8.0E-01		3.5E-01
COBALT	3.0E+00	Aquatic Habitat Goal	5.0E+04		3.0E+00
COPPER	3.1E+00	Aquatic Habitat Goal	5.0E+04		3.1E+00
CYANIDE (Free)	1.0E+00	Aquatic Habitat Goal	1.7E+03		1.0E+00
DIBENZO(a,h)ANTHTRACENE	2.5E-01	Ceiling Value	2.5E-01		7.5E+00

TABLE F-1b. GROUNDWATER SCREENING LEVELS
(groundwater IS NOT a current or potential drinking water resource)
(ug/l)

CHEMICAL PARAMETER	[1]Final Groundwater Screening Level	Basis	Groundwater Ceiling Value (odors, etc.) Table I-2	Indoor Air Impacts Table E-1a	Estuary Aquatic Habitat Goal (chronic) Table F-4a
DIBROMOCHLOROMETHANE	1.8E+02	Indoor Air Impacts	5.0E+04	1.8E+02	3.2E+03
1,2-DIBROMO-3-CHLOROPROPANE	2.0E-01	Aquatic Habitat Goal	1.0E+02	(NV: Use soil gas)	2.0E-01
DIBROMOETHANE, 1,2-	1.6E+02	Indoor Air Impacts	5.0E+04	1.6E+02	1.4E+03
DICHLOROBENZENE, 1,2-	1.4E+01	Aquatic Habitat Goal	1.0E+02	7.8E+04	1.4E+01
DICHLOROBENZENE, 1,3-	6.5E+01	Aquatic Habitat Goal	5.0E+04	(NV: Use soil gas)	6.5E+01
DICHLOROBENZENE, 1,4-	1.5E+01	Aquatic Habitat Goal	1.1E+02	3.5E+02	1.5E+01
DICHLOROBENZIDINE, 3,3-	2.5E+02	Aquatic Habitat Goal	1.6E+03		2.5E+02
DICHLORODIPHENYLDICHLOROETHANE (DDD)	1.0E-03	Aquatic Habitat Goal	8.0E+01		1.0E-03
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	1.0E-03	Aquatic Habitat Goal	2.0E+01		1.0E-03
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	1.0E-03	Aquatic Habitat Goal	1.5E+00		1.0E-03
DICHLOROETHANE, 1,1-	4.7E+01	Aquatic Habitat Goal	5.0E+04	1.0E+03	4.7E+01
DICHLOROETHANE, 1,2-	2.0E+02	Indoor Air Impacts	5.0E+04	2.0E+02	1.0E+04
DICHLOROETHYLENE, 1,1-	2.5E+01	Aquatic Habitat Goal	1.5E+04	6.3E+03	2.5E+01
DICHLOROETHYLENE, Cis 1,2-	5.9E+02	Aquatic Habitat Goal	5.0E+04	6.2E+03	5.9E+02
DICHLOROETHYLENE, Trans 1,2-	5.9E+02	Aquatic Habitat Goal	2.6E+03	6.7E+03	5.9E+02
DICHLOROPHENOL, 2,4-	3.0E+00	Ceiling Value	3.0E+00		1.8E+02
DICHLOROPROPANE, 1,2-	1.0E+02	Ceiling Value	1.0E+02	2.9E+02	1.5E+03
DICHLOROPROPENE, 1,3-	4.9E+01	Indoor Air Impacts	5.0E+04	4.9E+01	1.2E+02
DIELDRIN	1.9E-03	Aquatic Habitat Goal	9.3E+01		1.9E-03
DIETHYLPHTHALATE	1.5E+00	Aquatic Habitat Goal	5.0E+04		1.5E+00
DIMETHYLPHTHALATE	1.5E+00	Aquatic Habitat Goal	5.0E+04		1.5E+00
DIMETHYLPHENOL, 2,4-	1.1E+02	Aquatic Habitat Goal	4.0E+03	2.8E+06	1.1E+02
DINITROPHENOL, 2,4-	7.5E+01	Aquatic Habitat Goal	5.0E+04		7.5E+01
DINITROTOLUENE, 2,4-	1.2E+02	Aquatic Habitat Goal	5.0E+04		1.2E+02
1,4 DIOXANE	5.0E+04	Ceiling Value	5.0E+04		3.4E+05
DIOXIN (2,3,7,8-TCDD)	5.0E-06	Aquatic Habitat Goal	5.0E+04		5.0E-06
ENDOSULFAN	8.7E-03	Aquatic Habitat Goal	7.5E+01		8.7E-03
ENDRIN	2.3E-03	Aquatic Habitat Goal	1.3E+02		2.3E-03
ETHYLBENZENE	2.9E+02	Aquatic Habitat Goal	3.0E+02	1.4E+04	2.9E+02
FLUORANTHENE	8.0E+00	Aquatic Habitat Goal	1.3E+02		8.0E+00
FLUORENE	3.9E+00	Aquatic Habitat Goal	9.5E+02	1.9E+03	3.9E+00
HEPTACHLOR	3.8E-03	Aquatic Habitat Goal	2.8E+01		3.8E-03
HEPTACHLOR EPOXIDE	3.8E-03	Aquatic Habitat Goal	1.8E+02		3.8E-03
HEXACHLOROBENZENE	3.7E+00	Aquatic Habitat Goal	5.5E+01		3.7E+00
HEXACHLOROBUTADIENE	4.7E+00	Aquatic Habitat Goal	6.0E+01		4.7E+00
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	8.0E-02	Aquatic Habitat Goal	3.5E+03		8.0E-02
HEXACHLOROETHANE	1.2E+01	Aquatic Habitat Goal	1.0E+02		1.2E+01
INDENO(1,2,3-cd)PYRENE	2.9E-02	Aquatic Habitat Goal	2.7E-01		2.9E-02
LEAD	2.5E+00	Aquatic Habitat Goal	5.0E+04		2.5E+00
MERCURY	1.2E-02	Aquatic Habitat Goal	5.0E+04		1.2E-02

TABLE F-1b. GROUNDWATER SCREENING LEVELS
(groundwater IS NOT a current or potential drinking water resource)
(ug/l)

CHEMICAL PARAMETER	[1]Final Groundwater Screening Level	Basis	Groundwater Ceiling Value (odors, etc.) Table I-2	Indoor Air Impacts Table E-1a	Estuary Aquatic Habitat Goal (chronic) Table F-4a
METHOXYCHLOR	1.9E-02	Aquatic Habitat Goal	2.0E+01		1.9E-02
METHYLENE CHLORIDE	2.2E+03	Aquatic Habitat Goal	5.0E+04	2.4E+03	2.2E+03
METHYL ETHYL KETONE	1.4E+04	Aquatic Habitat Goal	5.0E+04	5.5E+07	1.4E+04
METHYL ISOBUTYL KETONE	1.7E+02	Aquatic Habitat Goal	1.3E+04	3.1E+06	1.7E+02
METHYL MERCURY	3.0E-03	Aquatic Habitat Goal	5.0E+04		3.0E-03
METHYLNAPHTHALENE (total 1- & 2-)	2.1E+00	Aquatic Habitat Goal	1.0E+02	2.6E+04	2.1E+00
METHYL TERT BUTYL ETHER	1.8E+03	Ceiling Value	1.8E+03	2.4E+04	8.0E+03
MOLYBDENUM	2.4E+02	Aquatic Habitat Goal	5.0E+04		2.4E+02
NAPHTHALENE	2.4E+01	Aquatic Habitat Goal	2.1E+02	2.8E+04	2.4E+01
NICKEL	8.2E+00	Aquatic Habitat Goal	5.0E+04		8.2E+00
PENTACHLOROPHENOL	7.9E+00	Aquatic Habitat Goal	5.9E+03		7.9E+00
PERCHLORATE	6.0E+02	Aquatic Habitat Goal	5.0E+04		6.0E+02
PHENANTHRENE	4.6E+00	Aquatic Habitat Goal	4.1E+02	(NV: Use soil gas)	4.6E+00
PHENOL	1.3E+03	Aquatic Habitat Goal	5.0E+04		1.3E+03
POLYCHLORINATED BIPHENYLS (PCBs)	1.4E-02	Aquatic Habitat Goal	1.6E+01		1.4E-02
PYRENE	2.0E+00	Aquatic Habitat Goal	6.8E+01	1.4E+02	2.0E+00
SELENIUM	5.0E+00	Aquatic Habitat Goal	5.0E+04		5.0E+00
SILVER	1.9E-01	Aquatic Habitat Goal	5.0E+04		1.9E-01
STYRENE	1.0E+02	Aquatic Habitat Goal	1.1E+02	3.1E+05	1.0E+02
tert-BUTYL ALCOHOL	1.8E+04	Aquatic Habitat Goal	5.0E+04	(NV: Use soil gas)	1.8E+04
TETRACHLOROETHANE, 1,1,1,2-	9.3E+02	Aquatic Habitat Goal	5.0E+04	(NV: Use soil gas)	9.3E+02
TETRACHLOROETHANE, 1,1,2,2-	1.9E+02	Indoor Air Impacts	5.0E+03	1.9E+02	4.2E+02
TETRACHLOROETHYLENE	1.2E+02	Aquatic Habitat Goal	3.0E+03	1.3E+02	1.2E+02
THALLIUM	2.0E+01	Aquatic Habitat Goal	5.0E+04		2.0E+01
TOLUENE	1.3E+02	Aquatic Habitat Goal	4.0E+02	5.0E+05	1.3E+02
TOXAPHENE	2.0E-04	Aquatic Habitat Goal	1.4E+02		2.0E-04
TPH (gasolines)	5.0E+02	Aquatic Habitat Goal	5.0E+03	(NV: Use soil gas)	5.0E+02
TPH (middle distillates)	6.4E+02	Aquatic Habitat Goal	2.5E+03	(NV: Use soil gas)	6.4E+02
TPH (residual fuels)	6.4E+02	Aquatic Habitat Goal	2.5E+03		6.4E+02
TRICHLOROBENZENE, 1,2,4-	2.5E+01	Aquatic Habitat Goal	3.0E+04	1.5E+05	2.5E+01
TRICHLOROETHANE, 1,1,1-	6.2E+01	Aquatic Habitat Goal	5.0E+04	1.3E+05	6.2E+01
TRICHLOROETHANE, 1,1,2-	3.5E+02	Indoor Air Impacts	5.0E+04	3.5E+02	4.7E+03
TRICHLOROETHYLENE	3.6E+02	Aquatic Habitat Goal	5.0E+04	5.3E+02	3.6E+02
TRICHLOROPHENOL, 2,4,5-	1.1E+01	Aquatic Habitat Goal	2.0E+03	8.2E+05	1.1E+01
TRICHLOROPHENOL, 2,4,6-	4.9E+02	Aquatic Habitat Goal	1.0E+03		4.9E+02
VANADIUM	1.9E+01	Aquatic Habitat Goal	5.0E+04		1.9E+01

TABLE F-1b. GROUNDWATER SCREENING LEVELS
(groundwater IS NOT a current or potential drinking water resource)
(ug/l)

CHEMICAL PARAMETER	[1]Final Groundwater Screening Level	Basis	Groundwater Ceiling Value (odors, etc.) Table I-2	Indoor Air Impacts Table E-1a	Estuary Aquatic Habitat Goal (chronic) Table F-4a
VINYL CHLORIDE	4.0E+00	Indoor Air Impacts	3.4E+04	4.0E+00	7.8E+02
XYLENES	1.3E+01	Aquatic Habitat Goal	5.3E+03	1.5E+05	1.3E+01
ZINC	8.1E+01	Aquatic Habitat Goal	5.0E+04		8.1E+01

Notes:

Red: Updated with respect to RBSLs presented in August 2000 RBSL document.

1. Lowest of groundwater Ceiling Value, Drinking Water (toxicity) goal, Indoor-Air Impact goal and Aquatic Habitat Goal. Used to develop soil leaching levels for protection of groundwater quality.

NV: No Value. Use of soil gas screening levels recommended for chemicals with inadequate physio-chemical constant data for groundwater models.

TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.

sol - solubility threshold

Category includes groundwater that does not meet drinking water quality requirements under natural conditions (e.g., excessive total dissolved solids) AND/OR situated in strata that lack adequate aquifer characteristics AND is not likely to otherwise directly impact a source of drinking water.

Ceiling Level: Odor threshold, 1/2 solubility or 50000 ug/L maximum, whichever is lower. Intended to limit general groundwater resource degradation.

Odor-thresholds assume ten-fold dilution of groundwater upon mixing with surface water.

Indoor Air Impact: Addresses potential emission of volatile chemicals from groundwater and subsequent impact on indoor air. Value for very permeable (e.g., coarse-grained soils).

Aquatic Life Protection: Addresses potential discharge of groundwater to surface waterbody and subsequent impact on aquatic life; screening levels assume no dilution upon discharge to surface water unless otherwise noted.

Method detection limits and background concentrations replace final screening level as appropriate.

TABLE F-2a. SURFACE WATER SCREENING LEVELS
Fresh Water Habitats
(ug/l)

CHEMICAL PARAMETER	[1]Final Surface Water Screening Level	Basis	Surface Water Ceiling Value (Taste & odors, etc.) Table I-3	Drinking Water (Toxicity) Table F-3	Fresh Water Aquatic Habitat Goal (chronic toxicity) Table F-4a	Bioaccumulation and Human Consumption Table F-4d
ACENAPHTHENE	2.0E+01	Ceiling Value	2.0E+01	4.2E+02	2.3E+01	2.7E+03
ACENAPHTHYLENE	3.0E+01	Aquatic Habitat Chronic Toxicity	2.0E+03	2.8E+02	3.0E+01	
ACETONE	7.0E+02	Drinking Water Toxicity	2.0E+04	7.0E+02	1.5E+03	
ALDRIN	1.4E-04	Bioaccumulation/Human Consumption	8.5E+00	2.0E-03	3.0E-01	1.4E-04
ANTHRACENE	7.3E-01	Aquatic Habitat Chronic Toxicity	2.2E+01	2.1E+03	7.3E-01	1.1E+05
ANTIMONY	6.0E+00	Drinking Water Toxicity	5.0E+04	6.0E+00	3.0E+01	4.3E+03
ARSENIC	1.4E-01	Bioaccumulation/Human Consumption	5.0E+04	5.0E+01	1.5E+02	1.4E-01
BARIUM	1.0E+03	Drinking Water Toxicity	5.0E+04	1.0E+03	1.0E+03	
BENZENE	1.0E+00	Drinking Water Toxicity	1.7E+02	1.0E+00	4.6E+01	7.1E+01
BENZO(a)ANTHRACENE	2.7E-02	Aquatic Habitat Chronic Toxicity	5.0E+00	2.9E-02	2.7E-02	4.9E-02
BENZO(b)FLUORANTHENE	2.9E-02	Drinking Water Toxicity	7.0E+00	2.9E-02	2.9E-02	4.9E-02
BENZO(k)FLUORANTHENE	2.9E-02	Drinking Water Toxicity	4.0E-01	2.9E-02	3.7E+00	4.9E-02
BENZO(g,h,i)PERYLENE	1.0E-01	Aquatic Habitat Chronic Toxicity	1.3E-01	2.8E+02	1.0E-01	
BENZO(a)PYRENE	1.4E-02	Aquatic Habitat Chronic Toxicity	1.9E+00	2.0E-01	1.4E-02	4.9E-02
BERYLLIUM	2.7E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	4.0E+00	2.7E+00	
BIPHENYL, 1,1-	5.0E-01	Ceiling Value	5.0E-01	3.5E+02	1.4E+01	
BIS(2-CHLOROETHYL)ETHER	1.4E-02	Drinking Water Toxicity	3.6E+02	1.4E-02	6.1E+01	1.4E+00
BIS(2-CHLOROISOPROPYL)ETHER	5.0E-01	Drinking Water Toxicity	3.2E+02	5.0E-01	6.1E+01	1.7E+05
BIS(2-ETHYLHEXYL)PHTHALATE	4.0E+00	Drinking Water Toxicity	6.5E+02	4.0E+00	3.2E+01	5.9E+00
BORON	1.6E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	1.0E+03	1.6E+00	
BROMODICHLOROMETHANE	1.0E+02	Drinking Water Toxicity	5.0E+04	1.0E+02	3.2E+03	
BROMOFORM	1.0E+02	Drinking Water Toxicity	5.1E+02	1.0E+02	3.2E+03	3.6E+02
BROMOMETHANE	9.8E+00	Drinking Water Toxicity	5.0E+04	9.8E+00	1.6E+02	4.0E+03
CADMIUM	2.2E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	5.0E+00	2.2E+00	
CARBON TETRACHLORIDE	5.0E-01	Drinking Water Toxicity	5.2E+02	5.0E-01	9.8E+00	4.4E+00
CHLORDANE	5.9E-04	Bioaccumulation/Human Consumption	2.5E+00	1.0E-01	4.3E-03	5.9E-04
CHLOROANILINE, p-	5.0E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	2.8E+01	5.0E+00	
CHLOROBENZENE	2.5E+01	Aquatic Habitat Chronic Toxicity	5.0E+01	7.0E+01	2.5E+01	2.1E+04
CHLOROETHANE	1.2E+01	Drinking Water Toxicity	1.6E+01	1.2E+01	1.2E+01	
CHLOROFORM	1.0E+02	Drinking Water Toxicity	2.4E+03	1.0E+02	6.2E+02	4.7E+02
CHLOROMETHANE	2.7E+00	Drinking Water Toxicity	5.0E+04	2.7E+00	3.2E+03	
CHLOROPHENOL, 2-	1.8E-01	Ceiling Value	1.8E-01	3.5E+01	4.4E+02	4.0E+02
CHROMIUM (Total)	5.0E+01	Drinking Water Toxicity	5.0E+04	5.0E+01	1.8E+02	
CHROMIUM III	1.8E+02	Aquatic Habitat Chronic Toxicity	5.0E+04	2.0E+05	1.8E+02	
CHROMIUM VI	1.1E+01	Aquatic Habitat Chronic Toxicity	5.0E+04	2.1E+01	1.1E+01	
CHRYSENE	4.9E-02	Bioaccumulation/Human Consumption	8.0E-01	2.9E-01	3.5E-01	4.9E-02

TABLE F-2a. SURFACE WATER SCREENING LEVELS
Fresh Water Habitats
(ug/l)

CHEMICAL PARAMETER	[1]Final Surface Water Screening Level	Basis	Surface Water Ceiling Value (Taste & odors, etc.) Table I-3	Drinking Water (Toxicity) Table F-3	Fresh Water Aquatic Habitat Goal (chronic toxicity) Table F-4a	Bioaccumulation and Human Consumption Table F-4d
COBALT	3.0E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	1.4E+02	3.0E+00	
COPPER	9.0E+00	Aquatic Habitat Chronic Toxicity	1.0E+03	1.3E+03	9.0E+00	
CYANIDE (Free)	5.2E+00	Aquatic Habitat Chronic Toxicity	1.7E+02	2.0E+02	5.2E+00	2.2E+05
DIBENZO(a,h)ANTHTRACENE	8.5E-03	Drinking Water Toxicity	2.5E-01	8.5E-03	7.5E+00	4.9E-02
DIBROMOCHLOROMETHANE	4.6E+01	Bioaccumulation/Human Consumption	5.0E+04	1.0E+02	3.2E+03	4.6E+01
1,2-DIBROMO-3-CHLOROPROPANE	2.0E-01	Drinking Water Toxicity	1.0E+01	2.0E-01	2.0E-01	
DIBROMOETHANE, 1,2-	5.0E-02	Drinking Water Toxicity	5.0E+04	5.0E-02	1.4E+03	
DICHLOROBENZENE, 1,2-	1.0E+01	Ceiling Value	1.0E+01	6.0E+02	1.4E+01	1.7E+04
DICHLOROBENZENE, 1,3-	6.3E+00	Drinking Water Toxicity	5.0E+04	6.3E+00	7.1E+01	2.6E+03
DICHLOROBENZENE, 1,4-	5.0E+00	Ceiling Value, Drinking Water Toxicity	5.0E+00	5.0E+00	1.5E+01	2.6E+03
DICHLOROBENZIDINE, 3,3-	2.9E-02	Drinking Water Toxicity	1.6E+03	2.9E-02	2.5E+02	7.7E-02
DICHLORODIPHENYLDICHLOROETHANE (DDD)	8.4E-04	Bioaccumulation/Human Consumption	8.0E+01	1.5E-01	1.0E-03	8.4E-04
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	5.9E-04	Bioaccumulation/Human Consumption	2.0E+01	1.0E-01	1.0E-03	5.9E-04
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	5.9E-04	Bioaccumulation/Human Consumption	1.5E+00	1.0E-01	1.0E-03	5.9E-04
DICHLOROETHANE, 1,1-	5.0E+00	Drinking Water Toxicity	5.0E+04	5.0E+00	4.7E+01	
DICHLOROETHANE, 1,2-	5.0E-01	Drinking Water Toxicity	7.0E+03	5.0E-01	1.0E+04	9.9E+01
DICHLOROETHYLENE, 1,1-	3.2E+00	Bioaccumulation/Human Consumption	1.5E+03	6.0E+00	2.5E+01	3.2E+00
DICHLOROETHYLENE, Cis 1,2-	6.0E+00	Drinking Water Toxicity	5.0E+04	6.0E+00	5.9E+02	
DICHLOROETHYLENE, Trans 1,2-	1.0E+01	Drinking Water Toxicity	2.6E+02	1.0E+01	5.9E+02	140000
DICHLOROPHENOL, 2,4-	3.0E-01	Ceiling Value	3.0E-01	2.1E+01	1.8E+02	7.9E+02
DICHLOROPROPANE, 1,2-	5.0E+00	Drinking Water Toxicity	1.0E+01	5.0E+00	2.9E+03	3.9E+01
DICHLOROPROPENE, 1,3-	5.0E-01	Drinking Water Toxicity	5.0E+04	5.0E-01	1.2E+02	1.7E+03
DIELDRIN	2.2E-03	Drinking Water Toxicity	4.1E+01	2.2E-03	5.6E-02	0.00014
DIETHYLPHTHALATE	1.5E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	5.6E+03	1.5E+00	120000
DIMETHYLPHTHALATE	1.5E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	7.0E+04	1.5E+00	2900000
DIMETHYLPHENOL, 2,4-	1.0E+02	Drinking Water Toxicity	4.0E+02	1.0E+02	5.3E+02	2300
DINITROPHENOL, 2,4-	1.4E+01	Drinking Water Toxicity	5.0E+04	1.4E+01	7.5E+01	1.4E+04
DINITROTOLUENE, 2,4-	1.1E-01	Drinking Water Toxicity	5.0E+04	1.1E-01	1.2E+02	9.1E+00
1,4 DIOXANE	3.0E+00	Drinking Water Toxicity	5.0E+04	3.0E+00	3.4E+05	
DIOXIN (2,3,7,8-TCDD)	1.4E-08	Bioaccumulation/Human Consumption	5.0E+04	3.0E-05	5.0E-06	1.4E-08
ENDOSULFAN	5.6E-02	Aquatic Habitat Chronic Toxicity	7.5E+01	4.2E+01	5.6E-02	2.4E+02
ENDRIN	3.6E-02	Aquatic Habitat Chronic Toxicity	4.1E+01	2.0E+00	3.6E-02	8.1E-01
ETHYLBENZENE	3.0E+01	Ceiling Value	3.0E+01	7.0E+02	2.9E+02	2.9E+04
FLUORANTHENE	8.1E+00	Aquatic Habitat Chronic Toxicity	1.3E+02	2.8E+02	8.1E+00	3.7E+02
FLUORENE	3.9E+00	Aquatic Habitat Chronic Toxicity	9.5E+02	2.8E+02	3.9E+00	1.4E+04
HEPTACHLOR	2.1E-04	Bioaccumulation/Human Consumption	2.0E+01	1.0E-02	3.8E-03	2.1E-04

TABLE F-2a. SURFACE WATER SCREENING LEVELS
Fresh Water Habitats
(ug/l)

CHEMICAL PARAMETER	[1]Final Surface Water Screening Level	Basis	Surface Water Ceiling Value (Taste & odors, etc.) Table I-3	Drinking Water (Toxicity) Table F-3	Fresh Water Aquatic Habitat Goal (chronic toxicity) Table F-4a	Bioaccumulation and Human Consumption Table F-4d
HEPTACHLOR EPOXIDE	1.1E-04	Bioaccumulation/Human Consumption	1.8E+02	1.0E-02	3.8E-03	1.1E-04
HEXACHLOROBENZENE	7.7E-04	Bioaccumulation/Human Consumption	5.5E+01	1.0E+00	3.7E+00	7.7E-04
HEXACHLOROBUTADIENE	2.1E-01	Drinking Water Toxicity	6.0E+00	2.1E-01	4.7E+00	5.0E+01
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	6.3E-02	Bioaccumulation/Human Consumption	3.5E+03	2.0E-01	8.0E-02	6.3E-02
HEXACHLOROETHANE	7.0E-01	Drinking Water Toxicity	1.0E+01	7.0E-01	1.2E+01	8.9E+00
INDENO(1,2,3-cd)PYRENE	2.9E-02	Drinking Water Toxicity	2.7E-01	2.9E-02	2.9E-02	4.9E-02
LEAD	2.5E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	1.5E+01	2.5E+00	
MERCURY	5.1E-02	Bioaccumulation/Human Consumption	5.0E+04	2.0E+00	7.7E-01	5.1E-02
METHOXYCHLOR	1.9E-02	Aquatic Habitat Chronic Toxicity	2.0E+01	4.0E+01	1.9E-02	
METHYLENE CHLORIDE	5.0E+00	Drinking Water Toxicity	9.1E+03	5.0E+00	2.2E+03	1.6E+03
METHYL ETHYL KETONE	4.2E+03	Drinking Water Toxicity	8.4E+03	4.2E+03	1.4E+04	
METHYL ISOBUTYL KETONE	1.2E+02	Drinking Water Toxicity	1.3E+03	1.2E+02	1.7E+02	
METHYL MERCURY	3.0E-03	Aquatic Habitat Chronic Toxicity	5.0E+04	7.0E-02	3.0E-03	
METHYLNAPHTHALENE (total 1- & 2-)	2.1E+00	Aquatic Habitat Chronic Toxicity	1.0E+01	2.8E+02	2.1E+00	
METHYL TERT BUTYL ETHER	5.0E+00	Ceiling Value	5.0E+00	1.3E+01	6.6E+04	
MOLYBDENUM	3.5E+01	Drinking Water Toxicity	5.0E+04	3.5E+01	2.4E+02	
NAPHTHALENE	2.1E+01	Ceiling Value	2.1E+01	1.7E+02	2.4E+01	
NICKEL	5.2E+01	Aquatic Habitat Chronic Toxicity	5.0E+04	1.0E+02	5.2E+01	4.6E+03
PENTACHLOROPHENOL	1.0E+00	Drinking Water Toxicity	3.0E+01	1.0E+00	1.5E+01	8.2E+00
PERCHLORATE	7.0E-01	Drinking Water Toxicity	5.0E+04	7.0E-01	6.0E+02	
PHENANTHRENE	6.3E+00	Aquatic Habitat Chronic Toxicity	4.1E+02	2.8E+02	6.3E+00	
PHENOL	5.0E+00	Ceiling Value	5.0E+00	4.2E+03	1.3E+03	4.6E+06
POLYCHLORINATED BIPHENYLS (PCBs)	1.7E-04	Bioaccumulation/Human Consumption	1.6E+01	5.0E-01	1.4E-02	1.7E-04
PYRENE	2.0E+00	Aquatic Habitat Chronic Toxicity	6.8E+01	2.1E+02	2.0E+00	1.1E+04
SELENIUM	5.0E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	5.0E+01	5.0E+00	
SILVER	3.4E-01	Aquatic Habitat Chronic Toxicity	1.0E+02	1.0E+02	3.4E-01	
STYRENE	1.0E+01	Ceiling Value	1.0E+01	1.0E+02	1.0E+02	
tert-BUTYL ALCOHOL	1.2E+01	Drinking Water Toxicity	5.0E+04	1.2E+01	1.8E+04	
TETRACHLOROETHANE, 1,1,1,2-	1.3E+00	Drinking Water Toxicity	5.0E+04	1.3E+00	9.3E+02	
TETRACHLOROETHANE, 1,1,2,2-	1.0E+00	Drinking Water Toxicity	5.0E+02	1.0E+00	4.2E+02	1.1E+01
TETRACHLOROETHYLENE	5.0E+00	Drinking Water Toxicity	1.7E+02	5.0E+00	1.2E+02	8.9E+00
THALLIUM	2.0E+00	Drinking Water Toxicity	5.0E+04	2.0E+00	2.0E+01	6.3E+00
TOLUENE	4.0E+01	Ceiling Value	4.0E+01	1.5E+02	1.3E+02	2.0E+05
TOXAPHENE	2.0E-04	Aquatic Habitat Chronic Toxicity	1.4E+02	3.0E+00	2.0E-04	7.5E-04
TPH (gasolines)	1.0E+02	Ceiling Value	1.0E+02	2.1E+02	5.0E+02	
TPH (middle distilates)	1.0E+02	Ceiling Value	1.0E+02	2.1E+02	6.4E+02	

TABLE F-2a. SURFACE WATER SCREENING LEVELS
Fresh Water Habitats
(ug/l)

CHEMICAL PARAMETER	[1]Final Surface Water Screening Level	Basis	Surface Water Ceiling Value (Taste & odors, etc.) Table I-3	Drinking Water (Toxicity) Table F-3	Fresh Water Aquatic Habitat Goal (chronic toxicity) Table F-4a	Bioaccumulation and Human Consumption Table F-4d
TPH (residual fuels)	1.0E+02	Ceiling Value	1.0E+02	2.1E+02	6.4E+02	
TRICHLOROBENZENE, 1,2,4-	2.5E+01	Aquatic Habitat Chronic Toxicity	3.0E+03	7.0E+01	2.5E+01	
TRICHLOROETHANE, 1,1,1-	6.2E+01	Aquatic Habitat Chronic Toxicity	9.7E+02	2.0E+02	6.2E+01	
TRICHLOROETHANE, 1,1,2-	5.0E+00	Drinking Water Toxicity	5.0E+04	5.0E+00	4.7E+03	4.2E+01
TRICHLOROETHYLENE	5.0E+00	Drinking Water Toxicity	3.1E+02	5.0E+00	3.6E+02	8.1E+01
TRICHLOROPHENOL, 2,4,5-	6.3E+01	Aquatic Habitat Chronic Toxicity	2.0E+02	7.0E+02	6.3E+01	3.6E+03
TRICHLOROPHENOL, 2,4,6-	5.0E-01	Drinking Water Toxicity	1.0E+02	5.0E-01	4.9E+02	6.5E+00
VANADIUM	1.5E+01	Drinking Water Toxicity	5.0E+04	1.5E+01	1.9E+01	
VINYL CHLORIDE	5.0E-01	Drinking Water Toxicity	3.4E+03	5.0E-01	7.8E+02	5.3E+02
XYLENES	1.3E+01	Aquatic Habitat Chronic Toxicity	2.0E+01	1.8E+03	1.3E+01	
ZINC	1.2E+02	Aquatic Habitat Chronic Toxicity	5.0E+03	5.0E+03	1.2E+02	

Notes:

1. Lowest of ceiling value, drinking water goal, aquatic habitat goal, and bioaccumulation goal.

TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.
Ceiling Level: Odor threshold, 1/2 solubility or 50000 ug/L maximum, whichever is lower. Intended to limit nuisances and general resource degradation.
Method detection limits and background concentrations replace final screening level as appropriate.

TABLE F-2b. SURFACE WATER SCREENING LEVELS
Marine Habitats
(ug/l)

CHEMICAL PARAMETER	[1]Final Surface Water Screening Level	Basis	Surface Water Ceiling Value (odors, etc.) Table I-4	Marine Aquatic Habitat Goal (chronic toxicity) Table F-4a	Bioaccumulation and Human Consumption Table F-4d
ACENAPHTHENE	2.0E+01	Ceiling Level	2.0E+01	4.0E+01	2.7E+03
ACENAPHTHYLENE	3.0E+01	Aquatic Habitat Chronic Toxicity	2.0E+03	3.0E+01	
ACETONE	1.5E+03	Aquatic Habitat Chronic Toxicity	2.0E+04	1.5E+03	
ALDRIN	1.4E-04	Bioaccumulation/Human Consumption	8.5E+00	1.3E-01	1.4E-04
ANTHRACENE	7.3E-01	Aquatic Habitat Chronic Toxicity	2.2E+01	7.3E-01	1.1E+05
ANTIMONY	5.0E+02	Aquatic Habitat Chronic Toxicity	5.0E+04	5.0E+02	4.3E+03
ARSENIC	1.4E-01	Bioaccumulation/Human Consumption	5.0E+04	3.6E+01	1.4E-01
BARIUM	1.0E+03	Aquatic Habitat Chronic Toxicity	5.0E+04	1.0E+03	
BENZENE	7.1E+01	Bioaccumulation/Human Consumption	2.0E+03	3.5E+02	7.1E+01
BENZO(a)ANTHRACENE	2.7E-02	Aquatic Habitat Chronic Toxicity	5.0E+00	2.7E-02	4.9E-02
BENZO(b)FLUORANTHENE	2.9E-02	Aquatic Habitat Chronic Toxicity	7.0E+00	2.9E-02	4.9E-02
BENZO(k)FLUORANTHENE	4.9E-02	Bioaccumulation/Human Consumption	4.0E-01	3.7E+00	4.9E-02
BENZO(g,h,i)PERYLENE	1.0E-01	Aquatic Habitat Chronic Toxicity	1.3E-01	1.0E-01	
BENZO(a)PYRENE	1.4E-02	Aquatic Habitat Chronic Toxicity	1.9E+00	1.4E-02	4.9E-02
BERYLLIUM	2.7E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	2.7E+00	
BIPHENYL, 1,1-	5.0E-01	Ceiling Level	5.0E-01	1.4E+01	
BIS(2-CHLOROETHYL)ETHER	1.4E+00	Bioaccumulation/Human Consumption	3.6E+02	6.1E+01	1.4E+00
BIS(2-CHLOROISOPROPYL)ETHER	6.1E+01	Aquatic Habitat Chronic Toxicity	3.2E+02	6.1E+01	1.7E+05
BIS(2-ETHYLHEXYL)PHTHALATE	5.9E+00	Bioaccumulation/Human Consumption	6.5E+02	3.2E+01	5.9E+00
BORON	1.6E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	1.6E+00	
BROMODICHLOROMETHANE	3.2E+03	Aquatic Habitat Chronic Toxicity	5.0E+04	3.2E+03	
BROMOFORM	3.6E+02	Bioaccumulation/Human Consumption	5.1E+02	3.2E+03	3.6E+02
BROMOMETHANE	3.2E+03	Aquatic Habitat Chronic Toxicity	5.0E+04	3.2E+03	4.0E+03
CADMIUM	9.3E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	9.3E+00	
CARBON TETRACHLORIDE	4.4E+00	Bioaccumulation/Human Consumption	5.2E+02	3.2E+03	4.4E+00
CHLORDANE	5.9E-04	Bioaccumulation/Human Consumption	2.5E+00	4.0E-03	5.9E-04
CHLOROANILINE, p-	5.0E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	5.0E+00	
CHLOROBENZENE	5.0E+01	Ceiling Level	5.0E+01	6.5E+01	2.1E+04
CHLOROETHANE	1.2E+01	Aquatic Habitat Chronic Toxicity	1.6E+01	1.2E+01	
CHLOROFORM	4.7E+02	Bioaccumulation/Human Consumption	2.4E+03	3.2E+03	4.7E+02
CHLOROMETHANE	3.2E+03	Aquatic Habitat Chronic Toxicity	5.0E+04	3.2E+03	
CHLOROPHENOL, 2-	1.8E-01	Ceiling Level	1.8E-01	4.4E+02	4.0E+02
CHROMIUM (Total)	1.8E+02	Aquatic Habitat Chronic Toxicity	5.0E+04	1.8E+02	
CHROMIUM III	1.8E+02	Aquatic Habitat Chronic Toxicity	5.0E+04	1.8E+02	
CHROMIUM VI	5.0E+01	Aquatic Habitat Chronic Toxicity	5.0E+04	5.0E+01	
CHRYSENE	4.9E-02	Bioaccumulation/Human Consumption	8.0E-01	3.5E-01	4.9E-02

TABLE F-2b. SURFACE WATER SCREENING LEVELS
Marine Habitats
(ug/l)

CHEMICAL PARAMETER	[1]Final Surface Water Screening Level	Basis	Surface Water Ceiling Value (odors, etc.) Table I-4	Marine Aquatic Habitat Goal (chronic toxicity) Table F-4a	Bioaccumulation and Human Consumption Table F-4d
COBALT	3.0E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	3.0E+00	
COPPER	3.1E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	3.1E+00	
CYANIDE (Free)	1.0E+00	Aquatic Habitat Chronic Toxicity	1.7E+02	1.0E+00	2.2E+05
DIBENZO(a,h)ANTHTRACENE	4.9E-02	Bioaccumulation/Human Consumption	2.5E-01	7.5E+00	4.9E-02
DIBROMOCHLOROMETHANE	4.6E+01	Bioaccumulation/Human Consumption	5.0E+04	3.2E+03	4.6E+01
1,2-DIBROMO-3-CHLOROPROPANE	2.0E-01	Aquatic Habitat Chronic Toxicity	1.0E+01	2.0E-01	
DIBROMOETHANE, 1,2-	1.4E+03	Aquatic Habitat Chronic Toxicity	5.0E+04	1.4E+03	
DICHLOROBENZENE, 1,2-	1.0E+01	Ceiling Level	1.0E+01	6.5E+01	1.7E+04
DICHLOROBENZENE, 1,3-	6.5E+01	Aquatic Habitat Chronic Toxicity	5.0E+04	6.5E+01	2.6E+03
DICHLOROBENZENE, 1,4-	1.1E+01	Ceiling Level	1.1E+01	6.5E+01	2.6E+03
DICHLOROBENZIDINE, 3,3-	7.7E-02	Bioaccumulation/Human Consumption	1.6E+03	2.5E+02	7.7E-02
DICHLORODIPHENYLDICHLOROETHANE (DDD)	8.4E-04	Bioaccumulation/Human Consumption	8.0E+01	1.0E-03	8.4E-04
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	5.9E-04	Bioaccumulation/Human Consumption	2.0E+01	1.0E-03	5.9E-04
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	5.9E-04	Bioaccumulation/Human Consumption	1.5E+00	1.0E-03	5.9E-04
DICHLOROETHANE, 1,1-	4.7E+01	Aquatic Habitat Chronic Toxicity	5.0E+04	4.7E+01	
DICHLOROETHANE, 1,2-	9.9E+01	Bioaccumulation/Human Consumption	2.0E+04	1.0E+04	9.9E+01
DICHLOROETHYLENE, 1,1-	3.2E+00	Bioaccumulation/Human Consumption	1.5E+03	2.5E+01	3.2E+00
DICHLOROETHYLENE, Cis 1,2-	5.9E+02	Aquatic Habitat Chronic Toxicity	5.0E+04	5.9E+02	
DICHLOROETHYLENE, Trans 1,2-	2.6E+02	Ceiling Level	2.6E+02	5.9E+02	140000
DICHLOROPHENOL, 2,4-	3.0E-01	Ceiling Level	3.0E-01	1.8E+02	7.9E+02
DICHLOROPROPANE, 1,2-	1.0E+01	Ceiling Level	1.0E+01	1.5E+03	3.9E+01
DICHLOROPROPENE, 1,3-	1.2E+02	Aquatic Habitat Chronic Toxicity	5.0E+04	1.2E+02	1.7E+03
DIELDRIN	1.9E-03	Aquatic Habitat Chronic Toxicity	4.1E+01	1.9E-03	0.00014
DIETHYLPHTHALATE	1.7E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	1.7E+00	120000
DIMETHYLPHTHALATE	1.7E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	1.7E+00	2900000
DIMETHYLPHENOL, 2,4-	1.1E+02	Aquatic Habitat Chronic Toxicity	4.0E+02	1.1E+02	2300
DINITROPHENOL, 2,4-	7.5E+01	Aquatic Habitat Chronic Toxicity	5.0E+04	7.5E+01	1.4E+04
DINITROTOLUENE, 2,4-	9.1E+00	Bioaccumulation/Human Consumption	5.0E+04	1.9E+02	9.1E+00
1,4 DIOXANE	5.0E+04	Ceiling Level	5.0E+04	5.0E+05	
DIOXIN (2,3,7,8-TCDD)	1.4E-08	Bioaccumulation/Human Consumption	5.0E+04	5.0E-06	1.4E-08
ENDOSULFAN	8.7E-03	Aquatic Habitat Chronic Toxicity	7.5E+01	8.7E-03	2.4E+02
ENDRIN	2.3E-03	Aquatic Habitat Chronic Toxicity	4.1E+01	2.3E-03	8.1E-01
ETHYLBENZENE	3.0E+01	Ceiling Level	3.0E+01	2.9E+02	2.9E+04
FLUORANTHENE	8.0E+00	Aquatic Habitat Chronic Toxicity	1.3E+02	8.0E+00	3.7E+02
FLUORENE	3.9E+00	Aquatic Habitat Chronic Toxicity	9.5E+02	3.9E+00	1.4E+04
HEPTACHLOR	2.1E-04	Bioaccumulation/Human Consumption	2.0E+01	0.0036	2.1E-04

TABLE F-2b. SURFACE WATER SCREENING LEVELS
Marine Habitats
(ug/l)

CHEMICAL PARAMETER	[1]Final Surface Water Screening Level	Basis	Surface Water Ceiling Value (odors, etc.) Table I-4	Marine Aquatic Habitat Goal (chronic toxicity) Table F-4a	Bioaccumulation and Human Consumption Table F-4d
HEPTACHLOR EPOXIDE	1.1E-04	Bioaccumulation/Human Consumption	1.8E+02	0.0036	1.1E-04
HEXACHLOROBENZENE	7.7E-04	Bioaccumulation/Human Consumption	5.5E+01	6.5E+01	7.7E-04
HEXACHLOROBUTADIENE	4.7E+00	Aquatic Habitat Chronic Toxicity	6.0E+00	4.7E+00	5.0E+01
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	6.3E-02	Bioaccumulation/Human Consumption	3.5E+03	8.0E-02	6.3E-02
HEXACHLOROETHANE	8.9E+00	Bioaccumulation/Human Consumption	1.0E+01	1.2E+01	8.9E+00
INDENO(1,2,3-cd)PYRENE	2.9E-02	Aquatic Habitat Chronic Toxicity	2.7E-01	2.9E-02	4.9E-02
LEAD	8.1E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	8.1E+00	
MERCURY	2.5E-02	Aquatic Habitat Chronic Toxicity	5.0E+04	2.5E-02	5.1E-02
METHOXYCHLOR	1.9E-02	Aquatic Habitat Chronic Toxicity	2.0E+01	1.9E-02	
METHYLENE CHLORIDE	1.6E+03	Bioaccumulation/Human Consumption	9.1E+03	3.2E+03	1.6E+03
METHYL ETHYL KETONE	8.4E+03	Ceiling Level	8.4E+03	1.4E+04	
METHYL ISOBUTYL KETONE	1.7E+02	Aquatic Habitat Chronic Toxicity	1.3E+03	1.7E+02	
METHYL MERCURY	3.0E-03	Aquatic Habitat Chronic Toxicity	5.0E+04	3.0E-03	
METHYLNAPHTHALENE (total 1- & 2-)	2.1E+00	Aquatic Habitat Chronic Toxicity	1.0E+01	2.1E+00	
METHYL TERT BUTYL ETHER	1.8E+02	Ceiling Level	1.8E+02	8.0E+03	
MOLYBDENUM	2.4E+02	Aquatic Habitat Chronic Toxicity	5.0E+04	2.4E+02	
NAPHTHALENE	2.1E+01	Ceiling Level	2.1E+01	2.4E+01	
NICKEL	8.2E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	8.2E+00	4.6E+03
PENTACHLOROPHENOL	7.9E+00	Aquatic Habitat Chronic Toxicity	5.9E+02	7.9E+00	8.2E+00
PERCHLORATE	6.0E+02	Aquatic Habitat Chronic Toxicity	5.0E+04	6.0E+02	
PHENANTHRENE	4.6E+00	Aquatic Habitat Chronic Toxicity	4.1E+02	4.6E+00	
PHENOL	1.3E+03	Aquatic Habitat Chronic Toxicity	7.9E+03	1.3E+03	4.6E+06
POLYCHLORINATED BIPHENYLS (PCBs)	1.7E-04	Bioaccumulation/Human Consumption	1.6E+01	3.0E-02	1.7E-04
PYRENE	2.0E+00	Aquatic Habitat Chronic Toxicity	6.8E+01	2.0E+00	1.1E+04
SELENIUM	7.1E+01	Aquatic Habitat Chronic Toxicity	5.0E+04	7.1E+01	
SILVER	1.9E-01	Aquatic Habitat Chronic Toxicity	5.0E+04	1.9E-01	
STYRENE	1.1E+01	Ceiling Level	1.1E+01	1.0E+02	
tert-BUTYL ALCOHOL	1.8E+04	Aquatic Habitat Chronic Toxicity	5.0E+04	1.8E+04	
TETRACHLOROETHANE, 1,1,1,2-	9.3E+02	Aquatic Habitat Chronic Toxicity	5.0E+04	9.3E+02	
TETRACHLOROETHANE, 1,1,2,2-	1.1E+01	Bioaccumulation/Human Consumption	5.0E+02	4.2E+02	1.1E+01
TETRACHLOROETHYLENE	8.9E+00	Bioaccumulation/Human Consumption	3.0E+02	2.3E+02	8.9E+00
THALLIUM	6.3E+00	Bioaccumulation/Human Consumption	5.0E+04	2.0E+01	6.3E+00
TOLUENE	4.0E+01	Ceiling Level	4.0E+01	2.5E+03	2.0E+05
TOXAPHENE	2.0E-04	Aquatic Habitat Chronic Toxicity	1.4E+02	2.0E-04	7.5E-04
TPH (gasolines)	3.7E+03	Aquatic Habitat Chronic Toxicity	5.0E+03	3.7E+03	
TPH (middle distillates)	6.4E+02	Aquatic Habitat Chronic Toxicity	2.5E+03	6.4E+02	

TABLE F-2b. SURFACE WATER SCREENING LEVELS
Marine Habitats
(ug/l)

CHEMICAL PARAMETER	[1]Final Surface Water Screening Level	Basis	Surface Water Ceiling Value (odors, etc.) Table I-4	Marine Aquatic Habitat Goal (chronic toxicity) Table F-4a	Bioaccumulation and Human Consumption Table F-4d
TPH (residual fuels)	6.4E+02	Aquatic Habitat Chronic Toxicity	2.5E+03	6.4E+02	
TRICHLOROBENZENE, 1,2,4-	6.5E+01	Aquatic Habitat Chronic Toxicity	3.0E+03	6.5E+01	
TRICHLOROETHANE, 1,1,1-	6.2E+01	Aquatic Habitat Chronic Toxicity	5.0E+04	6.2E+01	
TRICHLOROETHANE, 1,1,2-	4.2E+01	Bioaccumulation/Human Consumption	5.0E+04	4.7E+03	4.2E+01
TRICHLOROETHYLENE	8.1E+01	Bioaccumulation/Human Consumption	1.0E+04	3.6E+02	8.1E+01
TRICHLOROPHENOL, 2,4,5-	1.1E+01	Aquatic Habitat Chronic Toxicity	2.0E+02	1.1E+01	3.6E+03
TRICHLOROPHENOL, 2,4,6-	6.5E+00	Bioaccumulation/Human Consumption	1.0E+02	4.9E+02	6.5E+00
VANADIUM	1.9E+01	Aquatic Habitat Chronic Toxicity	5.0E+04	1.9E+01	
VINYL CHLORIDE	5.3E+02	Bioaccumulation/Human Consumption	3.4E+03	7.8E+02	5.3E+02
XYLENES	1.3E+01	Aquatic Habitat Chronic Toxicity	5.3E+02	1.3E+01	
ZINC	8.1E+01	Aquatic Habitat Chronic Toxicity	5.0E+04	8.1E+01	

Notes:

1. Lowest of Ceiling Value, aquatic habitat goal, and bioaccumulation goal.

TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.
Ceiling Level: Odor threshold, 1/2 solubility or 50000 ug/L maximum, whichever is lower. Intended to limit nuisances and general resource degradation.
Method detection limits and background concentrations replace final screening level as appropriate.

TABLE F-2c. SURFACE WATER SCREENING LEVELS
*Estuary Habitats
(ug/l)

CHEMICAL PARAMETER	[1]Final Surface Water Screening Level	Basis	Surface Water Ceiling Value (odors, etc.) Table I-4	Estuary Aquatic Habitat Goal (chronic toxicity) Table F-4a	Bioaccumulation and Human Consumption Table F-4d
ACENAPHTHENE	2.0E+01	Ceiling Level	2.0E+01	2.3E+01	2.7E+03
ACENAPHTHYLENE	3.0E+01	Aquatic Habitat Chronic Toxicity	2.0E+03	3.0E+01	
ACETONE	1.5E+03	Aquatic Habitat Chronic Toxicity	2.0E+04	1.5E+03	
ALDRIN	1.4E-04	Bioaccumulation/Human Consumption	8.5E+00	1.3E-01	1.4E-04
ANTHRACENE	7.3E-01	Aquatic Habitat Chronic Toxicity	2.2E+01	7.3E-01	1.1E+05
ANTIMONY	3.0E+01	Aquatic Habitat Chronic Toxicity	5.0E+04	3.0E+01	4.3E+03
ARSENIC	1.4E-01	Bioaccumulation/Human Consumption	5.0E+04	3.6E+01	1.4E-01
BARIUM	1.0E+03	Aquatic Habitat Chronic Toxicity	5.0E+04	1.0E+03	
BENZENE	4.6E+01	Aquatic Habitat Chronic Toxicity	2.0E+03	4.6E+01	7.1E+01
BENZO(a)ANTHRACENE	2.7E-02	Aquatic Habitat Chronic Toxicity	5.0E+00	2.7E-02	4.9E-02
BENZO(b)FLUORANTHENE	2.9E-02	Aquatic Habitat Chronic Toxicity	7.0E+00	2.9E-02	4.9E-02
BENZO(k)FLUORANTHENE	4.9E-02	Bioaccumulation/Human Consumption	4.0E-01	3.7E+00	4.9E-02
BENZO(g,h,i)PERYLENE	1.0E-01	Aquatic Habitat Chronic Toxicity	1.3E-01	1.0E-01	
BENZO(a)PYRENE	1.4E-02	Aquatic Habitat Chronic Toxicity	1.9E+00	1.4E-02	4.9E-02
BERYLLIUM	2.7E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	2.7E+00	
BIPHENYL, 1,1-	5.0E-01	Ceiling Level	5.0E-01	1.4E+01	
BIS(2-CHLOROETHYL)ETHER	1.4E+00	Bioaccumulation/Human Consumption	3.6E+02	6.1E+01	1.4E+00
BIS(2-CHLOROISOPROPYL)ETHER	6.1E+01	Aquatic Habitat Chronic Toxicity	3.2E+02	6.1E+01	1.7E+05
BIS(2-ETHYLHEXYL)PHTHALATE	5.9E+00	Bioaccumulation/Human Consumption	6.5E+02	3.2E+01	5.9E+00
BORON	1.6E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	1.6E+00	
BROMODICHLOROMETHANE	3.2E+03	Aquatic Habitat Chronic Toxicity	5.0E+04	3.2E+03	
BROMOFORM	3.6E+02	Bioaccumulation/Human Consumption	5.1E+02	3.2E+03	3.6E+02
BROMOMETHANE	1.6E+02	Aquatic Habitat Chronic Toxicity	5.0E+04	1.6E+02	4.0E+03
CADMIUM	2.2E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	2.2E+00	
CARBON TETRACHLORIDE	4.4E+00	Bioaccumulation/Human Consumption	5.2E+02	9.8E+00	4.4E+00
CHLORDANE	5.9E-04	Bioaccumulation/Human Consumption	2.5E+00	4.0E-03	5.9E-04
CHLOROANILINE, p-	5.0E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	5.0E+00	
CHLOROBENZENE	2.5E+01	Aquatic Habitat Chronic Toxicity	5.0E+01	2.5E+01	2.1E+04
CHLOROETHANE	1.2E+01	Aquatic Habitat Chronic Toxicity	1.6E+01	1.2E+01	
CHLOROFORM	4.7E+02	Bioaccumulation/Human Consumption	2.4E+03	6.2E+02	4.7E+02
CHLOROMETHANE	3.2E+03	Aquatic Habitat Chronic Toxicity	5.0E+04	3.2E+03	
CHLOROPHENOL, 2-	1.8E-01	Ceiling Level	1.8E-01	4.4E+02	4.0E+02
CHROMIUM (Total)	1.8E+02	Aquatic Habitat Chronic Toxicity	5.0E+04	1.8E+02	
CHROMIUM III	1.8E+02	Aquatic Habitat Chronic Toxicity	5.0E+04	1.8E+02	
CHROMIUM VI	1.1E+01	Aquatic Habitat Chronic Toxicity	5.0E+04	1.1E+01	
CHRYSENE	4.9E-02	Bioaccumulation/Human Consumption	8.0E-01	3.5E-01	4.9E-02

TABLE F-2c. SURFACE WATER SCREENING LEVELS
*Estuary Habitats
(ug/l)

CHEMICAL PARAMETER	[1]Final Surface Water Screening Level	Basis	Surface Water Ceiling Value (odors, etc.) Table I-4	Estuary Aquatic Habitat Goal (chronic toxicity) Table F-4a	Bioaccumulation and Human Consumption Table F-4d
COBALT	3.0E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	3.0E+00	
COPPER	3.1E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	3.1E+00	
CYANIDE (Free)	1.0E+00	Aquatic Habitat Chronic Toxicity	1.7E+02	1.0E+00	2.2E+05
DIBENZO(a,h)ANTHTRACENE	4.9E-02	Bioaccumulation/Human Consumption	2.5E-01	7.5E+00	4.9E-02
DIBROMOCHLOROMETHANE	4.6E+01	Bioaccumulation/Human Consumption	5.0E+04	3.2E+03	4.6E+01
1,2-DIBROMO-3-CHLOROPROPANE	2.0E-01	Aquatic Habitat Chronic Toxicity	1.0E+01	2.0E-01	
DIBROMOETHANE, 1,2-	1.4E+03	Aquatic Habitat Chronic Toxicity	5.0E+04	1.4E+03	
DICHLOROBENZENE, 1,2-	1.0E+01	Ceiling Level	1.0E+01	1.4E+01	1.7E+04
DICHLOROBENZENE, 1,3-	6.5E+01	Aquatic Habitat Chronic Toxicity	5.0E+04	6.5E+01	2.6E+03
DICHLOROBENZENE, 1,4-	1.1E+01	Ceiling Level	1.1E+01	1.5E+01	2.6E+03
DICHLOROBENZIDINE, 3,3-	7.7E-02	Bioaccumulation/Human Consumption	1.6E+03	2.5E+02	7.7E-02
DICHLORODIPHENYLDICHLOROETHANE (DDD)	8.4E-04	Bioaccumulation/Human Consumption	8.0E+01	1.0E-03	8.4E-04
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	5.9E-04	Bioaccumulation/Human Consumption	2.0E+01	1.0E-03	5.9E-04
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	5.9E-04	Bioaccumulation/Human Consumption	1.5E+00	1.0E-03	5.9E-04
DICHLOROETHANE, 1,1-	4.7E+01	Aquatic Habitat Chronic Toxicity	5.0E+04	4.7E+01	
DICHLOROETHANE, 1,2-	9.9E+01	Bioaccumulation/Human Consumption	2.0E+04	1.0E+04	9.9E+01
DICHLOROETHYLENE, 1,1-	3.2E+00	Bioaccumulation/Human Consumption	1.5E+03	2.5E+01	3.2E+00
DICHLOROETHYLENE, Cis 1,2-	5.9E+02	Aquatic Habitat Chronic Toxicity	5.0E+04	5.9E+02	
DICHLOROETHYLENE, Trans 1,2-	2.6E+02	Ceiling Level	2.6E+02	5.9E+02	140000
DICHLOROPHENOL, 2,4-	3.0E-01	Ceiling Level	3.0E-01	1.8E+02	7.9E+02
DICHLOROPROPANE, 1,2-	1.0E+01	Ceiling Level	1.0E+01	1.5E+03	3.9E+01
DICHLOROPROPENE, 1,3-	1.2E+02	Aquatic Habitat Chronic Toxicity	5.0E+04	1.2E+02	1.7E+03
DIELDRIN	1.9E-03	Aquatic Habitat Chronic Toxicity	4.1E+01	1.9E-03	0.00014
DIETHYLPHTHALATE	1.5E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	1.5E+00	120000
DIMETHYLPHTHALATE	1.5E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	1.5E+00	2900000
DIMETHYLPHENOL, 2,4-	1.1E+02	Aquatic Habitat Chronic Toxicity	4.0E+02	1.1E+02	2300
DINITROPHENOL, 2,4-	7.5E+01	Aquatic Habitat Chronic Toxicity	5.0E+04	7.5E+01	1.4E+04
DINITROTOLUENE, 2,4-	9.1E+00	Bioaccumulation/Human Consumption	5.0E+04	1.2E+02	9.1E+00
1,4 DIOXANE	5.0E+04	Ceiling Level	5.0E+04	3.4E+05	
DIOXIN (2,3,7,8-TCDD)	1.4E-08	Bioaccumulation/Human Consumption	5.0E+04	5.0E-06	1.4E-08
ENDOSULFAN	8.7E-03	Aquatic Habitat Chronic Toxicity	7.5E+01	8.7E-03	2.4E+02
ENDRIN	2.3E-03	Aquatic Habitat Chronic Toxicity	4.1E+01	2.3E-03	8.1E-01
ETHYLBENZENE	3.0E+01	Ceiling Level	3.0E+01	2.9E+02	2.9E+04
FLUORANTHENE	8.0E+00	Aquatic Habitat Chronic Toxicity	1.3E+02	8.0E+00	3.7E+02
FLUORENE	3.9E+00	Aquatic Habitat Chronic Toxicity	9.5E+02	3.9E+00	1.4E+04
HEPTACHLOR	2.1E-04	Bioaccumulation/Human Consumption	2.0E+01	3.8E-03	2.1E-04

TABLE F-2c. SURFACE WATER SCREENING LEVELS
*Estuary Habitats
(ug/l)

CHEMICAL PARAMETER	[1]Final Surface Water Screening Level	Basis	Surface Water Ceiling Value (odors, etc.) Table I-4	Estuary Aquatic Habitat Goal (chronic toxicity) Table F-4a	Bioaccumulation and Human Consumption Table F-4d
HEPTACHLOR EPOXIDE	1.1E-04	Bioaccumulation/Human Consumption	1.8E+02	3.8E-03	1.1E-04
HEXACHLOROBENZENE	7.7E-04	Bioaccumulation/Human Consumption	5.5E+01	3.7E+00	7.7E-04
HEXACHLOROBUTADIENE	4.7E+00	Aquatic Habitat Chronic Toxicity	6.0E+00	4.7E+00	5.0E+01
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	6.3E-02	Bioaccumulation/Human Consumption	3.5E+03	8.0E-02	6.3E-02
HEXACHLOROETHANE	8.9E+00	Bioaccumulation/Human Consumption	1.0E+01	1.2E+01	8.9E+00
INDENO(1,2,3-cd)PYRENE	2.9E-02	Aquatic Habitat Chronic Toxicity	2.7E-01	2.9E-02	4.9E-02
LEAD	2.5E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	2.5E+00	
MERCURY	1.2E-02	Aquatic Habitat Chronic Toxicity	5.0E+04	1.2E-02	5.1E-02
METHOXYCHLOR	1.9E-02	Aquatic Habitat Chronic Toxicity	2.0E+01	1.9E-02	
METHYLENE CHLORIDE	1.6E+03	Bioaccumulation/Human Consumption	9.1E+03	2.2E+03	1.6E+03
METHYL ETHYL KETONE	8.4E+03	Ceiling Level	8.4E+03	1.4E+04	
METHYL ISOBUTYL KETONE	1.7E+02	Aquatic Habitat Chronic Toxicity	1.3E+03	1.7E+02	
METHYL MERCURY	3.0E-03	Aquatic Habitat Chronic Toxicity	5.0E+04	3.0E-03	
METHYLNAPHTHALENE (total 1- & 2-)	2.1E+00	Aquatic Habitat Chronic Toxicity	1.0E+01	2.1E+00	
METHYL TERT BUTYL ETHER	1.8E+02	Ceiling Level	1.8E+02	8.0E+03	
MOLYBDENUM	2.4E+02	Aquatic Habitat Chronic Toxicity	5.0E+04	2.4E+02	
NAPHTHALENE	2.1E+01	Ceiling Level	2.1E+01	2.4E+01	
NICKEL	8.2E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	8.2E+00	4.6E+03
PENTACHLOROPHENOL	7.9E+00	Aquatic Habitat Chronic Toxicity	5.9E+02	7.9E+00	8.2E+00
PERCHLORATE	6.0E+02	Aquatic Habitat Chronic Toxicity	5.0E+04	6.0E+02	
PHENANTHRENE	4.6E+00	Aquatic Habitat Chronic Toxicity	4.1E+02	4.6E+00	
PHENOL	1.3E+03	Aquatic Habitat Chronic Toxicity	7.9E+03	1.3E+03	4.6E+06
POLYCHLORINATED BIPHENYLS (PCBs)	1.7E-04	Bioaccumulation/Human Consumption	1.6E+01	1.4E-02	1.7E-04
PYRENE	2.0E+00	Aquatic Habitat Chronic Toxicity	6.8E+01	2.0E+00	1.1E+04
SELENIUM	5.0E+00	Aquatic Habitat Chronic Toxicity	5.0E+04	5.0E+00	
SILVER	1.9E-01	Aquatic Habitat Chronic Toxicity	5.0E+04	1.9E-01	
STYRENE	1.1E+01	Ceiling Level	1.1E+01	1.0E+02	
tert-BUTYL ALCOHOL	1.8E+04	Aquatic Habitat Chronic Toxicity	5.0E+04	1.8E+04	
TETRACHLOROETHANE, 1,1,1,2-	9.3E+02	Aquatic Habitat Chronic Toxicity	5.0E+04	9.3E+02	
TETRACHLOROETHANE, 1,1,2,2-	1.1E+01	Bioaccumulation/Human Consumption	5.0E+02	4.2E+02	1.1E+01
TETRACHLOROETHYLENE	8.9E+00	Bioaccumulation/Human Consumption	3.0E+02	1.2E+02	8.9E+00
THALLIUM	6.3E+00	Bioaccumulation/Human Consumption	5.0E+04	2.0E+01	6.3E+00
TOLUENE	4.0E+01	Ceiling Level	4.0E+01	1.3E+02	2.0E+05
TOXAPHENE	2.0E-04	Aquatic Habitat Chronic Toxicity	1.4E+02	2.0E-04	7.5E-04
TPH (gasolines)	5.0E+02	Aquatic Habitat Chronic Toxicity	5.0E+03	5.0E+02	
TPH (middle distillates)	6.4E+02	Aquatic Habitat Chronic Toxicity	2.5E+03	6.4E+02	

TABLE F-2c. SURFACE WATER SCREENING LEVELS
*Estuary Habitats
(ug/l)

CHEMICAL PARAMETER	[1]Final Surface Water Screening Level	Basis	Surface Water Ceiling Value (odors, etc.) Table I-4	Estuary Aquatic Habitat Goal (chronic toxicity) Table F-4a	Bioaccumulation and Human Consumption Table F-4d
TPH (residual fuels)	6.4E+02	Aquatic Habitat Chronic Toxicity	2.5E+03	6.4E+02	
TRICHLOROBENZENE, 1,2,4-	2.5E+01	Aquatic Habitat Chronic Toxicity	3.0E+03	2.5E+01	
TRICHLOROETHANE, 1,1,1-	6.2E+01	Aquatic Habitat Chronic Toxicity	5.0E+04	6.2E+01	
TRICHLOROETHANE, 1,1,2-	4.2E+01	Bioaccumulation/Human Consumption	5.0E+04	4.7E+03	4.2E+01
TRICHLOROETHYLENE	8.1E+01	Bioaccumulation/Human Consumption	1.0E+04	3.6E+02	8.1E+01
TRICHLOROPHENOL, 2,4,5-	1.1E+01	Aquatic Habitat Chronic Toxicity	2.0E+02	1.1E+01	3.6E+03
TRICHLOROPHENOL, 2,4,6-	6.5E+00	Bioaccumulation/Human Consumption	1.0E+02	4.9E+02	6.5E+00
VANADIUM	1.9E+01	Aquatic Habitat Chronic Toxicity	5.0E+04	1.9E+01	
VINYL CHLORIDE	5.3E+02	Bioaccumulation/Human Consumption	3.4E+03	7.8E+02	5.3E+02
XYLENES	1.3E+01	Aquatic Habitat Chronic Toxicity	5.3E+02	1.3E+01	
ZINC	8.1E+01	Aquatic Habitat Chronic Toxicity	5.0E+04	8.1E+01	

*Estuary Habitats: Mixed freshwater/marine water habitats.

Notes:

1. Lowest of Ceiling Value, aquatic habitat goal, and bioaccumulation goal.

TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.

Ceiling Level: Odor threshold, 1/2 solubility or 50000 ug/L maximum, whichever is lower. Intended to limit nuisances and general resource degradation.

Method detection limits and background concentrations replace final screening level as appropriate.

TABLE F-3. SUMMARY OF DRINKING WATER SCREENING LEVELS FOR HUMAN TOXICITY
(ug/L)

CHEMICAL PARAMETER	Final Screening Level	Basis	Cal DHS Primary MCL	Other CalEPA Criteria	Reference	*Risk-Based Goals (Drinking Water Toxicity)	Basis
ACENAPHTHENE	4.2E+02	Noncarcinogenic Effects				4.2E+02	Noncarcinogenic Effects
ACENAPHTHYLENE	2.8E+02	Noncarcinogenic Effects				2.8E+02	Noncarcinogenic Effects
ACETONE	7.0E+02	Noncarcinogenic Effects				7.0E+02	Noncarcinogenic Effects
ALDRIN	2.0E-03	Cal DHS AL		2.0E-03	Cal DHS AL	2.1E-03	Carcinogenic Effects
ANTHRACENE	2.1E+03	Noncarcinogenic Effects				2.1E+03	Noncarcinogenic Effects
ANTIMONY	6.0E+00	Cal DHS Primary MCL	6.0E+00	2.0E+01	Cal OEHHA PHG	2.8E+00	Noncarcinogenic Effects
ARSENIC	5.0E+01	Cal DHS Primary MCL	5.0E+01			2.3E-02	Carcinogenic Effects
BARIUM	1.0E+03	Cal DHS Primary MCL	1.0E+03			4.9E+02	Noncarcinogenic Effects
BENZENE	1.0E+00	Cal DHS Primary MCL	1.0E+00	1.5E-01	Cal OEHHA PHG	3.5E-01	Carcinogenic Effects
BENZO(a)ANTHRACENE	2.9E-02	Carcinogenic Effects				2.9E-02	Carcinogenic Effects
BENZO(b)FLUORANTHENE	2.9E-02	Carcinogenic Effects				2.9E-02	Carcinogenic Effects
BENZO(k)FLUORANTHENE	2.9E-02	Carcinogenic Effects				2.9E-02	Carcinogenic Effects
BENZO(g,h,i)PERYLENE	2.8E+02	Noncarcinogenic Effects				2.8E+02	Noncarcinogenic Effects
BENZO(a)PYRENE	2.0E-01	Cal DHS Primary MCL	2.0E-01			2.9E-03	Carcinogenic Effects
BERYLLIUM	4.0E+00	Cal DHS Primary MCL	4.0E+00			1.4E+01	Noncarcinogenic Effects
BIPHENYL, 1,1-	3.5E+02	Noncarcinogenic Effects				3.5E+02	Noncarcinogenic Effects
BIS(2-CHLOROETHYL)ETHER	1.4E-02	Carcinogenic Effects				1.4E-02	Carcinogenic Effects
BIS(2-CHLOROISOPROPYL)ETHER	5.0E-01	Carcinogenic Effects				5.0E-01	Carcinogenic Effects
BIS(2-ETHYLHEXYL)PHTHALATE	4.0E+00	Cal DHS Primary MCL	4.0E+00			1.2E+01	Carcinogenic Effects
BORON	1.0E+03	Cal DHS AL		1.0E+03	Cal DHS AL	1.4E+03	Noncarcinogenic Effects
BROMODICHLOROMETHANE	1.0E+02	Cal DHS Primary MCL	1.0E+02			2.7E-01	Carcinogenic Effects
BROMOFORM	1.0E+02	Cal DHS Primary MCL	1.0E+02			4.4E+00	Carcinogenic Effects
BROMOMETHANE	9.8E+00	Noncarcinogenic Effects				9.8E+00	Noncarcinogenic Effects
CADMIUM	5.0E+00	Cal DHS Primary MCL	5.0E+00	7.0E-02	Cal OEHHA PHG	9.2E-02	Carcinogenic Effects
CARBON TETRACHLORIDE	5.0E-01	Cal DHS Primary MCL	5.0E-01	1.0E-01	Cal OEHHA PHG	2.3E-01	Carcinogenic Effects
CHLORDANE	1.0E-01	Cal DHS Primary MCL	1.0E-01	3.0E-02	Cal OEHHA PHG	2.7E-02	Carcinogenic Effects
CHLOROANILINE, p-	2.8E+01	Noncarcinogenic Effects				2.8E+01	Noncarcinogenic Effects
CHLOROBENZENE	7.0E+01	Cal DHS Primary MCL	7.0E+01			1.4E+02	Noncarcinogenic Effects
CHLOROETHANE	1.2E+01	Carcinogenic Effects				1.2E+01	Carcinogenic Effects
CHLOROFORM	1.0E+02	Cal DHS Primary MCL	1.0E+02			1.1E+00	Carcinogenic Effects
CHLOROMETHANE	2.7E+00	Carcinogenic Effects				2.7E+00	Carcinogenic Effects
CHLOROPHENOL, 2-	3.5E+01	Noncarcinogenic Effects				3.5E+01	Noncarcinogenic Effects
CHROMIUM (Total)	5.0E+01	Cal DHS Primary MCL	5.0E+01			-	Noncarcinogenic Effects
CHROMIUM III	2.0E+05	OEHHA PHG		2.0E+05	OEHHA PHG	1.1E+04	Noncarcinogenic Effects
CHROMIUM VI	2.1E+01	Noncarcinogenic Effects				2.1E+01	Noncarcinogenic Effects
CHRYSENE	2.9E-01	Carcinogenic Effects				2.9E-01	Carcinogenic Effects
COBALT	1.4E+02	Noncarcinogenic Effects				1.4E+02	Noncarcinogenic Effects
COPPER	1.3E+03	Cal DHS Primary MCL	1.3E+03	1.7E+02	Cal OEHHA PHG	2.8E+02	Noncarcinogenic Effects

TABLE F-3. SUMMARY OF DRINKING WATER SCREENING LEVELS FOR HUMAN TOXICITY
(ug/L)

CHEMICAL PARAMETER	Final Screening Level	Basis	Cal DHS Primary MCL	Other CalEPA Criteria	Reference	*Risk-Based Goals (Drinking Water Toxicity)	Basis
CYANIDE (Free)	2.0E+02	Cal DHS Primary MCL	2.0E+02	1.5E+02	Cal OEHHA PHG	1.4E+02	Noncarcinogenic Effects
DIBENZO(a,h)ANTHRACENE	8.5E-03	Carcinogenic Effects				8.5E-03	Carcinogenic Effects
DIBROMOCHLOROMETHANE	1.0E+02	Cal DHS Primary MCL	1.0E+02			3.7E-01	Carcinogenic Effects
1,2-DIBROMO-3-CHLOROPROPANE	2.0E-01	Cal DHS Primary MCL	2.0E-01	1.7E-03	Cal OEHHA PHG	5.0E-03	Carcinogenic Effects
DIBROMOETHANE, 1,2-	5.0E-02	Cal DHS Primary MCL	5.0E-02			9.7E-03	Carcinogenic Effects
DICHLOROBENZENE, 1,2-	6.0E+02	Cal DHS Primary MCL	6.0E+02	6.0E+02	Cal OEHHA PHG	6.3E+02	Noncarcinogenic Effects
DICHLOROBENZENE, 1,3-	6.3E+00	Noncarcinogenic Effects				6.3E+00	Noncarcinogenic Effects
DICHLOROBENZENE, 1,4-	5.0E+00	Cal DHS Primary MCL	5.0E+00	6.0E+00	Cal OEHHA PHG	6.5E+00	Carcinogenic Effects
DICHLOROBENZIDINE, 3,3-	2.9E-02	Carcinogenic Effects				2.9E-02	Carcinogenic Effects
DICHLORODIPHENYLDICHLOROETHANE (DDD)	1.5E-01	Carcinogenic Effects				1.5E-01	Carcinogenic Effects
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	1.0E-01	Carcinogenic Effects				1.0E-01	Carcinogenic Effects
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	1.0E-01	Carcinogenic Effects				1.0E-01	Carcinogenic Effects
DICHLOROETHANE, 1,1-	5.0E+00	Cal DHS Primary MCL	5.0E+00			6.1E+00	Carcinogenic Effects
DICHLOROETHANE, 1,2-	5.0E-01	Cal DHS Primary MCL	5.0E-01	4.0E-01	Cal OEHHA PHG	7.4E-01	Carcinogenic Effects
DICHLOROETHYLENE, 1,1-	6.0E+00	Cal DHS Primary MCL	6.0E+00	1.0E+01	Cal OEHHA PHG	3.5E+01	Noncarcinogenic Effects
DICHLOROETHYLENE, Cis 1,2-	6.0E+00	Cal DHS Primary MCL	6.0E+00			7.0E+01	Noncarcinogenic Effects
DICHLOROETHYLENE, Trans 1,2-	1.0E+01	Cal DHS Primary MCL	1.0E+01			1.4E+02	Noncarcinogenic Effects
DICHLOROPHENOL, 2,4-	2.1E+01	Noncarcinogenic Effects				2.1E+01	Noncarcinogenic Effects
DICHLOROPROPANE, 1,2-	5.0E+00	Cal DHS Primary MCL	5.0E+00	5.0E-01	Cal OEHHA PHG	9.7E-01	Carcinogenic Effects
DICHLOROPROPENE, 1,3-	5.0E-01	Cal DHS Primary MCL	5.0E-01	2.0E-01	Cal OEHHA PHG	3.8E-01	Carcinogenic Effects
DIELDRIN	2.2E-03	Carcinogenic Effects				2.2E-03	Carcinogenic Effects
DIETHYLPHTHALATE	5.6E+03	Noncarcinogenic Effects				5.6E+03	Noncarcinogenic Effects
DIMETHYLPHTHALATE	7.0E+04	Noncarcinogenic Effects				7.0E+04	Noncarcinogenic Effects
DIMETHYLPHENOL, 2,4-	1.0E+02	Cal DHS AL		1.0E+02	Cal DHS AL	1.4E+02	Noncarcinogenic Effects
DINITROPHENOL, 2,4-	1.4E+01	Noncarcinogenic Effects				1.4E+01	Noncarcinogenic Effects
DINITROTOLUENE, 2,4-	1.1E-01	Carcinogenic Effects				1.1E-01	Carcinogenic Effects
1,4 DIOXANE	3.0E+00	Cal OEHHA PHG		3.0E+00	Cal OEHHA PHG	1.3E+00	Carcinogenic Effects
DIOXIN (2,3,7,8-TCDD)	3.0E-05	Cal DHS Primary MCL	3.0E-05			2.7E-07	Carcinogenic Effects
ENDOSULFAN	4.2E+01	Noncarcinogenic Effects				4.2E+01	Noncarcinogenic Effects
ENDRIN	2.0E+00	Cal DHS Primary MCL	2.0E+00	1.8E+00	Cal OEHHA PHG	2.1E+00	Noncarcinogenic Effects
ETHYLBENZENE	7.0E+02	Cal DHS Primary MCL	7.0E+02	3.0E+02	Cal OEHHA PHG	9.0E+00	Carcinogenic Effects
FLUORANTHENE	2.8E+02	Noncarcinogenic Effects				2.8E+02	Noncarcinogenic Effects
FLUORENE	2.8E+02	Noncarcinogenic Effects				2.8E+02	Noncarcinogenic Effects
HEPTACHLOR	1.0E-02	Cal DHS Primary MCL	1.0E-02	8.0E-03	Cal OEHHA PHG	8.5E-03	Carcinogenic Effects
HEPTACHLOR EPOXIDE	1.0E-02	Cal DHS Primary MCL	1.0E-02	6.0E-03	Cal OEHHA PHG	6.4E-03	Carcinogenic Effects
HEXACHLOROBENZENE	1.0E+00	Cal DHS Primary MCL	1.0E+00			1.9E-02	Carcinogenic Effects
HEXACHLOROBUTADIENE	2.1E-01	Noncarcinogenic Effects				2.1E-01	Noncarcinogenic Effects
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	2.0E-01	Cal DHS Primary MCL	2.0E-01			3.2E-02	Carcinogenic Effects

TABLE F-3. SUMMARY OF DRINKING WATER SCREENING LEVELS FOR HUMAN TOXICITY
(ug/L)

CHEMICAL PARAMETER	Final Screening Level	Basis	Cal DHS Primary MCL	Other CalEPA Criteria	Reference	*Risk-Based Goals (Drinking Water Toxicity)	Basis
HEXACHLOROETHANE	7.0E-01	Noncarcinogenic Effects				7.0E-01	Noncarcinogenic Effects
INDENO(1,2,3-cd)PYRENE	2.9E-02	Carcinogenic Effects				2.9E-02	Carcinogenic Effects
LEAD	1.5E+01	Cal DHS Primary MCL	1.5E+01	2.0E+00	Cal OEHHA PHG	-	Noncarcinogenic Effects
MERCURY	2.0E+00	Cal DHS Primary MCL	2.0E+00	1.2E+00	Cal OEHHA PHG	1.1E+00	Noncarcinogenic Effects
METHOXYCHLOR	4.0E+01	Cal DHS Primary MCL	4.0E+01	3.0E+01	Cal OEHHA PHG	3.5E+01	Noncarcinogenic Effects
METHYLENE CHLORIDE	5.0E+00	Cal DHS Primary MCL	5.0E+00	4.0E+00	Cal OEHHA PHG	2.5E+00	Carcinogenic Effects
METHYL ETHYL KETONE	4.2E+03	Noncarcinogenic Effects				4.2E+03	Noncarcinogenic Effects
METHYL ISOBUTYL KETONE	1.2E+02	Cal DHS AL		1.2E+02	Cal DHS AL	5.6E+02	Noncarcinogenic Effects
METHYL MERCURY	7.0E-02	Noncarcinogenic Effects				7.0E-02	Noncarcinogenic Effects
METHYLNAPHTHALENE (total 1- & 2-)	2.8E+02	Noncarcinogenic Effects				2.8E+02	Noncarcinogenic Effects
METHYL TERT BUTYL ETHER	1.3E+01	Cal OEHHA		1.3E+01	Cal OEHHA	1.9E+01	Carcinogenic Effects
MOLYBDENUM	3.5E+01	Noncarcinogenic Effects				3.5E+01	Noncarcinogenic Effects
NAPHTHALENE	1.7E+02	Cal DHS AL		1.7E+02	Cal DHS AL	1.4E+01	Noncarcinogenic Effects
NICKEL	1.0E+02	Cal DHS Primary MCL	1.0E+02	1.2E+01	Cal OEHHA PHG	1.4E+02	Noncarcinogenic Effects
PENTACHLOROPHENOL	1.0E+00	Cal DHS Primary MCL	1.0E+00	4.0E-01	Cal OEHHA PHG	4.3E-01	Carcinogenic Effects
PERCHLORATE	7.0E-01	Noncarcinogenic Effects				7.0E-01	Noncarcinogenic Effects
PHENANTHRENE	2.8E+02	Noncarcinogenic Effects				2.8E+02	Noncarcinogenic Effects
PHENOL	4.2E+03	Cal DHS AL		4.2E+03	Cal DHS AL	4.2E+03	Noncarcinogenic Effects
POLYCHLORINATED BIPHENYLS (PCBs)	5.0E-01	Cal DHS Primary MCL	5.0E-01			1.8E-02	Carcinogenic Effects
PYRENE	2.1E+02	Noncarcinogenic Effects				2.1E+02	Noncarcinogenic Effects
SELENIUM	5.0E+01	Cal DHS Primary MCL	5.0E+01			3.5E+01	Noncarcinogenic Effects
SILVER	1.0E+02	Cal DHS Primary MCL	1.0E+02			3.5E+01	Noncarcinogenic Effects
STYRENE	1.0E+02	Cal DHS Primary MCL	1.0E+02			1.4E+02	Noncarcinogenic Effects
tert-BUTYL ALCOHOL	1.2E+01	Carcinogenic Effects				1.2E+01	Carcinogenic Effects
TETRACHLOROETHANE, 1,1,1,2-	1.3E+00	Carcinogenic Effects				1.3E+00	Carcinogenic Effects
TETRACHLOROETHANE, 1,1,2,2-	1.0E+00	Cal DHS Primary MCL	1.0E+00			1.3E-01	Carcinogenic Effects
TETRACHLOROETHYLENE	5.0E+00	Cal DHS Primary MCL	5.0E+00	6.0E-02	Cal OEHHA PHG	6.5E-02	Carcinogenic Effects
THALLIUM	2.0E+00	Cal DHS Primary MCL	2.0E+00	1.0E-01	Cal OEHHA PHG	4.6E-01	Noncarcinogenic Effects
TOLUENE	1.5E+02	Cal DHS Primary MCL	1.5E+02	1.5E+02	Cal OEHHA PHG	1.4E+03	Noncarcinogenic Effects
TOXAPHENE	3.0E+00	Cal DHS Primary MCL	3.0E+00			2.9E-02	Carcinogenic Effects
TPH (gasolines)	2.1E+02	Noncarcinogenic Effects				2.1E+02	Noncarcinogenic Effects
TPH (middle distillates)	2.1E+02	Noncarcinogenic Effects				2.1E+02	Noncarcinogenic Effects
TPH (residual fuels)	2.1E+02	Noncarcinogenic Effects				2.1E+02	Noncarcinogenic Effects
TRICHLOROBENZENE, 1,2,4-	7.0E+01	Cal DHS Primary MCL	7.0E+01	5.0E+00	Cal OEHHA PHG	9.7E+00	Carcinogenic Effects
TRICHLOROETHANE, 1,1,1-	2.0E+02	Cal DHS Primary MCL	2.0E+02			2.0E+03	Noncarcinogenic Effects
TRICHLOROETHANE, 1,1,2-	5.0E+00	Cal DHS Primary MCL	5.0E+00			4.9E-01	Carcinogenic Effects
TRICHLOROETHYLENE	5.0E+00	Cal DHS Primary MCL	5.0E+00	8.0E-01	Cal OEHHA PHG	2.1E+00	Noncarcinogenic Effects
TRICHLOROPHENOL, 2,4,5-	7.0E+02	Noncarcinogenic Effects				7.0E+02	Noncarcinogenic Effects

TABLE F-3. SUMMARY OF DRINKING WATER SCREENING LEVELS FOR HUMAN TOXICITY
(ug/L)

CHEMICAL PARAMETER	Final Screening Level	Basis	Cal DHS Primary MCL	Other CalEPA Criteria	Reference	*Risk-Based Goals (Drinking Water Toxicity)	Basis
TRICHLOROPHENOL, 2,4,6-	5.0E-01	Carcinogenic Effects				5.0E-01	Carcinogenic Effects
VANADIUM	1.5E+01	Cal DHS AL		1.5E+01	Cal DHS AL	4.9E+01	Noncarcinogenic Effects
VINYL CHLORIDE	5.0E-01	Cal DHS Primary MCL	5.0E-01	5.0E-02	Cal OEHHA PHG	1.3E-01	Carcinogenic Effects
XYLENES	1.8E+03	Cal DHS Primary MCL	1.8E+03	1.8E+03	Cal OEHHA PHG	4.9E+03	Noncarcinogenic Effects
ZINC	5.0E+03	Cal DHS Primary MCL	5.0E+03			2.1E+03	Noncarcinogenic Effects

Source (unless otherwise noted):
A Compilation of Water Quality Goals (August 2000 and updates), CalEPA RWQCB - Central Valley Region (CRWQCBCV 2000)

Notes:
Used for development of groundwater and soil screening levels.
TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.
Final health-based screening level for drinking water: Cal EPA Primary MCL or, in order of preference and availability, CalEPA Public Health Goal, Cal DHS Action Level and risk-based goal.
Cal DHS MCL: California EPA Department of Health Services Maximum Concentration Level.
OEHHA PHG: California Office of Environmental Health Hazard Assessment Public Health Goal.
Cal DHS AL: California Department of Health Services Action Level based on toxicity to humans.
*Risk-based goals calculated using Cal DHS model as presented in *A Compilation of Water Quality Goals* (August 2000).
Calculated goals for carcinogenic effects based on target excess cancer risk of 10^{-6} (see Chapter 2 of text).
Calculated goals for noncarcinogenic effects based on relative source contribution factor of 20% (see Chapter 2 of text).

TABLE F-4a. SUMMARY OF SELECTED CHRONIC AQUATIC HABITAT GOALS
(ug/l)

	Aquatic Habitat Goals					
CHEMICAL PARAMETER	[1]Lowest Estuary Aquatic Habitat Goal	Basis	Lowest Freshwater Aquatic Habitat Goal	Basis	Lowest Marine Aquatic Habitat Goal	Basis
ACENAPHTHENE	2.3E+01	USEPA Ecotox FW Chronic	2.3E+01	USEPA Ecotox FW Chronic	4.0E+01	USEPA Ecotox SW Chronic
ACENAPHTHYLENE	3.0E+01	10% USEPA SW Acute LOEL	3.0E+01	10% USEPA SW Acute LOEL	3.0E+01	10% USEPA SW Acute LOEL
ACETONE	1.5E+03	USDOE FW Chronic PRG	1.5E+03	USDOE FW Chronic PRG	1.5E+03	USDOE FW Chronic PRG
ALDRIN	1.3E-01	10% CTR SW CMC	3.0E-01	10% CTR FW CMC	1.3E-01	10% CTR SW CMC
ANTHRACENE	7.3E-01	USDOE FW Chronic PRG	7.3E-01	USDOE FW Chronic PRG	7.3E-01	USDOE FW Chronic PRG
ANTIMONY	3.0E+01	USEPA FW CCC	3.0E+01	USEPA FW CCC	5.0E+02	USEPA SW CCC
ARSENIC	3.6E+01	CTR SW CCC	1.5E+02	CTR FW CCC	3.6E+01	CTR SW CCC
BARIUM	1.0E+03	=Drinking Water (Table F-3)	1.0E+03	=Drinking Water (Table F-3)	1.0E+03	=Drinking Water (Table F-3)
BENZENE	4.6E+01	USEPA Ecotox FW Chronic	4.6E+01	USEPA Ecotox FW Chronic	3.5E+02	50% USEPA SW Chronic LOEL
BENZO(a)ANTHRACENE	2.7E-02	USDOE FW Chronic PRG	2.7E-02	USDOE FW Chronic PRG	2.7E-02	USDOE FW Chronic PRG
BENZO(b)FLUORANTHENE	2.9E-02	=Drinking Water (Table F-3)	2.9E-02	=Drinking Water (Table F-3)	2.9E-02	=Drinking Water (Table F-3)
BENZO(k)FLUORANTHENE	3.7E+00	50% MOEE FW Chronic LOEL	3.7E+00	50% MOEE FW Chronic LOEL	3.7E+00	50% MOEE FW Chronic LOEL
BENZO(g,h,i)PERYLENE	1.0E-01	50% MOEE FW Chronic LOEL	1.0E-01	50% MOEE FW Chronic LOEL	1.0E-01	50% MOEE FW Chronic LOEL
BENZO(a)PYRENE	1.4E-02	USEPA Ecotox FW Chronic	1.4E-02	USEPA Ecotox FW Chronic	1.4E-02	USEPA Ecotox FW Chronic
BERYLLIUM	2.7E+00	50% USEPA FW Chronic LOEL	2.7E+00	50% USEPA FW Chronic LOEL	2.7E+00	50% USEPA FW Chronic LOEL
BIPHENYL, 1,1-	1.4E+01	USEPA Ecotox FW Chronic	1.4E+01	USEPA Ecotox FW Chronic	1.4E+01	USEPA Ecotox FW Chronic
BIS(2-CHLOROETHYL)ETHER	6.1E+01	50% USEPA FW Chronic LOEL	6.1E+01	50% USEPA FW Chronic LOEL	6.1E+01	50% USEPA FW Chronic LOEL
BIS(2-CHLOROISOPROPYL)ETHER	6.1E+01	50% USEPA FW Chronic LOEL	6.1E+01	50% USEPA FW Chronic LOEL	6.1E+01	50% USEPA FW Chronic LOEL
BIS(2-ETHYLHEXYL)PHTHALATE	3.2E+01	USEPA Ecotox FW Chronic	3.2E+01	USEPA Ecotox FW Chronic	3.2E+01	USEPA Ecotox FW Chronic
BORON	1.6E+00	USDOE FW Chronic PRG	1.6E+00	USDOE FW Chronic PRG	1.6E+00	USDOE FW Chronic PRG
BROMODICHLOROMETHANE	3.2E+03	50% USEPA SW Chronic LOEL	3.2E+03	50% USEPA SW Chronic LOEL	3.2E+03	50% USEPA SW Chronic LOEL
BROMOFORM	3.2E+03	50% USEPA SW Chronic LOEL	3.2E+03	50% USEPA SW Chronic LOEL	3.2E+03	50% USEPA SW Chronic LOEL
BROMOMETHANE	1.6E+02	50% MOEE FW Chronic LOEL	1.6E+02	50% MOEE FW Chronic LOEL	3.2E+03	50% USEPA SW Chronic LOEL
CADMIUM	2.2E+00	CTR FW CCC	2.2E+00	CTR FW CCC	9.3E+00	CTR SW CCC
CARBON TETRACHLORIDE	9.8E+00	USDOE FW Chronic PRG	9.8E+00	USDOE FW Chronic PRG	3.2E+03	50% USEPA SW Chronic LOEL
CHLORDANE	4.0E-03	CTR SW CCC	4.3E-03	CTR FW CCC	4.0E-03	CTR SW CCC
CHLOROANILINE, p-	5.0E+00	50% MOEE FW Chronic LOEL	5.0E+00	50% MOEE FW Chronic LOEL	5.0E+00	50% MOEE FW Chronic LOEL
CHLOROBENZENE	2.5E+01	50% USEPA FW Chronic LOEL	2.5E+01	50% USEPA FW Chronic LOEL	6.5E+01	50% USEPA SW Chronic LOEL
CHLOROETHANE	1.2E+01	=Drinking Water (Table F-3)	1.2E+01	=Drinking Water (Table F-3)	1.2E+01	=Drinking Water (Table F-3)
CHLOROFORM	6.2E+02	50% USEPA FW Chronic LOEL	6.2E+02	50% USEPA FW Chronic LOEL	3.2E+03	50% USEPA SW Chronic LOEL
CHLOROMETHANE	3.2E+03	50% USEPA SW Chronic LOEL	3.2E+03	50% USEPA SW Chronic LOEL	3.2E+03	50% USEPA SW Chronic LOEL
CHLOROPHENOL, 2-	4.4E+02	10% USEPA FW Acute LOEL	4.4E+02	10% USEPA FW Acute LOEL	4.4E+02	10% USEPA FW Acute LOEL
CHROMIUM (Total)	1.8E+02	*=Cr III*	1.8E+02	CTR FW CCC	1.8E+02	CTR FW CCC
CHROMIUM III	1.8E+02	CTR FW CCC	1.8E+02	CTR FW CCC	1.8E+02	CTR FW CCC
CHROMIUM VI	1.1E+01	CTR FW CCC	1.1E+01	CTR FW CCC	5.0E+01	CTR SW CCC
CHRYSENE	3.5E-01	50% MOEE FW Chronic LOEL	3.5E-01	50% MOEE FW Chronic LOEL	3.5E-01	50% MOEE FW Chronic LOEL
COBALT	3.0E+00	USEPA Ecotox FW Chronic	3.0E+00	USEPA Ecotox FW Chronic	3.0E+00	USEPA Ecotox FW Chronic
COPPER	3.1E+00	CTR SW CCC	9.0E+00	CTR FW CCC	3.1E+00	CTR SW CCC
CYANIDE (Free)	1.0E+00	CTR SW CCC	5.2E+00	CTR FW CCC	1.0E+00	CTR SW CCC
DIBENZO(a,h)ANTHTRACENE	7.5E+00	50% MOEE FW Chronic LOEL	7.5E+00	50% MOEE FW Chronic LOEL	7.5E+00	50% MOEE FW Chronic LOEL

TABLE F-4a. SUMMARY OF SELECTED CHRONIC AQUATIC HABITAT GOALS
(ug/l)

	Aquatic Habitat Goals					
CHEMICAL PARAMETER	[1]Lowest Estuary Aquatic Habitat Goal	Basis	Lowest Freshwater Aquatic Habitat Goal	Basis	Lowest Marine Aquatic Habitat Goal	Basis
DIBROMOCHLOROMETHANE	3.2E+03	50% USEPA SW Chronic LOEL	3.2E+03	50% USEPA SW Chronic LOEL	3.2E+03	50% USEPA SW Chronic LOEL
1,2-DIBROMO-3-CHLOROPROPANE	2.0E-01	=Drinking Water (Table F-3)	2.0E-01	=Drinking Water (Table F-3)	2.0E-01	=Drinking Water (Table F-3)
DIBROMOETHANE, 1,2-	1.4E+03	50% MOEE FW Chronic AWQC	1.4E+03	50% MOEE FW Chronic AWQC	1.4E+03	50% MOEE FW Chronic AWQC
DICHLOROBENZENE, 1,2-	1.4E+01	USEPA Ecotox FW Chronic	1.4E+01	USEPA Ecotox FW Chronic	6.5E+01	50% USEPA SW Chronic LOEL
DICHLOROBENZENE, 1,3-	6.5E+01	50% USEPA SW Chronic LOEL	7.1E+01	USEPA Ecotox FW Chronic	6.5E+01	50% USEPA SW Chronic LOEL
DICHLOROBENZENE, 1,4-	1.5E+01	USEPA Ecotox FW Chronic	1.5E+01	USEPA Ecotox FW Chronic	6.5E+01	50% USEPA SW Chronic LOEL
DICHLOROBENZIDINE, 3,3-	2.5E+02	50% MOEE FW Chronic LOEL	2.5E+02	50% MOEE FW Chronic LOEL	2.5E+02	50% MOEE FW Chronic LOEL
DICHLORODIPHENYLDICHLOROETHANE (DDD)	1.0E-03	=DDT	1.0E-03	=DDT	1.0E-03	=DDT
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	1.0E-03	=DDT	1.0E-03	=DDT	1.0E-03	=DDT
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	1.0E-03	CTR FW/SW CCC	1.0E-03	CTR FW CCC	1.0E-03	CTR SW CCC
DICHLOROETHANE, 1,1-	4.7E+01	USEPA Ecotox FW Chronic	4.7E+01	USEPA Ecotox FW Chronic	4.7E+01	USEPA Ecotox FW Chronic
DICHLOROETHANE, 1,2-	1.0E+04	50% USEPA FW Chronic LOEL	1.0E+04	50% USEPA FW Chronic LOEL	1.0E+04	50% USEPA FW Chronic LOEL
DICHLOROETHYLENE, 1,1-	2.5E+01	USDOE FW Chronic PRG	2.5E+01	USDOE FW Chronic PRG	2.5E+01	USDOE FW Chronic PRG
DICHLOROETHYLENE, Cis 1,2-	5.9E+02	USDOE FW Chronic PRG	5.9E+02	USDOE FW Chronic PRG	5.9E+02	USDOE FW Chronic PRG
DICHLOROETHYLENE, Trans 1,2-	5.9E+02	USDOE FW Chronic PRG	5.9E+02	USDOE FW Chronic PRG	5.9E+02	USDOE FW Chronic PRG
DICHLOROPHENOL, 2,4-	1.8E+02	50% USEPA FW Chronic LOEL	1.8E+02	50% USEPA FW Chronic LOEL	1.8E+02	50% USEPA FW Chronic LOEL
DICHLOROPROPANE, 1,2-	1.5E+03	50% USEPA SW Chronic LOEL	2.9E+03	50% USEPA FW Chronic LOEL	1.5E+03	50% USEPA SW Chronic LOEL
DICHLOROPROPENE, 1,3-	1.2E+02	50% USEPA FW Chronic LOEL	1.2E+02	50% USEPA FW Chronic LOEL	1.2E+02	50% USEPA FW Chronic LOEL
DIELDRIN	1.9E-03	CTR SW CCC	5.6E-02	CTR FW CCC	1.9E-03	CTR SW CCC
DIETHYLPHTHALATE	1.5E+00	50% USEPA FW Chronic LOEL	1.5E+00	50% USEPA FW Chronic LOEL	1.7E+00	50% USEPA SW Chronic LOEL
DIMETHYLPHTHALATE	1.5E+00	50% USEPA FW Chronic LOEL	1.5E+00	50% USEPA FW Chronic LOEL	1.7E+00	50% USEPA SW Chronic LOEL
DIMETHYLPHENOL, 2,4-	1.1E+02	USEPA SW CCC	5.3E+02	USEPA FW CCC	1.1E+02	USEPA SW CCC
DINITROPHENOL, 2,4-	7.5E+01	50% USEPA FW Chronic LOEL	7.5E+01	50% USEPA FW Chronic LOEL	7.5E+01	50% USEPA FW Chronic LOEL
DINITROTOLUENE, 2,4-	1.2E+02	50% USEPA FW Chronic LOEL	1.2E+02	50% USEPA FW Chronic LOEL	1.9E+02	50% USEPA SW Chronic LOEL
1,4 DIOXANE	3.4E+05	5% LC 50	3.4E+05	5% LC 50	5.0E+05	5% LC 50
DIOXIN (2,3,7,8-TCDD)	5.0E-06	50% USEPA FW Chronic LOEL	5.0E-06	50% USEPA FW Chronic LOEL	5.0E-06	50% USEPA FW Chronic LOEL
ENDOSULFAN	8.7E-03	CTR SW CCC	5.6E-02	CTR FW CCC	8.7E-03	CTR SW CCC
ENDRIN	2.3E-03	CTR SW CCC	3.6E-02	CTR FW CCC	2.3E-03	CTR SW CCC
ETHYLBENZENE	2.9E+02	USEPA Ecotox FW Chronic	2.9E+02	USEPA Ecotox FW Chronic	2.9E+02	USEPA Ecotox FW Chronic
FLUORANTHENE	8.0E+00	50% USEPA SW Chronic LOEL	8.1E+00	USEPA Ecotox FW Chronic	8.0E+00	50% USEPA SW Chronic LOEL
FLUORENE	3.9E+00	USEPA Ecotox FW Chronic	3.9E+00	USEPA Ecotox FW Chronic	3.9E+00	USEPA Ecotox FW Chronic
HEPTACHLOR	3.8E-03	CTR FW CCC	3.8E-03	CTR FW CCC	0.0036	CTR SW CCC
HEPTACHLOR EPOXIDE	3.8E-03	CTR FW CCC	3.8E-03	CTR FW CCC	0.0036	CTR SW CCC
HEXACHLOROBENZENE	3.7E+00	USEPA FW CCC	3.7E+00	USEPA FW CCC	6.5E+01	50% USEPA SW Chronic LOEL
HEXACHLOROBUTADIENE	4.7E+00	50% USEPA FW Chronic LOEL	4.7E+00	50% USEPA FW Chronic LOEL	4.7E+00	50% USEPA FW Chronic LOEL
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	8.0E-02	USEPA Ecotox FW Chronic	8.0E-02	USEPA Ecotox FW Chronic	8.0E-02	USEPA Ecotox FW Chronic
HEXACHLOROETHANE	1.2E+01	USEPA Ecotox FW Chronic	1.2E+01	USEPA Ecotox FW Chronic	1.2E+01	USEPA Ecotox FW Chronic
INDENO(1,2,3-cd)PYRENE	2.9E-02	=Drinking Water (Table F-3)	2.9E-02	=Drinking Water (Table F-3)	2.9E-02	=Drinking Water (Table F-3)
LEAD	2.5E+00	CTR FW CCC	2.5E+00	CTR FW CCC	8.1E+00	CTR SW CCC
MERCURY	1.2E-02	RWQCBSF Basin Plan	1.2E-02	RWQCBSF Basin Plan	2.5E-02	RWQCBSF Basin Plan

TABLE F-4a. SUMMARY OF SELECTED CHRONIC AQUATIC HABITAT GOALS
(ug/l)

	Aquatic Habitat Goals					
CHEMICAL PARAMETER	[1]Lowest Estuary Aquatic Habitat Goal	Basis	Lowest Freshwater Aquatic Habitat Goal	Basis	Lowest Marine Aquatic Habitat Goal	Basis
METHOXYCHLOR	1.9E-02	USEPA Ecotox FW Chronic	1.9E-02	USEPA Ecotox FW Chronic	1.9E-02	USEPA Ecotox FW Chronic
METHYLENE CHLORIDE	2.2E+03	USDOE FW Chronic PRG	2.2E+03	USDOE FW Chronic PRG	3.2E+03	50% USEPA SW Chronic LOEL
METHYL ETHYL KETONE	1.4E+04	USDOE FW Chronic PRG	1.4E+04	USDOE FW Chronic PRG	1.4E+04	USDOE FW Chronic PRG
METHYL ISOBUTYL KETONE	1.7E+02	USDOE FW Chronic PRG	1.7E+02	USDOE FW Chronic PRG	1.7E+02	USDOE FW Chronic PRG
METHYL MERCURY	3.0E-03	USEPA Ecotox FW Chronic	3.0E-03	USEPA Ecotox FW Chronic	3.0E-03	USEPA Ecotox FW Chronic
METHYLNAPHTHALENE (total 1- & 2-)	2.1E+00	USDOE FW Chronic PRG	2.1E+00	USDOE FW Chronic PRG	2.1E+00	USDOE FW Chronic PRG
METHYL TERT BUTYL ETHER	8.0E+03	CTR SW CCC	6.6E+04	CTR FW CCC	8.0E+03	CTR SW CCC
MOLYBDENUM	2.4E+02	USEPA Ecotox FW Chronic	2.4E+02	USEPA Ecotox FW Chronic	2.4E+02	USEPA Ecotox FW Chronic
NAPHTHALENE	2.4E+01	USEPA Ecotox FW Chronic	2.4E+01	USEPA Ecotox FW Chronic	2.4E+01	USEPA Ecotox FW Chronic
NICKEL	8.2E+00	CTR SW CCC	5.2E+01	CTR FW CCC	8.2E+00	CTR SW CCC
PENTACHLOROPHENOL	7.9E+00	CTR SW CCC	1.5E+01	CTR FW CCC	7.9E+00	CTR SW CCC
PERCHLORATE	6.0E+02	USEPA Ecotox FW Chronic	6.0E+02	USEPA Ecotox FW Chronic	6.0E+02	USEPA Ecotox FW Chronic
PHENANTHRENE	4.6E+00	USEPA SW CCC	6.3E+00	USEPA FW CCC	4.6E+00	USEPA SW CCC
PHENOL	1.3E+03	50% USEPA FW Chronic LOEL	1.3E+03	50% USEPA FW Chronic LOEL	1.3E+03	50% USEPA FW Chronic LOEL
POLYCHLORINATED BIPHENYLS (PCBs)	1.4E-02	CTR FW CCC	1.4E-02	CTR FW CCC	3.0E-02	CTR SW CCC
PYRENE	2.0E+00	50% MOEE FW Chronic LOEL	2.0E+00	50% MOEE FW Chronic LOEL	2.0E+00	50% MOEE FW Chronic LOEL
SELENIUM	5.0E+00	CTR FW CCC	5.0E+00	CTR FW CCC	7.1E+01	CTR SW CCC
SILVER	1.9E-01	10% CTR SW CMC	3.4E-01	10% CTR FW CMC	1.9E-01	10% CTR SW CMC
STYRENE	1.0E+02	=Drinking Water (Table F-3)	1.0E+02	=Drinking Water (Table F-3)	1.0E+02	=Drinking Water (Table F-3)
tert-BUTYL ALCOHOL	1.8E+04	10% Acute FW LC 0	1.8E+04	10% Acute FW LC 0	1.8E+04	10% Acute FW LC 0
TETRACHLOROETHANE, 1,1,1,2-	9.3E+02	10% USEPA FW Acute LOEL	9.3E+02	10% USEPA FW Acute LOEL	9.3E+02	10% USEPA FW Acute LOEL
TETRACHLOROETHANE, 1,1,2,2-	4.2E+02	USEPA Ecotox FW Chronic	4.2E+02	USEPA Ecotox FW Chronic	4.2E+02	USEPA Ecotox FW Chronic
TETRACHLOROETHYLENE	1.2E+02	USEPA Ecotox FW Chronic	1.2E+02	USEPA Ecotox FW Chronic	2.3E+02	50% USEPA SW Chronic LOEL
THALLIUM	2.0E+01	50% USEPA FW Chronic LOEL	2.0E+01	50% USEPA FW Chronic LOEL	2.0E+01	50% USEPA FW Chronic LOEL
TOLUENE	1.3E+02	USEPA Ecotox FW Chronic	1.3E+02	USEPA Ecotox FW Chronic	2.5E+03	50% USEPA SW Chronic LOEL
TOXAPHENE	2.0E-04	CTR FW/SW CCC	2.0E-04	CTR FW CCC	2.0E-04	CTR SW CCC
TPH (gasolines)	5.0E+02	RWQCBSF (see notes)	5.0E+02	RWQCBSF (see notes)	3.7E+03	RWQCBSF (see notes)
TPH (middle distillates)	6.4E+02	RWQCBSF (see notes)	6.4E+02	RWQCBSF (see notes)	6.4E+02	RWQCBSF (see notes)
TPH (residual fuels)	6.4E+02	RWQCBSF (see notes)	6.4E+02	RWQCBSF (see notes)	6.4E+02	RWQCBSF (see notes)
TRICHLOROBENZENE, 1,2,4-	2.5E+01	50% USEPA FW Chronic LOEL	2.5E+01	50% USEPA FW Chronic LOEL	6.5E+01	50% USEPA SW Chronic LOEL
TRICHLOROETHANE, 1,1,1-	6.2E+01	USEPA Ecotox FW Chronic	6.2E+01	USEPA Ecotox FW Chronic	6.2E+01	USEPA Ecotox FW Chronic
TRICHLOROETHANE, 1,1,2-	4.7E+03	50% USEPA FW Chronic LOEL	4.7E+03	50% USEPA FW Chronic LOEL	4.7E+03	50% USEPA FW Chronic LOEL
TRICHLOROETHYLENE	3.6E+02	USEPA Ecotox FW Chronic	3.6E+02	USEPA Ecotox FW Chronic	3.6E+02	USEPA Ecotox FW Chronic
TRICHLOROPHENOL, 2,4,5-	1.1E+01	USEPA SW CCC	6.3E+01	USEPA FW CCC	1.1E+01	USEPA SW CCC
TRICHLOROPHENOL, 2,4,6-	4.9E+02	50% USEPA FW Chronic LOEL	4.9E+02	50% USEPA FW Chronic LOEL	4.9E+02	50% USEPA FW Chronic LOEL
VANADIUM	1.9E+01	USEPA Ecotox FW Chronic	1.9E+01	USEPA Ecotox FW Chronic	1.9E+01	USEPA Ecotox FW Chronic

TABLE F-4a. SUMMARY OF SELECTED CHRONIC AQUATIC HABITAT GOALS
(ug/l)

	Aquatic Habitat Goals					
CHEMICAL PARAMETER	[1]Lowest Estuary Aquatic Habitat Goal	Basis	Lowest Freshwater Aquatic Habitat Goal	Basis	Lowest Marine Aquatic Habitat Goal	Basis
VINYL CHLORIDE	7.8E+02	USDOE FW Chronic PRG	7.8E+02	USDOE FW Chronic PRG	7.8E+02	USDOE FW Chronic PRG
XYLENES	1.3E+01	USDOE FW Chronic PRG	1.3E+01	USDOE FW Chronic PRG	1.3E+01	USDOE FW Chronic PRG
ZINC	8.1E+01	CTR SW CCC	1.2E+02	CTR FW CCC	8.1E+01	CTR SW CCC

Notes:

1. Lowest Estuary Goal = Lowest of Freshwater vs Marine chronic goals. Used for development of groundwater and soil screening levels.
Aquatic Habitat Goals: Addresses potential impact on freshwater or marine aquatic habitats. Final screening levels are lowest of marine and freshwater criteria.
See text for prioritization and selection of surface water quality screening levels. CTR HH criteria for potential bioaccumulation of chemicals in aquatic life considered in surface water screening levels only (refer to main text).
Drinking water goal substituted as aqautic habitat goal if later was not available (see text).
Methyl tert-Butyl Ether: Interim salt water CCC proposed by Region 2 Water Quality Control Board (RWQCBSF, 1998b)
TPH screening levels: Based on TPH screening levels published in RWQCB Board Orders. See footnotes for Table F-4b.
AWQC: Aquatic Water Quality Criteria
CCC: Criterion for Continuous Concentration
CMC: Criterion for Maximum Concentration
CTR: California (interim) Toxics Rule (in RWQCBCV 2000 and Federal Register 2000)
FCV: Final Chronic Value
FW: Freshwater
LOEL: Lowest Observed Effects Level
MOEE: Ontario Ministry of Environment and Energy (MOEE 1996)
PRG: USDOE Preliminary Remediation Goal for ecological concerns.
SW: Saltwater
TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.
USDOE: U. S. Department of Energy
USEPA: U.S. Environmental Protection Agency

TABLE F-4b. SUMMARY OF CALIFORNIA CONTINUOUS AND MAXIMUM AQUATIC HABITAT GOALS (ug/l)

	Freshwater			Saltwater		
CHEMICAL PARAMETER	Criterion for Continuous Concentration	Criterion for Maximum Concentration	Region 2 Basin Plan	Criterion for Continuous Concentration	Criterion for Maximum Concentration	Region 2 Basin Plan
ACENAPHTHENE						
ACENAPHTHYLENE						
ACETONE						
ALDRIN		3.0E+00			1.3E+00	
ANTHRACENE						
ANTIMONY						
ARSENIC	1.5E+02	3.4E+02	1.9E+02	3.6E+01	6.9E+01	3.6E+01
BARIUM						
BENZENE						
BENZO(a)ANTHRACENE						
BENZO(b)FLUORANTHENE						
BENZO(k)FLUORANTHENE						
BENZO(g,h,i)PERYLENE						
BENZO(a)PYRENE						
BERYLLIUM						
BIPHENYL, 1,1-						
BIS(2-CHLOROETHYL)ETHER						
BIS(2-CHLOROISOPROPYL)ETHER						
BIS(2-ETHYLHEXYL)PHTHALATE						
BORON						
BROMODICHLOROMETHANE						
BROMOFORM						
BROMOMETHANE						
CADMIUM	2.2E+00	4.3E+00	1.1E+00	9.3E+00	4.2E+01	9.3E+00
CARBON TETRACHLORIDE						
CHLORDANE	4.3E-03	2.4E+00		4.0E-03	9.0E-02	
CHLOROANILINE, p-						
CHLOROBENZENE						
CHLOROETHANE						
CHLOROFORM						
CHLOROMETHANE						
CHLOROPHENOL, 2-						
CHROMIUM (Total)	1.8E+02	5.5E+02				
CHROMIUM III	1.8E+02	5.5E+02				
CHROMIUM VI	1.1E+01	1.6E+01	1.1E+01	5.0E+01	1.1E+03	5.0E+01
CHRYSENE						
COBALT						
COPPER	9.0E+00	1.3E+01	6.5E+00	3.1E+00	4.8E+00	

TABLE F-4b. SUMMARY OF CALIFORNIA CONTINUOUS AND MAXIMUM AQUATIC HABITAT GOALS (ug/l)

	Freshwater			Saltwater		
CHEMICAL PARAMETER	Criterion for Continuous Concentration	Criterion for Maximum Concentration	Region 2 Basin Plan	Criterion for Continuous Concentration	Criterion for Maximum Concentration	Region 2 Basin Plan
CYANIDE (Free)	5.2E+00	2.2E+01		1.0E+00	1.0E+00	
DIBENZO(a,h)ANTHTRACENE						
DIBROMOCHLOROMETHANE						
1,2-DIBROMO-3-CHLOROPROPANE						
DIBROMOETHANE, 1,2-						
DICHLOROBENZENE, 1,2-						
DICHLOROBENZENE, 1,3-						
DICHLOROBENZENE, 1,4-						
DICHLOROBENZIDINE, 3,3-						
DICHLORODIPHENYLDICHLOROETHANE (DDD)						
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)						
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	1.0E-03	1.1E+00		1.0E-03	1.3E-01	
DICHLOROETHANE, 1,1-						
DICHLOROETHANE, 1,2-						
DICHLOROETHYLENE, 1,1-						
DICHLOROETHYLENE, Cis 1,2-						
DICHLOROETHYLENE, Trans 1,2-						
DICHLOROPHENOL, 2,4-						
DICHLOROPROPANE, 1,2-						
DICHLOROPROPENE, 1,3-						
DIELDRIN	5.6E-02	2.4E-01		1.9E-03	7.1E-01	
DIETHYLPHTHALATE						
DIMETHYLPHTHALATE						
DIMETHYLPHENOL, 2,4-						
DINITROPHENOL, 2,4-						
DINITROTOLUENE, 2,4-						
1,4 DIOXANE						
DIOXIN (2,3,7,8-TCDD)						
ENDOSULFAN	5.6E-02	2.2E-01		8.7E-03	3.4E-02	
ENDRIN	3.6E-02	8.6E-02		2.3E-03	3.7E-02	
ETHYLBENZENE						
FLUORANTHENE						
FLUORENE						
HEPTACHLOR	3.8E-03	5.2E-02		0.0036	5.3E-02	
HEPTACHLOR EPOXIDE	3.8E-03	5.2E-02		0.0036	5.3E-02	
HEXACHLOROBENZENE						
HEXACHLOROBUTADIENE						
HEXACHLOROCYCLOHEXANE (gamma) LINDANE		9.5E-01			1.6E-01	

TABLE F-4b. SUMMARY OF CALIFORNIA CONTINUOUS AND MAXIMUM AQUATIC HABITAT GOALS (ug/l)

	Freshwater			Saltwater		
CHEMICAL PARAMETER	Criterion for Continuous Concentration	Criterion for Maximum Concentration	Region 2 Basin Plan	Criterion for Continuous Concentration	Criterion for Maximum Concentration	Region 2 Basin Plan
HEXACHLOROETHANE						
INDENO(1,2,3-cd)PYRENE						
LEAD	2.5E+00	6.5E+01	3.2E+00	8.1E+00	2.1E+02	5.6E+00
MERCURY			1.2E-02			2.5E-02
METHOXYCHLOR						
METHYLENE CHLORIDE						
METHYL ETHYL KETONE						
METHYL ISOBUTYL KETONE						
METHYL MERCURY						
METHYLNAPHTHALENE (total 1- & 2-)						
METHYL TERT BUTYL ETHER	6.6E+04	1.2E+05		8.0E+03	1.4E+04	
MOLYBDENUM						
NAPHTHALENE						
NICKEL	5.2E+01	4.7E+02		8.2E+00	7.4E+01	
PENTACHLOROPHENOL	1.5E+01	1.9E+01		7.9E+00	1.3E+01	
PERCHLORATE						
PHENANTHRENE						
PHENOL						
POLYCHLORINATED BIPHENYLS (PCBs)	1.4E-02			3.0E-02		
PYRENE						
SELENIUM	5.0E+00			7.1E+01	2.9E+02	
SILVER		3.4E+00			1.9E+00	
STYRENE						
tert-BUTYL ALCOHOL						
TETRACHLOROETHANE, 1,1,1,2-						
TETRACHLOROETHANE, 1,1,2,2-						
TETRACHLOROETHYLENE						
THALLIUM						
TOLUENE						
TOXAPHENE	2.0E-04	7.3E-01		2.0E-04	2.1E-01	
TPH (gasolines)			5.0E+02			3.7E+03
TPH (middle distillates)			6.4E+02			
TPH (residual fuels)			6.4E+02			
TRICHLOROBENZENE, 1,2,4-						
TRICHLOROETHANE, 1,1,1-						
TRICHLOROETHANE, 1,1,2-						
TRICHLOROETHYLENE						
TRICHLOROPHENOL, 2,4,5-						

TABLE F-4b. SUMMARY OF CALIFORNIA CONTINUOUS AND MAXIMUM AQUATIC HABITAT GOALS (ug/l)

	Freshwater			Saltwater		
CHEMICAL PARAMETER	Criterion for Continuous Concentration	Criterion for Maximum Concentration	Region 2 Basin Plan	Criterion for Continuous Concentration	Criterion for Maximum Concentration	Region 2 Basin Plan
TRICHLOROPHENOL, 2,4,6-						
VANADIUM						
VINYL CHLORIDE						
XYLENES						
ZINC	1.2E+02	1.2E+02		8.1E+01	9.0E+01	

References:

Primary sources: 1) 40 CFR Part 131: Water Quality Standards; Establishment of Numerical Criteria for Priority Toxic Pollutants for the State of California: Federal Register (May 18, 2000). 2) Interim California Toxics Rule, as summarized in A Compilation of Water Quality Goals (August 2000), CalEPA RWQCB - Central Valley Region (CRWQCBCV 2000).

Notes:

Used for development of groundwater and soil screening levels.

See text for prioritization and selection of surface water quality screening levels. Criteria for potential bioaccumulation of chemicals in aquatic organism and subsequent human consumption considered separately (refer to Table F-4d and main text).

CCC: Criterion for Continuous Concentration

CMC: Criterion for Maximum Concentration

Methyl tert-Butyl Ether: Interim aquatic surface water criteria proposed by Region 2 Water Quality Control Board (RWQCBSF, 1998a).

TPH screening levels: Gasoline freshwater screening level based on studies carried out for Presidio of San Francisco (RWQCBSF 1998b). Gasoline screening level for saltwater and diesel and residual fuels screening levels in general based on studies carried out for San Francisco Airport (RWQCB 1999). See Appendix 1 text.

TABLE F-4c. SUMMARY OF USEPA AND OTHER PUBLISHED AQUATIC HABITAT GOALS
(ug/l)

	Freshwater							Marine					Other	
CHEMICAL PARAMETER	USEPA CCC	USEPA Chronic LOEL	USEPA CMC	USEPA Acute LOEL	Ecotox Chronic Threshold (AWQC, FCV Or Tier II)	Other	Basis	USEPA CCC	USEPA Chronic LOEL	USEPA CMC	USEPA Acute LOEL	Ecotox Chronic Threshold (AWQC, FCV Or Tier II)	Value	Basis
ACENAPHTHENE		5.2E+02		1.7E+03	2.3E+01				7.1E+02		9.7E+02	4.0E+01		
ACENAPHTHYLENE											3.0E+02			
ACETONE						1.5E+03	USDOE FW Chronic PRG							
ALDRIN			3.0E+00							1.3E+00				
ANTHRACENE						7.3E-01	USDOE FW Chronic PRG							
ANTIMONY	3.0E+01		8.8E+01					5.0E+02		1.5E+03				
ARSENIC	1.5E+02		3.4E+02		1.9E+02			3.6E+01		6.9E+01		3.6E+01		
BARIUM														
BENZENE				5.3E+03	4.6E+01				7.0E+02		5.1E+03			
BENZO(a)ANTHRACENE						2.7E-02	USDOE FW Chronic PRG							
BENZO(b)FLUORANTHENE														
BENZO(k)FLUORANTHENE						3.7E+00	50% MOEE FW Chronic LOEL							
BENZO(g,h,i)PERYLENE						1.0E-01	50% MOEE FW Chronic LOEL							
BENZO(a)PYRENE					1.4E-02									
BERYLLIUM		5.3E+00		1.3E+02	5.1E+00									
BIPHENYL, 1,1					1.4E+01									
BIS(2CHLOROETHYL)ETHER		1.2E+02		2.4E+05										
BIS(2CHLOROISOPROPYL)ETHER		1.2E+02		2.4E+05										
BIS(2ETHYLHEXYL)PHTHALATE					3.2E+01									
BORON						1.6E+00	USDOE FW Chronic PRG							
BROMODICHLOROMETHANE				1.1E+04					6.4E+03		1.2E+04			
BROMOFORM				1.1E+04					6.4E+03		1.2E+04			
BROMOMETHANE				1.1E+04		1.6E+02	50% MOEE FW Chronic LOEL		6.4E+03		1.2E+04			
CADMIUM	2.5E-01		2.0E+00		1.0E+00			8.8E+00		4.0E+01		9.3E+00		
CARBON TETRACHLORIDE				3.5E+04		9.8E+00	USDOE FW Chronic PRG		6.4E+03		5.0E+04			
CHLORDANE	4.3E-03		2.4E+00					4.0E-03		9.0E-02				
CHLOROANILINE, p						5.0E+00	50% MOEE FW Chronic LOEL							
CHLOROBENZENE		5.0E+01		2.5E+02	1.3E+02				1.3E+02		1.6E+02			
CHLOROETHANE														
CHLOROFORM		1.2E+03		2.9E+04		2.8E+01	USDOE FW Chronic PRG		6.4E+03		1.2E+04			
CHLOROMETHANE				1.1E+04					6.4E+03		1.2E+04			
CHLOROPHENOL, 2				4.4E+03										
CHROMIUM (Total)														
CHROMIUM III	7.4E+01		5.7E+02		1.8E+02						1.03E+04			
CHROMIUM VI	1.1E+01		1.6E+01		1.0E+01			5.0E+01		1.1E+03				
CHRYSENE						3.5E-01	50% MOEE FW Chronic LOEL							
COBALT					3.0E+00									
COPPER	9.0E+00		1.3E+01		1.1E+01			3.1E+00		4.8E+00		2.4E+00		
CYANIDE (Free)	5.2E+00		2.2E+01		5.2E+00					1.0E+00		1.0E+00		
DIBENZO(a,h)ANTHTRACENE						7.5E+00	50% MOEE FW Chronic LOEL							
DIBROMOCHLOROMETHANE				1.1E+04					6.4E+03		1.2E+04			
1,2DIBROMO3CHLOROPROPANE														
DIBROMOETHANE, 1,2						1.4E+03	50% MOEE FW Chronic AWQC							
DICHLOROBENZENE, 1,2		7.6E+02		1.1E+03	1.4E+01				1.3E+02		1.97E+03			
DICHLOROBENZENE, 1,3		7.6E+02		1.1E+03	7.1E+01				1.3E+02		1.97E+03			

TABLE F-4c. SUMMARY OF USEPA AND OTHER PUBLISHED AQUATIC HABITAT GOALS
(ug/l)

	Freshwater							Marine					Other	
CHEMICAL PARAMETER	USEPA CCC	USEPA Chronic LOEL	USEPA CMC	USEPA Acute LOEL	Ecotox Chronic Threshold (AWQC, FCV Or Tier II)	Other	Basis	USEPA CCC	USEPA Chronic LOEL	USEPA CMC	USEPA Acute LOEL	Ecotox Chronic Threshold (AWQC, FCV Or Tier II)	Value	Basis
DICHLOROBENZENE, 1,4		7.6E+02		1.1E+03	1.5E+01				1.3E+02		1.97E+03			
DICHLOROBENZIDINE, 3,3						2.5E+02	50% MOEE FW Chronic LOEL							
DICHLORODIPHENYLDICHLOROETHANE (DDD)				6.0E-01		1.0E-03	=DDT				3.6E+00		1.0E-03	=DDT
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)				1.1E+03		1.0E-03	=DDT				1.4E+01		1.0E-03	=DDT
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	1.0E-03		1.1E+00		1.3E-02			1.0E-03		1.3E-01				
DICHLOROETHANE, 1,1					4.7E+01									
DICHLOROETHANE, 1,2		2.0E+04		1.2E+05		9.1E+02	USDOE FW Chronic PRG				1.13E+05			
DICHLOROETHYLENE, 1,1				1.2E+04		2.5E+01	USDOE FW Chronic PRG				2.24E+05			
DICHLOROETHYLENE, Cis 1,2				1.2E+04		5.9E+02	USDOE FW Chronic PRG				2.24E+05			
DICHLOROETHYLENE, Trans 1,2				1.2E+04		5.9E+02	USDOE FW Chronic PRG				2.24E+05			
DICHLOROPHENOL, 2,4		3.7E+02		2.0E+03										
DICHLOROPROPANE, 1,2		5.7E+03		2.3E+04					3.0E+03		1.03E+04			
DICHLOROPROPENE, 1,3		2.4E+02		6.1E+03							7.9E+02			
DIELDRIN	5.6E-02		2.4E-01		6.2E-02			1.9E-03		7.1E-01		1.1E-01		
DIETHYLPHTHALATE		3.0E+00		9.4E+02	2.2E+02				3.4E+00		2.94E+03			
DIMETHYLPHTHALATE		3.0E+00		9.4E+02					3.4E+00		2.94E+03			
DIMETHYLPHENOL, 2,4	5.3E+02		1.3E+03					1.1E+02		2.7E+02				
DINITROPHENOL, 2,4		1.5E+02		2.3E+02							4.85E+03			
DINITROTOLUENE, 2,4		2.3E+02		3.3E+02					3.7E+02		5.9E+02			
1,4 DIOXANE						3.4E+05	5% LC 50						5.0E+05	5% LC 50
DIOXIN (2,3,7,8TCDD)		1.0E-05		1.0E-02										
ENDOSULFAN	5.6E-02		2.2E-01		5.6E-02			8.7E-03		3.4E-02				
ENDRIN	3.6E-02		8.6E-02		6.1E-02			2.3E-03		3.7E-02		1.0E-02		
ETHYLBENZENE				3.2E+04	2.9E+02						4.3E+02			
FLUORANTHENE				3.980E+03	8.1E+00				1.6E+01		4.0E+01	1.1E+01		
FLUORENE					3.9E+00						3.0E+02			
HEPTACHLOR	3.8E-03		5.2E-01		6.9E-03			3.6E-03		5.3E-02				
HEPTACHLOR EPOXIDE	3.8E-03		5.2E-01					3.6E-03		5.3E-02				
HEXACHLOROBENZENE	3.7E+00		6.0E+00						1.3E+02		1.6E+02			
HEXACHLOROBUTADIENE		9.3E+00		9.0E+01							3.2E+01			
HEXACHLOROCYCLOHEXANE (gamma) LINDANE			9.5E-01		8.0E-02					1.6E-01				
HEXACHLOROETHANE		5.4E+02		9.6E+02	1.2E+01						9.4E+02			
INDENO(1,2,3cd)PYRENE														
LEAD	2.5E+00		6.5E+01		2.5E+00			8.1E+00		2.1E+02		8.1E+00		
MERCURY	7.7E-01		1.4E+00		1.3E+00			9.4E-01		1.8E+00		1.1E+00		
METHOXYCHLOR			3.0E-02		1.9E-02					3.0E-02				
METHYLENE CHLORIDE				1.1E+04		2.2E+03	USDOE FW Chronic PRG		6.4E+03		1.2E+04			
METHYL ETHYL KETONE						1.4E+04	USDOE FW Chronic PRG							
METHYL ISOBUTYL KETONE						1.7E+02	USDOE FW Chronic PRG							
METHYL MERCURY					3.0E-03									
METHYLNAPHTHALENE (total 1 & 2)						2.1E+00	USDOE FW Chronic PRG				3.0E+02			
METHYL TERT BUTYL ETHER														
MOLYBDENUM					2.4E+02									
NAPHTHALENE		6.2E+02		2.3E+03	2.4E+01						2.4E+03			
NICKEL	5.2E+01		4.7E+02		1.6E+02			8.2E+00		7.4E+01		8.2E+00		

TABLE F-4c. SUMMARY OF USEPA AND OTHER PUBLISHED AQUATIC HABITAT GOALS
(ug/l)

	Freshwater							Marine					Other	
CHEMICAL PARAMETER	USEPA CCC	USEPA Chronic LOEL	USEPA CMC	USEPA Acute LOEL	Ecotox Chronic Threshold (AWQC, FCV Or Tier II)	Other	Basis	USEPA CCC	USEPA Chronic LOEL	USEPA CMC	USEPA Acute LOEL	Ecotox Chronic Threshold (AWQC, FCV Or Tier II)	Value	Basis
PENTACHLOROPHENOL	1.5E+01		1.9E+01		1.3E+01			7.9E+00		1.3E+01		7.9E+00		
PERCHLORATE					6.0E+02									
PHENANTHRENE	6.3E+00		3.0E+01		6.3E+00			4.6E+00		7.7E+00		8.3E+00		
PHENOL		2.56E+03		1.02E+04							5.8E+03			
POLYCHLORINATED BIPHENYLS (PCBs)	1.4E-02				1.9E-01			3.0E-02						
PYRENE						2.0E+00	50% MOEE FW Chronic LOEL							
SELENIUM	5.0E+00				5.0E+00			7.1E+01		2.9E+02		7.1E+01		
SILVER			3.2E+00							1.9E+00				
STYRENE														
tert-BUTYL ALCOHOL						1.8E+04	10% Acute FW LC 0							
TETRACHLOROETHANE, 1,1,1,2				9.32E+03										
TETRACHLOROETHANE, 1,1,2,2		2.4E+03		9.32E+03	4.2E+02						9.02E+03			
TETRACHLOROETHYLENE		8.4E+02		5.28E+03	1.2E+02				4.5E+02		1.02E+04			
THALLIUM		4.0E+01		1.4E+03							2.13E+03			
TOLUENE				1.75E+04	1.3E+02				5.0E+03		6.3E+03			
TOXAPHENE	2.0E-04		7.3E-01		1.1E-02			2.0E-04		2.1E-01		2.1E-01		
TPH (gasolines)														
TPH (middle distillates)														
TPH (residual fuels)														
TRICHLOROBENZENE, 1,2,4		5.0E+01		2.5E+02	1.1E+02				1.29E+02		1.6E+02			
TRICHLOROETHANE, 1,1,1				1.8E+04	6.2E+01						3.12E+04			
TRICHLOROETHANE, 1,1,2		9.4E+03		1.8E+04										
TRICHLOROETHYLENE		2.19E+04		4.5E+04	3.6E+02						2.0E+03			
TRICHLOROPHENOL, 2,4,5	6.3E+01		1.0E+02					1.1E+01		2.4E+02				
TRICHLOROPHENOL, 2,4,6		9.7E+02												
VANADIUM					1.9E+01									

TABLE F-4c. SUMMARY OF USEPA AND OTHER PUBLISHED AQUATIC HABITAT GOALS
(ug/l)

	Freshwater							Marine					Other	
CHEMICAL PARAMETER	USEPA CCC	USEPA Chronic LOEL	USEPA CMC	USEPA Acute LOEL	Ecotox Chronic Threshold (AWQC, FCV Or Tier II)	Other	Basis	USEPA CCC	USEPA Chronic LOEL	USEPA CMC	USEPA Acute LOEL	Ecotox Chronic Threshold (AWQC, FCV Or Tier II)	Value	Basis
VINYL CHLORIDE						7.82E+02	USDOE FW Chronic PRG							
XYLENES						1.3E+01	USDOE FW Chronic PRG							
ZINC	1.2E+02		1.2E+02		1.0E+02			8.1E+01		9.0E+01		8.1E+01		

References:
Primary sources USEPA (1996b,c); MOEE (1996), USDOE (1997). USEPA criteria summarized in A Compilation of Water Quality Goals, CalEPA RWQCB Central Valley Region (RWQCBCV 2000).
LC 50 values for 1,4 Dioxane presented in "Solvent Stabilizers White Paper" (Mohr 2001).
Chronic goal for perchlorate from "Perchlorate Environmental Contamination (draft)" (USEPA 1998).

Notes:
Used for development of groundwater and soil screening levels.
See text for prioritization and selection of surface water quality screening levels.
Lowest Chronic Aquatic Habitat Goal: Addresses potential impact on freshwater or marine aquatic life.
Acute LOEL and CMC criteria divided by a factor of ten if selected as lowest screening level. LC 50 divided by factor of twenty.
tert Butyl Alcohol (TBA): Chronic aquatic goal based on in-house review of USEPA ECOTOX database for TBA (USEPA 2003). Ten percent of LC0 concentration for Lepomis macrochirus (Bluegill) selected as most conservative goal of data presented.
Xylenes: Final criteria based on USDOE PRG; confidence in USEPA Ecotox criteria is low.
AWQC: Aquatic Water Quality Criteria
CCC: Criterion for Continuous Concentration
CMC: Criterion for Maximum Concentration
FCV: Final Chronic Value
FW: Freshwater
LOEL: Lowest Observed Effects Level
MOEE: Ontario Ministry of Environment and Energy (MOEE 1996)
PRG: USDOE Preliminary Remediation Goal for ecological concerns.
SW: Saltwater
TPH Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.
USDOE: U. S. Department of Energy
USEPA: U.S. Environmental Protection Agency

TABLE F-4d. SURFACE WATER QUALITY STANDARDS FOR BIOACCUMULATION AND HUMAN CONSUMPTION OF AQUATIC ORGANISMS

(ug/l)

CHEMICAL PARAMETER	Selected Criteria	[1]California Toxics Rule	[2]USEPA NWQC
ACENAPHTHENE	2.7E+03	2.7E+03	9.9E+02
ACENAPHTHYLENE			
ACETONE			
ALDRIN	1.4E-04	1.4E-04	5.0E-05
ANTHRACENE	1.1E+05	1.1E+05	4.0E+04
ANTIMONY	4.3E+03	4.3E+03	6.4E+02
ARSENIC	1.4E-01		1.4E-01
BARIUM			
BENZENE	7.1E+01	7.1E+01	5.1E+01
BENZO(a)ANTHRACENE	4.9E-02	4.9E-02	1.8E-02
BENZO(b)FLUORANTHENE	4.9E-02	4.9E-02	1.8E-02
BENZO(k)FLUORANTHENE	4.9E-02	4.9E-02	1.8E-02
BENZO(g,h,i)PERYLENE			
BENZO(a)PYRENE	4.9E-02	4.9E-02	1.8E-02
BERYLLIUM			
BIPHENYL, 1,1-			
BIS(2-CHLOROETHYL)ETHER	1.4E+00	1.4E+00	5.3E-01
BIS(2-CHLOROISOPROPYL)ETHER	1.7E+05	1.7E+05	6.5E+04
BIS(2-ETHYLHEXYL)PHTHALATE	5.9E+00	5.9E+00	2.2E+00
BORON			
BROMODICHLOROMETHANE			
BROMOFORM	3.6E+02	3.6E+02	1.4E+02
BROMOMETHANE	4.0E+03	4.0E+03	1.5E+03
CADMIUM			
CARBON TETRACHLORIDE	4.4E+00	4.4E+00	1.6E+00
CHLORDANE	5.9E-04	5.9E-04	8.1E-04
CHLOROANILINE, p-			
CHLOROBENZENE	2.1E+04	2.1E+04	2.1E+04
CHLOROETHANE			
CHLOROFORM	4.7E+02	4.7E+02	4.7E+02
CHLOROMETHANE			
CHLOROPHENOL, 2-	4.0E+02	4.0E+02	1.5E+02
CHROMIUM (Total)			
CHROMIUM III			
CHROMIUM VI			
CHRYSENE	4.9E-02	4.9E-02	1.8E-02
COBALT			
COPPER			
CYANIDE (Free)	2.2E+05	2.2E+05	2.2E+05
DIBENZO(a,h)ANTHTRACENE	4.9E-02	4.9E-02	1.8E-02
DIBROMOCHLOROMETHANE	4.6E+01	4.6E+01	1.3E+01
1,2-DIBROMO-3-CHLOROPROPANE			
DIBROMOETHANE, 1,2-			
DICHLOROBENZENE, 1,2-	1.7E+04	1.7E+04	1.7E+04
DICHLOROBENZENE, 1,3-	2.6E+03	2.6E+03	9.6E+02
DICHLOROBENZENE, 1,4-	2.6E+03	2.6E+03	2.6E+03
DICHLOROBENZIDINE, 3,3-	7.7E-02	7.7E-02	2.8E-02
DICHLORODIPHENYLDICHLOROETHANE (DDD)	8.4E-04	8.4E-04	3.1E-04
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	5.9E-04	5.9E-04	2.2E-04
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	5.9E-04	5.9E-04	2.2E-04

TABLE F-4d. SURFACE WATER QUALITY STANDARDS FOR BIOACCUMULATION AND HUMAN CONSUMPTION OF AQUATIC ORGANISMS

(ug/l)

CHEMICAL PARAMETER	Selected Criteria	[1]California Toxics Rule	[2]USEPA NWQC
DICHLOROETHANE, 1,1-			
DICHLOROETHANE, 1,2-	9.9E+01	9.9E+01	3.7E+01
DICHLOROETHYLENE, 1,1-	3.2E+00	3.2E+00	3.2E+00
DICHLOROETHYLENE, Cis 1,2-			
DICHLOROETHYLENE, Trans 1,2-	140000	140000	140000
DICHLOROPHENOL, 2,4-	7.9E+02	7.9E+02	2.9E+02
DICHLOROPROPANE, 1,2-	3.9E+01	3.9E+01	1.5E+01
DICHLOROPROPENE, 1,3-	1.7E+03	1.7E+03	1.7E+03
DIELDRIN	0.00014	0.00014	5.4E-05
DIETHYLPHTHALATE	120000	120000	4.4E+04
DIMETHYLPHTHALATE	2900000	2900000	1.1E+06
DIMETHYLPHENOL, 2,4-	2300	2300	8.5E+02
DINITROPHENOL, 2,4-	1.4E+04	1.4E+04	5.3E+03
DINITROTOLUENE, 2,4-	9.1E+00	9.1E+00	3.4E+00
1,4 DIOXANE			
DIOXIN (2,3,7,8-TCDD)	1.4E-08	1.4E-08	5.1E-09
ENDOSULFAN	2.4E+02	2.4E+02	8.9E+01
ENDRIN	8.1E-01	8.1E-01	8.1E-01
ETHYLBENZENE	2.9E+04	2.9E+04	2.9E+04
FLUORANTHENE	3.7E+02	3.7E+02	1.4E+02
FLUORENE	1.4E+04	1.4E+04	5.3E+03
HEPTACHLOR	2.1E-04	2.1E-04	7.9E-05
HEPTACHLOR EPOXIDE	1.1E-04	1.1E-04	3.9E-05
HEXACHLOROBENZENE	7.7E-04	7.7E-04	2.9E-04
HEXACHLOROBUTADIENE	5.0E+01	5.0E+01	1.8E+01
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	6.3E-02	6.3E-02	6.3E-02
HEXACHLOROETHANE	8.9E+00	8.9E+00	3.3E+00
INDENO(1,2,3-cd)PYRENE	4.9E-02	4.9E-02	1.8E-02
LEAD			
MERCURY	5.1E-02	5.1E-02	3.0E-01
METHOXYCHLOR			
METHYLENE CHLORIDE	1.6E+03	1.6E+03	5.9E+02
METHYL ETHYL KETONE			
METHYL ISOBUTYL KETONE			
METHYL MERCURY			
METHYLNAPHTHALENE (total 1- & 2-)			
METHYL TERT BUTYL ETHER			
MOLYBDENUM			
NAPHTHALENE			
NICKEL	4.6E+03	4.6E+03	4.6E+03
PENTACHLOROPHENOL	8.2E+00	8.2E+00	3.0E+00
PERCHLORATE			
PHENANTHRENE			
PHENOL	4.6E+06	4.6E+06	1.7E+06
POLYCHLORINATED BIPHENYLS (PCBs)	1.7E-04	1.7E-04	6.4E-05
PYRENE	1.1E+04	1.1E+04	4.0E+03
SELENIUM			
SILVER			
STYRENE			
tert-BUTYL ALCOHOL			

TABLE F-4d. SURFACE WATER QUALITY STANDARDS FOR BIOACCUMULATION AND HUMAN CONSUMPTION OF AQUATIC ORGANISMS

(ug/l)

CHEMICAL PARAMETER	Selected Criteria	[1]California Toxics Rule	[2]USEPA NWQC
TETRACHLOROETHANE, 1,1,1,2-			
TETRACHLOROETHANE, 1,1,2,2-	1.1E+01	1.1E+01	4.0E+00
TETRACHLOROETHYLENE	8.9E+00	8.85E+00	3.3E+00
THALLIUM	6.3E+00	6.3E+00	6.3E+00
TOLUENE	2.0E+05	2.0E+05	2.0E+05
TOXAPHENE	7.5E-04	7.5E-04	2.8E-04
TPH (gasolines)			
TPH (middle distillates)			
TPH (residual fuels)			
TRICHLOROBENZENE, 1,2,4-			
TRICHLOROETHANE, 1,1,1-			
TRICHLOROETHANE, 1,1,2-	4.2E+01	4.2E+01	1.6E+01
TRICHLOROETHYLENE	8.1E+01	8.1E+01	3.0E+01
TRICHLOROPHENOL, 2,4,5-	3.6E+03		3.6E+03
TRICHLOROPHENOL, 2,4,6-	6.5E+00	6.5E+00	
VANADIUM			
VINYL CHLORIDE	5.3E+02	5.25E+02	5.30E+02
XYLENES			
ZINC			

References:

1. 40 CFR Part 131: Water Quality Standards; Establishment of Numerical Criteria for Priority Toxic Pollutants for the State of California: Federal Register, May 18, 2000.
2. USEPA National Recommended Water Quality Criteria: 2002, EPA-822-R-02-047.

Notes:

California CTR goals considered for surface water (see Tables F-2 series) if available.
Addresses potential accumulation of chemical in aquatic organisms and subsequent consumption by humans.

TABLE F-5. AGRICULTURAL WATER QUALITY GOALS
(ug/l)

CHEMICAL PARAMETER	Agricultural Water Quality Goals
ACENAPHTHENE	-
ACENAPHTHYLENE	-
ACETONE	-
ALDRIN	-
ANTHRACENE	-
ANTIMONY	-
ARSENIC	1.0E+02
BARIUM	-
BENZENE	-
BENZO(a)ANTHRACENE	-
BENZO(b)FLUORANTHENE	-
BENZO(k)FLUORANTHENE	-
BENZO(g,h,i)PERYLENE	-
BENZO(a)PYRENE	-
BERYLLIUM	1.0E+02
BIPHENYL, 1,1-	-
BIS(2-CHLOROETHYL)ETHER	-
BIS(2-CHLOROISOPROPYL)ETHER	-
BIS(2-ETHYLHEXYL)PHTHALATE	-
BORON	7.0E+02
BROMODICHLOROMETHANE	-
BROMOFORM	-
BROMOMETHANE	-
CADMIUM	1.0E+01
CARBON TETRACHLORIDE	-
CHLORDANE	-
CHLOROANILINE, p-	-
CHLOROBENZENE	-
CHLOROETHANE	-
CHLOROFORM	-
CHLOROMETHANE	-
CHLOROPHENOL, 2-	-
CHROMIUM (Total)	-
CHROMIUM III	-
CHROMIUM VI	1.0E+02
CHRYSENE	-
COBALT	5.0E+01
COPPER	2.0E+02
CYANIDE (Free)	-
DIBENZO(a,h)ANTHTRACENE	-
DIBROMOCHLOROMETHANE	-
1,2-DIBROMO-3-CHLOROPROPANE	-
DIBROMOETHANE, 1,2-	-
DICHLOROBENZENE, 1,2-	-
DICHLOROBENZENE, 1,3-	-
DICHLOROBENZENE, 1,4-	-
DICHLOROBENZIDINE, 3,3-	-
DICHLORODIPHENYLDICHLOROETHANE (DDD)	-
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	-
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	-

TABLE F-5. AGRICULTURAL WATER QUALITY GOALS
(ug/l)

CHEMICAL PARAMETER	Agricultural Water Quality Goals
DICHLOROETHANE, 1,1-	-
DICHLOROETHANE, 1,2-	-
DICHLOROETHYLENE, 1,1-	-
DICHLOROETHYLENE, Cis 1,2-	-
DICHLOROETHYLENE, Trans 1,2-	-
DICHLOROPHENOL, 2,4-	-
DICHLOROPROPANE, 1,2-	-
DICHLOROPROPENE, 1,3-	-
DIELDRIN	-
DIETHYLPHTHALATE	-
DIMETHYLPHTHALATE	-
DIMETHYLPHENOL, 2,4-	-
DINITROPHENOL, 2,4-	-
DINITROTOLUENE, 2,4-	-
1,4 DIOXANE	-
DIOXIN (2,3,7,8-TCDD)	-
ENDOSULFAN	-
ENDRIN	-
ETHYLBENZENE	-
FLUORANTHENE	-
FLUORENE	-
HEPTACHLOR	-
HEPTACHLOR EPOXIDE	-
HEXACHLOROBENZENE	-
HEXACHLOROBUTADIENE	-
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	-
HEXACHLOROETHANE	-
INDENO(1,2,3-cd)PYRENE	-
LEAD	-
MERCURY	-
METHOXYCHLOR	-
METHYLENE CHLORIDE	-
METHYL ETHYL KETONE	-
METHYL ISOBUTYL KETONE	-
METHYL MERCURY	-
METHYLNAPHTHALENE (total 1- & 2-)	-
METHYL TERT BUTYL ETHER	-
MOLYBDENUM	1.0E+01
NAPHTHALENE	-
NICKEL	2.0E+02
PENTACHLOROPHENOL	-
PERCHLORATE	-
PHENANTHRENE	-
PHENOL	-
POLYCHLORINATED BIPHENYLS (PCBs)	-
PYRENE	-
SELENIUM	2.0E+01
SILVER	-
STYRENE	-
tert-BUTYL ALCOHOL	-

TABLE F-5. AGRICULTURAL WATER QUALITY GOALS
(ug/l)

CHEMICAL PARAMETER	Agricultural Water Quality Goals
TETRACHLOROETHANE, 1,1,1,2-	-
TETRACHLOROETHANE, 1,1,2,2-	-
TETRACHLOROETHYLENE	-
THALLIUM	-
TOLUENE	-
TOXAPHENE	-
TPH (gasolines)	-
TPH (middle distillates)	-
TPH (residual fuels)	-
TRICHLOROBENZENE, 1,2,4-	-
TRICHLOROETHANE, 1,1,1-	-
TRICHLOROETHANE, 1,1,2-	-
TRICHLOROETHYLENE	-
TRICHLOROPHENOL, 2,4,5-	-
TRICHLOROPHENOL, 2,4,6-	-
VANADIUM	1.0E+02
VINYL CHLORIDE	2.0E+03
XYLENES	-
ZINC	-

References:
A Compiliation of Water Quality Goals (RWQCBCV 2000).

Notes:
Addresses use of water (including groundwater) for agricultural/irrigation purposes.

TABLE F-6. USEPA REGION IX
TAP WATER GOALS
(ug/l)

CHEMICAL PARAMETER	Tap Water Goal (NonCarcinogenic Effects)	Tap Water Goal (Carcinogenic Effects)
ACENAPHTHENE	3.7E+02	
ACENAPHTHYLENE	2.4E+02	
ACETONE	6.1E+02	
ALDRIN	1.1E+00	4.0E-03
ANTHRACENE	1.8E+03	
ANTIMONY	1.5E+01	
ARSENIC	1.1E+01	4.5E-02
BARIUM	2.6E+03	
BENZENE	1.1E+01	1.1E-01
BENZO(a)ANTHRACENE		5.6E-02
BENZO(b)FLUORANTHENE		5.6E-02
BENZO(k)FLUORANTHENE		5.6E-02
BENZO(g,h,i)PERYLENE	1.5E+03	
BENZO(a)PYRENE		5.6E-03
BERYLLIUM	7.3E+01	
BIPHENYL, 1,1-	3.0E+02	
BIS(2-CHLOROETHYL)ETHER		4.5E-03
BIS(2-CHLOROISOPROPYL)ETHER	2.4E+02	2.7E-01
BIS(2-ETHYLHEXYL)PHTHALATE	7.3E+02	2.2E+01
BORON	7.3E+03	
BROMODICHLOROMETHANE	1.2E+02	8.6E-02
BROMOFORM	7.3E+02	8.5E+00
BROMOMETHANE	8.5E+00	
CADMIUM	1.8E+01	1.8E-01
CARBON TETRACHLORIDE	4.3E+00	7.5E-02
CHLORDANE	1.8E+01	5.2E-02
CHLOROANILINE, p-	1.5E+02	
CHLOROBENZENE	1.1E+02	
CHLOROETHANE	8.6E+03	3.9E+00
CHLOROFORM	6.2E+00	5.3E-01
CHLOROMETHANE	6.3E+02	1.5E+00
CHLOROPHENOL, 2-	3.0E+01	
CHROMIUM (Total)		
CHROMIUM III	5.5E+04	
CHROMIUM VI	1.1E+02	
CHRYSENE		5.6E-01
COBALT	7.3E+02	
COPPER	1.5E+03	
CYANIDE (Free)	7.3E+02	
DIBENZO(a,h)ANTHTRACENE		1.6E-02
DIBROMOCHLOROMETHANE	1.2E+02	1.2E-01
1,2-DIBROMO-3-CHLOROPROPANE	3.5E-01	1.6E-03
DIBROMOETHANE, 1,2-	3.5E-01	1.4E-02
DICHLOROBENZENE, 1,2-	3.7E+02	
DICHLOROBENZENE, 1,3-	5.5E+00	
DICHLOROBENZENE, 1,4-	1.8E+02	3.3E-01
DICHLOROBENZIDINE, 3,3-		5.6E-02
DICHLORODIPHENYLDICHLOROETHANE (DDD)		2.8E-01
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)		2.0E-01
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	1.8E+01	2.0E-01

TABLE F-6. USEPA REGION IX
TAP WATER GOALS
(ug/l)

CHEMICAL PARAMETER	Tap Water Goal (NonCarcinogenic Effects)	Tap Water Goal (Carcinogenic Effects)
DICHLOROETHANE, 1,1-	8.0E+02	2.0E+00
DICHLOROETHANE, 1,2-	1.0E+01	1.7E-01
DICHLOROETHYLENE, 1,1-	3.4E+02	
DICHLOROETHYLENE, Cis 1,2-	6.1E+01	
DICHLOROETHYLENE, Trans 1,2-	1.2E+02	
DICHLOROPHENOL, 2,4-	1.1E+02	
DICHLOROPROPANE, 1,2-	6.7E+00	3.1E-01
DICHLOROPROPENE, 1,3-	4.0E+01	1.8E-01
DIELDRIN	1.8E+00	4.2E-03
DIETHYLPHTHALATE	2.9E+04	
DIMETHYLPHTHALATE	3.7E+05	
DIMETHYLPHENOL, 2,4-	1.2E+02	
DINITROPHENOL, 2,4-	7.3E+01	
DINITROTOLUENE, 2,4-	7.3E+01	2.2E-01
1,4 DIOXANE		2.5E+00
DIOXIN (2,3,7,8-TCDD)		5.2E-07
ENDOSULFAN	2.2E+02	
ENDRIN	1.1E+01	
ETHYLBENZENE	1.3E+03	2.9E+00
FLUORANTHENE	1.5E+03	
FLUORENE	2.4E+02	
HEPTACHLOR	1.8E+01	1.6E-02
HEPTACHLOR EPOXIDE	4.7E-01	1.2E-02
HEXACHLOROBENZENE	2.9E+01	3.7E-02
HEXACHLOROBUTADIENE	1.1E+01	8.6E-01
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	1.1E+01	6.1E-02
HEXACHLOROETHANE	3.7E+01	1.7E+00
INDENO(1,2,3-cd)PYRENE		5.6E-02
LEAD		
MERCURY	5.8E+00	
METHOXYCHLOR	1.8E+02	
METHYLENE CHLORIDE	1.6E+03	2.1E+00
METHYL ETHYL KETONE	1.9E+03	
METHYL ISOBUTYL KETONE	1.6E+02	
METHYL MERCURY	3.7E+00	
METHYLNAPHTHALENE (total 1- & 2-)	2.4E+02	
METHYL TERT BUTYL ETHER	5.2E+03	1.1E+01
MOLYBDENUM	1.8E+02	
NAPHTHALENE	6.2E+00	
NICKEL	7.3E+02	
PENTACHLOROPHENOL	1.1E+03	8.3E-01
PERCHLORATE	3.7E+00	
PHENANTHRENE	2.4E+02	
PHENOL	2.2E+04	
POLYCHLORINATED BIPHENYLS (PCBs)	7.3E-01	3.4E-02
PYRENE	1.8E+02	
SELENIUM	1.8E+02	
SILVER	1.8E+02	
STYRENE	1.6E+03	
tert-BUTYL ALCOHOL		2.2E+01

TABLE F-6. USEPA REGION IX
TAP WATER GOALS
(ug/l)

CHEMICAL PARAMETER	Tap Water Goal (NonCarcinogenic Effects)	Tap Water Goal (Carcinogenic Effects)
TETRACHLOROETHANE, 1,1,1,2-	1.8E+02	4.3E-01
TETRACHLOROETHANE, 1,1,2,2-	3.7E+02	5.3E-02
TETRACHLOROETHYLENE	2.8E+02	1.0E-01
THALLIUM	2.4E+00	
TOLUENE	7.2E+02	
TOXAPHENE		5.6E-02
TPH (gasolines)	9.3E+01	
TPH (middle distillates)	9.3E+01	
TPH (residual fuels)	1.1E+03	
TRICHLOROBENZENE, 1,2,4-	1.9E+02	1.9E+01
TRICHLOROETHANE, 1,1,1-	4.4E+02	
TRICHLOROETHANE, 1,1,2-	2.4E+01	1.9E-01
TRICHLOROETHYLENE	9.5E+00	1.3E+00
TRICHLOROPHENOL, 2,4,5-	6.1E+02	
TRICHLOROPHENOL, 2,4,6-		9.6E-01
VANADIUM	2.6E+02	
VINYL CHLORIDE		4.2E-02
XYLENES	2.1E+02	
ZINC	1.1E+04	

References:
Calculated using Tap Water equations in USEPA Region IX Preliminary Remediation Goals document (USEPA 2002).

Notes:
Addresses use of water for drinking water and inhalation of volatile chemicals during showering.
Target risk = 10-6. Target HQ = 1.0. Adjusted to CalEPA CSFs. See Appendix 2 for equations.

TABLE G. SOIL SCREENING LEVELS FOR LEACHING CONCERNS

					Target Groundwater Concentrations		Soil Leaching Screening Levels	
CHEMICAL	Organic Carbon Coefficient (Koc) (cm^3/g)	Henry's Law Constant (H) (atm-m^3/mol)	Dilution/ Atenuation Factor (DAF)	Saturation Limit (mg/kg)	Target Groundwater Concentration (Drinking Water Resource) (ug/L)	Target Groundwater Concentration (NON-Drinking Water Resource) (ug/L)	Soil Leaching Screening Level (Drinking Water Resource) (mg/kg)	Soil Leaching Screening Level (NON-Drinking Water Resource) (mg/kg)
ACENAPHTHENE	4.90E+03	1.55E-04	8.14E+02	1.3E+02	2.0E+01	2.3E+01	1.6E+01	1.9E+01
ACENAPHTHYLENE	2.50E+03	1.45E-03	4.24E+02	5.9E+01	3.0E+01	3.0E+01	1.3E+01	1.3E+01
ACETONE	5.75E-01	3.88E-05	3.36E-01	1.0E+05	7.0E+02	1.5E+03	2.4E-01	5.0E-01
#ALDRIN	4.90E+04	4.96E-05	8.13E+03	5.0E+00	2.0E-03	1.3E-01	5.0E+00	5.0E+00
ANTHRACENE	2.35E+04	6.50E-05	3.90E+03	6.1E+00	7.3E-01	7.3E-01	2.8E+00	2.8E+00
ANTIMONY					6.0E+00	3.0E+01		
ARSENIC					3.6E+01	3.6E+01		
BARIUM					1.0E+03	1.0E+03		
BENZENE	5.90E+01	5.56E-03	4.43E+01	8.7E+02	1.0E+00	4.6E+01	4.4E-02	2.0E+00
#BENZO(a)ANTHRACENE	2.00E+05	1.00E-06	3.32E+04	1.2E+01	2.7E-02	2.7E-02	1.2E+01	1.2E+01
#BENZO(b)FLUORANTHENE	5.50E+05	1.22E-05	9.13E+04	4.6E+01	2.9E-02	2.9E-02	4.6E+01	4.6E+01
#BENZO(k)FLUORANTHENE	5.50E+05	3.87E-05	9.13E+04	2.6E+00	2.9E-02	4.0E-01	2.7E+00	3.7E+01
#BENZO(g,h,i)PERYLENE	1.60E+06	1.44E-07	2.66E+05	2.5E+00	1.0E-01	1.0E-01	2.7E+01	2.7E+01
#BENZO(a)PYRENE	5.50E+06	4.90E-07	9.13E+05	1.3E+02	1.4E-02	1.4E-02	1.3E+02	1.3E+02
BERYLLIUM					2.7E+00	2.7E+00		
BIPHENYL, 1,1-	7.76E+03	3.00E-04	1.29E+03	3.5E+02	5.0E-01	5.0E+00	6.5E-01	6.5E+00
BIS(2-CHLOROETHYL)ETHER	7.60E+01	1.80E-05	1.27E+01	9.6E+03	1.4E-02	6.1E+01	1.8E-04	7.8E-01
BIS(2-CHLOROISOPROPYL)ETHER	6.10E+01	1.13E-04	1.08E+01	7.9E+02	5.0E-01	6.1E+01	5.4E-03	6.6E-01
BIS(2-ETHYLHEXYL)PHTHALATE	1.00E+05	3.00E-07	1.66E+04	7.8E+02	4.0E+00	3.2E+01	6.6E+01	5.3E+02
BORON					1.6E+00	1.6E+00		
BROMODICHLOROMETHANE	5.50E+01	1.60E-03	1.91E+01	3.0E+03	1.0E+02	1.6E+02	1.9E+00	3.0E+00
BROMOFORM	1.10E+02	5.32E-04	2.16E+01	2.4E+03	1.0E+02	3.2E+03	2.2E+00	6.9E+01
BROMOMETHANE	9.00E+00	6.24E-03	4.02E+01	3.1E+03	9.8E+00	1.6E+02	3.9E-01	6.4E+00
CADMIUM					2.2E+00	2.2E+00		
CARBON TETRACHLORIDE	1.74E+02	3.04E-02	2.18E+02	1.1E+03	5.0E-01	9.5E+00	1.1E-01	2.1E+00
#CHLORDANE	4.40E+04	4.79E-05	7.30E+03	1.5E+01	4.0E-03	4.0E-03	1.5E+01	1.5E+01
CHLOROANILINE, p-	6.40E+01	3.31E-07	1.06E+01	1.3E+03	5.0E+00	5.0E+00	5.3E-02	5.3E-02
CHLOROBENZENE	2.19E+02	3.70E-03	5.93E+01	6.8E+02	2.5E+01	2.5E+01	1.5E+00	1.5E+00
CHLOROETHANE	1.47E+01	1.10E-02	7.07E+01	1.6E+03	1.2E+01	1.2E+01	8.5E-01	8.5E-01
CHLOROFORM	3.98E+01	3.67E-03	2.94E+01	2.9E+03	1.0E+02	3.4E+02	2.9E+00	1.0E+01
CHLOROMETHANE	3.50E+01	2.40E-02	1.55E+02	4.1E+03	2.7E+00	1.7E+02	4.2E-01	2.6E+01
CHLOROPHENOL, 2-	3.98E+02	3.91E-04	6.85E+01	5.5E+04	1.8E-01	1.8E+00	1.2E-02	1.2E-01
CHROMIUM (Total)					5.0E+01	1.8E+02		
CHROMIUM III					1.8E+02	1.8E+02		
CHROMIUM VI					1.1E+01	1.1E+01		
#CHRYSENE	4.00E+05	9.46E-05	6.64E+04	3.8E+00	2.9E-01	3.5E-01	1.9E+01	2.3E+01
COBALT					3.0E+00	3.0E+00		
COPPER					3.1E+00	3.1E+00		

TABLE G. SOIL SCREENING LEVELS FOR LEACHING CONCERNS

					Target Groundwater Concentrations		Soil Leaching Screening Levels	
CHEMICAL	Organic Carbon Coefficient (Koc) (cm^3/g)	Henry's Law Constant (H) ($atm\text{-}m^3/mol$)	Dilution/ Atenuation Factor (DAF)	Saturation Limit (mg/kg)	Target Groundwater Concentration (Drinking Water Resource) (ug/L)	Target Groundwater Concentration (NON-Drinking Water Resource) (ug/L)	Soil Leaching Screening Level (Drinking Water Resource) (mg/kg)	Soil Leaching Screening Level (NON-Drinking Water Resource) (mg/kg)
CYANIDE (Free)	9.20E+00	1.90E+03	1.18E+07	1.5E+10	1.0E+00	1.0E+00	1.2E+04	1.2E+04
#DIBENZO(a,h)ANTHTRACENE	3.30E+06	7.30E-08	5.48E+05	9.9E+00	8.5E-03	2.5E-01	9.9E+00	1.4E+02
DIBROMOCHLOROMETHANE	4.68E+02	8.50E-04	8.30E+01	1.3E+04	1.0E+02	1.8E+02	8.3E+00	1.5E+01
1,2-DIBROMO-3-CHLOROPROPANE	2.83E+01	1.47E-04	5.61E+00	3.3E+02	2.0E-01	2.0E-01	1.1E-03	1.1E-03
DIBROMOETHANE, 1,2-	2.81E+01	3.20E-04	6.65E+00	9.2E+02	5.0E-02	1.6E+02	3.3E-04	1.1E+00
DICHLOROBENZENE, 1,2-	6.17E+02	1.90E-03	1.14E+02	6.0E+02	1.0E+01	1.4E+01	1.1E+00	1.6E+00
DICHLOROBENZENE, 1,3-	6.17E+02	1.90E-03	1.14E+02	6.0E+02	6.3E+00	6.5E+01	7.2E-01	7.4E+00
DICHLOROBENZENE, 1,4-	6.17E+02	2.43E-03	1.18E+02	2.8E+02	5.0E+00	1.5E+01	5.9E-01	1.8E+00
DICHLOROBENZIDINE, 3,3-	1.60E+03	8.33E-07	2.66E+02	3.0E+01	2.9E-02	2.5E+02	7.7E-03	6.6E+01
#DICHLORODIPHENYLDICHLOROETHANE (DDD)	7.80E+05	7.96E-06	1.29E+05	7.5E+02	1.0E-03	1.0E-03	7.5E+02	7.5E+02
#DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	4.40E+06	6.80E-05	7.30E+05	1.1E+03	1.0E-03	1.0E-03	1.1E+03	1.1E+03
#DICHLORODIPHENYLTRICHLOROETHANE (DDT)	2.40E+05	3.89E-05	3.98E+04	4.3E+00	1.0E-03	1.0E-03	4.3E+00	4.3E+00
DICHLOROETHANE, 1,1-	3.16E+01	5.62E-03	4.01E+01	1.7E+03	5.0E+00	4.7E+01	2.0E-01	1.9E+00
DICHLOROETHANE, 1,2-	1.74E+01	9.79E-04	8.97E+00	1.8E+03	5.0E-01	2.0E+02	4.5E-03	1.8E+00
DICHLOROETHYLENE, 1,1-	5.89E+01	2.61E-02	1.72E+02	1.5E+03	6.0E+00	2.5E+01	1.0E+00	4.3E+00
DICHLOROETHYLENE, Cis 1,2-	3.55E+01	4.08E-03	3.12E+01	1.2E+03	6.0E+00	5.9E+02	1.9E-01	1.8E+01
DICHLOROETHYLENE, Trans 1,2-	5.25E+01	9.38E-03	6.69E+01	3.1E+03	1.0E+01	5.9E+02	6.7E-01	3.9E+01
DICHLOROPHENOL, 2,4-	6.00E+03	2.80E-06	9.96E+02	1.6E+05	3.0E-01	3.0E+00	3.0E-01	3.0E+00
DICHLOROPROPANE, 1,2-	4.37E+01	2.80E-03	2.46E+01	1.1E+03	5.0E+00	1.0E+02	1.2E-01	2.5E+00
DICHLOROPROPENE, 1,3-	4.57E+01	1.77E-02	1.17E+02	1.4E+03	5.0E-01	4.9E+01	5.9E-02	5.8E+00
DIELDRIN	7.40E+03	5.84E-05	1.23E+03	8.3E+00	1.9E-03	1.9E-03	2.3E-03	2.3E-03
DIETHYLPHTHALATE	1.40E+02	1.14E-06	2.32E+01	8.4E+02	1.5E+00	1.5E+00	3.5E-02	3.5E-02
DIMETHYLPHTHALATE	1.40E+02	1.05E-07	2.32E+01	4.7E+03	1.5E+00	1.5E+00	3.5E-02	3.5E-02
DIMETHYLPHENOL, 2,4-	4.00E+01	1.70E-05	6.75E+00	2.7E+03	1.0E+02	1.1E+02	6.7E-01	7.4E-01
DINITROPHENOL, 2,4-	1.70E+01	6.45E-10	2.82E+00	1.1E+03	1.4E+01	7.5E+01	4.0E-02	2.1E-01
DINITROTOLUENE, 2,4-	4.50E+01	4.50E-06	7.50E+00	1.0E+02	1.1E-01	1.2E+02	8.5E-04	8.6E-01
1,4 DIOXANE	3.50E+00	3.00E-06	6.00E-01	1.2E+05	3.0E+00	5.0E+04	1.8E-03	3.0E+01
DIOXIN (2,3,7,8-TCDD)					5.0E-06	5.0E-06		
ENDOSULFAN	3.20E+03	1.00E-05	5.31E+02	2.9E+00	8.7E-03	8.7E-03	4.6E-03	4.6E-03
ENDRIN	1.70E+03	7.51E-06	2.82E+02	2.7E+00	2.3E-03	2.3E-03	6.5E-04	6.5E-04
ETHYLBENZENE	3.63E+02	7.88E-03	1.09E+02	4.0E+02	3.0E+01	2.9E+02	3.3E+00	3.2E+01
#FLUORANTHENE	3.80E+04	6.50E-06	6.31E+03	6.0E+01	8.0E+00	8.0E+00	6.0E+01	6.0E+01
FLUORENE	1.38E+04	7.70E-05	2.29E+03	1.6E+02	3.9E+00	3.9E+00	8.9E+00	8.9E+00
HEPTACHLOR	2.20E+04	1.48E-03	3.66E+03	7.4E+00	3.8E-03	3.8E-03	1.4E-02	1.4E-02
HEPTACHLOR EPOXIDE	2.30E+04	3.16E-05	3.82E+03	4.8E+01	3.8E-03	3.8E-03	1.5E-02	1.5E-02
#HEXACHLOROBENZENE	1.20E+06	1.70E-03	1.99E+05	7.9E+02	1.0E+00	3.7E+00	7.9E+02	7.9E+02
HEXACHLOROBUTADIENE	2.90E+04	2.56E-02	4.97E+03	3.5E+02	2.1E-01	4.7E+00	1.0E+00	2.3E+01
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	3.70E+03	4.93E-07	6.14E+02	1.6E+02	8.0E-02	8.0E-02	4.9E-02	4.9E-02

TABLE G. SOIL SCREENING LEVELS FOR LEACHING CONCERNS

					Target Groundwater Concentrations		Soil Leaching Screening Levels	
CHEMICAL	Organic Carbon Coefficient (Koc) (cm³/g)	Henry's Law Constant (H) (atm-m³/mol)	Dilution/ Atenuation Factor (DAF)	Saturation Limit (mg/kg)	Target Groundwater Concentration (Drinking Water Resource) (ug/L)	Target Groundwater Concentration (NON-Drinking Water Resource) (ug/L)	Soil Leaching Screening Level (Drinking Water Resource) (mg/kg)	Soil Leaching Screening Level (NON-Drinking Water Resource) (mg/kg)
HEXACHLOROETHANE	2.00E+04	9.85E-03	3.38E+03	6.0E+03	7.0E-01	1.2E+01	2.4E+00	4.1E+01
#INDENO(1,2,3-cd)PYRENE	1.60E+06	6.95E-08	2.66E+05	5.1E+00	2.9E-02	2.9E-02	7.7E+00	7.7E+00
LEAD					2.5E+00	2.5E+00		
MERCURY					1.2E-02	1.2E-02		
#METHOXYCHLOR	7.90E+04	1.58E-05	1.31E+04	1.9E+01	1.9E-02	1.9E-02	1.9E+01	1.9E+01
METHYLENE CHLORIDE	1.11E+01	2.19E-03	1.54E+01	2.4E+03	5.0E+00	2.2E+03	7.7E-02	3.4E+01
METHYL ETHYL KETONE	4.50E+00	2.74E-05	9.17E-01	3.4E+04	4.2E+03	1.4E+04	3.9E+00	1.3E+01
METHYL ISOBUTYL KETONE	1.34E+02	1.40E-04	2.31E+01	1.7E+04	1.2E+02	1.7E+02	2.8E+00	3.9E+00
METHYL MERCURY					3.0E-03	3.0E-03		
METHYLNAPHTHALENE (total 1- & 2-)	7.20E+02	2.90E-04	1.21E+02	1.1E+02	2.1E+00	2.1E+00	2.5E-01	2.5E-01
METHYL TERT BUTYL ETHER	6.00E+00	5.87E-04	4.64E+00	2.1E+04	5.0E+00	1.8E+03	2.3E-02	8.4E+00
MOLYBDENUM					3.5E+01	2.4E+02		
NAPHTHALENE	1.19E+03	4.83E-04	2.01E+02	2.2E+02	2.1E+01	2.4E+01	4.2E+00	4.8E+00
NICKEL					8.2E+00	8.2E+00		
PENTACHLOROPHENOL	3.20E+04	2.80E-06	5.31E+03	2.7E+06	1.0E+00	7.9E+00	5.3E+00	4.2E+01
PERCHLORATE					7.0E-01	6.0E+02	7.0E-03	1.2E+00
PHENANTHRENE	1.40E+04	3.93E-05	2.32E+03	6.9E+01	4.6E+00	4.6E+00	1.1E+01	1.1E+01
PHENOL	9.10E+01	1.30E-06	1.51E+01	5.2E+04	5.0E+00	1.3E+03	7.6E-02	1.9E+01
#POLYCHLORINATED BIPHENYLS (PCBs)	3.30E+04	5.20E-04	5.48E+03	6.3E+00	1.4E-02	1.4E-02	6.3E+00	6.3E+00
#PYRENE	1.05E+05	1.10E-05	1.74E+04	8.5E+01	2.0E+00	2.0E+00	8.5E+01	8.5E+01
SELENIUM					5.0E+00	5.0E+00		
SILVER					1.9E-01	1.9E-01		
STYRENE	7.76E+02	2.75E-03	1.46E+02	1.5E+03	1.0E+01	1.0E+02	1.5E+00	1.5E+01
tert-BUTYL ALCOHOL	3.70E+01	1.17E-05	6.21E+00	3.2E+05	1.2E+01	1.8E+04	7.3E-02	1.1E+02
TETRACHLOROETHANE, 1,1,1,2-	9.37E+01	3.45E-04	1.77E+01	2.0E+03	1.3E+00	9.3E+02	2.4E-02	1.6E+01
TETRACHLOROETHANE, 1,1,2,2-	9.37E+01	3.45E-04	1.77E+01	2.0E+03	1.0E+00	1.9E+02	1.8E-02	3.4E+00
TETRACHLOROETHYLENE	1.55E+02	1.84E-02	1.40E+02	2.3E+02	5.0E+00	1.2E+02	7.0E-01	1.7E+01
THALLIUM					2.0E+00	2.0E+01		
TOLUENE	1.82E+02	6.64E-03	7.14E+01	6.5E+02	4.0E+01	1.3E+02	2.9E+00	9.3E+00
TOXAPHENE	4.90E+03	2.10E-01	2.12E+03	9.3E+01	2.0E-04	2.0E-04	4.2E-04	4.2E-04
TPH (gasolines)	5.00E+03	7.20E-04	8.34E+02	4.5E+03	1.0E+02	5.0E+02	1.0E+02	4.0E+02
TPH (middle distillates)	5.00E+03	7.20E-04	8.34E+02	1.5E+02	1.0E+02	6.4E+02	1.0E+02	5.0E+02
TPH (residual fuels)					1.0E+02	6.4E+02	1.0E+03	1.0E+03
TRICHLOROBENZENE, 1,2,4-	1.78E+03	1.42E-03	3.04E+02	3.2E+03	2.5E+01	2.5E+01	7.6E+00	7.6E+00
TRICHLOROETHANE, 1,1,1-	1.10E+02	1.72E-02	1.25E+02	1.2E+03	6.2E+01	6.2E+01	7.8E+00	7.8E+00
TRICHLOROETHANE, 1,1,2-	5.01E+01	9.13E-04	1.40E+01	1.8E+03	5.0E+00	3.5E+02	7.0E-02	4.9E+00
TRICHLOROETHYLENE	1.66E+02	1.03E-02	9.15E+01	1.3E+03	5.0E+00	3.6E+02	4.6E-01	3.3E+01
TRICHLOROPHENOL, 2,4,5-	8.90E+01	2.18E-04	1.61E+01	7.6E+02	1.1E+01	1.1E+01	1.8E-01	1.8E-01

TABLE G. SOIL SCREENING LEVELS FOR LEACHING CONCERNS

					Target Groundwater Concentrations		Soil Leaching Screening Levels	
CHEMICAL	Organic Carbon Coefficient (Koc) (cm^3/g)	Henry's Law Constant (H) ($atm\text{-}m^3/mol$)	Dilution/ Atenuation Factor (DAF)	Saturation Limit (mg/kg)	Target Groundwater Concentration (Drinking Water Resource) (ug/L)	Target Groundwater Concentration (NON-Drinking Water Resource) (ug/L)	Soil Leaching Screening Level (Drinking Water Resource) (mg/kg)	Soil Leaching Screening Level (NON-Drinking Water Resource) (mg/kg)
TRICHLOROPHENOL, 2,4,6-	2.00E+03	4.00E-06	3.32E+02	9.7E+03	5.0E-01	4.9E+02	1.7E-01	1.6E+02
VANADIUM					1.5E+01	1.9E+01		
VINYL CHLORIDE	1.86E+01	2.70E-02	1.71E+02	1.2E+03	5.0E-01	4.0E+00	8.5E-02	6.8E-01
XYLENES	4.07E+02	7.34E-03	1.13E+02	4.2E+02	1.3E+01	1.3E+01	1.5E+00	1.5E+00
ZINC					8.1E+01	8.1E+01		

Notes:

Soil leaching equation from Ontario MOEE guidance (see text).

Groundwater Category Drinking Water Resource - protective of groundwater that is a source of drinking water AND protective of discharge of groundwater to a surface water and subsequent impact on aquatic life.

Groundwater Category NON-Drinking Water Resource - protective of discharge of impacted groundwater to surface water and subsequent impact on aquatic life.

#: Leaching model used considered to be excessively conservative for highly sorptive chemicals. For chemicals with koc values greater than 30,000 cm^3/g, theoretical soil saturation level ("sat") used in place of leaching model screening level if higher (see text). Soil saturation levels calculated using equation presented in USEPA Region IX PRG guidance (USEPA 2002, see Appendix 2). Exceptions include bis(2-ethylhexyl)phthalate and pentchlorophenol (see text).

TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.

Physio-Chemical constants for chemicals from USEPA Region IX (USEPA 2002) or Ontario MOEE (MOEE 1996) when not available.

Physio-Chemical constants for TPH (gasolines and middle distillates) based on constants developed for C11 to C22 aromatic carbon range fraction by Massachusetts DEP and used to develop RBSLs for leaching of TPH in general from soil (MADEP 1997). Soil leaching level rounded to nearest hundred.

Target groundwater concentrations from Table F-1 and F-2.

Target groundwater concentration and corresponding soil leaching levels for TPH based on criteria in Board Order 99-045 for San Francisco Airport (RWQCBSF,1999).

Screening Levels for TPH (gasolines) and TPH (middle distilates) rounded to nearest 100 mg/kg.

TPH (residual fuels) soil screening level for leaching from California Regional Water Board, Region 4 - drinking water protection, C23-C32 carbon range (RWQCBLA 1996).

Screening levels for perchlorate calculated using leaching equation in USEPA Soil Screening Guidance and assumed Dilution/Attenuation Factor of 20 (see text).

TABLE H-1. CRITERIA FOR ASSIGNMENT OF SOIL CEILING LEVELS

Soil Category	Criteria	Ceiling Level (mg/kg)
Surface Soils		
Residential/Parkland/Agricultural	Odor Index ≥ 100 OR no Odor Index and Vapor Pressure ≥ 1 Torr OR no data	100
	0.1 ≤ Odor Index < 100 OR no Odor Index and Vapor Pressure < 1 Torr	500
	Odor Index < 0.1 OR non-odorous chemical	1000
Industrial/Commercial	Odor Index ≥ 100 OR no Odor Index and Vapor Pressure ≥ 1 Torr OR no data	500
	0.1 ≤ Odor Index < 100 OR no Odor Index and Vapor Pressure < 1 Torr	1000
	Odor Index < 0.1 OR non-odorous chemical	2500
Subsurface Soils		
Residential/Parkland/Agricultural	Odor Index ≥ 100 OR no Odor Index and Vapor Pressure ≥ 1 Torr OR no data	500
	0.1 ≤ Odor Index < 100 OR no Odor Index and Vapor Pressure < 1 Torr	1000
	Odor Index < 0.1 OR non-odorous chemical	2500
Industrial/Commercial	Odor Index ≥ 100 OR no Odor Index and Vapor Pressure ≥ 1 Torr OR no data	1000
	0.1 ≤ Odor Index < 100 OR no Odor Index and Vapor Pressure < 1 Torr	2500
	Odor Index < 0.1 OR non-odorous chemical	5000

Modified from Ontario Ministry of Environment and Energy (MOEE 1996) and Massachusetts Department of Environmental Protection (MADEP 1994).

TABLE H-2. COMPONENTS FOR SHALLOW SOIL CEILING LEVELS
(mg/kg)

CHEMICAL PARAMETER	[1]Residential Ceiling Level	Industrial/ Commercial Ceiling Level	Soil Saturation Limit (mg/kg)	Vapor Pressure (VP) (Torr @ 20-30 °C)	50 Percentile Odor Recognition Threshold (ORT) (ug/m^3)	50 Percentile Odor Recognition Threshold (ORT) (ppm-v)	Odor Index
ACENAPHTHENE	1.0E+03	2.5E+03	NA	4.5E-03	5.13E+02	8.00E-02	5.63E-02
ACENAPHTHYLENE	5.0E+02	1.0E+03	NA	2.9E-02	-	-	-
ACETONE	5.0E+02	1.0E+03	1.0E+05	2.70E+02	3.09E+04	1.30E+01	2.08E+01
ALDRIN	1.0E+03	2.5E+03	NA	2.3E-05	2.63E+02	1.70E-02	1.35E-03
ANTHRACENE	5.0E+02	1.0E+03	NA	1.7E-05	-	-	-
ANTIMONY	1.0E+03	2.5E+03	NA	-	-	-	-
ARSENIC	1.0E+03	2.5E+03	NA	-	-	-	-
BARIUM	1.0E+03	2.5E+03	NA	-	-	-	-
BENZENE	5.0E+02	1.0E+03	8.7E+02	9.50E+01	4.89E+03	1.50E+00	6.33E+01
BENZO(a)ANTHRACENE	5.0E+02	1.0E+03	NA	2.2E-08	-	-	-
BENZO(b)FLUORANTHENE	5.0E+02	1.0E+03	NA	5.0E-07	-	-	-
BENZO(k)FLUORANTHENE	5.0E+02	1.0E+03	NA	9.6E-11	-	-	-
BENZO(g,h,i)PERYLENE	5.0E+02	1.0E+03	NA	1.1E-10	-	-	-
BENZO(a)PYRENE	5.0E+02	1.0E+03	NA	5.6E-09	-	-	-
BERYLLIUM	1.0E+03	2.5E+03	NA	-	-	-	-
BIPHENYL, 1,1-	5.0E+02	1.0E+03	NA	5.00E-03	6.00E+01	9.50E-03	5.26E-01
BIS(2-CHLOROETHYL)ETHER	5.0E+02	1.0E+03	9.6E+03	7.1E-01	2.87E+02	4.9E-02	1.45E+01
BIS(2-CHLOROISOPROPYL)ETHER	5.0E+02	7.9E+02	7.9E+02	8.5E-01	2.24E+03	3.20E-01	2.66E+00
BIS(2-ETHYLHEXYL)PHTHALATE	5.0E+02	1.0E+03	NA	6.2E-08	-	-	-
BORON	no criteria	no criteria	NA	-	-	-	-
BROMODICHLOROMETHANE	1.0E+03	2.5E+03	3.0E+03	5.00E+01	1.10E+07	1.68E+03	2.98E-02
BROMOFORM	5.0E+02	1.0E+03	NA	5.60E+00	1.35E+04	1.30E+00	4.31E+00
BROMOMETHANE	5.0E+02	1.0E+03	3.1E+03	1.42E+03	8.00E+04	2.00E+01	7.10E+01
CADMIUM	1.0E+03	2.5E+03	NA	-	-	-	-
CARBON TETRACHLORIDE	5.0E+02	9.8E+02	1.1E+03	1.13E+02	6.30E+04	1.00E+01	1.13E+01
CHLORDANE	1.0E+03	2.5E+03	NA	1.0E-05	8.40E+00	4.92E-04	2.03E-02
CHLOROANILINE, p-	1.0E+03	2.5E+03	NA	1.0E-05	-	-	-
CHLOROBENZENE	5.0E+02	6.8E+02	6.8E+02	1.18E+01	1.00E+03	2.20E-01	5.36E+01
CHLOROETHANE	5.0E+02	1.0E+03	1.6E+03	1.01E+03	3.80E+05	1.40E+02	7.20E+00
CHLOROFORM	5.0E+02	1.0E+03	2.9E+03	1.60E+02	4.22E+05	8.50E+01	1.88E+00
CHLOROMETHANE	1.0E+02	5.0E+02	4.1E+03	4.30E+03	-	-	-
CHLOROPHENOL, 2-	1.0E+02	5.0E+02	5.5E+04	1.42E+00	1.90E+01	3.60E-03	3.94E+02
CHROMIUM (Total)	1.0E+03	2.5E+03	NA	-	-	-	-
CHROMIUM III	1.0E+03	2.5E+03	NA	-	-	-	-
CHROMIUM VI	1.0E+03	2.5E+03	NA	-	-	-	-
CHRYSENE	1.0E+03	2.5E+03	NA	6.3E-07	-	-	-
COBALT	1.0E+03	2.5E+03	NA	-	-	-	-
COPPER	1.0E+03	2.5E+03	NA	-	-	-	-

TABLE H-2. COMPONENTS FOR SHALLOW SOIL CEILING LEVELS
(mg/kg)

CHEMICAL PARAMETER	[1]Residential Ceiling Level	Industrial/ Commercial Ceiling Level	Soil Saturation Limit (mg/kg)	Vapor Pressure (VP) (Torr @ 20-30 °C)	50 Percentile Odor Recognition Threshold (ORT) (ug/m^3)	50 Percentile Odor Recognition Threshold (ORT) (ppm-v)	Odor Index
CYANIDE (Free)	1.0E+02	5.0E+02	NA	6.20E+02	6.52E+02	5.80E-01	1.07E+03
DIBENZO(a,h)ANTHTRACENE	5.0E+02	1.0E+03	NA	1.0E-10	-	-	-
DIBROMOCHLOROMETHANE	1.0E+02	5.0E+02	NA	7.60E+01	-	-	-
1,2-DIBROMO-3-CHLOROPROPANE	5.0E+02	1.0E+03	3.3E+02	8.00E-01	-	-	-
DIBROMOETHANE, 1,2-	5.0E+02	1.0E+03	NA	1.20E+01	2.00E+05	2.60E+01	4.62E-01
DICHLOROBENZENE, 1,2-	3.7E+02	3.7E+02	6.0E+02	1.50E+00	3.05E+05	5.00E+01	3.00E-02
DICHLOROBENZENE, 1,3-	1.0E+02	3.8E+02	6.0E+02	2.30E+00	-	-	-
DICHLOROBENZENE, 1,4-	5.0E+02	1.0E+03	NA	1.80E+00	1.10E+03	1.80E-01	1.00E+01
DICHLOROBENZIDINE, 3,3-	5.0E+02	1.0E+03	NA	4.5E-09	-	-	-
DICHLORODIPHENYLDICHLOROETHANE (DDD)	5.0E+02	1.0E+03	NA	1.0E-06	-	-	-
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	5.0E+02	1.0E+03	NA	6.5E-06	-	-	-
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	1.0E+03	2.5E+03	NA	5.5E-06	-	-	-
DICHLOROETHANE, 1,1-	5.0E+02	1.0E+03	1.7E+03	2.34E+02	1.25E+05	3.00E+01	7.80E+00
DICHLOROETHANE, 1,2-	5.0E+02	1.0E+03	1.8E+03	7.90E+01	2.42E+03	5.90E-01	1.34E+02
DICHLOROETHYLENE, 1,1-	5.0E+02	1.0E+03	1.5E+03	5.91E+02	2.00E+06	5.00E+02	1.18E+00
DICHLOROETHYLENE, Cis 1,2-	1.0E+02	5.0E+02	1.2E+03	2.15E+02	-	-	-
DICHLOROETHYLENE, Trans 1,2-	5.0E+02	1.0E+03	3.1E+03	3.31E+02	6.73E+04	1.70E+01	1.95E+01
DICHLOROPHENOL, 2,4-	5.0E+02	1.0E+03	NA	6.7E-02	1.40E+03	2.10E-01	3.19E-01
DICHLOROPROPANE, 1,2-	1.0E+02	5.0E+02	1.1E+03	4.20E+01	1.19E+03	2.50E-01	1.68E+02
DICHLOROPROPENE, 1,3-	5.0E+02	1.0E+03	1.4E+03	4.30E+01	4.16E+03	1.00E+00	4.30E+01
DIELDRIN	1.0E+03	2.5E+03	NA	1.8E-08	-	-	-
DIETHYLPHTHALATE	5.0E+02	1.0E+03	NA	3.5E-04	-	-	-
DIMETHYLPHTHALATE	5.0E+02	1.0E+03	NA	1.7E-03	-	-	-
DIMETHYLPHENOL, 2,4-	1.0E+02	5.0E+02	NA	9.8E-02	1.00E+00	1.97E-04	4.97E+02
DINITROPHENOL, 2,4-	5.0E+02	1.0E+03	NA	1.5E-05	-	-	-
DINITROTOLUENE, 2,4-	5.0E+02	1.0E+03	NA	5.1E-03	-	-	-
1,4 DIOXANE	5.0E+02	1.0E+03	NA	3.70E+01	6.12E+05	1.70E+02	2.18E-01
DIOXIN (2,3,7,8-TCDD)	no criteria	no criteria	NA	-	-	-	-
ENDOSULFAN	5.0E+02	1.0E+03	NA	1.0E-05	-	-	-
ENDRIN	5.0E+02	1.0E+03	NA	2.0E-07	-	-	-
ETHYLBENZENE	2.3E+02	2.3E+02	4.0E+02	1.00E+01	2.00E+03	4.50E-01	2.22E+01
FLUORANTHENE	5.0E+02	1.0E+03	NA	5.0E-06	-	-	-
FLUORENE	5.0E+02	1.0E+03	NA	3.2E-04	-	-	-
HEPTACHLOR	1.0E+03	2.5E+03	NA	3.0E-04	3.00E+02	2.00E-02	1.50E-02
HEPTACHLOR EPOXIDE	1.0E+03	2.5E+03	NA	2.6E-06	3.00E+02	1.90E-02	1.37E-04
HEXACHLOROBENZENE	5.0E+02	1.0E+03	NA	1.1E-05	-	-	-
HEXACHLOROBUTADIENE	5.0E+02	1.0E+03	NA	1.50E-01	1.20E+04	1.10E+00	1.36E-01

TABLE H-2. COMPONENTS FOR SHALLOW SOIL CEILING LEVELS
(mg/kg)

CHEMICAL PARAMETER	[1]Residential Ceiling Level	Industrial/ Commercial Ceiling Level	Soil Saturation Limit (mg/kg)	Vapor Pressure (VP) (Torr @ 20-30 °C)	50 Percentile Odor Recognition Threshold (ORT) (ug/m^3)	50 Percentile Odor Recognition Threshold (ORT) (ppm-v)	Odor Index
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	5.0E+02	1.0E+03	NA	9.4E-06	-	-	-
HEXACHLOROETHANE	5.0E+02	1.0E+03	NA	2.1E-01	-	-	-
INDENO(1,2,3-cd)PYRENE	5.0E+02	1.0E+03	NA	1.0E-06	-	-	-
LEAD	1.0E+03	2.5E+03	NA	-	-	-	-
MERCURY	5.0E+02	1.0E+03	NA	2.0E-03	-	-	-
METHOXYCHLOR	5.0E+02	1.0E+03	NA	1.4E-06	-	-	-
METHYLENE CHLORIDE	5.0E+02	1.0E+03	2.4E+03	4.29E+02	5.60E+05	1.60E+02	2.68E+00
METHYL ETHYL KETONE	5.0E+02	1.0E+03	3.4E+04	1.00E+02	3.20E+04	1.10E+01	9.09E+00
METHYL ISOBUTYL KETONE	1.0E+02	5.0E+02	1.7E+04	1.00E+01	4.20E+02	1.00E-01	1.00E+02
METHYL MERCURY	1.0E+02	5.0E+02	NA	-	-	-	-
METHYLNAPHTHALENE (total 1- & 2-)	5.0E+02	1.0E+03	NA	6.8E-02	6.80E+01	1.15E-02	5.91E+00
METHYL TERT BUTYL ETHER	1.0E+02	5.0E+02	2.1E+04	2.45E+02	5.30E+02	1.30E-01	1.88E+03
MOLYBDENUM	1.0E+03	2.5E+03	NA	-	-	-	-
NAPHTHALENE	5.0E+02	1.0E+03	NA	8.2E-02	4.40E+02	8.40E-02	9.76E-01
NICKEL	1.0E+03	2.5E+03	NA	-	-	-	-
PENTACHLOROPHENOL	5.0E+02	1.0E+03	NA	1.1E-04	-	-	-
PERCHLORATE	1.0E+03	2.5E+03	NA	-	-	-	-
PHENANTHRENE	5.0E+02	1.0E+03	NA	9.6E-04	5.50E+01	7.42E-03	1.29E-01
PHENOL	5.0E+02	1.0E+03	NA	3.50E-01	1.56E+02	4.00E-02	8.75E+00
POLYCHLORINATED BIPHENYLS (PCBs)	5.0E+02	1.0E+03	NA	4.9E-04 to 6.7E-03	-	-	-
PYRENE	5.0E+02	1.0E+03	NA	2.5E-06	-	-	-
SELENIUM	1.0E+03	2.5E+03	NA	-	-	-	-
SILVER	1.0E+03	2.5E+03	NA	-	-	-	-
STYRENE	5.0E+02	1.0E+03	1.5E+03	5.00E+00	1.36E+03	3.00E-01	1.67E+01
tert-BUTYL ALCOHOL	1.0E+02	5.0E+02	3.2E+05	4.20E+01	-	-	-
TETRACHLOROETHANE, 1,1,1,2-	1.0E+02	5.0E+02	2.0E+03	1.20E+01	-	-	-
TETRACHLOROETHANE, 1,1,2,2-	5.0E+02	1.0E+03	2.0E+03	4.00E+00	1.05E+04	1.50E+00	2.67E+00
TETRACHLOROETHYLENE	3.7E+02	3.7E+02	2.3E+02	1.90E+01	3.17E+04	4.68E+00	4.06E+00
THALLIUM	1.0E+03	2.5E+03	NA	-	-	-	-
TOLUENE	5.0E+02	5.2E+02	6.5E+02	2.80E+01	3.00E+04	8.00E+00	3.50E+00
TOXAPHENE	5.0E+02	1.0E+03	NA	4.00E-01	-	-	-
TPH (gasolines)	1.0E+02	5.0E+02	-	-	1.00E+02	-	-
TPH (middle distillates)	5.0E+02	1.0E+03	-	-	1.00E+03	-	-
TPH (residual fuels)	5.0E+02	2.5E+03	-	-	-	-	-
TRICHLOROBENZENE, 1,2,4-	5.0E+02	1.0E+03	NA	2.9E-01	2.20E+04	2.96E+00	9.80E-02
TRICHLOROETHANE, 1,1,1-	5.0E+02	1.0E+03	1.2E+03	1.00E+02	6.51E+04	1.20E+01	8.33E+00
TRICHLOROETHANE, 1,1,2-	1.0E+02	5.0E+02	1.8E+03	2.25E+01	-	-	-

TABLE H-2. COMPONENTS FOR SHALLOW SOIL CEILING LEVELS (mg/kg)

CHEMICAL PARAMETER	[1]Residential Ceiling Level	Industrial/ Commercial Ceiling Level	Soil Saturation Limit (mg/kg)	Vapor Pressure (VP) (Torr @ 20-30 °C)	50 Percentile Odor Recognition Threshold (ORT) (ug/m^3)	50 Percentile Odor Recognition Threshold (ORT) (ppm-v)	Odor Index
TRICHLOROETHYLENE	5.0E+02	8.2E+02	1.3E+03	7.70E+01	1.36E+06	2.49E+02	3.09E-01
TRICHLOROPHENOL, 2,4,5-	1.0E+02	5.0E+02	NA	-	-	-	-
TRICHLOROPHENOL, 2,4,6-	5.0E+02	1.0E+03	NA	1.2E-02	3.00E-01	3.60E-05	3.33E+02
VANADIUM	1.0E+03	2.5E+03	NA	-	-	-	-
VINYL CHLORIDE	5.0E+02	1.0E+03	1.2E+03	2.58E+03	7.71E+05	2.94E+02	8.78E+00
XYLENES	2.1E+02	2.1E+02	4.2E+02	6.00E+00	4.41E+02	1.00E-01	6.00E+01
ZINC	1.0E+03	2.5E+03	NA	-	-	-	-

Notes:

1. "Residential Land Use" screening levels generally considered adequate for other sensitive uses (e.g., day-care centers, hospitals, etc.).

Odor Index = VP/ORT in ppm-v

Physio-chemical constants Ontario MOEE (MOEE 1996) except as noted.

Physio-chemical constants for cloroethane and chloromethane from ATSDR Toxicological Profiles (ATSDR 2001).

Odor Recognition Threshold in parts per million - volume (ppm-v = (concentration in mg/m3) x (24/molecular weight)).

TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.

Ceiling Level: Based on comparison of vapor pressure and odor index to Table H-1 or saturation limit, if lower.

Saturation limits calculated using equation in USEPA Region IX PRG guidance (for chemicals that are liquid at ambient temperatures and pressures; refer to Appendix 2).

50% ORT of 0.13 ppm-v for MTBE from information in CaEPA Public Health Goal for MTBE (CalEPA 1999).

TPH VP values from NIOSH (2002); ORT values from ATSDR (2001a).

References for vapor pressure and odor threshold data (in order of use):

1. Ontario Ministry of Environment and Energy (MOEE 1996).
2. Massachusetts Department of Environmental Protection (MADEP 1994).
3. Agency for Toxic Substances and Disease Registry (ATSDR 2001).
4. Vapor Pressure for 1,4 Dioxane from "Solvent Stabilizers - White Paper" (Mohr 2001). Odor Threshold from US Department of Health and Human Services, National Toxicology Program (USDHHS, 2001).

TABLE H-3. COMPONENTS FOR DEEP SOIL CEILING LEVELS
(mg/kg)

CHEMICAL PARAMETER	[1]Residential Ceiling Level	Industrial/ Commercial Ceiling Level	Soil Saturation Limit (mg/kg)	Vapor Pressure (VP) (Torr @ 20-30 °C)	50 Percentile Odor Recognition Threshold (ORT) (ug/m^3)	50 Percentile Odor Recognition Threshold (ORT) (ppm-v)	Odor Index
ACENAPHTHENE	2.5E+03	5.0E+03	NA	4.5E-03	5.13E+02	8.00E-02	5.63E-02
ACENAPHTHYLENE	1.0E+03	2.5E+03	NA	2.9E-02	-	-	-
ACETONE	1.0E+03	2.5E+03	1.0E+05	2.70E+02	3.09E+04	1.30E+01	2.08E+01
ALDRIN	2.5E+03	5.0E+03	NA	2.3E-05	2.63E+02	1.70E-02	1.35E-03
ANTHRACENE	1.0E+03	2.5E+03	NA	1.7E-05	-	-	-
ANTIMONY	2.5E+03	5.0E+03	NA	-	-	-	-
ARSENIC	2.5E+03	5.0E+03	NA	-	-	-	-
BARIUM	2.5E+03	5.0E+03	NA	-	-	-	-
BENZENE	1.0E+03	1.1E+03	8.7E+02	9.50E+01	4.89E+03	1.50E+00	6.33E+01
BENZO(a)ANTHRACENE	1.0E+03	2.5E+03	NA	2.2E-08	-	-	-
BENZO(b)FLUORANTHENE	1.0E+03	2.5E+03	NA	5.0E-07	-	-	-
BENZO(k)FLUORANTHENE	1.0E+03	2.5E+03	NA	9.6E-11	-	-	-
BENZO(g,h,i)PERYLENE	1.0E+03	2.5E+03	NA	1.1E-10	-	-	-
BENZO(a)PYRENE	1.0E+03	2.5E+03	NA	5.6E-09	-	-	-
BERYLLIUM	2.5E+03	5.0E+03	NA	-	-	-	-
BIPHENYL, 1,1-	1.0E+03	2.5E+03	NA	5.00E-03	6.00E+01	9.50E-03	5.26E-01
BIS(2-CHLOROETHYL)ETHER	1.0E+03	2.5E+03	9.6E+03	7.1E-01	2.87E+02	4.9E-02	1.45E+01
BIS(2-CHLOROISOPROPYL)ETHER	7.9E+02	7.9E+02	7.9E+02	8.5E-01	2.24E+03	3.20E-01	2.66E+00
BIS(2-ETHYLHEXYL)PHTHALATE	1.0E+03	2.5E+03	NA	6.2E-08	-	-	-
BORON	no criteria	no critiera	NA	-	-	-	-
BROMODICHLCROMETHANE	2.5E+03	4.8E+03	3.0E+03	5.00E+01	1.10E+07	1.68E+03	2.98E-02
BROMOFORM	1.0E+03	2.5E+03	NA	5.60E+00	1.35E+04	1.30E+00	4.31E+00
BROMOMETHANE	1.0E+03	2.5E+03	3.1E+03	1.42E+03	8.00E+04	2.00E+01	7.10E+01
CADMIUM	2.5E+03	5.0E+03	NA	-	-	-	-
CARBON TETRACHLORIDE	9.8E+02	9.8E+02	1.1E+03	1.13E+02	6.30E+04	1.00E+01	1.13E+01
CHLORDANE	2.5E+03	5.0E+03	NA	1.0E-05	8.40E+00	4.92E-04	2.03E-02
CHLOROANILINE, p-	2.5E+03	5.0E+03	NA	1.0E-05	-	-	-
CHLOROBENZENE	6.8E+02	6.8E+02	6.8E+02	1.18E+01	1.00E+03	2.20E-01	5.36E+01
CHLOROETHANE	1.0E+03	2.5E+03	1.6E+03	1.01E+03	3.80E+05	1.40E+02	7.20E+00
CHLOROFORM	1.0E+03	2.5E+03	2.9E+03	1.60E+02	4.22E+05	8.50E+01	1.88E+00
CHLOROMETHANE	5.0E+02	1.0E+03	4.1E+03	4.30E+03	-	-	-
CHLOROPHENOL, 2-	5.0E+02	1.0E+03	5.5E+04	1.42E+00	1.90E+01	3.60E-03	3.94E+02
CHROMIUM (Total)	2.5E+03	5.0E+03	NA	-	-	-	-
CHROMIUM III	2.5E+03	5.0E+03	NA	-	-	-	-
CHROMIUM VI	2.5E+03	5.0E+03	NA	-	-	-	-
CHRYSENE	2.5E+03	5.0E+03	NA	6.3E-07	-	-	-
COBALT	2.5E+03	5.0E+03	NA	-	-	-	-
COPPER	2.5E+03	5.0E+03	NA	-	-	-	-
CYANIDE (Free)	5.0E+02	1.0E+03	NA	6.20E+02	6.52E+02	5.80E-01	1.07E+03

TABLE H-3. COMPONENTS FOR DEEP SOIL CEILING LEVELS
(mg/kg)

CHEMICAL PARAMETER	[1]Residential Ceiling Level	Industrial/ Commercial Ceiling Level	Soil Saturation Limit (mg/kg)	Vapor Pressure (VP) (Torr @ 20-30 °C)	50 Percentile Odor Recognition Threshold (ORT) (ug/m^3)	50 Percentile Odor Recognition Threshold (ORT) (ppm-v)	Odor Index
DIBENZO(a,h)ANTHTRACENE	1.0E+03	2.5E+03	NA	1.0E-10	-	-	-
DIBROMOCHLOROMETHANE	5.0E+02	1.0E+03	NA	7.60E+01	-	-	-
1,2-DIBROMO-3-CHLOROPROPANE	1.0E+03	2.5E+03	3.3E+02	8.00E-01	-	-	-
DIBROMOETHANE, 1,2-	1.0E+03	2.5E+03	NA	1.20E+01	2.00E+05	2.60E+01	4.62E-01
DICHLOROBENZENE, 1,2-	3.7E+02	3.7E+02	6.0E+02	1.50E+00	3.05E+05	5.00E+01	3.00E-02
DICHLOROBENZENE, 1,3-	3.8E+02	3.8E+02	6.0E+02	2.30E+00	-	-	-
DICHLOROBENZENE, 1,4-	1.0E+03	2.5E+03	NA	1.80E+00	1.10E+03	1.80E-01	1.00E+01
DICHLOROBENZIDINE, 3,3-	1.0E+03	2.5E+03	NA	4.5E-09	-	-	-
DICHLORODIPHENYLDICHLOROETHANE (DDD)	1.0E+03	2.5E+03	NA	1.0E-06	-	-	-
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	1.0E+03	2.5E+03	NA	6.5E-06	-	-	-
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	2.5E+03	5.0E+03	NA	5.5E-06	-	-	-
DICHLOROETHANE, 1,1-	1.0E+03	2.3E+03	1.7E+03	2.34E+02	1.25E+05	3.00E+01	7.80E+00
DICHLOROETHANE, 1,2-	1.0E+03	2.5E+03	1.8E+03	7.90E+01	2.42E+03	5.90E-01	1.34E+02
DICHLOROETHYLENE, 1,1-	1.0E+03	1.6E+03	1.5E+03	5.91E+02	2.00E+06	5.00E+02	1.18E+00
DICHLOROETHYLENE, Cis 1,2-	5.0E+02	1.0E+03	1.2E+03	2.15E+02	-	-	-
DICHLOROETHYLENE, Trans 1,2-	1.0E+03	2.5E+03	3.1E+03	3.31E+02	6.73E+04	1.70E+01	1.95E+01
DICHLOROPHENOL, 2,4-	1.0E+03	2.5E+03	NA	6.7E-02	1.40E+03	2.10E-01	3.19E-01
DICHLOROPROPANE, 1,2-	5.0E+02	1.0E+03	1.1E+03	4.20E+01	1.19E+03	2.50E-01	1.68E+02
DICHLOROPROPENE, 1,3-	1.0E+03	1.1E+03	1.4E+03	4.30E+01	4.16E+03	1.00E+00	4.30E+01
DIELDRIN	2.5E+03	5.0E+03	NA	1.8E-08	-	-	-
DIETHYLPHTHALATE	1.0E+03	2.5E+03	NA	3.5E-04	-	-	-
DIMETHYLPHTHALATE	1.0E+03	2.5E+03	NA	1.7E-03	-	-	-
DIMETHYLPHENOL, 2,4-	5.0E+02	1.0E+03	NA	9.8E-02	1.00E+00	1.97E-04	4.97E+02
DINITROPHENOL, 2,4-	1.0E+03	2.5E+03	NA	1.5E-05	-	-	-
DINITROTOLUENE, 2,4-	1.0E+03	2.5E+03	NA	5.1E-03	-	-	-
1,4 DIOXANE	1.0E+03	2.5E+03	NA	3.70E+01	6.12E+05	1.70E+02	2.18E-01
DIOXIN (2,3,7,8-TCDD)	no criteria	no criteria	NA	-	-	-	-
ENDOSULFAN	1.0E+03	2.5E+03	NA	1.0E-05	-	-	-
ENDRIN	1.0E+03	2.5E+03	NA	2.0E-07	-	-	-
ETHYLBENZENE	2.3E+02	2.3E+02	4.0E+02	1.00E+01	2.00E+03	4.50E-01	2.22E+01
FLUORANTHENE	1.0E+03	2.5E+03	NA	5.0E-06	-	-	-
FLUORENE	1.0E+03	2.5E+03	NA	3.2E-04	-	-	-
HEPTACHLOR	2.5E+03	5.0E+03	NA	3.0E-04	3.00E+02	2.00E-02	1.50E-02
HEPTACHLOR EPOXIDE	2.5E+03	5.0E+03	NA	2.6E-06	3.00E+02	1.90E-02	1.37E-04
HEXACHLOROBENZENE	1.0E+03	2.5E+03	NA	1.1E-05	-	-	-
HEXACHLOROBUTADIENE	1.0E+03	2.5E+03	NA	1.50E-01	1.20E+04	1.10E+00	1.36E-01
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	1.0E+03	2.5E+03	NA	9.4E-06	-	-	-
HEXACHLOROETHANE	1.0E+03	2.5E+03	NA	2.1E-01	-	-	-
INDENO(1,2,3-cd)PYRENE	1.0E+03	2.5E+03	NA	1.0E-06	-	-	-

TABLE H-3. COMPONENTS FOR DEEP SOIL CEILING LEVELS
(mg/kg)

CHEMICAL PARAMETER	[1]Residential Ceiling Level	Industrial/ Commercial Ceiling Level	Soil Saturation Limit (mg/kg)	Vapor Pressure (VP) (Torr @ 20-30 °C)	50 Percentile Odor Recognition Threshold (ORT) (ug/m^3)	50 Percentile Odor Recognition Threshold (ORT) (ppm-v)	Odor Index
LEAD	2.5E+03	5.0E+03	NA	-	-	-	-
MERCURY	1.0E+03	2.5E+03	NA	2.0E-03	-	-	-
METHOXYCHLOR	1.0E+03	2.5E+03	NA	1.4E-06	-	-	-
METHYLENE CHLORIDE	1.0E+03	2.3E+03	2.4E+03	4.29E+02	5.60E+05	1.60E+02	2.68E+00
METHYL ETHYL KETONE	1.0E+03	2.5E+03	3.4E+04	1.00E+02	3.20E+04	1.10E+01	9.09E+00
METHYL ISOBUTYL KETONE	5.0E+02	1.0E+03	1.7E+04	1.00E+01	4.20E+02	1.00E-01	1.00E+02
METHYL MERCURY	5.0E+02	1.0E+03	NA	-	-	-	-
METHYLNAPHTHALENE (total 1- & 2-)	1.0E+03	2.5E+03	NA	6.8E-02	6.80E+01	1.15E-02	5.91E+00
METHYL TERT BUTYL ETHER	5.0E+02	1.0E+03	2.1E+04	2.45E+02	5.30E+02	1.30E-01	1.88E+03
MOLYBDENUM	2.5E+03	5.0E+03	NA	-	-	-	-
NAPHTHALENE	1.0E+03	2.5E+03	NA	8.2E-02	4.40E+02	8.40E-02	9.76E-01
NICKEL	2.5E+03	5.0E+03	NA	-	-	-	-
PENTACHLOROPHENOL	1.0E+03	2.5E+03	NA	1.1E-04	-	-	-
PERCHLORATE	2.5E+03	5.0E+03	NA	-	-	-	-
PHENANTHRENE	1.0E+03	2.5E+03	NA	9.6E-04	5.50E+01	7.42E-03	1.29E-01
PHENOL	1.0E+03	2.5E+03	NA	3.50E-01	1.56E+02	4.00E-02	8.75E+00
POLYCHLORINATED BIPHENYLS (PCBs)	1.0E+03	2.5E+03	NA	4.9E-04 to 6.7E-03	-	-	-
PYRENE	1.0E+03	2.5E+03	NA	2.5E-06	-	-	-
SELENIUM	2.5E+03	5.0E+03	NA	-	-	-	-
SILVER	2.5E+03	5.0E+03	NA	-	-	-	-
STYRENE	1.0E+03	1.7E+03	1.5E+03	5.00E+00	1.36E+03	3.00E-01	1.67E+01
tert-BUTYL ALCOHOL	5.0E+02	1.0E+03	3.2E+05	4.20E+01	-	-	-
TETRACHLOROETHANE, 1,1,1,2-	5.0E+02	1.0E+03	2.0E+03	1.20E+01	-	-	-
TETRACHLOROETHANE, 1,1,2,2-	1.0E+03	1.7E+03	2.0E+03	4.00E+00	1.05E+04	1.50E+00	2.67E+00
TETRACHLOROETHYLENE	3.7E+02	3.7E+02	2.3E+02	1.90E+01	3.17E+04	4.68E+00	4.06E+00
THALLIUM	2.5E+03	5.0E+03	NA	-	-	-	-
TOLUENE	5.2E+02	5.2E+02	6.5E+02	2.80E+01	3.00E+04	8.00E+00	3.50E+00
TOXAPHENE	1.0E+03	2.5E+03	NA	4.00E-01	-	-	-
TPH (gasolines)	5.0E+03	5.0E+03	-	-	1.00E+02	-	-
TPH (middle distillates)	5.0E+03	5.0E+03	-	-	1.00E+03	-	-
TPH (residual fuels)	5.0E+03	5.0E+03	-	-	-	-	-
TRICHLOROBENZENE, 1,2,4-	1.0E+03	2.5E+03	NA	2.9E-01	2.20E+04	2.96E+00	9.80E-02
TRICHLOROETHANE, 1,1,1-	1.0E+03	1.4E+03	1.2E+03	1.00E+02	6.51E+04	1.20E+01	8.33E+00
TRICHLOROETHANE, 1,1,2-	5.0E+02	1.0E+03	1.8E+03	2.25E+01	-	-	-
TRICHLOROETHYLENE	8.2E+02	8.2E+02	1.3E+03	7.70E+01	1.36E+06	2.49E+02	3.09E-01
TRICHLOROPHENOL, 2,4,5-	5.0E+02	1.0E+03	NA	-	-	-	-
TRICHLOROPHENOL, 2,4,6-	1.0E+03	2.5E+03	NA	1.2E-02	3.00E-01	3.60E-05	3.33E+02
VANADIUM	2.5E+03	5.0E+03	NA	-	-	-	-
VINYL CHLORIDE	1.0E+03	2.5E+03	1.2E+03	2.58E+03	7.71E+05	2.94E+02	8.78E+00

TABLE H-3. COMPONENTS FOR DEEP SOIL CEILING LEVELS
(mg/kg)

CHEMICAL PARAMETER	[1]Residential Ceiling Level	Industrial/ Commercial Ceiling Level	Soil Saturation Limit (mg/kg)	Vapor Pressure (VP) (Torr @ 20-30 °C)	50 Percentile Odor Recognition Threshold (ORT) (ug/m^3)	50 Percentile Odor Recognition Threshold (ORT) (ppm-v)	Odor Index
XYLENES	2.1E+02	2.1E+02	4.2E+02	6.00E+00	4.41E+02	1.00E-01	6.00E+01
ZINC	2.5E+03	5.0E+03	NA	-	-	-	-

Notes:

1. "Residential Land Use" screening levels generally considered adequate for other sensitive uses (e.g., day-care centers, hospitals, etc.).

Odor Index = VP/ORT in ppm-v
Physio-chemical constants Ontario MOEE (MOEE 1996) except as noted.
Physio-chemical constants for cloroethane and chloromethane from ATSDR Toxicological Profiles (ATSDR 2001).
Odor Recognition Threshold in parts per million - volume (ppm-v = (concentration in mg/m3) x (24/molecular weight)).
TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.
Ceiling Level: Based on comparison of vapor pressure and odor index to Table H-1 or saturation limit, if lower.
Saturation limits calculated using equation in USEPA Region IX PRG guidance (for chemicals that are liquid at ambient temperatures and pressures; refer to Appendix 2).
Ceiling Levels for TPH after guidance from Massachusetts Department of Environmental Protection (MADEP 1997a).

References for vapor pressure and odor threshold data (in order of use):

1. Ontario Ministry of Environment and Energy (MOEE 1996).
2. Massachusetts Department of Environmental Protection (MADEP 1994).
3. Agency for Toxic Substances and Disease Registry (ATSDR 2001).
4. National Library of Medicine, Hazardous Substances Data Bank (NLM 2000).
5. U.S. Department of Health and Human Services (NIOSH 2000).

TABLE I-1. GROUNDWATER CEILING LEVELS
(groundwater IS a current or potential source of drinking water)
(ug/L)

CHEMICAL PARAMETER	Final Ceiling Level	Basis	Solubility (1/2)	Taste And Odor Threshold	Basis	Upper Limit
ACENAPHTHENE	2.0E+01	Taste & Odors	2.1E+03	2.0E+01	Ontario MOEE	5.0E+04
ACENAPHTHYLENE	2.0E+03	Solubility	2.0E+03	-	-	5.0E+04
ACETONE	2.0E+04	Taste & Odors	5.0E+08	2.0E+04	Amoore & Hautala	5.0E+04
ALDRIN	8.5E+00	Solubility	8.5E+00	1.7E+01	Ontario MOEE	5.0E+04
ANTHRACENE	2.2E+01	Solubility	2.2E+01	-	-	5.0E+04
ANTIMONY	5.0E+04	Upper Limit		-	-	5.0E+04
ARSENIC	5.0E+04	Upper Limit		-	-	5.0E+04
BARIUM	5.0E+04	Upper Limit		-	-	5.0E+04
BENZENE	1.7E+02	Taste & Odors	8.8E+05	1.7E+02	Amoore & Hautala	5.0E+04
BENZO(a)ANTHRACENE	5.0E+00	Solubility	5.0E+00	-	-	5.0E+04
BENZO(b)FLUORANTHENE	7.0E+00	Solubility	7.0E+00	-	-	5.0E+04
BENZO(k)FLUORANTHENE	4.0E-01	Solubility	4.0E-01	-	-	5.0E+04
BENZO(g,h,i)PERYLENE	1.3E-01	Solubility	1.3E-01	-	-	5.0E+04
BENZO(a)PYRENE	1.9E+00	Solubility	1.9E+00	-	-	5.0E+04
BERYLLIUM	5.0E+04	Upper Limit		-	-	5.0E+04
BIPHENYL, 1,1-	5.0E-01	Taste & Odors	3.8E+03	5.0E-01	Amoore & Hautala	5.0E+04
BIS(2-CHLOROETHYL)ETHER	3.6E+02	Taste & Odors	8.6E+06	3.6E+02	Amoore & Hautala	5.0E+04
BIS(2-CHLOROISOPROPYL)ETHER	3.2E+02	Taste & Odors	8.5E+05	3.2E+02	Ontario MOEE	5.0E+04
BIS(2-ETHYLHEXYL)PHTHALATE	6.5E+02	Solubility	6.5E+02	-	-	5.0E+04
BORON	5.0E+04	Upper Limit		-	-	5.0E+04
BROMODICHLOROMETHANE	5.0E+04	Upper Limit	3.4E+06	-	-	5.0E+04
BROMOFORM	5.1E+02	Taste & Odors	1.6E+06	5.1E+02	Amoore & Hautala	5.0E+04
BROMOMETHANE	5.0E+04	Upper Limit	7.6E+06	-	-	5.0E+04
CADMIUM	5.0E+04	Upper Limit		-	-	5.0E+04
CARBON TETRACHLORIDE	5.2E+02	Taste & Odors	4.0E+05	5.2E+02	Amoore & Hautala	5.0E+04
CHLORDANE	2.5E+00	Taste & Odors	2.8E+01	2.5E+00	Ontario MOEE	5.0E+04
CHLOROANILINE, p-	5.0E+04	Upper Limit	1.3E+06	-	-	5.0E+04
CHLOROBENZENE	5.0E+01	Taste & Odors	2.4E+05	5.0E+01	Amoore & Hautala	5.0E+04
CHLOROETHANE	1.6E+01	Taste & Odors	2.9E+06	1.6E+01	Amoore & Hautala	5.0E+04
CHLOROFORM	2.4E+03	Taste & Odors	4.0E+06	2.4E+03	Amoore & Hautala	5.0E+04
CHLOROMETHANE	5.0E+04	Upper Limit	4.1E+06		-	5.0E+04
CHLOROPHENOL, 2-	1.8E-01	Taste & Odors	1.1E+07	1.8E-01	Ontario MOEE	5.0E+04
CHROMIUM (Total)	5.0E+04	Upper Limit		-	-	5.0E+04
CHROMIUM III	5.0E+04	Upper Limit		-	-	5.0E+04
CHROMIUM VI	5.0E+04	Upper Limit		-	-	5.0E+04
CHRYSENE	8.0E-01	Solubility	8.0E-01	-	-	5.0E+04

TABLE I-1. GROUNDWATER CEILING LEVELS
(groundwater IS a current or potential source of drinking water)
(ug/L)

CHEMICAL PARAMETER	Final Ceiling Level	Basis	Solubility (1/2)	Taste And Odor Threshold	Basis	Upper Limit
COBALT	5.0E+04	Upper Limit		-	-	5.0E+04
COPPER	1.0E+03	Taste & Odors		1.0E+03	CalDHS 2nd MCL	5.0E+04
CYANIDE (Free)	1.7E+02	Taste & Odors	5.0E+08	1.7E+02	Amoore & Hautala	5.0E+04
DIBENZO(a,h)ANTHTRACENE	2.5E-01	Solubility	2.5E-01	-	-	5.0E+04
DIBROMOCHLOROMETHANE	5.0E+04	Upper Limit	2.2E+06	-	-	5.0E+04
1,2-DIBROMO-3-CHLOROPROPANE	1.0E+01	Taste & Odors	6.0E+05	1.0E+01	Amoore & Hautala	5.0E+04
DIBROMOETHANE, 1,2-	5.0E+04	Upper Limit	1.7E+06	-	-	5.0E+04
DICHLOROBENZENE, 1,2-	1.0E+01	Taste & Odors	7.8E+04	1.0E+01	USEPA 2nd MCL	5.0E+04
DICHLOROBENZENE, 1,3-	5.0E+04	Upper Limit	7.8E+04	-	-	5.0E+04
DICHLOROBENZENE, 1,4-	5.0E+00	Taste & Odors	3.7E+04	5.0E+00	USEPA 2nd MCL	5.0E+04
DICHLOROBENZIDINE, 3,3-	1.6E+03	Solubility	1.6E+03	-	-	5.0E+04
DICHLORODIPHENYLDICHLOROETHANE (DDD)	8.0E+01	Solubility	8.0E+01	-	-	5.0E+04
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	2.0E+01	Solubility	2.0E+01	-	-	5.0E+04
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	1.5E+00	Solubility	1.5E+00	3.5E+02	Ontario MOEE	5.0E+04
DICHLOROETHANE, 1,1-	5.0E+04	Upper Limit	2.5E+06	-	-	5.0E+04
DICHLOROETHANE, 1,2-	7.0E+03	Taste & Odors	4.3E+06	7.0E+03	Amoore & Hautala	5.0E+04
DICHLOROETHYLENE, 1,1-	1.5E+03	Taste & Odors	1.1E+06	1.5E+03	Amoore & Hautala	5.0E+04
DICHLOROETHYLENE, Cis 1,2-	5.0E+04	Upper Limit	1.8E+06	-	-	5.0E+04
DICHLOROETHYLENE, Trans 1,2-	2.6E+02	Taste & Odors	3.2E+06	2.6E+02	Amoore & Hautala	5.0E+04
DICHLOROPHENOL, 2,4-	3.0E-01	Taste & Odors	2.3E+06	3.0E-01	Ontario MOEE	5.0E+04
DICHLOROPROPANE, 1,2-	1.0E+01	Taste & Odors	1.4E+06	1.0E+01	Ontario MOEE	5.0E+04
DICHLOROPROPENE, 1,3-	5.0E+04	Upper Limit	1.4E+06	-	-	5.0E+04
DIELDRIN	4.1E+01	Taste & Odors	9.3E+01	4.1E+01	Ontario MOEE	5.0E+04
DIETHYLPHTHALATE	5.0E+04	Upper Limit	4.5E+05	-	-	5.0E+04
DIMETHYLPHTHALATE	5.0E+04	Upper Limit	2.5E+06	-	-	5.0E+04
DIMETHYLPHENOL, 2,4-	4.0E+02	Taste & Odors	3.9E+06	4.0E+02	Cal DHS AL	5.0E+04
DINITROPHENOL, 2,4-	5.0E+04	Upper Limit	2.8E+06	-	-	5.0E+04
DINITROTOLUENE, 2,4-	5.0E+04	Upper Limit	1.4E+05	-	-	5.0E+04
1,4 DIOXANE	5.0E+04	Upper Limit	5.0E+08	2.3E+05	Amoore & Hautala	5.0E+04
DIOXIN (2,3,7,8-TCDD)	5.0E+04	Upper Limit		-	-	5.0E+04
ENDOSULFAN	7.5E+01	Solubility	7.5E+01	-	-	5.0E+04
ENDRIN	4.1E+01	Taste & Odors	1.3E+02	4.1E+01	Ontario MOEE	5.0E+04
ETHYLBENZENE	3.0E+01	Taste & Odors	8.5E+04	3.0E+01	USEPA 2nd MCL	5.0E+04
FLUORANTHENE	1.3E+02	Solubility	1.3E+02	-	-	5.0E+04
FLUORENE	9.5E+02	Solubility	9.5E+02	-	-	5.0E+04
HEPTACHLOR	2.0E+01	Taste & Odors	2.8E+01	2.0E+01	Ontario MOEE	5.0E+04

TABLE I-1. GROUNDWATER CEILING LEVELS
(groundwater IS a current or potential source of drinking water)
(ug/L)

CHEMICAL PARAMETER	Final Ceiling Level	Basis	Solubility (1/2)	Taste And Odor Threshold	Basis	Upper Limit
HEPTACHLOR EPOXIDE	1.8E+02	Solubility	1.8E+02	-	-	5.0E+04
HEXACHLOROBENZENE	5.5E+01	Solubility	5.5E+01	3.0E+03	Ontario MOEE	5.0E+04
HEXACHLOROBUTADIENE	6.0E+00	Taste & Odors	1.0E+03	6.0E+00	Ontario MOEE	5.0E+04
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	3.5E+03	Solubility	3.5E+03	1.2E+04	Ontario MOEE	5.0E+04
HEXACHLOROETHANE	1.0E+01	Taste & Odors	2.5E+04	1.0E+01	Amoore & Hautala	5.0E+04
INDENO(1,2,3-cd)PYRENE	2.7E-01	Solubility	2.7E-01	-	-	5.0E+04
LEAD	5.0E+04	Upper Limit		-	-	5.0E+04
MERCURY	5.0E+04	Upper Limit		-	-	5.0E+04
METHOXYCHLOR	2.0E+01	Solubility	2.0E+01	4.7E+03	Amoore & Hautala	5.0E+04
METHYLENE CHLORIDE	9.1E+03	Taste & Odors	6.6E+06	9.1E+03	Ontario MOEE	5.0E+04
METHYL ETHYL KETONE	8.4E+03	Taste & Odors	1.3E+08	8.4E+03	Amoore & Hautala	5.0E+04
METHYL ISOBUTYL KETONE	1.3E+03	Taste & Odors	9.5E+06	1.3E+03	Amoore & Hautala	5.0E+04
METHYL MERCURY	5.0E+04	Upper Limit		-	-	5.0E+04
METHYLNAPHTHALENE (total 1- & 2-)	1.0E+01	Taste & Odors	1.3E+04	1.0E+01	Ontario MOEE	5.0E+04
METHYL TERT BUTYL ETHER	5.0E+00	Taste & Odors	7.5E+07	5.0E+00	Cal DHS 2nd MCL	5.0E+04
MOLYBDENUM	5.0E+04	Upper Limit		-	-	5.0E+04
NAPHTHALENE	2.1E+01	Taste & Odors	1.6E+04	2.1E+01	Amoore & Hautala	5.0E+04
NICKEL	5.0E+04	Upper Limit		-	-	5.0E+04
PENTACHLOROPHENOL	3.0E+01	Taste & Odors	7.0E+06	3.0E+01	Amoore & Hautala	5.0E+04
PERCHLORATE	5.0E+04	Upper Limit	1.0E+08	-	-	5.0E+04
PHENANTHRENE	4.1E+02	Solubility	4.1E+02	1.0E+03	Ontario MOEE	5.0E+04
PHENOL	5.0E+00	Taste & Odors	4.0E+07	5.0E+00	Cal DHS AL	5.0E+04
POLYCHLORINATED BIPHENYLS (PCBs)	1.6E+01	Solubility	1.6E+01	-	-	5.0E+04
PYRENE	6.8E+01	Solubility	6.8E+01	-	-	5.0E+04
SELENIUM	5.0E+04	Upper Limit		-	-	5.0E+04
SILVER	1.0E+02	Taste & Odors		1.0E+02	Cal DHS 2nd MCL	5.0E+04
STYRENE	1.0E+01	Taste & Odors	1.6E+05	1.0E+01	USEPA 2nd MCL	5.0E+04
tert-BUTYL ALCOHOL	5.0E+04	Upper Limit	5.0E+08	-	-	5.0E+04
TETRACHLOROETHANE, 1,1,1,2-	5.0E+04	Upper Limit	1.5E+06	-	-	5.0E+04
TETRACHLOROETHANE, 1,1,2,2-	5.0E+02	Taste & Odors	1.5E+06	5.0E+02	Amoore & Hautala	5.0E+04
TETRACHLOROETHYLENE	1.7E+02	Taste & Odors	1.0E+05	1.7E+02	Amoore & Hautala	5.0E+04
THALLIUM	5.0E+04	Upper Limit		-	-	5.0E+04
TOLUENE	4.0E+01	Taste & Odors	2.6E+05	4.0E+01	USEPA 2nd MCL	5.0E+04
TOXAPHENE	1.4E+02	Taste & Odors	1.5E+03	1.4E+02	USEPA 2nd MCL	5.0E+04
TPH (gasolines)	1.0E+02	Taste & Odors	7.5E+04	1.0E+02	USEPA SNARL	5.0E+04
TPH (middle distillates)	1.0E+02	Taste & Odors	2.5E+03	1.0E+02	USEPA SNARL	5.0E+04

TABLE I-1. GROUNDWATER CEILING LEVELS
(groundwater IS a current or potential source of drinking water)
(ug/L)

CHEMICAL PARAMETER	Final Ceiling Level	Basis	Solubility (1/2)	Taste And Odor Threshold	Basis	Upper Limit
TPH (residual fuels)	1.0E+02	Taste & Odors	2.5E+03	1.0E+02	USEPA SNARL	5.0E+04
TRICHLOROBENZENE, 1,2,4-	3.0E+03	Taste & Odors	1.5E+05	3.0E+03	USEPA (1995)	5.0E+04
TRICHLOROETHANE, 1,1,1-	9.7E+02	Taste & Odors	6.7E+05	9.7E+02	Amoore & Hautala	5.0E+04
TRICHLOROETHANE, 1,1,2-	5.0E+04	Upper Limit	2.2E+06	-	-	5.0E+04
TRICHLOROETHYLENE	3.1E+02	Taste & Odors	5.5E+05	3.1E+02	Amoore & Hautala	5.0E+04
TRICHLOROPHENOL, 2,4,5-	2.0E+02	Taste & Odors	6.0E+05	2.0E+02	Ontario MOEE	5.0E+04
TRICHLOROPHENOL, 2,4,6-	1.0E+02	Taste & Odors	4.0E+05	1.0E+02	Ontario MOEE	5.0E+04
VANADIUM	5.0E+04	Upper Limit		-	-	5.0E+04
VINYL CHLORIDE	3.4E+03	Taste & Odors	1.4E+06	3.4E+03	Amoore & Hautala	5.0E+04
XYLENES	2.0E+01	Taste & Odors	8.1E+04	2.0E+01	USEPA 2nd MCL	5.0E+04
ZINC	5.0E+03	Taste & Odors		5.0E+03	Cal DHS 2nd MCL	5.0E+04

References:
Unless otherwise noted, criteria for drinking water taste and odor threshhold from summary in *A Compilation of Water Quality Goals* (RWQCBCV 1998) or Ontario MOEE if not available (MOEE 1996).
Upper limit of 50000 ug/L intended to limit general groundwater resource degradation (MOEE 1996).
1/2 solubility based on solubility constants in USEPA Region IX (USEPA 1998) or Ontario MOEE (MOEE 1996) if not available.

Notes:
Ceiling Level: lowest of 1/2 solubility, taste and odor threshhold and 50000 ug/L maximum level
TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.
TPH ceiling levels after Massachusetts DEP (MADEP 1997a).
TPH Taste and Odor Thresholds based on USEPA Suggested-No-Adverse-reaction (SNARL) level for TPH diesel.

TABLE I-2. GROUNDWATER CEILING LEVELS
(groundwater IS NOT a current or potential source of drinking water)
(ug/L)

CHEMICAL PARAMETER	Final Ceiling Level	Basis	Solubility (1/2)	Nuisance Odor Threshold	Basis	Upper Limit
ACENAPHTHENE	2.0E+02	Taste & Odors	2.1E+03	2.0E+02	Ontario MOEE	5.0E+04
ACENAPHTHYLENE	2.0E+03	Solubility	2.0E+03	-	-	5.0E+04
ACETONE	5.0E+04	Upper Limit	5.0E+08	200000	Ontario MOEE	5.0E+04
ALDRIN	8.5E+00	Solubility	8.5E+00	170	Ontario MOEE	5.0E+04
ANTHRACENE	2.2E+01	Solubility	2.2E+01	-	-	5.0E+04
ANTIMONY	5.0E+04	Upper Limit			-	5.0E+04
ARSENIC	5.0E+04	Upper Limit		-	-	5.0E+04
BARIUM	5.0E+04	Upper Limit		-	-	5.0E+04
BENZENE	2.0E+04	Taste & Odors	8.8E+05	2.0E+04	Ontario MOEE	5.0E+04
BENZO(a)ANTHRACENE	5.0E+00	Solubility	5.0E+00	-	-	5.0E+04
BENZO(b)FLUORANTHENE	7.0E+00	Solubility	7.0E+00	-	-	5.0E+04
BENZO(k)FLUORANTHENE	4.0E-01	Solubility	4.0E-01	-	-	5.0E+04
BENZO(g,h,i)PERYLENE	1.3E-01	Solubility	1.3E-01	-	-	5.0E+04
BENZO(a)PYRENE	1.9E+00	Solubility	1.9E+00	-	-	5.0E+04
BERYLLIUM	5.0E+04	Upper Limit		-	-	5.0E+04
BIPHENYL, 1,1-	5.0E+00	Taste & Odors	3.8E+03	5.0E+00	Amoore & Hautala	5.0E+04
BIS(2-CHLOROETHYL)ETHER	3.6E+03	Taste & Odors	8.6E+06	3.6E+03	Amoore & Hautala	5.0E+04
BIS(2-CHLOROISOPROPYL)ETHER	3.2E+03	Taste & Odors	8.5E+05	3.2E+03	Ontario MOEE	5.0E+04
BIS(2-ETHYLHEXYL)PHTHALATE	6.5E+02	Solubility	6.5E+02	-	-	5.0E+04
BORON	5.0E+04	Upper Limit		-	-	5.0E+04
BROMODICHLOROMETHANE	5.0E+04	Upper Limit	3.4E+06	-	-	5.0E+04
BROMOFORM	5.1E+03	Taste & Odors	1.6E+06	5.1E+03	Ontario MOEE	5.0E+04
BROMOMETHANE	5.0E+04	Upper Limit	7.6E+06	-	-	5.0E+04
CADMIUM	5.0E+04	Upper Limit		-	-	5.0E+04
CARBON TETRACHLORIDE	5.2E+03	Taste & Odors	4.0E+05	5.2E+03	Ontario MOEE	5.0E+04
CHLORDANE	2.5E+01	Taste & Odors	2.8E+01	2.5E+01	Ontario MOEE	5.0E+04
CHLOROANILINE, p-	5.0E+04	Upper Limit	1.3E+06	-	-	5.0E+04
CHLOROBENZENE	5.0E+02	Taste & Odors	2.4E+05	5.0E+02	Ontario MOEE	5.0E+04
CHLOROETHANE	1.6E+02	Taste & Odors	2.9E+06	1.6E+02	Amoore & Hautala	5.0E+04
CHLOROFORM	2.4E+04	Taste & Odors	4.0E+06	2.4E+04	Ontario MOEE	5.0E+04
CHLOROMETHANE	5.0E+04	Upper Limit	4.1E+06	-	-	5.0E+04
CHLOROPHENOL, 2-	1.8E+00	Taste & Odors	1.1E+07	1.8E+00	Ontario MOEE	5.0E+04
CHROMIUM (Total)	5.0E+04	Upper Limit		-	-	5.0E+04
CHROMIUM III	5.0E+04	Upper Limit		-	-	5.0E+04
CHROMIUM VI	5.0E+04	Upper Limit		-	-	5.0E+04
CHRYSENE	8.0E-01	Solubility	8.0E-01	-	-	5.0E+04
COBALT	5.0E+04	Upper Limit		-	-	5.0E+04

TABLE I-2. GROUNDWATER CEILING LEVELS
(groundwater IS NOT a current or potential source of drinking water)
(ug/L)

CHEMICAL PARAMETER	Final Ceiling Level	Basis	Solubility (1/2)	Nuisance Odor Threshold	Basis	Upper Limit
COPPER	5.0E+04	Upper Limit		-	-	5.0E+04
CYANIDE (Free)	1.7E+03	Taste & Odors	5.0E+08	1.7E+03	Ontario MOEE	5.0E+04
DIBENZO(a,h)ANTHTRACENE	2.5E-01	Solubility	2.5E-01	-	-	5.0E+04
DIBROMOCHLOROMETHANE	5.0E+04	Upper Limit	2.2E+06	-	-	5.0E+04
1,2-DIBROMO-3-CHLOROPROPANE	1.0E+02	Taste & Odors	6.0E+05	1.0E+02	Amoore & Hautala	5.0E+04
DIBROMOETHANE, 1,2-	5.0E+04	Upper Limit	1.7E+06	-	-	5.0E+04
DICHLOROBENZENE, 1,2-	1.0E+02	Taste & Odors	7.8E+04	1.0E+02	Ontario MOEE	5.0E+04
DICHLOROBENZENE, 1,3-	5.0E+04	Upper Limit	7.8E+04	-	-	5.0E+04
DICHLOROBENZENE, 1,4-	1.1E+02	Taste & Odors	3.7E+04	1.1E+02	Ontario MOEE	5.0E+04
DICHLOROBENZIDINE, 3,3-	1.6E+03	Solubility	1.6E+03	-	-	5.0E+04
DICHLORODIPHENYLDICHLOROETHANE (DDD)	8.0E+01	Solubility	8.0E+01	-	-	5.0E+04
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	2.0E+01	Solubility	2.0E+01	-	-	5.0E+04
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	1.5E+00	Solubility	1.5E+00	3.5E+03	Ontario MOEE	5.0E+04
DICHLOROETHANE, 1,1-	5.0E+04	Upper Limit	2.5E+06	-	-	5.0E+04
DICHLOROETHANE, 1,2-	5.0E+04	Upper Limit	4.3E+06	2.0E+05	Ontario MOEE	5.0E+04
DICHLOROETHYLENE, 1,1-	1.5E+04	Taste & Odors	1.1E+06	1.5E+04	Amoore & Hautala	5.0E+04
DICHLOROETHYLENE, Cis 1,2-	5.0E+04	Upper Limit	1.8E+06	-	-	5.0E+04
DICHLOROETHYLENE, Trans 1,2-	2.6E+03	Taste & Odors	3.2E+06	2.6E+03	Ontario MOEE	5.0E+04
DICHLOROPHENOL, 2,4-	3.0E+00	Taste & Odors	2.3E+06	3.0E+00	Ontario MOEE	5.0E+04
DICHLOROPROPANE, 1,2-	1.0E+02	Taste & Odors	1.4E+06	1.0E+02	Ontario MOEE	5.0E+04
DICHLOROPROPENE, 1,3-	5.0E+04	Upper Limit	1.4E+06	-	-	5.0E+04
DIELDRIN	9.3E+01	Solubility	9.3E+01	4.1E+02	Ontario MOEE	5.0E+04
DIETHYLPHTHALATE	5.0E+04	Upper Limit	4.5E+05	-	-	5.0E+04
DIMETHYLPHTHALATE	5.0E+04	Upper Limit	2.5E+06	-	-	5.0E+04
DIMETHYLPHENOL, 2,4-	4.0E+03	Taste & Odors	3.9E+06	4.0E+03	Ontario MOEE	5.0E+04
DINITROPHENOL, 2,4-	5.0E+04	Upper Limit	2.8E+06	-	-	5.0E+04
DINITROTOLUENE, 2,4-	5.0E+04	Upper Limit	1.4E+05	-	-	5.0E+04
1,4 DIOXANE	5.0E+04	Upper Limit	5.0E+08	-	-	5.0E+04
DIOXIN (2,3,7,8-TCDD)	5.0E+04	Upper Limit		-	-	5.0E+04
ENDOSULFAN	7.5E+01	Solubility	7.5E+01	-	-	5.0E+04
ENDRIN	1.3E+02	Solubility	1.3E+02	4.1E+02	Ontario MOEE	5.0E+04
ETHYLBENZENE	3.0E+02	Taste & Odors	8.5E+04	3.0E+02	USEPA 2nd MCL	5.0E+04
FLUORANTHENE	1.3E+02	Solubility	1.3E+02	-	-	5.0E+04
FLUORENE	9.5E+02	Solubility	9.5E+02	-	-	5.0E+04
HEPTACHLOR	2.8E+01	Solubility	2.8E+01	2.0E+02	Ontario MOEE	5.0E+04
HEPTACHLOR EPOXIDE	1.8E+02	Solubility	1.8E+02	-	-	5.0E+04
HEXACHLOROBENZENE	5.5E+01	Solubility	5.5E+01	3.0E+04	Ontario MOEE	5.0E+04

TABLE I-2. GROUNDWATER CEILING LEVELS
(groundwater IS NOT a current or potential source of drinking water)
(ug/L)

CHEMICAL PARAMETER	Final Ceiling Level	Basis	Solubility (1/2)	Nuisance Odor Threshold	Basis	Upper Limit
HEXACHLOROBUTADIENE	6.0E+01	Taste & Odors	1.0E+03	6.0E+01	Ontario MOEE	5.0E+04
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	3.5E+03	Solubility	3.5E+03	1.2E+05	Ontario MOEE	5.0E+04
HEXACHLOROETHANE	1.0E+02	Taste & Odors	2.5E+04	1.0E+02	Ontario MOEE	5.0E+04
INDENO(1,2,3-cd)PYRENE	2.7E-01	Solubility	2.7E-01	-	-	5.0E+04
LEAD	5.0E+04	Upper Limit		-	-	5.0E+04
MERCURY	5.0E+04	Upper Limit		-	-	5.0E+04
METHOXYCHLOR	2.0E+01	Solubility	2.0E+01	4.7E+04	Ontario MOEE	5.0E+04
METHYLENE CHLORIDE	5.0E+04	Upper Limit	6.6E+06	9.1E+04	Ontario MOEE	5.0E+04
METHYL ETHYL KETONE	5.0E+04	Upper Limit	1.3E+08	8.4E+04	Amoore & Hautala	5.0E+04
METHYL ISOBUTYL KETONE	1.3E+04	Taste & Odors	9.5E+06	1.3E+04	Amoore & Hautala	5.0E+04
METHYL MERCURY	5.0E+04	Upper Limit		-	-	5.0E+04
METHYLNAPHTHALENE (total 1- & 2-)	1.0E+02	Taste & Odors	1.3E+04	1.0E+02	Ontario MOEE	5.0E+04
METHYL TERT BUTYL ETHER	1.8E+03	Taste & Odors	7.5E+07	1.8E+03	CalDHS	5.0E+04
MOLYBDENUM	5.0E+04	Upper Limit		-	-	5.0E+04
NAPHTHALENE	2.1E+02	Taste & Odors	1.6E+04	2.1E+02	Ontario MOEE	5.0E+04
NICKEL	5.0E+04	Upper Limit		-	-	5.0E+04
PENTACHLOROPHENOL	5.9E+03	Taste & Odors	7.0E+06	5.9E+03	Ontario MOEE	5.0E+04
PERCHLORATE	5.0E+04	Upper Limit	1.0E+08	-	-	5.0E+04
PHENANTHRENE	4.1E+02	Solubility	4.1E+02	1.0E+04	Ontario MOEE	5.0E+04
PHENOL	5.0E+04	Upper Limit	4.0E+07	7.9E+04	Ontario MOEE	5.0E+04
POLYCHLORINATED BIPHENYLS (PCBs)	1.6E+01	Solubility	1.6E+01	-	-	5.0E+04
PYRENE	6.8E+01	Solubility	6.8E+01	-	-	5.0E+04
SELENIUM	5.0E+04	Upper Limit		-	-	5.0E+04
SILVER	5.0E+04	Upper Limit		-	-	5.0E+04
STYRENE	1.1E+02	Taste & Odors	1.6E+05	1.1E+02	Ontario MOEE	5.0E+04
tert-BUTYL ALCOHOL	5.0E+04	Upper Limit	5.0E+08	-	-	5.0E+04
TETRACHLOROETHANE, 1,1,1,2-	5.0E+04	Upper Limit	1.5E+06	-	-	5.0E+04
TETRACHLOROETHANE, 1,1,2,2-	5.0E+03	Taste & Odors	1.5E+06	5.0E+03	Ontario MOEE	5.0E+04
TETRACHLOROETHYLENE	3.0E+03	Taste & Odors	1.0E+05	3.0E+03	Ontario MOEE	5.0E+04
THALLIUM	5.0E+04	Upper Limit		-	-	5.0E+04
TOLUENE	4.0E+02	Taste & Odors	2.6E+05	4.0E+02	Ontario MOEE	5.0E+04
TOXAPHENE	1.4E+02	Taste & Odors	1.5E+03	1.4E+02	USEPA 2nd MCL	5.0E+04
TPH (gasolines)	5.0E+03	Taste & Odors	7.5E+04	5.0E+03	MADEP	5.0E+04
TPH (middle distillates)	2.5E+03	Solubility	2.5E+03	5.0E+03	MADEP	5.0E+04
TPH (residual fuels)	2.5E+03	Solubility	2.5E+03	5.0E+03	MADEP	5.0E+04
TRICHLOROBENZENE, 1,2,4-	3.0E+04	Taste & Odors	1.5E+05	3.0E+04	USEPA (1995)	5.0E+04
TRICHLOROETHANE, 1,1,1-	5.0E+04	Upper Limit	6.7E+05	5.0E+05	Ontario MOEE	5.0E+04

TABLE I-2. GROUNDWATER CEILING LEVELS
(groundwater IS NOT a current or potential source of drinking water)
(ug/L)

CHEMICAL PARAMETER	Final Ceiling Level	Basis	Solubility (1/2)	Nuisance Odor Threshold	Basis	Upper Limit
TRICHLOROETHANE, 1,1,2-	5.0E+04	Upper Limit	2.2E+06	-	-	5.0E+04
TRICHLOROETHYLENE	5.0E+04	Upper Limit	5.5E+05	1.0E+05	Ontario MOEE	5.0E+04
TRICHLOROPHENOL, 2,4,5-	2.0E+03	Taste & Odors	6.0E+05	2.0E+03	Ontario MOEE	5.0E+04
TRICHLOROPHENOL, 2,4,6-	1.0E+03	Taste & Odors	4.0E+05	1.0E+03	Ontario MOEE	5.0E+04
VANADIUM	5.0E+04	Upper Limit		-	-	5.0E+04
VINYL CHLORIDE	3.4E+04	Taste & Odors	1.4E+06	3.4E+04	Ontario MOEE	5.0E+04
XYLENES	5.3E+03	Taste & Odors	8.1E+04	5.3E+03	Ontario MOEE	5.0E+04
ZINC	5.0E+04	Upper Limit		-	-	5.0E+04

References:

Unless otherwise noted, criteria for nuisance odor threshhold from Ontario MOEE (MOEE 1996) OR data from Amoore and Hautala (1983) as presented in *A Compilation of Water Quality Goals* if not available *(RWQCBCV 2000)*.

Upper limit of 50000 ug/L intended to limit general groundwater resource degradation (MOEE 1996).

1/2 solubility based on solubility constants in USEPA Region IX (USEPA 2000) or Ontario MOEE (MOEE 1996) if not available.

Odor threshold for MTBE based on average, upper range at which most subjects could smell MTBE in water (CalEPA 1999).

Notes:

Nuisance Odor Thresholds assume ten-fold attenuation/dilution of chemical in groundwater upon discharge to surface water.

Ceiling Level: lowest of 1/2 solubility, odor/taste threshhold and 50000 ug/L maximum level (intended to limit general groundwater resource degradation).

TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.

TPH ceiling level after Massachusetts DEP (MADEP 1997a).

TABLE I-3. SURFACE WATER CEILING LEVELS
(surface water IS a current or potential source of drinking water)
(ug/L)

CHEMICAL PARAMETER	Final Ceiling Level	Basis	Solubility (1/2)	Taste And Odor Threshold	Basis	Upper Limit
ACENAPHTHENE	2.0E+01	Taste & Odors	2.1E+03	2.0E+01	Ontario MOEE	5.0E+04
ACENAPHTHYLENE	2.0E+03	Solubility	2.0E+03	-	-	5.0E+04
ACETONE	2.0E+04	Taste & Odors	5.0E+08	2.0E+04	Amoore & Hautala	5.0E+04
ALDRIN	8.5E+00	Solubility	8.5E+00	1.7E+01	Ontario MOEE	5.0E+04
ANTHRACENE	2.2E+01	Solubility	2.2E+01	-	-	5.0E+04
ANTIMONY	5.0E+04	Upper Limit		-	-	5.0E+04
ARSENIC	5.0E+04	Upper Limit		-	-	5.0E+04
BARIUM	5.0E+04	Upper Limit		-	-	5.0E+04
BENZENE	1.7E+02	Taste & Odors	8.8E+05	1.7E+02	Amoore & Hautala	5.0E+04
BENZO(a)ANTHRACENE	5.0E+00	Solubility	5.0E+00	-	-	5.0E+04
BENZO(b)FLUORANTHENE	7.0E+00	Solubility	7.0E+00	-	-	5.0E+04
BENZO(k)FLUORANTHENE	4.0E-01	Solubility	4.0E-01	-	-	5.0E+04
BENZO(g,h,i)PERYLENE	1.3E-01	Solubility	1.3E-01	-	-	5.0E+04
BENZO(a)PYRENE	1.9E+00	Solubility	1.9E+00	-	-	5.0E+04
BERYLLIUM	5.0E+04	Upper Limit		-	-	5.0E+04
BIPHENYL, 1,1-	5.0E-01	Taste & Odors	3.8E+03	5.0E-01	Amoore & Hautala	5.0E+04
BIS(2-CHLOROETHYL)ETHER	3.6E+02	Taste & Odors	8.6E+06	3.6E+02	Amoore & Hautala	5.0E+04
BIS(2-CHLOROISOPROPYL)ETHER	3.2E+02	Taste & Odors	8.5E+05	3.2E+02	Ontario MOEE	5.0E+04
BIS(2-ETHYLHEXYL)PHTHALATE	6.5E+02	Solubility	6.5E+02	-	-	5.0E+04
BORON	5.0E+04	Upper Limit		-	-	5.0E+04
BROMODICHLOROMETHANE	5.0E+04	Upper Limit	3.4E+06	-	-	5.0E+04
BROMOFORM	5.1E+02	Taste & Odors	1.6E+06	5.1E+02	Amoore & Hautala	5.0E+04
BROMOMETHANE	5.0E+04	Upper Limit	7.6E+06	-	-	5.0E+04
CADMIUM	5.0E+04	Upper Limit		-	-	5.0E+04
CARBON TETRACHLORIDE	5.2E+02	Taste & Odors	4.0E+05	5.2E+02	Amoore & Hautala	5.0E+04
CHLORDANE	2.5E+00	Taste & Odors	2.8E+01	2.5E+00	Ontario MOEE	5.0E+04
CHLOROANILINE, p-	5.0E+04	Upper Limit	1.3E+06	-	-	5.0E+04
CHLOROBENZENE	5.0E+01	Taste & Odors	2.4E+05	5.0E+01	Amoore & Hautala	5.0E+04
CHLOROETHANE	1.6E+01	Taste & Odors	2.9E+06	1.6E+01	Amoore & Hautala	5.0E+04
CHLOROFORM	2.4E+03	Taste & Odors	4.0E+06	2.4E+03	Amoore & Hautala	5.0E+04
CHLOROMETHANE	5.0E+04	Upper Limit	4.1E+06		-	5.0E+04
CHLOROPHENOL, 2-	1.8E-01	Taste & Odors	1.1E+07	1.8E-01	Ontario MOEE	5.0E+04
CHROMIUM (Total)	5.0E+04	Upper Limit		-	-	5.0E+04
CHROMIUM III	5.0E+04	Upper Limit		-	-	5.0E+04
CHROMIUM VI	5.0E+04	Upper Limit		-	-	5.0E+04
CHRYSENE	8.0E-01	Solubility	8.0E-01	-	-	5.0E+04

TABLE I-3. SURFACE WATER CEILING LEVELS
(surface water IS a current or potential source of drinking water)
(ug/L)

CHEMICAL PARAMETER	Final Ceiling Level	Basis	Solubility (1/2)	Taste And Odor Threshold	Basis	Upper Limit
COBALT	5.0E+04	Upper Limit		-	-	5.0E+04
COPPER	1.0E+03	Taste & Odors		1.0E+03	CalDHS 2nd MCL	5.0E+04
CYANIDE (Free)	1.7E+02	Taste & Odors	5.0E+08	1.7E+02	Amoore & Hautala	5.0E+04
DIBENZO(a,h)ANTHTRACENE	2.5E-01	Solubility	2.5E-01	-	-	5.0E+04
DIBROMOCHLOROMETHANE	5.0E+04	Upper Limit	2.2E+06	-	-	5.0E+04
1,2-DIBROMO-3-CHLOROPROPANE	1.0E+01	Taste & Odors	6.0E+05	1.0E+01	Amoore & Hautala	5.0E+04
DIBROMOETHANE, 1,2-	5.0E+04	Upper Limit	1.7E+06	-	-	5.0E+04
DICHLOROBENZENE, 1,2-	1.0E+01	Taste & Odors	7.8E+04	1.0E+01	USEPA 2nd MCL	5.0E+04
DICHLOROBENZENE, 1,3-	5.0E+04	Upper Limit	7.8E+04	-	-	5.0E+04
DICHLOROBENZENE, 1,4-	5.0E+00	Taste & Odors	3.7E+04	5.0E+00	USEPA 2nd MCL	5.0E+04
DICHLOROBENZIDINE, 3,3-	1.6E+03	Solubility	1.6E+03	-	-	5.0E+04
DICHLORODIPHENYLDICHLOROETHANE (DDD)	8.0E+01	Solubility	8.0E+01	-	-	5.0E+04
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	2.0E+01	Solubility	2.0E+01	-	-	5.0E+04
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	1.5E+00	Solubility	1.5E+00	3.5E+02	Ontario MOEE	5.0E+04
DICHLOROETHANE, 1,1-	5.0E+04	Upper Limit	2.5E+06	-	-	5.0E+04
DICHLOROETHANE, 1,2-	7.0E+03	Taste & Odors	4.3E+06	7.0E+03	Amoore & Hautala	5.0E+04
DICHLOROETHYLENE, 1,1-	1.5E+03	Taste & Odors	1.1E+06	1.5E+03	Amoore & Hautala	5.0E+04
DICHLOROETHYLENE, Cis 1,2-	5.0E+04	Upper Limit	1.8E+06	-	-	5.0E+04
DICHLOROETHYLENE, Trans 1,2-	2.6E+02	Taste & Odors	3.2E+06	2.6E+02	Amoore & Hautala	5.0E+04
DICHLOROPHENOL, 2,4-	3.0E-01	Taste & Odors	2.3E+06	3.0E-01	Ontario MOEE	5.0E+04
DICHLOROPROPANE, 1,2-	1.0E+01	Taste & Odors	1.4E+06	1.0E+01	Ontario MOEE	5.0E+04
DICHLOROPROPENE, 1,3-	5.0E+04	Upper Limit	1.4E+06	-	-	5.0E+04
DIELDRIN	4.1E+01	Taste & Odors	9.3E+01	4.1E+01	Ontario MOEE	5.0E+04
DIETHYLPHTHALATE	5.0E+04	Upper Limit	4.5E+05	-	-	5.0E+04
DIMETHYLPHTHALATE	5.0E+04	Upper Limit	2.5E+06	-	-	5.0E+04
DIMETHYLPHENOL, 2,4-	4.0E+02	Taste & Odors	3.9E+06	4.0E+02	Cal DHS AL	5.0E+04
DINITROPHENOL, 2,4-	5.0E+04	Upper Limit	2.8E+06	-	-	5.0E+04
DINITROTOLUENE, 2,4-	5.0E+04	Upper Limit	1.4E+05	-	-	5.0E+04
1,4 DIOXANE	5.0E+04	Upper Limit	5.0E+08	2.3E+05	Amoore & Hautala	5.0E+04
DIOXIN (2,3,7,8-TCDD)	5.0E+04	Upper Limit		-	-	5.0E+04
ENDOSULFAN	7.5E+01	Solubility	7.5E+01	-	-	5.0E+04
ENDRIN	4.1E+01	Taste & Odors	1.3E+02	4.1E+01	Ontario MOEE	5.0E+04
ETHYLBENZENE	3.0E+01	Taste & Odors	8.5E+04	3.0E+01	USEPA 2nd MCL	5.0E+04
FLUORANTHENE	1.3E+02	Solubility	1.3E+02	-	-	5.0E+04
FLUORENE	9.5E+02	Solubility	9.5E+02	-	-	5.0E+04

TABLE I-3. SURFACE WATER CEILING LEVELS
(surface water IS a current or potential source of drinking water)
(ug/L)

CHEMICAL PARAMETER	Final Ceiling Level	Basis	Solubility (1/2)	Taste And Odor Threshold	Basis	Upper Limit
HEPTACHLOR	2.0E+01	Taste & Odors	2.8E+01	2.0E+01	Ontario MOEE	5.0E+04
HEPTACHLOR EPOXIDE	1.8E+02	Solubility	1.8E+02	-	-	5.0E+04
HEXACHLOROBENZENE	5.5E+01	Solubility	5.5E+01	3.0E+03	Ontario MOEE	5.0E+04
HEXACHLOROBUTADIENE	6.0E+00	Taste & Odors	1.0E+03	6.0E+00	Ontario MOEE	5.0E+04
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	3.5E+03	Solubility	3.5E+03	1.2E+04	Ontario MOEE	5.0E+04
HEXACHLOROETHANE	1.0E+01	Taste & Odors	2.5E+04	1.0E+01	Amoore & Hautala	5.0E+04
INDENO(1,2,3-cd)PYRENE	2.7E-01	Solubility	2.7E-01	-	-	5.0E+04
LEAD	5.0E+04	Upper Limit		-	-	5.0E+04
MERCURY	5.0E+04	Upper Limit		-	-	5.0E+04
METHOXYCHLOR	2.0E+01	Solubility	2.0E+01	4.7E+03	Amoore & Hautala	5.0E+04
METHYLENE CHLORIDE	9.1E+03	Taste & Odors	6.6E+06	9.1E+03	Ontario MOEE	5.0E+04
METHYL ETHYL KETONE	8.4E+03	Taste & Odors	1.3E+08	8.4E+03	Amoore & Hautala	5.0E+04
METHYL ISOBUTYL KETONE	1.3E+03	Taste & Odors	9.5E+06	1.3E+03	Amoore & Hautala	5.0E+04
METHYL MERCURY	5.0E+04	Upper Limit		-	-	5.0E+04
METHYLNAPHTHALENE (total 1- & 2-)	1.0E+01	Taste & Odors	1.3E+04	1.0E+01	Ontario MOEE	5.0E+04
METHYL TERT BUTYL ETHER	5.0E+00	Taste & Odors	7.5E+07	5.0E+00	Cal DHS 2nd MCL	5.0E+04
MOLYBDENUM	5.0E+04	Upper Limit		-	-	5.0E+04
NAPHTHALENE	2.1E+01	Taste & Odors	1.6E+04	2.1E+01	Amoore & Hautala	5.0E+04
NICKEL	5.0E+04	Upper Limit		-	-	5.0E+04
PENTACHLOROPHENOL	3.0E+01	Taste & Odors	7.0E+06	3.0E+01	Amoore & Hautala	5.0E+04
PERCHLORATE	5.0E+04	Upper Limit	1.0E+08	-	-	5.0E+04
PHENANTHRENE	4.1E+02	Solubility	4.1E+02	1.0E+03	Ontario MOEE	5.0E+04
PHENOL	5.0E+00	Taste & Odors	4.0E+07	5.0E+00	Cal DHS AL	5.0E+04
POLYCHLORINATED BIPHENYLS (PCBs)	1.6E+01	Solubility	1.6E+01	-	-	5.0E+04
PYRENE	6.8E+01	Solubility	6.8E+01	-	-	5.0E+04
SELENIUM	5.0E+04	Upper Limit		-	-	5.0E+04
SILVER	1.0E+02	Taste & Odors		1.0E+02	Cal DHS 2nd MCL	5.0E+04
STYRENE	1.0E+01	Taste & Odors	1.6E+05	1.0E+01	USEPA 2nd MCL	5.0E+04
tert-BUTYL ALCOHOL	5.0E+04	Upper Limit	5.0E+08	-	-	5.0E+04
TETRACHLOROETHANE, 1,1,1,2-	5.0E+04	Upper Limit	1.5E+06	-	-	5.0E+04
TETRACHLOROETHANE, 1,1,2,2-	5.0E+02	Taste & Odors	1.5E+06	5.0E+02	Amoore & Hautala	5.0E+04
TETRACHLOROETHYLENE	1.7E+02	Taste & Odors	1.0E+05	1.7E+02	Amoore & Hautala	5.0E+04
THALLIUM	5.0E+04	Upper Limit		-	-	5.0E+04
TOLUENE	4.0E+01	Taste & Odors	2.6E+05	4.0E+01	USEPA 2nd MCL	5.0E+04
TOXAPHENE	1.4E+02	Taste & Odors	1.5E+03	1.4E+02	USEPA 2nd MCL	5.0E+04

TABLE I-3. SURFACE WATER CEILING LEVELS
(surface water IS a current or potential source of drinking water)
(ug/L)

CHEMICAL PARAMETER	Final Ceiling Level	Basis	Solubility (1/2)	Taste And Odor Threshold	Basis	Upper Limit
TPH (gasolines)	1.0E+02	Taste & Odors	7.5E+04	1.0E+02	USEPA SNARL	5.0E+04
TPH (middle distillates)	1.0E+02	Taste & Odors	2.5E+03	1.0E+02	USEPA SNARL	5.0E+04
TPH (residual fuels)	1.0E+02	Taste & Odors	2.5E+03	1.0E+02	USEPA SNARL	5.0E+04
TRICHLOROBENZENE, 1,2,4-	3.0E+03	Taste & Odors	1.5E+05	3.0E+03	USEPA (1995)	5.0E+04
TRICHLOROETHANE, 1,1,1-	9.7E+02	Taste & Odors	6.7E+05	9.7E+02	Amoore & Hautala	5.0E+04
TRICHLOROETHANE, 1,1,2-	5.0E+04	Upper Limit	2.2E+06	-	-	5.0E+04
TRICHLOROETHYLENE	3.1E+02	Taste & Odors	5.5E+05	3.1E+02	Amoore & Hautala	5.0E+04
TRICHLOROPHENOL, 2,4,5-	2.0E+02	Taste & Odors	6.0E+05	2.0E+02	Ontario MOEE	5.0E+04
TRICHLOROPHENOL, 2,4,6-	1.0E+02	Taste & Odors	4.0E+05	1.0E+02	Ontario MOEE	5.0E+04
VANADIUM	5.0E+04	Upper Limit		-	-	5.0E+04
VINYL CHLORIDE	3.4E+03	Taste & Odors	1.4E+06	3.4E+03	Amoore & Hautala	5.0E+04
XYLENES	2.0E+01	Taste & Odors	8.1E+04	2.0E+01	USEPA 2nd MCL	5.0E+04
ZINC	5.0E+03	Taste & Odors		5.0E+03	Cal DHS 2nd MCL	5.0E+04

References:
Unless otherwise noted, criteria for drinking water taste and odor threshhold from summary in *A Compilation of Water Quality Goals* (RWQCBCV 1998) or Ontario MOEE if not available (MOEE 1996).
Upper limit of 50000 ug/L intended to limit general groundwater resource degradation (MOEE 1996).
1/2 solubility based on solubility constants in USEPA Region IX (USEPA 1998) or Ontario MOEE (MOEE 1996) if not available.
Notes:
Ceiling Level: lowest of 1/2 solubility, taste and odor threshhold and 50000 ug/L maximum level
TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.
TPH ceiling levels after Massachusetts DEP (MADEP 1997a).
TPH Taste and Odor Thresholds based on USEPA Suggested-No-Adverse-reaction (SNARL) level for TPH diesel.

TABLE I-4. SURFACE WATER CEILING LEVELS
(surface water IS NOT a current or potential source of drinking water)
(ug/L)

CHEMICAL PARAMETER	Final Ceiling Level	Basis	Solubility (1/2)	Nuisance Odor Threshold	Basis	Upper Limit
ACENAPHTHENE	2.0E+01	Taste & Odors	2.1E+03	2.0E+01	Ontario MOEE	5.0E+04
ACENAPHTHYLENE	2.0E+03	Solubility	2.0E+03	-	-	5.0E+04
ACETONE	2.0E+04	Taste & Odors	5.0E+08	2.0E+04	Ontario MOEE	5.0E+04
ALDRIN	8.5E+00	Solubility	8.5E+00	1.7E+01	Ontario MOEE	5.0E+04
ANTHRACENE	2.2E+01	Solubility	2.2E+01	-	-	5.0E+04
ANTIMONY	5.0E+04	Upper Limit		-	-	5.0E+04
ARSENIC	5.0E+04	Upper Limit		-	-	5.0E+04
BARIUM	5.0E+04	Upper Limit		-	-	5.0E+04
BENZENE	2.0E+03	Taste & Odors	8.8E+05	2.0E+03	Ontario MOEE	5.0E+04
BENZO(a)ANTHRACENE	5.0E+00	Solubility	5.0E+00	-	-	5.0E+04
BENZO(b)FLUORANTHENE	7.0E+00	Solubility	7.0E+00	-	-	5.0E+04
BENZO(k)FLUORANTHENE	4.0E-01	Solubility	4.0E-01	-	-	5.0E+04
BENZO(g,h,i)PERYLENE	1.3E-01	Solubility	1.3E-01	-	-	5.0E+04
BENZO(a)PYRENE	1.9E+00	Solubility	1.9E+00	-	-	5.0E+04
BERYLLIUM	5.0E+04	Upper Limit		-	-	5.0E+04
BIPHENYL, 1,1-	5.0E-01	Taste & Odors	3.8E+03	5.0E-01	Amoore & Hautala	5.0E+04
BIS(2-CHLOROETHYL)ETHER	3.6E+02	Taste & Odors	8.6E+06	3.6E+02	Amoore & Hautala	5.0E+04
BIS(2-CHLOROISOPROPYL)ETHER	3.2E+02	Taste & Odors	8.5E+05	3.2E+02	Ontario MOEE	5.0E+04
BIS(2-ETHYLHEXYL)PHTHALATE	6.5E+02	Solubility	6.5E+02	-	-	5.0E+04
BORON	5.0E+04	Upper Limit		-	-	5.0E+04
BROMODICHLOROMETHANE	5.0E+04	Upper Limit	3.4E+06	-	-	5.0E+04
BROMOFORM	5.1E+02	Taste & Odors	1.6E+06	5.1E+02	Ontario MOEE	5.0E+04
BROMOMETHANE	5.0E+04	Upper Limit	7.6E+06	-	-	5.0E+04
CADMIUM	5.0E+04	Upper Limit		-	-	5.0E+04
CARBON TETRACHLORIDE	5.2E+02	Taste & Odors	4.0E+05	5.2E+02	Ontario MOEE	5.0E+04
CHLORDANE	2.5E+00	Taste & Odors	2.8E+01	2.5E+00	Ontario MOEE	5.0E+04
CHLOROANILINE, p-	5.0E+04	Upper Limit	1.3E+06	-	-	5.0E+04
CHLOROBENZENE	5.0E+01	Taste & Odors	2.4E+05	5.0E+01	Ontario MOEE	5.0E+04
CHLOROETHANE	1.6E+01	Taste & Odors	2.9E+06	1.6E+01	Amoore & Hautala	5.0E+04
CHLOROFORM	2.4E+03	Taste & Odors	4.0E+06	2.4E+03	Ontario MOEE	5.0E+04
CHLOROMETHANE	5.0E+04	Upper Limit	4.1E+06	-	-	5.0E+04
CHLOROPHENOL, 2-	1.8E-01	Taste & Odors	1.1E+07	1.8E-01	Ontario MOEE	5.0E+04
CHROMIUM (Total)	5.0E+04	Upper Limit		-	-	5.0E+04
CHROMIUM III	5.0E+04	Upper Limit		-	-	5.0E+04
CHROMIUM VI	5.0E+04	Upper Limit		-	-	5.0E+04
CHRYSENE	8.0E-01	Solubility	8.0E-01	-	-	5.0E+04
COBALT	5.0E+04	Upper Limit		-	-	5.0E+04

TABLE I-4. SURFACE WATER CEILING LEVELS
(surface water IS NOT a current or potential source of drinking water)
(ug/L)

CHEMICAL PARAMETER	Final Ceiling Level	Basis	Solubility (1/2)	Nuisance Odor Threshold	Basis	Upper Limit
COPPER	5.0E+04	Upper Limit		-	-	5.0E+04
CYANIDE (Free)	1.7E+02	Taste & Odors	5.0E+08	1.7E+02	Ontario MOEE	5.0E+04
DIBENZO(a,h)ANTHTRACENE	2.5E-01	Solubility	2.5E-01	-	-	5.0E+04
DIBROMOCHLOROMETHANE	5.0E+04	Upper Limit	2.2E+06	-	-	5.0E+04
1,2-DIBROMO-3-CHLOROPROPANE	1.0E+01	Taste & Odors	6.0E+05	1.0E+01	Amoore & Hautala	5.0E+04
DIBROMOETHANE, 1,2-	5.0E+04	Upper Limit	1.7E+06	-	-	5.0E+04
DICHLOROBENZENE, 1,2-	1.0E+01	Taste & Odors	7.8E+04	1.0E+01	Ontario MOEE	5.0E+04
DICHLOROBENZENE, 1,3-	5.0E+04	Upper Limit	7.8E+04	-	-	5.0E+04
DICHLOROBENZENE, 1,4-	1.1E+01	Taste & Odors	3.7E+04	1.1E+01	Ontario MOEE	5.0E+04
DICHLOROBENZIDINE, 3,3-	1.6E+03	Solubility	1.6E+03	-	-	5.0E+04
DICHLORODIPHENYLDICHLOROETHANE (DDD)	8.0E+01	Solubility	8.0E+01	-	-	5.0E+04
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	2.0E+01	Solubility	2.0E+01	-	-	5.0E+04
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	1.5E+00	Solubility	1.5E+00	3.5E+02	Ontario MOEE	5.0E+04
DICHLOROETHANE, 1,1-	5.0E+04	Upper Limit	2.5E+06	-	-	5.0E+04
DICHLOROETHANE, 1,2-	2.0E+04	Taste & Odors	4.3E+06	2.0E+04	Ontario MOEE	5.0E+04
DICHLOROETHYLENE, 1,1-	1.5E+03	Taste & Odors	1.1E+06	1.5E+03	Amoore & Hautala	5.0E+04
DICHLOROETHYLENE, Cis 1,2-	5.0E+04	Upper Limit	1.8E+06	-	-	5.0E+04
DICHLOROETHYLENE, Trans 1,2-	2.6E+02	Taste & Odors	3.2E+06	2.6E+02	Ontario MOEE	5.0E+04
DICHLOROPHENOL, 2,4-	3.0E-01	Taste & Odors	2.3E+06	3.0E-01	Ontario MOEE	5.0E+04
DICHLOROPROPANE, 1,2-	1.0E+01	Taste & Odors	1.4E+06	1.0E+01	Ontario MOEE	5.0E+04
DICHLOROPROPENE, 1,3-	5.0E+04	Upper Limit	1.4E+06	-	-	5.0E+04
DIELDRIN	4.1E+01	Taste & Odors	9.3E+01	4.1E+01	Ontario MOEE	5.0E+04
DIETHYLPHTHALATE	5.0E+04	Upper Limit	4.5E+05	-	-	5.0E+04
DIMETHYLPHTHALATE	5.0E+04	Upper Limit	2.5E+06	-	-	5.0E+04
DIMETHYLPHENOL, 2,4-	4.0E+02	Taste & Odors	3.9E+06	4.0E+02	Ontario MOEE	5.0E+04
DINITROPHENOL, 2,4-	5.0E+04	Upper Limit	2.8E+06	-	-	5.0E+04
DINITROTOLUENE, 2,4-	5.0E+04	Upper Limit	1.4E+05	-	-	5.0E+04
1,4 DIOXANE	5.0E+04	Upper Limit	5.0E+08	-	-	5.0E+04
DIOXIN (2,3,7,8-TCDD)	5.0E+04	Upper Limit		-	-	5.0E+04
ENDOSULFAN	7.5E+01	Solubility	7.5E+01	-	-	5.0E+04
ENDRIN	4.1E+01	Taste & Odors	1.3E+02	4.1E+01	Ontario MOEE	5.0E+04
ETHYLBENZENE	3.0E+01	Taste & Odors	8.5E+04	3.0E+01	USEPA 2nd MCL	5.0E+04
FLUORANTHENE	1.3E+02	Solubility	1.3E+02	-	-	5.0E+04
FLUORENE	9.5E+02	Solubility	9.5E+02	-	-	5.0E+04
HEPTACHLOR	2.0E+01	Taste & Odors	2.8E+01	2.0E+01	Ontario MOEE	5.0E+04
HEPTACHLOR EPOXIDE	1.8E+02	Solubility	1.8E+02	-	-	5.0E+04

TABLE I-4. SURFACE WATER CEILING LEVELS
(surface water IS NOT a current or potential source of drinking water)
(ug/L)

CHEMICAL PARAMETER	Final Ceiling Level	Basis	Solubility (1/2)	Nuisance Odor Threshold	Basis	Upper Limit
HEXACHLOROBENZENE	5.5E+01	Solubility	5.5E+01	3.0E+03	Ontario MOEE	5.0E+04
HEXACHLOROBUTADIENE	6.0E+00	Taste & Odors	1.0E+03	6.0E+00	Ontario MOEE	5.0E+04
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	3.5E+03	Solubility	3.5E+03	1.2E+04	Ontario MOEE	5.0E+04
HEXACHLOROETHANE	1.0E+01	Taste & Odors	2.5E+04	1.0E+01	Ontario MOEE	5.0E+04
INDENO(1,2,3-cd)PYRENE	2.7E-01	Solubility	2.7E-01	-	-	5.0E+04
LEAD	5.0E+04	Upper Limit		-	-	5.0E+04
MERCURY	5.0E+04	Upper Limit		-	-	5.0E+04
METHOXYCHLOR	2.0E+01	Solubility	2.0E+01	4.7E+03	Ontario MOEE	5.0E+04
METHYLENE CHLORIDE	9.1E+03	Taste & Odors	6.6E+06	9.1E+03	Ontario MOEE	5.0E+04
METHYL ETHYL KETONE	8.4E+03	Taste & Odors	1.3E+08	8.4E+03	Amoore & Hautala	5.0E+04
METHYL ISOBUTYL KETONE	1.3E+03	Taste & Odors	9.5E+06	1.3E+03	Amoore & Hautala	5.0E+04
METHYL MERCURY	5.0E+04	Upper Limit		-	-	5.0E+04
METHYLNAPHTHALENE (total 1- & 2-)	1.0E+01	Taste & Odors	1.3E+04	1.0E+01	Ontario MOEE	5.0E+04
METHYL TERT BUTYL ETHER	1.8E+02	Taste & Odors	7.5E+07	1.8E+02	CalDHS	5.0E+04
MOLYBDENUM	5.0E+04	Upper Limit		-	-	5.0E+04
NAPHTHALENE	2.1E+01	Taste & Odors	1.6E+04	2.1E+01	Ontario MOEE	5.0E+04
NICKEL	5.0E+04	Upper Limit		-	-	5.0E+04
PENTACHLOROPHENOL	5.9E+02	Taste & Odors	7.0E+06	5.9E+02	Ontario MOEE	5.0E+04
PERCHLORATE	5.0E+04	Upper Limit	1.0E+08	-	-	5.0E+04
PHENANTHRENE	4.1E+02	Solubility	4.1E+02	1.0E+03	Ontario MOEE	5.0E+04
PHENOL	7.9E+03	Taste & Odors	4.0E+07	7.9E+03	Ontario MOEE	5.0E+04
POLYCHLORINATED BIPHENYLS (PCBs)	1.6E+01	Solubility	1.6E+01	-	-	5.0E+04
PYRENE	6.8E+01	Solubility	6.8E+01	-	-	5.0E+04
SELENIUM	5.0E+04	Upper Limit		-	-	5.0E+04
SILVER	5.0E+04	Upper Limit		-	-	5.0E+04
STYRENE	1.1E+01	Taste & Odors	1.6E+05	1.1E+01	Ontario MOEE	5.0E+04
tert-BUTYL ALCOHOL	5.0E+04	Upper Limit	5.0E+08	-	-	5.0E+04
TETRACHLOROETHANE, 1,1,1,2-	5.0E+04	Upper Limit	1.5E+06	-	-	5.0E+04
TETRACHLOROETHANE, 1,1,2,2-	5.0E+02	Taste & Odors	1.5E+06	5.0E+02	Ontario MOEE	5.0E+04
TETRACHLOROETHYLENE	3.0E+02	Taste & Odors	1.0E+05	3.0E+02	Ontario MOEE	5.0E+04
THALLIUM	5.0E+04	Upper Limit		-	-	5.0E+04
TOLUENE	4.0E+01	Taste & Odors	2.6E+05	4.0E+01	Ontario MOEE	5.0E+04
TOXAPHENE	1.4E+02	Taste & Odors	1.5E+03	1.4E+02	USEPA 2nd MCL	5.0E+04
TPH (gasolines)	5.0E+03	Taste & Odors	7.5E+04	5.0E+03	MADEP	5.0E+04
TPH (middle distillates)	2.5E+03	Solubility	2.5E+03	5.0E+03	MADEP	5.0E+04
TPH (residual fuels)	2.5E+03	Solubility	2.5E+03	5.0E+03	MADEP	5.0E+04

TABLE I-4. SURFACE WATER CEILING LEVELS
(surface water IS NOT a current or potential source of drinking water)
(ug/L)

CHEMICAL PARAMETER	Final Ceiling Level	Basis	Solubility (1/2)	Nuisance Odor Threshold	Basis	Upper Limit
TRICHLOROBENZENE, 1,2,4-	3.0E+03	Taste & Odors	1.5E+05	3.0E+03	USEPA (1995)	5.0E+04
TRICHLOROETHANE, 1,1,1-	5.0E+04	Taste & Odors	6.7E+05	5.0E+04	Ontario MOEE	5.0E+04
TRICHLOROETHANE, 1,1,2-	5.0E+04	Upper Limit	2.2E+06	-	-	5.0E+04
TRICHLOROETHYLENE	1.0E+04	Taste & Odors	5.5E+05	1.0E+04	Ontario MOEE	5.0E+04
TRICHLOROPHENOL, 2,4,5-	2.0E+02	Taste & Odors	6.0E+05	2.0E+02	Ontario MOEE	5.0E+04
TRICHLOROPHENOL, 2,4,6-	1.0E+02	Taste & Odors	4.0E+05	1.0E+02	Ontario MOEE	5.0E+04
VANADIUM	5.0E+04	Upper Limit		-	-	5.0E+04
VINYL CHLORIDE	3.4E+03	Taste & Odors	1.4E+06	3.4E+03	Ontario MOEE	5.0E+04
XYLENES	5.3E+02	Taste & Odors	8.1E+04	5.3E+02	Ontario MOEE	5.0E+04
ZINC	5.0E+04	Upper Limit		-	-	5.0E+04

References:

Unless otherwise noted, criteria for nuisance odor threshhold from Ontario MOEE (MOEE 1996, minus groundwater-to-surface water dilution factor) OR data from Amoore and Hautala (1983) as presented in *A Compilation of Water Quality Goals* if not available (RWQCBCV 2000).

Upper limit of 50000 ug/L intended to limit general groundwater resource degradation (MOEE 1996).

1/2 solubility based on solubility constants in USEPA Region IX (USEPA 2000) or Ontario MOEE (MOEE 1996) if not available.

Odor threshold for MTBE based on average, upper range at which most subjects could smell MTBE in water (CalEPA 1999).

Notes:

Nuisance Odor Thresholds assume no attenuation/dilution of chemical in surface water.

Ceiling Level: lowest of 1/2 solubility, odor/taste threshhold and 50000 ug/L maximum level (intended to limit general groundwater resource degradation).

TPH -Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.

TPH ceiling level after Massachusetts DEP (MADEP 1997a).

TABLE J. PHYSIO-CHEMICAL AND TOXICITY CONSTANTS USED IN MODELS.

CHEMICAL PARAMETER	Physical State		Molecular Weight	Organic carbon partition coefficient, K_{oc}	Diffusivity in air, D_a	Diffusivity in water, D_w	Pure component water solubility, S	Henry's Law constant H	Henry's Law constant H'	Skin Absorption Factor ABS	Cancer Slope Factor Oral CSFo	Cancer Slope Factor Inhaled CSFi	Reference Dose Oral RfDo	Reference Dose Inhaled RfDi
				(cm^3/g)	(cm^2/s)	(cm^2/s)	(mg/L)	(atm-m^3/mol)	(unitless)	(unitless)	(mg/kg-d)$^{-1}$	(mg/kg-d)$^{-1}$	(mg/kg-d)	(mg/kg-d)
ACENAPHTHENE	V	S	154	4.90E+03	4.21E-02	7.69E-06	4.24E+00	1.55E-04	6.36E-03				6.0E-02	6.0E-02
ACENAPHTHYLENE	V	S	152	2.50E+03			3.93E+00	1.45E-03	5.95E-02				4.0E-02	4.0E-02
ACETONE	V	L	58	5.75E-01	1.24E-01	1.14E-05	1.00E+06	3.88E-05	1.59E-03				1.0E-01	1.0E-01
*ALDRIN	NV	S	365	4.90E+04			1.70E-02	4.96E-05	2.03E-03	0.10	1.7E+01	1.7E+01	3.0E-05	3.0E-05
ANTHRACENE	V	S	178	2.35E+04	3.24E-02	7.74E-06	4.34E-02	6.50E-05	2.67E-03				3.0E-01	3.0E-01
ANTIMONY	NV	S	122										4.0E-04	
*ARSENIC	NV	S	75							0.03	1.5E+00	1.2E+01	3.0E-04	
BARIUM	NV	S	137										7.0E-02	1.4E-04
*BENZENE	V	L	78	5.90E+01	8.80E-02	9.80E-06	1.75E+03	5.56E-03	2.28E-01		1.0E-01	1.0E-01	3.0E-03	1.7E-03
*BENZO(a)ANTHRACENE	NV	S	228	2.00E+05			1.00E-02	1.00E-06	4.10E-05	0.13	1.2E+00	3.9E-01		
*BENZO(b)FLUORANTHENE	NV	S	252	5.50E+05			1.40E-02	1.22E-05	5.00E-04	0.13	1.2E+00	3.9E-01		
*BENZO(k)FLUORANTHENE	NV	S	252	5.50E+05			8.00E-04	3.87E-05	1.59E-03	0.13	1.2E+00	3.90E-01		
BENZO(g,h,i)PERYLENE	NV	S	276	1.60E+06			2.60E-04	1.44E-07	5.90E-06	0.13			4.0E-02	4.0E-02
*BENZO(a)PYRENE	NV	S	252	5.50E+06			3.80E-03	4.90E-07	2.01E-05	0.13	1.20E+01	3.90E+00		
*BERYLLIUM	NV	S	9									8.4E+00	2.0E-03	5.7E-06
BIPHENYL, 1,1-	V	S	150	7.76E+03	4.04E-02	8.20E-06	7.50E+00	3.00E-04	1.23E-02				5.0E-02	5.0E-02
*BIS(2-CHLOROETHYL)ETHER	V	L	142	7.60E+01	6.92E-02	7.53E-06	1.72E+04	1.80E-05	7.38E-04		2.5E+00	2.5E+00		
BIS(2-CHLOROISOPROPYL)ETHER	V	L	171	6.10E+01	6.31E-02	6.40E-06	1.70E+03	1.13E-04	4.63E-03		7.0E-02	3.5E-02	4.0E-02	4.0E-02
*BIS(2-ETHYLHEXYL)PHTHALATE	NV	S	391	1.00E+05			1.30E+00	3.00E-07	1.23E-05	0.10	3.0E-03	8.4E-03	2.0E-02	2.2E-02
BORON	NV	S	11							0.10			2.0E-01	5.7E-03
*BROMODICHLOROMETHANE	V	L	164	5.50E+01	2.98E-02	1.06E-05	6.74E+03	1.60E-03	6.56E-02		1.3E-01	1.3E-01	2.0E-02	2.0E-02
BROMOFORM	NV	S	253	1.10E+02			3.20E+03	5.32E-04	2.18E-02	0.10	7.9E-03	3.9E-03	2.0E-02	2.0E-02
BROMOMETHANE	V	G	95	9.00E+00	7.28E-02	1.21E-05	1.52E+04	6.24E-03	2.56E-01				1.4E-03	1.4E-03
*CADMIUM	NV	S	112							0.001	3.8E-01	1.5E+01	5.0E-04	
*CARBON TETRACHLORIDE	V	L	154	1.74E+02	7.80E-02	8.80E-06	7.93E+02	3.04E-02	1.25E+00		1.5E-01	1.5E-01	7.0E-04	7.0E-04
*CHLORDANE	NV	S	410	4.40E+04			5.60E-02	4.79E-05	1.96E-03	0.04	1.3E+00	1.2E+00	5.0E-04	2.0E-04
CHLOROANILINE, p-	NV	S	128	6.40E+01			2.60E+03	3.31E-07	1.36E-05	0.10			4.0E-03	4.0E-03
CHLOROBENZENE	V	L	113	2.19E+02	7.30E-02	8.70E-06	4.72E+02	3.70E-03	1.52E-01				2.0E-02	1.7E-02
CHLOROETHANE	V	G	65	1.47E+01	1.04E-01	1.15E-05	5.70E+03	1.10E-02	4.51E-01		2.9E-03	2.9E-03	4.0E-01	2.9E+00
*CHLOROFORM	V	L	119	3.98E+01	1.04E-01	1.00E-05	7.92E+03	3.67E-03	1.50E-01		3.1E-02	1.9E-02	1.0E-02	8.6E-04
CHLOROMETHANE	V	G	51	3.50E+01	1.10E-01	6.50E-06	8.20E+03	2.40E-02	9.84E-01		1.3E-02	6.3E-03		8.6E-02
CHLOROPHENOL, 2-	V	L	132	3.98E+02	5.01E-01	9.46E-06	2.20E+04	3.91E-04	1.60E-02				5.0E-03	5.0E-03
*CHROMIUM (Total)	NV	S	52											
CHROMIUM III	NV	S	52										1.5E+00	
*CHROMIUM VI	NV	S	52									5.1E+02	3.0E-03	
*CHRYSENE	NV	S	228	4.00E+05	2.48E-02	6.21E-06	1.60E-03	9.46E-05	3.88E-03	0.13	1.2E-01	3.9E-02		
*COBALT	NV	S	59									9.8E+00	2.0E-02	5.7E-6
COPPER	NV	S	64										4.0E-02	
CYANIDE (Free)	NV	S	26	9.20E+00	1.80E-01	1.80E-05	1.00E+06	1.90E+03	7.79E+04	0.10			2.0E-02	
*DIBENZO(a,h)ANTHTRACENE	NV	S	278	3.30E+06			5.00E-04	7.30E-08	2.99E-06	0.13	4.1E+00	4.1E+00		
*DIBROMOCHLOROMETHANE	V	S	208	4.68E+02	9.60E-02	1.00E-05	4.40E+03	8.50E-04	3.49E-02		9.4E-02	9.4E-02	2.0E-02	2.0E-02
*1,2-DIBROMO-3-CHLOROPROPANE	V	L	236	2.83E+01	2.12E-02	7.00E-06	1.20E+03	1.47E-04	6.03E-03		7.0E+00	7.0E+00	5.70E-05	5.70E-05

TABLE J. PHYSIO-CHEMICAL AND TOXICITY CONSTANTS USED IN MODELS.

CHEMICAL PARAMETER	Physical State		Molecular Weight	Organic carbon partition coefficient, K_{oc}	Diffusivity in air, D_a	Diffusivity in water, D_w	Pure component water solubility, S	Henry's Law constant H	Henry's Law constant H'	Skin Absorption Factor ABS	Cancer Slope Factor Oral CSFo	Cancer Slope Factor Inhaled CSFi	Reference Dose Oral RfDo	Reference Dose Inhaled RfDi
				(cm^3/g)	(cm^2/s)	(cm^2/s)	(mg/L)	(atm-m^3/mol)	(unitless)	(unitless)	$(mg/kg\text{-}d)^{-1}$	$(mg/kg\text{-}d)^{-1}$	(mg/kg-d)	(mg/kg-d)
*DIBROMOETHANE, 1,2-	V	S	188	2.81E+01	7.33E-02	8.06E-06	3.40E+03	3.20E-04	1.31E-02		3.6E+00	2.5E-01	5.7E-05	5.7E-05
DICHLOROBENZENE, 1,2-	V	L	147	6.17E+02	6.90E-02	7.90E-06	1.56E+02	1.90E-03	7.79E-02				9.0E-02	5.7E-02
DICHLOROBENZENE, 1,3-	V	L	147	6.17E+02	6.90E-02	7.90E-06	1.56E+02	1.90E-03	7.79E-02				9.0E-04	9.0E-04
*DICHLOROBENZENE, 1,4-	V	S	147	6.17E+02	6.90E-02	7.90E-06	7.38E+01	2.43E-03	9.96E-02		5.4E-03	4.0E-02	3.0E-02	3.0E-02
*DICHLOROBENZIDINE, 3,3-	NV	S	253	1.60E+03			3.11E+00	8.33E-07	3.42E-05	0.10	1.2E+00	1.2E+00		
*DICHLORODIPHENYLDICHLOROETHANE (DDD)	NV	S	331	7.80E+05			1.60E-01	7.96E-06	3.26E-04	0.03	2.4E-01	2.4E-01		
*DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	NV	S	329	4.40E+06			4.00E-02	6.80E-05	2.79E-03	0.03	3.4E-01	3.4E-01		
*DICHLORODIPHENYLTRICHLOROETHANE (DDT)	NV	S	355	2.40E+05			3.00E-03	3.89E-05	1.59E-03	0.03	3.4E-01	3.4E-01	5.0E-04	5.0E-04
*DICHLOROETHANE, 1,1-	V	L	99	3.16E+01	7.42E-02	1.05E-05	5.06E+03	5.62E-03	2.30E-01		5.7E-03	5.7E-03	1.0E-01	1.4E-01
*DICHLOROETHANE, 1,2-	V	L	99	1.74E+01	1.04E-01	9.90E-06	8.52E+03	9.79E-04	4.01E-02		4.7E-02	7.2E-02	3.0E-02	1.4E-03
DICHLOROETHYLENE, 1,1-	V	L	97	5.89E+01	9.00E-02	1.04E-05	2.25E+03	2.61E-02	1.07E+00				5.0E-02	5.7E-02
DICHLOROETHYLENE, Cis 1,2-	V	L	97	3.55E+01	7.36E-02	1.13E-05	3.50E+03	4.08E-03	1.67E-01				1.0E-02	1.0E-02
DICHLOROETHYLENE, Trans 1,2-	V	L	97	5.25E+01	7.07E-02	1.19E-05	6.30E+03	9.38E-03	3.85E-01				2.0E-02	2.0E-02
DICHLOROPHENOL, 2,4-	NV	S	163	6.00E+03			4.50E+03	2.80E-06	1.15E-04	0.10			3.0E-03	3.0E-03
*DICHLOROPROPANE, 1,2-	V	L	113	4.37E+01	7.82E-02	8.73E-06	2.80E+03	2.80E-03	1.15E-01		3.6E-02	3.6E-02	1.1E-03	1.1E-03
*DICHLOROPROPENE, 1,3-	V	L	111	4.57E+01	6.26E-02	1.00E-05	2.80E+03	1.77E-02	7.26E-01		9.1E-02	5.5E-02	3.0E-02	5.7E-03
*DIELDRIN	NV	S	381	7.40E+03			1.86E-01	5.84E-05	2.39E-03	0.10	1.6E+01	1.6E+01	5.0E-05	5.0E-05
DIETHYLPHTHALATE	NV	S	222	1.40E+02			8.96E+02	1.14E-06	4.67E-05	0.10			8.0E-01	8.0E-01
DIMETHYLPHTHALATE	NV	S	194	1.40E+02			5.00E+03	1.05E-07	4.31E-06	0.10			1.0E+01	1.0E+01
DIMETHYLPHENOL, 2,4-	V	S	122	4.00E+01	5.84E-02	8.69E-06	7.87E+03	1.70E-05	6.97E-04	0.10			2.0E-02	2.0E-02
DINITROPHENOL, 2,4-	NV	S	184	1.70E+01			5.60E+03	6.45E-10	2.64E-08	0.10			2.0E-03	2.0E-03
*DINITROTOLUENE, 2,4-	NV	S	182	4.50E+01			2.70E+02	4.50E-06	1.85E-04	0.10	3.1E-01	3.1E-01	2.0E-03	2.0E-03
*1,4 DIOXANE	NV	L	88	3.50E+00			1.00E+06	3.00E-06	1.23E-04	0.10	2.7E-02	2.7E-02		
*DIOXIN (2,3,7,8-TCDD)	NV	S	322							0.03	1.3E+05	1.3E+05		
ENDOSULFAN	NV	S	407	3.20E+03			1.50E-01	1.00E-05	4.10E-04	0.10			6.0E-03	6.0E-03
ENDRIN	NV	S	381	1.70E+03			2.60E-01	7.51E-06	3.08E-04	0.10			3.0E-04	3.0E-04
ETHYLBENZENE	V	L	106	3.63E+02	7.50E-02	7.80E-06	1.69E+02	7.88E-03	3.23E-01		3.9E-03	3.9E-03	1.0E-01	2.9E-01
FLUORANTHENE	NV	S	202	3.80E+04			2.65E-01	6.50E-06	2.67E-04	0.13			4.0E-02	4.0E-02
FLUORENE	V	S	166	1.38E+04	6.08E-02	7.88E-06	1.90E+00	7.70E-05	3.16E-03				4.0E-02	4.0E-02
*HEPTACHLOR	NV	S	373	2.20E+04			5.60E-02	1.48E-03	6.07E-02	0.10	4.1E+00	4.1E+00	5.0E-04	5.0E-04
*HEPTACHLOR EPOXIDE	NV	S	389	2.30E+04			3.50E-01	3.16E-05	1.30E-03	0.10	5.5E+00	5.5E+00	1.3E-05	1.3E-05
*HEXACHLOROBENZENE	NV	S	285	1.20E+06			1.10E-01	1.70E-03	6.97E-02	0.10	1.8E+00	1.8E+00	8.0E-04	8.0E-04
HEXACHLOROBUTADIENE	NV	S	261	2.90E+04			2.00E+00	2.56E-02	1.05E+00	0.10	7.8E-02	7.8E-02	3.0E-04	3.0E-04
*HEXACHLOROCYCLOHEXANE (gamma) LINDANE	NV	S	291	3.70E+03			7.00E+00	4.93E-07	2.02E-05	0.04	1.1E+00	1.1E+00	3.0E-04	3.0E-04
*HEXACHLOROETHANE	NV	S	237	2.00E+04			5.00E+01	9.85E-03	4.04E-01	0.10	3.9E-02	3.9E-02	1.0E-03	1.0E-03
*INDENO(1,2,3-cd)PYRENE	NV	S	276	1.60E+06			5.30E-04	6.95E-08	2.85E-06	0.13	1.2E+00	3.9E-01		
LEAD	NV	S	207											
MERCURY	NV	S	201										1.60E-04	8.5E-05
METHOXYCHLOR	NV	S	347	7.90E+04			4.00E-02	1.58E-05	6.48E-04	0.10			5.0E-03	5.0E-03
*METHYLENE CHLORIDE	V	L	85	1.11E+01	1.01E-01	1.17E-05	1.32E+04	2.19E-03	8.98E-02		1.4E-02	3.5E-03	6.0E-02	8.6E-01
METHYL ETHYL KETONE	V	L	72	4.50E+00	8.95E-02	9.80E-06	2.68E+05	2.74E-05	1.12E-03				6.0E-01	2.9E-01
METHYL ISOBUTYL KETONE	V	L	100	1.34E+02	7.50E-02	7.80E-06	1.90E+04	1.40E-04	5.74E-03				8.0E-02	2.3E-02

TABLE J. PHYSIO-CHEMICAL AND TOXICITY CONSTANTS USED IN MODELS.

CHEMICAL PARAMETER	Physical State		Molecular Weight	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's Law constant H ($atm\text{-}m^3/mol$)	Henry's Law constant H' (unitless)	Skin Absorption Factor ABS (unitless)	Cancer Slope Factor Oral CSFo $(mg/kg\text{-}d)^{-1}$	Cancer Slope Factor Inhaled CSFi $(mg/kg\text{-}d)^{-1}$	Reference Dose Oral RfDo (mg/kg-d)	Reference Dose Inhaled RfDi (mg/kg-d)
METHYL MERCURY	NV	S	216							0.10			1.0E-04	
METHYLNAPHTHALENE (total 1- & 2-)	V	S	142	7.20E+02	5.90E-02	7.50E-06	2.60E+01	2.90E-04	1.19E-02				4.0E-02	4.0E-2
*METHYL TERT BUTYL ETHER	V	L	98	6.00E+00	8.00E-02	1.00E-05	1.50E+05	5.87E-04	2.41E-02		1.8E-03	9.1E-04	8.61E-01	8.60E-01
MOLYBDENUM	NV	S	96										5.0E-03	
NAPHTHALENE	V	S	128	1.19E+03	5.90E-02	7.50E-06	3.10E+01	4.83E-04	1.98E-02				2.0E-02	8.6E-04
*NICKEL	NV	S	59									9.1E-01	2.0E-02	
*PENTACHLOROPHENOL	NV	S	266	3.20E+04			1.40E+04	2.80E-06	1.15E-04	0.25	8.1E-02	1.8E-02	3.0E-02	3.0E-02
PERCHLORATE	NV	S	100				2.00E+05						1.0E-04	
PHENANTHRENE	V	S	178	1.40E+04			8.16E-01	3.93E-05					4.0E-02	4.0E-02
PHENOL	NV	S	94	9.10E+01			8.00E+04	1.30E-06	5.33E-05	0.10			6.0E-01	6.0E-01
*POLYCHLORINATED BIPHENYLS (PCBs)	NV	S	327 (ave)	3.30E+04			3.20E-02	5.20E-04	2.13E-02	0.14	2.0E+00	2.0E+00	2.00E-05	2.00E-05
PYRENE	V	S	202	1.05E+05	2.72E-02	7.24E-06	1.35E-01	1.10E-05	4.51E-04				3.0E-02	3.0E-02
SELENIUM	NV	S	79										5.0E-03	
SILVER	NV	S	47										5.0E-03	
STYRENE	V	L	104	7.76E+02	7.10E-02	8.00E-06	3.10E+02	2.75E-03	1.13E-01				2.0E-01	2.9E-01
tert-BUTYL ALCOHOL	V	L	74	3.70E+01	9.00E-02	9.10E-06	1.00E+06	1.17E-05	4.80E-04		3.0E-03			
TETRACHLOROETHANE, 1,1,1,2-	V	L	168	9.37E+01	7.10E-02	7.90E-06	2.97E+03	3.45E-04	1.41E-02		2.6E-02	2.6E-02	3.0E-02	3.0E-02
*TETRACHLOROETHANE, 1,1,2,2-	V	L	168	9.37E+01	7.10E-02	7.90E-06	2.97E+03	3.45E-04	1.41E-02		2.7E-01	2.0E-01	6.0E-02	6.0E-02
*TETRACHLOROETHYLENE	V	L	166	1.55E+02	7.20E-02	8.20E-06	2.00E+02	1.84E-02	7.54E-01		5.4E-01	2.1E-02	1.0E-02	1.7E-01
THALLIUM	NV	S	204										6.6E-05	
TOLUENE	V	L	92	1.82E+02	8.70E-02	8.60E-06	5.26E+02	6.64E-03	2.72E-01				2.0E-01	1.1E-01
TOXAPHENE	NV	S	414	4.90E+03			3.00E+00	2.10E-01	8.61E+00	0.10	1.2E+00	1.2E+00		
TPH (gasolines)	V	L		5.00E+03			1.50E+02	7.20E-04	2.95E-02				0.03	0.014
TPH (middle distillates)	NV	L		5.00E+03			5.00E+00	7.20E-04	2.95E-02				0.03	0.014
TPH (residual fuels)	NV	L/S					5.00E+00						0.03	0.014
*TRICHLOROBENZENE, 1,2,4-	V	S	180	1.78E+03	3.00E-02	8.23E-06	3.00E+02	1.42E-03	5.82E-02		3.6E-03		1.0E-02	5.7E-02
TRICHLOROETHANE, 1,1,1-	V	L	133	1.10E+02	7.80E-02	8.80E-06	1.33E+03	1.72E-02	7.05E-01				2.8E-01	0.63E-01
*TRICHLOROETHANE, 1,1,2-	V	L	133	5.01E+01	7.80E-02	8.80E-06	4.42E+03	9.13E-04	3.74E-02		7.2E-02	5.7E-02	4.0E-03	4.0E-03
*TRICHLOROETHYLENE	V	L	131	1.66E+02	7.90E-02	9.10E-06	1.10E+03	1.03E-02	4.22E-01		1.50E-02	7.0E-03	3.0E-04	1.0E-02
TRICHLOROPHENOL, 2,4,5-	V	S	198	8.90E+01	2.9E-02	7.0E-06	1.19E+03	2.18E-04	8.94E-03	0.10			1.0E-01	1.0E-01
*TRICHLOROPHENOL, 2,4,6-	NV	S	198	2.00E+03			8.00E+02	4.00E-06	1.64E-04	0.10	7.0E-02	7.0E-02		
VANADIUM	NV	S	51										7.0E-03	

TABLE J. PHYSIO-CHEMICAL AND TOXICITY CONSTANTS USED IN MODELS.

CHEMICAL PARAMETER	Physical State		Molecular Weight	Organic carbon partition coefficient, K_{oc}	Diffusivity in air, D_a	Diffusivity in water, D_w	Pure component water solubility, S	Henry's Law constant H	Henry's Law constant H'	Skin Absorption Factor ABS	Cancer Slope Factor Oral CSFo	Cancer Slope Factor Inhaled CSFi	Reference Dose Oral RfDo	Reference Dose Inhaled RfDi
				(cm^3/g)	(cm^2/s)	(cm^2/s)	(mg/L)	($atm-m^3/mol$)	(unitless)	(unitless)	$(mg/kg-d)^{-1}$	$(mg/kg-d)^{-1}$	(mg/kg-d)	(mg/kg-d)
*VINYL CHLORIDE	V	G	63	1.86E+01	1.06E-01	1.23E-06	2.76E+03	2.70E-02	1.11E+00		2.7E-01	2.7E-01		
XYLENES	V	L	106	4.07E+02	7.00E-02	7.80E-06	1.61E+02	7.34E-03	3.01E-01				7.0E-01	2.9E-02
ZINC	NV	S	65										3.0E-01	

Red (in electronic version): Toxicity factor updated with respect to factors presented in December 2001 RBSL document.

Notes:

Physical state of chemical at ambient conditions (V - volatile, NV - nonvolatile, S - solid, L - liquid, G - gas).

Chemical considered to be "volatile" if Henry's number (atm m3/mole) >0.00001 and molecular weight <200.

Dibromochloromethane, dibromochloropropane and pyrene considered volatile for purposes of modeling (USEPA 2002). (Molecular weight adjusted to 199 in column E (hidden) to permit generation of volatilization factor in soil direct-exposure models.)

TPH -Total Petroleum Hydrocarbons. RfD values from MADEP 2002. See text for discussion of different TPH categories.

Physio-chemical constants and ABS values from USEPA Region IX (USEPA 2002) or Ontario MOEE (MOEE 1996) when not available, except as noted.

Physio-chemical constants for polychlorinated biphenyls and toxaphene from ATSDR 2001a. PCB solubility from MOEE (1996).

Physio-chemical constants for 1,4 Dioxane from "Solvent Stabilizers - White Paper" (Mohr 2001).

Cancer Slope Factors from CalEPA 2003 where available (marked by "*"); otherwise from USEPA as presented in Region IX PRGs (USEPA 2002). Reference dose factors from USEPA Region IX PRGs.

Physio-chemical for TBA from *Assessment and Management of MtBE Impacted Sites* (RWQCB 2001). Oral cancer slope factor from OEHHA (CalEPA 1999b).

Physio-chemicals and toxicity constants for xylenes based on m-xylene.

Diffusivity constants for methylnaphthalene not available. Constants presented based on naphthalene.

RfDs for acenaphthylene, methylnaphthylene, and phenanthrene based on fluorene; RfDs for benzo(g,h,i)perylene based on fluoranthene (after MADEP 1994).

TABLE K-1. DIRECT-EXPOSURE SCREENING LEVELS
[1]RESIDENTIAL EXPOSURE SCENARIO

CHEMICAL	Final Screening Level (mg/kg)	Basis	Carcinogens (Risk = 10^{-6}) (mg/kg)	Noncarcinogens (HQ = 0.2) (mg/kg)	Noncarcinogens (HQ = 1.0) (mg/kg)	Saturation (mg/kg)
ACENAPHTHENE	7.3E+02	noncarcinogenic effects	-	7.3E+02	3.7E+03	NA
ACENAPHTHYLENE	5.5E+02	=fluorene	-	5.5E+02	2.7E+03	NA
ACETONE	3.1E+02	noncarcinogenic effects	-	3.1E+02	1.6E+03	1.0E+05
*ALDRIN	2.9E-02	carcinogenic effects	2.9E-02	3.7E-01	1.8E+00	NA
ANTHRACENE	4.4E+03	noncarcinogenic effects	-	4.4E+03	2.2E+04	NA
ANTIMONY	6.3E+00	noncarcinogenic effects	-	6.3E+00	3.1E+01	NA
*ARSENIC	3.9E-01	carcinogenic effects	3.9E-01	4.3E+00	2.2E+01	NA
BARIUM	1.1E+03	noncarcinogenic effects	-	1.1E+03	5.4E+03	NA
*BENZENE	1.8E-01	carcinogenic effects	1.8E-01	1.4E+00	7.0E+00	8.7E+02
*BENZO(a)ANTHRACENE	3.8E-01	carcinogenic effects	3.8E-01	-	-	NA
*BENZO(b)FLUORANTHENE	3.8E-01	carcinogenic effects	3.8E-01	-	-	NA
*BENZO(k)FLUORANTHENE	3.8E-01	carcinogenic effects	3.8E-01	-	-	NA
BENZO(g,h,i)PERYLENE	4.6E+02	noncarcinogenic effects	-	4.6E+02	2.3E+03	NA
*BENZO(a)PYRENE	3.8E-02	carcinogenic effects	3.8E-02	-	-	NA
*BERYLLIUM	3.1E+01	noncarcinogenic effects	1.1E+03	3.1E+01	1.5E+02	NA
BIPHENYL, 1,1-	6.0E+02	noncarcinogenic effects	-	6.0E+02	3.0E+03	NA
*BIS(2-CHLOROETHYL)ETHER	9.5E-02	carcinogenic effects	9.5E-02	-	-	9.6E+03
BIS(2-CHLOROISOPROPYL)ETHER	2.9E+00	carcinogenic effects	2.9E+00	1.9E+02	9.5E+02	7.9E+02
*BIS(2-ETHYLHEXYL)PHTHALATE	1.6E+02	carcinogenic effects	1.6E+02	2.4E+02	1.2E+03	NA
BORON	2.4E+03	noncarcinogenic effects	-	2.4E+03	1.2E+04	NA
*BROMODICHLOROMETHANE	3.9E-01	carcinogenic effects	3.9E-01	4.4E+01	2.2E+02	3.0E+03
BROMOFORM	6.1E+01	carcinogenic effects	6.1E+01	2.4E+02	1.2E+03	NA
BROMOMETHANE	7.6E-01	noncarcinogenic effects	-	7.6E-01	3.8E+00	3.1E+03
*CADMIUM	1.7E+00	carcinogenic effects	1.7E+00	7.8E+00	3.9E+01	NA
*CARBON TETRACHLORIDE	9.0E-02	carcinogenic effects	9.0E-02	4.3E-01	2.2E+00	1.1E+03
*CHLORDANE	4.4E-01	carcinogenic effects	4.4E-01	7.0E+00	3.5E+01	NA
CHLOROANILINE, p-	4.9E+01	noncarcinogenic effects	-	4.9E+01	2.4E+02	NA
CHLOROBENZENE	3.0E+01	noncarcinogenic effects	-	3.0E+01	1.5E+02	6.8E+02
CHLOROETHANE	3.0E+00	carcinogenic effects	3.0E+00	1.0E+03	5.0E+03	1.6E+03
*CHLOROFORM	7.0E-01	noncarcinogenic effects	8.9E-01	7.0E-01	3.5E+00	2.9E+03
CHLOROMETHANE	1.2E+00	carcinogenic effects	1.2E+00	3.1E+01	1.6E+02	4.1E+03
CHLOROPHENOL, 2-	1.3E+01	noncarcinogenic effects	-	1.3E+01	6.3E+01	5.5E+04
CHROMIUM (Total)	-	-	-	-	-	NA
CHROMIUM III	2.3E+04	noncarcinogenic effects	-	2.3E+04	1.2E+05	NA
*CHROMIUM VI	1.8E+00	trench/construction worker	1.7E+01	4.7E+01	2.3E+02	NA
*CHRYSENE	3.8E+00	carcinogenic effects	3.8E+00	-	-	NA
COBALT	9.4E+01	trench/construction worker	9.1E+02	2.8E+02	1.4E+03	NA

TABLE K-1. DIRECT-EXPOSURE SCREENING LEVELS
[1]RESIDENTIAL EXPOSURE SCENARIO

CHEMICAL	Final Screening Level (mg/kg)	Basis	Carcinogens (Risk = 10^{-6}) (mg/kg)	Noncarcinogens (HQ = 0.2) (mg/kg)	Noncarcinogens (HQ = 1.0) (mg/kg)	Saturation (mg/kg)
COPPER	6.3E+02	noncarcinogenic effects	-	6.3E+02	3.1E+03	NA
CYANIDE (Free)	2.4E+02	noncarcinogenic effects	-	2.4E+02	1.2E+03	NA
*DIBENZO(a,h)ANTHTRACENE	1.1E-01	carcinogenic effects	1.1E-01	-	-	NA
*DIBROMOCHLOROMETHANE	9.8E-01	carcinogenic effects	9.8E-01	7.6E+01	3.8E+02	NA
*1,2-DIBROMO-3-CHLOROPROPANE	1.9E-02	carcinogenic effects	1.9E-02	3.0E-01	1.5E+00	3.3E+02
*DIBROMOETHANE, 1,2-	1.0E-01	carcinogenic effects	1.0E-01	1.4E-01	6.9E-01	NA
DICHLOROBENZENE, 1,2-	2.2E+02	noncarcinogenic effects	-	2.2E+02	1.1E+03	6.0E+02
DICHLOROBENZENE, 1,3-	3.2E+00	noncarcinogenic effects	-	3.2E+00	1.6E+01	6.0E+02
*DICHLOROBENZENE, 1,4-	2.1E+00	carcinogenic effects	2.1E+00	9.6E+01	4.8E+02	NA
*DICHLOROBENZIDINE, 3,3-	4.0E-01	carcinogenic effects	4.0E-01	-	-	NA
*DICHLORODIPHENYLDICHLOROETHANE (DDD)	2.4E+00	carcinogenic effects	2.4E+00	-	-	NA
*DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	1.7E+00	carcinogenic effects	1.7E+00	-	-	NA
*DICHLORODIPHENYLTRICHLOROETHANE (DDT)	1.7E+00	carcinogenic effects	1.7E+00	7.2E+00	3.6E+01	NA
*DICHLOROETHANE, 1,1-	2.8E+00	carcinogenic effects	2.8E+00	9.8E+01	4.9E+02	1.7E+03
*DICHLOROETHANE, 1,2-	3.5E-01	carcinogenic effects	3.5E-01	1.7E+00	8.4E+00	1.8E+03
DICHLOROETHYLENE, 1,1-	2.4E+01	noncarcinogenic effects	-	2.4E+01	1.2E+02	1.5E+03
DICHLOROETHYLENE, Cis 1,2-	8.5E+00	noncarcinogenic effects	-	8.5E+00	4.2E+01	1.2E+03
DICHLOROETHYLENE, Trans 1,2-	1.4E+01	noncarcinogenic effects	-	1.4E+01	6.9E+01	3.1E+03
DICHLOROPHENOL, 2,4-	3.7E+01	noncarcinogenic effects	-	3.7E+01	1.8E+02	NA
*DICHLOROPROPANE, 1,2-	6.4E-01	carcinogenic effects	6.4E-01	1.1E+00	5.7E+00	1.1E+03
*DICHLOROPROPENE, 1,3-	2.2E-01	carcinogenic effects	2.2E-01	3.2E+00	1.6E+01	1.4E+03
*DIELDRIN	3.0E-02	carcinogenic effects	3.0E-02	6.1E-01	3.1E+00	NA
DIETHYLPHTHALATE	9.8E+03	noncarcinogenic effects	-	9.8E+03	4.9E+04	NA
DIMETHYLPHTHALATE	1.2E+05	noncarcinogenic effects	-	1.2E+05	6.1E+05	NA
DIMETHYLPHENOL, 2,4-	1.4E+02	noncarcinogenic effects	-	1.4E+02	6.8E+02	NA
DINITROPHENOL, 2,4-	2.4E+01	noncarcinogenic effects	-	2.4E+01	1.2E+02	NA
*DINITROTOLUENE, 2,4-	1.6E+00	carcinogenic effects	1.6E+00	2.4E+01	1.2E+02	NA
*1,4 DIOXANE	1.8E+01	carcinogenic effects	1.8E+01	-	-	NA
*DIOXIN (2,3,7,8-TCDD)	4.5E-06	carcinogenic effects	4.5E-06	-	-	NA
ENDOSULFAN	7.3E+01	noncarcinogenic effects	-	7.3E+01	3.7E+02	NA
ENDRIN	3.7E+00	noncarcinogenic effects	-	3.7E+00	1.8E+01	NA
ETHYLBENZENE	8.7E+00	carcinogenic effects	8.7E+00	3.7E+02	1.8E+03	4.0E+02
FLUORANTHENE	4.6E+02	noncarcinogenic effects	-	4.6E+02	2.3E+03	NA
FLUORENE	5.5E+02	noncarcinogenic effects	-	5.5E+02	2.7E+03	NA
*HEPTACHLOR	1.2E-01	carcinogenic effects	1.2E-01	6.1E+00	3.1E+01	NA
*HEPTACHLOR EPOXIDE	8.8E-02	carcinogenic effects	8.8E-02	1.6E-01	7.9E-01	NA
*HEXACHLOROBENZENE	2.7E-01	carcinogenic effects	2.7E-01	9.8E+00	4.9E+01	NA

TABLE K-1. DIRECT-EXPOSURE SCREENING LEVELS
[1]RESIDENTIAL EXPOSURE SCENARIO

CHEMICAL	Final Screening Level (mg/kg)	Basis	Carcinogens (Risk = 10^{-6}) (mg/kg)	Noncarcinogens (HQ = 0.2) (mg/kg)	Noncarcinogens (HQ = 1.0) (mg/kg)	Saturation (mg/kg)
HEXACHLOROBUTADIENE	3.7E+00	noncarcinogenic effects	6.2E+00	3.7E+00	1.8E+01	NA
*HEXACHLOROCYCLOHEXANE (gamma) LINDANE	5.2E-01	carcinogenic effects	5.2E-01	4.2E+00	2.1E+01	NA
*HEXACHLOROETHANE	1.2E+01	noncarcinogenic effects	1.2E+01	1.2E+01	6.1E+01	NA
*INDENO(1,2,3-cd)PYRENE	3.8E-01	carcinogenic effects	3.8E-01	-	-	NA
LEAD	2.55E+02	DTSC	-	-	-	NA
MERCURY	2.5E+00	noncarcinogenic effects	-	2.5E+00	1.3E+01	NA
METHOXYCHLOR	6.1E+01	noncarcinogenic effects	-	6.1E+01	3.1E+02	NA
*METHYLENE CHLORIDE	4.3E+00	carcinogenic effects	4.3E+00	3.9E+02	1.9E+03	2.4E+03
METHYL ETHYL KETONE	1.5E+03	noncarcinogenic effects	-	1.5E+03	7.3E+03	3.4E+04
METHYL ISOBUTYL KETONE	1.6E+02	noncarcinogenic effects	-	1.6E+02	7.8E+02	1.7E+04
METHYL MERCURY	1.2E+00	noncarcinogenic effects	-	1.2E+00	6.1E+00	NA
METHYLNAPHTHALENE (total 1- & 2-)	2.9E+02	noncarcinogenic effects	-	2.9E+02	1.4E+03	NA
*METHYL TERT BUTYL ETHER	3.1E+01	carcinogenic effects	3.1E+01	1.1E+03	5.7E+03	2.1E+04
MOLYBDENUM	7.8E+01	noncarcinogenic effects	-	7.8E+01	3.9E+02	NA
NAPHTHALENE	1.1E+01	noncarcinogenic effects	-	1.1E+01	5.5E+01	NA
*NICKEL	3.1E+02	noncarcinogenic effects	9.8E+03	3.1E+02	1.6E+03	NA
*PENTACHLOROPHENOL	4.4E+00	carcinogenic effects	4.4E+00	2.8E+02	1.4E+03	NA
PERCHLORATE	1.6E+00	noncarcinogenic effects	-	1.6E+00	7.8E+00	NA
PHENANTHRENE	5.5E+02	=fluorene	-	5.5E+02	2.7E+03	NA
PHENOL	7.3E+03	noncarcinogenic effects	-	7.3E+03	3.7E+04	NA
*POLYCHLORINATED BIPHENYLS (PCBs)	2.2E-01	carcinogenic effects	2.2E-01	2.2E-01	1.1E+00	NA
PYRENE	4.6E+02	noncarcinogenic effects	-	4.6E+02	2.3E+03	NA
SELENIUM	7.8E+01	noncarcinogenic effects	-	7.8E+01	3.9E+02	NA
SILVER	7.8E+01	noncarcinogenic effects	-	7.8E+01	3.9E+02	NA
STYRENE	8.7E+02	noncarcinogenic effects	-	8.7E+02	4.3E+03	1.5E+03
tert-BUTYL ALCOHOL	2.1E+02	carcinogenic effects	2.1E+02	-	-	3.2E+05
TETRACHLOROETHANE, 1,1,1,2-	3.1E+00	carcinogenic effects	3.1E+00	1.0E+02	5.1E+02	2.0E+03
*TETRACHLOROETHANE, 1,1,2,2-	3.9E-01	carcinogenic effects	3.9E-01	2.0E+02	1.0E+03	2.0E+03
*TETRACHLOROETHYLENE	4.8E-01	carcinogenic effects	4.8E-01	7.2E+01	3.6E+02	2.3E+02
THALLIUM	1.0E+00	noncarcinogenic effects	-	1.0E+00	5.2E+00	NA
TOLUENE	1.3E+02	noncarcinogenic effects	-	1.3E+02	6.5E+02	6.5E+02
TOXAPHENE	4.0E-01	carcinogenic effects	4.0E-01	-	-	NA
TPH (gasolines)	5.0E+02	=pyrene	-	4.6E+02	2.3E+03	NA
TPH (middle distillates)	5.0E+02	=pyrene	-	4.6E+02	2.3E+03	NA
TPH (residual fuels)	5.0E+02	=pyrene	-	4.6E+02	2.3E+03	NA
*TRICHLOROBENZENE, 1,2,4-	1.3E+02	noncarcinogenic effects	1.8E+02	1.3E+02	6.5E+02	NA
TRICHLOROETHANE, 1,1,1-	4.3E+01	noncarcinogenic effects	-	4.3E+01	2.1E+02	1.2E+03

TABLE K-1. DIRECT-EXPOSURE SCREENING LEVELS
[1]RESIDENTIAL EXPOSURE SCENARIO

CHEMICAL	Final Screening Level (mg/kg)	Basis	Carcinogens (Risk = 10^{-6}) (mg/kg)	Noncarcinogens (HQ = 0.2) (mg/kg)	Noncarcinogens (HQ = 1.0) (mg/kg)	Saturation (mg/kg)
*TRICHLOROETHANE, 1,1,2-	7.0E-01	carcinogenic effects	7.0E-01	7.1E+00	3.6E+01	1.8E+03
*TRICHLOROETHYLENE	2.9E+00	carcinogenic effects	2.9E+00	3.2E+00	1.6E+01	1.3E+03
TRICHLOROPHENOL, 2,4,5-	5.0E+02	noncarcinogenic effects	-	5.0E+02	2.5E+03	NA
*TRICHLOROPHENOL, 2,4,6-	6.9E+00	carcinogenic effects	6.9E+00	-	-	NA
VANADIUM	1.1E+02	noncarcinogenic effects	-	1.1E+02	5.5E+02	NA
*VINYL CHLORIDE	2.5E-02	carcinogenic effects	2.5E-02	-	-	1.2E+03
XYLENES	5.4E+01	noncarcinogenic effects	-	5.4E+01	2.7E+02	4.2E+02
ZINC	4.7E+03	noncarcinogenic effects	-	4.7E+03	2.3E+04	NA

Primary source: USEPA Region IX Preliminary Remediation Goals (PRGs, USEPA 2002), modified as noted below. See text for discussion.

Notes:

1. "Residential" screening levels generally considered adequate for other sensitive uses (*e.g., day-care centers, hospitals, etc.*).

See text for equations and assumptions used in models.

Final screening level is lowest of individual screening levels for carcinogenic effects and noncarcinogenic effects (based on HQ=0.2) or screening level for construction/trench workers if lower (see Table K-3). Saturation limit used as upper limit for volatile organic compounds that are liquid at ambient conditions (see text).

Carcinogens: Based on target cancer risk of 10^{-6}; modified with respct to CalEPA/OEHHA slope factors when available (marked by "*"). Screening levels for PCBs based on updated USEPA slope factors as presented in USEPA Region IX Preliminary Remediation Goals document (USEPA 2002).

Noncarcinogens: Adjusted to target hazard quotient of 0.2 for use in tables. Screening levels based on hazard quotient of 1.0 provided for reference.

Saturation: Theoretical soil saturation level in the absence of free product; calculated for volatile organic compounds that are liquids under ambient conditions (refer to Table J).

TPH:Total Petroleum Hydrocarbons. See text for discussion of different TPH categories. Direct exposure screening levels after Massachusetts Department of Environmental Protection (see text).

Residential screening level for lead from Interim Guidance for Evaluating Lead-Based Paint and Asbestos Containing Materials at Proposed School Sites (DTSC 2001).

TABLE K-2. DIRECT-EXPOSURE SCREENING LEVELS
COMMERCIAL/INDUSTRIAL WORKER EXPOSURE SCENARIO

CHEMICAL	Final Screening Level (mg/kg)	Basis	Carcinogens (Risk = 10^{-6}) (mg/kg)	Noncarcinogens (HQ = 0.2) (mg/kg)	Noncarcinogens (HQ = 1.0) (mg/kg)	Saturation (mg/kg)
ACENAPHTHENE	5.8E+03	noncarcinogenic effects	-	5.8E+03	2.9E+04	NA
ACENAPHTHYLENE	5.2E+03	=fluorene	-	5.2E+03	2.6E+04	NA
ACETONE	1.2E+03	noncarcinogenic effects	-	1.2E+03	6.0E+03	1.0E+05
*ALDRIN	1.0E-01	carcinogenic effects	1.0E-01	3.7E+00	1.8E+01	NA
ANTHRACENE	4.8E+04	noncarcinogenic effects	-	4.8E+04	2.4E+05	NA
ANTIMONY	8.2E+01	noncarcinogenic effects	-	8.2E+01	4.1E+02	NA
*ARSENIC	1.6E+00	carcinogenic effects	1.6E+00	5.1E+01	2.6E+02	NA
BARIUM	2.5E+03	trench/construction worker	-	1.3E+04	6.7E+04	NA
*BENZENE	3.8E-01	carcinogenic effects	3.8E-01	4.7E+00	2.3E+01	8.7E+02
*BENZO(a)ANTHRACENE	1.3E+00	carcinogenic effects	1.3E+00	-	-	NA
*BENZO(b)FLUORANTHENE	1.3E+00	carcinogenic effects	1.3E+00	-	-	NA
*BENZO(k)FLUORANTHENE	1.3E+00	carcinogenic effects	1.3E+00	-	-	NA
BENZO(g,h,i)PERYLENE	4.4E+03	noncarcinogenic effects	-	4.4E+03	2.2E+04	NA
*BENZO(a)PYRENE	1.3E-01	carcinogenic effects	1.3E-01	-	-	NA
*BERYLLIUM	9.8E+01	trench/construction worker	2.2E+03	3.9E+02	1.9E+03	NA
BIPHENYL, 1,1-	4.6E+03	noncarcinogenic effects	-	4.6E+03	2.3E+04	NA
*BIS(2-CHLOROETHYL)ETHER	2.5E-01	carcinogenic effects	2.5E-01	-	-	9.6E+03
BIS(2-CHLOROISOPROPYL)ETHER	7.3E+00	carcinogenic effects	7.3E+00	8.0E+02	4.0E+03	7.9E+02
*BIS(2-ETHYLHEXYL)PHTHALATE	5.7E+02	carcinogenic effects	5.7E+02	2.5E+03	1.2E+04	NA
BORON	2.5E+04	noncarcinogenic effects	-	2.5E+04	1.2E+05	NA
*BROMODICHLOROMETHANE	8.6E-01	carcinogenic effects	8.6E-01	1.6E+02	8.0E+02	3.0E+03
BROMOFORM	2.2E+02	carcinogenic effects	2.2E+02	2.5E+03	1.2E+04	NA
BROMOMETHANE	2.5E+00	noncarcinogenic effects	-	2.5E+00	1.3E+01	3.1E+03
*CADMIUM	7.4E+00	carcinogenic effects	7.4E+00	1.0E+02	5.1E+02	NA
*CARBON TETRACHLORIDE	1.9E-01	carcinogenic effects	1.9E-01	1.4E+00	7.2E+00	1.1E+03
*CHLORDANE	1.7E+00	carcinogenic effects	1.7E+00	8.1E+01	4.0E+02	NA
CHLOROANILINE, p-	4.9E+02	noncarcinogenic effects	-	4.9E+02	2.5E+03	NA
CHLOROBENZENE	1.0E+02	noncarcinogenic effects	-	1.0E+02	5.2E+02	6.8E+02
CHLOROETHANE	6.4E+00	carcinogenic effects	6.4E+00	3.7E+03	1.9E+04	1.6E+03
*CHLOROFORM	1.9E+00	carcinogenic effects	1.9E+00	2.3E+00	1.2E+01	2.9E+03
CHLOROMETHANE	2.6E+00	carcinogenic effects	2.6E+00	1.0E+02	5.1E+02	4.1E+03
CHLOROPHENOL, 2-	4.7E+01	noncarcinogenic effects	-	4.7E+01	2.3E+02	5.5E+04
CHROMIUM (Total)	-	-	-	-	-	NA
CHROMIUM III	3.1E+05	noncarcinogenic effects	-	3.1E+05	1.5E+06	NA
*CHROMIUM VI	1.8E+00	trench/construction worker	3.7E+01	6.1E+02	3.1E+03	NA
*CHRYSENE	1.3E+01	carcinogenic effects	1.3E+01	-	-	NA

TABLE K-2. DIRECT-EXPOSURE SCREENING LEVELS
COMMERCIAL/INDUSTRIAL WORKER EXPOSURE SCENARIO

CHEMICAL	Final Screening Level (mg/kg)	Basis	Carcinogens (Risk = 10^{-6}) (mg/kg)	Noncarcinogens (HQ = 0.2) (mg/kg)	Noncarcinogens (HQ = 1.0) (mg/kg)	Saturation (mg/kg)
COBALT	9.4E+01	trench/construction worker	1.9E+03	2.7E+03	1.3E+04	NA
COPPER	8.2E+03	noncarcinogenic effects	-	8.2E+03	4.1E+04	NA
CYANIDE (Free)	2.5E+03	noncarcinogenic effects	-	2.5E+03	1.2E+04	NA
*DIBENZO(a,h)ANTHTRACENE	3.8E-01	carcinogenic effects	3.8E-01	-	-	NA
*DIBROMOCHLOROMETHANE	2.3E+00	carcinogenic effects	2.3E+00	3.0E+02	1.5E+03	NA
*1,2-DIBROMO-3-CHLOROPROPANE	4.5E-02	carcinogenic effects	4.5E-02	1.3E+00	6.5E+00	3.3E+02
*DIBROMOETHANE, 1,2-	3.1E-01	carcinogenic effects	3.1E-01	5.1E-01	2.5E+00	NA
DICHLOROBENZENE, 1,2-	6.0E+02	saturation limit	-	8.1E+02	4.0E+03	6.0E+02
DICHLOROBENZENE, 1,3-	1.2E+01	noncarcinogenic effects	-	1.2E+01	6.2E+01	6.0E+02
*DICHLOROBENZENE, 1,4-	4.5E+00	carcinogenic effects	4.5E+00	3.7E+02	1.8E+03	NA
*DICHLOROBENZIDINE, 3,3-	1.4E+00	carcinogenic effects	1.4E+00	-	-	NA
*DICHLORODIPHENYLDICHLOROETHANE (DDD)	1.0E+01	carcinogenic effects	1.0E+01	-	-	NA
*DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	7.0E+00	carcinogenic effects	7.0E+00	-	-	NA
*DICHLORODIPHENYLTRICHLOROETHANE (DDT)	7.0E+00	carcinogenic effects	7.0E+00	8.5E+01	4.3E+02	NA
*DICHLOROETHANE, 1,1-	5.9E+00	carcinogenic effects	5.9E+00	3.4E+02	1.7E+03	1.7E+03
*DICHLOROETHANE, 1,2-	7.6E-01	carcinogenic effects	7.6E-01	5.5E+00	2.8E+01	1.8E+03
DICHLOROETHYLENE, 1,1-	8.2E+01	noncarcinogenic effects	-	8.2E+01	4.1E+02	1.5E+03
DICHLOROETHYLENE, Cis 1,2-	2.9E+01	noncarcinogenic effects	-	2.9E+01	1.4E+02	1.2E+03
DICHLOROETHYLENE, Trans 1,2-	4.6E+01	noncarcinogenic effects	-	4.6E+01	2.3E+02	3.1E+03
DICHLOROPHENOL, 2,4-	3.7E+02	noncarcinogenic effects	-	3.7E+02	1.8E+03	NA
*DICHLOROPROPANE, 1,2-	1.4E+00	carcinogenic effects	1.4E+00	3.9E+00	2.0E+01	1.1E+03
*DICHLOROPROPENE, 1,3-	4.7E-01	carcinogenic effects	4.7E-01	1.1E+01	5.3E+01	1.4E+03
*DIELDRIN	1.1E-01	carcinogenic effects	1.1E-01	6.2E+00	3.1E+01	NA
DIETHYLPHTHALATE	9.8E+04	noncarcinogenic effects	-	9.8E+04	4.9E+05	NA
DIMETHYLPHTHALATE	1.2E+06	noncarcinogenic effects	-	1.2E+06	6.2E+06	NA
DIMETHYLPHENOL, 2,4-	7.1E+02	noncarcinogenic effects	-	7.1E+02	3.6E+03	NA
DINITROPHENOL, 2,4-	2.5E+02	noncarcinogenic effects	-	2.5E+02	1.2E+03	NA
*DINITROTOLUENE, 2,4-	5.6E+00	carcinogenic effects	5.6E+00	2.5E+02	1.2E+03	NA
*1,4 DIOXANE	6.4E+01	carcinogenic effects	6.4E+01	-	-	NA
*DIOXIN (2,3,7,8-TCDD)	1.8E-05	carcinogenic effects	1.8E-05	-	-	NA
ENDOSULFAN	7.4E+02	noncarcinogenic effects	-	7.4E+02	3.7E+03	NA
ENDRIN	3.7E+01	noncarcinogenic effects	-	3.7E+01	1.8E+02	NA
ETHYLBENZENE	1.9E+01	carcinogenic effects	1.9E+01	1.5E+03	7.3E+03	4.0E+02
FLUORANTHENE	4.4E+03	noncarcinogenic effects	-	4.4E+03	2.2E+04	NA
FLUORENE	5.2E+03	noncarcinogenic effects	-	5.2E+03	2.6E+04	NA
*HEPTACHLOR	4.2E-01	carcinogenic effects	4.2E-01	6.2E+01	3.1E+02	NA

TABLE K-2. DIRECT-EXPOSURE SCREENING LEVELS
COMMERCIAL/INDUSTRIAL WORKER EXPOSURE SCENARIO

CHEMICAL	Final Screening Level (mg/kg)	Basis	Carcinogens (Risk = 10^{-6}) (mg/kg)	Noncarcinogens (HQ = 0.2) (mg/kg)	Noncarcinogens (HQ = 1.0) (mg/kg)	Saturation (mg/kg)
*HEPTACHLOR EPOXIDE	3.1E-01	carcinogenic effects	3.1E-01	1.6E+00	8.0E+00	NA
*HEXACHLOROBENZENE	9.6E-01	carcinogenic effects	9.6E-01	9.8E+01	4.9E+02	NA
HEXACHLOROBUTADIENE	2.2E+01	carcinogenic effects	2.2E+01	3.7E+01	1.8E+02	NA
*HEXACHLOROCYCLOHEXANE (gamma) LINDANE	2.1E+00	carcinogenic effects	2.1E+00	4.9E+01	2.4E+02	NA
*HEXACHLOROETHANE	4.4E+01	carcinogenic effects	4.4E+01	1.2E+02	6.2E+02	NA
*INDENO(1,2,3-cd)PYRENE	1.3E+00	carcinogenic effects	1.3E+00	-	-	NA
LEAD	7.5E+02	USEPA Region IX	-	-	-	NA
MERCURY	3.3E+01	noncarcinogenic effects	-	3.3E+01	1.6E+02	NA
METHOXYCHLOR	6.2E+02	noncarcinogenic effects	-	6.2E+02	3.1E+03	NA
*METHYLENE CHLORIDE	9.5E+00	carcinogenic effects	9.5E+00	1.8E+03	9.1E+03	2.4E+03
METHYL ETHYL KETONE	5.4E+03	noncarcinogenic effects	-	5.4E+03	2.7E+04	3.4E+04
METHYL ISOBUTYL KETONE	5.6E+02	noncarcinogenic effects	-	5.6E+02	2.8E+03	1.7E+04
METHYL MERCURY	1.2E+01	noncarcinogenic effects	-	1.2E+01	6.2E+01	NA
METHYLNAPHTHALENE (total 1- & 2-)	1.4E+03	noncarcinogenic effects	-	1.4E+03	7.2E+03	NA
*METHYL TERT BUTYL ETHER	7.0E+01	carcinogenic effects	7.0E+01	4.0E+03	2.0E+04	2.1E+04
MOLYBDENUM	1.0E+03	noncarcinogenic effects	-	1.0E+03	5.1E+03	NA
NAPHTHALENE	3.7E+01	noncarcinogenic effects	-	3.7E+01	1.9E+02	NA
*NICKEL	1.0E+03	trench/construction worker	2.1E+04	4.1E+03	2.0E+04	NA
*PENTACHLOROPHENOL	1.3E+01	carcinogenic effects	1.3E+01	2.3E+03	1.2E+04	NA
PERCHLORATE	2.0E+01	noncarcinogenic effects	-	2.0E+01	1.0E+02	NA
PHENANTHRENE	5.2E+03	=fluorene	-	5.2E+03	2.6E+04	NA
PHENOL	7.4E+04	noncarcinogenic effects	-	7.4E+04	3.7E+05	NA
*POLYCHLORINATED BIPHENYLS (PCBs)	7.4E-01	carcinogenic effects	7.4E-01	2.1E+00	1.1E+01	NA
PYRENE	5.8E+03	noncarcinogenic effects	-	5.8E+03	2.9E+04	NA
SELENIUM	1.0E+03	noncarcinogenic effects	-	1.0E+03	5.1E+03	NA
SILVER	1.0E+03	noncarcinogenic effects	-	1.0E+03	5.1E+03	NA
STYRENE	1.5E+03	saturation limit	-	3.6E+03	1.8E+04	1.5E+03
tert-BUTYL ALCOHOL	9.5E+02	carcinogenic effects	9.5E+02	-	-	3.2E+05
TETRACHLOROETHANE, 1,1,1,2-	7.2E+00	carcinogenic effects	7.2E+00	4.0E+02	2.0E+03	2.0E+03
*TETRACHLOROETHANE, 1,1,2,2-	9.1E-01	carcinogenic effects	9.1E-01	8.0E+02	4.0E+03	2.0E+03
*TETRACHLOROETHYLENE	1.3E+00	carcinogenic effects	1.3E+00	3.6E+02	1.8E+03	2.3E+02
THALLIUM	1.3E+01	noncarcinogenic effects	-	1.3E+01	6.7E+01	NA
TOLUENE	4.4E+02	noncarcinogenic effects	-	4.4E+02	2.2E+03	6.5E+02
TOXAPHENE	1.4E+00	carcinogenic effects	1.4E+00	-	-	NA
TPH (gasolines)	5.8E+03	=pyrene	-	5.8E+03	2.9E+04	4.5E+03
TPH (middle distillates)	5.8E+03	=pyrene	-	5.8E+03	2.9E+04	1.5E+02

TABLE K-2. DIRECT-EXPOSURE SCREENING LEVELS
COMMERCIAL/INDUSTRIAL WORKER EXPOSURE SCENARIO

CHEMICAL	Final Screening Level (mg/kg)	Basis	Carcinogens (Risk = 10^{-6}) (mg/kg)	Noncarcinogens (HQ = 0.2) (mg/kg)	Noncarcinogens (HQ = 1.0) (mg/kg)	Saturation (mg/kg)
TPH (residual fuels)	5.8E+03	=pyrene	-	5.8E+03	2.9E+04	NA
*TRICHLOROBENZENE, 1,2,4-	7.9E+02	carcinogenic effects	7.9E+02	1.1E+03	5.6E+03	NA
TRICHLOROETHANE, 1,1,1-	1.4E+02	noncarcinogenic effects	-	1.4E+02	7.0E+02	1.2E+03
*TRICHLOROETHANE, 1,1,2-	1.5E+00	carcinogenic effects	1.5E+00	2.5E+01	1.3E+02	1.8E+03
*TRICHLOROETHYLENE	6.4E+00	carcinogenic effects	6.4E+00	2.1E+01	1.1E+02	1.3E+03
TRICHLOROPHENOL, 2,4,5-	2.2E+03	noncarcinogenic effects	-	2.2E+03	1.1E+04	NA
*TRICHLOROPHENOL, 2,4,6-	2.5E+01	carcinogenic effects	2.5E+01	-	-	NA
VANADIUM	1.4E+03	noncarcinogenic effects	-	1.4E+03	7.2E+03	NA
*VINYL CHLORIDE	5.4E-02	carcinogenic effects	5.4E-02	-	-	1.2E+03
XYLENES	1.8E+02	noncarcinogenic effects	-	1.8E+02	8.9E+02	4.2E+02
ZINC	6.1E+04	noncarcinogenic effects	-	6.1E+04	3.1E+05	NA

Primary source: USEPA Region IX Preliminary Remediation Goals (PRGs, USEPA 2002), modified as noted below. See text for discussion.

Notes:

See text for equations and assumptions used in models.

Final screening level is lowest of individual screening levels for carcinogenic effects and noncarcinogenic effects (based on HQ=0.2) or screening level for construction/trench workers if lower (see Table K-3). Saturation limit used as upper limit for volatile organic compounds that are liquid at ambient conditions (see text).

Carcinogens: Based on target cancer risk of 10^{-6}; modified with respct to CalEPA/OEHHA slope factors when available (marked by "*"). Screening levels for PCBs based on updated USEPA slope factors as presented in USEPA Region IX Preliminary Remediation Goals document (USEPA 2002).

Noncarcinogens: Adjusted to target hazard quotient of 0.2 for use in tables. Screening levels based on hazard quotient of 1.0 provided for reference.

Saturation: Theoretical soil saturation level in the absence of free product; calculated for volatile organic compounds that are liquids under ambient conditions (refer to Table J).

TPH:Total Petroleum Hydrocarbons. See text for discussion of different TPH categories. Direct exposure screening levels after Massachusetts Department of Environmental Protection (see text).

Residential screening level for lead from Interim Guidance for Evaluating Lead-Based Paint and Asbestos Containing Materials at Proposed School Sites (DTSC 2001).

TABLE K-3. DIRECT-EXPOSURE SCREENING LEVELS
CONSTRUCTION/TRENCH WORKER EXPOSURE SCENARIO

CHEMICAL	Final Screening Level (mg/kg)	Basis	Carcinogens (Risk = 10^{-6}) (mg/kg)	Noncarcinogens HQ = 0.2 (mg/kg)	Noncarcinogens (HQ = 1.0) (mg/kg)	Saturation (mg/kg)
ACENAPHTHENE	3.5E+04	noncarcinogenic effects	-	3.5E+04	1.7E+05	NA
ACENAPHTHYLENE	2.6E+04	=fluorene	-	2.6E+04	1.3E+05	NA
ACETONE	1.3E+04	noncarcinogenic effects	-	1.3E+04	6.6E+04	1.0E+05
*ALDRIN	1.2E+00	carcinogenic effects	1.2E+00	1.2E+01	6.0E+01	NA
ANTHRACENE	2.1E+05	noncarcinogenic effects	-	2.1E+05	1.1E+06	NA
ANTIMONY	3.1E+02	noncarcinogenic effects	-	3.1E+02	1.5E+03	NA
*ARSENIC	1.6E+01	carcinogenic effects	1.6E+01	1.8E+02	9.2E+02	NA
BARIUM	2.5E+03	noncarcinogenic effects	-	2.5E+03	1.2E+04	NA
*BENZENE	1.7E+01	carcinogenic effects	1.7E+01	5.7E+01	2.9E+02	8.7E+02
*BENZO(a)ANTHRACENE	1.5E+01	carcinogenic effects	1.5E+01	-	-	NA
*BENZO(b)FLUORANTHENE	1.5E+01	carcinogenic effects	1.5E+01	-	-	NA
*BENZO(k)FLUORANTHENE	1.5E+01	carcinogenic effects	1.5E+01	-	-	NA
BENZO(g,h,i)PERYLENE	1.4E+04	noncarcinogenic effects	-	1.4E+04	7.0E+04	NA
*BENZO(a)PYRENE	1.5E+00	carcinogenic effects	1.5E+00	-	-	NA
*BERYLLIUM	9.8E+01	noncarcinogenic effects	1.1E+02	9.8E+01	4.9E+02	NA
BIPHENYL, 1,1-	2.8E+04	noncarcinogenic effects	-	2.8E+04	1.4E+05	NA
*BIS(2-CHLOROETHYL)ETHER	7.4E+00	carcinogenic effects	7.4E+00	-	-	9.6E+03
BIS(2-CHLOROISOPROPYL)ETHER	2.3E+02	carcinogenic effects	2.3E+02	8.2E+03	4.1E+04	7.9E+02
*BIS(2-ETHYLHEXYL)PHTHALATE	6.4E+03	carcinogenic effects	6.4E+03	8.0E+03	4.0E+04	NA
BORON	4.6E+04	noncarcinogenic effects	-	4.6E+04	2.3E+05	NA
*BROMODICHLOROMETHANE	3.5E+01	carcinogenic effects	3.5E+01	1.8E+03	9.2E+03	3.0E+03
BROMOFORM	2.6E+03	carcinogenic effects	2.6E+03	8.0E+03	4.0E+04	NA
BROMOMETHANE	3.1E+01	noncarcinogenic effects	-	3.1E+01	1.6E+02	3.1E+03
*CADMIUM	3.8E+01	carcinogenic effects	3.8E+01	3.8E+02	1.9E+03	NA
*CARBON TETRACHLORIDE	8.4E+00	carcinogenic effects	8.4E+00	1.8E+01	8.8E+01	1.1E+03
*CHLORDANE	2.1E+01	carcinogenic effects	2.1E+01	2.6E+02	1.3E+03	NA
CHLOROANILINE, p-	1.6E+03	noncarcinogenic effects	-	1.6E+03	8.0E+03	NA
CHLOROBENZENE	6.8E+02	saturation limit	-	1.2E+03	6.2E+03	6.8E+02
CHLOROETHANE	2.8E+02	carcinogenic effects	2.8E+02	4.2E+04	2.1E+05	1.6E+03
*CHLOROFORM	2.9E+01	noncarcinogenic effects	8.3E+01	2.9E+01	1.4E+02	2.9E+03
CHLOROMETHANE	1.1E+02	carcinogenic effects	1.1E+02	1.3E+03	6.4E+03	4.1E+03
CHLOROPHENOL, 2-	5.3E+02	noncarcinogenic effects	-	5.3E+02	2.6E+03	5.5E+04
CHROMIUM (Total)	-	-	-	-	-	NA
CHROMIUM III	1.2E+06	noncarcinogenic effects	-	1.2E+06	5.8E+06	NA
*CHROMIUM VI	1.8E+00	carcinogenic effects	1.8E+00	2.3E+03	1.2E+04	NA
*CHRYSENE	1.5E+02	carcinogenic effects	1.5E+02	-	-	NA

TABLE K-3. DIRECT-EXPOSURE SCREENING LEVELS
CONSTRUCTION/TRENCH WORKER EXPOSURE SCENARIO

CHEMICAL	Final Screening Level (mg/kg)	Basis	Carcinogens (Risk = 10^{-6}) (mg/kg)	Noncarcinogens HQ = 0.2 (mg/kg)	Noncarcinogens (HQ = 1.0) (mg/kg)	Saturation (mg/kg)
COBALT	9.4E+01	carcinogenic effects	9.4E+01	1.0E+02	5.2E+02	NA
COPPER	3.1E+04	noncarcinogenic effects	-	3.1E+04	1.5E+05	NA
CYANIDE (Free)	8.2E+03	noncarcinogenic effects	-	8.2E+03	4.1E+04	NA
*DIBENZO(a,h)ANTHTRACENE	4.3E+00	carcinogenic effects	4.3E+00	-	-	NA
*DIBROMOCHLOROMETHANE	8.6E+01	carcinogenic effects	8.6E+01	3.2E+03	1.6E+04	NA
*1,2-DIBROMO-3-CHLOROPROPANE	1.6E+00	carcinogenic effects	1.6E+00	1.3E+01	6.4E+01	3.3E+02
*DIBROMOETHANE, 1,2-	5.8E+00	noncarcinogenic effects	7.4E+00	5.8E+00	2.9E+01	NA
DICHLOROBENZENE, 1,2-	6.0E+02	saturation limit	-	9.1E+03	4.6E+04	6.0E+02
DICHLOROBENZENE, 1,3-	1.3E+02	noncarcinogenic effects	-	1.3E+02	6.7E+02	6.0E+02
*DICHLOROBENZENE, 1,4-	2.0E+02	carcinogenic effects	2.0E+02	4.0E+03	2.0E+04	NA
*DICHLOROBENZIDINE, 3,3-	1.7E+01	carcinogenic effects	1.7E+01	-	-	NA
*DICHLORODIPHENYLDICHLOROETHANE (DDD)	1.2E+02	carcinogenic effects	1.2E+02	-	-	NA
*DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	8.7E+01	carcinogenic effects	8.7E+01	-	-	NA
*DICHLORODIPHENYLTRICHLOROETHANE (DDT)	8.7E+01	carcinogenic effects	8.7E+01	3.0E+02	1.5E+03	NA
*DICHLOROETHANE, 1,1-	2.6E+02	carcinogenic effects	2.6E+02	4.1E+03	2.0E+04	1.7E+03
*DICHLOROETHANE, 1,2-	3.3E+01	carcinogenic effects	3.3E+01	6.9E+01	3.4E+02	1.8E+03
DICHLOROETHYLENE, 1,1-	1.0E+03	noncarcinogenic effects	-	1.0E+03	5.0E+03	1.5E+03
DICHLOROETHYLENE, Cis 1,2-	3.5E+02	noncarcinogenic effects	-	3.5E+02	1.8E+03	1.2E+03
DICHLOROETHYLENE, Trans 1,2-	5.7E+02	noncarcinogenic effects	-	5.7E+02	2.8E+03	3.1E+03
DICHLOROPHENOL, 2,4-	1.2E+03	noncarcinogenic effects	-	1.2E+03	6.0E+03	NA
*DICHLOROPROPANE, 1,2-	4.7E+01	noncarcinogenic effects	5.9E+01	4.7E+01	2.4E+02	1.1E+03
*DICHLOROPROPENE, 1,3-	2.0E+01	carcinogenic effects	2.0E+01	1.3E+02	6.6E+02	1.4E+03
*DIELDRIN	1.2E+00	carcinogenic effects	1.2E+00	2.0E+01	1.0E+02	NA
DIETHYLPHTHALATE	3.2E+05	noncarcinogenic effects	-	3.2E+05	1.6E+06	NA
DIMETHYLPHTHALATE	4.0E+06	noncarcinogenic effects	-	4.0E+06	2.0E+07	NA
DIMETHYLPHENOL, 2,4-	4.9E+03	noncarcinogenic effects	-	4.9E+03	2.5E+04	NA
DINITROPHENOL, 2,4-	8.0E+02	noncarcinogenic effects	-	8.0E+02	4.0E+03	NA
*DINITROTOLUENE, 2,4-	6.4E+01	carcinogenic effects	6.4E+01	8.0E+02	4.0E+03	NA
*1,4 DIOXANE	7.4E+02	carcinogenic effects	7.4E+02	-	-	NA
*DIOXIN (2,3,7,8-TCDD)	2.3E-04	carcinogenic effects	2.3E-04	-	-	NA
ENDOSULFAN	2.4E+03	noncarcinogenic effects	-	2.4E+03	1.2E+04	NA
ENDRIN	1.2E+02	noncarcinogenic effects	-	1.2E+02	6.0E+02	NA
ETHYLBENZENE	4.0E+02	saturation limit	8.0E+02	1.6E+04	7.9E+04	4.0E+02
FLUORANTHENE	1.4E+04	noncarcinogenic effects	-	1.4E+04	7.0E+04	NA
FLUORENE	2.6E+04	noncarcinogenic effects	-	2.6E+04	1.3E+05	NA
*HEPTACHLOR	4.9E+00	carcinogenic effects	4.9E+00	2.0E+02	1.0E+03	NA

TABLE K-3. DIRECT-EXPOSURE SCREENING LEVELS
CONSTRUCTION/TRENCH WORKER EXPOSURE SCENARIO

CHEMICAL	Final Screening Level (mg/kg)	Basis	Carcinogens (Risk = 10^{-6}) (mg/kg)	Noncarcinogens HQ = 0.2 (mg/kg)	Noncarcinogens (HQ = 1.0) (mg/kg)	Saturation (mg/kg)
*HEPTACHLOR EPOXIDE	3.6E+00	carcinogenic effects	3.6E+00	5.2E+00	2.6E+01	NA
*HEXACHLOROBENZENE	1.1E+01	carcinogenic effects	1.1E+01	3.2E+02	1.6E+03	NA
HEXACHLOROBUTADIENE	1.2E+02	noncarcinogenic effects	2.6E+02	1.2E+02	6.0E+02	NA
*HEXACHLOROCYCLOHEXANE (gamma) LINDANE	2.5E+01	carcinogenic effects	2.5E+01	1.7E+02	8.3E+02	NA
*HEXACHLOROETHANE	4.0E+02	noncarcinogenic effects	5.1E+02	4.0E+02	2.0E+03	NA
*INDENO(1,2,3-cd)PYRENE	1.5E+01	carcinogenic effects	1.5E+01	-	-	NA
LEAD	7.5E+02	=occupational	-	-	-	NA
MERCURY	1.1E+02	noncarcinogenic effects	-	1.1E+02	5.7E+02	NA
METHOXYCHLOR	2.0E+03	noncarcinogenic effects	-	2.0E+03	1.0E+04	NA
*METHYLENE CHLORIDE	3.8E+02	carcinogenic effects	3.8E+02	1.7E+04	8.5E+04	2.4E+03
METHYL ETHYL KETONE	3.4E+04	saturation limit	-	6.2E+04	3.1E+05	3.4E+04
METHYL ISOBUTYL KETONE	6.5E+03	noncarcinogenic effects	-	6.5E+03	3.3E+04	1.7E+04
METHYL MERCURY	4.1E+01	noncarcinogenic effects	-	4.1E+01	2.0E+02	NA
METHYLNAPHTHALENE (total 1- & 2-)	1.3E+04	noncarcinogenic effects	-	1.3E+04	6.4E+04	NA
*METHYL TERT BUTYL ETHER	2.8E+03	carcinogenic effects	2.8E+03	4.7E+04	2.4E+05	2.1E+04
MOLYBDENUM	3.9E+03	noncarcinogenic effects	-	3.9E+03	1.9E+04	NA
NAPHTHALENE	4.6E+02	noncarcinogenic effects	-	4.6E+02	2.3E+03	NA
*NICKEL	1.0E+03	carcinogenic effects	1.0E+03	1.5E+04	7.7E+04	NA
*PENTACHLOROPHENOL	1.5E+02	carcinogenic effects	1.5E+02	7.1E+03	3.5E+04	NA
PERCHLORATE	7.7E+01	noncarcinogenic effects	-	7.7E+01	3.9E+02	NA
PHENANTHRENE	2.6E+04	=fluorene	-	2.6E+04	1.3E+05	NA
PHENOL	2.4E+05	noncarcinogenic effects	-	2.4E+05	1.2E+06	NA
*POLYCHLORINATED BIPHENYLS (PCBs)	6.7E+00	noncarcinogenic effects	8.4E+00	6.7E+00	3.4E+01	NA
PYRENE	2.3E+04	noncarcinogenic effects	-	2.3E+04	1.1E+05	NA
SELENIUM	3.9E+03	noncarcinogenic effects	-	3.9E+03	1.9E+04	NA
SILVER	3.9E+03	noncarcinogenic effects	-	3.9E+03	1.9E+04	NA
STYRENE	1.5E+03	saturation limit	-	3.7E+04	1.9E+05	1.5E+03
tert-BUTYL ALCOHOL	1.3E+04	carcinogenic effects	1.3E+04	-	-	3.2E+05
TETRACHLOROETHANE, 1,1,1,2-	2.8E+02	carcinogenic effects	2.8E+02	4.3E+03	2.2E+04	2.0E+03
*TETRACHLOROETHANE, 1,1,2,2-	3.4E+01	carcinogenic effects	3.4E+01	8.7E+03	4.3E+04	2.0E+03
*TETRACHLOROETHYLENE	3.7E+01	carcinogenic effects	3.7E+01	3.2E+03	1.6E+04	2.3E+02
THALLIUM	5.1E+01	noncarcinogenic effects	-	5.1E+01	2.6E+02	NA
TOLUENE	6.5E+02	saturation limit	-	5.3E+03	2.7E+04	6.5E+02
TOXAPHENE	1.7E+01	carcinogenic effects	1.7E+01	-	-	NA
TPH (gasolines)	2.3E+04	=pyrene	-	2.3E+04	1.1E+05	NA
TPH (middle distillates)	2.3E+04	=pyrene	-	2.3E+04	1.1E+05	NA

TABLE K-3. DIRECT-EXPOSURE SCREENING LEVELS
CONSTRUCTION/TRENCH WORKER EXPOSURE SCENARIO

CHEMICAL	Final Screening Level (mg/kg)	Basis	Carcinogens (Risk = 10^{-6}) (mg/kg)	Noncarcinogens HQ = 0.2 (mg/kg)	Noncarcinogens (HQ = 1.0) (mg/kg)	Saturation (mg/kg)
TPH (residual fuels)	2.3E+04	=pyrene	-	2.3E+04	1.1E+05	NA
*TRICHLOROBENZENE, 1,2,4-	6.2E+03	noncarcinogenic effects	1.1E+04	6.2E+03	3.1E+04	NA
TRICHLOROETHANE, 1,1,1-	1.2E+03	saturation limit	-	1.7E+03	8.7E+03	1.2E+03
*TRICHLOROETHANE, 1,1,2-	6.3E+01	carcinogenic effects	6.3E+01	3.0E+02	1.5E+03	1.8E+03
*TRICHLOROETHYLENE	1.5E+02	noncarcinogenic effects	2.6E+02	1.5E+02	7.4E+02	1.3E+03
TRICHLOROPHENOL, 2,4,5-	1.9E+04	noncarcinogenic effects	-	1.9E+04	9.3E+04	NA
*TRICHLOROPHENOL, 2,4,6-	2.9E+02	carcinogenic effects	2.9E+02	-	-	NA
VANADIUM	5.4E+03	noncarcinogenic effects	-	5.4E+03	2.7E+04	NA
*VINYL CHLORIDE	2.4E+00	carcinogenic effects	2.4E+00	-	-	1.2E+03
XYLENES	4.2E+02	saturation limit	-	2.2E+03	1.1E+04	4.2E+02
ZINC	2.3E+05	noncarcinogenic effects	-	2.3E+05	1.2E+06	NA

Primary source: USEPA Region IX Preliminary Remediation Goals (PRGs, USEPA 2002), modified as noted below. See text for discussion.

Notes:

See text for equations and assumptions used in models.

Final screening level is lowest of individual screening levels for carcinogenic effects and noncarcinogenic effects (based on HQ=0.2) or screening level for construction/trench workers if lower (see Table K-3). Saturation limit used as upper limit for volatile organic compounds that are liquid at ambient conditions (see text).

Carcinogens: Based on target cancer risk of 10^{-6}; modified with respct to CalEPA/OEHHA slope factors when available (marked by "*"). Screening levels for PCBs based on updated USEPA slope factors as presented in USEPA Region IX Preliminary Remediation Goals document (USEPA 2002).

Noncarcinogens: Adjusted to target hazard quotient of 0.2 for use in tables. Screening levels based on hazard quotient of 1.0 provided for reference.

Saturation: Theoretical soil saturation level in the absence of free product; calculated for volatile organic compounds that are liquids under ambient conditions (refer to Table J).

TPH:Total Petroleum Hydrocarbons. See text for discussion of different TPH categories. Direct exposure screening levels after Massachusetts Department of Environmental Protection (see text).

Residential screening level for lead from Interim Guidance for Evaluating Lead-Based Paint and Asbestos Containing Materials at Proposed School Sites (DTSC 2001).

TABLE L. TARGET ORGANS AND CHRONIC HEALTH EFFECTS

(For general reference only. May not be adequately comprehensive for some chemicals. Some noted effects may be insignificant. Refer to original documents for additional information.)

CHEMICAL PARAMETER	Target Organs And Health Effects													
	[a]Carcinogen	[b]Alimentary Tract	Cardiovascular	Developmental	Endocrine	Eye	Hematologic	Immune	Kidney	Nervous	Reproductive	Respiratory	[c]Skin	Other
ACENAPHTHENE	NA	5,6						4					4	
ACENAPHTHYLENE	D						5,6	4					4	= Fluorene
ACETONE	D	5,6					3		5,6					
ALDRIN	B2	6								3				
ANTHRACENE	D							4					4	
ANTIMONY	D		4			3,4	5,7				4	1,3,4		hair loss (4)
ARSENIC	A	3,4,6	1,2,4	1,2,3,4			3,4,6			1,2,3,4			1,3,4,6	
BARIUM	D		4				5		6		5			hypertension (6)
BENZENE	A	3		1,2,4			1,2,3,4	3		1,2				
BENZO(a)ANTHRACENE	B2							4					4	No chronic toxicity factors.
BENZO(b)FLUORANTHENE	B2							4					4	No chronic toxicity factors.
BENZO(k)FLUORANTHENE	B2							4					4	No chronic toxicity factors.
BENZO(g,h,i)PERYLENE	D	5,6					5,6	4	5,6				4	= Fluoranthene
BENZO(a)PYRENE	B2							4			3		4	No chronic toxicity factors.
BERYLLIUM	B1	1,6						2	1			1,2,3,4,6	3	
BIPHENYL, 1,1-	D	3							6	3				
BIS(2-CHLOROETHYL)ETHER	B2									4	4			No chronic toxicity factors.
BIS(2-CHLOROISOPROPYL)ETHER	NA						6							
BIS(2-ETHYLHEXYL)PHTHALATE	NA	7												No chronic toxicity factors.
BORON	D										4,6	5		
BROMODICHLOROMETHANE	B2	4							4,6					
BROMOFORM	B2	3,4,6							4	3,4				
BROMOMETHANE	D	3,5,6	3	1,2					3,4	1,2,3,4		1,2,3,4,5,6		
CADMIUM	B1/D								1,2,3,4,5,6			1,2,3,4		bone loss (1,4)
CARBON TETRACHLORIDE	B2	1,2,4,6		1,2					4	1,2				
CHLORDANE	B2	3,4,6						3,5		4				
CHLOROANILINE, p-	NA	3,6						5	3				3	
CHLOROBENZENE	D	1,2,3,5,6					3		1,2,3,4,5	3	1,2			
CHLOROETHANE	B	1,2		1,2,4										
CHLOROFORM	B2	1,2,3,4,6		1,2					1,2,3,4					
CHLOROMETHANE	C/D			4						3	3,4			
CHLOROPHENOL, 2-	D	1,4		1							1,5,6			
CHROMIUM (Total)	-													

TABLE L. TARGET ORGANS AND CHRONIC HEALTH EFFECTS
(For general reference only. May not be adequately comprehensive for some chemicals. Some noted effects may be insignificant. Refer to original documents for additional information.)

CHEMICAL PARAMETER	Target Organs And Health Effects													
	[a]Carcinogen	[b]Allimentary Tract	Cardiovascular	Developmental	Endocrine	Eye	Hematologic	Immune	Kidney	Nervous	Reproductive	Respiratory	[c]Skin	Other
CHROMIUM III	D												3	
CHROMIUM VI	A						1				2	1,6		
CHRYSENE	B2							4					4	No chronic toxicity factors.
COBALT	NA		3									3	3	hearing (3)
COPPER	D											1,4	3	
CYANIDE (Free)	D		1,4		1,4,6		4			1,5,6		4		
DIBENZO(a,h)ANTHTRACENE	B2							4					3,4	
DIBROMOCHLOROMETHANE	C	6												
1,2-DIBROMO-3-CHLOROPROPANE		1		1					3		1,3,4,5,6	1		
DIBROMOETHANE, 1,2-	B2			4							4	1,3		
DICHLOROBENZENE, 1,2-	D	3							3				3	
DICHLOROBENZENE, 1,3-	D	3							3					
DICHLOROBENZENE, 1,4-	C	1,2,3,6					3		1,2,3	1,2	6	1,2		
DICHLOROBENZIDINE, 3,3-	B2	3												No chronic toxicity factors.
DICHLORODIPHENYLDICHLOROETHANE (DDD)	B2													No chronic toxicity factors.
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	B2													No chronic toxicity factors.
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	B2	3,4,6								3	3			
DICHLOROETHANE, 1,1-	C	3							3,4,5,7					
DICHLOROETHANE, 1,2-	B2	1,2												
DICHLOROETHYLENE, 1,1-	C/D	1,2,3,4,5,6							3	4		4		
DICHLOROETHYLENE, Cis 1,2-	D	4					4,5,7							
DICHLOROETHYLENE, Trans 1,2-	D	4					5,6					4		
DICHLOROPHENOL, 2,4-	E							5						
DICHLOROPROPANE, 1,2-	B2	3					3					5		
DICHLOROPROPENE, 1,3-	B2	6										4		
DIELDRIN	B2	6								3				
DIETHYLPHTHALATE	D			6							4			
DIMETHYLPHTHALATE	D													
DIMETHYLPHENOL, 2,4-	NA						5,6			5,6				
DINITROPHENOL, 2,4-	NA					3,6				3				
DINITROTOLUENE, 2,4-	B2	6	3				3			3,6				
1,4 DIOXANE	B2	1,2	1,2						1,2					
DIOXIN (2,3,7,8-TCDD)	NA	1,2,4		1,2,4	1,2,4		1,2	4			1,2,4	1,2,4	4	No chronic toxicity factors.

TABLE L. TARGET ORGANS AND CHRONIC HEALTH EFFECTS
(For general reference only. May not be adequately comprehensive for some chemicals. Some noted effects may be insignificant. Refer to original documents for additional information.)

CHEMICAL PARAMETER	Target Organs And Health Effects													
	[a]Carcinogen	[b]Alimentary Tract	Cardiovascular	Developmental	Endocrine	Eye	Hematologic	Immune	Kidney	Nervous	Reproductive	Respiratory	[c]Skin	Other
ENDOSULFAN	NA	4		4,6			6	4	4,5,6	4,6	4			
ENDRIN	D	5,6		4					6	5				
ETHYLBENZENE	D	1,2,5,6		1,2,4,6	1,2				1,2,5,6	3	3		3	
FLUORANTHENE	D	5,6					5,6	4	5,6				4	
FLUORENE	D						5,6	4					4	
HEPTACHLOR	B2	6								7				
HEPTACHLOR EPOXIDE	B2	6								7				
HEXACHLOROBENZENE	B2	1,3,4,6			4		4	4	4	3,4	3			bones (4)
HEXACHLOROBUTADIENE	C	4							4				3	
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	NA	1,3,6							1,3,6					
HEXACHLOROETHANE	C	3,4							3,4,6					
INDENO(1,2,3-cd)PYRENE	B2							4					4	No chronic toxicity factors.
LEAD	B2	3,7	7	3,7			3,7	3,7	3,7	3,7	7			
MERCURY	D			4				1	1,3	1,2,3,5,6				
METHOXYCHLOR	D	3		6					3	3	3,5,6			
METHYLENE CHLORIDE	B2	3,6	1,2						3	1,2				
METHYL ETHYL KETONE	D			6							1,3			
METHYL ISOBUTYL KETONE	NA									7				
METHYL MERCURY	C			6						1,6				
METHYLNAPHTHALENE (total 1- & 2-)	C						5,6	4					4	= Fluorene
METHYL TERT BUTYL ETHER	NA	1,2,6				1,2			1,2,6					
MOLYBDENUM	D						6							
NAPHTHALENE	C					3	3	4				1,2,6	4	
NICKEL	A/D	1,6					1,2		6			1,2,3	3	
PENTACHLOROPHENOL	B2	1,3,4,6		1,4			4	4	3,6	3,4	1	3,4		
PERCHLORATE					8		3							
PHENANTHRENE	D						5,6	4					4	= Fluorene
PHENOL	D	1,2,3	1,2	4,6					1,2,3	1,2	5			
POLYCHLORINATED BIPHENYLS (PCBs)	B2	1,3,4		1,4	4	6	4	1,4,6			1,3,4		4	
PYRENE	D							4	5,6					
SELENIUM	D	1,2,3,6	1,2				6			1,2		1,3	3,4,6	Selenosis (4,6)
SILVER	D												3,4,6	
STYRENE	C	4,5,6					5,6			1,2,3,5,6		3	3	

TABLE L. TARGET ORGANS AND CHRONIC HEALTH EFFECTS
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CHEMICAL PARAMETER	Target Organs And Health Effects													
	[a]Carcinogen	[b]Alimentary Tract	Cardiovascular	Developmental	Endocrine	Eye	Hematologic	Immune	Kidney	Nervous	Reproductive	Respiratory	[c]Skin	Other
tert-BUTYL ALCOHOL														No chronic toxicity factors.
TETRACHLOROETHANE, 1,1,1,2-	C	6							6					
TETRACHLOROETHANE, 1,1,2,2-	C	3,4								3,4				
TETRACHLOROETHYLENE	NA	1,2,3,6							1,2,3					
THALLIUM	D	3	3			3	6			3,4	3,4		3	
TOLUENE	D	5,6		1,2,4					5,6	1,2,3,6	3	1,2,6		
TOXAPHENE	B2	4			4			4	4					
TPH (gasolines)	-													
TPH (middle distillates)	-													
TPH (residual fuels)	-													
TRICHLOROBENZENE, 1,2,4-	D				5,6									
TRICHLOROETHANE, 1,1,1-	D	3,7								1,2				
TRICHLOROETHANE, 1,1,2-	C	6					7						3	
TRICHLOROETHYLENE	B2	3,4,7		4,7		1,2	4	7	3,4,7	1,2,3,4				
TRICHLOROPHENOL, 2,4,5-	NA	1,3,5,6		1					3,5,6		1			
TRICHLOROPHENOL, 2,4,6-	B2	3												
VANADIUM	D	4							4			3,4		

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	[a]Carcinogen	[b]Alimentary Tract	Cardiovascular	Developmental	Endocrine	Eye	Hematologic	Immune	Kidney	Nervous	Reproductive	Respiratory	[c]Skin	Other
VINYL CHLORIDE	A	1,3,4,6		1,4			3,4	4		4	1,4		3	No chronic toxicity factors.
XYLENES	D									1,2,3,4,5,6		1,2		
ZINC	D		1		4		1,2,4,5,6					1		

Notes:

a. Carcinogen type from RWQCBCV 2001; ORNL 2001 (see classification below).

b. Includes gastro-intestinal tract, liver, spleen, gall bladder, etc.

c. Includes skin sensitization but not general dermatitus or defatting of skin.

Perchlorate: Chronic effects as summarized in California DHS Perchlorate Action Level supporting documemt (CalDHS 2001).

Carcinogen Classification

A: Human carcinogen

B: Probable human carcinogen (B1: limited human evidence; B2 Sufficient evidence in animals and inadequate or no evidence in humans)

C: Possible human carcinogen

D: Not classifiable as to human carcinogenicity

E: Evidence of noncarcinogenicity for humans

NA: Carcinogen classification information not available

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8. For additional online references, see also: Hazardous Substances (On-line) Database: U.S. National Library of Medicine, Toxicology Data Network, http://toxnet.nlm.nih.gov.