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Superfund

EPA Superfund Chemical Data Matrix

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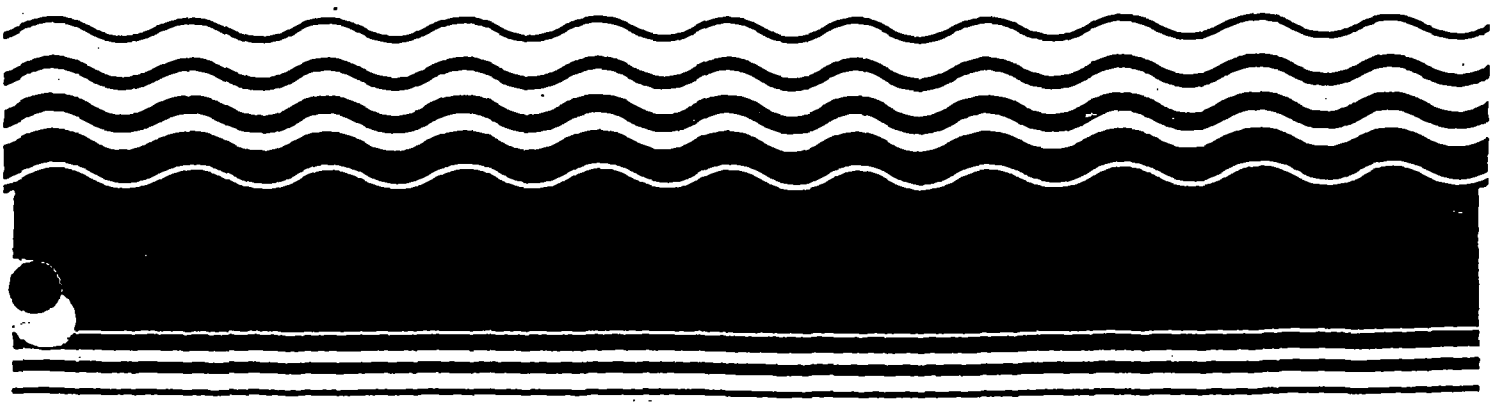

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Superfund Chemical Data Matrix

Office of Emergency and Remedial Response
U.S. Environmental Protection Agency
Washington, DC 20460

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SECTION 1
INTRODUCTION

The Superfund Chemical Data Matrix (SCDM) is a source for factor values and benchmark values applied when evaluating potential National Priorities List (NPL) sites using the Hazard Ranking System (HRS; 40 CFR Part 300, 55 *FR* 51583). The HRS assigns factor values for toxicity, gas migration potential, gas and ground water mobility, surface water persistence, and bioaccumulation potential based on the physical, chemical, and radiological properties of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substances present at a site. Hazardous substances, as defined for HRS purposes, are CERCLA hazardous substances plus CERCLA pollutants and contaminants. The HRS also assigns extra weight to targets with exposure levels to hazardous substances that are at or above benchmarks. These benchmarks include both risk-based screening concentrations and concentrations specified in regulatory limits for the hazardous substances present at a site for a particular migration pathway.

SCDM contains HRS factor values and benchmarks for hazardous substances that are frequently found at sites evaluated using the HRS, as well as the physical, chemical, and radiological data used to calculate those values. The raw data in SCDM are taken directly from literature sources or other databases or are calculated. HRS rules are then applied to the raw data to determine a factor value or benchmark.

Section 2 of this document explains how data are selected for inclusion in SCDM. Section 3 describes how some types of data (i.e., volatilization half-lives, distribution coefficients, and screening concentrations) are internally calculated using data in SCDM and methodologies from published literature or regulatory guidance documents. Section 4 describes how SCDM data, HRS factor values, and benchmark values are presented. The factor values and benchmark values are listed, substance by substance, in Appendix A. Appendix B-1 contains the HRS factor values and benchmark tables (organized by pathway) for nonradiological hazardous substances. Appendix B-2 contains similar tables for radionuclides, and Appendix C contains a cross-reference index of substance name synonyms.

1.1 DEFINITIONS

In addition to the definitions found in Section 1.1 of the HRS (55 *FR* 51585-51587), the following definitions are used in this document:

- **Cancer Risk Screening Concentrations**: Substance-specific intake concentrations that are based on a cancer slope factor and on estimates of a daily exposure level of a

substance. They are used in the HRS as benchmarks in evaluating target populations actually exposed to carcinogenic substances (see also the definitions of "Slope Factor" and "Screening Concentration" in Section 1.1 of the HRS).

- **Reference Dose Screening Concentrations**: Substance-specific intake concentrations that are based on a noncancer reference dose (RfD) and estimates of a daily exposure level of a substance. They are used in the HRS as benchmarks in evaluating target populations actually exposed to noncarcinogenic substances (see also the definitions of "Reference Dose" and "Screening Concentration" in Section 1.1 of the HRS).

SECTION 2

SUPERFUND CHEMICAL DATA MATRIX DATA SELECTION METHODOLOGY

This section describes how the data available in specified literature sources and regulatory guidance documents are selected for inclusion in SCDM. Section 2.1 describes how to resolve ambiguities that arise in determining whether particular values apply to particular hazardous substances. Sections 2.2 through 2.9 specify the references used to obtain the data for SCDM and the methodologies used to extract the data. The criteria described in these sections were developed based on the type and quality of data available in the current SCDM references; they are not intended to apply to all data in general. As different compilations of data become available, different criteria may be considered.

2.1 HAZARDOUS SUBSTANCE IDENTITIES AND SCDM PROTOCOLS

Compiling data for SCDM requires determining which data reasonably apply to a hazardous substance. Data in the references cited in Sections 2.2 through 2.9 are sometimes available for classes and mixtures of hazardous substances, but not for the individual substances that make up that mixture. Thus, there may be questions concerning whether the hazardous substance identities in the references match the hazardous substance identities in SCDM. This section describes how ambiguities in assigning particular values to members of classes of hazardous substances in SCDM have been resolved.

SCDM contains generic values for the following classes of compounds (for chromium and chlordane, these generic values are used only when the specific oxidation state or isomer concentration is not adequately known):

- chromium (III and VI oxidation states)
- arsenic (III and V oxidation states)
- mercury (elemental and inorganic compounds)
- polychlorinated biphenyls (PCBs) (various congeners and Arochlors)
- endosulfans (I and II)
- chlordane (α and γ).

In general, if any member of these classes is present at a hazardous substance site, it is assumed that the most toxic, most persistent, or most bioaccumulative member of the class is present. In other words, from among the data given in the specified references for members of these classes,

SCDM contains those data resulting in the greatest HRS factor values (e.g., lowest LD_{50}, longest half-life, greatest bioaccumulation factor).

For chromium, if the oxidation state is known, the generic values are not used. For arsenic, SCDM contains data for the more mobile and toxic arsenic III species. For mercury, SCDM contains data for elemental and inorganic species. The oral RfD is for mercuric chloride and the inhalation RfD is for elemental mercury vapor. Vapor pressure and Henry's law constant are for the elemental form, while the distribution coefficient is for the (+2) species.

PCBs are represented solely as a class of compounds in SCDM, with a single value used regardless of the mixture of compounds identified at a site. For PCBs, chemical properties in SCDM are based on Arochlor 1254, which results in the most conservative bioaccumulation/ human food chain-based factor values for this group of compounds. Although the endosulfans I and II can be distinguished analytically, no data for either isomer by itself are available in the designated sources. All data in SCDM represent a mixture of endosulfan isomers. SCDM contains some data for the α and γ isomers of chlordane, but, for the most part, values represent a mixture of the isomers.

For the following classes of compounds, SCDM contains values for individual substances:

- dichlorobenzenes
- dinitrotoluenes
- hexachlorocyclohexanes
- xylenes.

If no data can be found in the specified references for an individual substance in the class but data are available for the generic class, SCDM assigns the generic value to that substance. These classes are all relatively small sets of isomers, which are likely to occur as mixtures. Furthermore, these classes are well defined in the sense that the generic class (e.g., xylenes) almost always refers to a mixture of all members of the class (*o*-, *m*-, and *p*-xylene). The expected similarity in chemical behavior for members of each class, as well as the likelihood that they will occur as mixtures, makes using data from mixtures reasonable.

SCDM also defines another class of compounds containing the following polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans:

- 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD)
- 1,2,3,7,8-pentachlorodibenzo-*p*-dioxin
- 1,2,3,4,7,8-hexachlorodibenzo-*p*-dioxin
- 1,2,3,6,7,8-hexachlorodibenzo-*p*-dioxin
- 1,2,3,7,8,9-hexachlorodibenzo-*p*-dioxin

- 1,2,3,4,6,7,8-heptachlorodibenzo-*p*-dioxin
- 2,3,7,8-tetrachlorodibenzofuran
- 1,2,3,7,8-pentachlorodibenzofuran
- 2,3,4,7,8-pentachlorodibenzofuran
- 1,2,3,4,7,8-hexachlorodibenzofuran
- 1,2,3,6,7,8-hexachlorodibenzofuran
- 1,2,3,7,8,9-hexachlorodibenzofuran
- 2,3,4,6,7,8-hexachlorodibenzofuran
- 1,2,3,4,6,7,8-heptachlorodibenzofuran
- 1,2,3,4,6,7,9-heptachlorodibenzofuran.

SCDM contains the cancer slope factor for 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) from the Health Effects Assessment Summary Tables (HEAST) (EPA, 1995d). For all other dioxins and dibenzofurans, the cancer slope for TCDD is multiplied by the *toxicity equivalence factor* (TEF) for each substance to give an estimated slope factor that is entered into SCDM for that substance. TEF values are obtained from Section 3, Table 2 of EPA's *Interim Procedures for Estimating Risks Associated with Mixtures of Chlorinated Dibenzo-*p*-Dioxins and Dibenzofurans (CDDs and CDFs) and 1989 Update*, (1989a, p. 12). All members of this class are assigned the weight of evidence for TCDD (B2).

For cadmium, the Integrated Risk Information System (IRIS) contains two RfD values: one for drinking water and one for dietary exposure. Since SCDM calculates RfD-based screening concentrations for both drinking water and dietary exposure, and only one RfD per substance can be entered into SCDM, SCDM uses the more conservative drinking water RfD for cadmium.

The HRS specifies that a human toxicity factor of 10,000 be assigned to asbestos and lead compounds. SCDM does this automatically within the data manager's computer code.

2.2 TOXICITY INFORMATION

2.2.1 Reference Dose (RfD)—Oral, Inhalation

SCDM uses data from the following references (listed in order of preference) for oral and inhalation RfD:

1. U.S. Environmental Protection Agency (EPA). 1996a. *Integrated Risk Information System (IRIS)*. Office of Research and Development, Cincinnati, OH.

2. U.S. Environmental Protection Agency (EPA). 1995d. *Health Effects Assessment Summary Tables (HEAST)*. EPA 5401R-95-036. Office of Research and Development, Washington, DC. NTIS PB95-921199.

SCDM prefers IRIS data over HEAST data. Inhalation data in IRIS are given as reference concentrations (RfCs) equivalent to dose rather than RfDs. RfCs are converted to RfDs by the following equation:

$$RfD_{inhal} = \frac{RfC \times IR \times AR}{BW \times 100} \quad (1)$$

where:

RfC = Reference concentration in air (mg/m^3)
IR = Inhalation rate (20 m^3/day)
AR = Absorption rate (%)
BW = Adult body weight (70 kg).

Using the default exposure assumptions listed above, Equation (1) may be simplified as:

$$RfD_{inhal}\ mg/kg\text{-}day = RfC_{inhal} \times AR \times 2.857 \times 10^{-3}\ . \quad (2)$$

Equation (2) is used to convert RfCs to RfDs for use in SCDM. If IRIS or HEAST does not provide an absorption rate, it is assumed to be 100 percent; this is consistent with the convention described in HEAST.

SCDM also contains interim or provisional reference dose values for certain hazardous substances for use in the Superfund site assessment program for compounds that do not have values in IRIS or HEAST. These values are identified by their datafile source, LIVECHEM, with data sources described in the LIVECHEM datafile comment field (not displayed on screen). Sources of human toxicity data in LIVECHEM are also given in:

Research Triangle Institute (RTI). 1996. *Chemical Properties for SCDM Development.* Prepared for U.S. EPA Office of Emergency and Remedial Response. Washington, DC.

2.2.2 LD_{50}—Oral, Dermal

SCDM uses data from the following references (listed in order of preference) for oral and dermal LD_{50}:

1. C-E Environmental, Inc. 1990. *The Identification of Health Effects Data for Chemicals Contained in the Clean Air Act Amendments: Final Report to Dr. John Vanderburg.* U.S. Environmental Protection Agency, Research Triangle Park, NC.

2. American Conference of Governmental Industrial Hygienists (ACGIH). 1991. *Documentation of the Threshold Limit Value and Biological Exposure Indices.* ACGIH, Cincinnati, OH.

3. National Institute for Occupational Safety and Health (NIOSH). 1995. *Registry of Toxic Effects of Chemical Substances (RTECS).* NIOSH, Cincinnati, OH.

SCDM contains the lowest value for any mammalian species by the specified route of exposure (i.e., oral or dermal) in controlled dose studies in laboratory animals. Human lethality data (i.e., data from suicide and worker poisonings) are not used due to the associated inaccuracy of the dosage estimates. Data from former Eastern Bloc countries (e.g., former Soviet Union) are not used due to the typically poor data quality. Only data for exposure durations <24 hours are used. If an LD_{50} value is not given, SCDM uses an LD_{LO} value: (1) if it is for the same exposure route, (2) if it has an exposure <24 hours, and (3) if it is reasonable relative to the other values (e.g., relative to chronic values) given for that substance and exposure route.

2.2.3 LC_{50}—Inhalation

SCDM uses data from the following references (listed in order of preference) for inhalation LC_{50}:

1. American Conference of Governmental Industrial Hygienists (ACGIH). 1991. *Documentation of the Threshold Limit Value and Biological Exposure Indices.* ACGIH, Cincinnati, OH.

2. National Institute for Occupational Safety and Health (NIOSH). 1995. *Registry of Toxic Effects of Chemical Substances (RTECS).* NIOSH, Cincinnati, OH.

SCDM contains the lowest value for any mammalian species by inhalation in controlled dose studies in laboratory animals. Human lethality data (i.e., data from suicide and worker poisonings) are not used due to the associated inaccuracy of the dosage estimates. Data from former Eastern Bloc countries (e.g., former Soviet Union) are not used due to the typically poor data quality. Only data for exposure durations <24 hours are used. If an LC_{50} value is not given, SCDM uses an LC_{LO} value: (1) if it is for the same exposure route, (2) if it has an exposure <24 hours, and (3) if it is reasonable relative to the other values (e.g., relative to chronic values) given for that substance and exposure route.

2.3 CARCINOGENICITY INFORMATION

2.3.1 Cancer Slope Factor (SF) and Weight of Evidence—Oral, Inhalation

SCDM uses data from the following references (listed in order of preference) for oral and inhalation cancer slope factors and the associated weights of evidence:

1. U.S. Environmental Protection Agency (EPA). 1996a. *Integrated Risk Information System (IRIS)*. Office of Research and Development, Cincinnati, OH.

2. U.S. Environmental Protection Agency (EPA). 1995d. *Health Effects Assessment Summary Tables (HEAST)*. EPA-540/R-95-036. Office of Research and Development, Washington, DC. NTIS PB95-921199.

SCDM prefers IRIS values for nonradioactive hazardous substances over HEAST values. For radioactive hazardous substances, SCDM contains values from HEAST.

Data in IRIS for inhalation are given as unit risk factors (URFs), which are related to cancer slope factors by the following equation (used for nonradionuclides only):

$$SF_{inhal} = \frac{URF \times BW \times CF \times 100}{IR \times AR} \quad (3)$$

where:

SF = Cancer slope factor $(mg/kg\text{-}day)^{-1}$
URF = Unit risk factor $(\mu g/m^3)^{-1}$
BW = Adult body weight (70 kg)
CF = Conversion factor (1,000 µg/mg)
IR = Inhalation rate (20 m^3/day)
AR = Absorption rate (%).

Using the assumptions listed above reduces Equation (3) to the following equation:

$$SF_{inhal}\ (mg/kg\text{-}day)^{-1} = \frac{URF \times 3.50 \times 10^5}{AR} \quad (4)$$

Equation (4) is used to convert unit risk to cancer slope factors for use in SCDM. If IRIS or HEAST does not provide an absorption rate, it is assumed to be 100 percent; this is consistent with the convention described in HEAST.

SCDM uses the weight of evidence from the same reference that provides the corresponding slope factor. Typically, IRIS reports a single weight of evidence; this value is recorded separately as both the oral weight of evidence and the inhalation weight of evidence. In HEAST, there are usually two values listed, one for oral and one for inhalation. Usually these values are identical; SCDM records each value separately.

SCDM also contains interim or provisional cancer slope factors for certain hazardous substances for use in the Superfund site assessment program for compounds that do not have values in IRIS or HEAST. These values are identified by their datafile source, LIVECHEM, with data sources given in the LIVECHEM datafile comment field (not displayed on screen). Sources of human toxicity data in LIVECHEM are also given in:

Research Triangle Institute (RTI). 1996. *Chemical Properties for SCDM Development.* Prepared for U.S. EPA Office of Emergency and Remedial Response, Washington, DC.

2.3.2 ED_{10} and Weight of Evidence—Oral, Inhalation

SCDM uses data from the following references (listed in order of preference) for oral and inhalation ED_{10} and the associated weights of evidence:

1. U.S. Environmental Protection Agency (EPA). 1988. *Methodology for Evaluating Potential Carcinogenicity in Support of Reportable Quantity Adjustments Pursuant to CERCLA Section 102* (EPA_ED10). Office of Health and Environmental Assessment, Washington, DC (EPA/600/8-89/053).

2. U.S. Environmental Protection Agency (EPA). 1986. *Superfund Public Health Evaluation Manual (SPHEM).* Office of Emergency and Remedial Response, Washington, DC (EPA/540/1-86/060).

A single potency factor ($1/ED_{10}$) is reported for oral and inhalation exposure routes in EPA (1988). The reported value is the reciprocal of ED_{10}. Therefore, the oral and inhalation ED_{10} values contained in SCDM are calculated by taking the reciprocal of the potency factor (i.e., ED_{10} = 1/potency factor).

2.4 MOBILITY INFORMATION

2.4.1 Vapor Pressure

SCDM generally uses data from the following references (listed in order of preference) for vapor pressure:

1. U.S. Environmental Protection Agency (EPA). 1995c. FATE Database. Office of Research and Development, Athens, GA.

2. Syracuse Research Corporation (SRC). 1995. CHEMFATE Database. SRC, Syracuse, NY.

3. CHEMCALC values, calculated according to procedures in Lyman et al. (1990), as described in Research Triangle Institute (RTI). 1996. *Chemical Properties for SCDM Development.* Prepared for U.S. EPA Office of Emergency and Remedial Response, Washington, DC.

4. GSC Corporation. 1990. CHEMEST Database. Developed for U.S. EPA Office of Pesticides and Toxic Substances, Washington, DC.

SCDM only uses measured values from the FATE database. If an estimated or calculated value is presented in FATE, that value is not used in SCDM. Within CHEMFATE, the recommended value is preferred. If more than one recommended value is available, SCDM uses the highest value. If a recommended value is not available, SCDM uses a value measured at 25 °C. If more than one value measured at 25 °C is available, SCDM uses the highest one. If values are not available for measurements at 25 °C, values determined within the range of 20 to 30 °C are used. If there is more than one value measured at the same temperature and none is recommended, SCDM uses the highest value. If no temperature is specified in CHEMFATE for all vapor pressure measurements for a substance, SCDM uses the highest value.

If vapor pressure values are not available in either FATE or CHEMFATE, the procedures described in Lyman et al. (1990) are used to calculate vapor pressure, which is entered in the CHEMCALC datafile. RTI (1996) describes the use of these procedures for specific hazardous substances found in SCDM. If these procedures are not applicable, a CHEMEST estimated value is used.

The above heirarchy is superseded by values in the LIVECHEM datafile when a value selected by the heirarchy is suspect or a measured value is not available in the SCDM data sources. For a particular chemical, suspect values are identified by comparison with other vapor pressure values in SCDM data sources or other sources of chemical property data. The

LIVECHEM datafile includes a comment field (not displayed onscreen by SCDM-DM) listing the source of each LIVECHEM value. RTI (1996) describes the selection of LIVECHEM values and documents their sources.

For nonmetallic substances, if vapor pressure is not available, a normal boiling point is obtained from the *Handbook of Chemistry and Physics* (Lide, 1994) and entered into BASEDATA. If a boiling point is not available from the handbook, a value from the Merck Index (Merck, 1989) is used. If the boiling point at 1 atmosphere (atm) is <25 °C, a default vapor pressure of 760 Torr is entered into LIVECHEM (i.e., the compound is assumed to be a gas at 25 °C).

If no vapor pressure is available for a substance and the normal boiling point is ≥25 °C, SCDM assumes that the substance is in a particulate rather than a gaseous form, and no default vapor pressure value is assigned. This assumption is made because the absence of a vapor pressure value often reflects an extremely low and difficult-to-measure (under standard conditions) value for nongaseous substances.

2.4.2 Henry's Law Constant

SCDM uses data from the following references (listed in order of preference) for Henry's law constant (HLC):

1. U.S. Environmental Protection Agency (EPA). 1995c. FATE Database. Office of Research and Development, Athens, GA.

2. Syracuse Research Corporation (SRC). 1995. CHEMFATE Database. SRC, Syracuse, NY.

3. CHEMCALC values, calculated according to procedures in Lyman et al. (1990) (no values available for June 1996 version).

4. GSC Corporation. 1990. CHEMEST Database. Developed for U.S. EPA Office of Pesticides and Toxic Substances, Washington, DC.

SCDM uses only measured values from the FATE database. If an estimated or calculated value is presented in FATE, that value is not used in SCDM. Within CHEMFATE, the recommended value is preferred. If more than one recommended value is available, SCDM uses the highest value. If a recommended value is not available, SCDM uses a value measured at 25 °C. If more than one value measured at 25 °C is available, SCDM uses the highest one. If values are not available for measurements at 25 °C, values determined within the range of 20 to 30 °C are used. If more than one value measured at the same temperature is available and none

is recommended, SCDM uses the highest value. If temperature is specified in CHEMFATE for all HLC measurements for a substance, SCDM uses the highest value.

If HLC values are not available in either FATE or CHEMFATE, the procedures described in Lyman et al. (1990) are used to calculate an HLC. If these procedures do not apply, a CHEMEST estimated value is used.

The above heirarchy is superseded by values in the LIVECHEM datafile when a value selected by the heirarchy is suspect or a measured value is not available in the SCDM data sources. For a particular chemical, suspect values are identified by comparison with other Henry's law values in SCDM data sources or other sources of chemical property data. The LIVECHEM datafile includes a comment field (not displayed on screen by SCDM-DM) listing the source of each LIVECHEM value. RTI (1996) describes the selection of LIVECHEM values and documents their sources.

2.4.3 Water Solubility—Nonmetallic Compounds

SCDM uses data from the following references (listed in order of preference) for water solubility for nonmetallic compounds:

1. U.S. Environmental Protection Agency (EPA). 1995c. FATE Database. Office of Research and Development, Athens, GA.

2. Syracuse Research Corporation (SRC). 1995. CHEMFATE Database. SRC, Syracuse, NY.

3. CHEMCALC values, calculated according to procedures in Lyman et al. (1990), as described in Research Triangle Institute (RTI). 1996. *Chemical Properties for SCDM Development.* Prepared for U.S. EPA Office of Emergency and Remedial Response, Washington, DC.

4. GSC Corporation. 1990. CHEMEST Database. Developed for U.S. EPA Office of Pesticides and Toxic Substances, Washington, DC.

SCDM uses only measured values from the FATE database. If an estimated or calculated value is presented in FATE, that value is not used in SCDM. Within CHEMFATE, the recommended value is preferred. If more than one recommended value is available, SCDM uses the highest value. If a recommended value is not available, SCDM uses a value measured at 25 °C. If more than one value measured at 25 °C is available, SCDM uses the highest one. If values are not available for measurements at 25 °C, values determined within the range of 20 to 30 °C are used. If more than one value measured at the same temperature is available and none

is recommended, SCDM uses the highest value. If no temperature is specified in CHEMFATE for all water solubility measurements for a substance, SCDM uses the highest value.

If water solubility values are not available in either FATE or CHEMFATE, the procedures described in Lyman et al. (1990) are used to calculate water solubility. RTI (1996) describes the use of these procedures for specific hazardous substances found in SCDM. If these procedures do not apply, a CHEMEST estimated value is used.

The above heirarchy is superseded by values in the LIVECHEM datafile when a value selected by the heirarchy is suspect or a measured value is not available in the SCDM data sources. For a particular chemical, suspect values are identified by comparison with other water solubility values in SCDM data sources or other sources of chemical property data. The LIVECHEM datafile includes a comment field (not displayed onscreen by SCDM-DM) listing the source of each LIVECHEM value. RTI (1996) describes the selection of LIVECHEM values and documents their sources.

2.4.4 Water Solubility—Metals and Metalloids

SCDM uses data from the following references (in order of preference) for water solubility of metals and metalloid compounds:

1. Weast, R.C. 1981. *Handbook of Chemistry and Physics*. 62nd ed. CRC Press, Cleveland, OH. pp. B-73–B-166.

2. Dean, J.A. (Ed.). 1985. *Lange's Handbook of Chemistry*, 13th ed. McGraw-Hill, New York. pp. 5-7–5-12.

SCDM contains geometric mean water solubility values that are defined in the HRS as the geometric mean of the highest and the lowest water solubility values available for any inorganic compound containing the metal or metalloid. Highest and lowest compound solubility values were taken directly from Weast (1981), except for the following low-solubility compounds:

- copper (II) sulfide
- lead (II) sulfide
- mercury (II) sulfide
- nickel (II) sulfide
- silver (I) sulfide
- thallium (III) hydroxide
- thorium (IV) hydroxide
- uranyl hydroxide
- zinc (II) sulfide.

Solubility values for these compounds were calculated using the standard expression for the solubility product (K_{sp}) for each compound and the K_{sp} value taken from Dean (1985).

2.4.5 Soil/Water Distribution Coefficient (K_d)

SCDM uses data from the following references (listed in order of preference) for soil/water distribution coefficients (K_d) values for metals:

1. U.S. Envrionmental Protection Agency (EPA). 1996b. *Soil Screening Guidance: Technical Background Document.* EPA/540/R95/128. Office of Emergency and Remedial Response, Washington, DC. NTIS PB96-963502.

2. Baes III, C.F., R.D. Sharp, A.L. Sjoreen, and R.W. Shor. 1984. *A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture.* Oak Ridge National Laboratory, Oak Ridge, TN. ORNL-5786.

For metals, SCDM uses K_d values contained in EPA (1996b) that were estimated for the Soil Screening Guidance using the MINTEQ aqueous speciation geochemical model or, when the required thermodynamic data are not available in the MINTEQ databases, using empirical pH-dependent relationships developed by EPA's Office of Research and Development Laboratory in Athens, Georgia. Values corresponding to a typical subsurface pH (6.8) are used in SCDM. The derivation of these metal K_d values is described in EPA (1996b).

For organic hazardous substances, SCDM uses K_d values calculated using the following relationship between K_d and K_{oc}:

$$K_d = K_{oc} \times f_{oc} \quad (5)$$

where:

K_{oc} = Soil organic carbon/water partition coefficient (mL/g)
f_{oc} = Fraction of organic carbon in soil (g carbon/g soil).

The f_{oc} is assumed to be 0.002 g/g, which is typical of subsurface soils. This f_{oc} and the K_{oc} values used in SCDM are consistent with those used for the Soil Screening Guidance. SCDM datafiles (SSG_KD and RTI_ION) contain K_d values calculated from Soil Screening Guidance K_{oc} values for volatile organic compounds, certain chlorinated pesticides, and ionizing organic compounds. K_{oc} values for organic hazardous substances that ionize under subsurface pH conditions (i.e., pH = 4.9 to 8.0) are derived by applying a theoretical relationship that accounts for both the neutral and the ionized fractions of the compound. Values corresponding to a typical subsurface pH (pH = 6.8) are used in SCDM. The methodology used to develop these K_{oc} values is described in *Soil Screening Guidance: Technical Background Document.* K_d values for other organic compounds are calculated directly from Log K_{ow} values in SCDM, as described in

Section 3.2. RTI (1996) provides additional detail on the selection of soil/water distribution coefficients for organic compounds in SCDM.

2.5 PERSISTENCE INFORMATION

2.5.1 Hydrolysis, Biodegradation, and Photolysis Half-Lives

SCDM uses data from the following references (listed in order of preference) for hydrolysis, biodegradation, and photolysis half-lives:

1. U.S. Environmental Protection Agency (EPA). 1995c. FATE Database. Office of Research and Development, Athens, GA.

2. Howard, P.H., W.F. Jarvis, W.M. Meylan, and E.M. Michalenko. 1991. *Handbook of Environmental Degradation Rates* (FATERATE). Lewis Publishers/CRC Press, Boca Raton, FL.

3. Syracuse Research Corporation (SRC). 1995. CHEMFATE Database. SRC, Syracuse, NY.

SCDM only uses measured values from the FATE Database. If estimated or calculated values are presented in FATE, those values are not used in SCDM. SCDM only uses values listed as "first-order" in Howard et al. (1991). If high and low values are given, the highest values are used. Within CHEMFATE, the recommended values are preferred. If more than one recommended value is available, the highest is selected. If a recommended value is not available, SCDM uses a value measured at 25 °C. If more than one value measured at 25 °C is available, the highest is selected. If values are not available for measurements at 25 °C, values determined within the range of 20 to 30 °C are used. If there is more than one value measured at the same temperature and none is recommended, SCDM uses the highest value. If no half-life value is provided in CHEMFATE, the half-life used in SCDM is calculated based on the percent change over time by assuming a first-order rate law.

2.5.2 Radioactive Half-Life

SCDM uses data from the following reference for radioactive half-life:

International Commission on Radiological Protection (ICRP). 1983. *Radionuclide Transformations: Energy and Intensity of Emissions*. ICRP Publication No. 38. Pergamon Press, New York.

If more than one value is given for a single decay mode, SCDM uses the highest value. If values are given for more than one decay mode, the half-life of the isotope is computed from the values for all decay modes according to the following formula:

$$t_{1/2} = 1/(1/t_1 + 1/t_2 \ldots + 1/t_n) \quad (6)$$

where:

$t_{1/2}$ = Half-life of the isotope
t_1 = Value given for the first decay mode
t_2 = Value given for the second decay mode
t_n = Value given for the n-th decay mode.

2.6 BIOACCUMULATION POTENTIAL INFORMATION

2.6.1 Bioconcentration Factor—Freshwater, Saltwater

SCDM uses data from the following references (listed in order of preference) for freshwater and saltwater bioconcentration factors (BCFs):

1. Versar, Inc. 1990. *Issue Paper: Bioaccumulation Potential Based on Ambient Water Quality Criteria Documents* (VER_BCF). Prepared for U.S. EPA Office of Emergency and Remedial Response, Washington, DC. Contract No. 68-W8-0098.

2. U.S. Environmental Protection Agency (EPA). 1995a. Aquatic Information Retrieval (AQUIRE) Database. Environmental Research Laboratory, Duluth, MN.

SCDM contains the highest measured value from the Versar (1990) document in preference to an estimated value from the same document. If no value is reported in Versar (1990), the highest value from AQUIRE is used. All values where no environment (i.e., saltwater or freshwater) is given but that list NaCl as a control are considered as freshwater values.

SCDM uses the highest value from the following aquatic organisms to establish human food chain threat BCF values (this list includes only aquatic human food chain organisms in the cited references and is not meant to be a complete list of aquatic human food chain organisms):

- American or Virginia oyster
- Asiatic clam
- Atlantic salmon
- Atlantic silverside
- black crappie
- black bullhead

- black mussel
- blue crab
- bluegill
- brook trout
- brown trout
- channel catfish
- clam
- common bay mussel
- common mirror colored carp
- common shrimp
- crayfish
- dungeness or edible crab
- giant gourami
- gulf toadfish
- kiyi
- lake trout (siscowet)
- lake whitefish
- mangrove snapper
- Manila littleneck clam
- mussel
- northern pike
- northern anchovy
- pilchard sardine
- pinfish
- pink salmon
- rainbow trout
- red swamp crayfish
- rock bass
- sauger
- shore crab
- spot
- striped bass
- striped mullet
- swan mussel
- tong sole
- topmouth gudgeon (golden shiner)
- white mullet
- white sand mussel

Nonhuman food chain aquatic organisms are not used for the food chain BCF. The highest value from *any* aquatic organism mentioned in each reference is used to establish environmental threat BCF values, using the same order of preference described above.

2.6.2 Octanol/Water Partition Coefficient (Log K_{ow})

For *n*-octanol/water partition coefficient (K_{ow}), SCDM uses Log K_{ow} (also referred to as Log P) data from the following references (listed in order of preference):

1. Research Triangle Institute (RTI). 1996. *Chemical Properties for SCDM Development.* Prepared for U.S. EPA Office of Emergency and Remedial Response, Washington, DC.

2. U.S. Environmental Protection Agency (EPA). 1995c. FATE Database. Office of Research and Development, Athens, GA.

3. Syracuse Research Corporation (SRC). 1995. CHEMFATE Database. SRC, Syracuse, NY.

4. GSC Corporation. 1990. CHEMEST Database. Developed for U.S. EPA Office of Pesticides and Toxic Substances, Washington, DC.

Most of the chemicals in SCDM are addressed in RTI (1996). Many of these values were selected by EPA's Office of Research and Development in Athens, Georgia (ORD-Athens), from an extensive list of measured values compiled by RTI and values calculated by ORD-Athens using the SPARC and CLOGP computer programs. Values not selected by ORD-Athens were selected by RTI from a compilation of measured values. Compilation and selection procedures are described in RTI (1996). SCDM only uses measured values from the FATE database. If estimated or calculated values are presented in FATE, those values are not used in SCDM. SCDM uses only recommended values from the CHEMFATE Database. CHEMEST estimated Log K_{ow} values are used if values are not available from the other data sources.

2.7 ECOTOXICITY PARAMETERS

2.7.1 Acute and Chronic Freshwater and Saltwater Criteria

SCDM uses data from the following reference for acute and chronic freshwater and saltwater criteria:

U.S. Environmental Protection Agency (EPA). 1995e. *Water Quality Criteria-Draft (the Silver Book)*. Office of Water, Washington, DC.

SCDM uses only values that are specifically stated as criteria. At this time, no Ambient Aquatic Life Advisory Concentrations (AALACs) have been specified.

2.7.2 LC_{50}—Freshwater, Saltwater

SCDM uses data from the following reference for freshwater and saltwater LC_{50} values:

U.S. Environmental Protection Agency (EPA). 1995a. Aquatic Information Retrieval (AQUIRE) Database. Environmental Research Laboratory, Duluth, MN.

SCDM uses the lowest, acute LC_{50} value found for any aquatic organism in the specified environment with an acute exposure duration of >1 day and ≤4 days. All LC_{50} values where no environment is given but that use NaCl as a control are considered as freshwater LC_{50} values. When no durations or environments are given, LC_{50} values are not entered into SCDM.

2.8 REGULATORY BENCHMARKS

The HRS assigns extra weight to targets with exposure levels to hazardous substances that are at or above benchmark values. This section describes the sources for certain regulatory limits that the HRS uses as health-based or ecological-based benchmarks.

2.8.1 National Ambient Air Quality Standards

SCDM uses data from the following reference for National Ambient Air Quality Standards (NAAQS):

40 CFR Part 50. 1994. National Ambient Air Quality Standards.

2.8.2 National Emissions Standards for Hazardous Air Pollutants

SCDM uses the following reference for National Emission Standards for Hazardous Air Pollutants (NESHAP):

40 CFR Part 61. 1994. National Emission Standards for Hazardous Air Pollutants.

SCDM uses only values that are reported in ambient concentration units ($\mu g/m^3$).

2.8.3 Maximum Contaminant Levels and Maximum Contaminant Level Goals

SCDM uses the following reference for Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs):

U.S. Environmental Protection Agency (EPA). 1995b. *Drinking Water Regulations and Health Advisories*. Office of Water, Washington, DC.

SCDM uses only MCLs that are reported in units of concentration (mg/L or µg/L). SCDM does not contain MCLs for total trihalomethanes (bromoform + bromodichloromethane + chloroform + dibromochloromethane), asbestos, radium isotopes, gross α-particle activity, or β-particle plus photon radioactivity.

SCDM uses only nonzero MCLGs that are reported in units of concentration (mg/L or µg/L). For substances where multiple values are listed due to lack of consensus on appropriate carcinogen class, SCDM contains the lowest number. For substances where both MCLs and MCLGs are reported but are different, SCDM selects the MCLG as the lower of the two values (55 *FR* 51593).

2.8.4 FDA Action Level

SCDM uses the following references (listed in order of preference) for Food and Drug Administration (FDA) Action Levels:

1. U.S. Food and Drug Administration. 1994. *Changes in Action Levels, Addendum to the 1992 Action Levels for Poisonous or Deleterious Substances in Human and Animal Feed.* Center for Food Safety and Applied Nutrition, Washington, DC.

2. U.S. Food and Drug Administration. 1992. *Action Levels for Poisonous or Deleterious Substances in Human and Animal Feed.* Center for Food Safety and Applied Nutrition, Washington, DC.

SCDM contains FDA Action Levels for fish and shellfish only.

2.8.5 Uranium Mill Tailings Radiation Control Act Standards

SCDM uses the following reference for Uranium Mill Tailings Radiation Control Act (UMTRCA) standards:

40 CFR Part 192. 1994. Uranium Mill Tailings Radiation Control Act Standards.

2.8.6 Ecological Based Benchmarks

The Ambient Water Quality Criteria and the Ambient Aquatic Life Advisory Concentrations discussed in Section 2.7.1 are also used to assign the ecological-based benchmarks.

2.9 OTHER CHEMICAL DATA

SCDM contains other chemical data and information that are not contained in the 28 data-files previously discussed. This information is contained in the BASEDATA file.

2.9.1 Physical Properties

SCDM uses data from the following references (listed in order of preference) for chemical formula, molecular weight, density, boiling point, and melting point:

1. Lide, D.R. (Ed.). 1994. *CRC Handbook of Chemistry and Physics.* 75th ed. CRC Press, Boca Raton, FL.

2. Merck. 1989. *The Merck Index.* 11th Edition. S. Budavari, Ed. Merck & Co., Inc., Rahway, NJ.

Data are extracted directly from *Section 3. Physical Constants of Organic Compounds* and *Section 4. Properties of the Elements and Inorganic Compounds* in the CRC Handbook. If data are unavailable in the CRC Handbook, or if the conditions of the experiment are not appropriate

to standard conditions (e.g., temperature is not in the range of 20 to 30 °C), data from the Merck Index are used.

Density values are extracted (preferably in g/mL or g/cc) along with the temperature at which the density was measured (preferably Celsius, or °C). If multiple values are available for density, the value measured closest to 25 °C is selected.

Boiling point and melting point are extracted (preferably in °C) along with the pressure at which boiling point was measured. Note that tests to determine the melting point are usually performed at the same pressure as the boiling point tests. If multiple values are available, the value measured closest to 1 atm (760 Torr or 760 mm Hg) is selected.

2.9.2 Logical Fields

SCDM uses four logical (or boolean yes/no) flags to classify substances that are entered into BASEDATA.

- Organic Substance ("Organic")—"Y" indicates that the substance is organic, and "N" indicates an inorganic substance. This flag is used to determine factor values for ground water mobility and bioaccumulation potential.

- Metal-Containing Substance ("Metal Contain")—"Y" indicates that the substance is a metal or metalloid or an inorganic compound that contains a metal or metalloid. "N" indicates that the substance is not, or does not contain, a metal or metalloid. This flag is used to determine factor values for ground water mobility and surface water persistence.

- Radioactive Isotope ("Radionuclide")—"Y" indicates that the substance is a radionuclide or radioactive isotope, and "N" indicates that it is not. A substance in SCDM cannot be both a radioactive element and a radioactive isotope. This flag is used to determine factor values for human toxicity, ecosystem toxicity, and surface water persistence.

- Radioactive Element ("Rad. Element")—"Y" indicates that the substance is a radioactive element, and "N" indicates that it is not. This flag determines whether or not the HRS factors and benchmarks are printed in Appendix A.

2.9.3 Substitution Classes

SCDM contains fields for three substitution classes: toxicity, ground water mobility, and other data. For a particular chemical, a parent CAS number can be entered for any of these three substitution classes and SCDM automatically copies the relevant data from the parent chemical to the chemical of interest. Toxicity class data include all toxicity and benchmark data used to

determine human or ecotoxicity factor values. Ground water mobility class data include water solubility, geometric mean water solubility, and soil/water distribution coefficient (K_d). "Other" class data include hydrolysis, biodegredation, photolysis, and volatilization half-lives, as well as BCF and Log K_{ow}.

Currently two groups of substances inherit data from a parent substance: metals and radioactive substances. Generally, metal-containing substances inherit data for the ground water mobility class with the elemental metal as the class parent. Radioactive isotopes may inherit data from their primary radioactive element for the ground water and "other" classes.

SECTION 3

CALCULATIONS IN SUPERFUND CHEMICAL DATA MATRIX

3.1 VOLATILIZATION HALF-LIFE

SCDM estimates volatilization half-life in surface water for organic substances using Equation 15-12 from Thomas (1990). In this method, the volatilization half-life ($\tau_{1/2}$) can be expressed as follows,

$$\tau_{1/2} = \frac{Z \times \ln 2}{K_L \text{ hr}} \tag{7}$$

where:

Z = Mean water body depth (cm)
K_L = Overall liquid-phase mass transfer coefficient.

The following expression gives the overall liquid-phase mass transfer coefficient:

$$K_L = \frac{(H/RT)k_g \times k_l}{(H/RT)k_g + k_l} \text{ cm/hr} \tag{8}$$

where:

H = Henry's law constant (atm·m^3/mol)
R = Universal gas constant (8.2×10^{-5} atm·m^3/mol·K)
T = Temperature (K ;°C + 273)
k_g = Gas-phase exchange coefficient
k_l = Liquid-phase exchange coefficient.

The gas-phase exchange coefficient expression depends on the molecular weight (MW) of the compound. If MW is <65 g/mol, the following equation is used:

$$k_g = 3{,}000 \times (18/MW)^{1/2} \text{ cm/hr} . \tag{9}$$

If MW is ≥65 g/mol, the following equation is used:

$$k_g = 1{,}137.5 \times (V_{wind} + V_{curr}) \times (18/MW)^{1/2} \text{ cm/hr} \quad (10)$$

where:

V_{wind} = Wind velocity (m/sec)
V_{curr} = Current velocity (m/sec).

The liquid-phase exchange coefficient expression also depends on the molecular weight of the compound. If MW is <65 g/mol, the following equation is used:

$$k_l = 20 \times (44/MW)^{1/2} \text{ cm/hr} . \quad (11)$$

If MW is ≥65 g/mol, the expression also depends on the wind and current velocities; the following equation is used when V_{wind} is ≤1.9 m/sec and MW is ≥65 g/mol:

$$k_l = 23.51 \times (V_{curr}^{0.969} / Z^{0.673}) \times (32/MW)^{1/2} \text{ cm/hr} . \quad (12)$$

The following equation is used when V_{wind} is >1.9 m/sec and ≤5 m/sec, and MW is ≥65 g/mol:

$$k_l = 23.51 \times (V_{curr}^{0.969} / Z^{0.673}) \times (32/MW)^{1/2} \, e^{0.526(V_{wind}-1.9)} \text{ cm/hr} . \quad (13)$$

No liquid-phase exchange coefficient equation is provided in Thomas (1990) for wind velocities >5 m/sec.

Combining Equations (7), (8), (9), and (11) into a single equation for estimating volatilization half-life ($\tau_{1/2}$) for compounds with MW <65 g/mol gives the following equation:

$$\tau_{1/2} = Z \times \ln 2 \times \{[(1/20) \times (MW/44)^{1/2}] + [(RT/H \times 3{,}000) \times (MW/18)^{1/2}]\} \text{ hr} . \quad (14)$$

The following equation, combining Equations (7), (8), (10), and (12), can be used to estimate the volatilization half-life ($\tau_{1/2}$) for compounds with MW ≥65 g/mol if the wind velocity is ≤1.9 m/sec:

$$\tau_{1/2} = Z \times \ln 2 \times \{[(Z^{0.673}/23.51 \times V_{curr}^{0.969}) \times (MW/32)^{1/2}] + [(RT/H \times 1{,}137.5) \times (V_{wind} + V_{curr}) \times (MW/18)^{1/2}]\} \text{ hr} . \quad (15)$$

The following equation, combining Equations (7), (8), (10), and (13), can be used to estimate the volatilization half-life ($\tau_{1/2}$) for compounds with MW ≥65 g/mol if the wind velocity is >1.9 m/sec and ≤5 m/sec:

$$\tau_{1/2} = Z \times \ln 2 \times \{[(Z^{0.673}/23.51 \times V_{curr}^{0.969}) \times (MW/32)^{1/2}] \, e^{0.526(1.9-V_{wind})} + [(RT/H \times 1{,}137.5) \times (V_{wind} + V_{curr}) \times (MW/18)^{1/2}]\} \text{ hr} . \quad (16)$$

If H is $<10^{-7}$ atm·m^3/mol, the substance is less volatile than water and its concentration will increase as the water evaporates. The substance is considered essentially nonvolatile (Thomas, 1990, p. 15-15) and no volatilization half-life is estimated for rivers or lakes.

3.1.1 Volatilization Half-Life for Rivers, Oceans, Coastal Tidal Waters, and the Great Lakes

In order to calculate the volatilization half-life for rivers, oceans, coastal tidal waters, and the Great Lakes, the mean water body depth is taken as 100 cm, the temperature as 298 K, the wind velocity as 5 m/sec, and the current velocity as 1 m/sec. Using these values, Equations (14) and (16) reduce to the following:

- MW <65 g/mol

$$\tau^{1/2} = 2.89 \times \{[0.05 \times (MW/44)^{1/2}] + [(8.1 \times 10^{-6}/H) \times (MW/18)^{1/2}]\} \text{ days} \quad (17)$$

- MW ≥65 g/mol

$$\tau^{1/2} = 2.89 \times \{[0.185 \times (MW/32)^{1/2}] + [(3.6 \times 10^{-6}/H) \times (MW/18)^{1/2}]\} \text{ days} \quad (18)$$

where

H = Henry's law constant (atm·m^3/mol)
MW = Molecular weight (g/mol).

3.1.2 Volatilization Half-Life for Lakes

In order to calculate the volatilization half-life for lakes, the mean water body depth is taken as 100 cm, the temperature as 298 K, the wind velocity as 0.5 m/sec, and the current velocity as 0.05 m/sec. Using these values, Equations (14) and (15) reduce to the following:

- MW <65 g/mol

$$\tau^{1/2} = 2.89 \times \{[0.05 \times (MW/44)^{1/2}] + [(8.1 \times 10^{-6}/H) \times (MW/18)^{1/2}]\} \text{ days} \quad (19)$$

- MW ≥65 g/mol

$$\tau^{1/2} = 2.89 \times \{[17.2 \times (MW/32)^{1/2}] + [(3.9 \times 10^{-6}/H) \times (MW/18)^{1/2}]\} \text{ days} \quad (20)$$

where

H = Henry's law constant (atm·m^3/mol)
MW = Molecular weight (g/mol).

3.2 SOIL/WATER DISTRIBUTION COEFFICIENTS (K_d)

As described in Section 2.4.5, SCDM soil/water distribution coefficients (K_d, mL/g) are based on the relationship

$$K_d = K_{oc} \times f_{oc} \quad (21)$$

where K_{oc} is the chemical's soil organic carbon/water partition coefficient (mL/g) and f_{oc} is assumed to be 0.002 g organic carbon/g soil. For organic chemicals without K_d values in SCDM datafiles SSG_KD or RTI_ION (see Section 2.4.5), SCDM calculates a K_d value based on this relationship, using a K_{oc} value calculated from a compound's SCDM Log octanol/water partition coefficient (Log K_{ow} or Log P). To perform this calculation, SCDM uses the relationship between these properties determined by DiToro (1985) for semivolatile organic compounds:

$$K_{oc} = 0.00028 + 0.983 \text{ Log } K_{ow} . \quad (22)$$

This equation is also used in the Soil Screening Guidance (EPA, 1996b).

Combining Equations (21) and (22) yields the following equation:

$$K_d = f_{oc} \times 10^{(0.00028 \cdot 0.983 \text{Log } K_{ow})} . \quad (23)$$

For any organic hazardous substance for which no K_d value is available in SCDM datafiles SSG_KD or RTI_ION, but with a Log K_{ow} value chosen as described in Section 2.6.2, SCDM calculates K_d using Equation (23).

3.3 SCREENING CONCENTRATION BENCHMARKS

The HRS assigns extra weight to targets with exposure levels to hazardous substances that are at or above benchmark values. In addition to the regulatory limits discussed in Section 2.8, the HRS uses a number of benchmarks called screening concentrations. Screening concentrations correspond to a 10^{-6} individual cancer risk or a noncancer hazard quotient of 1 under specified exposure assumptions. These assumptions, discussed below, are conservative and broadly apply to sites nationwide. The Agency recognizes that modeling human activity patterns would provide a more realistic determination of exposure or risk. While such information may be determined on a site-specific basis with considerable effort, it is difficult to develop assumptions on the activity patterns of target populations that could be applied to sites on a nationwide basis in order to develop exposure scenarios for the HRS. For this reason, the HRS exposure assumptions reflect values used for the assessment of risk throughout different programs within the Agency. EPA recognizes that a critical evaluation of the references cited below, along with other information, could lead to differing exposure assumptions. Moreover, the Agency is still refining the assumptions used in this area of risk assessment.

EPA also considered the limited number of samples available at the National Priority List (NPL) listing stage when it selected these assumptions. As outlined in the Field Test of the proposed revised HRS, the Agency generally expects to have <100 samples for all pathways to support the HRS analysis. This limited sampling may miss areas of maximum contamination, or "hot spots," and thus the sample results may not represent the maximum level of contamination. Although using conservative exposure assumptions does not fully compensate for the limited data available for analysis, using less conservative assumptions would likely lead to a greater incidence of false negatives; i.e., the Agency may not identify sites that should be investigated further under the remedial program.

3.3.1 Screening Concentrations for Drinking Water Pathways

The following equation (EPA, 1989b, p. 6-35) is used to calculate the average daily intake of a hazardous substance from the ingestion of contaminated ground water or surface water:

$$\text{Average Daily Intake (mg/kg-day)} = \frac{C_{water} \times IR \times EF \times ED}{BW \times AT} \qquad (24)$$

where:

C_{water} = Contaminant concentration in water (mg/L)
IR = Drinking water intake (ingestion) rate (L/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (days).

Under the assumptions used for HRS purposes, the adult drinking water ingestion rate is 2 L/day, the exposure frequency for residents is daily (350 days/year), the exposure duration is 30 years, and the average adult body weight is 70 kg. The ingestion rate of 2 L/day is routinely used by the Agency as the default value for drinking water ingestion and assumes that the entire 2 L are from the contaminated drinking water source. Refinements in risk assessments sometime assume that an individual will be away for vacations or that some water will be consumed at the workplace.

Cancer Risk Screening Concentration. The cancer risk screening concentration is estimated by solving Equation (24) for the contaminant concentration in a medium of concern (C_{medium}), at a specified target risk level using the following relationship:

$$\text{Target Risk} = \text{Average Daily Intake} \times \text{Cancer Slope Factor (SF)} \; . \qquad (25)$$

When Equation (25) is rearranged to solve for the average daily intake (I), Equations (24) and (25) can be combined to estimate the water concentration (C_{water}) that corresponds to a 10^{-6} target risk level. Over a lifetime, the average daily intake may be calculated assuming an averaging time (AT) of 25,550 days (i.e., 70 years) for carcinogenic effects. Therefore, the drinking water screening concentration for carcinogens presumed to result in one excess case of cancer per million people exposed (SC_c) is given by:

$$SC_c = \frac{10^{-6} \times BW \times 25{,}550 \text{ days}}{SF_{oral} \times IR \times EF \times ED} \quad (26)$$

With the exposure assumptions described above for Equation (24), Equation (26) may be simplified as:

$$SC_c \text{ (mg/L)} = \frac{8.52 \times 10^{-5}}{SF_{oral}} \quad (27)$$

This equation is used to calculate SC_c for nonradioactive carcinogenic substances. Because cancer slope factors for radionuclides are in units of pC_i^{-1}, body weight and averaging time do not apply. Thus, the following equation for radionuclides is analogous to Equation (26) for chemical carcinogens:

$$SC_c = \frac{10^{-6}}{SF_{oral} \times IR \times EF \times ED} \quad (28)$$

When the exposure assumptions described for Equation (24) are used, Equation (28) may be rewritten to estimate the concentration in water that corresponds to a target risk level of 10^{-6}. The screening concentration for radionuclides ingested in drinking water (SC_r) is given by:

$$SC_r \text{ (pC}_i\text{/L)} = \frac{4.76 \times 10^{-11}}{SF_{oral}} \quad (29)$$

Noncancer Risk Screening Concentration. The RfD is based on the assumption that thresholds exist for certain toxic effects. In general, the RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. When the acceptable daily intake for drinking water ingestion is set equal to the RfD_{oral} (i.e., hazard quotient = 1), Equation (24) may be rearranged to solve for the contaminant concentration in water that corresponds to the no adverse effects level described above. To solve for the drinking water screening concentration for noncarcinogens (SC_n), Equation (24) becomes:

$$SC_n = \frac{RfD_{oral} \times BW \times AT}{IR \times EF \times ED} \quad (30)$$

For noncarcinogenic effects, the averaging time is 30 years, or 10,950 days. When the assumptions described for Equation (24) are used, Equation (30) may be simplified as:

$$SC_n \text{ (mg/L)} = RfD_{oral} \times 36.5 \; . \quad (31)$$

3.3.2 Screening Concentrations for the Surface Water Food Chain Pathway

The following equation (EPA, 1989b, p. 6-45) is used to calculate the average daily intake from fish and shellfish ingestion:

$$\text{Average Daily Intake (mg/kg-day)} = \frac{C_{fish} \times IR \times F \times EF \times ED}{BW \times AT} \quad (32)$$

where:

C_{fish}	=	Contaminant concentration in fish/shellfish (mg/kg)
IR	=	Fish/shellfish intake (ingestion) rate (kg/day)
F	=	Fraction ingested from contaminated source (unitless)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time (days).

The high end fish ingestion rate for recreational fishers is 0.054 kg/day (USDA, 1982), with the fraction ingested (F) set equal to 1 (i.e., all fish are assumed to come from contaminated waters). The exposure frequency is assumed to be 350 days/year, the exposure duration is 30 years, and the average adult body weight is 70 kg.

Cancer Risk Screening Concentration. When Equation (25) is rearranged to solve for the average daily intake (I), Equations (25) and (32) can be combined to estimate the fish/shellfish concentration that corresponds to a 10^{-6} target risk level. Over a lifetime, the average daily intake may be calculated assuming an averaging time (AT) of 25,550 days (i.e., 70 years) for carcinogenic effects. Therefore, the fish/shellfish concentration presumed to result in one excess case of cancer per million people exposed (SC_c) is given by:

$$SC_c = \frac{10^{-6} \times BW \times 25{,}550 \text{ days}}{SF_{oral} \times IR \times F \times EF \times ED} . \quad (33)$$

Using the exposure assumptions listed for Equation (31) results in a simplified screening concentration equation for nonradioactive carcinogenic substances in fish/shellfish:

$$SC_c \text{ (mg/kg)} = \frac{3.15 \times 10^{-3}}{SF_{oral}} . \quad (34)$$

If the same exposure assumptions, excluding body weight and averaging time, are used, Equation (34) may be rewritten to estimate the fish/shellfish concentration that corresponds to a target risk level of 10^{-6} for ingestion of radionuclides in fish and shellfish (SC_r):

$$SC_r \text{ (pC}_i\text{/kg)} = \frac{1.76 \times 10^{-9}}{SF_{oral}} . \quad (35)$$

Noncancer Risk Screening Concentration. Setting the intake from fish and shellfish ingestion equal to the oral reference dose (RfD_{oral}) and solving Equation (32) for concentration gives the following equation:

$$SC_n = \frac{RfD_{oral} \times BW \times AT}{IR \times F \times EF \times ED} . \quad (36)$$

For noncarcinogenic effects, the averaging time is 30 years, or 10,950 days. If the other assumptions listed for Equation (32) are used, Equation (36) may be simplified as follows:

$$SC_n \text{ (mg/kg)} = RfD_{oral} \times 1{,}352 . \quad (37)$$

3.3.3 Screening Concentrations for Soil Ingestion

The following equation (EPA, 1991, p. 3-25) is used to calculate the average daily intake from soil ingestion:

$$\text{Average Daily Intake (mg/kg-day)} = \frac{C_{soil} \times CF \times IF \times EF}{AT} \quad (38)$$

where:

C_{soil} = Contaminant concentration in soil (mg/kg)
CF = Conversion factor (10^{-6} kg/mg)
IF = Age-adjusted soil ingestion factor (mg-yr/kg-day)
EF = Exposure frequency (days/year)
AT = Averaging time (days)

and IF is given by:

$$IF_{soil/adj}\ (\text{mg-yr/kg-day}) = \frac{IR_{soil/age1-6} \times ED_{age1-6}}{BW_{age1-6}} + \frac{IR_{soil/age7-13} \times ED_{age7-31}}{BW_{age7-31}} \quad (39)$$

where:

$IR_{soil/age1-6}$ = Soil intake (ingestion) rate, age 1 to 6 (mg/day)
ED_{age1-6} = Exposure duration during ages 1-6 (yr)
BW_{age1-6} = Average body weight from ages 1-6 (kg)
$IR_{soil/age7-31}$ = Soil intake (ingestion) rate, ages 7 and older (mg/day)
$ED_{age7-31}$ = Exposure duration during ages 7-31 (yr)
$BW_{age7-31}$ = Average body weight from ages 7-31 (kg).

The soil ingestion rate is assumed to be 200 mg/day for ages 6 and younger, and 100 mg/day for ages 7 and older; the exposure durations are 6 years and 24 years for children and "adults" (ages 7 to 31), respectively; and the average body weights are 15 kg for children and 70 kg for adults. As with Equation (24), the exposure frequency is assumed to be 350 days/year. With these assumptions, the age-adjusted soil ingestion factor is 114 mg-yr/kg-day.

Cancer Risk Screening Concentration. When Equation (25) is rearranged to solve for the average daily intake (I), Equations (25) and (38) can be combined to estimate the soil concentration that corresponds to a 10^{-6} target risk level. Over a lifetime, the average daily intake may be calculated assuming an averaging time (AT) of 25,550 days (i.e., 70 years) for carcinogenic effects. Therefore, the screening soil concentration presumed to result in one excess case of cancer per million people exposed (SC_c) is given by:

$$SC_c = \frac{10^{-6} \times 25{,}500 \text{ days}}{SF_{oral} \times IF \times CF \times EF} . \quad (40)$$

Using the assumptions listed for Equations (38) and (39) results in a simplified screening concentration equation for nonradioactive carcinogenic substances in soil:

$$SC_c \text{ (mg/kg)} = \frac{0.640}{SF_{oral}} . \quad (41)$$

Since cancer slope factors for radionuclides are provided in pCi^{-1}, body weight and averaging time do not apply. As a result, IF is calculated without body weight (BW) in Equation (39) and is equal to 3,600 mg-yr/day. If the other exposure assumptions described for chemical carcinogens are used, Equation (41) may be rewritten to estimate the soil concentration that corresponds to a target risk level of 10^{-6} for ingestion of radionuclides in contaminated soils (SC_r):

$$SC_r \text{ (pCi/kg)} = \frac{7.94 \times 10^{-7}}{SF_{oral}} . \quad (42)$$

Noncancer Risk Screening Concentration. Setting the intake from soil ingestion equal to the oral reference dose (RfD_{oral}) and solving Equation (38) for concentration gives the following equation:

$$SC_n = \frac{RfD_{oral} \times BW \times AT}{IR \times CF \times EF \times ED} . \quad (43)$$

For noncarcinogenic effects, the averaging time (AT) is a function of the exposure duration (ED) assumed for children or 6 years × 365 days/year = 2,190 days. Assuming daily exposure (i.e., EF = 350 days/year), an average body weight of 15 kg, and an ingestion rate (IR) for children of 200 mg soil per day results in the following simplified equation:

$$SC_n \text{ (mg/kg)} = RfD_{oral} \text{ (mg/kg-day)} \times 78{,}214 \ . \qquad (44)$$

3.3.4 Screening Concentrations for the Air Pathway

The following equation (EPA, 1989b, p. 6-44) is used to calculate intake from inhalation of airborne hazardous substances:

$$\text{Average Daily Intake (mg/kg-day)} = \frac{C_{air} \times IR \times EF \times ED}{BW \times AT} \qquad (45)$$

where:

C_{air} = Contaminant concentration in air (mg/m^3)
IR = Air intake (inhalation) rate (m^3/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (days).

The inhalation rate is assumed to be 20 m^3/day, the exposure frequency is 350 days/year, the exposure duration is 30 years, and the average adult body weight is 70 kg.

Cancer Risk Screening Concentration. By rearranging Equation (25) to solve for the average daily intake (I), Equations (25) and (45) can be combined to estimate the concentration in air that corresponds to a 10^{-6} target risk level. Over a lifetime, the average daily intake may be calculated assuming an averaging time (AT) of 25,550 days (i.e., 70 years) for carcinogenic effects. Therefore, the air concentration presumed to result in one excess case of cancer per million people exposed (SC_c) is given by:

$$SC_c = \frac{10^{-6} \times BW \times 25{,}550 \text{ days}}{SF_{inhal} \times IR \times EF \times ED} \ . \qquad (46)$$

Using the exposure assumptions listed above for Equation (45) results in the following equation for nonradioactive carcinogenic substances:

$$SC_c\ (mg/m^3) = \frac{8.52 \times 10^{-6}}{SF_{inhal}} . \quad (47)$$

Using the same exposure assumptions (excluding body weight and averaging time), Equation (46) may be rewritten to estimate the air concentration of radionuclides that corresponds to a target risk level of 10^{-6} for inhalation of contaminated air (SC_r):

$$SC_r\ (pC_i/m^3) = \frac{4.76 \times 10^{-12}}{SF_{inhal}} . \quad (48)$$

Noncancer Risk Screening Concentration. Setting the average daily intake equal to the inhalation reference dose (RfD_{inhal}) and solving Equation (45) for the air concentration results in the following equation:

$$SC_n = \frac{RfD_{inhal} \times BW \times AT}{IR \times EF \times ED} . \quad (49)$$

For noncarcinogenic effects, the averaging time (AT) is 30 years, or 10,950 days. The inhalation rate (IR) is assumed to be 20 m^3/day, the exposure frequency (EF) is 350 days/year, the exposure duration (ED) is 30 years, and the average adult body weight (BW) is 70 kg. When these assumptions are used, Equation (49) may be simplified as:

$$SC_n\ (mg/m^3) = RfD_{inhal} \times 3.65 . \quad (50)$$

SECTION 4

CHEMICAL DATA, FACTOR VALUES, AND BENCHMARKS

Appendix A contains a two-page listing of selected data, HRS factor values, and benchmarks for each hazardous substance in SCDM (the "SCDM page reports"). Data selected for SCDM for each substance are on the first page; factor values and benchmarks are on the second page.

Figure 1 presents the header that appears on both sides of the page report. The header contains the date the report was printed, the substance name and synonym, the SCDM version (month, year), and the Chemical Abstract Service (CAS) number for the substance.

```
Date:      06/15/96          SUPERFUND CHEMICAL DATA MATRIX      SCDM Version: JUN96
Chemical:  Acenaphthene                                        CAS Number:   000083-32-9
```

Figure 1. Page Heading

The first page contains all of the selected chemical data, the data units, and an acroynym describing the source of the information in SCDM. The chemical data are divided into six functional groups: toxicity, persistence, physical characteristics, mobility, bioaccumulation, and other data.

The toxicity section (Figure 2) contains the acute, chronic, and carcinogenicity data that were compiled using the methodology described in Sections 2.2, 2.3, and 2.7 and used to derive toxicity and ecotoxicity factor values. The top half of this section contains the data used to determine the human toxicity factor value: reference dose (oral and inhalation), cancer slope factor (oral and inhalation), ED_{10} (oral and inhalation),

TOXICITY

Parameter	Value	Unit	Source
Oral RfD:	6.0E-02	mg/kg/day	IRIS
Inhal RfD:		mg/kg/day	
Oral Slope:		(mg/kg/day)^-1	
Oral Wt-of-Evid:			
Inhal Slope:		(mg/kg/day)^-1	
Inhal Wt-of-Evid:			
Oral ED10:		mg/kg/day	
Oral ED10 Wgt:			
Inhal ED10:		mg/kg/day	
Inhal ED10 Wgt:			
Oral LD50:		mg/kg	
Dermal LD50:		mg/kg	
Gas Inhal LC50:		ppm	
Dust Inhal LC50:		mg/L	
ACUTE			
Fresh AWQC:		µg/L	
Salt AWQC:		µg/L	
Fresh AALAC:		µg/L	
Salt AALAC:		µg/L	
CHRONIC			
Fresh AWQC:		µg/L	
Salt AWQC:		µg/L	
Fresh AALAC:		µg/L	
Salt AALAC:		µg/L	
Fresh Ecol LC50:	6.0E+01	µg/L	AQUIRE
Salt Ecol LC50:	2.2E+03	µg/L	AQUIRE

Figure 2. Toxicity Section

LD_{50} (oral and dermal), and LC_{50} (gas and dust inhalation). The bottom half of this section contains the data used to determine an ecotoxicity factor value: acute and chronic ambient water quality criteria (AWQC) for fresh and salt water, acute and chronic aquatic life advisory concentrations (AALACs) for fresh and salt water (at this time no AALACs have been promulgated), and fresh and salt water LC_{50} values. Blank entries indicate that no value was found using the procedures and references specified in Section 2.

The persistence section (Figure 3) contains the surface water persistence data compiled using the methodology described in Sections 2.5, 2.6.2, and 3.1. Surface water persistence factors can also be determined using the logarithm of the *n*-octanol/water partition coefficient (Log K_{ow} or Log P) if, as specified in the HRS, this gives a higher factor value than the half-lives (or a default, if applicable).

PERSISTENCE

Parameter	Value	Unit	Source
LAKE - Halflives			
Hydrolysis:		days	
Volatility:	1.1E+02	days	THOMAS
Photolysis:	2.5E+00	days	FATERATE
Biodeg:	1.0E+02	days	FATERATE
Radio:		days	
RIVER - Halflives			
Hydrolysis:		days	
Volatility:	1.4E+00	days	THOMAS
Photolysis:	2.5E+00	days	FATERATE
Biodeg:	1.0E+02	days	FATERATE
Radio:		days	
Log Kow:	3.9E+00		RTI_LOGP

Figure 3. Persistence Section

The physical characteristics section (Figure 4) contains logical "yes/no" flags that classify the substance. The "metal contain" flag indicates that the hazardous substance is a metal or metalloid and is used to determine ground water mobility and surface water persistence factors. The "organic" and "inorganic" flags are used to determine ground water mobility and bioaccumulation. The "radionuclide" flag is used to determine the human toxicity factor, the ecosystem toxicity factor, and the surface water persistence factor. The radioactive element flag ("rad. element") is used to determine whether or not the HRS factors and benchmarks (second page) are printed. The gas and particulate flags are used to determine mobility and likelihood of release for the air pathway. Molecular weight is used to determine volatilization half-life, as described in Section 3.1.

PHYSICAL CHARACTERISTICS

Parameter	Value
Metal Contain:	No
Organic:	Yes
Inorganic:	No
Gas:	Yes
Particulate:	Yes
Radionuclide:	No
Rad. Element:	No
Molecular Weight:	1.5E+02
Density:	1.0E+00 g/mL @ 99.00° C

Figure 4. Physical Characteristics

The mobility section (Figure 5) contains the air and ground water mobility data compiled using the methodology described in Sections 2.4.3, 2.4.4, 2.4.5, and 3.2. Vapor pressure and

MOBILITY

Parameter	Value	Unit	Source
Vapor Press:	2.5E-03	Torr	CHEMFATE
Henry's Law:	1.6E-06	atm-m3/mol	CHEMFATE
Water Solub:	4.2E+00	mg/L	LIVECHEM
Distrib Coef:	1.4E+01	ml/g	
Geo. Mean Sol.:			

Figure 5. Mobility Section

Henry's law constant are used to determine gas migration potential and gas mobility factors. Henry's law constant is also used to calculate the volatilization half-life as described in Section 3.1. Water solubility and the soil/water distribution coefficient are used to determine the ground water mobility factor. Substance-specific water solubility is used for nonmetal and nonmetalloid substances, whereas for metal-containing substances the solubility value is the geometric mean of the available water solubilities for inorganic compounds containing the hazardous substance.

The bioaccumulation section (Figure 6) contains the human food chain and environmental bioaccumulation potential factor data compiled using the methodology described in Section 2.6. Bioconcentration factors (BCFs) are collected for fresh and salt water for the human food chain and environmental threats. Log K_{ow} or water solubility is used to establish bioaccumulation potential when a BCF is not available.

BIOACCUMULATION

Parameter	Value	Unit	Source
FOOD CHAIN			
Fresh BCF:	3.9E+02		VER_BCF
Salt BCF:			
ENVIRONMENTAL			
Fresh BCF:	3.9E+02		VER_BCF
Salt BCF:			
Log Kow:	3.9E+00		RTI_LOGP
Water Solub:	4.2E+00	mg/L	LIVECHEM

Figure 6. Bioaccumulation Section

The section labeled "other data" (Figure 7) contains values for melting points and boiling points (°C) along with the associated vapor pressure (Torr), if applicable. Chemical formula is also listed here.

OTHER DATA

Melting Point :93.40° C
Boiling Point :279.00° C
Formula :C12H10

Figure 7. Other Data Section

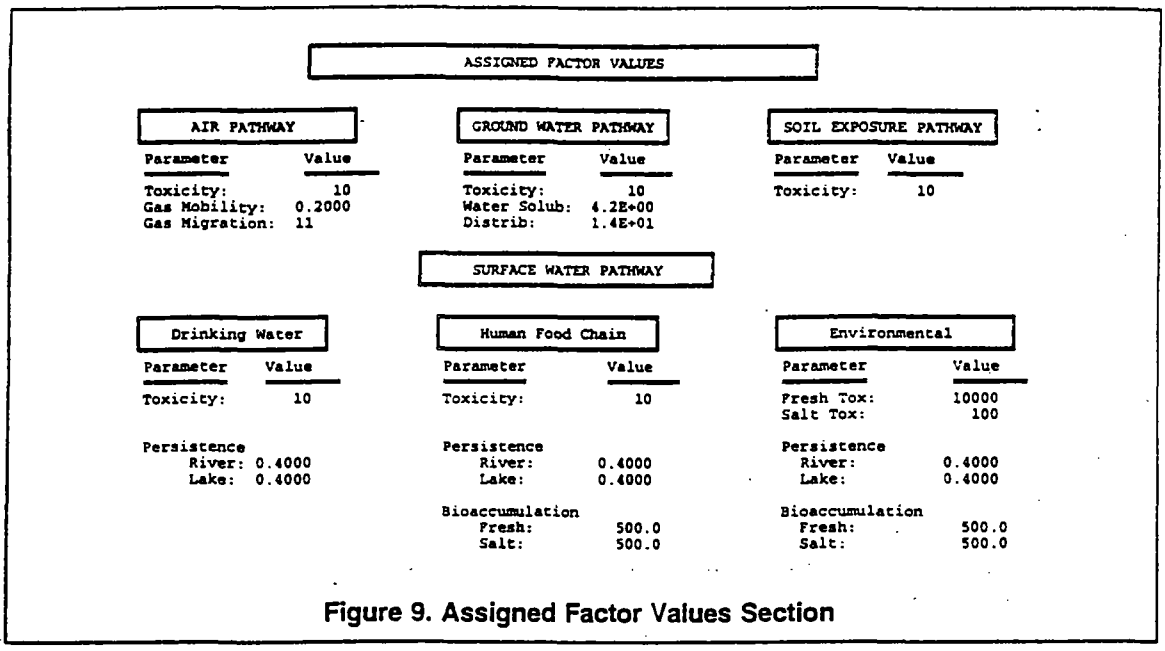
The class information section (Figure 8) lists parent substances for three data substitution classes: toxicity, ground water mobility, and other data. The toxicity class includes all toxicity and benchmark data used to determine human or ecotoxicity factor values. The ground water mobility class includes water solubility, soil/water distribution coefficient, and geometric mean water solubility. The "other" class includes hydrolysis, biodegradation, photolysis, and volatilization half-lives, as well as BCFs and Log K_{ow}.

CLASS INFORMATION

Class	Parent Substance
Toxicity:	NA
GW Mob:	NA
Other:	NA

Figure 8. Class Information Section

Currently only two groups of substances inherit data from a parent substance: metals and radioactive substances. Generally, metal-containing substances inherit data for the ground water mobility class with the elemental metal as the class parent. Radioactive isotopes may inherit data from their primary radioactive element for the ground water mobility and "other" classes.



ASSIGNED FACTOR VALUES

AIR PATHWAY

Parameter	Value
Toxicity:	10
Gas Mobility:	0.2000
Gas Migration:	11

GROUND WATER PATHWAY

Parameter	Value
Toxicity:	10
Water Solub:	4.2E+00
Distrib:	1.4E+01

SOIL EXPOSURE PATHWAY

Parameter	Value
Toxicity:	10

SURFACE WATER PATHWAY

Drinking Water

Parameter	Value
Toxicity:	10
Persistence	
River:	0.4000
Lake:	0.4000

Human Food Chain

Parameter	Value
Toxicity:	10
Persistence	
River:	0.4000
Lake:	0.4000
Bioaccumulation	
Fresh:	500.0
Salt:	500.0

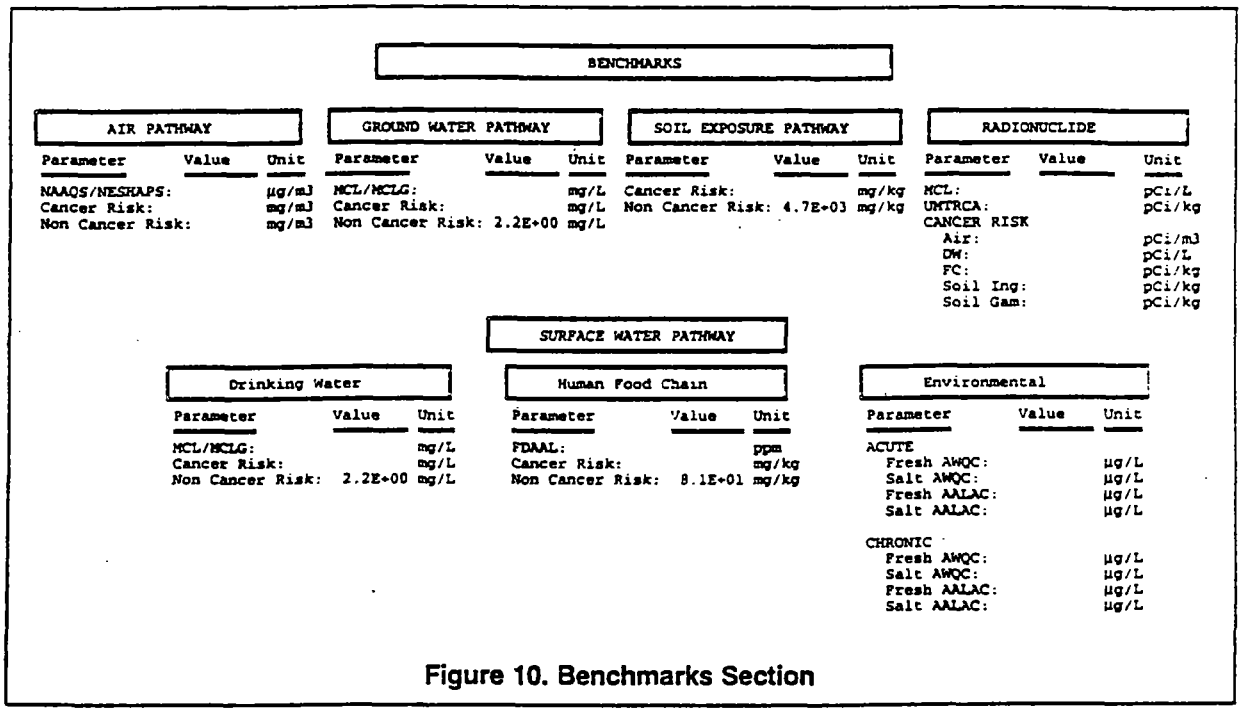
Environmental

Parameter	Value
Fresh Tox:	10000
Salt Tox:	100
Persistence	
River:	0.4000
Lake:	0.4000
Bioaccumulation	
Fresh:	500.0
Salt:	500.0

Figure 9. Assigned Factor Values Section

The second page for each substance is divided into top and bottom sections that contain factor values (Figure 9) and benchmarks (Figure 10) required by the HRS. SCDM determines factor values using HRS methodologies, from selected data on the first page of the SCDM page report. The factor values are presented by pathway: air, ground water, soil exposure, and surface water. The surface water pathway is further subdivided by threat: drinking water, human food chain, and environmental. The toxicity factor value represents human toxicity and is the same for all pathways. The air pathway gas migration factor value is used to determine likelihood of release. The surface water environmental toxicity factor values are based on fresh and salt water ecosystem toxicity data, and the surface water persistence factor values are based on BCFs for all aquatic species. The surface water human food chain factor values are based on human toxicity and BCFs for only those aquatic species consumed by humans. For radioactive substances, human toxicity, ecosystem toxicity, and surface water persistence factor values are determined as specified in Chapter 7 of the HRS.

The benchmarks (Figure 10), like the factor values, are presented by pathway: air, ground water, soil exposure, and surface water. The surface water pathway is further subdivided by threat: drinking water, human food chain, and environmental. For HRS scoring, actual sampled contaminant concentrations for a particular media are compared to these benchmark concentrations to determine if the target will be scored as subject to Level I or Level II contamination.



BENCHMARKS

AIR PATHWAY

Parameter	Value	Unit
NAAQS/NESHAPS:		µg/m3
Cancer Risk:		mg/m3
Non Cancer Risk:		mg/m3

GROUND WATER PATHWAY

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:		mg/L
Non Cancer Risk:	2.2E+00	mg/L

SOIL EXPOSURE PATHWAY

Parameter	Value	Unit
Cancer Risk:		mg/kg
Non Cancer Risk:	4.7E+03	mg/kg

RADIONUCLIDE

Parameter	Value	Unit
MCL:		pCi/L
UMTRCA:		pCi/kg
CANCER RISK		
Air:		pCi/m3
DW:		pCi/L
FC:		pCi/kg
Soil Ing:		pCi/kg
Soil Gam:		pCi/kg

SURFACE WATER PATHWAY

Drinking Water

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:		mg/L
Non Cancer Risk:	2.2E+00	mg/L

Human Food Chain

Parameter	Value	Unit
FDAAL:		ppm
Cancer Risk:		mg/kg
Non Cancer Risk:	8.1E+01	mg/kg

Environmental

Parameter	Value	Unit
ACUTE		
Fresh AWQC:		µg/L
Salt AWQC:		µg/L
Fresh AALAC:		µg/L
Salt AALAC:		µg/L
CHRONIC		
Fresh AWQC:		µg/L
Salt AWQC:		µg/L
Fresh AALAC:		µg/L
Salt AALAC:		µg/L

Figure 10. Benchmarks Section

Appendix B-1 contains tables for nonradioactive hazardous substances. The first table in Appendix B-1 lists all of the factor values by pathway. The second table presents the benchmarks for the air and ground water pathways, the third table presents benchmarks for the surface water pathway, and the fourth table presents benchmarks for the soil exposure pathway. Appendix B-2 contains tables for radionuclides; the first table lists all of the factor values by pathway, and the second table presents benchmarks for all pathways. Appendix C contains a cross-reference index of hazardous substance names, synonyms, and CAS numbers for substances in SCDM.

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HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid: Karst	Ground Water Mobility: Liquid: Non-Karst	Ground Water Mobility: Non-Liquid: Karst	Ground Water Mobility: Non-Liquid: Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain: Fresh	Bioaccumulation: Food Chain: Salt	Bioaccumulation: Environmental: Fresh	Bioaccumulation: Environmental: Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Gas	Part
Acenaphthene	000083-32-9	10	1.0E+00	1.0E-02	2.0E-01	2.0E-03	0.4000	0.4000*	500.0	500.0	500.0	500.0	10000	100	11	0.2000	Yes	Yes
Acenaphthylene	000208-96-8	...	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	0.4000*	1.0000	500.0	500.0	500.0	500.0	...	...	11	0.0200	Yes	Yes
Acetaldehyde	000075-07-0	1000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	0.5	0.5	0.5	0.5	10	10	17	1.0000	Yes	No
Acetone	000067-64-1	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000*	0.0700	0.5	0.5	0.5	0.5	100	1	17	1.0000	Yes	No
Acetonitrile	000075-05-8	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000*	0.0700	0.5	0.5	0.5	0.5	1	1	17	1.0000	Yes	No
Acetophenone	000098-86-2	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	5.0	5.0	5.0	5.0	1	1	11	1.0000	Yes	No
Acetyl-2-thiourea, 1-	000591-08-2	10	1.0E+00	...	...	...	1.0000	1.0000	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Acrolein	000107-02-8	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.0700	0.0700	500.0	500.0	500.0	500.0	10000	1000	17	1.0000	Yes	No
Acrylamide	000079-06-1	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	5.0	5.0	5.0	5.0	10	10	6	0.2000	Yes	Yes
Acrylic acid	000079-10-7	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000*	0.5	0.5	0.5	0.5	...	...	11	1.0000	Yes	No
Acrylonitrile	000107-13-1	1000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	50.0	50.0	50.0	50.0	100	100*	17	1.0000	Yes	No
Adipic acid	000124-04-9	1	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000*	0.4000*	0.5	0.5	0.5	0.5	10	10	6	0.2000*	Yes	Yes
Aldicarb	000116-06-3	1000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000*	1.0000*	5.0	5.0	5.0	5.0	10000	10000	6	0.0200	Yes	Yes
Aldrin	000309-00-2	10000	1.0E+00	1.0E-04	2.0E-03	2.0E-07	1.0000	1.0000	50000.0*	50000.0*	50000.0	50000.0	10000	10000	6*	0.0020*	Yes	Yes
Allyl alcohol	000107-18-6	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000	0.5	0.5	0.5	0.5	1000	1000	11	1.0000	Yes	No!
Allyl chloride**	000107-05-1	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.4000	5.0	5.0	5.0	5.0	1000	1000	17	1.0000	Yes	No
Aluminum	007429-90-5	...	1.0E+00	1.0E-04*	...	...	1.0000	1.0000	50.0	50.0	50.0	50.0	100*	100*	NA	NA	No	Yes
Aluminum phosphide	020859-73-8	10000	1.0E+00	...	...	...	1.0000	1.0000	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Ammonia	007664-41-7	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.0007	0.0700	0.5	0.5	0.5	0.5	100*	100*	17	1.0000	Yes	No

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HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid: Karst	Ground Water Mobility: Liquid: Non-Karst	Ground Water Mobility: Non-Liquid: Karst	Ground Water Mobility: Non-Liquid: Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain: Fresh	Bioaccumulation: Food Chain: Salt	Bioaccumulation: Environmental: Fresh	Bioaccumulation: Environmental: Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Gas	Part
Ammonium picrate	000131-74-8	...	1.0E+00	...	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Ammonium sulfamate	007773-06-0	10	1.0E+00	...	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	1	1	NA	NA	No	Yes
Aniline	000062-53-3	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000	5.0	5.0	500.0	500.0	10000	10	11	1.0000	Yes	No
Anthracene	000120-12-7	10	1.0E+00	1.0E-02*	2.0E-03	2.0E-05*	1.0000*	1.0000*	5000.0	5000.0	5000.0	5000.0	10000	100	6	0.0020	Yes	Yes
Antimony	007440-36-0	10000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	5.0*	5.0*	100*	100*	NA	NA	No	Yes
Arsenic	007440-38-2	10000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	5.0	500.0	500.0*	500.0	10	100	NA	NA	No	Yes
Asbestos	001332-21-4	10000	1.0E+00	1.0E-04	...	...	1.0000	1.0000	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Atrazine	001912-24-9	100	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	0.0007	0.0700	50.0	50.0	50.0	50.0	1000	10000	6	0.0020	Yes	Yes
Azinphos- ethyl	002642-71-9	100	1.0E+00	1.0E+00*	2.0E-01*	2.0E-01*	0.4000	0.0700	500.0	500.0	500.0	500.0	10000	10000	NA	NA	No	Yes
Azinphos- methyl	000086-50-0	1000	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	1.0000*	1.0000*	50.0	50.0	50.0	50.0	10000	10000	NA	NA	No	Yes
Aziridine	000151-56-4	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000*	0.5	0.5	0.5	0.5	10*	10*	11	1.0000	Yes	No
Barium	007440-39-3	10000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	0.5	0.5	1	1	NA	NA	No	Yes
Barium cyanide	000542-62-1	...*	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Benz(a)anthracene	000056-55-3	1000	1.0E+00	1.0E-02*	2.0E-05	2.0E-07*	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	10000	10000	6	0.0020*	Yes	Yes
Benzene	000071-43-2	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.4000	5000.0	5000.0	500.0	50000.0	100	1000*	17	1.0000	Yes	No
Benzene carbonyl chloride	000098-88-4	1	1.0E+00	...	...	...	0.4000	0.4000*	0.5	0.5	0.5	0.5	10	1	11	1.0000	Yes	No
Benzidine	000092-87-5	10000	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000*	0.4000*	50.0	50.0	50.0	50.0	...	...	0	0.0002	Yes	Yes
Benzo(a)pyrene	000050-32-8	10000	1.0E+00	1.0E-04	2.0E-05	2.0E-09	1.0000	1.0000	50000.0	500.0	50000.0	500.0	10000	1000	6	0.0002	Yes	Yes

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HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

			Ground Water Mobility						Bioaccumulation								
			Liquid		Non-Liquid		Persistence		Food Chain		Environmental		Ecotoxicity				
Substance Name	CAS Number	Toxicity	Karst	Non-Karst	Karst	Non-Karst	River	Lake	Fresh	Salt	Fresh	Salt	Fresh	Salt	Air Gas Migration	Air Gas Mobility	Gas	Part
Benzo(b)fluoranthene	000205-99-2	1000*	1.0E+00	1.0E-04	2.0E-05	2.0E-09	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	...	...	6	0.0020	Yes	Yes
Benzo(g,h,i)perylene	000191-24-2	...	1.0E+00	1.0E-04	2.0E-05	2.0E-09	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	...	...	NA	NA	No	Yes
Benzo(k)fluoranthene	000207-08-9	100*	1.0E+00	1.0E-04	2.0E-05	2.0E-09	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	...	...	6	0.0002	Yes	Yes
Benzoic acid	000065-85-0	1	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	5.0	5.0	5.0	5.0	1	1	11	0.2000	Yes	Yes
Benzonitrile	000100-47-0	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	5.0	5.0	5.0	5.0	10	10	11	1.0000	Yes	No
Benzothiazole, 1,2,-	000095-16-9	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	50.0	50.0	50.0	50.0	10	10	11	1.0000*	Yes	No*
Benzyl alcohol**	000100-51-6	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	5.0	5.0	5.0	5.0	100	100	11	0.2000	Yes	Yes
Benzyl chloride	000100-44-7	100	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000*	0.0700	50.0	50.0	50.0	50.0	100	100	11	1.0000	Yes	No
Beryllium	007440-41-7	10000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	50.0	50.0	50.0	50.0	...	...	NA	NA	No	Yes
Biphenyl, 1,1-	000092-52-4	10	1.0E+00	1.0E-02	2.0E-01	2.0E-03	0.4000	0.0700*	500.0	500.0	500.0	500.0	1000	100	11	0.2000	Yes	Yes
Bis (2-ethylhexyl) phthalate	000117-81-7	100	1.0E+00	1.0E-04	2.0E-03	2.0E-07	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	1000	1	6	0.0020	Yes	Yes
Bis(2-chloroethoxy)methane	000111-91-1	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	0.5	0.5	0.5	0.5	1*	1*	6	0.0200	Yes	Yes
Bis(2-chloroethyl)ether	000111-44-4	1000	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000	1.0000	50.0	50.0	50.0	50.0	1	1	11	1.0000	Yes	No
Bis(2-chloroisopropyl)ether**	039638-32-9	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	50.0	50.0	50.0	50.0	...	...	NA	NA	No	Yes
Bis(chloromethyl)ether	000542-88-1	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.0007	0.0007	5.0	5.0	5.0	5.0	...	...	17	1.0000	Yes	No
Boron	007440-42-8	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Bromodichloromethane	000075-27-4	100	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	50.0	50.0	50.0	50.0	...	...	17	1.0000	Yes	No
Bromomethane	000074-83-9	1000	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	0.4000	5.0	5.0	5.0	5.0	10000	10	17	1.0000	Yes	No
Bromophenyl-phenylether, 4-**	000101-55-3	...	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	5000.0	5000.0	5000.0	5000.0	1000	1000	11	0.2000	Yes	Yes

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HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid: Karst	Ground Water Mobility: Liquid: Non-Karst	Ground Water Mobility: Non-Liquid: Karst	Ground Water Mobility: Non-Liquid: Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain: Fresh	Bioaccumulation: Food Chain: Salt	Bioaccumulation: Environmental: Fresh	Bioaccumulation: Environmental: Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Gas	Part
Bromoxynil	001689-84-5	100	1.0E+00	1.0E+00*	1.0E+00*	1.0E+00*	0.4000	0.0700	50.0	50.0	50.0	50.0	10	10	0	0.0002	Yes	Yes
Butadiene, 1,3-	000106-99-0	1000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.0007	0.0700	5.0	5.0	5.0	5.0	...	...	17	1.0000	Yes	No
Butanol	000071-36-3	10	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000	0.4000*	5.0	5.0	5.0	5.0	1	1	11	1.0000	Yes	No
Butylbenzyl phthalate	000085-68-7	10	1.0E+00	1.0E-02*	2.0E-01	2.0E-03*	1.0000	1.0000	500.0	500.0	500.0	500.0	100	10000*	6	0.0020	Yes	Yes
Butyric acid, 4-(2,4-dichlorophenoxy)	000094-82-6	100	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	1.0000*	0.4000*	500.0*	500.0*	500.0*	500.0*	100	100	0	0.0020	Yes	Yes
Cadmium	007440-43-9	10000	1.0E+00	1.0E-02*	2.0E-01	2.0E-03*	1.0000	1.0000	5000.0	5000.0	5000.0	5000.0	1000	1000	NA	NA	No	Yes
Calcium**	007440-70-2	...	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	500.0	500.0	500.0	500.0	...	...	NA	NA	No	Yes
Captan	000133-06-2	10	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	0.0007	0.0700	50.0	50.0	50.0	50.0	10000	100	6	0.0200	Yes	Yes
Carbaryl	000063-25-2	10	1.0E+00	1.0E+00	1.0E+00*	1.0E+00*	1.0000*	0.4000*	50.0	50.0	50.0	50.0	10000	10000	0	0.0020	Yes	Yes
Carbazole**	000086-74-8	10	1.0E+00	1.0E+00	2.0E-01	2.0E-01	0.4000	0.0700	500.0	500.0	500.0	500.0	...	...	0	0.0020	Yes	Yes
Carbofuran	001563-66-2	100	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000	1.0000	5.0*	5.0*	50.0	50.0	10000	10000*	11	1.0000	Yes	No
Carbon disulfide	000075-15-0	10*	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	0.4000	500.0*	500.0*	500.0*	500.0*	100	100	17	1.0000	Yes	No
Carbon tetrachloride	000056-23-5	1000	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	50.0	50.0	50.0	50.0	100	1	17	1.0000	Yes	No
Carbophenothion	000786-19-6	100	1.0E+00	1.0E-02*	2.0E-03*	2.0E-05*	1.0000	1.0000	50000.0*	50000.0*	50000.0*	50000.0*	10000	10000	NA	NA	No	Yes
Cesium	007440-46-2	...	1.0E+00	1.0E-02*	1.0E+00*	1.0E-02*	1.0000	1.0000	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Chloral	000075-87-6	1000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	5.0	5.0	5.0	5.0	1*	1*	11	1.0000	Yes	No
Chlordane	000057-74-9	10000	1.0E+00	1.0E-02*	2.0E-03	2.0E-05*	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	10000	10000	6	0.0020	Yes	Yes
Chlordane, alpha-**	005103-71-9	10	1.0E+00	1.0E-02	2.0E-03	2.0E-05	1.0000	1.0000	500.0	500.0	500.0	500.0	10000	10000	NA	NA	No	Yes
Chlordane, gamma-**	005566-34-7	10	1.0E+00	1.0E-02	2.0E-03	2.0E-05	1.0000	1.0000	50000.0	50000.0	500.0	500.0	10000	10000	NA	NA	No	Yes

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HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid: Karst	Ground Water Mobility: Liquid: Non-Karst	Ground Water Mobility: Non-Liquid: Karst	Ground Water Mobility: Non-Liquid: Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain: Fresh	Bioaccumulation: Food Chain: Salt	Bioaccumulation: Environmental: Fresh	Bioaccumulation: Environmental: Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Air Gas	Part
Chlorine cyanide	000506-77-4	10	1.0E+00	1.0E+00*	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	10000	10000	17	1.0000	Yes	No
Chloro-3-methylphenol, 4-	000059-50-7	1	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000	1.0000	50.0	50.0	50.0	50.0	100	100	11	0.2000	Yes	Yes
Chloroaniline, p-	000106-47-8	1000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.0700	0.0700	5.0	5.0	5.0	5.0	10000	10	11	0.2000	Yes	Yes
Chlorobenzene	000108-90-7	100	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.0007	0.0700	50.0	50.0	50.0	50.0	1000	100	17	1.0000	Yes	No
Chlorobenzilate**	000510-15-6	100	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	500.0	500.0	500.0	500.0	1000	1000	6	0.0020	Yes	Yes
Chloroform	000067-66-3	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	5.0	5.0	5.0	5.0	10	10	17	1.0000	Yes	No
Chloromethane	000074-87-3	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.0007	0.0700	5.0	5.0	5.0	5.0	1	1	17	1.0000	Yes	No
Chloromethyl methyl ether	000107-30-2	100*	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.0007	0.0007	0.5	0.5	0.5	0.5	...	...	17	1.0000	Yes	No
Chloromethyloxirane, 2-	000106-89-8	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000*	0.4000	0.5	0.5	0.5	0.5	10	10	17	1.0000	Yes	No
Chloronaphthalene, 2-	000091-58-7	10	1.0E+00	1.0E-02	2.0E-01	2.0E-03	0.4000	1.0000	500.0	500.0	500.0	500.0	100*	100*	11	0.2000	Yes	Yes
Chlorophenol, 2-	000095-57-8	100	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	500.0	500.0	500.0	500.0	100	100	11	1.0000	Yes	No
Chlorophenyl-phenyl ether, 4-**	007005-72-3	...	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	5000.0	5000.0	5000.0	5000.0	1000	1000	NA	NA	No	Yes
Chloroprene**	000126-99-8	1000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	50.0	50.0	50.0	50.0	...	...	17	1.0000	Yes	No
Chlorpyrifos	002921-88-2	1000	1.0E+00	1.0E-02*	2.0E-01	2.0E-03*	1.0000	1.0000	500.0	5000.0	5000.0	5000.0	10000	10000	NA	NA	No	Yes
Chromium	007440-47-3	10000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	5.0	500.0	5.0	500.0	100*	100*	NA	NA	No	Yes
Chromium(III)	016065-83-1	1	1.0E+00	1.0E-04*	1.0E+00	1.0E-04*	1.0000	1.0000	500.0	500.0	500.0	500.0	10	10	NA	NA	No	Yes
Chromium(VI)	018540-29-9	10000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	5.0	500.0	5.0	500.0	100	100	NA	NA	No	Yes
Chrysene	000218-01-9	10*	1.0E+00	1.0E-02*	2.0E-05	2.0E-07*	1.0000	1.0000	500.0	500.0	5000.0	500.0	1000	1000	6	0.0002	Yes	Yes

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HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

			Ground Water Mobility						Bioaccumulation									
			Liquid		Non-Liquid		Persistence		Food Chain		Environmental		Ecotoxicity		Air Gas	Air Gas		
Substance Name	CAS Number	Toxicity	Karst	Non-Karst	Karst	Non-Karst	River	Lake	Fresh	Salt	Fresh	Salt	Fresh	Salt	Migration	Mobility	Gas	Part
Cobalt	007440-48-4	1	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	5000.0	5000.0	...	...	NA	NA	No	Yes
Copper	007440-50-8	...	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	100	100*	NA	NA	No	Yes
Copper cyanide	000544-92-3	100	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	500.0	500.0	500.0	500.0	...	...	NA	NA	No	Yes
Coumaphos	000056-72-4	100	1.0E+00	1.0E-02*	2.0E-01	2.0E-03*	0.4000	0.4000	500.0	500.0	500.0	500.0	10000	1000	NA	NA	No	Yes
Creosote	008001-58-9	10	1.0E+00	...	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Cresol, m-	000108-39-4	10	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000	1.0000	5.0	5.0	5.0	5.0	100	100	11	1.0000	Yes	No
Cresol, o-**	000095-48-7	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000	5.0	5.0	5.0	5.0	100	100	11	1.0000	Yes	No
Cresol, p-	000106-44-5	100	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000*	0.0700	5.0	5.0	5.0	5.0	...*	...*	11	1.0000	Yes	No
Cumene	000098-82-8	1000	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	0.4000	0.4000*	500.0	500.0	500.0	500.0	100	1	17	1.0000	Yes	No
Cyanazine	021725-46-2	1000	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	0.0700	50.0	50.0	50000.0	50000.0	100	100	0	0.0020	Yes	Yes
Cyanide	000057-12-5	100	1.0E+00	1.0E+00*	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	1000	1000	NA	NA	No	Yes
Cyanogen	000460-19-5	100	1.0E+00	1.0E+00*	1.0E+00	1.0E+00	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	17	1.0000	Yes	No
Cyanogen bromide	000506-68-3	10	1.0E+00	1.0E+00*	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	1000	1000	17*	1.0000*	Yes*	No*
Cyclohexane	000110-82-7	1	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	0.4000	1.0000	500.0	500.0	500.0	500.0	100	100	17	1.0000	Yes	No
Cyclohexanone	000108-94-1	1	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	5.0	5.0	5.0	5.0	1	1	11	1.0000	Yes	No
Cyclotrimethylenetrinitramine	000121-82-4	1000	1.0E+00	1.0E+00*	2.0E-01*	2.0E-01*	0.4000	0.0700	5.0*	5.0*	5.0*	5.0*	100	100	NA	NA	No	Yes
DDD	000072-54-8	100	1.0E+00	1.0E-04	2.0E-03	2.0E-07	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	10000	10000	6	0.0020	Yes	Yes
DDE	000072-55-9	100	1.0E+00	1.0E-04	2.0E-03	2.0E-07	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	10000	10000	6	0.0020	Yes	Yes
DDT	000050-29-3	1000	1.0E+00	1.0E-04	2.0E-03	2.0E-07	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	10000	10000	6	0.0020	Yes	Yes

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** Indicates new hazardous substance in current version of chemical data (JUN96).

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HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid: Karst	Ground Water Mobility: Liquid: Non-Karst	Ground Water Mobility: Non-Liquid: Karst	Ground Water Mobility: Non-Liquid: Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain: Fresh	Bioaccumulation: Food Chain: Salt	Bioaccumulation: Environmental: Fresh	Bioaccumulation: Environmental: Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Gas	Part
DEF	000078-48-8	10000	1.0E+00	1.0E+00*	2.0E-01*	2.0E-01*	1.0000	0.0700*	5000.0	5000.0	5000.0	5000.0	1000	10000	NA	NA	No	Yes
Di-n-butyl phthalate	000084-74-2	10	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	5000.0	5000.0	5000.0	5000.0	1000	10000	6	0.0200	Yes	Yes
Di-n-octyl phthalate	000117-84-0	100	1.0E+00	1.0E-04	2.0E-03	2.0E-07	1.0000	1.0000	500.0	500.0	500.0	500.0	...	...	6	0.0020	Yes	Yes
Diallate**	002303-16-4	100	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	500.0	500.0	500.0	500.0	100	100	11	0.2000	Yes	Yes
Diazinon	000333-41-5	1000	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	1.0000*	1.0000*	500.0	500.0	500.0	500.0	10000	10000*	17	1.0000	Yes	No
Dibenz(a,h)anthracene	000053-70-3	10000*	1.0E+00	1.0E-04	2.0E-05	2.0E-09	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	...	...	NA	NA	No	Yes
Dibenzofuran	000132-64-9	...	1.0E+00	1.0E-02*	2.0E-01	2.0E-03*	1.0000	1.0000	500.0	500.0	500.0	500.0	100	100	11	0.0200	Yes	Yes
Dibromo-3-chloropropane, 1,2-	000096-12-8	10000	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000	1.0000	50.0	50.0	50.0	50.0	...	...	11	1.0000	Yes	No
Dibromochloromethane	000124-48-1	100	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	50.0	50.0	50.0	50.0	...	...	11	1.0000	Yes	No
Dibromoethane, 1,2-	000106-93-4	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	5.0	5.0	5.0	5.0	...	...	17	1.0000	Yes	No
Dicamba	001918-00-9	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	50.0*	50.0*	50.0*	50.0*	100	100	6	0.0200	Yes	Yes
Dichlorobenzene, 1,2-	000095-50-1	10	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	50.0	50.0	50.0	50.0	100	100	17	1.0000	Yes	No
Dichlorobenzene, 1,3-	000541-73-1	...	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	50.0	50.0	50.0	50.0	100	100	17	1.0000	Yes	No
Dichlorobenzene, 1,4-	000106-46-7	10	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	0.4000	1.0000	50.0	50.0	50.0	50.0	100	100	17	1.0000	Yes	No
Dichlorobenzidine, 3,3-	000091-94-1	100	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	0.0700*	0.0700	500.0	500.0	500.0	500.0	...	...	0	0.0002	Yes	Yes
Dichlorodifluoromethane	000075-71-8	10	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	50.0	50.0	50.0	50.0	...	...	17	1.0000	Yes	No
Dichloroethane, 1,1-	000075-34-3	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	5.0	5.0	5.0	5.0	...	...	17	1.0000	Yes	No
Dichloroethane, 1,2-	000107-06-2	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	5.0	5.0	5.0	5.0	1	1	17	1.0000	Yes	No
Dichloroethylene, 1,1-	000075-35-4	100	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	50.0	50.0	50.0	50.0	10	1	17	1.0000	Yes	No

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** Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid Karst	Ground Water Mobility: Liquid Non-Karst	Ground Water Mobility: Non-Liquid Karst	Ground Water Mobility: Non-Liquid Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain Fresh	Bioaccumulation: Food Chain Salt	Bioaccumulation: Environmental Fresh	Bioaccumulation: Environmental Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Gas	Part
Dichloroethylene, cis-1,2-	000156-59-2	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	5.0	5.0	5.0	5.0	...	...	17	1.0000	Yes	No
Dichloroethylene, trans-1,2-	000156-60-5	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	50.0	50.0	50.0	50.0	1	1	17	1.0000	Yes	No
Dichlorophenol, 2,4-	000120-83-2	1000	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.0007*	0.0700*	50.0*	50.0*	500.0	500.0	100	100	11	0.2000	Yes	Yes
Dichlorophenoxyacetic acid, 2,4-	000094-75-7	100	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000	0.4000*	50.0	50.0	50.0	50.0	100	100	0	0.0020	Yes	Yes
Dichloropropane, 1,2-	000078-87-5	1000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	5.0*	5.0*	5.0*	5.0*	10	1	17	1.0000	Yes	No
Dichloropropene, 1,3-	000542-75-6	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.4000	50.0*	50.0*	50.0*	50.0*	1000	100	17	1.0000	Yes	No
Dichloropropene, cis-1,3-**	010061-01-5	...	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	50.0	50.0	50.0	50.0	...	...	17	1.0000	Yes	No
Dichloropropene, trans-1,3-**	010061-02-6	...	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	50.0	50.0	50.0	50.0	...	...	17	1.0000	Yes	No
Dichlorvos	000062-73-7	10000*	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.4000*	5.0	5.0	5.0	5.0	10000	10000	17	0.2000	Yes	Yes
Dicofol	000115-32-2	10	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	0.4000*	0.4000*	500.0*	500.0*	50000.0	50000.0	10000	1000	NA	NA	No	Yes
Dieldrin	000060-57-1	10000	1.0E+00	1.0E-02*	2.0E-03	2.0E-05*	1.0000	1.0000	50000.0	5000.0	50000.0	5000.0	10000	10000	6	0.0020	Yes	Yes
Diethyl phthalate	000084-66-2	1	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000	1.0000	500.0	500.0	500.0	500.0	10*	10*	11	0.2000	Yes	Yes
Diethylene glycol	000111-46-6	1	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	0.5	0.5	0.5	0.5	1	1	11	0.2000	Yes	Yes
Diethylstilbestrol**	000056-53-1	10000	1.0E+00	1.0E-02	2.0E-03	2.0E-05	1.0000	1.0000	5000.0	5000.0	5000.0	5000.0	...	...	0	0.0002	Yes	Yes
Diisopropylmethyl-phosphonate	001445-75-6	10	1.0E+00	...	...	...	0.4000	0.0700	5.0	5.0	5.0	5.0	1	1	NA	NA	No	Yes
Dimethoate	000060-51-5	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	0.5	0.5	0.5	0.5	10000	10000*	0	0.0020	Yes	Yes
Dimethoxybenzidine, 3,3-	000119-90-4	10	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	1.0000	1.0000	5.0	5.0	5.0	5.0	...	...	0	0.0020	Yes	Yes
Dimethyl phenol, 2,4-	000105-67-9	100	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000	0.4000*	500.0	500.0	500.0	500.0	100	100	11	0.2000	Yes	Yes

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** Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid: Karst	Ground Water Mobility: Liquid: Non-Karst	Ground Water Mobility: Non-Liquid: Karst	Ground Water Mobility: Non-Liquid: Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain: Fresh	Bioaccumulation: Food Chain: Salt	Bioaccumulation: Environmental: Fresh	Bioaccumulation: Environmental: Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Air Gas	Part
Dimethyl phthalate	000131-11-3	10*	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000	0.4000	50.0	50.0	50.0	50.0	10	10	11	0.2000	Yes	Yes
Dimethyl sulfate	000077-78-1	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.0007	0.0700	5.0	5.0	5.0	5.0	100	10	11	1.0000	Yes	No
Dimethylbenz(a)anthracene, 7,12-**	000057-97-6	10000	1.0E+00	1.0E-04	2.0E-03	2.0E-07	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	...	...	0	0.0002	Yes	Yes
Dimethylbenzidine, 3,3'-**	000119-93-7	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000	50.0	50.0	50.0	50.0	...	...	0	0.0002	Yes	Yes
Dinitro-2-methylphenol, 4,6-**	000534-52-1	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000	50.0	50.0	50.0	50.0	10000	10000	6	0.0200	Yes	Yes
Dinitrobenzene, 1,3-	000099-65-0	10000	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000	1.0000	5.0	5.0	5.0	5.0	100	100	6	0.0200	Yes	Yes
Dinitrophenol, 2,4-	000051-28-5	1000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	5.0	5.0	5.0	5.0	10000	100*	11	0.2000	Yes	Yes
Dinitrotoluene, 2,4-	000121-14-2	1000	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000*	0.4000	50.0	50.0	50.0	50.0	100	100	6	0.0200	Yes	Yes
Dinitrotoluene, 2,6-	000606-20-2	1000	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	0.0700	5.0*	5.0*	5.0*	5.0*	10	10	6	0.0200	Yes	Yes
Dinoseb	000088-85-7	1000	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	1.0000	1.0000	50.0*	50.0*	50.0	50.0	10000	100	6	0.0200	Yes	Yes
Dioxane, 1,4-	000123-91-1	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	0.5	0.5	0.5	0.5	1	1	11	1.0000	Yes	No
Dioxathion	000078-34-2	100	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	0.0700	50.0	50.0	50.0	50.0	10000	10000	NA	NA	No	Yes
Diphenylamine**	000122-39-4	100	1.0E+00	1.0E+00	2.0E-01	2.0E-01	1.0000	1.0000	500.0	500.0	500.0	500.0	100	100	6	0.0200	Yes	Yes
Diphenylhydrazine, 1,2-	000122-66-7	1000	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	1.0000	1.0000	50.0	50.0	50.0	50.0	1000*	1000*	6	0.0200	Yes	Yes
Diquat	000085-00-7	1000	1.0E+00	...	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	1000	1000	NA	NA	No	Yes
Disulfoton	000298-04-4	10000	1.0E+00	1.0E-02*	2.0E-01	2.0E-03*	1.0000	0.4000*	500.0	500.0	500.0	500.0	10000	1000*	6	0.0200	Yes	Yes
Diuron	000330-54-1	1000	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	0.4000	0.0700	50.0	50.0	500.0	500.0	1000	100	NA	NA	No	Yes
Endosulfan (I or II)	000115-29-7	100	1.0E+00	1.0E+00*	2.0E-03	2.0E-03*	1.0000	0.4000	500.0*	5000.0	50000.0*	5000.0	10000	10000	11	0.0020	Yes	Yes
Endosulfan sulfate	001031-07-8	100	1.0E+00	1.0E+00*	2.0E-01*	2.0E-01*	1.0000	1.0000	500.0*	500.0*	500.0*	500.0*	...	...	17	1.0000	Yes	No

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** Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid Karst	Ground Water Mobility: Liquid Non-Karst	Ground Water Mobility: Non-Liquid Karst	Ground Water Mobility: Non-Liquid Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain Fresh	Bioaccumulation: Food Chain Salt	Bioaccumulation: Environmental Fresh	Bioaccumulation: Environmental Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Gas	Part
Endothall	000145-73-3	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	0.5	0.5	500.0	500.0	10000	10000	6	0.0200	Yes	Yes
Endrin	000072-20-8	10000	1.0E+00	1.0E-02*	2.0E-03	2.0E-05*	1.0000	1.0000	5000.0	5000.0	50000.0	5000.0	10000	10000	6	0.0020	Yes	Yes
Endrin aldehyde	007421-93-4	...	1.0E+00	1.0E-02*	2.0E-01*	2.0E-03*	0.4000	0.0700	500.0*	500.0*	500.0*	500.0*	...*	...*	NA	NA	No	Yes
Endrin ketone**	053494-70-5	100	1.0E+00	...	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Ethion	000563-12-2	1000	1.0E+00	1.0E-02*	2.0E-03	2.0E-05*	1.0000	1.0000	5000.0	5000.0	5000.0	5000.0	10000	10000	NA	NA	No	Yes
Ethyl acetate	000141-78-6	1	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.4000	0.5	0.5	0.5	0.5	1	1	17	1.0000	Yes	No
Ethyl benzene	000100-41-4	10	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	0.4000	50.0	50.0	50.0	50.0	100	10	17	1.0000	Yes	No
Ethyl chloride	000075-00-3	1	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.0007	0.0700	5.0	5.0	5.0	5.0	...	...	17	1.0000	Yes	No
Ethyl ether	000060-29-7	10	1.0E+00	1.0E+00	1.0E+00*	1.0E+00*	0.4000	1.0000	5.0*	5.0*	5.0*	5.0*	1	1	17	1.0000	Yes	No
Ethyl methacrylate**	000097-63-2	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	5.0	5.0	5.0	5.0	...	...	17	1.0000	Yes	No
Ethyl methanesulfonate**	000062-50-0	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.0007	0.0700	0.5	0.5	0.5	0.5	...	...	11	1.0000	Yes	No
Ethyldipropylthiocarbamate, s-	000759-94-4	100	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000	1.0000	500.0	500.0	500.0	500.0	10	10	11	1.0000	Yes	No
Ethylene glycol	000107-21-1	1	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000	0.5	0.5	0.5	0.5	1	10*	6	0.2000	Yes	Yes
Ethylene glycol monoethyl ether	000110-80-5	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	0.5	0.5	0.5	0.5	1	1	11	1.0000	Yes	No
Ethylene thiourea**	000096-45-7	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	0.5	0.5	0.5	0.5	10	10	6	0.0200	Yes	Yes
Fenthion	000055-38-9	100	1.0E+00	1.0E-02*	2.0E-01	2.0E-03*	0.4000	0.4000	500.0	500.0	50.0	50.0	10000	10000	NA	NA	No	Yes
Ferrous sulfate	007720-78-7	10	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	0.5	0.5	1000	1000	NA	NA	No	Yes
Fluoranthene	000206-44-0	100	1.0E+00	1.0E-02*	2.0E-03	2.0E-05*	1.0000	1.0000	5000.0	5000.0	500.0*	5000.0	10000	1000	6	0.0020*	Yes	Yes
Fluorene	000086-73-7	100	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	5000.0	5000.0	5000.0	5000.0	1000	1000	11	0.0200*	Yes	Yes

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HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid: Karst	Ground Water Mobility: Liquid: Non-Karst	Ground Water Mobility: Non-Liquid: Karst	Ground Water Mobility: Non-Liquid: Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain: Fresh	Bioaccumulation: Food Chain: Salt	Bioaccumulation: Environmental: Fresh	Bioaccumulation: Environmental: Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Gas	Part
Fluorine	007782-41-4	10	1.0E+00	1.0E-02	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	17	1.0000	Yes	No
Formaldehyde	000050-00-0	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000*	0.5	0.5	0.5	0.5	100	10	11	1.0000	Yes	No
Formic acid	000064-18-6	1	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000*	0.5	0.5	0.5	0.5	10*	10*	11	1.0000	Yes	No
Furan	000110-00-9	1000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	5.0	5.0	5.0	5.0	10	10	17	1.0000	Yes	No
Furfural	000098-01-1	1000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	0.5	0.5	0.5	0.5	10	10	11	1.0000	Yes	No
Glycidylaldehyde	000765-34-4	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	0.5	0.5	0.5	0.5	...	...	11	1.0000	Yes	No
Heptachlor	000076-44-8	1000	1.0E+00	1.0E-04*	2.0E-03	2.0E-07*	1.0000*	1.0000*	5000.0	5000.0	50000.0	50000.0	10000	10000	11	0.0200	Yes	Yes
Heptachlor epoxide	001024-57-3	10000	1.0E+00	1.0E-02*	2.0E-03	2.0E-05*	1.0000	1.0000	5.0	5.0	50000.0	50000.0	10000	10000	6*	0.0200	Yes	Yes
Heptachlorinated dibenzo-p-dioxin, 1,2,3,4,6,	035822-46-9	10000*	1.0E+00	1.0E-04*	2.0E-05*	2.0E-09*	1.0000*	1.0000*	50000.0	50000.0	50000.0	50000.0	...	...	NA	NA	No	Yes
Heptachlorinated dibenzofuran, 1,2,3,4,6,7,8-	067562-39-4	10000*	1.0E+00	1.0E-04*	2.0E-05*	2.0E-09*	1.0000*	1.0000*	50000.0*	50000.0*	50000.0*	50000.0*	...	...	NA	NA	No	Yes
Heptachlorinated dibenzofuran, 1,2,3,4,6,7,9-	055673-89-7	...	1.0E+00	...	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Hexabromobenzene	000087-82-1	1000	1.0E+00	1.0E-04	2.0E-05	2.0E-09	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	...	...	6	0.0002	Yes	Yes
Hexachlorinated dibenzo-p-dioxin, 1,2,3,4,7,8	039227-28-6	10000*	1.0E+00	1.0E-04*	2.0E-05*	2.0E-09*	1.0000*	1.0000*	50000.0*	50000.0*	50000.0*	50000.0*	...	...	NA	NA	No	Yes
Hexachlorinated dibenzo-p-dioxin, 1,2,3,6,7,8	057653-85-7	10000*	1.0E+00	...	...	...	0.4000	0.0700	5000.0	5000.0	5000.0	5000.0	10000	10000	NA	NA	No	Yes
Hexachlorinated dibenzo-p-dioxin, 1,2,3,7,8,9	019408-74-3	10000	1.0E+00	...	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Hexachlorinated dibenzofuran, 1,2,3,4,7,8-	070648-26-9	10000*	1.0E+00	1.0E-04*	2.0E-05*	2.0E-09*	1.0000*	1.0000*	50000.0*	50000.0*	50000.0*	50000.0*	...	...	NA	NA	No	Yes
Hexachlorinated dibenzofuran, 1,2,3,6,7,8-	057117-44-9	10000*	1.0E+00	...	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Hexachlorinated dibenzofuran, 1,2,3,7,8,9-	072918-21-9	10000*	1.0E+00	...	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes

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HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid Karst	Ground Water Mobility: Liquid Non-Karst	Ground Water Mobility: Non-Liquid Karst	Ground Water Mobility: Non-Liquid Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain Fresh	Bioaccumulation: Food Chain Salt	Bioaccumulation: Environmental Fresh	Bioaccumulation: Environmental Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Gas	Part
Hexachlorinated dibenzofuran, 2,3,4,6,7,8-	060851-34-5	10000*	1.0E+00	...	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Hexachlorobenzene	000118-74-1	1000	1.0E+00	1.0E-02*	2.0E-05*	2.0E-07*	1.0000	1.0000	5000.0	50000.0	50000.0	50000.0	10	10000*	11	0.0200	Yes	Yes
Hexachlorobutadiene	000087-68-3	10000	1.0E+00	1.0E-02*	2.0E-01	2.0E-03*	1.0000	1.0000	50.0	50.0	5000.0	5000.0	10000	100	17	1.0000*	Yes	No*
Hexachlorocyclohexane, alpha-	000319-84-6	10000	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	1.0000	1.0000	500.0	500.0	500.0	5000.0*	100	1000	11	0.0200	Yes	Yes
Hexachlorocyclohexane, beta-	000319-85-7	100	1.0E+00	1.0E+00*	2.0E-03	2.0E-03*	1.0000	1.0000	500.0	500.0	500.0	5000.0	...	...	6	0.0020	Yes	Yes
Hexachlorocyclohexane, delta-	000319-86-8	1	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	1.0000	1.0000	500.0	500.0	500.0	500.0	...	...	6	0.0200	Yes	Yes
Hexachlorocyclopentadiene	000077-47-4	10000	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	5000.0	5000.0	50.0	50.0	10000	10000	17	0.2000	Yes	Yes
Hexachloroethane	000067-72-1	1000	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	0.4000	1.0000	500.0	500.0	500.0	500.0	1000	100	17	1.0000	Yes	No
Hexachlorophene	000070-30-4	10000	1.0E+00	1.0E-04*	1.0E+00	1.0E-04*	1.0000	1.0000	5000.0	5000.0	5000.0	5000.0	10000	10000	NA	NA	No	Yes
Hexane	000110-54-3	10	1.0E+00	1.0E-02	2.0E-01	2.0E-03	0.4000	1.0000	500.0	500.0	500.0	500.0	100	100	17	1.0000	Yes	No
Hexanone, 2-**	000591-78-6	1	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	5.0	5.0	5.0	5.0	1	1	17	1.0000	Yes	No
Hydrazine	000302-01-2	10000	1.0E+00	1.0E+00*	1.0E+00	1.0E+00	1.0000	0.4000	0.5	0.5	0.5	0.5	10000*	100	17	1.0000	Yes	No
Hydrochloric acid	007647-01-0	100*	1.0E+00	1.0E+00	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	1	1	17	1.0000	Yes	No
Hydrogen cyanide	000074-90-8	1000*	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.0700*	0.0700	0.5	0.5	0.5	0.5	1000	10000*	17	1.0000	Yes	No
Hydrogen sulfide	007783-06-4	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	0.5	0.5	0.5	0.5	1000	1000	17	1.0000	Yes	No
Indeno(1,2,3-cd)pyrene	000193-39-5	.1000*	1.0E+00	1.0E-04	2.0E-05	2.0E-09	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	...	...	NA	NA	No	Yes
Ioxynil	001689-83-4	1000	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	0.4000	0.0700	500.0	500.0	500.0	500.0	1000	1000	NA	NA	No	Yes
Iron	007439-89-6	1*	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	0.5	0.5	10	10	NA	NA	No	Yes
Isobutanol	000078-83-1	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000*	0.4000*	0.5	0.5	0.5	0.5	10	1	17	1.0000	Yes	No

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HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid, Karst	Ground Water Mobility: Liquid, Non-Karst	Ground Water Mobility: Non-Liquid, Karst	Ground Water Mobility: Non-Liquid, Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain, Fresh	Bioaccumulation: Food Chain, Salt	Bioaccumulation: Environmental, Fresh	Bioaccumulation: Environmental, Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Gas	Part
Isophorone	000078-59-1	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	5.0	5.0	5.0	5.0	1	1	11	1.0000	Yes	No
Kepone	000143-50-0	10000	1.0E+00	1.0E-02*	2.0E-01	2.0E-03*	1.0000*	1.0000*	50000.0	50000.0	50000.0	50000.0	10000	10000	0	0.0020	Yes	Yes
Lead	007439-92-1	10000	1.0E+00	1.0E-02	2.0E-03	2.0E-05	1.0000	1.0000	50.0	5000.0	5000.0	5000.0	1000	1000	NA	NA	No	Yes
Lindane	000058-89-9	10000	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	1.0000	1.0000	500.0	500.0	500.0	500.0	10000	10000	11	0.0200	Yes	Yes
Magnesium	007439-95-4	...	1.0E+00	1.0E+00	...	...	1.0000	1.0000	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Malathion	000121-75-5	100	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000	0.4000*	50.0	50.0	50.0	50.0	10000	10000	0	0.0020	Yes	Yes
Maleic anhydride	000108-31-6	10	1.0E+00	...	...	...	0.0007	0.0007	0.5	0.5	0.5	0.5	1	1	11	1.0000	Yes	No
Maleic hydrazide	000123-33-1	1	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	0.5	0.5	0.5	0.5	10	10	17	1.0000	Yes	No
Manganese	007439-96-5	10000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	50000.0	50000.0	...	...	NA	NA	No	Yes
Mercury	007439-97-6	10000	1.0E+00	1.0E-02*	2.0E-05	2.0E-07*	0.4000*	1.0000	50000.0	50000.0	50000.0	50000.0	10000	10000	17*	0.2000	Yes	Yes
Methacrylonitrile	000126-98-7	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	0.5	0.5	0.5	0.5	...	...	17	1.0000	Yes	No
Methanol	000067-56-1	1	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000	0.5	0.5	0.5	0.5	10*	1	11	1.0000	Yes	No
Methomyl	016752-77-5	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	0.5	0.5	0.5	0.5	10000	10000	17	1.0000	Yes	No
Methoxychlor	000072-43-5	100	1.0E+00	1.0E-02*	2.0E-03	2.0E-05*	1.0000	1.0000	50000.0	5000.0	50000.0	5000.0	10000	10000	6	0.0020	Yes	Yes
Methyl chlorocarbonate	000079-22-1	100	1.0E+00	...	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	17	1.0000	Yes	No
Methyl ethyl ketone	000078-93-3	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.4000	0.5	0.5	0.5	0.5	1	1	17	1.0000	Yes	No
Methyl isobutyl ketone	000108-10-1	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.4000*	5.0	5.0	5.0	5.0	1	1	17	1.0000	Yes	No
Methyl methacrylate	000080-62-6	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000*	5.0	5.0	5.0	5.0	1	1	17	1.0000	Yes	No
Methylcholanthrene, 3-**	000056-49-5	1000	1.0E+00	1.0E-04	2.0E-05	2.0E-09	1.0000	1.0000	50000.0	50000.0	50.0	50.0	...	...	6	0.0002	Yes	Yes

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HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

			Ground Water Mobility						Bioaccumulation									
			Liquid		Non-Liquid		Persistence		Food Chain		Environmental		Ecotoxicity		Air Gas	Air Gas		
Substance Name	CAS Number	Toxicity	Karst	Non-Karst	Karst	Non-Karst	River	Lake	Fresh	Salt	Fresh	Salt	Fresh	Salt	Migration	Mobility	Gas	Part
Methylene bis (2-chloroaniline), 4,4-	000101-14-4	1000	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	1.0000*	1.0000*	5.0*	5.0*	5.0*	5.0*	...	...	0	0.0002	Yes	Yes
Methylene bromide**	000074-95-3	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	5.0	5.0	5.0	5.0	...	...	17	1.0000	Yes	No
Methylene chloride	000075-09-2	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	5.0	5.0	5.0	5.0	1	10	17	1.0000	Yes	No
Methylenediphenyl diisocyanate, 4,4-	000101-68-8	10000	1.0E+00	...	...	...	0.0700*	0.0700	0.5	0.5	0.5	0.5	...	...	6	0.0020	Yes	Yes
Methylnaphthalene, 2-	000091-57-6	...	1.0E+00	1.0E-02	2.0E-01	2.0E-03	0.4000	0.4000	5000.0	5000.0	5000.0	5000.0	1000	1000	11	0.2000	Yes	Yes
Metribuzin	021087-64-9	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	5.0	5.0	5.0	5.0	100*	100*	17	1.0000	Yes	No
Mirex	002385-85-5	10000	1.0E+00	1.0E-04*	2.0E-05*	2.0E-09*	1.0000*	1.0000*	5000.0	50000.0	50000.0	50000.0	10000	10000	NA	NA	No	Yes
Molybdenum**	007439-98-7	100	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
N-nitroso-di-n-propylamine**	000621-64-7	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.0007	0.0700	5.0	5.0	5.0	5.0	...	...	11	1.0000	Yes	No
N-nitrosopiperidine**	000100-75-4	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000	0.5	0.5	0.5	0.5	...	...	11	1.0000	Yes	No
Naphthalene	000091-20-3	100*	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	0.4000	0.4000	500.0	5.0	500.0	5000.0	1000	1000	11	0.2000	Yes	Yes
Naphthylamine**	000091-59-8	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	50.0	50.0	50.0	50.0	...	...	6	0.0200	Yes	Yes
Nickel	007440-02-0	10000*	1.0E+00	1.0E-02	2.0E-03	2.0E-05	1.0000	1.0000	0.5	500.0	500.0	500.0	10	1000	NA	NA	No	Yes
Nitric acid	007697-37-2	10*	1.0E+00	1.0E+00	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	17	1.0000	Yes	No
Nitric oxide	010102-43-9	10	1.0E+00	1.0E+00	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	17*	1.0000*	Yes*	No*
Nitroaniline, 2-**	000088-74-4	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	5.0	5.0	5.0	5.0	10	10	11	0.0200	Yes	Yes
Nitroaniline, 3-**	000099-09-2	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	5.0	5.0	5.0	5.0	10	10	6	0.0200	Yes	Yes
Nitroaniline, p-	000100-01-6	1	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	5.0	5.0	5.0	5.0	10*	10*	0	0.0020	Yes	Yes

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HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid: Karst	Ground Water Mobility: Liquid: Non-Karst	Ground Water Mobility: Non-Liquid: Karst	Ground Water Mobility: Non-Liquid: Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain: Fresh	Bioaccumulation: Food Chain: Salt	Bioaccumulation: Environmental: Fresh	Bioaccumulation: Environmental: Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Gas	Part
Nitrobenzene	000098-95-3	1000	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000	1.0000	5.0	5.0	5.0	5.0	100	10	11	1.0000	Yes	No
Nitrogen dioxide	010102-44-0	1000*	1.0E+00	1.0E+00	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	17	1.0000	Yes	No
Nitroglycerine	000055-63-0	10	1.0E+00	1.0E+00*	1.0E+00	1.0E+00	1.0000	0.4000*	50.0	50.0	50.0	50.0	100	100	6	0.0200	Yes	Yes
Nitrophenol, 2-**	000088-75-5	1	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	5.0	5.0	5.0	5.0	100	100	11	1.0000	Yes	No
Nitrophenol, 4-	000100-02-7	1	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000	5.0	5.0	500.0	500.0	100	10	6	0.0200	Yes	Yes
Nitropropane, 2-**	000079-46-9	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	5.0	5.0	5.0	5.0	1	1	17	1.0000	Yes	No
Nitroso-di-n-butylamine, N-	000924-16-3	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.0700*	0.0700*	50.0*	50.0*	50.0*	50.0*	...	...	11	0.2000	Yes	Yes
Nitroso-di-n-methylurethane, N-	000615-53-2	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	11	1.0000	Yes	No
Nitrosodiethanolamine, N-	001116-54-7	1000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	0.5	0.5	0.5	0.5	...	...	6	0.0200	Yes	Yes
Nitrosodiethylamine, N-	000055-18-5	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.0700*	0.0700*	0.5	0.5	0.5	0.5	1	1	11	1.0000	Yes	No
Nitrosodimethylamine, N-	000062-75-9	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.0007*	0.0700*	0.5	0.5	0.5	0.5	1	1	11	1.0000	Yes	No
Nitrosodiphenylamine, N-	000086-30-6	10	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	1.0000	1.0000	500.0	500.0	500.0	500.0	100	100	6	0.0200	Yes	Yes
Nitrosomethylethylamine**	010595-95-6	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Nitrosopyrrolidine, N-	000930-55-2	1000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000*	1.0000*	0.5	0.5	0.5	0.5	...	...	6	0.2000	Yes	Yes
Nitrotoluene, 4-	000099-99-0	100	1.0E+00	1.0E+00*	2.0E-01*	2.0E-01*	1.0000	1.0000	50.0	50.0	50.0	50.0	10	10	11	0.2000	Yes	Yes
Octamethylpyrophosphoramide**	000152-16-9	1000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	0.5	0.5	0.5	0.5	100	100	NA	NA	No	Yes
Oxybis (1-chloropropane), 2,3'-**	000108-60-1	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	50.0	50.0	50.0	50.0	...	...	11	1.0000	Yes	No
Parathion, ethyl-	000056-38-2	100	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	500.0	500.0	500.0	500.0	10000	10000	6	0.0020	Yes	Yes
Parathion, methyl-	000298-00-0	10000	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	1.0000	0.4000	50.0	50.0	50.0	50.0	10000	10000	6	0.0200	Yes	Yes

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** Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid Karst	Ground Water Mobility: Liquid Non-Karst	Ground Water Mobility: Non-Liquid Karst	Ground Water Mobility: Non-Liquid Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain Fresh	Bioaccumulation: Food Chain Salt	Bioaccumulation: Environmental Fresh	Bioaccumulation: Environmental Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Gas	Part
PCBs	001336-36-3	10000	1.0E+00	1.0E-04	2.0E-03	2.0E-07	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	10000	10000	11	0.0200	Yes	Yes
Pentachlorinated dibenzo-p-dioxin, 1,2,3,7,8-	040321-76-4	10000*	1.0E+00	1.0E-04*	2.0E-03*	2.0E-07*	1.0000*	1.0000*	50000.0*	50000.0*	50000.0*	50000.0*	10000*	10000*	NA	NA	No	Yes
Pentachlorinated dibenzofuran, 1,2,3,7,8-	109719-77-9	10000*	1.0E+00	1.0E-04*	2.0E-05*	2.0E-09*	1.0000*	1.0000*	50000.0*	50000.0*	50000.0*	50000.0*	...	...	NA	NA	No	Yes
Pentachlorinated dibenzofuran, 2,3,4,7,8-	057117-41-6	10000*	1.0E+00	1.0E-04*	2.0E-05*	2.0E-09*	1.0000*	1.0000*	50000.0*	50000.0*	50000.0*	50000.0*	...	...	NA	NA	No	Yes
Pentachlorobenzene	000608-93-5	1000	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	5000.0	5000.0	5000.0	5000.0	1000*	1000	11	0.2000	Yes	Yes
Pentachloroethane	000076-01-7	10	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	0.4000*	50.0	50.0	50.0	50.0	100	1	17	1.0000	Yes	No
Pentachloronitrobenzene	000082-68-8	1000	1.0E+00	1.0E-02	2.0E-03	2.0E-05	1.0000	1.0000	500.0	500.0	500.0	500.0	...	...	11	0.0200	Yes	Yes
Pentachlorophenol	000087-86-5	100	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000	1.0000	500.0	500.0	5000.0	500.0	100	1000*	6	0.0200	Yes	Yes
Phenanthrene	000085-01-8	...	1.0E+00	1.0E-02*	2.0E-01	2.0E-03*	1.0000*	1.0000*	50.0	50.0	5000.0	50.0	1000	1000	11	0.0200	Yes	Yes
Phenol	000108-95-2	1	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000	5.0	5.0	5.0	5.0	10000	100	11	1.0000	Yes	No
Phenyl sulfide	000139-66-2	10	1.0E+00	1.0E-02*	2.0E-01*	2.0E-03*	1.0000	1.0000	500.0	500.0	500.0	500.0	...	...	11	0.2000*	Yes	Yes
Phenylenediamine, m-**	000108-45-2	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	0.5	0.5	0.5	0.5	...	...	6	0.2000	Yes	Yes
Phenylmercuric acetate	000062-38-4	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	50.0*	50.0*	50.0*	50.0*	10000	1000	6	0.0002*	Yes	Yes
Phorate	000298-02-2	10000	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	0.4000	500.0	500.0	500.0*	500.0*	10000	10000	11	0.0200	Yes	Yes
Phosgene	000075-44-5	1000	1.0E+00	...	...	...	0.0007*	0.0700	0.5	0.5	0.5	0.5	...	...	17	1.0000	Yes	No
Phosphamidon	013171-21-6	1000	1.0E+00	...	1.0E+00*	...	0.4000	0.0700	0.5	0.5	0.5	0.5	10000	10000	11*	0.0200*	Yes*	Yes
Phosphine	007803-51-2	10000	1.0E+00	...	1.0E+00*	...	0.4000	0.0700	5000.0*	5000.0*	5000.0*	5000.0*	...	...	17	1.0000	Yes	No
Phosphonodithioic acid, phenyl-o-ethyl-o-(4-n	002104-64-5	10000	1.0E+00	1.0E-02*	2.0E-01*	2.0E-03*	0.4000	0.0700	50.0*	500.0	5000.0	500.0	10000	10000	NA	NA	No	Yes
Phosphoric acid	007664-38-2	1000*	1.0E+00	1.0E+00	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	10000	10000	NA	NA	No	Yes

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** Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid Karst	Ground Water Mobility: Liquid Non-Karst	Ground Water Mobility: Non-Liquid Karst	Ground Water Mobility: Non-Liquid Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain Fresh	Bioaccumulation: Food Chain Salt	Bioaccumulation: Environmental Fresh	Bioaccumulation: Environmental Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Air Gas	Part
Phosphorous (elemental)	007723-14-0	10000*	1.0E+00	1.0E+00	1.0E+00*	1.0E+00*	1.0000*	1.0000*	0.5	0.5	0.5	0.5	10000	10000	NA	NA	No	Yes
Phthalic anhydride	000085-44-9	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000*	0.4000*	0.5	0.5	0.5	0.5	...	...	6	0.0200	Yes	Yes
Plutonium	007440-07-5	...	1.0E+00	1.0E-04*	...	...	1.0000	1.0000	50.0	50.0	50000.0	50000.0	...	...	NA	NA	No	Yes
Polychlorinated triphenyl	012642-23-8	1	1.0E+00	...	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	10	10	NA	NA	No	Yes
Potassium**	007440-09-7	...	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Potassium silver cyanide	000506-61-6	10	1.0E+00	1.0E+00	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Pronamide	023950-58-5	10	1.0E+00	1.0E+00*	2.0E-01*	2.0E-01*	1.0000	1.0000	500.0*	500.0*	500.0*	500.0*	...	...	11	0.2000	Yes	Yes
Pyrene	000129-00-0	100	1.0E+00	1.0E-02*	2.0E-03*	2.0E-05*	1.0000	1.0000	50.0	5000.0*	50.0	5000.0*	10000*	10000*	6	0.0020	Yes	Yes
Pyridine	000110-86-1	1000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000*	0.5	0.5	0.5	0.5	100	10	11	1.0000	Yes	No
Quinoline	000091-22-5	1000	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000	0.4000*	0.5	0.5	50.0	50.0	1000	1000	11	0.2000	Yes	Yes
Radium	007440-14-4	...	1.0E+00	1.0E-02	2.0E-01*	2.0E-03*	1.0000	1.0000	5000.0*	5000.0*	5000.0*	5000.0*	...	...	NA	NA	No	Yes
Radon	010043-92-2	...	1.0E+00	1.0E+00	1.0E+00*	1.0E+00*	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	17*	1.0000*	Yes*	No*
Resorcinol	000108-46-3	1*	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	0.5*	0.5*	0.5*	0.5*	1000	10	6	0.0200	Yes	Yes
Ronnel	000299-84-3	10	1.0E+00	1.0E-02*	2.0E-01	2.0E-03*	1.0000	1.0000	5000.0	5000.0	5.0	5.0	10000	10000	NA	NA	No	Yes
Safrole**	000094-59-7	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	50.0	50.0	50.0	50.0	...	...	11	0.2000	Yes	Yes
Selenium	007782-49-2	100	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	5000.0	50.0	5000.0	50.0	1000*	100	NA	NA	No	Yes
Selenourea	000630-10-4	100	1.0E+00	...	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Silver	007440-22-4	100	1.0E+00	1.0E+00*	2.0E-05	2.0E-05*	1.0000	1.0000	50.0	50.0	50.0	50.0	10000	10000	NA	NA	No	Yes

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** Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid Karst	Ground Water Mobility: Liquid Non-Karst	Ground Water Mobility: Non-Liquid Karst	Ground Water Mobility: Non-Liquid Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain Fresh	Bioaccumulation: Food Chain Salt	Bioaccumulation: Environmental Fresh	Bioaccumulation: Environmental Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Gas	Part
Silver Cyanide	000506-64-9	10	1.0E+00	1.0E+00*	2.0E-05	2.0E-05*	1.0000	1.0000	500.0	500.0	500.0	500.0	...	...	NA	NA	No	Yes
Sodium	007440-23-5	...	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Strontium	007440-24-6	1	1.0E+00	1.0E-02*	1.0E+00*	1.0E-02*	1.0000	1.0000	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Strychnine	000057-24-9	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000*	1.0000*	5.0	5.0	5.0	5.0	1000	1000	NA	NA	No	Yes
Styrene	000100-42-5	10	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	50.0	50.0	50.0	50.0	100	100	17	1.0000	Yes	No
Sulfuric acid	007664-93-9	1000	1.0E+00	1.0E+00	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	10	10	11	0.0200	Yes	Yes
TB, 2,4,5-	000093-80-1	...	1.0E+00	1.0E-02	2.0E-01*	2.0E-03*	0.4000	0.0700	500.0	500.0	500.0	500.0	...	...	0	0.0020	Yes	Yes
TCDD	001746-01-6	10000	1.0E+00	1.0E-04	2.0E-05	2.0E-09	1.0000	1.0000	5000.0	5000.0	5000.0	5000.0	10000	10000	6	0.0002	Yes	Yes
Tetrachlorobenzene, 1,2,4,5-	000095-94-3	10000	1.0E+00	1.0E-02*	2.0E-03	2.0E-05*	1.0000	1.0000	5000.0	5000.0	5000.0	5000.0	100	1000	17	0.2000	Yes	Yes
Tetrachlorodibenzofuran, 2,3,7,8-	051207-31-9	10000*	1.0E+00	1.0E-04*	2.0E-03*	2.0E-07*	1.0000*	1.0000*	50000.0*	50000.0*	50000.0*	50000.0*	...	...	NA	NA	No	Yes
Tetrachloroethane, 1,1,1,2-	000630-20-6	100	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000*	50.0	50.0	50.0	50.0	10	10	17	1.0000	Yes	No
Tetrachloroethane, 1,1,2,2-	000079-34-5	10	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	5.0	5.0	5.0	5.0	100	10	11	1.0000	Yes	No
Tetrachloroethylene	000127-18-4	100	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	50.0	50.0	50.0	50.0	100	10	17	1.0000	Yes	No
Tetrachlorophenol, 2,3,4,6-	000058-90-2	100	1.0E+00	1.0E+00*	2.0E-01*	2.0E-01*	1.0000	0.4000*	500.0	500.0	5000.0	5000.0	1000	100	11	0.2000	Yes	Yes
Tetraethyl lead	000078-00-2	10000	1.0E+00	...	2.0E-03	...	0.0700	0.0700	500.0	500.0	500.0	500.0	100	10000	17	1.0000	Yes	No
Tetraethyldithiopyrophosphate	003689-24-5	1000	1.0E+00	...	2.0E-01*	...	0.4000	0.0700	5000.0*	5000.0*	5000.0*	5000.0*	1000*	1000*	11*	0.0200*	Yes*	Yes
Tetrahydrofuran	000109-99-9	1	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	0.5	0.5	0.5	0.5	1	1	17	1.0000	Yes	No
Thallium	007440-28-0	100*	1.0E+00	1.0E-04	1.0E+00	1.0E-04	1.0000	1.0000	500.0	50.0	500.0	50.0	1*	100*	NA	NA	No	Yes
Thiourea	000062-56-6	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000*	0.5	0.5	0.5	0.5	100	100	0*	0.0002*	Yes	Yes

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HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid: Karst	Ground Water Mobility: Liquid: Non-Karst	Ground Water Mobility: Non-Liquid: Karst	Ground Water Mobility: Non-Liquid: Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain: Fresh	Bioaccumulation: Food Chain: Salt	Bioaccumulation: Environmental: Fresh	Bioaccumulation: Environmental: Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Air Gas	Air Part
Thiram	000137-26-8	100	1.0E+00	...	2.0E-01	...	1.0000	1.0000*	5000.0	5000.0	5000.0	5000.0	10000	10000	NA	NA	No	Yes
Toluene	000108-88-3	10	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	0.4000	50.0	50.0	50.0	50.0	100	100	17	1.0000	Yes	No
Toluene diisocyanate	000584-84-9	10000*	1.0E+00	...	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	1	1	11	0.2000	Yes	Yes
Toluenediamine, 2,4-**	000095-80-7	1000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	0.5	0.5	0.5	0.5	1	1	6	0.0200	Yes	Yes
Toluidine, o-**	000095-53-4	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000	5.0	5.0	5.0	5.0	1000	1000	11	1.0000	Yes	No
Toluidine, p-**	000106-49-0	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	5.0	5.0	5.0	5.0	1	1	11	1.0000	Yes	No
Toxaphene	008001-35-2	1000	1.0E+00	1.0E-02	2.0E-03	2.0E-05	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	10000	10000	6	0.0020	Yes	Yes
TP, 2,4,5-	000093-72-1	100	1.0E+00	1.0E-02	1.0E+00	1.0E-02	0.4000	0.0700	500.0	500.0	500.0	500.0	1000	1000	0	0.0020	Yes	Yes
Tribromomethane	000075-25-2	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	50.0	50.0	50.0	50.0	10	100*	11	1.0000	Yes	No
Trichloro-1,2,2-Trifluoroethane, 1,1,2-	000076-13-1	1	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	50.0	50.0	50.0	50.0	...	...	17	1.0000	Yes	No
Trichlorobenzene, 1,2,4-	000120-82-1	100*	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	0.4000	1.0000	500.0	500.0	500.0	500.0	1000	1000	17	1.0000	Yes	No
Trichloroethane, 1,1,1-	000071-55-6	1	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	5.0	5.0	5.0	5.0	10	10	17	1.0000	Yes	No
Trichloroethane, 1,1,2-	000079-00-5	1000	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	50.0	50.0	50.0	50.0	10	10	17	1.0000	Yes	No
Trichloroethylene	000079-01-6	10	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	50.0	50.0	50.0	50.0	100	10	17	1.0000	Yes	No
Trichlorofluoromethane	000075-69-4	10	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	50.0	50.0	50.0	50.0	...	...	17	1.0000	Yes	No
Trichlorophenol, 2,3,5-	000933-78-8	...	1.0E+00	1.0E-02*	2.0E-01	2.0E-03*	1.0000	1.0000	500.0*	500.0*	500.0*	500.0*	1000*	100*	6	0.0200	Yes	Yes
Trichlorophenol, 2,3,6-	000933-75-5	...	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	1.0000	1.0000	500.0	500.0	500.0	500.0	100*	100*	6	0.0200	Yes	Yes
Trichlorophenol, 2,4,5-	000095-95-4	10	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000	0.4000	500.0	500.0	5000.0	5000.0	1000	100	11	0.2000	Yes	Yes
Trichlorophenol, 2,4,6-	000088-06-2	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000	500.0	500.0	50000.0	50000.0	1000	100	11	0.2000	Yes	Yes

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** Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid Karst	Ground Water Mobility: Liquid Non-Karst	Ground Water Mobility: Non-Liquid Karst	Ground Water Mobility: Non-Liquid Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain Fresh	Bioaccumulation: Food Chain Salt	Bioaccumulation: Environmental Fresh	Bioaccumulation: Environmental Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Gas	Part
Trichlorophenol, 3,4,5-	000609-19-8	...	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	500.0	500.0	500.0	500.0	1000	100*	11	0.0200	Yes	Yes
Trichlorophenoxyacetic acid, 2,4,5-	000093-76-5	100	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	1.0000*	0.4000*	500.0*	500.0*	500.0	500.0	10000	100*	0	0.0020	Yes	Yes
Trichloropropane, 1,2,3-	000096-18-4	10000*	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	50.0*	50.0*	50.0*	50.0*	10	10	11	1.0000	Yes	No.
Triethanolamine	000102-71-6	1	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	0.5	0.5	0.5	0.5	1	10*	0	0.0020	Yes	Yes
Trifluralin	001582-09-8	100	1.0E+00	1.0E-02*	2.0E-01	2.0E-03*	1.0000	1.0000	5000.0	5000.0	50000.0	50000.0	10000	1000	11	0.0200	Yes	Yes
Trinitrobenzene, 1,3,5-	000099-35-4	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	5.0	5.0	5.0	5.0	1000*	1000*	6	0.0200	Yes	Yes
Trinitrotoluene	000118-96-7	1000	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.0700*	0.0700*	5.0	5.0	5.0	5.0	100	100	0*	0.0020*	Yes	Yes
Tris (2,3-dibromopropyl) phosphate	000126-72-7	1000	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	1.0000	0.4000*	500.0*	500.0*	5.0	5.0	...	...	11	0.0200	Yes	Yes
Vanadium	007440-62-2	100	1.0E+00	1.0E-02	...	...	1.0000	1.0000	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Vanadium pentoxide	001314-62-1	100	1.0E+00	...	...	...	1.0000	1.0000	0.5	0.5	0.5	0.5	1000*	1000*	NA	NA	No	Yes
Vinyl acetate	000108-05-4	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.4000	0.5	0.5	0.5	0.5	10	10	17	1.0000	Yes	No
Vinyl chloride	000075-01-4	10000	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.0007	0.0700	5.0	5.0	5.0	5.0	...	...	17	1.0000	Yes	No
Warfarin	000081-81-2	10000	1.0E+00	1.0E+00*	2.0E-01	2.0E-01*	1.0000*	1.0000*	50.0	50.0	50.0	50.0	10	10	NA	NA	No	Yes
Xylene, m-	000108-38-3	1	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	500.0	500.0	500.0	500.0	100	10	17	1.0000	Yes	No
Xylene, o-	000095-47-6	1	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	50.0	50.0	50.0	50.0	100	100	17	1.0000	Yes	No
Xylene, p-	000106-42-3	10	1.0E+00	1.0E+00*	1.0E+00	1.0E+00*	0.4000	1.0000	50.0	50.0	50.0	50.0	100	1	17	1.0000	Yes	No
Zinc	007440-66-6	10	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	500.0	50000.0	500.0	50000.0	10	100	NA	NA	No	Yes
Zinc cyanide	000557-21-1	10	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	...	...	NA	NA	No	Yes

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** Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
375 Substances

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid: Karst	Ground Water Mobility: Liquid: Non-Karst	Ground Water Mobility: Non-Liquid: Karst	Ground Water Mobility: Non-Liquid: Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain: Fresh	Bioaccumulation: Food Chain: Salt	Bioaccumulation: Environmental: Fresh	Bioaccumulation: Environmental: Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility Gas	Part
Zinc phosphide	001314-84-7	10000	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	...	...	NA	NA	No Yes
Zinc sulfate	007733-02-0	10	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	5.0	50.0	50.0	50000.0	10000	10000	NA	NA	No Yes

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HAZARD RANKING SYSTEM
Hazardous Substance Benchmarks
375 Substances

tance Name	CAS Number	AIR PATHWAY: NAAQS NESHAPS (ug/m^3)	AIR PATHWAY: Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY: Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY: MCL/MCLG (mg/L)	GROUND WATER PATHWAY: Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY: Cancer Risk Screen Conc (mg/L)
aphthene	000083-32-9	...	...	...	...	2.2E+00*	...
aphthylene	000208-96-8	...	...	...	...	...	...
aldehyde	000075-07-0	...	9.4E-03*	1.1E-03*	...	...	...
one	000067-64-1	...	...	...	...	3.7E+00*	...
onitrile	000075-05-8	...	2.2E-01*	...	...	2.2E-01*	...
ophenone	000098-86-2	...	...	...	...	3.7E+00*	...
yl-2-thiourea, 1-	000591-08-2	...	...	...	...	...	...
lein	000107-02-8	...	2.1E-05*	...	...	7.3E-01*	...
lamide	000079-06-1	...	...	1.9E-06*	...	7.3E-03*	1.9E-05*
lic acid	000079-10-7	...	1.0E-03*	...	...	1.8E+01*	...
lonitrile	000107-13-1	...	2.1E-03*	3.6E-05*	...	3.7E-02*	1.6E-04*
ic acid	000124-04-9	...	...	...	...	...	...
carb	000116-06-3	...	...	...	...	3.7E-02*	...
in	000309-00-2	...	...	5.0E-07*	...	1.1E-03*	5.0E-06*
l alcohol	000107-18-6	...	...	...	...	1.8E-01*	...
l chloride**	000107-05-1	...	1.0E-03	...	...	...	...
inum	007429-90-5	...	...	...	...	...	...
inum phosphide	020859-73-8	...	...	...	...	1.5E-02*	...
nia	007664-41-7	...	1.0E-01*	...	...	3.5E+01*	...

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HAZARD RANK STEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	AIR PATHWAY			GROUND WATER PATHWAY		
		NAAQS NESHAPS (ug/m^3)	Reference Dose Screen Conc (mg/m^3)	Cancer Risk Screen Conc (mg/m^3)	MCL/MCLG (mg/L)	Reference Dose Screen Conc (mg/L)	Cancer Risk Screen Conc (mg/L)
Ammonium picrate	000131-74-8	...	...	...	...	...	...
Ammonium sulfamate	007773-06-0	...	...	...	...	7.3E+00*	...
Aniline	000062-53-3	...	1.0E-03*	...	...	...	1.5E-02*
Anthracene	000120-12-7	...	...	...	...	1.1E+01*	...
Antimony	007440-36-0	...	...	...	6.0E-03	1.5E-02*	...
Arsenic	007440-38-2	...	...	5.7E-07*	5.0E-02	1.1E-02*	5.7E-05*
Asbestos	001332-21-4	...	...	3.7E-05* fibers/mL	7.0E+00*	...	...
Atrazine	001912-24-9	...	...	...	3.0E-03	1.3E+00*	3.8E-04*
Azinphos- ethyl	002642-71-9	...	...	...	...	...	...
Azinphos- methyl	000086-50-0	...	...	...	...	...	...
Aziridine	000151-56-4	...	...	...	...	...	...
Barium	007440-39-3	...	5.2E-04*	...	2.0E+00	2.6E+00*	...
Barium cyanide	000542-62-1	...	...	...	...	... *	...
Benz(a)anthracene	000056-55-3	...	...	...	...	...	1.2E-04*
Benzene	000071-43-2	...	...	2.9E-04*	5.0E-03	...	2.9E-03*
Benzene carbonyl chloride	000098-88-4	...	...	...	...	...	...
Benzidine	000092-87-5	...	...	3.6E-08*	...	1.1E-01*	3.7E-07*
Benzo(a)pyrene	000050-32-8	...	...	...	2.0E-04	...	1.2E-05*

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HAZARD RANKING SYSTEM
Hazardous Substance Benchmarks
375 Substances

:ance Name	CAS Number	AIR PATHWAY: NAAQS NESHAPS (ug/m^3)	AIR PATHWAY: Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY: Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY: MCL/MCLG (mg/L)	GROUND WATER PATHWAY: Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY: Cancer Risk Screen Conc (mg/L)
)(b)fluoranthene	000205-99-2	...	...	...	...	...	1.2E-04*
)(g,h,i)perylene	000191-24-2	...	...	...	...	...	...
)(k)fluoranthene	000207-08-9	...	...	...	...	...	1.2E-03*
oic acid	000065-85-0	...	...	...	...	1.5E+02*	...
onitrile	000100-47-0	...	...	...	...	...	...
othiazole, 1,2,-	000095-16-9	...	...	...	...	...	...
yl alcohol**	000100-51-6	...	...	...	...	1.1E+01	...
yl chloride	000100-44-7	...	...	...	...	...	5.0E-04*
llium	007440-41-7	1.0E-02	...	1.0E-06*	4.0E-03	1.8E-01*	2.0E-05*
enyl, 1,1-	000092-52-4	...	...	...	...	1.8E+00*	...
(2-ethylhexyl) phthalate	000117-81-7	...	...	...	6.0E-03*	7.3E-01*	6.1E-03*
2-chloroethoxy)methane	000111-91-1	...	...	...	...	...	...
2-chloroethyl)ether	000111-44-4	...	...	7.4E-06*	...	...	7.7E-05*
2-chloroisopropyl)ether**	039638-32-9	...	...	2.4E-04	...	1.5E+00	1.2E-03
chloromethyl)ether	000542-88-1	...	...	3.9E-08*	...	...	3.9E-07*
)n	007440-42-8	...	2.1E-02*	...	...	3.3E+00*	...
)odichloromethane	000075-27-4	...	...	...	1.0E-01*	7.3E-01*	1.4E-03*
)omethane	000074-83-9	...	5.2E-03*	...	...	5.1E-02*	...
nophenyl-phenylether, 4-**	000101-55-3	...	...	...	...	...	...

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HAZARD RANKI. STEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	AIR PATHWAY: NAAQS NESHAPS (ug/m^3)	AIR PATHWAY: Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY: Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY: MCL/MCLG (mg/L)	GROUND WATER PATHWAY: Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY: Cancer Risk Screen Conc (mg/L)
omoxynil	001689-84-5	...	...	...	...	7.3E-01*	...
tadiene, 1,3-	000106-99-0	...	...	8.7E-06*	...	...	...
tanol	000071-36-3	...	...	...	...	3.7E+00*	...
tylbenzyl phthalate	000085-68-7	...	...	...	...	7,3E+00*	...
utyric acid, 4-(2,4-dichlorophenoxy)	000094-82-6	...	...	...	...	2.9E-01*	...
admium	007440-43-9	...	...	1.4E-06*	5.0E-03	1.8E-02*	...
alcium**	007440-70-2	...	...	...	...	...	...
aptan	000133-06-2	...	...	...	...	4.7E+00*	2.4E-02*
arbaryl	000063-25-2	...	...	...	...	3.7E+00*	...
arbazole**	000086-74-8	...	...	...	...	...	4.3E-03
arbofuran	001563-66-2	...	...	...	4.0E-02	1.8E-01*	...
arbon disulfide	000075-15-0	...	7.3E-01*	...	...	3.7E+00*	...
arbon tetrachloride	000056-23-5	...	...	1.6E-04*	5.0E-03	2.6E-02*	6.6E-04*
arbophenothion	000786-19-6	...	...	...	...	...	...
esium	007440-46-2	...	...	...	...	...	...
hloral	000075-87-6	...	...	...	...	7.3E-02*	...
hlordane	000057-74-9	...	...	6.6E-06*	2.0E-03	2.2E-03*	6.6E-05*
hlordane, alpha-**	005103-71-9	...	...	...	...	...	...
hlordane, gamma-**	005566-34-7	...	...	...	...	...	...

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HAZARD RANKING SYSTEM
Hazardous Substance Benchmarks
375 Substances

tance Name	CAS Number	AIR PATHWAY: NAAQS NESHAPS (ug/m^3)	AIR PATHWAY: Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY: Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY: MCL/MCLG (mg/L)	GROUND WATER PATHWAY: Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY: Cancer Risk Screen Conc (mg/L)
rine cyanide	000506-77-4	...	...	...	...	1.8E+00*	...
ro-3-methylphenol, 4-	000059-50-7	...	...	...	...	7.3E+01*	...
roaniline, p-	000106-47-8	...	...	...	...	1.5E-01*	...
robenzene	000108-90-7	...	2.1E-02*	...	1.0E-01*	7.3E-01*	...
robenzilate**	000510-15-6	...	...	3.2E-05	...	7.3E-01	3.2E-04
roform	000067-66-3	...	...	1.1E-04*	1.0E-01*	3.7E-01*	1.4E-02*
romethane	000074-87-3	...	...	1.4E-03*	...	...	6.6E-03*
romethyl methyl ether	000107-30-2	...	...	...	...	...	...
romethyloxirane, 2-	000106-89-8	...	1.0E-03*	2.0E-03*	...	7.3E-02*	8.6E-03*
ronaphthalene, 2-	000091-58-7	...	...	...	...	2.9E+00*	...
rophenol, 2-	000095-57-8	...	...	...	...	1.8E-01*	...
rophenyl-phenyl ether, 4-**	007005-72-3	...	...	...	...	...	...
roprene**	000126-99-8	...	7.3E-03	...	...	...	...
rpyrifos	002921-88-2	...	...	...	...	1.1E-01*	...
mium	007440-47-3	...	...	2.0E-07*	1.0E-01	1.8E-01*	...
mium(III)	016065-83-1	...	...	...	...	3.7E+01*	...
mium(VI)	018540-29-9	...	...	2.0E-07*	...	1.8E-01*	...
sene	000218-01-9	...	...	...	...	...	1.2E-02*

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HAZARD RANK. STEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	AIR PATHWAY: NAAQS NESHAPS (ug/m^3)	AIR PATHWAY: Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY: Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY: MCL/MCLG (mg/L)	GROUND WATER PATHWAY: Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY: Cancer Risk Screen Conc (mg/L)
obalt	007440-48-4	...	...	...	...	...	...
opper	007440-50-8	...	...	...	1.3E+00	...	...
opper cyanide	000544-92-3	...	...	...	...	1.8E-01*	...
oumaphos	000056-72-4	...	...	...	...	...	...
reosote	008001-58-9	...	...	...	...	...	...
resol, m-	000108-39-4	...	...	...	...	1.8E+00*	...
resol, o-**	000095-48-7	...	...	...	...	1.8E+00	...
resol, p-	000106-44-5	...	...	...	...	1.8E-01*	...
umene	000098-82-8	...	9.4E-03*	...	...	1.5E+00*	...
yanazine	021725-46-2	...	...	...	...	7.3E-02*	1.0E-04*
yanide	000057-12-5	...	...	...	2.0E-01	7.3E-01*	...
yanogen	000460-19-5	...	...	...	...	1.5E+00*	...
yanogen bromide	000506-68-3	...	...	...	...	3.3E+00*	...
yclohexane	000110-82-7	...	...	...	...	...	...
yclohexanone	000108-94-1	...	...	...	...	1.8E+02*	...
Cyclotrimethylenetrinitriamine	000121-82-4	...	...	...	...	1.1E-01*	7.7E-04*
DD	000072-54-8	...	...	...	...	...	3.6E-04*
DE	000072-55-9	...	...	...	...	...	2.5E-04*
DT	000050-29-3	...	...	2.5E-05*	...	1.8E-02*	2.5E-04*

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HAZARD RANKING SYSTEM
Hazardous Substance Benchmarks
375 Substances

tance Name	CAS Number	AIR PATHWAY: NAAQS NESHAPS (ug/m^3)	AIR PATHWAY: Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY: Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY: MCL/MCLG (mg/L)	GROUND WATER PATHWAY: Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY: Cancer Risk Screen Conc (mg/L)
	000078-48-8	...	...	...	...	1.1E-03*	...
-butyl phthalate	000084-74-2	...	...	...	...	3.7E+00*	...
-octyl phthalate	000117-84-0	...	...	...	...	7.3E-01*	...
late**	002303-16-4	...	...	...	...	...	1.4E-03
inon	000333-41-5	...	...	...	...	3.3E-02*	...
nz(a,h)anthracene	000053-70-3	...	...	...	...	...	1.2E-05*
nzofuran	000132-64-9	...	...	...	...	...	...
omo-3-chloropropane, 1,2-	000096-12-8	...	2.1E-04*	3.6E-03*	2.0E-04*	...	6.1E-05*
omochloromethane	000124-48-1	...	...	...	6.0E-02*	7.3E-01*	1.0E-03*
omoethane, 1,2-	000106-93-4	...	2.1E-04*	1.1E-05*	5.0E-05	...	1.0E-06*
nba	001918-00-9	...	...	...	...	1.1E+00*	...
lorobenzene, 1,2-	000095-50-1	...	2.1E-01*	...	6.0E-01	3.3E+00*	...
lorobenzene, 1,3-	000541-73-1	...	...	...	6.0E-01	...	...
lorobenzene, 1,4-	000106-46-7	...	8.3E-01*	...	7.5E-02	...	3.6E-03*
lorobenzidine, 3,3-	000091-94-1	...	...	...	...	...	1.9E-04*
lorodifluoromethane	000075-71-8	...	2.1E-01*	...	...	7.3E+00*	...
loroethane, 1,1-	000075-34-3	...	3.7E-01*	...	...	3.7E+00*	...
loroethane, 1,2-	000107-06-2	...	...	9.4E-05*	5.0E-03	...	9.4E-04*
loroethylene, 1,1-	000075-35-4	...	...	4.9E-05*	7.0E-03	3.3E-01*	1.4E-04*

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ndicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANK . STEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	AIR PATHWAY: NAAQS NESHAPS (ug/m^3)	AIR PATHWAY: Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY: Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY: MCL/MCLG (mg/L)	GROUND WATER PATHWAY: Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY: Cancer Risk Screen Conc (mg/L)
ichloroethylene, cis-1,2-	000156-59-2	...	...	...	7.0E-02	3.7E-01*	...
ichloroethylene, trans-1,2-	000156-60-5	...	...	...	1.0E-01	7.3E-01*	...
ichlorophenol, 2,4-	000120-83-2	...	...	...	...	1.1E-01*	...
ichlorophenoxyacetic acid, 2,4-	000094-75-7	...	...	...	7.0E-02	3.7E-01*	...
ichloropropane, 1,2-	000078-87-5	...	4.2E-03*	...	5.0E-03	...	1.3E-03*
ichloropropene, 1,3-	000542-75-6	...	2.1E-02*	6.6E-05*	...	1.1E-02*	4.7E-04*
ichloropropene, cis-1,3-**	010061-01-5	...	...	...	...	...	...
ichloropropene, trans-1,3-**	010061-02-6	...	...	...	...	...	...
ichlorvos	000062-73-7	...	5.2E-04*	...	...	1.8E-02*	2.9E-04*
icofol	000115-32-2	...	...	...	...	...	...
ieldrin	000060-57-1	...	...	5.3E-07*	...	1.8E-03*	5.3E-06*
iethyl phthalate	000084-66-2	...	...	...	...	2.9E+01*	...
iethylene glycol	000111-46-6	...	...	...	...	...	...
Diethylstibestrol**	000056-53-1	...	...	...	...	...	1.8E-08
Diisopropylmethyl-phosphonate	001445-75-6	...	...	...	...	2.9E+00*	...
Dimethoate	000060-51-5	...	...	...	...	7.3E-03*	...
Dimethoxybenzidine, 3,3-	000119-90-4	...	...	...	...	...	6.1E-03*
Dimethyl phenol, 2,4-	000105-67-9	...	...	...	...	7.3E-01*	...

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HAZARD RANKING SYSTEM
Hazardous Substance Benchmarks
375 Substances

tance Name	CAS Number	AIR PATHWAY: NAAQS NESHAPS (ug/m^3)	AIR PATHWAY: Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY: Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY: MCL/MCLG (mg/L)	GROUND WATER PATHWAY: Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY: Cancer Risk Screen Conc (mg/L)
thyl phthalate	000131-11-3	...	...	...	...	... *	...
thyl sulfate	000077-78-1	...	...	...	...	...	...
thylbenz(a)anthracene, 7,12-**	000057-97-6	...	...	...	...	...	...
thylbenzidine, 3,3'-**	000119-93-7	...	...	...	...	...	9.3E-06
tro-2-methylphenol, 4,6-**	000534-52-1	...	...	...	...	...	...
trobenzene, 1,3-	000099-65-0	...	...	...	...	3.7E-03*	...
trophenol, 2,4-	000051-28-5	...	...	...	...	7.3E-02*	...
trotoluene, 2,4-	000121-14-2	...	...	...	...	7.3E-02*	1.3E-04*
trotoluene, 2,6-	000606-20-2	...	...	...	...	3.7E-02*	1.3E-04*
seb	000088-85-7	...	...	...	7.0E-03	3.7E-02*	...
ane, 1,4-	000123-91-1	...	...	...	...	...	7.7E-03*
athion	000078-34-2	...	...	...	...	...	...
enylamine**	000122-39-4	...	...	...	...	9.1E-01	...
enylhydrazine, 1,2-	000122-66-7	...	...	1.1E-05*	...	...	1.1E-04*
at	000085-00-7	...	...	...	2.0E-02	8.0E-02*	...
lfoton	000298-04-4	...	...	...	...	1.5E-03*	...
on	000330-54-1	...	...	...	...	7.3E-02*	...
sulfan (I or II)	000115-29-7	...	...	...	...	2.2E-01*	...
sulfan sulfate	001031-07-8	...	...	...	...	...	...

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HAZARD RANK .STEM
Hazardous Substa... Benchmarks
375 Substances

Substance Name	CAS Number	AIR PATHWAY: NAAQS NESHAPS (ug/m^3)	AIR PATHWAY: Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY: Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY: MCL/MCLG (mg/L)	GROUND WATER PATHWAY: Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY: Cancer Risk Screen Conc (mg/L)
Endothall	000145-73-3	...	...	...	1.0E-01	7.3E-01*	...
Endrin	000072-20-8	...	...	...	2.0E-03	1.1E-02*	...
Endrin aldehyde	007421-93-4	...	...	...	...	...	...
Endrin ketone**	053494-70-5	...	...	...	...	...	...
Ethion	000563-12-2	...	...	...	...	1.8E-02*	...
Ethyl acetate	000141-78-6	...	...	...	...	3.3E+01*	...
Ethyl benzene	000100-41-4	...	1.0E+00*	...	7.0E-01	3.7E+00*	...
Ethyl chloride	000075-00-3	...	1.0E+01*	...	...	...	...
Ethyl ether	000060-29-7	...	...	...	...	7.3E+00*	...
Ethyl methacrylate**	000097-63-2	...	...	...	...	3.3E+00	...
Ethyl methanesulfonate**	000062-50-0	...	...	...	...	...	...
Ethyldipropylthiocarbamate, s-	000759-94-4	...	...	...	...	9.1E-01*	...
Ethylene glycol	000107-21-1	...	...	...	...	7.3E+01*	...
Ethylene glycol monoethyl ether	000110-80-5	...	2.1E-01*	...	...	1.5E+01*	...
Ethylene thiourea**	000096-45-7	...	...	...	...	2.9E-03	7.7E-04
Fenthion	000055-38-9	...	...	...	...	...	...
Ferrous sulfate	007720-78-7	...	...	...	...	...	...
Fluoranthene	000206-44-0	...	...	...	...	1.5E+00*	...
Fluorene	000086-73-7	...	...	...	...	1.5E+00*	...

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HAZARD RANKING SYSTEM
Hazardous Substance Benchmarks
375 Substances

stance Name	CAS Number	AIR PATHWAY: NAAQS NESHAPS (ug/m^3)	AIR PATHWAY: Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY: Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY: MCL/MCLG (mg/L)	GROUND WATER PATHWAY: Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY: Cancer Risk Screen Conc (mg/L)
orine	007782-41-4	...	...	...	...	2.2E+00*	...
maldehyde	000050-00-0	...	...	1.9E-04*	...	7.3E+00*	...
mic acid	000064-18-6	...	...	...	...	7.3E+01*	...
an	000110-00-9	...	...	...	...	3.7E-02*	...
fural	000098-01-1	...	5.2E-02*	...	...	1.1E-01*	...
cidylaldehyde	000765-34-4	...	5.2E-04*	...	...	1.5E-02*	...
tachlor	000076-44-8	...	...	1.9E-06*	4.0E-04	1.8E-02*	1.9E-05*
tachlor epoxide	001024-57-3	...	...	9.4E-07*	2.0E-04	4.7E-04*	9.4E-06*
tachlorinated dibenzo-p-dioxin, 1,2,3,4,6,7,8-	035822-46-9	...	...	5.3E-09*	...	...	5.3E-08*
tachlorinated dibenzofuran, 1,2,3,4,6,7,8-	067562-39-4	...	...	5.3E-09*	...	...	5.3E-08*
tachlorinated dibenzofuran, 1,2,3,4,6,7,9-	055673-89-7	...	...	... *	...	...	... *
abromobenzene	000087-82-1	...	...	...	...	7.3E-02*	...
achlorinated dibenzo-p-dioxin, 1,2,3,4,7,8-	039227-28-6	...	...	5.3E-10*	...	...	5.3E-09*
achlorinated dibenzo-p-dioxin, 1,2,3,6,7,8-	057653-85-7	...	...	1.9E-09*	...	...	1.4E-08*
achlorinated dibenzo-p-dioxin, 1,2,3,7,8,9-	019408-74-3	...	...	1.9E-09*	...	...	1.4E-08*
achlorinated dibenzofuran, 1,2,3,4,7,8-	070648-26-9	...	...	5.3E-10*	...	...	5.3E-09*
achlorinated dibenzofuran, 1,2,3,6,7,8-	057117-44-9	...	...	5.3E-10*	...	...	5.3E-09*
achlorinated dibenzofuran, 1,2,3,7,8,9-	072918-21-9	...	...	5.3E-10*	...	...	5.3E-09*

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HAZARD RANKI. .STEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	AIR PATHWAY: NAAQS NESHAPS (ug/m^3)	AIR PATHWAY: Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY: Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY: MCL/MCLG (mg/L)	GROUND WATER PATHWAY: Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY: Cancer Risk Screen Conc (mg/L)
exachlorinated dibenzofuran, 2,3,4,6,7,8-	060851-34-5	...	...	5.3E-10*	...	...	5.3E-09*
exachlorobenzene	000118-74-1	...	...	5.3E-06*	1.0E-03	2.9E-02*	5.3E-05*
exachlorobutadiene	000087-68-3	...	...	1.1E-04*	...	7.3E-03*	1.1E-03*
exachlorocyclohexane, alpha-	000319-84-6	...	...	1.4E-06*	...	...	1.4E-05*
exachlorocyclohexane, beta-	000319-85-7	...	...	4.6E-06*	...	...	4.7E-05*
exachlorocyclohexane, delta-	000319-86-8	...	...	...	...	...	...
exachlorocyclopentadiene	000077-47-4	...	7.3E-05*	...	5.0E-02	2.6E-01*	...
exachloroethane	000067-72-1	...	...	6.1E-04*	...	3.7E-02*	6.1E-03*
exachlorophene	000070-30-4	...	...	...	...	1.1E-02*	...
exane	000110-54-3	...	2.1E-01*	...	...	2.2E+00*	...
exanone, 2-**	000591-78-6	...	...	...	...	...	...
ydrazine	000302-01-2	...	...	5.0E-07*	...	...	2.8E-05*
ydrochloric acid	007647-01-0	...	2.1E-02*	...	...	...	...
ydrogen cyanide	000074-90-8	...	3.1E-03*	...	...	7.3E-01*	...
ydrogen sulfide	007783-06-4	...	1.0E-03*	...	...	1.1E-01*	...
ndeno(1,2,3-cd)pyrene	000193-39-5	...	...	...	...	...	1.2E-04*
oxynil	001689-83-4	...	...	...	...	...	...
ron	007439-89-6	...	...	...	...	...	...
sobutanol	000078-83-1	...	...	...	...	1.1E+01*	...

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HAZARD RANKING
Hazardous Substance Benchmarks
375 Substances

ance Name	CAS Number	AIR PATHWAY: NAAQS NESHAPS (ug/m^3)	AIR PATHWAY: Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY: Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY: MCL/MCLG (mg/L)	GROUND WATER PATHWAY: Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY: Cancer Risk Screen Conc (mg/L)
orone	000078-59-1	...	...	...	...	7.3E+00*	9.0E-02*
e	000143-50-0	...	...	...	...	...	...
	007439-92-1	1.5E+00	...	...	1.5E-02	...	...
ane	000058-89-9	...	...	...	2.0E-04	1.1E-02*	6.6E-05*
esium	007439-95-4	...	...	...	...	...	...
thion	000121-75-5	...	...	...	...	7.3E-01*	...
ic anhydride	000108-31-6	...	...	...	...	3.7E+00*	...
ic hydrazide	000123-33-1	...	...	...	...	1.8E+01*	...
anese	007439-96-5	...	5.2E-05*	...	...	5.1E+00*	...
ury	007439-97-6	...	3.1E-04*	...	2.0E-03	1.1E-02*	...
acrylonitrile	000126-98-7	...	3.7E-03*	...	...	3.7E-03*	...
anol	000067-56-1	...	...	...	...	1.8E+01*	...
omyl	016752-77-5	...	...	...	...	9.1E-01*	...
oxychlor	000072-43-5	...	...	...	4.0E-02	1.8E-01*	...
yl chlorocarbonate	000079-22-1	...	...	...	...	...	...
yl ethyl ketone	000078-93-3	...	1.0E+00*	...	...	2.2E+01*	...
yl isobutyl ketone	000108-10-1	...	8.3E-02*	...	...	2.9E+00*	...
yl methacrylate	000080-62-6	...	...	...	...	2.9E+00*	...
ylcholanthrene, 3-**	000056-49-5	...	...	...	...	...	...

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HAZARD RANKI. .TEM
Hazardous Substance Benchmarks
375 Substances

ıbstance Name	CAS Number	AIR PATHWAY: NAAQS NESHAPS (ug/m^3)	AIR PATHWAY: Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY: Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY: MCL/MCLG (mg/L)	GROUND WATER PATHWAY: Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY: Cancer Risk Screen Conc (mg/L)
ːthylene bis (2-chloroaniline), 4,4-	000101-14-4	...	...	6.6E-05*	...	2.6E-02*	6.6E-04*
ːthylene bromide**	000074-95-3	...	...	...	...	...	...
ːthylene chloride	000075-09-2	...	3.1E+00*	5.2E-03*	5.0E-03	2.2E+00*	1.1E-02*
ːthylenediphenyl diisocyanate, 4,4-	000101-68-8	...	2.1E-05*	...	...	...	...
ːthylnaphthalene, 2-	000091-57-6	...	...	...	...	...	...
ːtribuzin	021087-64-9	...	...	...	...	9.1E-01*	...
irex	002385-85-5	...	...	...	...	7.3E-03*	... *
ılybdenum**	007439-98-7	...	...	...	...	1.8E-01	...
nitroso-di-n-propylamine**	000621-64-7	...	...	...	...	...	1.2E-05
·nitrosopiperidine**	000100-75-4	...	...	...	...	...	...
ıphthalene	000091-20-3	...	1.5E-01*	...	...	1.5E+00*	...
ıphthylamine**	000091-59-8	...	...	...	...	...	...
ickel	007440-02-0	...	...	...	... *	7.3E-01*	...
itric acid	007697-37-2	...	...	...	...	...	...
itric oxide	010102-43-9	...	...	...	...	... *	...
ıitroaniline, 2-**	000088-74-4	...	2.1E-04	...	...	...	...
ıitroaniline, 3-**	000099-09-2	...	...	...	...	...	...
ıitroaniline, p-	000100-01-6	...	...	...	...	...	...

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Hazardous Substanc... nchmarks
375 Substances

Substance Name	CAS Number	AIR PATHWAY			GROUND WATER PATHWAY		
		NAAQS NESHAPS (ug/m^3)	Reference Dose Screen Conc (mg/m^3)	Cancer Risk Screen Conc (mg/m^3)	MCL/MCLG (mg/L)	Reference Dose Screen Conc (mg/L)	Cancer Risk Screen Conc (mg/L)
trobenzene	000098-95-3	...	1.8E-02*	...	...	1.8E-02*	...
trogen dioxide	010102-44-0	1.0E+02	...	...	...	... *	...
troglycerine	000055-63-0	...	...	...	...	...	...
trophenol, 2-**	000088-75-5	...	...	...	...	...	...
trophenol, 4-	000100-02-7	...	...	...	...	...	...
tropropane, 2-**	000079-46-9	...	2.1E-02	9.1E-07	...	...	...
troso-di-n-butylamine, N-	000924-16-3	...	...	1.5E-06*	...	...	1.6E-05*
troso-di-n-methylurethane, N-	000615-53-2	...	...	...	...	...	...
trosodiethanolamine, N-	001116-54-7	...	...	...	...	...	3.0E-05*
trosodiethylamine, N-	000055-18-5	...	...	5.7E-08*	...	...	5.7E-07*
trosodimethylamine, N-	000062-75-9	...	...	1.7E-07*	...	...	1.7E-06*
trosodiphenylamine, N-	000086-30-6	...	...	...	...	...	1.7E-02*
trosomethylethylamine**	010595-95-6	...	...	...	...	...	3.9E-06
trosopyrrolidine, N-	000930-55-2	...	...	4.0E-06*	...	...	4.1E-05*
trotoluene, 4-	000099-99-0	...	...	...	...	3.7E-01*	...
tamethylpyrophosphoramide**	000152-16-9	...	...	...	...	7.3E-02	...
ybis (1-chloropropane), 2,3'-**	000108-60-1	...	...	...	...	...	...
rathion, ethyl-	000056-38-2	...	...	...	...	2.2E-01*	...
rathion, methyl-	000298-00-0	...	...	...	...	9.1E-03*	...

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Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	AIR PATHWAY: NAAQS NESHAPS (ug/m^3)	AIR PATHWAY: Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY: Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY: MCL/MCLG (mg/L)	GROUND WATER PATHWAY: Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY: Cancer Risk Screen Conc (mg/L)
PCBs	001336-36-3	...	...	...	5.0E-04	7.3E-04*	1.1E-05*
Pentachlorinated dibenzo-p-dioxin, 1,2,3,7,8-	040321-76-4	...	...	1.1E-10*	...	...	1.1E-09*
Pentachlorinated dibenzofuran, 1,2,3,7,8-	109719-77-9	...	...	1.1E-09*	...	...	1.1E-08*
Pentachlorinated dibenzofuran, 2,3,4,7,8-	057117-41-6	...	...	1.1E-10*	...	...	1.1E-09*
Pentachlorobenzene	000608-93-5	...	...	...	...	2.9E-02*	...
Pentachloroethane	000076-01-7	...	...	...	...	...	...
Pentachloronitrobenzene	000082-68-8	...	...	...	...	1.1E-01*	3.3E-04*
Pentachlorophenol	000087-86-5	...	...	...	1.0E-03	1.1E+00*	7.1E-04*
Phenanthrene	000085-01-8	...	...	...	...	...	...
Phenol	000108-95-2	...	...	...	...	2.2E+01*	...
Phenyl sulfide	000139-66-2	...	...	...	...	...	...
Phenylenediamine, m-**	000108-45-2	...	...	...	...	2.2E-01	...
Phenylmercuric acetate	000062-38-4	...	...	...	...	2.9E-03*	...
Phorate	000298-02-2	...	...	...	...	7.3E-03*	...
Phosgene	000075-44-5	...	...	...	...	...	...
Phosphamidon	013171-21-6	...	...	...	...	...	...
Phosphine	007803-51-2	...	3.1E-04*	...	...	1.1E-02*	...
Phosphonodithioic acid, phenyl-o-ethyl-o-(4-nitrophenyl)	002104-64-5	...	...	...	...	3.7E-04*	...
Phosphoric acid	007664-38-2	...	1.0E-02*	...	...	...	...

* Indicates difference between previous version of chemical data (JUN94) and current version of chemical data (JUN96).
** Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANKIN[illegible]EM
Hazardous Substance[illegible]nchmarks
375 Substances

Substance Name	CAS Number	AIR PATHWAY: NAAQS NESHAPS (ug/m^3)	AIR PATHWAY: Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY: Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY: MCL/MCLG (mg/L)	GROUND WATER PATHWAY: Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY: Cancer Risk Screen Conc (mg/L)
sphorous (elemental)	007723-14-0	...	...	...	...	7.3E-04*	...
halic anhydride	000085-44-9	...	1.3E-01*	...	...	7.3E+01*	...
itonium	007440-07-5	...	...	...	...	...	...
ychlorinated triphenyl	012642-23-8	...	...	...	...	...	...
assium**	007440-09-7	...	...	...	...	...	...
assium silver cyanide	000506-61-6	...	...	...	...	7.3E+00*	...
namide	023950-58-5	...	...	...	...	2.7E+00*	...
ene	000129-00-0	...	...	...	...	1.1E+00*	...
idine	000110-86-1	...	...	...	...	3.7E-02*	...
noline	000091-22-5	...	...	...	...	...	7.1E-06*
lium	007440-14-4	...	...	...	...	...	...
lon	010043-92-2	...	...	...	...	...	...
orcinol	000108-46-3	...	...	...	...	...	...
nel	000299-84-3	...	...	...	...	1.8E+00*	...
frole**	000094-59-7	...	...	...	...	...	...
lenium	007782-49-2	...	...	...	5.0E-02	1.8E-01*	...
lenourea	000630-10-4	...	...	...	...	1.8E-01*	...
lver	007440-22-4	...	...	...	...	1.8E-01*	...

Indicates difference between previous version of chemical data (JUN94) and current version of chemical data (JUN96).
Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANK STEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	AIR PATHWAY: NAAQS NESHAPS (ug/m^3)	AIR PATHWAY: Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY: Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY: MCL/MCLG (mg/L)	GROUND WATER PATHWAY: Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY: Cancer Risk Screen Conc (mg/L)
Silver Cyanide	000506-64-9	...	...	...	...	3.7E+00*	...
Sodium	007440-23-5	...	...	...	...	...	...
Strontium	007440-24-6	...	...	...	...	2.2E+01*	...
Strychnine	000057-24-9	...	...	...	...	1.1E-02*	...
Styrene	000100-42-5	...	1.0E+00*	...	1.0E-01	7.3E+00*	...
Sulfuric acid	007664-93-9	...	...	...	...	...	...
TB, 2,4,5-	000093-80-1	...	...	...	...	...	...
TCDD	001746-01-6	...	...	5.0E-11*	3.0E-08	...	5.3E-10*
Tetrachlorobenzene, 1,2,4,5-	000095-94-3	...	...	...	...	1.1E-02*	...
Tetrachlorodibenzofuran, 2,3,7,8-	051207-31-9	...	...	5.3E-10*	...	...	5.3E-09*
Tetrachloroethane, 1,1,1,2-	000630-20-6	...	...	3.3E-04*	...	1.1E+00*	3.3E-03*
Tetrachloroethane, 1,1,2,2-	000079-34-5	...	...	4.2E-05*	...	...	4.3E-04*
Tetrachloroethylene	000127-18-4	...	...	... *	5.0E-03	3.7E-01*	1.6E-03*
Tetrachlorophenol, 2,3,4,6-	000058-90-2	...	...	...	...	1.1E+00*	...
Tetraethyl lead	000078-00-2	...	...	...	...	3.7E-06*	...
Tetraethyldithiopyrophosphate	003689-24-5	...	...	...	...	1.8E-02*	...
Tetrahydrofuran	000109-99-9	...	...	...	...	...	...
Thallium	007440-28-0	...	...	...	5.0E-04	...	...
Thiourea	000062-56-6	...	...	...	...	...	...

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HAZARD RANKING M
Hazardous Substance chmarks
375 Substances

tance Name	CAS Number	AIR PATHWAY NAAQS NESHAPS (ug/m^3)	AIR PATHWAY Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY MCL/MCLG (mg/L)	GROUND WATER PATHWAY Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY Cancer Risk Screen Conc (mg/L)
am	000137-26-8	...	...	...	...	1.8E-01*	...
ene	000108-88-3	...	4.2E-01*	...	1.0E+00	7.3E+00*	...
ene diisocyanate	000584-84-9	...	7.3E-05*	...	...	...	...
enediamine, 2,4-**	000095-80-7	...	...	...	...	...	2.7E-05
idine, o-**	000095-53-4	...	...	...	...	...	...
idine, p-**	000106-49-0	...	...	...	...	...	4.5E-04
phene	008001-35-2	...	...	7.6E-06*	3.0E-03	...	7.7E-05*
2,4,5-	000093-72-1	...	...	...	5.0E-02	2.9E-01*	...
romomethane	000075-25-2	...	...	2.2E-03*	1.0E-01*	7.3E-01*	1.1E-02*
hloro-1,2,2-Trifluoroethane, 1,1,2-	000076-13-1	...	3.1E+01*	...	...	1.1E+03*	...
hlorobenzene, 1,2,4-	000120-82-1	...	2.1E-01*	...	7.0E-02	3.7E-01*	...
hloroethane, 1,1,1-	000071-55-6	...	...	...	2.0E-01	...	...
hloroethane, 1,1,2-	000079-00-5	...	...	1.5E-04*	3.0E-03	1.5E-01*	1.5E-03*
hloroethylene	000079-01-6	...	...	... *	5.0E-03	...	7.7E-03*
hlorofluoromethane	000075-69-4	...	7.3E-01*	...	...	1.1E+01*	...
hlorophenol, 2,3,5-	000933-78-8	...	...	...	...	...	...
hlorophenol, 2,3,6-	000933-75-5	...	...	...	...	...	...
hlorophenol, 2,4,5-	000095-95-4	...	...	...	...	3.7E+00*	...
hlorophenol, 2,4,6-	000088-06-2	...	...	7.9E-04*	...	...	7.7E-03*

Indicates difference between previous version of chemical data (JUN94) and current version of chemical data (JUN96).
Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANK STEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	AIR PATHWAY NAAQS NESHAPS (ug/m^3)	AIR PATHWAY Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY MCL/MCLG (mg/L)	GROUND WATER PATHWAY Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY Cancer Risk Screen Conc (mg/L)
ichlorophenol, 3,4,5-	000609-19-8	...	...	...	...	...	...
ichlorophenoxyacetic acid, 2,4,5-	000093-76-5	...	...	...	...	3.7E-01*	...
richloropropane, 1,2,3-	000096-18-4	...	...	...	...	2.2E-01*	1.2E-05*
riethanolamine	000102-71-6	...	...	...	...	...	...
rifluralin	001582-09-8	...	...	...	...	2.7E-01*	1.1E-02*
rinitrobenzene, 1,3,5-	000099-35-4	...	...	...	...	1.8E-03*	...
rinitrotoluene	000118-96-7	...	...	...	...	1.8E-02*	2.8E-03*
ris (2,3-dibromopropyl) phosphate	000126-72-7	...	...	...	...	...	...
anadium	007440-62-2	...	...	...	...	2.6E-01*	...
anadium pentoxide	001314-62-1	...	...	...	...	3.3E-01*	...
inyl acetate	000108-05-4	...	2.1E-01*	...	...	3.7E+01*	...
inyl chloride	000075-01-4	...	...	2.8E-05*	2.0E-03	...	4.5E-05*
arfarin	000081-81-2	...	...	...	...	1.1E-02*	...
ylene, m-	000108-38-3	...	...	...	1.0E+01	7.3E+01*	...
ylene, o-	000095-47-6	...	...	...	1.0E+01	7.3E+01*	...
ylene, p-	000106-42-3	...	...	...	1.0E+01	...	...
inc	007440-66-6	...	...	...	...	1.1E+01*	...
inc cyanide	000557-21-1	...	...	...	...	1.8E+00*	...

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HAZARD RANKING EM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	AIR PATHWAY: NAAQS NESHAPS (ug/m^3)	AIR PATHWAY: Reference Dose Screen Conc (mg/m^3)	AIR PATHWAY: Cancer Risk Screen Conc (mg/m^3)	GROUND WATER PATHWAY: MCL/MCLG (mg/L)	GROUND WATER PATHWAY: Reference Dose Screen Conc (mg/L)	GROUND WATER PATHWAY: Cancer Risk Screen Conc (mg/L)
: phosphide	001314-84-7	...	...	...	...	1.1E-02*	...
: sulfate	007733-02-0	...	...	...	...	...	...

Indicates difference between previous version of chemical data (JUN94) and current version of chemical data (JUN96).
Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RAN /STEM
Hazardous Substance Benchmarks
375 Substances

ubstance Name	CAS Number	DRINKING WATER MCL/MCLG (mg/L)	DRINKING WATER Reference Dose Screen Conc (mg/L)	DRINKING WATER Cancer Risk Screen Conc (mg/L)	FOOD CHAIN FDAAL (ppm)	FOOD CHAIN Reference Dose Screen Conc (mg/kg)	FOOD CHAIN Cancer Risk Screen Conc (mg/kg)	ENVIRONMENTAL AWQC/AALAC Freshwater (ug/L)	ENVIRONMENTAL AWQC/AALAC Saltwater (ug/L)
cenaphthene	000083-32-9	...	2.2E+00*	...	...	8.1E+01*	...	...	...
cenaphthylene	000208-96-8	...	...	...	...	...	...	...	...
cetaldehyde	000075-07-0	...	...	...	...	...	...	...	...
cetone	000067-64-1	...	3.7E+00*	...	...	1.4E+02*	...	...	...
cetonitrile	000075-05-8	...	2.2E-01*	...	...	8.1E+00*	...	...	...
cetophenone	000098-86-2	...	3.7E+00*	...	...	1.4E+02*	...	...	...
cetyl-2-thiourea, 1-	000591-08-2	...	...	...	...	...	...	...	...
crolein	000107-02-8	...	7.3E-01*	...	...	2.7E+01*	...	...	...
crylamide	000079-06-1	...	7.3E-03*	1.9E-05*	...	2.7E-01*	7.0E-04*	...	...
crylic acid	000079-10-7	...	1.8E+01*	...	...	6.8E+02*	...	...	...
crylonitrile	000107-13-1	...	3.7E-02*	1.6E-04*	...	1.4E+00*	5.8E-03*	...	...
dipic acid	000124-04-9	...	...	...	...	...	...	...	...
ldicarb	000116-06-3	...	3.7E-02*	...	...	1.4E+00*	...	...	...
ldrin	000309-00-2	...	1.1E-03*	5.0E-06*	3.0E-01	4.1E-02*	1.9E-04*	3.0E+00	3.0E+00*
llyl alcohol	000107-18-6	...	1.8E-01*	...	...	6.8E+00*	...	...	...
llyl chloride**	000107-05-1	...	...	...	...	...	...	...	...
luminum	007429-90-5	...	...	...	...	...	...	...	...
luminum phosphide	020859-73-8	...	1.5E-02*	...	...	5.4E-01*	...	...	...
Ammonia	007664-41-7	...	3.5E+01*	...	...	1.3E+03*	...	...	...

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** Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANKIN EM
Hazardous Substance nchmarks
375 Substances

stance Name	CAS Number	DRINKING WATER MCL/MCLG (mg/L)	DRINKING WATER Reference Dose Screen Conc (mg/L)	DRINKING WATER Cancer Risk Screen Conc (mg/L)	FOOD CHAIN FDAAL (ppm)	FOOD CHAIN Reference Dose Screen Conc (mg/kg)	FOOD CHAIN Cancer Risk Screen Conc (mg/kg)	ENVIRONMENTAL AWQC/AALAC Freshwater (ug/L)	ENVIRONMENTAL AWQC/AALAC Saltwater (ug/L)
onium picrate	000131-74-8	...	...	...	...	...	...	...	...
onium sulfamate	007773-06-0	...	7.3E+00*	...	...	2.7E+02*	...	...	...
line	000062-53-3	...	...	1.5E-02*	...	...	5.5E-01*	...	...
hracene	000120-12-7	...	1.1E+01*	...	...	4.1E+02*	...	...	...
imony	007440-36-0	6.0E-03	1.5E-02*	...	...	5.4E-01*	...	...	...
enic	007440-38-2	5.0E-02	1.1E-02*	5.7E-05*	...	4.1E-01*	2.1E-03*	1.9E+02	1.9E+02*
estos	001332-21-4	7.0E+00*	...	...	...	...	...	...	...
azine	001912-24-9	3.0E-03	1.3E+00*	3.8E-04*	...	4.7E+01*	1.4E-02*	...	...
nphos- ethyl	002642-71-9	...	...	...	...	...	...	...	...
inphos- methyl	000086-50-0	...	...	...	...	...	...	1.0E-02*	1.0E-02*
iridine	000151-56-4	...	...	...	...	...	...	...	...
ium	007440-39-3	2.0E+00	2.6E+00*	...	...	9.5E+01*	...	...	...
ium cyanide	000542-62-1	...	... *	...	...	... *	...	...	...
nz(a)anthracene	000056-55-3	...	...	1.2E-04*	...	...	4.3E-03*	...	...
nzene	000071-43-2	5.0E-03	...	2.9E-03*	...	...	1.1E-01*	...	...
nzene carbonyl chloride	000098-88-4	...	...	...	...	...	...	...	...
nzidine	000092-87-5	...	1.1E-01*	3.7E-07*	...	4.1E+00*	1.4E-05*	...	...
nzo(a)pyrene	000050-32-8	2.0E-04	...	1.2E-05*	...	...	4.3E-04*	...	...

Indicates difference between previous version of chemical data (JUN94) and current version of chemical data (JUN96).
Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANK SYSTEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	DRINKING WATER MCL/MCLG (mg/L)	DRINKING WATER Reference Dose Screen Conc (mg/L)	DRINKING WATER Cancer Risk Screen Conc (mg/L)	FOOD CHAIN FDAAL (ppm)	FOOD CHAIN Reference Dose Screen Conc (mg/kg)	FOOD CHAIN Cancer Risk Screen Conc (mg/kg)	ENVIRONMENTAL AWQC/AALAC Freshwater (ug/L)	ENVIRONMENTAL AWQC/AALAC Saltwater (ug/L)
enzo(b)fluoranthene	000205-99-2	...	...	1.2E-04*	...	...	4.3E-03*	...	...
enzo(g,h,i)perylene	000191-24-2	...	...	...	...	...	...	...	...
enzo(k)fluoranthene	000207-08-9	...	...	1.2E-03*	...	...	4.3E-02*	...	...
enzoic acid	000065-85-0	...	1.5E+02*	...	...	5.4E+03*	...	...	...
enzonitrile	000100-47-0	...	...	...	...	...	...	...	...
enzothiazole, 1,2,-	000095-16-9	...	...	...	...	...	...	...	...
enzyl alcohol**	000100-51-6	...	1.1E+01	...	...	4.1E+02	...	...	...
enzyl chloride	000100-44-7	...	...	5.0E-04*	...	...	1.9E-02*	...	...
eryllium	007440-41-7	4.0E-03	1.8E-01*	2.0E-05*	...	6.8E+00*	7.3E-04*	...	...
iphenyl, 1,1-	000092-52-4	...	1.8E+00*	...	...	6.8E+01*	...	...	...
is (2-ethylhexyl) phthalate	000117-81-7	6.0E-03*	7.3E-01*	6.1E-03*	...	2.7E+01*	2.3E-01*	...	...
is(2-chloroethoxy)methane	000111-91-1	...	...	...	...	...	...	...	...
is(2-chloroethyl)ether	000111-44-4	...	...	7.7E-05*	...	...	2.9E-03*	...	...
is(2-chloroisopropyl)ether**	039638-32-9	...	1.5E+00	1.2E-03	...	5.4E+01	4.5E-02	...	...
is(chloromethyl)ether	000542-88-1	...	...	3.9E-07*	...	...	1.4E-05*	...	...
oron	007440-42-8	...	3.3E+00*	...	...	1.2E+02*	...	...	...
romodichloromethane	000075-27-4	1.0E-01*	7.3E-01*	1.4E-03*	...	2.7E+01*	5.1E-02*	...	...
romomethane	000074-83-9	...	5.1E-02*	...	...	1.9E+00*	...	...	...
romophenyl-phenylether, 4-**	000101-55-3	...	...	...	...	...	...	...	...

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HAZARD RANKING SYSTEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	DRINKING WATER MCL/MCLG (mg/L)	DRINKING WATER Reference Dose Screen Conc (mg/L)	DRINKING WATER Cancer Risk Screen Conc (mg/L)	FOOD CHAIN FDAAL (ppm)	FOOD CHAIN Reference Dose Screen Conc (mg/kg)	FOOD CHAIN Cancer Risk Screen Conc (mg/kg)	ENVIRONMENTAL AWQC/AALAC Freshwater (ug/L)	ENVIRONMENTAL AWQC/AALAC Saltwater (ug/L)
noxynil	001689-84-5	...	7.3E-01*	...	...	2.7E+01*	...	...	...
adiene, 1,3-	000106-99-0	...	...	...	...	...	...	...	...
anol	000071-36-3	...	3.7E+00*	...	...	1.4E+02*	...	...	...
ylbenzyl phthalate	000085-68-7	...	7.3E+00*	...	...	2.7E+02*	...	...	...
yric acid, 4-(2,4-dichlorophenoxy)	000094-82-6	...	2.9E-01*	...	...	1.1E+01*	...	...	...
nium	007440-43-9	5.0E-03	1.8E-02*	...	...	6.8E-01*	...	1.1E+00	1.1E+00*
ium**	007440-70-2	...	...	...	...	...	...	...	...
tan	000133-06-2	...	4.7E+00*	2.4E-02*	...	1.8E+02*	9.0E-01*	...	...
baryl	000063-25-2	...	3.7E+00*	...	...	1.4E+02*	...	...	...
bazole**	000086-74-8	...	...	4.3E-03	...	...	1.6E-01	...	...
bofuran	001563-66-2	4.0E-02	1.8E-01*	...	...	6.8E+00*	...	...	...
bon disulfide	000075-15-0	...	3.7E+00*	...	...	1.4E+02*	...	...	...
bon tetrachloride	000056-23-5	5.0E-03	2.6E-02*	6.6E-04*	...	9.5E-01*	2.4E-02*	...	...
bophenothion	000786-19-6	...	...	...	...	...	...	...	...
ium	007440-46-2	...	...	...	...	...	...	...	...
oral	000075-87-6	...	7.3E-02*	...	...	2.7E+00*	...	...	...
ordane	000057-74-9	2.0E-03	2.2E-03*	6.6E-05*	3.0E-01	8.1E-02*	2.4E-03*	4.3E-03	4.3E-03*
ordane, alpha-**	005103-71-9	...	...	...	...	...	...	...	...
ordane, gamma-**	005566-34-7	...	...	...	...	...	...	...	...

Indicates difference between previous version of chemical data (JUN94) and current version of chemical data (JUN96).
Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANK .STEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	DRINKING WATER MCL/MCLG (mg/L)	DRINKING WATER Reference Dose Screen Conc (mg/L)	DRINKING WATER Cancer Risk Screen Conc (mg/L)	FOOD CHAIN FDAAL (ppm)	FOOD CHAIN Reference Dose Screen Conc (mg/kg)	FOOD CHAIN Cancer Risk Screen Conc (mg/kg)	ENVIRONMENTAL AWQC/AALAC Freshwater (ug/L)	ENVIRONMENTAL AWQC/AALAC Saltwater (ug/L)
hlorine cyanide	000506-77-4	...	1.8E+00*	...	...	6.8E+01*	...	4.0E-03	4.0E-03
hloro-3-methylphenol, 4-	000059-50-7	...	7.3E+01*	...	...	2.7E+03*	...	...	...
hloroaniline, p-	000106-47-8	...	1.5E-01*	...	...	5.4E+00*	...	...	...
hlorobenzene	000108-90-7	1.0E-01*	7.3E-01*	...	...	2.7E+01*	...	...	...
hlorobenzilate**	000510-15-6	...	7.3E-01	3.2E-04	...	2.7E+01	1.2E-02	...	...
hloroform	000067-66-3	1.0E-01*	3.7E-01*	1.4E-02*	...	1.4E+01*	5.2E-01*	...	...
hloromethane	000074-87-3	...	...	6.6E-03*	...	...	2.4E-01*	...	...
hloromethyl methyl ether	000107-30-2	...	...	...	...	...	...	...	...
hloromethyloxirane, 2-	000106-89-8	...	7.3E-02*	8.6E-03*	...	2.7E+00*	3.2E-01*	...	...
hloronaphthalene, 2-	000091-58-7	...	2.9E+00*	...	...	1.1E+02*	...	...	...
hlorophenol, 2-	000095-57-8	...	1.8E-01*	...	...	6.8E+00*	...	...	...
hlorophenyl-phenyl ether, 4-**	007005-72-3	...	...	...	...	...	...	...	...
hloroprene**	000126-99-8	...	...	...	...	...	...	...	...
hlorpyrifos	002921-88-2	...	1.1E-01*	...	...	4.1E+00*	...	4.1E-02	4.1E-02*
hromium	007440-47-3	1.0E-01	1.8E-01*	...	...	6.8E+00*	...	1.1E+01*	1.1E+01*
hromium(III)	016065-83-1	...	3.7E+01*	...	...	1.4E+03*	...	2.1E+02	2.1E+02
hromium(VI)	018540-29-9	...	1.8E-01*	...	...	6.8E+00*	...	1.1E+01	1.1E+01*
hrysene	000218-01-9	...	...	1.2E-02*	...	...	4.3E-01*	...	...

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'* Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANKING EM
Hazardous Substance Benchmarks
375 Substances

stance Name	CAS Number	DRINKING WATER MCL/MCLG (mg/L)	DRINKING WATER Reference Dose Screen Conc (mg/L)	DRINKING WATER Cancer Risk Screen Conc (mg/L)	FOOD CHAIN FDAAL (ppm)	FOOD CHAIN Reference Dose Screen Conc (mg/kg)	FOOD CHAIN Cancer Risk Screen Conc (mg/kg)	ENVIRONMENTAL AWQC/AALAC Freshwater (ug/L)	ENVIRONMENTAL AWQC/AALAC Saltwater (ug/L)
alt	007440-48-4	...	...	...	...	...	...	...	...
per	007440-50-8	1.3E+00	...	...	...	...	...	1.2E+01	1.2E+01*
per cyanide	000544-92-3	...	1.8E-01*	...	...	6.8E+00*	...	...	...
maphos	000056-72-4	...	...	...	...	...	...	...	...
osote	008001-58-9	...	...	...	...	...	...	...	...
sol, m-	000108-39-4	...	1.8E+00*	...	...	6.8E+01*	...	...	...
sol, o-**	000095-48-7	...	1.8E+00	...	...	6.8E+01	...	...	...
sol, p-	000106-44-5	...	1.8E-01*	...	...	6.8E+00*	...	...	...
nene	000098-82-8	...	1.5E+00*	...	...	5.4E+01*	...	...	...
nazine	021725-46-2	...	7.3E-02*	1.0E-04*	...	2.7E+00*	3.8E-03*	...	...
nide	000057-12-5	2.0E-01	7.3E-01*	...	...	2.7E+01*	...	5.2E+00	5.2E+00*
nogen	000460-19-5	...	1.5E+00*	...	...	5.4E+01*	...	...	...
anogen bromide	000506-68-3	...	3.3E+00*	...	...	1.2E+02*	...	...	...
clohexane	000110-82-7	...	...	...	...	...	...	...	...
clohexanone	000108-94-1	...	1.8E+02*	...	...	6.8E+03*	...	...	...
clotrimethylenetrinitriamine	000121-82-4	...	1.1E-01*	7.7E-04*	...	4.1E+00*	2.9E-02*	...	...
D	000072-54-8	...	...	3.6E-04*	5.0E+00	...	1.3E-02*	...	...
E	000072-55-9	...	...	2.5E-04*	5.0E+00	...	9.3E-03*	...	...
T	000050-29-3	...	1.8E-02*	2.5E-04*	5.0E+00	6.8E-01*	9.3E-03*	1.0E-03	1.0E-03

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HAZARD RANK /STEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	DRINKING WATER MCL/MCLG (mg/L)	DRINKING WATER Reference Dose Screen Conc (mg/L)	DRINKING WATER Cancer Risk Screen Conc (mg/L)	FOOD CHAIN FDAAL (ppm)	FOOD CHAIN Reference Dose Screen Conc (mg/kg)	FOOD CHAIN Cancer Risk Screen Conc (mg/kg)	ENVIRONMENTAL AWQC/AALAC Freshwater (ug/L)	ENVIRONMENTAL AWQC/AALAC Saltwater (ug/L)
DEF	000078-48-8	...	1.1E-03*	...	...	4.1E-02*	...	...	...
Di-n-butyl phthalate	000084-74-2	...	3.7E+00*	...	...	1.4E+02*	...	...	...
Di-n-octyl phthalate	000117-84-0	...	7.3E-01*	...	...	2.7E+01*	...	...	...
Diallate**	002303-16-4	...	...	1.4E-03	...	...	5.2E-02	...	...
Diazinon	000333-41-5	...	3.3E-02*	...	...	1.2E+00*	...	...	...
Dibenz(a,h)anthracene	000053-70-3	...	...	1.2E-05*	...	...	4.3E-04*	...	...
Dibenzofuran	000132-64-9	...	...	...	...	...	...	...	...
Dibromo-3-chloropropane, 1,2-	000096-12-8	2.0E-04*	...	6.1E-05*	...	...	2.3E-03*	...	...
Dibromochloromethane	000124-48-1	6.0E-02*	7.3E-01*	1.0E-03*	...	2.7E+01*	3.8E-02*	...	...
Dibromoethane, 1,2-	000106-93-4	5.0E-05	...	1.0E-06*	...	...	3.7E-05*	...	...
Dicamba	001918-00-9	...	1.1E+00*	...	...	4.1E+01*	...	...	...
Dichlorobenzene, 1,2-	000095-50-1	6.0E-01	3.3E+00*	...	...	1.2E+02*	...	...	...
Dichlorobenzene, 1,3-	000541-73-1	6.0E-01	...	...	...	...	...	...	...
Dichlorobenzene, 1,4-	000106-46-7	7.5E-02	...	3.6E-03*	...	...	1.3E-01*	...	...
Dichlorobenzidine, 3,3-	000091-94-1	...	...	1.9E-04*	...	...	7.0E-03*	...	...
Dichlorodifluoromethane	000075-71-8	...	7.3E+00*	...	...	2.7E+02*	...	...	...
Dichloroethane, 1,1-	000075-34-3	...	3.7E+00*	...	...	1.4E+02*	...	...	...
Dichloroethane, 1,2-	000107-06-2	5.0E-03	...	9.4E-04*	...	...	3.5E-02*	...	...
Dichloroethylene, 1,1-	000075-35-4	7.0E-03	3.3E-01*	1.4E-04*	...	1.2E+01*	5.3E-03*	...	...

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HAZARD RANKING EM
Hazardous Substance chmarks
375 Substances

Substance Name	CAS Number	DRINKING WATER MCL/MCLG (mg/L)	DRINKING WATER Reference Dose Screen Conc (mg/L)	DRINKING WATER Cancer Risk Screen Conc (mg/L)	FOOD CHAIN FDAAL (ppm)	FOOD CHAIN Reference Dose Screen Conc (mg/kg)	FOOD CHAIN Cancer Risk Screen Conc (mg/kg)	ENVIRONMENTAL AWQC/AALAC Freshwater (ug/L)	ENVIRONMENTAL AWQC/AALAC Saltwater (ug/L)
ıloroethylene, cis-1,2-	000156-59-2	7.0E-02	3.7E-01*	...	...	1.4E+01*	...	...	...
ıloroethylene, trans-1,2-	000156-60-5	1.0E-01	7.3E-01*	...	...	2.7E+01*	...	...	...
ılorophenol, 2,4-	000120-83-2	...	1.1E-01*	...	...	4.1E+00*	...	...	...
ılorophenoxyacetic acid, 2,4-	000094-75-7	7.0E-02	3.7E-01*	...	...	1.4E+01*	...	...	...
ıloropropane, 1,2-	000078-87-5	5.0E-03	...	1.3E-03*	...	...	4.6E-02*	...	...
ıloropropene, 1,3-	000542-75-6	...	1.1E-02*	4.7E-04*	...	4.1E-01*	1.8E-02*	...	...
ıloropropene, cis-1,3-**	010061-01-5	...	...	...	...	...	...	...	...
ıloropropene, trans-1,3-**	010061-02-6	...	...	...	...	...	...	...	...
ılorvos	000062-73-7	...	1.8E-02*	2.9E-04*	...	6.8E-01*	1.1E-02*	...	...
ɔfol	000115-32-2	...	...	...	...	...	...	...	...
ldrin	000060-57-1	...	1.8E-03*	5.3E-06*	3.0E-01	6.8E-02*	2.0E-04*	1.9E-03	1.9E-03
thyl phthalate	000084-66-2	...	2.9E+01*	...	...	1.1E+03*	...	... *	... *
thylene glycol	000111-46-6	...	...	...	...	...	...	...	...
thylstibestrol**	000056-53-1	...	...	1.8E-08	...	...	6.7E-07	...	...
sopropylmethyl-phosphonate	001445-75-6	...	2.9E+00*	...	...	1.1E+02*	...	...	...
ethoate	000060-51-5	...	7.3E-03*	...	...	2.7E-01*	...	...	...
ethoxybenzidine, 3,3-	000119-90-4	...	...	6.1E-03*	...	...	2.3E-01*	...	...
ethyl phenol, 2,4-	000105-67-9	...	7.3E-01*	...	...	2.7E+01*	...	...	...

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Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANKI. ,TEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	DRINKING WATER MCL/MCLG (mg/L)	DRINKING WATER Reference Dose Screen Conc (mg/L)	DRINKING WATER Cancer Risk Screen Conc (mg/L)	FOOD CHAIN FDAAL (ppm)	FOOD CHAIN Reference Dose Screen Conc (mg/kg)	FOOD CHAIN Cancer Risk Screen Conc (mg/kg)	ENVIRONMENTAL AWQC/AALAC Freshwater (ug/L)	ENVIRONMENTAL AWQC/AALAC Saltwater (ug/L)
imethyl phthalate	000131-11-3	...	... *	...	...	... *	...	...	...
imethyl sulfate	000077-78-1	...	...	...	...	...	...	...	...
imethylbenz(a)anthracene, 7,12-**	000057-97-6	...	...	...	...	...	...	...	...
imethylbenzidine, 3,3'-**	000119-93-7	...	...	9.3E-06	...	...	3.4E-04	...	...
initro-2-methylphenol, 4,6-**	000534-52-1	...	...	...	...	...	...	...	...
initrobenzene, 1,3-	000099-65-0	...	3.7E-03*	...	...	1.4E-01*	...	...	...
initrophenol, 2,4-	000051-28-5	...	7.3E-02*	...	...	2.7E+00*	...	...	...
initrotoluene, 2,4-	000121-14-2	...	7.3E-02*	1.3E-04*	...	2.7E+00*	4.6E-03*	...	...
initrotoluene, 2,6-	000606-20-2	...	3.7E-02*	1.3E-04*	...	1.4E+00*	4.6E-03*	...	...
inoseb	000088-85-7	7.0E-03	3.7E-02*	...	...	1.4E+00*	...	...	...
ioxane, 1,4-	000123-91-1	...	...	7.7E-03*	...	...	2.9E-01*	...	...
ioxathion	000078-34-2	...	...	...	...	...	...	...	...
iphenylamine**	000122-39-4	...	9.1E-01	...	...	3.4E+01	...	...	...
iphenylhydrazine, 1,2-	000122-66-7	...	...	1.1E-04*	...	...	3.9E-03*	...	...
iquat	000085-00-7	2.0E-02	8.0E-02*	...	...	3.0E+00*	...	...	...
isulfoton	000298-04-4	...	1.5E-03*	...	...	5.4E-02*	...	...	...
iuron	000330-54-1	...	7.3E-02*	...	...	2.7E+00*	...	...	...
ndosulfan (I or II)	000115-29-7	...	2.2E-01*	...	...	8.1E+00*	...	5.6E-02	5.6E-02*
ndosulfan sulfate	001031-07-8	...	...	...	...	...	...	...	...

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HAZARD RANKING M
Hazardous Substance . chmarks
375 Substances

tance Name	CAS Number	DRINKING WATER MCL/MCLG (mg/L)	DRINKING WATER Reference Dose Screen Conc (mg/L)	DRINKING WATER Cancer Risk Screen Conc (mg/L)	FOOD CHAIN FDAAL (ppm)	FOOD CHAIN Reference Dose Screen Conc (mg/kg)	FOOD CHAIN Cancer Risk Screen Conc (mg/kg)	ENVIRONMENTAL AWQC/AALAC Freshwater (ug/L)	ENVIRONMENTAL AWQC/AALAC Saltwater (ug/L)
thall	000145-73-3	1.0E-01	7.3E-01*	...	...	2.7E+01*	...	...	...
in	000072-20-8	2.0E-03	1.1E-02*	...	... *	4.1E-01*	...	2.3E-03	2.3E-03
in aldehyde	007421-93-4	...	...	...	...	...	...	... *	... *
in ketone**	053494-70-5	...	...	...	...	...	...	...	...
on	000563-12-2	...	1.8E-02*	...	...	6.8E-01*	...	...	...
l acetate	000141-78-6	...	3.3E+01*	...	...	1.2E+03*	...	...	...
l benzene	000100-41-4	7.0E-01	3.7E+00*	...	...	1.4E+02*	...	...	...
l chloride	000075-00-3	...	...	...	...	...	...	...	...
l ether	000060-29-7	...	7.3E+00*	...	...	2.7E+02*	...	...	...
l methacrylate**	000097-63-2	...	3.3E+00	...	...	1.2E+02	...	...	...
l methanesulfonate**	000062-50-0	...	...	...	...	...	...	...	...
ldipropylthiocarbamate, s-	000759-94-4	...	9.1E-01*	...	...	3.4E+01*	...	...	...
lene glycol	000107-21-1	...	7.3E+01*	...	...	2.7E+03*	...	...	...
lene glycol monoethyl ether	000110-80-5	...	1.5E+01*	...	...	5.4E+02*	...	...	...
lene thiourea**	000096-45-7	...	2.9E-03	7.7E-04	...	1.1E-01	2.9E-02	...	...
thion	000055-38-9	...	...	...	...	...	...	...	...
rous sulfate	007720-78-7	...	...	...	...	...	...	...	...
oranthene	000206-44-0	...	1.5E+00*	...	...	5.4E+01*	...	...	...
orene	000086-73-7	...	1.5E+00*	...	...	5.4E+01*	...	...	...

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Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANK. SYSTEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	DRINKING WATER			FOOD CHAIN			ENVIRONMENTAL	
		MCL/MCLG (mg/L)	Reference Dose Screen Conc (mg/L)	Cancer Risk Screen Conc (mg/L)	FDAAL (ppm)	Reference Dose Screen Conc (mg/kg)	Cancer Risk Screen Conc (mg/kg)	AWQC/AALAC Freshwater (ug/L)	AWQC/AALAC Saltwater (ug/L)
luorine	007782-41-4	...	2.2E+00*	...	...	8.1E+01*	...	...	...
ormaldehyde	000050-00-0	...	7.3E+00*	...	...	2.7E+02*	...	...	...
ormic acid	000064-18-6	...	7.3E+01*	...	...	2.7E+03*	...	...	...
uran	000110-00-9	...	3.7E-02*	...	...	1.4E+00*	...	...	...
urfural	000098-01-1	...	1.1E-01*	...	...	4.1E+00*	...	...	...
lycidylaldehyde	000765-34-4	...	1.5E-02*	...	...	5.4E-01*	...	...	...
eptachlor	000076-44-8	4.0E-04	1.8E-02*	1.9E-05*	3.0E-01	6.8E-01*	7.0E-04*	3.8E-03	3.8E-03*
eptachlor epoxide	001024-57-3	2.0E-04	4.7E-04*	9.4E-06*	3.0E-01	1.8E-02*	3.5E-04*	3.8E-03*	3.8E-03*
eptachlorinated dibenzo-p-dioxin, 1,2,3,4	035822-46-9	...	...	5.3E-08*	...	...	2.0E-06*	...	...
eptachlorinated dibenzofuran, 1,2,3,4,6,7	067562-39-4	...	...	5.3E-08*	...	...	2.0E-06*	...	...
eptachlorinated dibenzofuran, 1,2,3,4,6,7	055673-89-7	...	...	... *	...	...	... *	...	...
exabromobenzene	000087-82-1	...	7.3E-02*	...	...	2.7E+00*	...	...	...
exachlorinated dibenzo-p-dioxin, 1,2,3,4,	039227-28-6	...	...	5.3E-09*	...	...	2.0E-07*	...	...
exachlorinated dibenzo-p-dioxin, 1,2,3,6,	057653-85-7	...	...	1.4E-08*	...	...	5.1E-07*	...	...
Hexachlorinated dibenzo-p-dioxin, 1,2,3,7,	019408-74-3	...	...	1.4E-08*	...	...	5.1E-07*	...	...
Hexachlorinated dibenzofuran, 1,2,3,4,7,8-	070648-26-9	...	...	5.3E-09*	...	...	2.0E-07*	...	...
Hexachlorinated dibenzofuran, 1,2,3,6,7,8-	057117-44-9	...	...	5.3E-09*	...	...	2.0E-07*	...	...
Hexachlorinated dibenzofuran, 1,2,3,7,8,9-	072918-21-9	...	...	5.3E-09*	...	...	2.0E-07*	...	...

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HAZARD RANKING EM
Hazardous Substance Benchmarks
375 Substances

Stance Name	CAS Number	DRINKING WATER MCL/MCLG (mg/L)	DRINKING WATER Reference Dose Screen Conc (mg/L)	DRINKING WATER Cancer Risk Screen Conc (mg/L)	FOOD CHAIN FDAAL (ppm)	FOOD CHAIN Reference Dose Screen Conc (mg/kg)	FOOD CHAIN Cancer Risk Screen Conc (mg/kg)	ENVIRONMENTAL AWQC/AALAC Freshwater (ug/L)	ENVIRONMENTAL AWQC/AALAC Saltwater (ug/L)
achlorinated dibenzofuran, 2,3,4,6,7,8-	060851-34-5	...	...	5.3E-09*	...	...	2.0E-07*	...	...
achlorobenzene	000118-74-1	1.0E-03	2.9E-02*	5.3E-05*	...	1.1E+00*	2.0E-03*	...	...
achlorobutadiene	000087-68-3	...	7.3E-03*	1.1E-03*	...	2.7E-01*	4.0E-02*	...	...
achlorocyclohexane, alpha-	000319-84-6	...	...	1.4E-05*	...	...	5.0E-04*	...	...
achlorocyclohexane, beta-	000319-85-7	...	...	4.7E-05*	...	...	1.8E-03*	...	...
achlorocyclohexane, delta-	000319-86-8	...	...	...	...	...	...	...	...
achlorocyclopentadiene	000077-47-4	5.0E-02	2.6E-01*	...	...	9.5E+00*	...	...	...
achloroethane	000067-72-1	...	3.7E-02*	6.1E-03*	...	1.4E+00*	2.3E-01*	...	...
achlorophene	000070-30-4	...	1.1E-02*	...	...	4.1E-01*	...	...	...
ane	000110-54-3	...	2.2E+00*	...	...	8.1E+01*	...	...	...
anone, 2-**	000591-78-6	...	...	...	...	...	...	...	...
razine	000302-01-2	...	...	2.8E-05*	...	...	1.1E-03*	...	...
lrochloric acid	007647-01-0	...	...	...	...	...	...	...	...
lrogen cyanide	000074-90-8	...	7.3E-01*	...	...	2.7E+01*	...	...	...
lrogen sulfide	007783-06-4	...	1.1E-01*	...	...	4.1E+00*	...	2.0E+00	2.0E+00
leno(1,2,3-cd)pyrene	000193-39-5	...	...	1.2E-04*	...	...	4.3E-03*	...	...
cynil	001689-83-4	...	...	...	...	...	...	...	...
on	007439-89-6	...	...	...	...	...	...	1.0E+03	1.0E+03
obutanol	000078-83-1	...	1.1E+01*	...	...	4.1E+02*	...	...	...

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Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANK. .STEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	DRINKING WATER MCL/MCLG (mg/L)	DRINKING WATER Reference Dose Screen Conc (mg/L)	DRINKING WATER Cancer Risk Screen Conc (mg/L)	FOOD CHAIN FDAAL (ppm)	FOOD CHAIN Reference Dose Screen Conc (mg/kg)	FOOD CHAIN Cancer Risk Screen Conc (mg/kg)	ENVIRONMENTAL AWQC/AALAC Freshwater (ug/L)	ENVIRONMENTAL AWQC/AALAC Saltwater (ug/L)
sophorone	000078-59-1	...	7.3E+00*	9.0E-02*	...	2.7E+02*	3.3E+00*	...	...
epone	000143-50-0	...	...	...	3.0E-01	...	...	...	...
ead	007439-92-1	1.5E-02	...	...	...	...	...	3.2E+00	3.2E+00*
indane	000058-89-9	2.0E-04	1.1E-02*	6.6E-05*	...	4.1E-01*	2.4E-03*	8.0E-02	8.0E-02
lagnesium	007439-95-4	...	...	...	...	...	...	...	...
lalathion	000121-75-5	...	7.3E-01*	...	...	2.7E+01*	...	1.0E-01	1.0E-01
aleic anhydride	000108-31-6	...	3.7E+00*	...	...	1.4E+02*	...	...	...
aleic hydrazide	000123-33-1	...	1.8E+01*	...	...	6.8E+02*	...	...	...
anganese	007439-96-5	...	5.1E+00*	...	...	1.9E+02*	...	...	...
ercury	007439-97-6	2.0E-03	1.1E-02*	...	1.0E+00	4.1E-01*	...	1.2E-02	1.2E-02*
ethacrylonitrile	000126-98-7	...	3.7E-03*	...	...	1.4E-01*	...	...	...
ethanol	000067-56-1	...	1.8E+01*	...	...	6.8E+02*	...	...	...
iethomyl	016752-77-5	...	9.1E-01*	...	...	3.4E+01*	...	...	...
iethoxychlor	000072-43-5	4.0E-02	1.8E-01*	...	...	6.8E+00*	...	3.0E-02	3.0E-02
iethyl chlorocarbonate	000079-22-1	...	...	...	...	...	...	...	...
iethyl ethyl ketone	000078-93-3	...	2.2E+01*	...	...	8.1E+02*	...	...	...
iethyl isobutyl ketone	000108-10-1	...	2.9E+00*	...	...	1.1E+02*	...	...	...
iethyl methacrylate	000080-62-6	...	2.9E+00*	...	...	1.1E+02*	...	...	...
Methylcholanthrene, 3-**	000056-49-5	...	...	...	...	...	...	...	...

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HAZARD RANKING [redacted]
Hazardous Substance Benchmarks
375 Substances

ance Name	CAS Number	DRINKING WATER MCL/MCLG (mg/L)	DRINKING WATER Reference Dose Screen Conc (mg/L)	DRINKING WATER Cancer Risk Screen Conc (mg/L)	FOOD CHAIN FDAAL (ppm)	FOOD CHAIN Reference Dose Screen Conc (mg/kg)	FOOD CHAIN Cancer Risk Screen Conc (mg/kg)	ENVIRONMENTAL AWQC/AALAC Freshwater (ug/L)	ENVIRONMENTAL AWQC/AALAC Saltwater (ug/L)
lene bis (2-chloroaniline), 4,4-	000101-14-4	...	2.6E-02*	6.6E-04*	...	9.5E-01*	2.4E-02*	...	...
lene bromide**	000074-95-3	...	...	...	...	...	...	...	...
lene chloride	000075-09-2	5.0E-03	2.2E+00*	1.1E-02*	...	8.1E+01*	4.2E-01*	...	...
lenediphenyl diisocyanate, 4,4-	000101-68-8	...	...	...	...	...	...	...	...
lnaphthalene, 2-	000091-57-6	...	...	...	...	...	...	...	...
ibuzin	021087-64-9	...	9.1E-01*	...	...	3.4E+01*	...	...	...
	002385-85-5	...	7.3E-03*	... *	1.0E-01	2.7E-01*	... *	1.0E-03	1.0E-03
denum**	007439-98-7	...	1.8E-01	...	...	6.8E+00	...	...	...
roso-di-n-propylamine**	000621-64-7	...	...	1.2E-05	...	...	4.5E-04	...	...
rosopiperidine**	000100-75-4	...	...	...	...	...	...	...	...
thalene	000091-20-3	...	1.5E+00*	...	...	5.4E+01*	...	...	...
thylamine**	000091-59-8	...	...	...	...	...	...	...	...
el	007440-02-0	... *	7.3E-01*	...	...	2.7E+01*	...	1.6E+02	1.6E+02*
ic acid	007697-37-2	...	...	...	...	...	...	...	...
ic oxide	010102-43-9	...	... *	...	...	... *	...	...	...
oaniline, 2-**	000088-74-4	...	...	...	...	...	...	...	...
oaniline, 3-**	000099-09-2	...	...	...	...	...	...	...	...
oaniline, p-	000100-01-6	...	...	...	...	...	...	...	...

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HAZARD RANK /STEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	DRINKING WATER MCL/MCLG (mg/L)	DRINKING WATER Reference Dose Screen Conc (mg/L)	DRINKING WATER Cancer Risk Screen Conc (mg/L)	FOOD CHAIN FDAAL (ppm)	FOOD CHAIN Reference Dose Screen Conc (mg/kg)	FOOD CHAIN Cancer Risk Screen Conc (mg/kg)	ENVIRONMENTAL AWQC/AALAC Freshwater (ug/L)	ENVIRONMENTAL AWQC/AALAC Saltwater (ug/L)
Nitrobenzene	000098-95-3	...	1.8E-02*	...	...	6.8E-01*	...	...	...
Nitrogen dioxide	010102-44-0	...	... *	...	...	... *	...	...	...
Nitroglycerine	000055-63-0	...	...	...	...	...	...	...	...
Nitrophenol, 2-**	000088-75-5	...	...	...	...	...	...	...	...
Nitrophenol, 4-	000100-02-7	...	...	...	...	...	...	...	...
Nitropropane, 2-**	000079-46-9	...	...	...	...	...	...	...	...
Nitroso-di-n-butylamine, N-	000924-16-3	...	...	1.6E-05*	...	...	5.8E-04*	...	...
Nitroso-di-n-methylurethane, N-	000615-53-2	...	...	...	...	...	...	...	...
Nitrosodiethanolamine, N-	001116-54-7	...	...	3.0E-05*	...	...	1.1E-03*	...	...
Nitrosodiethylamine, N-	000055-18-5	...	...	5.7E-07*	...	...	2.1E-05*	...	...
Nitrosodimethylamine, N-	000062-75-9	...	...	1.7E-06*	...	...	6.2E-05*	...	...
Nitrosodiphenylamine, N-	000086-30-6	...	...	1.7E-02*	...	...	6.4E-01*	...	...
Nitrosomethylethylamine**	010595-95-6	...	...	3.9E-06	...	...	1.4E-04	...	...
Nitrosopyrrolidine, N-	000930-55-2	...	...	4.1E-05*	...	...	1.5E-03*	...	...
Nitrotoluene, 4-	000099-99-0	...	3.7E-01*	...	...	1.4E+01*	...	...	...
Octamethylpyrophosphoramide**	000152-16-9	...	7.3E-02	...	...	2.7E+00	...	...	...
Oxybis (1-chloropropane), 2,3'-**	000108-60-1	...	...	...	...	...	...	...	...
Parathion, ethyl-	000056-38-2	...	2.2E-01*	...	...	8.1E+00*	...	1.3E-02*	1.3E-02*
Parathion, methyl-	000298-00-0	...	9.1E-03*	...	...	3.4E-01*	...	...	...

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HAZARD RANKING SY
Hazardous Substance Be...marks
375 Substances

ice Name	CAS Number	DRINKING WATER MCL/MCLG (mg/L)	DRINKING WATER Reference Dose Screen Conc (mg/L)	DRINKING WATER Cancer Risk Screen Conc (mg/L)	FOOD CHAIN FDAAL (ppm)	FOOD CHAIN Reference Dose Screen Conc (mg/kg)	FOOD CHAIN Cancer Risk Screen Conc (mg/kg)	ENVIRONMENTAL AWQC/AALAC Freshwater (ug/L)	ENVIRONMENTAL AWQC/AALAC Saltwater (ug/L)
	001336-36-3	5.0E-04	7.3E-04*	1.1E-05*	...	2.7E-02*	4.1E-04*	1.4E-02	1.4E-02*
ilorinated dibenzo-p-dioxin, 1,2,3,7	040321-76-4	...	...	1.1E-09*	...	...	3.9E-08*	...	...
ilorinated dibenzofuran, 1,2,3,7,8-	109719-77-9	...	...	1.1E-08*	...	...	3.9E-07*	...	...
hlorinated dibenzofuran, 2,3,4,7,8-	057117-41-6	...	...	1.1E-09*	...	...	3.9E-08*	...	...
hlorobenzene	000608-93-5	...	2.9E-02*	...	...	1.1E+00*	...	...	...
hloroethane	000076-01-7	...	...	...	...	...	...	...	...
hloronitrobenzene	000082-68-8	...	1.1E-01*	3.3E-04*	...	4.1E+00*	1.2E-02*	...	...
hlorophenol	000087-86-5	1.0E-03	1.1E+00*	7.1E-04*	...	4.1E+01*	2.6E-02*	1.3E+01	1.3E+01
threne	000085-01-8	...	...	...	...	...	...	...	...
	000108-95-2	...	2.2E+01*	...	...	8.1E+02*	...	...	...
sulfide	000139-66-2	...	...	...	...	...	...	...	...
enediamine, m-**	000108-45-2	...	2.2E-01	...	...	8.1E+00	...	...	...
mercuric acetate	000062-38-4	...	2.9E-03*	...	...	1.1E-01*	...	...	...
:e	000298-02-2	...	7.3E-03*	...	...	2.7E-01*	...	...	...
:ne	000075-44-5	...	...	...	...	...	...	...	...
iamidon	013171-21-6	...	...	...	...	...	...	...	...
iine	007803-51-2	...	1.1E-02*	...	...	4.1E-01*	...	...	...
ionodithioic acid, phenyl-o-ethyl-o-(	002104-64-5	...	3.7E-04*	...	...	1.4E-02*	...	1.0E-01*	1.0E-01*
ioric acid	007664-38-2	...	...	...	...	...	...	...	...

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HAZARD RANK. .STEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	DRINKING WATER MCL/MCLG (mg/L)	DRINKING WATER Reference Dose Screen Conc (mg/L)	DRINKING WATER Cancer Risk Screen Conc (mg/L)	FOOD CHAIN FDAAL (ppm)	FOOD CHAIN Reference Dose Screen Conc (mg/kg)	FOOD CHAIN Cancer Risk Screen Conc (mg/kg)	ENVIRONMENTAL AWQC/AALAC Freshwater (ug/L)	ENVIRONMENTAL AWQC/AALAC Saltwater (ug/L)
hosphorous (elemental)	007723-14-0	...	7.3E-04*	...	...	2.7E-02*	...	1.0E-01	1.0E-01
hthalic anhydride	000085-44-9	...	7.3E+01*	...	...	2.7E+03*	...	...	...
lutonium	007440-07-5	...	...	...	...	...	...	...	...
olychlorinated triphenyl	012642-23-8	...	...	...	...	...	...	...	...
otassium**	007440-09-7	...	...	...	...	...	...	...	...
otassium silver cyanide	000506-61-6	...	7.3E+00*	...	...	2.7E+02*	...	...	...
ronamide	023950-58-5	...	2.7E+00*	...	...	1.0E+02*	...	...	...
yrene	000129-00-0	...	1.1E+00*	...	...	4.1E+01*	...	...	...
yridine	000110-86-1	...	3.7E-02*	...	...	1.4E+00*	...	...	...
uinoline	000091-22-5	...	...	7.1E-06*	...	...	2.6E-04*	...	...
adium	007440-14-4	...	...	...	...	...	...	...	...
adon	010043-92-2	...	...	...	...	...	...	...	...
esorcinol	000108-46-3	...	...	...	...	...	...	...	...
onnel	000299-84-3	...	1.8E+00*	...	...	6.8E+01*	...	...	...
afrole**	000094-59-7	...	...	...	...	...	...	...	...
elenium	007782-49-2	5.0E-02	1.8E-01*	...	...	6.8E+00*	...	5.0E+00*	5.0E+00*
elenourea	000630-10-4	...	1.8E-01*	...	...	6.8E+00*	...	...	...
ilver	007440-22-4	...	1.8E-01*	...	...	6.8E+00*	...	4.1E+00*	4.1E+00*

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r Cyanide	000506-64-9	...	3.7E+00*	...	...	1.4E+02*	...	...	...
m	007440-23-5	...	...	...	...	...	...	...	...
tium	007440-24-6	...	2.2E+01*	...	...	8.1E+02*	...	...	...
hnine	000057-24-9	...	1.1E-02*	...	...	4.1E-01*	...	...	...
ne	000100-42-5	1.0E-01	7.3E+00*	...	...	2.7E+02*	...	...	...
ric acid	007664-93-9	...	...	...	...	...	...	...	...
,4,5-	000093-80-1	...	...	...	...	...	...	...	...
	001746-01-6	3.0E-08	...	5.3E-10*	...	...	2.0E-08*	...	...
chlorobenzene, 1,2,4,5-	000095-94-3	...	1.1E-02*	...	...	4.1E-01*	...	...	...
chlorodibenzofuran, 2,3,7,8-	051207-31-9	...	...	5.3E-09*	...	...	2.0E-07*	...	...
chloroethane, 1,1,1,2-	000630-20-6	...	1.1E+00*	3.3E-03*	...	4.1E+01*	1.2E-01*	...	...
chloroethane, 1,1,2,2-	000079-34-5	...	...	4.3E-04*	...	...	1.6E-02*	...	...
chloroethylene	000127-18-4	5.0E-03	3.7E-01*	1.6E-03*	...	1.4E+01*	6.1E-02*	...	...
chlorophenol, 2,3,4,6-	000058-90-2	...	1.1E+00*	...	...	4.1E+01*	...	...	...
ethyl lead	000078-00-2	...	3.7E-06*	...	...	1.4E-04*	...	...	...
ethyldithiopyrophosphate	003689-24-5	...	1.8E-02*	...	...	6.8E-01*	...	...	...
hydrofuran	000109-99-9	...	...	...	...	...	...	...	...
lium	007440-28-0	5.0E-04	...	...	...	...	...	...	...
urea	000062-56-6	...	...	...	...	...	...	...	...

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HAZARD RANK. . SYSTEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	DRINKING WATER MCL/MCLG (mg/L)	DRINKING WATER Reference Dose Screen Conc (mg/L)	DRINKING WATER Cancer Risk Screen Conc (mg/L)	FOOD CHAIN FDAAL (ppm)	FOOD CHAIN Reference Dose Screen Conc (mg/kg)	FOOD CHAIN Cancer Risk Screen Conc (mg/kg)	ENVIRONMENTAL AWQC/AALAC Freshwater (ug/L)	ENVIRONMENTAL AWQC/AALAC Saltwater (ug/L)
hiram	000137-26-8	...	1.8E-01*	...	...	6.8E+00*	...	...	...
oluene	000108-88-3	1.0E+00	7.3E+00*	...	...	2.7E+02*	...	...	...
oluene diisocyanate	000584-84-9	...	...	...	...	...	...	...	...
oluenediamine, 2,4-**	000095-80-7	...	...	2.7E-05	...	...	9.8E-04	...	...
oluidine, o-**	000095-53-4	...	...	...	...	...	...	...	...
oluidine, p-**	000106-49-0	...	...	4.5E-04	...	...	1.7E-02	...	...
oxaphene	008001-35-2	3.0E-03	...	7.7E-05*	... *	...	2.9E-03*	2.0E-04*	2.0E-04
P, 2,4,5-	000093-72-1	5.0E-02	2.9E-01*	...	...	1.1E+01*	...	...	...
ribromomethane	000075-25-2	1.0E-01*	7.3E-01*	1.1E-02*	...	2.7E+01*	4.0E-01*	...	...
richloro-1,2,2-Trifluoroethane, 1,1,2-	000076-13-1	...	1.1E+03*	...	...	4.1E+04*	...	...	...
richlorobenzene, 1,2,4-	000120-82-1	7.0E-02	3.7E-01*	...	...	1.4E+01*	...	...	...
richloroethane, 1,1,1-	000071-55-6	2.0E-01	...	...	...	...	...	...	...
richloroethane, 1,1,2-	000079-00-5	3.0E-03	1.5E-01*	1.5E-03*	...	5.4E+00*	5.5E-02*	...	...
richloroethylene	000079-01-6	5.0E-03	...	7.7E-03*	...	...	2.9E-01*	...	...
richlorofluoromethane	000075-69-4	...	1.1E+01*	...	...	4.1E+02*	...	...	...
richlorophenol, 2,3,5-	000933-78-8	...	...	...	...	...	...	...	...
richlorophenol, 2,3,6-	000933-75-5	...	...	...	...	...	...	...	...
richlorophenol, 2,4,5-	000095-95-4	...	3.7E+00*	...	...	1.4E+02*	...	...	...
richlorophenol, 2,4,6-	000088-06-2	...	...	7.7E-03*	...	...	2.9E-01*	...	...

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lorophenol, 3,4,5-	000609-19-8	...	...	...	...	...	...	...	...
lorophenoxyacetic acid, 2,4,5-	000093-76-5	...	3.7E-01*	...	...	1.4E+01*	...	...	...
loropropane, 1,2,3-	000096-18-4	...	2.2E-01*	1.2E-05*	...	8.1E+00*	4.5E-04*	...	...
hanolamine	000102-71-6	...	...	...	...	...	...	...	...
uralin	001582-09-8	...	2.7E-01*	1.1E-02*	...	1.0E+01*	4.1E-01*	...	...
trobenzene, 1,3,5-	000099-35-4	...	1.8E-03*	...	...	6.8E-02*	...	...	...
trotoluene	000118-96-7	...	1.8E-02*	2.8E-03*	...	6.8E-01*	1.1E-01*	...	...
(2,3-dibromopropyl) phosphate	000126-72-7	...	...	...	...	...	...	...	...
ium	007440-62-2	...	2.6E-01*	...	...	9.5E+00*	...	...	...
ium pentoxide	001314-62-1	...	3.3E-01*	...	...	1.2E+01*	...	...	...
acetate	000108-05-4	...	3.7E+01*	...	...	1.4E+03*	...	...	...
chloride	000075-01-4	2.0E-03	...	4.5E-05*	...	...	1.7E-03*	...	...
rin	000081-81-2	...	1.1E-02*	...	...	4.1E-01*	...	...	...
ıe, m-	000108-38-3	1.0E+01	7.3E+01*	...	...	2.7E+03*	...	...	...
ıe, o-	000095-47-6	1.0E+01	7.3E+01*	...	...	2.7E+03*	...	...	...
ıe, p-	000106-42-3	1.0E+01	...	...	...	...	...	...	...
	007440-66-6	...	1.1E+01*	...	...	4.1E+02*	...	1.1E+02	1.1E+02*
cyanide	000557-21-1	...	1.8E+00*	...	...	6.8E+01*	...	...	...

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HAZARD RANKI. .STEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	DRINKING WATER MCL/MCLG (mg/L)	DRINKING WATER Reference Dose Screen Conc (mg/L)	DRINKING WATER Cancer Risk Screen Conc (mg/L)	FOOD CHAIN FDAAL (ppm)	FOOD CHAIN Reference Dose Screen Conc (mg/kg)	FOOD CHAIN Cancer Risk Screen Conc (mg/kg)	ENVIRONMENTAL AWQC/AALAC Freshwater (ug/L)	ENVIRONMENTAL AWQC/AALAC Saltwater (ug/L)
nc phosphide	001314-84-7	...	1.1E-02*	...	...	4.1E-01*	...	...	...
nc sulfate	007733-02-0	...	...	...	...	...	...	...	...

Indicates difference between previous version of chemical data (JUN94) and current version of chemical data (JUN96).
* Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANKING S.
Hazardous Substance Be. .narks
375 Substances

ıce Name	CAS Number	SOIL PATHWAY: Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY: Cancer Risk Screen Conc (mg/kg)
ıthene	000083-32-9	4.7E+03*	...
ıthylene	000208-96-8	...	...
dehyde	000075-07-0	...	...
e	000067-64-1	7.8E+03*	...
itrile	000075-05-8	4.7E+02*	...
henone	000098-86-2	7.8E+03*	...
-2-thiourea, 1-	000591-08-2	...	...
in	000107-02-8	1.6E+03*	...
mide	000079-06-1	1.6E+01*	1.4E-01*
c acid	000079-10-7	3.9E+04*	...
nitrile	000107-13-1	7.8E+01*	1.2E+00*
acid	000124-04-9	...	...
ırb	000116-06-3	7.8E+01*	...
)	000309-00-2	2.3E+00*	3.8E-02*
alcohol	000107-18-6	3.9E+02*	...
chloride**	000107-05-1	...	...
ıum	007429-90-5	...	...
ıum phosphide	020859-73-8	3.1E+01*	...
ia	007664-41-7	7.6E+04*	...

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dicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANKI. ,TEM
Hazardous Substance Benchmarks
375 Substances

ıstance Name	CAS Number	SOIL PATHWAY Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY Cancer Risk Screen Conc (mg/kg)
ıonium picrate	000131-74-8	...	...
ıonium sulfamate	007773-06-0	1.6E+04*	...
line	000062-53-3	...	1.1E+02*
hracene	000120-12-7	2.3E+04*	...
imony	007440-36-0	3.1E+01*	...
enic	007440-38-2	2.3E+01*	4.3E-01*
estos	001332-21-4	...	...
azine	001912-24-9	2.7E+03*	2.9E+00*
nphos- ethyl	002642-71-9	...	...
nphos- methyl	000086-50-0	...	...
ridine	000151-56-4	...	...
ium	007440-39-3	5.5E+03*	...
ium cyanide	000542-62-1	...	...
nz(a)anthracene	000056-55-3	...	8.8E-01*
nzene	000071-43-2	...	2.2E+01*
nzene carbonyl chloride	000098-88-4	...	...
nzidine	000092-87-5	2.3E+02*	2.8E-03*
nzo(a)pyrene	000050-32-8	...	8.8E-02*

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Indicates new hazardous substance in current version of chemical data (JUN96).

Version: JUN96

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Hazardous Substance Ben rks
375 Substances

e Name	CAS Number	SOIL PATHWAY Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY Cancer Risk Screen Conc (mg/kg)
fluoranthene	000205-99-2	...	8.8E-01*
h,i)perylene	000191-24-2	...	...
fluoranthene	000207-08-9	...	8.8E+00*
acid	000065-85-0	3.1E+05*	...
trile	000100-47-0	...	...
iazole, 1,2,-	000095-16-9	...	...
alcohol**	000100-51-6	2.3E+04	...
chloride	000100-44-7	...	3.8E+00*
m	007440-41-7	3.9E+02*	1.5E-01*
l, 1,1-	000092-52-4	3.9E+03*	...
ethylhexyl) phthalate	000117-81-7	1.6E+03*	4.6E+01*
hloroethoxy)methane	000111-91-1	...	...
hloroethyl)ether	000111-44-4	...	5.8E-01*
hloroisopropyl)ether**	039638-32-9	3.1E+03	9.1E+00
oromethyl)ether	000542-88-1	...	2.9E-03*
	007440-42-8	7.0E+03*	...
ichloromethane	000075-27-4	1.6E+03*	1.0E+01*
thane	000074-83-9	1.1E+02*	...
enyl-phenylether, 4-**	000101-55-3	...	...

icates difference between previous version of chemical data (JUN94) and current version of chemical data (JUN96).
icates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANK. . .STEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	SOIL PATHWAY: Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY: Cancer Risk Screen Conc (mg/kg)
romoxynil	001689-84-5	1.6E+03*	...
utadiene, 1,3-	000106-99-0	...	...
utanol	000071-36-3	7.8E+03*	...
utylbenzyl phthalate	000085-68-7	1.6E+04*	...
utyric acid, 4-(2,4-dichlorophenoxy)	000094-82-6	6.3E+02*	...
admium	007440-43-9	3.9E+01*	...
alcium**	007440-70-2	...	...
aptan	000133-06-2	1.0E+04*	1.8E+02*
arbaryl	000063-25-2	7.8E+03*	...
arbazole**	000086-74-8	...	3.2E+01
arbofuran	001563-66-2	3.9E+02*	...
arbon disulfide	000075-15-0	7.8E+03*	...
arbon tetrachloride	000056-23-5	5.5E+01*	4.9E+00*
arbophenothion	000786-19-6	...	...
esium	007440-46-2	...	...
hloral	000075-87-6	1.6E+02*	...
hlordane	000057-74-9	4.7E+00*	4.9E-01*
hlordane, alpha-**	005103-71-9	...	...
hlordane, gamma-**	005566-34-7	...	...

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HAZARD RANKING
Hazardous Substance
375 Substances

ance Name	CAS Number	SOIL PATHWAY Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY Cancer Risk Screen Conc (mg/kg)
ine cyanide	000506-77-4	3.9E+03*	...
o-3-methylphenol, 4-	000059-50-7	1.6E+05*	...
oaniline, p-	000106-47-8	3.1E+02*	...
obenzene	000108-90-7	1.6E+03*	...
obenzilate**	000510-15-6	1.6E+03	2.4E+00
oform	000067-66-3	7.8E+02*	1.0E+02*
omethane	000074-87-3	...	4.9E+01*
omethyl methyl ether	000107-30-2	...	...
omethyloxirane, 2-	000106-89-8	1.6E+02*	6.5E+01*
onaphthalene, 2-	000091-58-7	6.3E+03*	...
ophenol, 2-	000095-57-8	3.9E+02*	...
ophenyl-phenyl ether, 4-**	007005-72-3	...	...
oprene**	000126-99-8	...	...
pyrifos	002921-88-2	2.3E+02*	...
ium	007440-47-3	3.9E+02*	...
ium(III)	016065-83-1	7.8E+04*	...
ium(VI)	018540-29-9	3.9E+02*	...
ene	000218-01-9	...	8.8E+01*

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dicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANK... STEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	SOIL PATHWAY: Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY: Cancer Risk Screen Conc (mg/kg)
obalt	007440-48-4	...	...
opper	007440-50-8	...	...
opper cyanide	000544-92-3	3.9E+02*	...
oumaphos	000056-72-4	...	...
reosote	008001-58-9	...	...
resol, m-	000108-39-4	3.9E+03*	...
resol, o-**	000095-48-7	3.9E+03	...
resol, p-	000106-44-5	3.9E+02*	...
umene	000098-82-8	3.1E+03*	...
yanazine	021725-46-2	1.6E+02*	7.6E-01*
yanide	000057-12-5	1.6E+03*	...
yanogen	000460-19-5	3.1E+03*	...
yanogen bromide	000506-68-3	7.0E+03*	...
yclohexane	000110-82-7	...	...
yclohexanone	000108-94-1	3.9E+05*	...
Cyclotrimethylenetrinitriamine	000121-82-4	2.3E+02*	5.8E+00*
DD	000072-54-8	...	2.7E+00*
DE	000072-55-9	...	1.9E+00*
DT	000050-29-3	3.9E+01*	1.9E+00*

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HAZARD RANKING S
Hazardous Substance B. .narks
375 Substances

nce Name	CAS Number	SOIL PATHWAY: Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY: Cancer Risk Screen Conc (mg/kg)
	000078-48-8	2.3E+00*	...
utyl phthalate	000084-74-2	7.8E+03*	...
ctyl phthalate	000117-84-0	1.6E+03*	...
te**	002303-16-4	...	1.0E+01
on	000333-41-5	7.0E+01*	...
(a,h)anthracene	000053-70-3	...	8.8E-02*
ofuran	000132-64-9	...	...
o-3-chloropropane, 1,2-	000096-12-8	...	4.6E-01*
ochloromethane	000124-48-1	1.6E+03*	7.6E+00*
oethane, 1,2-	000106-93-4	...	7.5E-03*
a	001918-00-9	2.3E+03*	...
robenzene, 1,2-	000095-50-1	7.0E+03*	...
robenzene, 1,3-	000541-73-1	...	...
robenzene, 1,4-	000106-46-7	...	2.7E+01*
robenzidine, 3,3-	000091-94-1	...	1.4E+00*
rodifluoromethane	000075-71-8	1.6E+04*	...
roethane, 1,1-	000075-34-3	7.8E+03*	...
roethane, 1,2-	000107-06-2	...	7.0E+00*
roethylene, 1,1-	000075-35-4	7.0E+02*	1.1E+00*

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Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	SOIL PATHWAY Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY Cancer Risk Screen Conc (mg/kg)
ichloroethylene, cis-1,2-	000156-59-2	7.8E+02*	...
ichloroethylene, trans-1,2-	000156-60-5	1.6E+03*	...
ichlorophenol, 2,4-	000120-83-2	2.3E+02*	...
ichlorophenoxyacetic acid, 2,4-	000094-75-7	7.8E+02*	...
ichloropropane, 1,2-	000078-87-5	...	9.4E+00*
ichloropropene, 1,3-	000542-75-6	2.3E+01*	3.6E+00*
ichloropropene, cis-1,3-**	010061-01-5	...	...
ichloropropene, trans-1,3-**	010061-02-6	...	...
ichlorvos	000062-73-7	3.9E+01*	2.2E+00*
icofol	000115-32-2	...	...
ieldrin	000060-57-1	3.9E+00*	4.0E-02*
iethyl phthalate	000084-66-2	6.3E+04*	...
iethylene glycol	000111-46-6	...	...
iethylstibestrol**	000056-53-1	...	1.4E-04
iisopropylmethyl-phosphonate	001445-75-6	6.3E+03*	...
imethoate	000060-51-5	1.6E+01*	...
imethoxybenzidine, 3,3-	000119-90-4	...	4.6E+01*
imethyl phenol, 2,4-	000105-67-9	1.6E+03*	...

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HAZARD RANKING S
Hazardous Substance B. .marks
375 Substances

nce Name	CAS Number	SOIL PATHWAY: Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY: Cancer Risk Screen Conc (mg/kg)
yl phthalate	000131-11-3	... *	...
yl sulfate	000077-78-1	...	...
ylbenz(a)anthracene, 7,12-**	000057-97-6	...	...
ylbenzidine, 3,3'-**	000119-93-7	...	7.0E-02
o-2-methylphenol, 4,6-**	000534-52-1	...	...
obenzene, 1,3-	000099-65-0	7.8E+00*	...
ophenol, 2,4-	000051-28-5	1.6E+02*	...
otoluene, 2,4-	000121-14-2	1.6E+02*	9.4E-01*
otoluene, 2,6-	000606-20-2	7.8E+01*	9.4E-01*
b	000088-85-7	7.8E+01*	...
e, 1,4-	000123-91-1	...	5.8E+01*
hion	000078-34-2	...	...
ylamine**	000122-39-4	2.0E+03	...
ylhydrazine, 1,2-	000122-66-7	...	8.0E-01*
t	000085-00-7	1.7E+02*	...
foton	000298-04-4	3.1E+00*	...
n	000330-54-1	1.6E+02*	...
ulfan (I or II)	000115-29-7	4.7E+02*	...
ulfan sulfate	001031-07-8	...	...

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Hazardous Substance Benchmarks
375 Substances

ubstance Name	CAS Number	SOIL PATHWAY Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY Cancer Risk Screen Conc (mg/kg)
ndothall	000145-73-3	1.6E+03*	...
ndrin	000072-20-8	2.3E+01*	...
ndrin aldehyde	007421-93-4	...	...
ndrin ketone**	053494-70-5	...	...
thion	000563-12-2	3.9E+01*	...
thyl acetate	000141-78-6	7.0E+04*	...
thyl benzene	000100-41-4	7.8E+03*	...
thyl chloride	000075-00-3	...	...
thyl ether	000060-29-7	1.6E+04*	...
thyl methacrylate**	000097-63-2	7.0E+03	...
thyl methanesulfonate**	000062-50-0	...	...
thyldipropylthiocarbamate, s-	000759-94-4	2.0E+03*	...
thylene glycol	000107-21-1	1.6E+05*	...
thylene glycol monoethyl ether	000110-80-5	3.1E+04*	...
thylene thiourea**	000096-45-7	6.3E+00	5.8E+00
Fenthion	000055-38-9	...	...
Ferrous sulfate	007720-78-7	...	...
Fluoranthene	000206-44-0	3.1E+03*	...
Fluorene	000086-73-7	3.1E+03*	...

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Hazardous Substance . .chmarks
375 Substances

tance Name	CAS Number	SOIL PATHWAY: Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY: Cancer Risk Screen Conc (mg/kg)
·ine	007782-41-4	4.7E+03*	...
aldehyde	000050-00-0	1.6E+04*	...
ic acid	000064-18-6	1.6E+05*	...
n	000110-00-9	7.8E+01*	...
ural	000098-01-1	2.3E+02*	...
idylaldehyde	000765-34-4	3.1E+01*	...
achlor	000076-44-8	3.9E+01*	1.4E-01*
achlor epoxide	001024-57-3	1.0E+00*	7.0E-02*
achlorinated dibenzo-p-dioxin, 1,2,3	035822-46-9	...	4.0E-04*
achlorinated dibenzofuran, 1,2,3,4,6	067562-39-4	...	4.0E-04*
achlorinated dibenzofuran, 1,2,3,4,6	055673-89-7	...	... *
bromobenzene	000087-82-1	1.6E+02*	...
ichlorinated dibenzo-p-dioxin, 1,2,3,	039227-28-6	...	4.0E-05*
ichlorinated dibenzo-p-dioxin, 1,2,3,	057653-85-7	...	1.0E-04*
ichlorinated dibenzo-p-dioxin, 1,2,3,	019408-74-3	...	1.0E-04*
ichlorinated dibenzofuran, 1,2,3,4,7,	070648-26-9	...	4.0E-05*
ichlorinated dibenzofuran, 1,2,3,6,7,	057117-44-9	...	4.0E-05*
achlorinated dibenzofuran, 1,2,3,7,8,	072918-21-9	...	4.0E-05*

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Indicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANKING SYSTEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	SOIL PATHWAY: Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY: Cancer Risk Screen Conc (mg/kg)
exachlorinated dibenzofuran, 2,3,4,6,7,	060851-34-5	...	4.0E-05*
exachlorobenzene	000118-74-1	6.3E+01*	4.0E-01*
exachlorobutadiene	000087-68-3	1.6E+01*	8.2E+00*
exachlorocyclohexane, alpha-	000319-84-6	...	1.0E-01*
exachlorocyclohexane, beta-	000319-85-7	...	3.6E-01*
exachlorocyclohexane, delta-	000319-86-8	...	...
exachlorocyclopentadiene	000077-47-4	5.5E+02*	...
exachloroethane	000067-72-1	7.8E+01*	4.6E+01*
exachlorophene	000070-30-4	2.3E+01*	...
exane	000110-54-3	4.7E+03*	...
exanone, 2-**	000591-78-6	...	...
ydrazine	000302-01-2	...	2.1E-01*
ydrochloric acid	007647-01-0	...	...
ydrogen cyanide	000074-90-8	1.6E+03*	...
ydrogen sulfide	007783-06-4	2.3E+02*	...
ndeno(1,2,3-cd)pyrene	000193-39-5	...	8.8E-01*
oxynil	001689-83-4	...	...
ron	007439-89-6	...	...
sobutanol	000078-83-1	2.3E+04*	...

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Hazardous Substance Benchmarks
375 Substances

ance Name	CAS Number	SOIL PATHWAY: Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY: Cancer Risk Screen Conc (mg/kg)
prone	000078-59-1	1.6E+04*	6.7E+02*
e	000143-50-0	...	...
	007439-92-1	...	...
ne	000058-89-9	2.3E+01*	4.9E-01*
sium	007439-95-4	...	...
hion	000121-75-5	1.6E+03*	...
c anhydride	000108-31-6	7.8E+03*	...
c hydrazide	000123-33-1	3.9E+04*	...
nese	007439-96-5	1.1E+04*	...
ry	007439-97-6	2.3E+01*	...
crylonitrile	000126-98-7	7.8E+00*	...
nol	000067-56-1	3.9E+04*	...
myl	016752-77-5	2.0E+03*	...
oxychlor	000072-43-5	3.9E+02*	...
yl chlorocarbonate	000079-22-1	...	...
yl ethyl ketone	000078-93-3	4.7E+04*	...
yl isobutyl ketone	000108-10-1	6.3E+03*	...
yl methacrylate	000080-62-6	6.3E+03*	...
ylcholanthrene, 3-**	000056-49-5	...	...

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ndicates new hazardous substance in current version of chemical data (JUN96).

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Hazardous Substance Benchmarks
375 Substances

bstance Name	CAS Number	SOIL PATHWAY: Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY: Cancer Risk Screen Conc (mg/kg)
thylene bis (2-chloroaniline), 4,4-	000101-14-4	5.5E+01*	4.9E+00*
thylene bromide**	000074-95-3	...	...
thylene chloride	000075-09-2	4.7E+03*	8.5E+01*
thylenediphenyl diisocyanate, 4,4-	000101-68-8	...	...
thylnaphthalene, 2-	000091-57-6	...	...
tribuzin	021087-64-9	2.0E+03*	...
rex	002385-85-5	1.6E+01*	... *
lybdenum**	007439-98-7	3.9E+02	...
nitroso-di-n-propylamine**	000621-64-7	...	9.1E-02
nitrosopiperidine**	000100-75-4	...	...
phthalene	000091-20-3	3.1E+03*	...
phthylamine**	000091-59-8	...	...
ckel	007440-02-0	1.6E+03*	...
tric acid	007697-37-2	...	...
itric oxide	010102-43-9	... *	...
itroaniline, 2-**	000088-74-4	...	...
itroaniline, 3-**	000099-09-2	...	...
itroaniline, p-	000100-01-6	...	...

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HAZARD RANKING S
Hazardous Substance B marks
375 Substances

nce Name	CAS Number	SOIL PATHWAY: Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY: Cancer Risk Screen Conc (mg/kg)
enzene	000098-95-3	3.9E+01*	...
en dioxide	010102-44-0	... *	...
lycerine	000055-63-0	...	...
henol, 2-**	000088-75-5	...	...
henol, 4-	000100-02-7	...	...
ropane, 2-**	000079-46-9	...	...
o-di-n-butylamine, N-	000924-16-3	...	1.2E-01*
o-di-n-methylurethane, N-	000615-53-2	...	...
odiethanolamine, N-	001116-54-7	...	2.3E-01*
odiethylamine, N-	000055-18-5	...	4.3E-03*
odimethylamine, N-	000062-75-9	...	1.3E-02*
odiphenylamine, N-	000086-30-6	...	1.3E+02*
omethylethylamine**	010595-95-6	...	2.9E-02
opyrrolidine, N-	000930-55-2	...	3.0E-01*
toluene, 4-	000099-99-0	7.8E+02*	...
ethylpyrophosphoramide**	000152-16-9	1.6E+02	...
s (1-chloropropane), 2,3'-**	000108-60-1	...	...
hion, ethyl-	000056-38-2	4.7E+02*	...
hion, methyl-	000298-00-0	2.0E+01*	...

dicates difference between previous version of chemical data (JUN94) and current version of chemical data (JUN96).
dicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANK /STEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	SOIL PATHWAY: Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY: Cancer Risk Screen Conc (mg/kg)
PCBs	001336-36-3	1.6E+00*	8.3E-02*
Pentachlorinated dibenzo-p-dioxin, 1,2,3	040321-76-4	...	8.0E-06*
Pentachlorinated dibenzofuran, 1,2,3,7,8	109719-77-9	...	8.0E-05*
Pentachlorinated dibenzofuran, 2,3,4,7,8	057117-41-6	...	8.0E-06*
Pentachlorobenzene	000608-93-5	6.3E+01*	...
Pentachloroethane	000076-01-7	...	...
Pentachloronitrobenzene	000082-68-8	2.3E+02*	2.5E+00*
Pentachlorophenol	000087-86-5	2.3E+03*	5.3E+00*
Phenanthrene	000085-01-8	...	...
Phenol	000108-95-2	4.7E+04*	...
Phenyl sulfide	000139-66-2	...	...
Phenylenediamine, m-**	000108-45-2	4.7E+02	...
Phenylmercuric acetate	000062-38-4	6.3E+00*	...
Phorate	000298-02-2	1.6E+01*	...
Phosgene	000075-44-5	...	...
Phosphamidon	013171-21-6	...	...
Phosphine	007803-51-2	2.3E+01*	...
Phosphonodithioic acid, phenyl-o-ethyl-o	002104-64-5	7.8E-01*	...
Phosphoric acid	007664-38-2	...	...

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ance Name	CAS Number	SOIL PATHWAY: Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY: Cancer Risk Screen Conc (mg/kg)
horous (elemental)	007723-14-0	1.6E+00*	...
lic anhydride	000085-44-9	1.6E+05*	...
nium	007440-07-5	...	...
hlorinated triphenyl	012642-23-8	...	...
sium**	007440-09-7	...	...
sium silver cyanide	000506-61-6	1.6E+04*	...
mide	023950-58-5	5.9E+03*	...
e	000129-00-0	2.3E+03*	...
line	000110-86-1	7.8E+01*	...
line	000091-22-5	...	5.3E-02*
m	007440-14-4	...	...
	010043-92-2	...	...
cinol	000108-46-3	...	...
el	000299-84-3	3.9E+03*	...
ole**	000094-59-7	...	...
ium	007782-49-2	3.9E+02*	...
ourea	000630-10-4	3.9E+02*	...
er	007440-22-4	3.9E+02*	...

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Hazardous Substance Benchmarks
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Substance Name	CAS Number	SOIL PATHWAY: Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY: Cancer Risk Screen Conc (mg/kg)
ilver Cyanide	000506-64-9	7.8E+03*	...
odium	007440-23-5	...	...
trontium	007440-24-6	4.7E+04*	...
trychnine	000057-24-9	2.3E+01*	...
tyrene	000100-42-5	1.6E+04*	...
ulfuric acid	007664-93-9	...	...
B, 2,4,5-	000093-80-1	...	...
CDD	001746-01-6	...	4.0E-06*
etrachlorobenzene, 1,2,4,5-	000095-94-3	2.3E+01*	...
etrachlorodibenzofuran, 2,3,7,8-	051207-31-9	...	4.0E-05*
etrachloroethane, 1,1,1,2-	000630-20-6	2.3E+03*	2.5E+01*
etrachloroethane, 1,1,2,2-	000079-34-5	...	3.2E+00*
etrachloroethylene	000127-18-4	7.8E+02*	1.2E+01*
etrachlorophenol, 2,3,4,6-	000058-90-2	2.3E+03*	...
etraethyl lead	000078-00-2	7.8E-03*	...
etraethyldithiopyrophosphate	003689-24-5	3.9E+01*	...
etrahydrofuran	000109-99-9	...	...
hallium	007440-28-0	...	...
hiourea	000062-56-6	...	...

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HAZARD RANKING S
Hazardous Substance b. .narks
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nce Name	CAS Number	SOIL PATHWAY: Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY: Cancer Risk Screen Conc (mg/kg)
	000137-26-8	3.9E+02*	...
e	000108-88-3	1.6E+04*	...
e diisocyanate	000584-84-9	...	...
iediamine, 2,4-**	000095-80-7	...	2.0E-01
line, o-**	000095-53-4	...	...
line, p-**	000106-49-0	...	3.4E+00
ene	008001-35-2	...	5.8E-01*
4,5-	000093-72-1	6.3E+02*	...
momethane	000075-25-2	1.6E+03*	8.1E+01*
oro-1,2,2-Trifluoroethane, 1,1,2-	000076-13-1	2.3E+06*	...
orobenzene, 1,2,4-	000120-82-1	7.8E+02*	...
oroethane, 1,1,1-	000071-55-6	...	...
oroethane, 1,1,2-	000079-00-5	3.1E+02*	1.1E+01*
loroethylene	000079-01-6	...	5.8E+01*
lorofluoromethane	000075-69-4	2.3E+04*	...
lorophenol, 2,3,5-	000933-78-8	...	...
lorophenol, 2,3,6-	000933-75-5	...	...
lorophenol, 2,4,5-	000095-95-4	7.8E+03*	...
lorophenol, 2,4,6-	000088-06-2	...	5.8E+01*

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HAZARD RANK. /STEM
Hazardous Substance Benchmarks
375 Substances

Substance Name	CAS Number	SOIL PATHWAY: Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY: Cancer Risk Screen Conc (mg/kg)
Trichlorophenol, 3,4,5-	000609-19-8	...	...
Trichlorophenoxyacetic acid, 2,4,5-	000093-76-5	7.8E+02*	...
Trichloropropane, 1,2,3-	000096-18-4	4.7E+02*	9.1E-02*
Triethanolamine	000102-71-6	...	...
Trifluralin	001582-09-8	5.9E+02*	8.3E+01*
Trinitrobenzene, 1,3,5-	000099-35-4	3.9E+00*	...
Trinitrotoluene	000118-96-7	3.9E+01*	2.1E+01*
Tris (2,3-dibromopropyl) phosphate	000126-72-7	...	...
Vanadium	007440-62-2	5.5E+02*	...
Vanadium pentoxide	001314-62-1	7.0E+02*	...
Vinyl acetate	000108-05-4	7.8E+04*	...
Vinyl chloride	000075-01-4	...	3.4E-01*
Warfarin	000081-81-2	2.3E+01*	...
Xylene, m-	000108-38-3	1.6E+05*	...
Xylene, o-	000095-47-6	1.6E+05*	...
Xylene, p-	000106-42-3	...	...
Zinc	007440-66-6	2.3E+04*	...
Zinc cyanide	000557-21-1	3.9E+03*	...

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ance Name	CAS Number	SOIL PATHWAY: Reference Dose Screen Conc (mg/kg)	SOIL PATHWAY: Cancer Risk Screen Conc (mg/kg)
phosphide	001314-84-7	2.3E+01*	...
sulfate	007733-02-0	...	...

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Appendix B-2

Tables for Radionuclides

HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
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Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid: Karst	Ground Water Mobility: Liquid: Non-Karst	Ground Water Mobility: Non-Liquid: Karst	Ground Water Mobility: Non-Liquid: Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain: Fresh	Bioaccumulation: Food Chain: Salt	Bioaccumulation: Environmental: Fresh	Bioaccumulation: Environmental: Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility Gas	Air Gas Mobility Part
Americium 241**	014596-10-2	10000	1.0E+00	1.0E-02	...	...	1.0000	1.0000	0.5	0.5	0.5	0.5	10000	10000	NA	NA	No Yes
Americium 243+D**	014993-75-0	10000	1.0E+00	1.0E-02	...	...	1.0000	1.0000	0.5	0.5	0.5	0.5	10000	10000	NA	NA	No Yes
Antimony 125(+D) (radionuclide)**	014234-35-6	1000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	5.0	5.0	1000	1000	NA	NA	No Yes
Cadmium 109 (radionuclide)**	014109-32-1	1000	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	5000.0	5000.0	5000.0	5000.0	1000	1000	NA	NA	No Yes
Cesium 134 (radionuclide)**	013967-70-9	10000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	0.5	0.5	10000	10000	NA	NA	No Yes
Cesium 135 (radionuclide)**	015726-30-4	1000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	0.5	0.5	1000	1000	NA	NA	No Yes
Cesium 137(+D) (radionuclide)**	010045-97-3	10000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	0.5	0.5	10000	10000	NA	NA	No Yes
Cobalt 57 (radionuclide)**	013981-50-5	100	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	5000.0	5000.0	100	100	NA	NA	No Yes
Cobalt 60 (radionuclide)**	010198-40-0	10000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	5000.0	5000.0	10000	10000	NA	NA	No Yes
Iron 55 (radionuclide)**	014681-59-5	100	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	0.5	0.5	100	100	NA	NA	No Yes
Lead 210(+D) (radionuclide)**	014255-04-0	10000	1.0E+00	1.0E-02	2.0E-03	2.0E-05	1.0000	1.0000	50.0	5000.0	5000.0	5000.0	10000	10000	NA	NA	No Yes
Manganese 54 (radionuclide)**	013966-31-9	1000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	50000.0	50000.0	1000	1000	NA	NA	No Yes
Nickel 59 (radionuclide)**	014336-70-0	100	1.0E+00	1.0E-02	2.0E-03	2.0E-05	1.0000	1.0000	0.5	500.0	500.0	500.0	100	100	NA	NA	No Yes
Nickel 63 (radionuclide)**	013981-37-8	100	1.0E+00	1.0E-02	2.0E-03	2.0E-05	1.0000	1.0000	0.5	500.0	500.0	500.0	100	100	NA	NA	No Yes
Plutonium 236 (radionuclide)	015411-92-4	10000	1.0E+00	1.0E-04*	...	...	1.0000	1.0000	50.0	50.0	50000.0	50000.0	10000	10000	NA	NA	No Yes
Plutonium 238 (radionuclide)	013981-16-3	10000	1.0E+00	1.0E-04*	...	...	1.0000	1.0000	50.0	50.0	50000.0	50000.0	10000	10000	NA	NA	No Yes
Plutonium 239 (radionuclide)	015117-48-3	10000	1.0E+00	1.0E-04*	...	...	1.0000	1.0000	50.0	50.0	50000.0	50000.0	10000	10000	NA	NA	No Yes
Plutonium 240 (radionuclide)	014119-33-6	10000	1.0E+00	1.0E-04*	...	...	1.0000	1.0000	50.0	50.0	50000.0	50000.0	10000	10000	NA	NA	No Yes
Plutonium 241(+D) (radionuclide)	014119-32-5	10000	1.0E+00	1.0E-04*	...	...	1.0000	1.0000	50.0	50.0	50000.0	50000.0	10000	10000	NA	NA	No Yes

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HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
47 Radionuclides

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid Karst	Ground Water Mobility: Liquid Non-Karst	Ground Water Mobility: Non-Liquid Karst	Ground Water Mobility: Non-Liquid Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain Fresh	Bioaccumulation: Food Chain Salt	Bioaccumulation: Environmental Fresh	Bioaccumulation: Environmental Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility Gas	Air Gas Mobility Part
Plutonium 242 (radionuclide)	013982-10-0	10000	1.0E+00	1.0E-04*	...	...	1.0000	1.0000	50.0	50.0	50000.0	50000.0	10000	10000	NA	NA	No Yes
Plutonium 243 (radionuclide)	015706-37-3	100	1.0E+00	1.0E-04*	...	...	0.0700	0.0700	50.0	50.0	50000.0	50000.0	100	100	NA	NA	No Yes
Plutonium 244(+D) (radionuclide)	014119-34-7	10000	1.0E+00	1.0E-04*	...	...	1.0000	1.0000	50.0	50.0	50000.0	50000.0	10000	10000	NA	NA	No Yes
Potassium 40 (radionuclide)**	013966-00-2	1000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	0.5	0.5	0.5	0.5	1000	1000	NA	NA	No Yes
Radium 226(+D) (radionuclide)	013982-63-3	10000	1.0E+00	1.0E-02	2.0E-01*	2.0E-03*	1.0000	1.0000	5000.0*	5000.0*	5000.0*	5000.0*	10000	10000	NA	NA	No Yes
Radium 228(+D) (Radionuclide)**	015262-20-1	10000	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	5000.0	5000.0	5000.0	5000.0	10000	10000	NA	NA	No Yes
Radon 222(+D) (radionuclide)	014859-67-7	1000*	1.0E+00	1.0E+00	1.0E+00*	1.0E+00*	1.0000	0.4000	0.5	0.5	0.5	0.5	1000*	1000*	17*	1.0000*	Yes* No*
Silver 108m(+D) (radionuclide)**	014391-65-2	10000	1.0E+00	1.0E+00	2.0E-05	2.0E-05	1.0000	1.0000	50.0	50.0	50.0	50.0	10000	10000	NA	NA	No Yes
Silver 110m (radionuclide)**	014391-76-5	10000	1.0E+00	1.0E+00	2.0E-05	2.0E-05	1.0000	1.0000	50.0	50.0	50.0	50.0	10000	10000	NA	NA	No Yes
Sodium 22 (radionuclide)**	013966-32-0	1000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	0.5	0.5	1000	1000	NA	NA	No Yes
Strontium 89 (radionuclide)**	014158-27-1	1000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	0.5	0.5	1000	1000	NA	NA	No Yes
Strontium 90(+D) (radionuclide)**	010098-97-2	10000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	0.5	0.5	10000	10000	NA	NA	No Yes
Thallium 204 (radionuclide)**	013968-51-9	100	1.0E+00	1.0E-04	1.0E+00	1.0E-04	1.0000	1.0000	500.0	50.0	500.0	50.0	100	100	NA	NA	No Yes
Thorium 227 (radionuclide)	015623-47-9	10000	1.0E+00	1.0E-04	1.0E+00*	1.0E-04*	1.0000	0.4000	500.0*	500.0*	500.0*	500.0*	10000	10000	NA	NA	No Yes
Thorium 228(+D) (radionuclide)	014274-82-9	10000	1.0E+00	1.0E-04	1.0E+00*	1.0E-04*	1.0000	1.0000	500.0*	500.0*	500.0*	500.0*	10000	10000	NA	NA	No Yes
Thorium 229(+D) (radionuclide)	015594-54-4	10000	1.0E+00	1.0E-04	1.0E+00*	1.0E-04*	1.0000	1.0000	500.0*	500.0*	500.0*	500.0*	10000	10000	NA	NA	No Yes
Thorium 230 (radionuclide)	014269-63-7	10000	1.0E+00	1.0E-04	1.0E+00*	1.0E-04*	1.0000	1.0000	500.0*	500.0*	500.0*	500.0*	10000	10000	NA	NA	No Yes
Thorium 231 (radionuclide)	014932-40-2	100	1.0E+00	1.0E-04	1.0E+00*	1.0E-04*	0.4000	0.0700	500.0*	500.0*	500.0*	500.0*	100	100	NA	NA	No Yes

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HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
47 Radionuclides

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid: Karst	Ground Water Mobility: Liquid: Non-Karst	Ground Water Mobility: Non-Liquid: Karst	Ground Water Mobility: Non-Liquid: Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain: Fresh	Bioaccumulation: Food Chain: Salt	Bioaccumulation: Environmental: Fresh	Bioaccumulation: Environmental: Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Gas	Part
Thorium 232 (radionuclide)	007440-29-1	10000	1.0E+00	1.0E-04	1.0E+00*	1.0E-04*	1.0000	1.0000	500.0*	500.0*	500.0*	500.0*	10000	10000	NA	NA	No	Yes
Thorium 234 (radionuclide)	015065-10-8	1000*	1.0E+00	1.0E-04	1.0E+00*	1.0E-04*	1.0000	1.0000	500.0*	500.0*	500.0*	500.0*	1000*	1000*	NA	NA	No	Yes
Tritium	010028-17-8	100	1.0E+00	1.0E+00	...	...	1.0000	1.0000	0.5	0.5	0.5	0.5	100	100	17*	1.0000*	Yes*	No*
Uranium 232 (radionuclide)**	014158-29-3	10000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	500.0	500.0	500.0	500.0	10000	10000	NA	NA	No	Yes
Uranium 233 (radionuclide)	013968-55-3	10000	1.0E+00	1.0E-02	1.0E+00*	1.0E-02*	1.0000	1.0000	500.0*	500.0*	500.0*	500.0*	10000	10000	NA	NA	No	Yes
Uranium 234 (radionuclide)	013966-29-5	10000	1.0E+00	1.0E-02	1.0E+00*	1.0E-02*	1.0000	1.0000	500.0*	500.0*	500.0*	500.0*	10000	10000	NA	NA	No	Yes
Uranium 235(+D) (radionuclide)	015117-96-1	10000	1.0E+00	1.0E-02	1.0E+00*	1.0E-02*	1.0000	1.0000	500.0*	500.0*	500.0*	500.0*	10000	10000	NA	NA	No	Yes
Uranium 236(+D) (radionuclide)**	013982-70-2	10000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	500.0	500.0	500.0	500.0	10000	10000	NA	NA	No	Yes
Uranium 238(+D) (radionuclide)	007440-61-1	10000	1.0E+00	1.0E-02	1.0E+00*	1.0E-02*	1.0000	1.0000	500.0*	500.0*	500.0*	500.0*	10000	10000	NA	NA	No	Yes
Zinc 65 (radionuclide)**	013982-39-3	1000	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	500.0	50000.0	500.0	50000.0	1000	1000	NA	NA	No	Yes

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ance Name	CAS Number	AIR PATHWAY Cancer Risk Screen Conc (pCi/m^3)	GROUND WATER PATHWAY MCL (pCi/L)	GROUND WATER PATHWAY Cancer Risk Screen Conc (pCi/L)	SURFACE WATER PATHWAY Drinking Water MCL (pCi/L)	SURFACE WATER PATHWAY Drinking Water Cancer Risk Screen Conc (pCi/L)	SURFACE WATER PATHWAY Food Chain Cancer Risk Screen Conc (pCi/kg)	SOIL EXPOSURE UMTRCA (pCi/kg)	SOIL EXPOSURE Cancer Risk Screen Conc Ingestion (pCi/kg)	SOIL EXPOSURE Cancer Risk Screen Conc External Exposure (pCi/kg)
cium 241**	014596-10-2	1.2E-04	...	1.5E-01	...	1.5E-01	5.4E+00	...	2.4E+03	...
cium 243+D**	014993-75-0	1.2E-04	...	1.4E-01	...	1.4E-01	5.3E+00	...	2.4E+03	...
ony 125(+D) (radionuclide)**	014234-35-6	8.1E-01	...	1.3E+01	...	1.3E+01	5.0E+02	...	2.2E+05	...
ium 109 (radionuclide)**	014109-32-1	2.6E-01	...	5.9E+00	...	5.9E+00	2.2E+02	...	9.9E+04	...
m 134 (radionuclide)**	013967-70-9	1.6E-01	...	1.0E+00	...	1.0E+00	3.7E+01	...	1.7E+04	...
m 135 (radionuclide)**	015726-30-4	1.8E+00	...	1.1E+01	...	1.1E+01	3.9E+02	...	1.8E+05	...
m 137(+D) (radionuclide)**	010045-97-3	2.5E-01	...	1.5E+00	...	1.5E+00	5.6E+01	...	2.5E+04	...
t 57 (radionuclide)**	013981-50-5	1.7E+00	...	4.9E+01	...	4.9E+01	1.8E+03	...	8.2E+05	...
t 60 (radionuclide)**	010198-40-0	6.9E-02	...	2.5E+00	...	2.5E+00	9.3E+01	...	4.2E+04	...
55 (radionuclide)**	014681-59-5	8.5E+00	...	1.4E+02	...	1.4E+02	5.0E+03	...	2.3E+06	...
210(+D) (radionuclide)**	014255-04-0	1.2E-03	...	4.7E-02	...	4.7E-02	1.7E+00	...	7.9E+02	...
nese 54 (radionuclide)**	013966-31-9	1.3E+00	...	2.4E+01	...	2.4E+01	9.0E+02	...	4.1E+05	...
l 59 (radionuclide)**	014336-70-0	1.2E+01	...	2.6E+02	...	2.6E+02	9.5E+03	...	4.3E+06	...
l 63 (radionuclide)**	013981-37-8	4.7E+00	...	8.7E+01	...	8.7E+01	3.2E+03	...	1.4E+06	...
nium 236 (radionuclide)	015411-92-4	3.6E-04*	...	6.2E-01*	...	6.2E-01*	2.3E+01*	...	1.0E+04*	...
nium 238 (radionuclide)	013981-16-3	1.7E-04*	...	1.6E-01*	...	1.6E-01*	6.0E+00*	...	2.7E+03*	...
onium 239 (radionuclide)	015117-48-3	1.7E-04*	...	1.5E-01*	...	1.5E-01*	5.6E+00*	...	2.5E+03*	...
onium 240 (radionuclide)	014119-33-6	1.7E-04*	...	1.5E-01*	...	1.5E-01*	5.6E+00*	...	2.5E+03*	...
onium 241(+D) (radionuclide)	014119-32-5	1.2E-04*	...	1.4E-01*	...	1.4E-01*	5.3E+00*	...	2.4E+03*	...

ndicates difference between previous version of chemical data (JUN94) and current version of chemical data (JUN96).
ndicates new hazardous substance in current version of chemical data (JUN96).

HAZARD RANK... SYSTEM
Hazardous Substance Benchmarks
47 Radionuclides

Substance Name	CAS Number	AIR PATHWAY	GROUND WATER PATHWAY		SURFACE WATER PATHWAY			SOIL EXPOSURE		
					Drinking Water		Food Chain		Cancer Risk Screen Conc	
		Cancer Risk Screen Conc (pCi/m^3)	MCL (pCi/L)	Cancer Risk Screen Conc (pCi/L)	MCL (pCi/L)	Cancer Risk Screen Conc (pCi/L)	Cancer Risk Screen Conc (pCi/kg)	UMTRCA (pCi/kg)	Ingestion (pCi/kg)	External Exposure (pCi/kg)
Plutonium 242 (radionuclide)	013982-10-0	1.8E-04*	...	1.6E-01*	...	1.6E-01*	5.9E+00*	...	2.6E+03*	...
Plutonium 243 (radionuclide)	015706-37-3	1.8E+01*	...	1.3E+02*	...	1.3E+02*	4.8E+03*	...	2.2E+06*	...
Plutonium 244(+D) (radionuclide)	014119-34-7	1.8E-04*	...	1.5E-01*	...	1.5E-01*	5.5E+00*	...	2.5E+03*	...
Potassium 40 (radionuclide)**	013966-00-2	6.4E-01	...	3.8E+00	...	3.8E+00	1.4E+02	...	6.4E+04	...
Radium 226(+D) (radionuclide)	013982-63-3	1.7E-03*	...	1.6E-01*	...	1.6E-01*	5.9E+00*	...	2.7E+03*	...
Radium 228(+D) (Radionuclide)**	015262-20-1	4.8E-03	...	1.9E-01	...	1.9E-01	7.1E+00	...	3.2E+03	...
Radon 222(+D) (radionuclide)	014859-67-7	6.3E-01*	...	... *	...	... *	... *	...	... *	...
Silver 108m(+D) (radionuclide)**	014391-65-2	6.8E-02	...	7.9E+00	...	7.9E+00	2.9E+02	...	1.3E+05	...
Silver 110m (radionuclide)**	014391-76-5	1.5E-01	...	5.6E+00	...	5.6E+00	2.1E+02	...	9.4E+04	...
Sodium 22 (radionuclide)**	013966-32-0	9.8E-01	...	5.9E+00	...	5.9E+00	2.2E+02	...	9.9E+04	...
Strontium 89 (radionuclide)**	014158-27-1	1.3E+00	...	4.6E+00	...	4.6E+00	1.7E+02	...	7.7E+04	...
Strontium 90(+D) (radionuclide)**	010098-97-2	6.9E-02	...	8.5E-01	...	8.5E-01	3.1E+01	...	1.4E+04	...
Thallium 204 (radionuclide)**	013968-51-9	4.1E+00	...	2.4E+01	...	2.4E+01	8.9E+02	...	4.0E+05	...
Thorium 227 (radionuclide)	015623-47-9	1.1E-03*	...	1.2E+00*	...	1.2E+00*	4.4E+01*	...	2.0E+04*	...
Thorium 228(+D) (radionuclide)	014274-82-9	4.9E-05*	...	2.1E-01*	...	2.1E-01*	7.6E+00*	...	3.4E+03*	...
Thorium 229(+D) (radionuclide)	015594-54-4	5.8E-05*	...	1.3E-01*	...	1.3E-01*	4.9E+00*	...	2.2E+03*	...
Thorium 230 (radionuclide)	014269-63-7	2.8E-04*	...	1.3E+00*	...	1.3E+00*	4.7E+01*	...	2.1E+04*	...
Thorium 231 (radionuclide)	014932-40-2	4.3E+00*	...	2.7E+01*	...	2.7E+01*	9.8E+02*	...	4.4E+05*	...

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HAZARD RANKING
Hazardous Substance Benchmarks
47 Radionuclides

Substance Name	CAS Number	AIR PATHWAY	GROUND WATER PATHWAY		SURFACE WATER PATHWAY			SOIL EXPOSURE		
					Drinking Water		Food Chain		Cancer Risk Screen Conc	
		Cancer Risk Screen Conc (pCi/m^3)	MCL (pCi/L)	Cancer Risk Screen Conc (pCi/L)	MCL (pCi/L)	Cancer Risk Screen Conc (pCi/L)	Cancer Risk Screen Conc (pCi/kg)	UMTRCA (pCi/kg)	Ingestion (pCi/kg)	External Exposure (pCi/kg)
um 232 (radionuclide)	007440-29-1	2.5E-04*	...	1.5E+00*	...	1.5E+00*	5.4E+01*	...	2.4E+04*	...
um 234 (radionuclide)	015065-10-8	2.5E-01*	...	2.5E+00*	...	2.5E+00*	9.1E+01*	...	4.1E+04*	...
ium	010028-17-8	5.0E+01*	...	6.6E+02*	...	6.6E+02*	2.4E+04*	...	1.1E+07*	...
ium 232 (radionuclide)**	014158-29-3	9.0E-05	...	5.9E-01	...	5.9E-01	2.2E+01	...	9.8E+03	...
ium 233 (radionuclide)	013968-55-3	3.4E-04*	...	1.1E+00*	...	1.1E+00*	3.9E+01*	...	1.8E+04*	...
ium 234 (radionuclide)	013966-29-5	3.4E-04*	...	1.1E+00*	...	1.1E+00*	4.0E+01*	...	1.8E+04*	...
ium 235(+D) (radionuclide)	015117-96-1	3.7E-04*	...	1.0E+00*	...	1.0E+00*	3.7E+01*	...	1.7E+04*	...
ium 236(+D) (radionuclide)**	013982-70-2	3.6E-04	...	1.1E+00	...	1.1E+00	4.2E+01	...	1.9E+04	...
ium 238(+D) (radionuclide)	007440-61-1	3.8E-04*	...	7.7E-01*	...	7.7E-01*	2.8E+01*	...	1.3E+04*	...
65 (radionuclide)**	013982-39-3	4.8E-01	...	4.8E+00	...	4.8E+00	1.8E+02	...	8.0E+04	...

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Appendix C

Synonym List

SCDM Data Version: JUN96

CAS Number	SCDM Name	Synonym Name
000083-32-9	Acenaphthene	*Acenaphthylene, 1,2-dihydro
000208-96-8	Acenaphthylene	
000075-07-0	Acetaldehyde	*Ethyl aldehyde
000067-64-1	Acetone	*2-Propanone
000075-05-8	Acetonitrile	*Methyl cyanide
000098-86-2	Acetophenone	*Acetylbenzene
000591-08-2	Acetyl-2-thiourea, 1-	*Acetylthiocarbamide, n-
000107-02-8	Acrolein	*Propenal
000079-06-1	Acrylamide	*Propenamide
000079-10-7	Acrylic acid	*Propenoic acid
000107-13-1	Acrylonitrile	*Vinyl cyanide
000124-04-9	Adipic acid	*Hexanedioic acid
000116-06-3	Aldicarb	
000309-00-2	Aldrin	
000107-18-6	Allyl alcohol	*Propenol, 2-
000107-05-1	Allyl chloride	
007429-90-5	Aluminum	
020859-73-8	Aluminum phosphide	*Phostoxin
014596-10-2	Americium 241	
014993-75-0	Americium 243+D	
007664-41-7	Ammonia	
000131-74-8	Ammonium picrate	*Phenol, 2,4,6-trinitro-, ammonium salt
007773-06-0	Ammonium sulfamate	*Sulfamic acid, monoammonium salt
000062-53-3	Aniline	*Benzeneamine
000120-12-7	Anthracene	*Paranaphthalene
007440-36-0	Antimony	
014234-35-6	Antimony 125(+D) (radionuclide)	
007440-38-2	Arsenic	
001332-21-4	Asbestos	
001912-24-9	Atrazine	
002642-71-9	Azinphos- ethyl	*Ethyl guthion
000086-50-0	Azinphos- methyl	*Methyl guthion
000151-56-4	Aziridine	*Ethylenimine
007440-39-3	Barium	
000542-62-1	Barium cyanide	*Barium dicyanide
000056-55-3	Benz(a)anthracene	*Benzanthrene
000071-43-2	Benzene	*Coal naptha
000098-88-4	Benzene carbonyl chloride	*Benzoyl chloride
000092-87-5	Benzidine	*(1,1'-biphenyl)-4,4'-diamine
000050-32-8	Benzo(a)pyrene	*Benz(a)pyrene
000205-99-2	Benzo(b)fluoranthene	*Benzo(b)fluoranthene
000191-24-2	Benzo(g,h,i)perylene	

- Indicates preferred synonym for this chemical.

SCDM Data Version: JUN96

CAS Number	SCDM Name	Synonym Name
000207-08-9	Benzo(k)fluoranthene	*Dibenzo(bjk)fluorene
000065-85-0	Benzoic acid	*Benzoate
000100-47-0	Benzonitrile	*Phenyl cyanide
000095-16-9	Benzothiazole, 1,2,-	
000100-51-6	Benzyl alcohol	
000100-44-7	Benzyl chloride	*Chloromethyl benzene
007440-41-7	Beryllium	
000092-52-4	Biphenyl, 1,1-	*Biphenyl
000117-81-7	Bis (2-ethylhexyl) phthalate	*Benzenedicarboxylic acid, bis (2-ethylhexyl) ester, 1,2-
000111-91-1	Bis(2-chloroethoxy)methane	
000111-44-4	Bis(2-chloroethyl)ether	*1,1'-oxybis(2-chloroethane)
039638-32-9	Bis(2-chloroisopropyl)ether	
000542-88-1	Bis(chloromethyl)ether	*Oxybis(chloromethane)
007440-42-8	Boron	
000075-27-4	Bromodichloromethane	*Dichlorobromomethane
000074-83-9	Bromomethane	*Methylbromide
000101-55-3	Bromophenyl-phenylether, 4-	
001689-84-5	Bromoxynil	*3,4-dibromo-4-hydroxy-benzonitrile
000106-99-0	Butadiene, 1,3-	*Butadiene
000071-36-3	Butanol	*Butyl alcohol
000085-68-7	Butylbenzyl phthalate	*1,2-benzenedicarboxylic acid, butyl phenylmethyl ester
000094-82-6	Butyric acid, 4-(2,4-dichlorophenoxy)	*2,4-DB
007440-43-9	Cadmium	
014109-32-1	Cadmium 109 (radionuclide)	
007440-70-2	Calcium	
000133-06-2	Captan	
000063-25-2	Carbaryl	*Methylcarbamate-1-naphthalenol
000086-74-8	Carbazole	
001563-66-2	Carbofuran	*2,3-dihydro-2,2-dimethyl-7-benzofuranol methylcarbamate
000075-15-0	Carbon disulfide	*Dithiocarbonic anhydride
000056-23-5	Carbon tetrachloride	*Tetrachloromethane
000786-19-6	Carbophenothion	*Carbofenthion
007440-46-2	Cesium	
013967-70-9	Cesium 134 (radionuclide)	
015726-30-4	Cesium 135 (radionuclide)	
010045-97-3	Cesium 137(+D) (radionuclide)	
000075-87-6	Chloral	*Trichloroacetaldehyde
000057-74-9	Chlordane	*Octachloro-4,7-methanotetrahydroindane
005103-71-9	Chlordane, alpha-	*cis-Chlordane
005566-34-7	Chlordane, gamma-	*trans-Chlordane
000506-77-4	Chlorine cyanide	*Cyanogen chloride
000059-50-7	Chloro-3-methylphenol, 4-	*Chloro-m-cresol, p-

Indicates preferred synonym for this chemical.

SCDM Data Version: JUN96

CAS Number	SCDM Name	Synonym Name
000106-47-8	Chloroaniline, p-	*Chloro-benzeneamine, 4-
000108-90-7	Chlorobenzene	*Phenyl chloride
000510-15-6	Chlorobenzilate	
000067-66-3	Chloroform	*Trichlormethane
000074-87-3	Chloromethane	*Methyl chloride
000107-30-2	Chloromethyl methyl ether	*Chloromethoxy-methane
000106-89-8	Chloromethyloxirane, 2-	*Chloropropylene oxide, 3-
000091-58-7	Chloronaphthalene, 2-	*Chloronaphthalene, beta-
000095-57-8	Chlorophenol, 2-	*Hydroxychlorobenzene, 2-
007005-72-3	Chlorophenyl-phenyl ether, 4-	
000126-99-8	Chloroprene	
002921-88-2	Chlorpyrifos	*Dursban
007440-47-3	Chromium	*Chrome
016065-83-1	Chromium(III)	
018540-29-9	Chromium(VI)	
000218-01-9	Chrysene	*Benzophenanthrene, 1,2-
007440-48-4	Cobalt	
013981-50-5	Cobalt 57 (radionuclide)	
010198-40-0	Cobalt 60 (radionuclide)	
007440-50-8	Copper	
000544-92-3	Copper cyanide	*Cuprous cyanide
000056-72-4	Coumaphos	*Coumafos
008001-58-9	Creosote	*Naphthalene oil
000108-39-4	Cresol, m-	*Methyl phenol, 3-
000095-48-7	Cresol, o-	
000106-44-5	Cresol, p-	*Methyl phenol, 4-
000098-82-8	Cumene	*Methylethylbenzene, 1-
021725-46-2	Cyanazine	
000057-12-5	Cyanide	*Hydrocyanic acid
000460-19-5	Cyanogen	*Oxalonitrile
000506-68-3	Cyanogen bromide	*Bromocyanide
000110-82-7	Cyclohexane	*Hexahydrobenzene
000108-94-1	Cyclohexanone	*Pimelic ketone
000121-82-4	Cyclotrimethylenetrinitramine	
000072-54-8	DDD	*Dichlorodiphenyl dichloroethane
000072-55-9	DDE	*Dichlorodiphenyldichloroethylene, p,p-
000050-29-3	DDT	*Dichlorodiphenyltrichloroethane, 4,4-
000078-48-8	DEF	*Tributyl phosphorotrithioate, s,s,s-
000084-74-2	Di-n-butyl phthalate	*Benzenedicarboxylic acid, dibutyl ester, 1,2-
000117-84-0	Di-n-octyl phthalate	*Benzenedicarboxylic acid, dioctyl ester, 1,2-
002303-16-4	Diallate	
000333-41-5	Diazinon	

* Indicates preferred synonym for this chemical.

SCDM Data Version: JUN96

CAS Number	SCDM Name	Synonym Name
000053-70-3	Dibenz(a,h)anthracene	*Dibenz(a)anthracene, 1,2:5,6-
000132-64-9	Dibenzofuran	Diphenylene Oxide
000096-12-8	Dibromo-3-chloropropane, 1,2-	*Nemazon
000124-48-1	Dibromochloromethane	
000106-93-4	Dibromoethane, 1,2-	*Ethylene dibromide (EDB)
001918-00-9	Dicamba	*Methoxy-3,6-dichlorobenzoic acid, 2-
000095-50-1	Dichlorobenzene, 1,2-	*Dichlorobenzene, o-
000541-73-1	Dichlorobenzene, 1,3-	*Phenylene dichloride, m-
000106-46-7	Dichlorobenzene, 1,4-	*Chlorophenyl chloride, p-
000091-94-1	Dichlorobenzidine, 3,3-	*Dichlorobenzidine, o,o-
000075-71-8	Dichlorodifluoromethane	*Freon 12
000075-34-3	Dichloroethane, 1,1-	*Ethylidene chloride
000107-06-2	Dichloroethane, 1,2-	*Ethylene chloride
000075-35-4	Dichloroethylene, 1,1-	*Dichloroethylene, 1,1-
000156-59-2	Dichloroethylene, cis-1,2-	*cis-dichloroethylene
000156-60-5	Dichloroethylene, trans-1,2-	*1,2-dichloroethylene
000120-83-2	Dichlorophenol, 2,4-	*Dichlorophenol, 4,6-
000094-75-7	Dichlorophenoxyacetic acid, 2,4-	*2,4- D, acid
000078-87-5	Dichloropropane, 1,2-	*Propylene chloride
000542-75-6	Dichloropropene, 1,3-	*Dichloropropylene, 1,3-
010061-01-5	Dichloropropene, cis-1,3-	
010061-02-6	Dichloropropene, trans-1,3-	
000062-73-7	Dichlorvos	*Dimethyl dichlorovinyl phosphate
000115-32-2	Dicofol	*Dichlorokelthane
000060-57-1	Dieldrin	*Aldrin epoxide
000084-66-2	Diethyl phthalate	*Benzenedicarboxylic acid, didecyl ester, 1,2-
000111-46-6	Diethylene glycol	*Oxybis-ethanol, 2,2-
000056-53-1	Diethylstibestrol	
001445-75-6	Diisopropylmethyl-phosphonate	
000060-51-5	Dimethoate	*Dimethyl S-(N-methylcarbamoylmethyl) dithiophosphate, o,o-
000119-90-4	Dimethoxybenzidine, 3,3-	*Diamino-3,3-dimethoxybiphenyl, 4,4-
000105-67-9	Dimethyl phenol, 2,4-	*1-Hydroxy-2,4-dimethylbenzene
000131-11-3	Dimethyl phthalate	*Benzenedicarboxylic acid, dimethyl ester, 1,2-
000077-78-1	Dimethyl sulfate	*Sulfuric acid, dimethyl ester
000057-97-6	Dimethylbenz(a)anthracene, 7,12-	
000119-93-7	Dimethylbenzidine, 3,3'-	
000534-52-1	Dinitro-2-methylphenol, 4,6-	
000099-65-0	Dinitrobenzene, 1,3-	*Dinitrobenzene, 1,2-
000051-28-5	Dinitrophenol, 2,4-	*Hydroxy-2,4-dinitrobenzene, 1-
000121-14-2	Dinitrotoluene, 2,4-	*Methyl-2,4-dinitrobenzene, 1-
000606-20-2	Dinitrotoluene, 2,6-	*2-Methyl-1,3-dinitrobenzene
000088-85-7	Dinoseb	*Dinitro-6-(1-methylpropyl) phenol, 2,4-

* Indicates preferred synonym for this chemical.

SCDM Data Version: JUN96

CAS Number	SCDM Name	Synonym Name
000123-91-1	Dioxane, 1,4-	*Tetrahydro-1,4-dioxin
000078-34-2	Dioxathion	
000122-39-4	Diphenylamine	
000122-66-7	Diphenylhydrazine, 1,2-	*Hydrazodibenzene
000085-00-7	Diquat	*Diquat dibromide
000298-04-4	Disulfoton	
000330-54-1	Diuron	*(3,4-Dichlorophenyl)-1,1-dimethylurea, 3-
000115-29-7	Endosulfan (I or II)	
001031-07-8	Endosulfan sulfate	*Thiodan sulfate
000145-73-3	Endothall	*Phthalic acid, hexahydro-3,6-endo-oxy-.
000072-20-8	Endrin	
007421-93-4	Endrin aldehyde	
053494-70-5	Endrin ketone	
000563-12-2	Ethion	*Tetraethyl S,S'-methylenebisphosphorithioate, o,o,o',o'-
000141-78-6	Ethyl acetate	*Acetic acid, ethyl ester
000100-41-4	Ethyl benzene	*Phenylethane
000075-00-3	Ethyl chloride	*Chloroethane
000060-29-7	Ethyl ether	*Diethyl ether
000097-63-2	Ethyl methacrylate	
000062-50-0	Ethyl methanesulfonate	
000759-94-4	Ethyldipropylthiocarbamate, s-	*Carbamothioic acid, dipropyl-, s-ethyl ester
000107-21-1	Ethylene glycol	*Ethanediol, 1,2-
000110-80-5	Ethylene glycol monoethyl ether	*Ethoxy-ethanol, 2-
000096-45-7	Ethylene thiourea	
000055-38-9	Fenthion	*Phosphorothioic acid, o,o-dimethyl
007720-78-7	Ferrous sulfate	*Sulfuric acid iron salt (1:1)
000206-44-0	Fluoranthene	*Fluoranthene
000086-73-7	Fluorene	*Methylenebiphenyl, 2,2-
007782-41-4	Fluorine	*Fluorine-19
000050-00-0	Formaldehyde	*Methylene oxide
000064-18-6	Formic acid	*Methanoic acid
000110-00-9	Furan	*Oxacyclopentadiene
000098-01-1	Furfural	*Furancarboxaldehyde, 2-
000765-34-4	Glycidylaldehyde	*Oxiranecarboxaldehyde
000076-44-8	Heptachlor	*Chlorochlordene, 3-
001024-57-3	Heptachlor epoxide	*Epoxyheptachlor
035822-46-9	Heptachlorinated dibenzo-p-dioxin, 1,2,3,4,6,7,8-	
067562-39-4	Heptachlorinated dibenzofuran, 1,2,3,4,6,7,8-	
055673-89-7	Heptachlorinated dibenzofuran, 1,2,3,4,6,7,9-	
000087-82-1	Hexabromobenzene	
039227-28-6	Hexachlorinated dibenzo-p-dioxin, 1,2,3,4,7,8-	
057653-85-7	Hexachlorinated dibenzo-p-dioxin, 1,2,3,6,7,8-	

* - Indicates preferred synonym for this chemical.

SCDM Data Version: JUN96

CAS Number	SCDM Name	Synonym Name
019408-74-3	Hexachlorinated dibenzo-p-dioxin, 1,2,3,7,8,9-	
070648-26-9	Hexachlorinated dibenzofuran, 1,2,3,4,7,8-	
057117-44-9	Hexachlorinated dibenzofuran, 1,2,3,6,7,8-	
072918-21-9	Hexachlorinated dibenzofuran, 1,2,3,7,8,9-	
060851-34-5	Hexachlorinated dibenzofuran, 2,3,4,6,7,8-	
000118-74-1	Hexachlorobenzene	*Perchlorobenzene
000087-68-3	Hexachlorobutadiene	*Perchlorobutadiene
000319-84-6	Hexachlorocyclohexane, alpha-	*alpha-BHC
000319-85-7	Hexachlorocyclohexane, beta-	*beta-BHC
000319-86-8	Hexachlorocyclohexane, delta-	*BHC-delta
000077-47-4	Hexachlorocyclopentadiene	*Perchlorocyclopentadiene
000067-72-1	Hexachloroethane	*Perchloroethane
000070-30-4	Hexachlorophene	*Methylene bis (3,4,6-trichlorophenol), 2,2-
000110-54-3	Hexane	
000591-78-6	Hexanone, 2-	
000302-01-2	Hydrazine	*Diamine
007647-01-0	Hydrochloric acid	*Muriatic acid
000074-90-8	Hydrogen cyanide	*Hydrocyanic acid
007783-06-4	Hydrogen sulfide	*Hydrosulfuric acid
000193-39-5	Indeno(1,2,3-cd)pyrene	
001689-83-4	Ioxynil	*Hydroxy-3,5-diiodo-benzonitrile, 4-
007439-89-6	Iron	
014681-59-5	Iron 55 (radionuclide)	
000078-83-1	Isobutanol	*Isobutyl alcohol
000078-59-1	Isophorone	*Trimethyl-2-cyclohexen-1-one, 3,5,5-
000143-50-0	Kepone	*Chlordecone
007439-92-1	Lead	
014255-04-0	Lead 210(+D) (radionuclide)	
000058-89-9	Lindane	*Hexachlorocyclohexane- gamma
007439-95-4	Magnesium	
000121-75-5	Malathion	
000108-31-6	Maleic anhydride	*Furandione, 2,5-
000123-33-1	Maleic hydrazide	*Dihydro-3,6-pyridazinedione, 1,2-
007439-96-5	Manganese	
013966-31-9	Manganese 54 (radionuclide)	
007439-97-6	Mercury	
000126-98-7	Methacrylonitrile	*Methyl-2-propanenitrile, 2-
000067-56-1	Methanol	*Methyl alcohol
016752-77-5	Methomyl	*Ethanimidothioic acid, n-
000072-43-5	Methoxychlor	*(2,2,2-trichloroethylidiene)bis(4-methoxy-benzene), 1,1'-
000079-22-1	Methyl chlorocarbonate	*Carbonochloridic acid, methyl ester
000078-93-3	Methyl ethyl ketone	*Butanone

*Indicates preferred synonym for this chemical.

SCDM Data Version: JUN96

CAS Number	SCDM Name	Synonym Name
000108-10-1	Methyl isobutyl ketone	*Methyl-2-pentanone, 4-
000080-62-6	Methyl methacrylate	*Methyl-2-propenoic acid, methyl ester, 2-
000056-49-5	Methylcholanthrene, 3-	
000101-14-4	Methylene bis (2-chloroaniline), 4,4-	*Methylene bis (2-chloro-benzeneamine), 4,4'-
000074-95-3	Methylene bromide	
000075-09-2	Methylene chloride	*Dichloromethane
000101-68-8	Methylenediphenyl diisocyanate, 4,4-	
000091-57-6	Methylnaphthalene, 2-	Methylnaphthalene, 2-
021087-64-9	Metribuzin	
002385-85-5	Mirex	*Dechlorane
007439-98-7	Molybdenum	
000621-64-7	N-nitroso-di-n-propylamine	
000100-75-4	N-nitrosopiperidine	
000091-20-3	Naphthalene	*Tar camphor
000091-59-8	Naphthylamine	
007440-02-0	Nickel	
014336-70-0	Nickel 59 (radionuclide)	
013981-37-8	Nickel 63 (radionuclide)	
007697-37-2	Nitric acid	*Hydrogen nitrate
010102-43-9	Nitric oxide	*Nitrogen oxide
000088-74-4	Nitroaniline, 2-	
000099-09-2	Nitroaniline, 3-	
000100-01-6	Nitroaniline, p-	*Benzeneamine, 4-nitro-
000098-95-3	Nitrobenzene	*Nitrobenzol
010102-44-0	Nitrogen dioxide	*Nitrogen oxide
000055-63-0	Nitroglycerine	*Propanetriol, trinitrate, 1,2,3-
000088-75-5	Nitrophenol, 2-	
000100-02-7	Nitrophenol, 4-	*Hydroxynitrobenzene, 4-
000079-46-9	Nitropropane, 2-	
000924-16-3	Nitroso-di-n-butylamine, N-	*Butyl-n-nitroso-1-butanamine, n-
000615-53-2	Nitroso-di-n-methylurethane, N-	*Methylnitroso-carbamic acid, ethyl ester
001116-54-7	Nitrosodiethanolamine, N-	*(nitrosoimino) bis-ethanol, 2,2'-
000055-18-5	Nitrosodiethylamine, N-	*Ethyl-n-nitroso-ethanamine, n-
000062-75-9	Nitrosodimethylamine, N-	*Methyl-n-nitroso-methanomine, n-
000086-30-6	Nitrosodiphenylamine, N-	*Nitrosophenylbenzeneamine, n-
010595-95-6	Nitrosomethylethylamine	
000930-55-2	Nitrosopyrrolidine, N-	*Nitrosopyrrolidine, 1-
000099-99-0	Nitrotoluene, 4-	*Methylnitrobenzene, p-
000152-16-9	Octamethylpyrophosphoramide	
000108-60-1	Oxybis (1-chloropropane), 2,3'-	
000056-38-2	Parathion, ethyl-	*Diethyl 4-nitrophenyl phosphorothionate
000298-00-0	Parathion, methyl-	*Dimethyl p-nitrophenyl thiophosphate

* Indicates preferred synonym for this chemical.

SCDM Data Version: JUN96

CAS Number	SCDM Name	Synonym Name
001336-36-3	PCBs	*Polychlorinated biphenyls
040321-76-4	Pentachlorinated dibenzo-p-dioxin, 1,2,3,7,8-	
109719-77-9	Pentachlorinated dibenzofuran, 1,2,3,7,8-	
057117-41-6	Pentachlorinated dibenzofuran, 2,3,4,7,8-	
000608-93-5	Pentachlorobenzene	
000076-01-7	Pentachloroethane	*Pentalin
000082-68-8	Pentachloronitrobenzene	
000087-86-5	Pentachlorophenol	
000085-01-8	Phenanthrene	*Phenanthren
000108-95-2	Phenol	*Phenyl alcohol
000139-66-2	Phenyl sulfide	
000108-45-2	Phenylenediamine, m-	
000062-38-4	Phenylmercuric acetate	*acetoxyphenylmercury
000298-02-2	Phorate	
000075-44-5	Phosgene	*Carbonic dichloride
013171-21-6	Phosphamidon	
007803-51-2	Phosphine	*Hydrogen phosphide
002104-64-5	Phosphonodithioic acid, phenyl-o-ethyl-o-(4-nitrophenyl)este	*EPN
007664-38-2	Phosphoric acid	
007723-14-0	Phosphorous (elemental)	*Phosphorous, white
000085-44-9	Phthalic anhydride	*Benzenedicarboxylic anhydride, 1,2-
007440-07-5	Plutonium	
015411-92-4	Plutonium 236 (radionuclide)	
013981-16-3	Plutonium 238 (radionuclide)	
015117-48-3	Plutonium 239 (radionuclide)	
014119-33-6	Plutonium 240 (radionuclide)	
014119-32-5	Plutonium 241(+D) (radionuclide)	
013982-10-0	Plutonium 242 (radionuclide)	
015706-37-3	Plutonium 243 (radionuclide)	
014119-34-7	Plutonium 244(+D) (radionuclide)	
012642-23-8	Polychlorinated triphenyl	PCT Aroclor 5442
007440-09-7	Potassium	
013966-00-2	Potassium 40 (radionuclide)	
000506-61-6	Potassium silver cyanide	*Potassium dicyanoargentate
023950-58-5	Pronamide	*Dichloro-N-(1,1-dimethylpropynyl)benzamide, 3,5-
000129-00-0	Pyrene	*Benzo(def)phenanthrene
000110-86-1	Pyridine	*Azobenzene
000091-22-5	Quinoline	*Benzopyridine
007440-14-4	Radium	
013982-63-3	Radium 226(+D) (radionuclide)	
015262-20-1	Radium 228(+D) (Radionuclide)	

Indicates preferred synonym for this chemical.

SCDM Data Version: JUN96

CAS Number	SCDM Name	Synonym Name
010043-92-2	Radon	
014859-67-7	Radon 222(+D) (radionuclide)	
000108-46-3	Resorcinol	*Benzenediol, 1,3-
000299-84-3	Ronnel	*Dimethyl o-(2,4,5-trichlorophenyl)thiophosphate, o,o-
000094-59-7	Safrole	
007782-49-2	Selenium	
000630-10-4	Selenourea	*Carbamidodselenoic acid
007440-22-4	Silver	
014391-65-2	Silver 108m(+D) (radionuclide)	
014391-76-5	Silver 110m (radionuclide)	
000506-64-9	Silver Cyanide	
007440-23-5	Sodium	
013966-32-0	Sodium 22 (radionuclide)	
007440-24-6	Strontium	
014158-27-1	Strontium 89 (radionuclide)	
010098-97-2	Strontium 90(+D) (radionuclide)	
000057-24-9	Strychnine	
000100-42-5	Styrene	*Vinylbenzene
007664-93-9	Sulfuric acid	
000093-80-1	TB, 2,4,5-	*Butanoic acid, 4-(2,4,5-trichlorophenoxy)-
001746-01-6	TCDD	*Tetrachlorodibenzo-p-dioxin, 2,3,7,8- 2,3,7,8-Tetrachlorodibenzo-p-dioxin
000095-94-3	Tetrachlorobenzene, 1,2,4,5-	*Tetrachlorobenzene, s-
051207-31-9	Tetrachlorodibenzofuran, 2,3,7,8-	
000630-20-6	Tetrachloroethane, 1,1,1,2-	
000079-34-5	Tetrachloroethane, 1,1,2,2-	*Acetylene tetrachloride
000127-18-4	Tetrachloroethylene	*Tetrachloroethylene
000058-90-2	Tetrachlorophenol, 2,3,4,6-	
000078-00-2	Tetraethyl lead	
003689-24-5	Tetraethyldithiopyrophosphate	*Dithiofos
000109-99-9	Tetrahydrofuran	*Epoxybutane, 1,4-
007440-28-0	Thallium	
013968-51-9	Thallium 204 (radionuclide)	
000062-56-6	Thiourea	*Thio-carbamide
000137-26-8	Thiram	*Bis(dimethylthiocarbamyl)disulfide
015623-47-9	Thorium 227 (radionuclide)	
014274-82-9	Thorium 228(+D) (radionuclide)	
015594-54-4	Thorium 229(+D) (radionuclide)	
014269-63-7	Thorium 230 (radionuclide)	
014932-40-2	Thorium 231 (radionuclide)	
007440-29-1	Thorium 232 (radionuclide)	*Thorium 232
015065-10-8	Thorium 234 (radionuclide)	

* - Indicates preferred synonym for this chemical.

SCDM Data Version: JUN96

CAS Number	SCDM Name	Synonym Name
000108-88-3	Toluene	*Methyl benzene
000584-84-9	Toluene diisocyanate	*Benzene, 2,4-diisocyano-1-methyl-
000095-80-7	Toluenediamine, 2,4-	
000095-53-4	Toluidine, o-	
000106-49-0	Toluidine, p-	
008001-35-2	Toxaphene	*Chlorinated camphene
000093-72-1	TP, 2,4,5-	*Silvex
000075-25-2	Tribromomethane	*Bromoform
000076-13-1	Trichloro-1,2,2-Trifluoroethane, 1,1,2-	*Freon 113
000120-82-1	Trichlorobenzene, 1,2,4-	
000071-55-6	Trichloroethane, 1,1,1-	*Methyl chloroform
000079-00-5	Trichloroethane, 1,1,2-	*Vinyl trichloride
000079-01-6	Trichloroethylene	*Trichloroethene
000075-69-4	Trichlorofluoromethane	*Freon 11
000933-78-8	Trichlorophenol, 2,3,5-	
000933-75-5	Trichlorophenol, 2,3,6-	
000095-95-4	Trichlorophenol, 2,4,5-	*TCP
000088-06-2	Trichlorophenol, 2,4,6-	
000609-19-8	Trichlorophenol, 3,4,5-	
000093-76-5	Trichlorophenoxyacetic acid, 2,4,5-	*2,4,5-T
000096-18-4	Trichloropropane, 1,2,3-	
000102-71-6	Triethanolamine	*Nitrilotriethanol, 2,2,2-
001582-09-8	Trifluralin	
000099-35-4	Trinitrobenzene, 1,3,5-	
000118-96-7	Trinitrotoluene	*Methyl-1,3,5-trinitrobenzene, 2-
000126-72-7	Tris (2,3-dibromopropyl) phosphate	
010028-17-8	Tritium	
014158-29-3	Uranium 232 (radionuclide)	
013968-55-3	Uranium 233 (radionuclide)	
013966-29-5	Uranium 234 (radionuclide)	
015117-96-1	Uranium 235(+D) (radionuclide)	
013982-70-2	Uranium 236(+D) (radionuclide)	
007440-61-1	Uranium 238(+D) (radionuclide)	*Uranium 238
007440-62-2	Vanadium	
001314-62-1	Vanadium pentoxide	*Vanadium oxide
000108-05-4	Vinyl acetate	*Acetic acid, vinyl ester
000075-01-4	Vinyl chloride	*Chloroethene
000081-81-2	Warfarin	*Coumafen
000108-38-3	Xylene, m-	*Dimethyl benzene, 1,3-
000095-47-6	Xylene, o-	*Methyltoulene, o-
000106-42-3	Xylene, p-	*Dimethylbenzene, 1,4-
007440-66-6	Zinc	

* - Indicates preferred synonym for this chemical.

Synonyms List by Chemical Name Report

SCDM Data Version: JUN96

CAS Number	SCDM Name	Synonym Name
013982-39-3	Zinc 65 (radionuclide)	
000557-21-1	Zinc cyanide	
001314-84-7	Zinc phosphide	
007733-02-0	Zinc sulfate	*Sulfuric acid, zinc salt

* - Indicates preferred synonym for this chemical.

REFERENCE 3

M E M O R A N D U M

TO: Cedric Sanborn, Chief, Technical Services Section

THROUGH: Robert B. Finucane, Chief, SMS

FROM: Brian Woods

DATE: May 21, 1992

SUBJECT: Removals at Pownal Tannery #77-0066

During the HMMD visit to the Pownal Tannery site on April 10, 1992, a number of environmental hazards were observed to be present in and around the building. I am referring the removal of these hazards, described in the following paragraphs, to Technical Services at his time.

There is an abandoned gasoline underground storage tank (UST) located to the south of the warehouse building which is part of the tannery property. This tank has been out of service for over a year, and is therefore out of compliance with UST regulations. The tank was sticked during the April 10 visit and found to be empty. The condition of the tank is unknown at this time. This tank should be scheduled for removal.

Four 10,000 gallon #6 fuel oil tanks are located on the east side of the tannery building (two tanks) and in a cinder block building on site property (two tanks). It appears that these tanks still contain fuel oil, and one of the tanks is clearly leaking. The contents of these tanks should be sampled, and the product removed.

On the first floor of the tannery building, on the south end, there is a lead chrome reducing tank liner with chrome residue remaining inside it. The residue is slowly running out of the crushed tank liner. This liner should be removed and any residue cleaned from the floor.

Also on the tannery building first floor, in the location of the old chrome reducing tanks (which have been removed), is a mixture of chrome powder and alum. This residue was apparently spilled during chrome reduction activities at the site, and should be removed.

In the filter house, located north of the tannery building, there remains an unknown amount of tannery sludge in the poured concrete settling tank. This sludge has a high chrome content, and should be pumped from the filter house and properly disposed of.

Finally, in fenced areas to the east of the tannery building are 6 transformers. These transformers are no longer in service. The oil in them should be tested for PCBs. If PCBs are detected, the transformers should be disposed of properly. If no PCBs are present, the transformers should be removed from the site and sold as scrap.

Before performing these removals, it will be necessary to give all six of the potentially responsible parties (PRPs) an opportunity to perform these removals. Section 1283/1941 notification letters will need to be prepared and

sent to the PRPs prior to sending this job out to bid. The division is working closely with the Attorney General's office on litigation concerning this site. The assistant attorney general assigned to the case, Mark DiStefano, has requested that any correspondence addressed to the PRPs be sent through his office for review. In addition, I would like to be kept informed as to the progress of these removals.

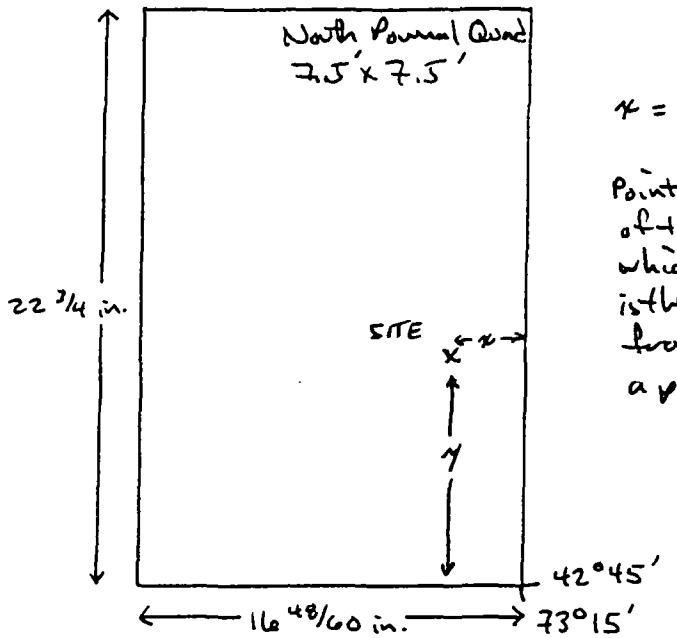
TRC
TRC Environmental Corporation
Boott Mills South
Foot of John Street
Lowell, Massachusetts 01852
Telephone: (508) 970-5600
Fax: (508) 452-1995

SHEET 1 OF 1
BY J. Schmidl
DATE 3/29/93

JOB NO. 1-6360-013-0-1003
PROJECT Pownal Tannery SIP
SUBJECT Latitude / Longitude Calculations

REFERENCE 4

B'K. CH'K. BY



$x = 2\ 7/60$ in $y = 8\ 35/60$ in

Point is measured to the intersection of the railroad tracks and the road which crosses the Hoosic River. This is the point of entry to the property from public roads, and is in the approximate center of the site.

$$\frac{x'}{7.5'} = \frac{2\ 7/60 \text{ in.}}{16\ 48/60 \text{ in.}}$$

$$x' = \frac{2\ 7/60 \text{ in.}\ (7.5')}{16\ 48/60 \text{ in.}}$$

$$x' = 0.944940'$$

$$= 0'\ 56.70''$$

$$\frac{y'}{7.5'} = \frac{8\ 35/60 \text{ in.}}{22\ 3/4 \text{ in.}}$$

$$y' = \frac{2\ 7/60 \text{ in.}\ (7.5')}{22\ 3/4 \text{ in.}}$$

$$y = 2.829670'$$

$$= 2'\ 49.78''$$

Latitude: $42°45' + 2'\ 49.78'' = 42°\ 47'\ 49.78''$

Longitude: $73°\ 15' + 0'\ 56.70'' = 73°\ 15'\ 56.70''$

247

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

NORTH POWNAL QUADRANGLE
VERMONT–NEW YORK
7.5 MINUTE SERIES (TOPOGRAPHIC)

(EAGLE BRIDGE) 6369 I NW

(BENNINGTON)

(TABORTON) 6369 III NW

(WILLIAMSTOWN) 6369 II NW

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography from aerial photographs by photogrammetric methods. Aerial photographs taken 1942. Field check 1943. Revised 1954

Polyconic projection
10,000-foot grids based on New York coordinate system, east zone, and Vermont coordinate system
1000-meter Universal Transverse Mercator grid ticks, zone 18, shown in blue. 1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 4 meters south and 36 meters west as shown by dashed corner ticks

There may be private inholdings within the boundaries of the National or State reservations shown on this map

UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

Revisions shown in purple compiled from aerial photographs taken 1978 and other source data. This information not field checked. Map edited 1980.

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY
DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

ROAD CLASSIFICATION

Heavy duty — Light-duty
Medium duty — Unimproved dirt
U. S. Route — State Route

NORTH POWNAL, VT.–N. Y.

1954

REFERENCE 5

REFERENCE 6

TOTAL LAND -

FOUNAL FARM

70 ACRES

888.3 --

2.9

---

987 ACRES

11-10-92

Enclosing copies of (2) appraisal cards and pages from the 1988 re-appraisal report of David C. Buckley, appraiser which I considered worthy of your perusal.

If there is anything further that I can get for you, let me know.

Doris Lillie,
Lister

GENERAL INFORMATION

POWNAL HYDROPOWER CORP.
C/O WILLIAM FULLER
80 BOSTON STREET
SALEM
MA 01970

LOC x PHY x RIVER
2.0 x 1.0 x .8

LAND VALUATION

SHORE FRONT & URBAN LAND COMPUTATION

Lot Size Front	Lot Size Rear	Lot Size Depth	Effective Frontage	Area	Unit Price	Factor	Adj. Unit Price	LAND VALUE

LAND COMPUTATION

Table	Parcel Size	Base Value / Size Adj	Grade Adjustment	Price Per Acre	Land Value
	0.65	1,050 / 0.867	9,121 x 1.6	14,594	9,486

TOTAL LAND VALUE 9,486

LAND IMPROVEMENTS

Water Supply:	Quality:	EX	G	A	F	P	CD	
	Quantity:	EX	MT	T	LT	M		
Sewage System:	Quality:	EX	G	A	F	P	CD	
	Quantity:	EX	MT	T	LT	M		
Landscaping	Quality:	EX	G	A	F	P	CD	
	Quantity:	EX	MT	T	LT	M		
Other:							CD	
Other:							CD	

Total Land Improvement Value X (TL Factor:) =

TRANSFER RECORD

ok	Page	Date	Grantor	Grantee	Sale Price
7	248	4-24	Pownal Tanning	Pownal Hydro Power	

LAND INFORMATION NEIGHBORHOOD CODE:

Zoning:

Tillage: Pastureland: Woodland: Floodplain:

Neighborhood:		Ex	Good	Average	Fair	Poor
Access to Parcel:	Site / Bulk	Ex	Good	Average	Fair	Poor
Access upon Parcel:	Site / Bulk	Ex	Good	Average	Fair	Poor
Topography:	Site / Bulk	Ex	Good	Average	Fair	Poor
View:	Site / Bulk	Ex	Good	Average	Fair	Poor
Soil Drainage:	Site / Bulk	Ex	Good	Average	Fair	Poor
Shape:	Site / Bulk	Ex	Good	Average	Fair	Poor
Waterway:	Site / Bulk	Ex	Good	Average	Fair	None
Other:		Ex	Good	Average	Fair	Poor

LISTING RECORD

ns	19	19	19	19	19	19	19	19	19	19
Land	X 89 5/24/ DL/EH		19 4-21-92							
Buildings										
Total										

LISTING RECORD

OWNER: Pownal Hydro Power 346-69 LOCATION: W/S 346 N FILE #: 4/1/88 50,000

COST APPROACH TO VALUE

CARD # ..... of .....

LAND SIZE: 0.65 A

YEAR OF COST SCHEDULE 1980

DATE OF INSPECTION BY

SOURCE: Owner | Tenant | Field Est. | Refusal | Old Records | Other

TOTAL ROOMS						BED ROOMS						BATH ROOMS					
	1	2	3	4	5	B	1	2	3	4	5	B	1	2	3	4	5

Scale 1 Inch = Feet

CONSTRUCTION TYPE			
Std.		CSTM	
Camp		Motel	
A Fr.		Comm.	
Sh. Ctr.		Misc.	
Pre Eng		Rstr.	

BASE COST ADJUSTMENT

BC
BE
BF
I

COND	UNIT STRUCTURE	EX	G	A	BA	LC	UNITS
	Exterior Walls						
	Exterior Trim						
	Roof Construction						
	Foundation						
	Floor Joists & Supports						
	Int. Walls & Partitions						
	Interior Trim						
	Ceilings						
	Hardware						
TOTAL STRUCTURAL UNITS							
DESIGN COST							
TOTAL UNITS							

UNIT DESCRIPTION

Wood Sh. Clp. Bd.	Siding Brick	Stone C. Block	
Wood Metal	Brick Stone	Alum, Wind.	

Gable Gamb.	Hip Flat	Asph. Sh. Slate	R.R. Metal	WS T & G	

Type: Height: Basmt. Floor

QN x on Ctrs. Bridged Span Ft.

Plaster	Dry Wall	Wood Paneling	
Soft Wood	Hard Wood	Metal	
Plaster	Sht. Rock	Compo. Tile	

Adj. Base Cost X Const. Adj. X Unit Factor = S.F. Cost

								S.F.			
								S.F.			
								S.F.			
								S.F.			
								S.F.			
								S.F.			
	Floors						HW SW	Lin Car			
	Wiring						EX	MT	T	LT	M
	Heating						Type	Fired By		Story	
	Kitchen						EX	MT	T	LT	M
	Bath & Plumbing						EX	MT	T	LT	M
	Fireplace Ex s/s						EX	MT	T	LT	M
	Fin. Area =						EX	MT	T	LT	M
	Dormers						LF @				

ADJUSTMENTS:

ESTIMATED REPRODUCTION COST NEW

EST. YEAR OF CONSTRUCTION:

PHYSICAL DETERIORATION

Remarks:

FUNCTIONAL OBSOLESCENCE

Remarks:

ECONOMIC OBSOLESCENCE

Remarks:

TOTAL DEPRECIATION

VALUE ANALYSIS

TL FACTOR ( )	
% GOOD	
MAIN BUILDING SALVAGE VALUE 10%	45,000
Miscellaneous Buildings	
LAND	9,496
LAND IMPROVEMENTS	
Total from Cards #	
INDICATED VALUE BY COST APPROACH	54,496

PERTINENT REMARKS

450

MISCELLANEOUS BUILDINGS

Building	GR	Sty	Fd	Ext. Walls	Roof Type	Size	Area	Unit	TL Factor	COST NEW	Year Built	% Good	ESTIMAT VALUE
						X							
						X							
						X							
						X							
						X							
						X							

GENERAL INFORMATION

Pownal Tanning Co.
P.O. Box 4488, 80 Boston St.
Salem, MA. 01970

70.0A, E/S OF RTE 346
ACCESS MULTIPLE R/W.
VERY STEEP
LOC × PHY × ACC
(70) 1.0 .3 × .5
(888) 1.0 .8 × .5
(29) 1.0 .05
WASTE DEPOSIT AREA

1- Sold .65 A to Pownal Hydro Power Plant

LAND VALUATION

SHORE FRONT & URBAN LAND COMPUTATION

Lot Size Front	Rear	Depth	Effective Frontage	Area	Unit Price	Factor	Adj. Unit Price	LAND VALUE

LAND COMPUTATION

Table	Parcel Size	Base Value / Size Adj	Grade Adjustment	Price Per Acre	Land Value
	70.0A.	1,050 / .916	962 × .15	144	10,080
	888.03A.	" / .500	525 × .4	210	186,486
	29.0A	" / 1.315	1,391 × .05	80	2,320

TOTAL LAND VALUE 198,886

LAND IMPROVEMENTS

Water Supply:	Quality:	EX	G	A	F	P	CD	
	Quantity:	EX	MT	T	LT	M		
Sewage System:	Quality:	EX	G	A	F	P	CD	
	Quantity:	EX	MT	T	LT	M		
Landscaping	Quality:	EX	G	A	F	P	CD	
	Quantity:	EX	MT	T	LT	M		
Other:							CD	
Other:							CD	

Total Land Improvement Value X (TL Factor:) =

TRANSFER RECORD

Book	Page	Date	Grantor	Grantee	Sale Price
[illegible]	507	1982	Moore, Timothy + Maureen	Pownal Tanning Co. Castle Hill	28A.
[illegible]	5	1939		Pownal Tanning Co.	

LAND INFORMATION NEIGHBORHOOD CODE:

Zoning:

Tillage: Pastureland: Woodland: Floodplain:

Neighborhood:		Ex	Good	Average	Fair	Poor
Access to Parcel:	Site Bulk	Ex	Good	Average	Fair	Poor
Access upon Parcel:	Site Bulk	Ex	Good	Average	Fair	Poor
Topography:	Site Bulk	Ex	Good	Average	Fair	Poor
View:	Site Bulk	Ex	Good	Average	Fair	Poor
Soil Drainage:	Site Bulk	Ex	Good	Average	Fair	Poor
Shape:	Site Bulk	Ex	Good	Average	Fair	Poor
Waterway:	Site Bulk	Ex	Good	Average	Fair	None
Other:		Ex	Good	Average	Fair	Poor

LISTING RECORD

Items	X	1989 5/24/89	19 X 5-?-91	19 5-12-91	19 4-27-92	19	19	19	19	19	19
Land		TI EH	[illegible]	[illegible]	DL-GW						
Buildings											
Total											

OWNER: Pownal Tanning Co 346-68 LOCATION: 346 N IC FILE #: 4/1/88 653,80

COST APPROACH TO VALUE

CARD # ..... of .....

LAND SIZE: (+14.35) 958.03A. 29.0A.

YEAR OF COST SCHEDULE 1980

DATE OF INSPECTION 2-12-80 BY RJH/LP

SOURCE: Owner | Tenant | Field Est. | Refusal | Old Records | Other

TOTAL ROOMS						BED ROOMS						BATH ROOMS					
B	1	2	3	4	5	B	1	2	3	4	5	B	1	2	3	4	5

Scale 1 Inch = Feet

CONSTRUCTION TYPE			
Std.		CSTM	
Camp		Motel	
A Fr.		Comm.	
Sh. Ctr.		Misc.	
Pre Eng		Rstr.	

BASE COST ADJUSTMENT

BC

BE

BF

I

COND	UNIT STRUCTURE	EX	G	A	BA	LC	UNITS
	Exterior Walls						
	Exterior Trim						
	Roof Construction						
	Foundation						
	Floor Joists & Supports						
	Int. Walls & Partitions						
	Interior Trim						
	Ceilings						
	Hardware						
TOTAL STRUCTURAL UNITS							
DESIGN COST							
TOTAL UNITS							

UNIT DESCRIPTION

Wood Sh. Clp. Bd.		Siding Brick		Stone C. Block	
Wood Metal		Brick Stone		Alum. Wind.	
Gable Gamb.		Hip Flat		Asph.Sh. Slate	
R.R. Metal		WS T & G			

Type: Height: Basmt. Floor

QN	x	on	Ctrs.	Bridged	Span Ft.

	Plaster	Dry Wall	Wood Paneling	
	Soft Wood	Hard Wood	Metal	
	Plaster	Sht. Rock	Compo. Tile	

Adj. Base Cost X Const. Adj. X Unit Factor = S.F. Cost

								S.F.			
								S.F.			
								S.F.			
								S.F.			
								S.F.			
								S.F.			
	Floors						HW SW	Lin Car			
	Wiring						EX	MT	T	LT	M
	Heating						Type	Fired By		Story	
	Kitchen						EX	MT	T	LT	M
	Bath & Plumbing						EX	MT	T	LT	M
	Fireplace Ex s/s						EX	MT	T	LT	M
	Fin. Area =						EX	MT	T	LT	M
	Dormers							LF @			

ADJUSTMENTS:

ESTIMATED REPRODUCTION COST NEW

EST. YEAR OF CONSTRUCTION:

PHYSICAL DETERIORATION

Remarks:

FUNCTIONAL OBSOLESCENCE

Remarks:

ECONOMIC OBSOLESCENCE

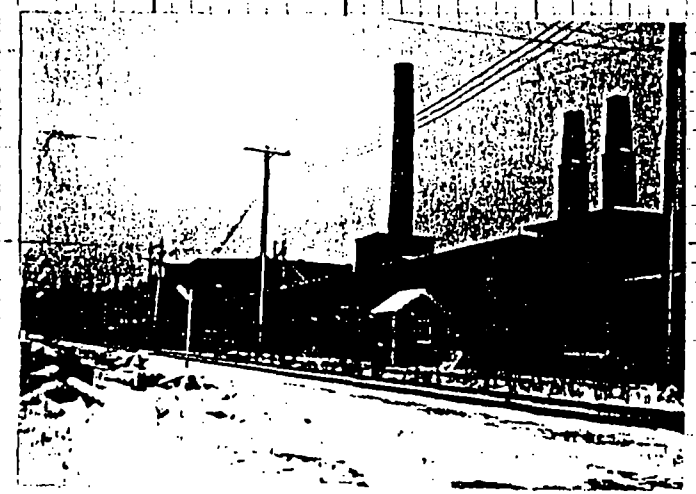
Remarks:

TOTAL DEPRECIATION

VALUE ANALYSIS

TL FACTOR ( )	
% GOOD	
MAIN BUILDING	
Miscellaneous Buildings	
LAND	1989
LAND IMPROVEMENTS	
Total from Cards # (Comm Repro)	455,00
INDICATED VALUE BY COST APPROACH	653,8

PERTINENT REMARKS

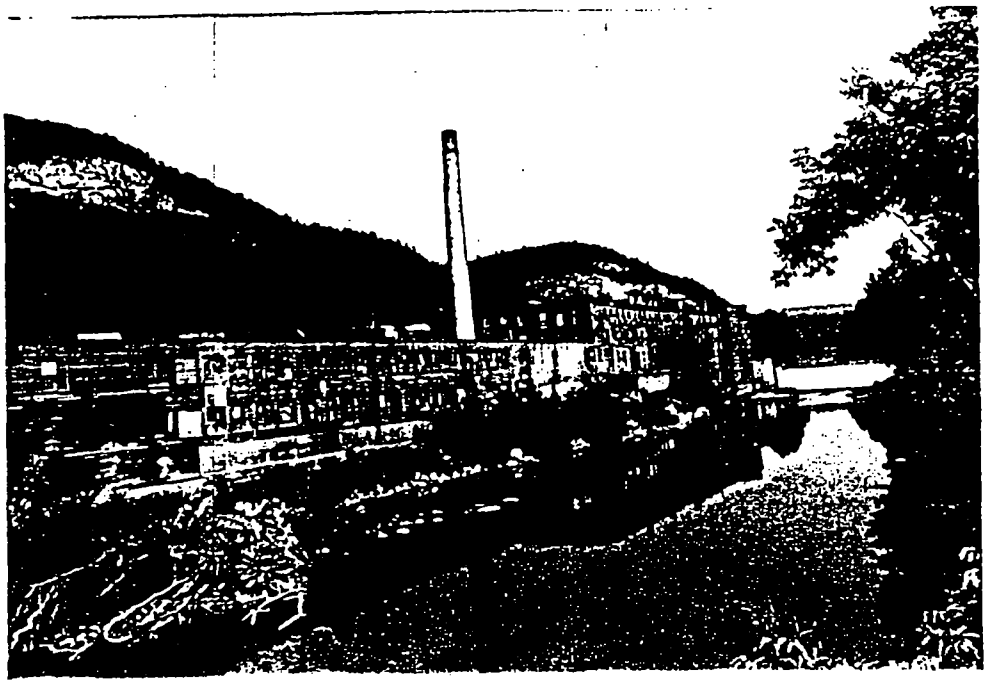


MISCELLANEOUS BUILDINGS

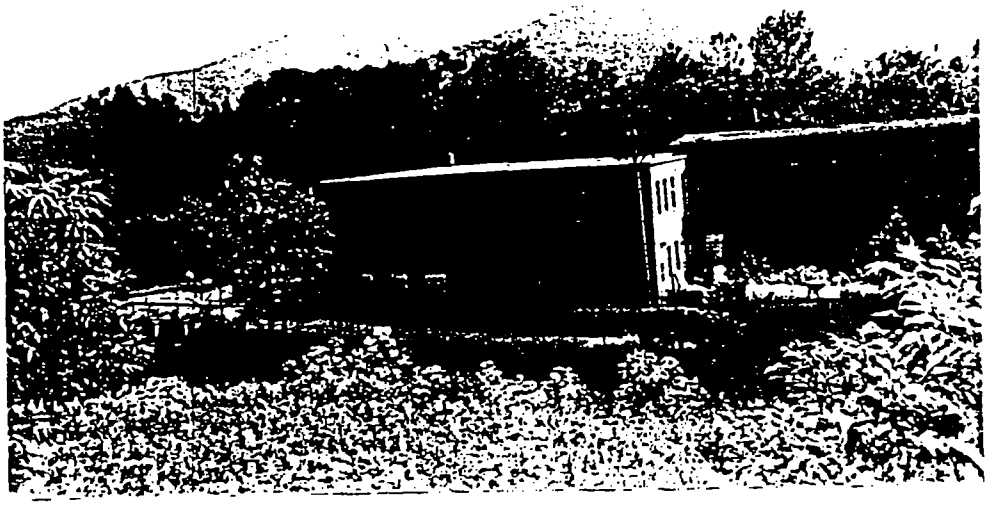
Building	GR	Sty	Fd	Ext. Walls	Roof Type	Size	Area	Unit	TL Factor	COST NEW	Year Built	% Good	ESTIMAT VALU
						X							
						X							
						X							
						X							
						X							
						X							

Extras:

SUBJECT PICTURES

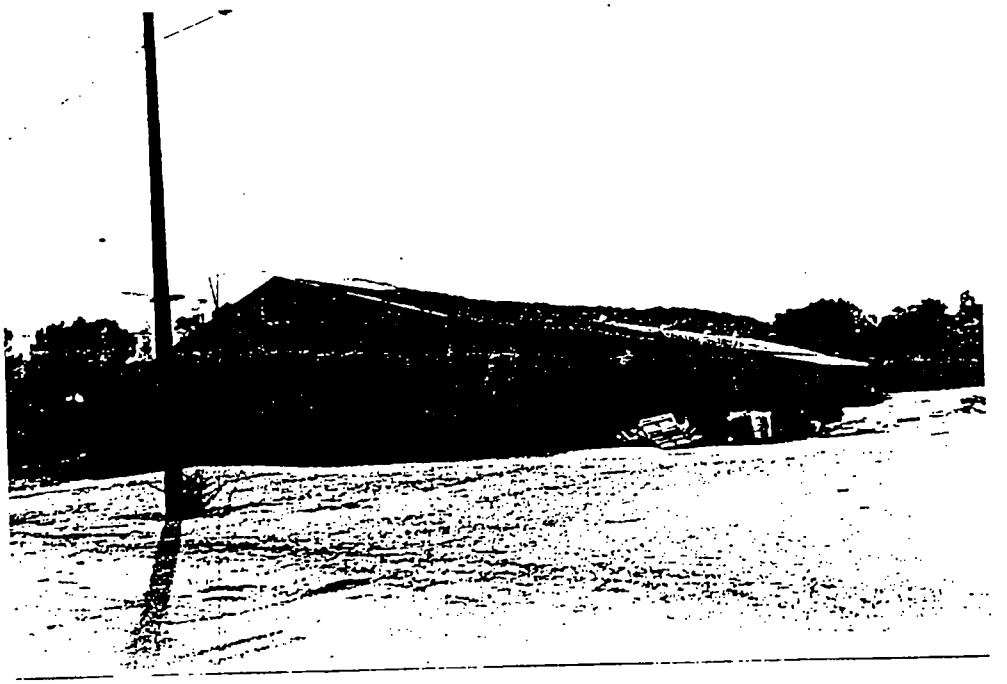


Western View of Plant

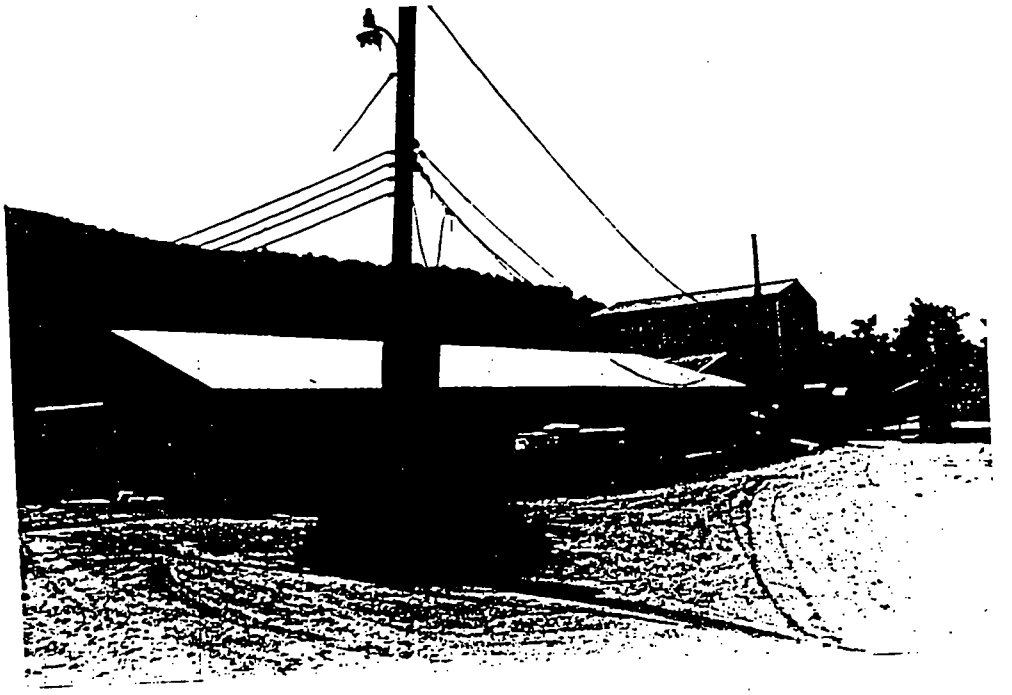


Eastern View

SUBJECT PICTURES



Warehouse



BUILDINGS & IMPROVEMENTS

IMPROVEMENT DESCRIPTION

Name	Pownal Tanning Company
Type and Design	12" Brick on wood frame 24" brick support columns
General Quality	Fair to average
Age	Originally 1880 added on c. 1940 (Built as Spinning mill - added on to through 1966.
Effective age	100% - 35-45 years old - Remaining economic life 15 years
Effective age	100% (warehouse) 25 years - Remaining economic life 20 years
Foundation	Concrete and rock footings
Frame	Wood and steel
Floor Structure	Wood - fair condition
Floor Cover	3" double decking -Cobblestone in basement
Ceilings	Open
Floor Height	12 foot clearance
No. Floors above Grade	Three
Interior Construction	Wood supports 8' on center with 16' wide bays
Plumbing	Minimal older lavatories, no cafeteria
Sprinkler System	Wet sprinkler throughout
Heating/Ventilation	3 Steam boilers - 2 operational to to heat exchangers - 800, 900 and 500 horsepower. Old but two operational Both are set up to burn #6 heating oil
Cooling	None
Electrical	Three entrances - 220 3 phase
Lighting	Ceiling mounted fluorescent
Exterior Walls	Brick on main steel clad detached warehouse
Windows	Single pane wood and metal sash
Doors	Conventional
Elevators	Four - (2) 2 stop 3,000 and 10,000 lb. (2) 4 stop 2,000 and 4,000 lb.
Roof Structure	Cement over newer building and wood slat older
Roof Cover	Rolled and Builtup - Effective age 10 years
Loading Docks	Limited - 2 on Main and 2 on warehouse
Drive-In Doors	None
Miscellaneous Features	2 exterior 10,000 gallon oil tanks
Spur Trackage	YES - Boston & Maine R.R. - 300 feet
General Condition	See discussion below - Fair
Gross Building Area	Approx. 127,071 sf.
Space Breakdown:	
Basement	42,676 sf.
Ground Floor	54,095 sf Main - 16,902 sf. Warehouse
Second Floor	52,049 sf Main
Third Floor	21,095 sf Main
Mezzanine	None
Parking	Approximately 100 to 125 cars
Manufacturing/Production	169,915 sf. (including basement)
Warehouse	16,902 sf.
Office	552 sf.
Air Conditioned	None

Site:

Land Size	15 acres
Access/Surface	Good
Parking/Surface	Approximately 40,000 sf. paved
Frontage	1,790 feet - Average depth of 250 feet
Landscaping	Minimal
Topo/Soil	River bed
Sewer/Water	On site - see description of improvements
additional Improvements	Water Reservoir- 1 mile 10" line Sewer treatment plant capable of handling 500 to 600 gallons a day - Lagoon system currently closed by the state of Vermont.

ADDITIONAL COMMENTS: Functionally, the facility operates with the raw material entering on the north basement end where the raw hides enter the "beam house" for the beginning of the tanning process; fleshing, pickling and washing. This is done with large moat areas containing wooden paddle wheels and large wooden barrels which turn. The hides travel from here to the second floor where the drying process begins. This process continues has the hides are dyed, stretched and final finished. Along the way dying is accomplished through a water process or lacquer solvent process. In any event, considerable chemicals are used and accumulate, requiring disposal.

The tanning process requires great volumes of water for processing, heat for drying and fresh air for employees. Ideally the air will completely change four times an hour. These three features combined result in considerable energy costs. Energy efficiency is not possible with air exchange and heat requirements.

The construction of a dam in 1955 replaced a former water wheel system with a hydro turbine system. The technology is old and excess energy sold to the power company is minimal. In fact, not enough income is derived after maintenance to properly provide for replacement of the equipment when it wears out. The existing equipment has been in plant for over 30 years.

In addition to the limitations mentioned above are the more conventional layout problems originating from narrow bays and excessive support beams associated with turn of the century multi-story brick structures. Ease of movement is restricted by support beams, low load wooden floors and old light load small elevators. The facility has little or no office space.

RECONCILIATION OF VALUE

In addition to regional data used, your appraiser conducted a statewide search of all industrial sales. Satisfied that local data was most indicative of the subject value, these sales are reviewed in this report. Due to their unique economic character, industrial properties near the end of their economic life have been shown to appreciate as fast as properties still enjoying a lengthy useful life.

Frederick Babcock identified this phenomona in his discussion of economic mortality of buildings.

"Few building have been demolished because they were no longer structurally sound. Most buildings come to the end of their useful lives as a result of obsolescence" (Babcock, The Valuation of Real Estate, McGraw-Hill, New York: 1932, p.110)

Since 1940 the subject property has been utilized exclusively as a tannery. A distinguishing feature of this business is extensive waste, both pollutants and energy. Great amounts of heat are required for drying and great amounts of water are required in the "beam room" for preparing the hides and in washing within the coloring process. The tanning process has not changed appreciably in 100 years. So harsh is the work environment, that air within the mill requires exchange 4 times per hour. Much of the world's tanning now is done off shore in countries where more waste is tolerated.

Tanneries throughout New England have closed in recent years. The price structure of the tanning industry does not allow for heavy investment in pollution control equipment; particularly in the context of a manufacturing process of few efficiencies.

The technology traditionally associated with tanning no longer is viable. With this in mind, a change of use for the subject property is inevitable. Considering the surrounding labor market, linkage to other markets and rural character of North Pownal, the most probable and feasible use for the subject property is that of warehouse storage.

The seven sales of similar old buildings described in the Market Discussion have followed a similar use history. The only accurate approach to estimating value of this type of property is a market approach utilizing a comparative sales analysis. A comparative sales grid ranks known sales of similar type properties to the subject intent on developing a indicated adjusted value.

As a part of this appraisal assignment, I was asked to estimate the value of a hydro-electric facility on site connected to a dam owned by the tannery. Physical inspection of the hydro facility reveals a system installed in the early 1950's and not appreciably updated since. Between the period of 3/87 and 3/88 the Pownal Tanning Co. billed the power company $12,137.52 for power produced and sold. Age, deferred maintenance and poor payback (ie. 3 cents per kilowatt hour) render this facility unable to earn a profit, much less provide for reserves to replace worn out equipment. Value is the present value of future returns. There is no reason to believe that the hydro facility will produce a positive cash flow in the future.

The value of a sewage treatment facility attached to a lagoon effluent disposal system appears far outweighed by the anticipated clean up costs associated with past use. This clean up cost has conservatively been estimated between $200,000 and $400,000 depending on findings not yet in.

Therefore as a result of the analysis and conclusions contained herein, the market value of the improved real estate referred to and known as the POWNAL TANNING COMPANY property owned by John Flynn & Sons, Inc located on Route 346 in North Pownal, Pownal, Vermont is as of April 1, 1987:

FOUR HUNDRED FIFTY FIVE
THOUSAND DOLLARS
($455,000)

> MEANS MORE THAN

< MEANS LESS THAN **REFERENCE 7**

POWNAL TANNING - SUBSTANCES REPORTED UNDER COMMUNITY RIGHT TO KNOW

0/20/87

MANUFACTURER'S NAME	TRADENAME	CAS #	CHEMICAL NAME	EPA #	QUANTITY	TYPES
ALLIED CHEMICAL COMPANY	NO TRADE NAME - NONE SPECIFIED	00144-62-7b	OXALIC ACID, DIHYDRATE	1,2,3	10-100	POUNDS
ALLIED CHEMICAL COMPANY	QUILON	00067-63-0b	ISOPROPANOL	4,5	10-100	GALLONS
ALLIED CHEMICAL COMPANY	QUILON	00067-64-1a	ACETONE	1,2,3,4,5	10-100	GALLONS
ALLIED CHEMICAL COMPANY	TIRE INFLATOR	07783-20-2	AMMONIUM SULFATE	3	>1000	POUNDS
BAY STATE CHEMICAL COMPANY	PG 201 YELLOW	18454-12-1	LEAD CHROMATE (VI) OXIDE	7	10-100	GALLONS
BAY STATE CHEMICAL COMPANY	PG 204 MOLY ORANGE	18454-12-1	LEAD CHROMATE (VI) OXIDE	7	10-100	GALLONS
BAY STATE CHEMICAL COMPANY	R-2055 THINNER	00067-63-0b	ISOPROPANOL	4,5	10-100	GALLONS
BAY STATE CHEMICAL COMPANY	R-2055 THINNER	00067-64-1a	ACETONE	1,2,3,4,5	10-100	GALLONS
BAY STATE CHEMICAL COMPANY	R-2055 THINNER	00078-93-3d	METHYL ETHYL KETONE (MEK)	1,2,4,5	10-100	GALLONS
BAY STATE CHEMICAL COMPANY	R-2055 THINNER	00108-83-8a	DIISOBUTYL KETONE	1,2,5	10-100	GALLONS
BAY STATE CHEMICAL COMPANY	R-2055 THINNER	00108-88-3d	TOLUOL	3,4,5 S6	10-100	GALLONS
BAY STATE CHEMICAL COMPANY	R-2055 THINNER	00123-86-4a	BUTYL ACETATE	1,3,4,5	10-100	GALLONS
BLUMBERG COMPANY, INC.	VITA-SAN #75 PESTICIDE ING.	00131-52-2	SODIUM PENTACHLOROPHENATE*	5	100-1000	GALLONS
CHEMTAN COMPANY, INC.	CHEMTAN BLACK MIX 33	07631-90-5a	SODIUM BISULFITE	2	100-1000	POUNDS
COMTAR CHEMICALS GROUP - LIME DIVISION	CHEM-CAL HYDRATED LIME	01305-62-0	CALCIUM HYDROXIDE	3,5	>1000	POUNDS
COMTAR CHEMICALS GROUP - LIME DIVISION	NO TRADE NAME - NONE SPECIFIED	01310-73-2c	SODIUM HYDROXIDE	3,5	100-1000	GALLONS
E. & F. KING, INC.	NO TRADE NAME - NONE SPECIFIED	16721-80-5	SODIUM HYDROSULFIDE	5	>1000	GALLONS
GARRATT-CALLAHAN COMPANY	ADJUNCT C & LC	01310-73-2c	SODIUM HYDROXIDE	1,2,3,5	>1000	GALLONS
HAMBLET & HAYES COMPANY	BLEACH	07681-52-9	SODIUM HYPOCHLORITE	5	10-100	GALLONS

10/20/87

FINAL TANNING - SUBSTANCES REPORTED UNDER COMMUNITY RIGHT TO KNOW

MANUFACTURER'S NAME	TRADENAME	CAS #	CHEMICAL NAME	QUANTITY	TYPES
HAMBLET & HAYES COMPANY	KITO 40	00075-21-8d	ETHYLENE OXIDE* 1,2,3,4,5,7	<10	GALLONS
HAMBLET & HAYES COMPANY	KITO 40	00107-21-1	ETHYLENE GLYCOL ?	<10	GALLONS
HAMBLET & HAYES COMPANY	TEK-CHROME 42-A	10101-53-8	CHROMIC SULFATE 3,5.	>1000	GALLONS
HOLLAND COMPANY, INC.	NO TRADE NAME - NONE SPECIFIED	10043-01-3	ALUMINUM SULFATE 5	>1000	GALLONS
J & W FINISH COMPANY	#6615	07758-97-6	LEAD CHROMATE AS CR 2,6,7	10-100	GALLONS
J.T. BAKER CHEMICAL COMPANY	NO TRADE NAME - NONE SPECIFIED	07722-64-7b	POTASSIUM PERMANGANATE 3,5	100-1000	POUNDS
LLOYD LABORATORIES	#38 THINNER	00109-86-4c	METHYL CELLOSOLVE ?	10-100	GALLONS
LLOYD LABORATORIES	CELLOSOLVE SOLVENT	00110-80-5c	ETHYLENE GLYCOL MONOETHYL ETHER 4,5	10-100	GALLONS
LLOYD LABORATORIES	CLB #5052	00108-83-8a	DIISOBUTYL KETONE 1,2,5	100-1000	GALLONS
LLOYD LABORATORIES	CLB #5052	00110-80-5c	ETHYLENE GLYCOL MONOETHYL ETHER 4,5	100-1000	GALLONS
LLOYD LABORATORIES	M-SERIES DYES	00110-80-5c	ETHYLENE GLYCOL MONOETHYL ETHER 4,5	10-100	GALLONS
LLOYD LABORATORIES	M71, M20, M70, M40, M60, M68	00110-80-5b	2-ETHOXYETHANOL 1,2,4	100-1000	GALLONS
LLOYD LABORATORIES	PLB PIGMENTS	00108-83-8a	DIISOBUTYL KETONE 1,2,5.	10-100	GALLONS
LLOYD LABORATORIES	PLB PIGMENTS	00110-80-5c	ETHYLENE GLYCOL MONOETHYL ETHER 4,5	10-100	GALLONS
LLOYD LABORATORIES	WCW #5102	00108-83-8a	DIISOBUTYL KETONE 1,2,5	10-100	GALLONS
LLOYD LABORATORIES	WCW #5102	00111-76-2c	ETHYLENE GLYCOL MONOBUTYL ETHER 4	10-100	GALLONS
MONSANTO ENVIRO-CHEM SYSTEMS	NO TRADE NAME - NONE SPECIFIED	07664-93-9e	SULFURIC ACID 5	>1000	GALLONS
PRIME LEATHER FINISHES COMPANY, INC.	PENETRATOR 5753-3	00067-63-0b	ISOPROPANOL 4,5	10-100	GALLONS
PRIME LEATHER FINISHES COMPANY, INC.	PENETRATOR 5753-3	00123-42-2a	DIACETONE ALCOHOL 1,2,5	10-100	GALLONS
ROHM & HAAS COMPANY, INC.	PENETRATOR L-274	00111-76-2a	2-BUTOXY ETHANOL 1,2,4	10-100	GALLONS
ROHM & HAAS COMPANY, INC.	PRIMAL 219	00111-76-2a	2-BUTOXY ETHANOL 1,2,4	10-100	GALLONS
ROHM & HAAS COMPANY, INC.	PRIMAL 219	01336-21-6a	AMMONIUM HYDROXIDE 5	10-100	GALLONS
ROHM & HAAS COMPANY, INC.	PRIMAL BINDER C-7	00102-71-6b	TRIETHANOLAMINE 3,4	10-100	GALLONS
STAHL FINISH COMPANY	BW 1214	00110-80-5c	ETHYLENE GLYCOL MONOETHYL ETHER 4,5	10-100	GALLONS
STAHL FINISH COMPANY	BW 1214	00111-76-2c	ETHYLENE GLYCOL MONOBUTYL ETHER 4	10-100	GALLONS.
STAHL FINISH COMPANY	D 1100	00067-63-0b	ISOPROPANOL 4,5	10-100	GALLONS

10/20/87

POWNAL TANNING - SUBSTANCES REPORTED UNDER COMMUNITY RIGHT TO KNOW

PAGE:

MANUFACTURER'S NAME	TRADENAME	CAS #	CHEMICAL NAME	QUANTITY	TYPES
STAHL FINISH COMPANY	D 1100	00110-19-0	ISOBUTYL ACETATE ?	10-100	GALLONS
STAHL FINISH COMPANY	D 1100	00110-80-5c	ETHYLENE GLYCOL MONOETHYL ETHER 4,5	10-100	GALLONS
STAHL FINISH COMPANY	D 1100	01330-20-7b	XYLENE 1,2,3,5	10-100	GALLONS
STAHL FINISH COMPANY	DW 1966	00872-50-4b	n-METHYL-2-PYRROLIDONE 4	100-1000	GALLONS
STAHL FINISH COMPANY	DW 1966	07631-86-9a	AMORPHOUS, SILICA, FUMED 2	100-1000	GALLONS
STAHL FINISH COMPANY	FI-50	00110-91-8b	TETRAHYDRO-P-OXAZINE 3	100-1000	GALLONS
STAHL FINISH COMPANY	HM 383	01336-21-6b	AQUA AMMONIA 5	10-100	GALLONS
STAHL FINISH COMPANY	HM 5533	00108-83-8a	DIISOBUTYL KETONE 1,2,5	10-100	GALLONS
STAHL FINISH COMPANY	HM 5533	00108-94-1	CYCLOHEXANONE 1,2	10-100	GALLONS
STAHL FINISH COMPANY	HM 635	00111-76-2c	ETHYLENE GLYCOL MONOBUTYL ETHER 4	10-100	GALLONS
STAHL FINISH COMPANY	LPS 231	00064-17-5c	ETHANOL 2,4,5	10-100	GALLONS
STAHL FINISH COMPANY	LPS 231	00110-80-5c	ETHYLENE GLYCOL MONOETHYL ETHER 4,5	10-100	GALLONS
STAHL FINISH COMPANY	LPS 231	01330-20-7b	XYLENE 1,2,3,5	10-100	GALLONS
STAHL FINISH COMPANY	LPS 990	00064-17-5c	ETHANOL 2,4,5	10-100	GALLONS
STAHL FINISH COMPANY	LPS 990	00110-19-0	ISOBUTYL ACETATE 1,2,3,4,5	10-100	GALLONS
STAHL FINISH COMPANY	LPS 990	00110-80-5c	ETHYLENE GLYCOL MONOETHYL ETHER 4,5	10-100	GALLONS
STAHL FINISH COMPANY	LPS-980	00067-63-0b	ISOPROPANOL 4,5	10-100	GALLONS
STAHL FINISH COMPANY	LPS-980	00108-88-3c	TOLUENE 1,2,3,4,5 86	10-100	GALLONS
STAHL FINISH COMPANY	LPS-980	01330-20-7b	XYLENE 1,2,3,5	10-100	GALLONS
STAHL FINISH COMPANY	LS 2244	00109-86-4a	ETHYLENE GLYCOL MONOMETHYL ETHER 45	10-100	GALLONS
STAHL FINISH COMPANY	LS 2244	00110-80-5c	ETHYLENE GLYCOL MONOETHYL ETHER 4,5	10-100	GALLONS
STAHL FINISH COMPANY	LS 979	00109-86-4a	ETHYLENE GLYCOL MONOMETHYL ETHER 4,5	10-100	GALLONS
STAHL FINISH COMPANY	LS 979	00110-19-0	ISOBUTYL ACETATE 1,2,3,4,5	10-100	GALLONS
STAHL FINISH COMPANY	LS 979	01330-20-7b	XYLENE 1,2,3,5	10-100	GALLONS
STAHL FINISH COMPANY	LSV 1082	00067-63-0b	ISOPROPANOL 4,5	10-100	GALLONS
STAHL FINISH COMPANY	LSV 1082	00108-88-3c	TOLUENE 1,2,3,4,5 86	10-100	GALLONS
STAHL FINISH COMPANY	LSV 1082	00109-86-4a	ETHYLENE GLYCOL MONOMETHYL ETHER 4,5	10-100	GALLONS
STAHL FINISH COMPANY	LSV-865	00109-86-4a	ETHYLENE GLYCOL MONOMETHYL ETHER 4,5	10-100	GALLONS
STAHL FINISH COMPANY	LSV-865	00110-80-5c	ETHYLENE GLYCOL MONOETHYL ETHER 4,5	10-100	GALLONS
STAHL FINISH COMPANY	LSV-865	00111-76-2c	ETHYLENE GLYCOL MONOBUTYL ETHER 4	10-100	GALLONS
STAHL FINISH COMPANY	LW 2198	00111-15-9c	ETHYL GLYCOL ACETATE 4	10-100	GALLONS

POWNAL TANNING - SUBSTANCES REPORTED UNDER COMMUNITY RIGHT TO KNOW

10/20/87

MANUFACTURER'S NAME	TRADENAME	CAS #	CHEMICAL NAME	QUANTITY	TYPE
STAHL FINISH COMPANY	LW 620	00078-59-1	ISOPHORONE 1,2,3,4	10-100	GALLON
STAHL FINISH COMPANY	LW 620	00108-83-8a	DIISOBUTYL KETONE 1,2,5	10-100	GALLON
STAHL FINISH COMPANY	LW 620	09004-70-0f	NITROCELLULOSE 3,4,5	10-100	GALLON
STAHL FINISH COMPANY	LWS 344C	00071-36-3a	1-BUTANOL 3,4	10-100	GALLON
STAHL FINISH COMPANY	LWS 344C	00108-83-8a	DIISOBUTYL KETONE 1,2,5	10-100	GALLON
STAHL FINISH COMPANY	LWS 344C	09004-70-0f	NITROCELLULOSE 3,4,5	10-100	GALLON
STAHL FINISH COMPANY	PT 415	01336-21-6b	AQUA AMMONIA 5	10-100	GALLON
STAHL FINISH COMPANY	RA 2354	00111-76-2c	ETHYLENE GLYCOL MONOBUTYL ETHER 4	100-1000	GALLON
STAHL FINISH COMPANY	RU 3506	00110-80-5c	ETHYLENE GLYCOL MONOETHYL ETHER 4,5	100-1000	GALLON
STAHL FINISH COMPANY	RU 4009	00110-80-5c	ETHYLENE GLYCOL MONOETHYL ETHER 4,5	100-1000	GALLON
STAHL FINISH COMPANY	RU 5152	00067-63-0b	ISOPROPANOL 4,5	100-1000	GALLON
STAHL FINISH COMPANY	S 426	00067-63-0b	ISOPROPANOL 4,5	10-100	GALLON
STAHL FINISH COMPANY	S 426	00108-10-1c	METHYL ISOBUTYL KETONE 1,2,4	10-100	GALLON
STAHL FINISH COMPANY	S 426	00108-88-3c	TOLUENE 1,2,3,4,5	10-100	GALLON
STAHL FINISH COMPANY	SW 501	00067-63-0b	ISOPROPANOL 4,5	10-100	GALLON
STAHL FINISH COMPANY	T-17	08032-32-4a	LIGROINE 3	10-100	GALLON
STAHL FINISH COMPANY	T-35	00110-80-5c	ETHYLENE GLYCOL MONOETHYL ETHER 4,5	100-1000	GALLON
STAHL FINISH COMPANY	T-35	00123-42-2a	DIACETONE ALCOHOL 1,2,5	100-1000	GALLON
TANNIN CORPORATION	NO TRADE NAME - NONE SPECIFIED	00064-18-6	FORMIC ACID 1,2,3,4,5	100-1000	GALLONS
TANNIN CORPORATION	NO TRADE NAME - NONE SPECIFIED	01066-33-7	AMMONIUM BICARBONATE 5	100-1000	POUNDS
TANNIN CORPORATION	NO TRADE NAME - NONE SPECIFIED	07664-41-7	AMMONIA 1,2,3,4,5	100-1000	GALLONS
TANNIN CORPORATION	NO TRADE NAME - NONE SPECIFIED	07783-06-4	HYDROGEN SULFIDE 1,2,3,4,5	>1000	GALLONS
UNION CARBIDE	NO TRADE NAME - NONE SPECIFIED	00064-19-7a	ACETIC ACID 1,2,3,4,5	10-100	GALLONS
UNION CARBIDE	UCAR G50	00111-30-8	GLUTARALDEHYDE 2	10-100	GALLONS

POWNAL TANNING - SUBSTANCES REPORTED UNDER COMMUNITY RIGHT TO KNOW

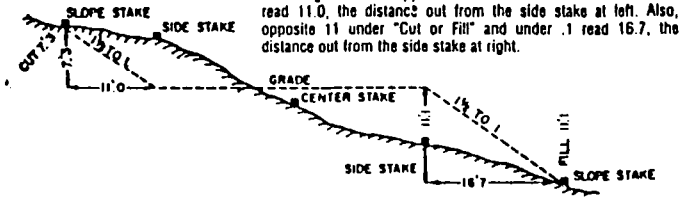
10/20/87

MANUFACTURER'S NAME	TRADENAME	CAS #	CHEMICAL NAME	QUANTITY	TYPE
UNION CHEMICALS DIV., UNION OIL CO. OF CALIFORNIA	D-TERGE CONCENTRATE M140	00141-43-5e	MONOETHANOLAMINE S	100-1000	GALLON

DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING

Roadway of any Width. Side Slopes 1½ to 1.

In the figure below: opposite 7 under "Cut or Fill" and under .3 read 11.0, the distance out from the side stake at left. Also, opposite 11 under "Cut or Fill" and under .1 read 16.7, the distance out from the side stake at right.



Cut or Fill	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	Cut or Fill
	Distance out from Side or Shoulder Stake										
0	0.0	0.2	0.3	0.5	0.8	0.8	0.9	1.1	1.2	1.4	0
1	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.9	1
2	3.0	3.2	3.3	3.5	3.6	3.8	3.9	4.1	4.2	4.4	2
3	4.5	4.7	4.8	5.0	5.1	5.3	5.4	5.6	5.7	5.9	3
4	6.0	6.2	6.3	6.5	6.6	6.8	6.9	7.1	7.2	7.4	4
5	7.5	7.7	7.8	8.0	8.1	8.3	8.4	8.6	8.7	8.9	5
6	9.0	9.2	9.3	9.5	9.6	9.8	9.9	10.1	10.2	10.4	6
7	10.5	10.7	10.8	11.0	11.1	11.3	11.4	11.6	11.7	11.9	7
8	12.0	12.2	12.3	12.5	12.6	12.8	12.9	13.1	13.2	13.4	8
9	13.5	13.7	13.8	14.0	14.1	14.3	14.4	14.6	14.7	14.9	9
10	15.0	15.2	15.3	15.5	15.6	15.8	15.9	16.1	16.2	16.4	10
11	16.5	16.7	16.8	17.0	17.1	17.3	17.4	17.6	17.7	17.9	11
12	18.0	18.2	18.3	18.5	18.8	18.8	18.9	19.1	19.2	19.4	12
13	19.5	19.7	19.8	20.0	20.1	20.3	20.4	20.6	20.7	20.9	13
14	21.0	21.2	21.3	21.5	21.6	21.8	21.9	22.1	22.2	22.4	14
15	22.5	22.7	22.8	23.0	23.1	23.3	23.4	23.6	23.7	23.9	15
16	24.0	24.2	24.3	24.5	24.6	24.8	24.9	25.1	25.2	25.4	16
17	25.5	25.7	25.8	26.0	26.1	26.3	26.4	26.6	26.7	26.9	17
18	27.0	27.2	27.3	27.5	27.8	27.8	27.9	28.1	28.2	28.4	18
19	28.5	28.7	28.8	29.0	29.1	29.3	29.4	29.6	29.7	29.9	19
20	30.0	30.2	30.3	30.5	30.8	30.8	30.9	31.1	31.2	31.4	20
21	31.5	31.7	31.8	32.0	32.1	32.3	32.4	32.6	32.7	32.9	21
22	33.0	33.2	33.3	33.5	33.6	33.8	33.9	34.1	34.2	34.4	22
23	34.5	34.7	34.8	35.0	35.1	35.3	35.4	35.8	35.7	35.9	23
24	36.0	36.2	36.3	36.5	36.6	36.8	36.9	37.1	37.2	37.4	24
25	37.5	37.7	37.8	38.0	38.1	38.3	38.4	38.6	38.7	38.9	25
26	39.0	39.2	39.3	39.5	39.6	39.8	39.9	40.1	40.2	40.4	26
27	40.5	40.7	40.8	41.0	41.1	41.3	41.4	41.8	41.7	41.9	27
28	42.0	42.2	42.3	42.5	42.6	42.8	42.9	43.1	43.2	43.4	28
29	43.5	43.7	43.8	44.0	44.1	44.3	44.4	44.6	44.7	44.9	29
30	45.0	45.2	45.3	45.5	45.6	45.8	45.9	46.1	46.2	46.4	30
31	46.5	46.7	46.8	47.0	47.1	47.3	47.4	47.8	47.7	47.9	31
32	48.0	48.2	48.3	48.5	48.6	48.8	48.9	49.1	49.2	49.4	32
33	49.5	49.7	49.8	50.0	50.1	50.3	50.4	50.6	50.7	50.9	33
34	51.0	51.2	51.3	51.5	51.8	51.8	51.9	52.1	52.2	52.4	34
35	52.5	52.7	52.8	53.0	53.1	53.3	53.4	53.6	53.7	53.9	35
36	54.0	54.2	54.3	54.5	54.8	54.8	54.9	55.1	55.2	55.4	36
37	55.5	55.7	55.8	56.0	56.1	56.3	56.4	56.6	56.7	56.9	37
38	57.0	57.2	57.3	57.5	57.6	57.8	57.9	58.1	58.2	58.4	38
39	58.5	58.7	58.8	59.0	59.1	59.3	59.4	59.6	59.7	59.9	39
40	60.0	60.2	60.3	60.5	60.6	60.8	60.9	61.1	61.2	61.4	40

Name Joseph Schmidl, Task Mgr.
TRC Environmental Corp.
Address Booth Mills So., Foot of John St.
Lowell, MA 01852-1124
Phone 508/970-5600

Project Pownal Tannery Lagoons
Site Inspection Prioritization
1-636-013-0-1J03-4
TDD No: 9209-27-ATY

REFERENCE 8

CONTENTS

PAGE NO.	REFERENCE	DATE

3/26/93 Joseph Schmidl (1)

While reviewing files in Bennington Vermont Assessor's Office on another project, I noted an 1845 Bennington county map. At the location of the Pownal Tannery Lagoons site is a building identified as a "woollen mill". The building is located approximately where the present Tannery Building is.

(2)

4/26/93 Joseph Schmidl

on Friday, April 23, Access Agreement was returned, signed by Michael J. Flynn, the past president of the Owner of Record, Paunal Tanning Company.

4/27/93 Joseph Schmidl contacted Susan Sevaski (CEPA SEAT) regarding accompanying us on our recon. She indicated that her first available day would be Monday, May 3. I said that we'd do it that day. I suggested that we depart TRC at 0600, but she insisted that she could not possibly leave earlier than 0800. She indicated that she preferred to ride with us, due to the difficulty of arranging a government vehicle. I indicated that this was acceptable, but that we would have a very late return because of it.

4/28/93 Joseph Schmidl (3)

09:10 I received a return message from Mary Dever (CEPA ESD) indicating that the EPA was still mobilized at the Paunal Tannery, conducting emergency removal. The site phone No. is: 802/823-0131.

12:00 call was returned by Lisa Danek (CEPA ESD) who is the OSC at Paunal Tannery. She gave me the following information:

We do not have to contact the man who is the "caretaker" at the site.

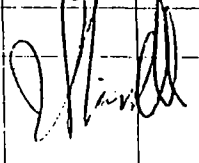
A breach in the wall of lagoon 4 was noted this spring at the northernmost end. A release to the river definitely occured this spring. We may revise sampling strategy to compensate.

④ 4/28/93 Joseph Schmidl

In order to enter the former Tannery Building, we will have to be in Full Level C, due to asbestos contamination, which is extensive.

Apparently, the river flow/level continues to fluctuate greatly on a daily basis. The area of river bank which Lisa is familiar with is located near the former tannery building. In this area, the banks of the river are steep, and access for sampling may be difficult. She indicated it may be wise to rig up a lifeline for access to the river. I hope that further downstream, where the river is less modified, we will have easier access.

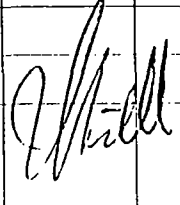
- Check w/ Nilda on any special precautions re: decon for asbestos.



4/28/93 Joseph Schmidl ⑤

Amendment to work plan drafted after consultation w/ Nilda Gavelis, regarding:

- Level C in former Tannery Building
- Safety lines needed on riverbanks.



(6) 5/3/93 Joseph Schmidl

08:00 Depart TRC Office in Lowell MA
TRC Personnel: Joseph Schmidl (JS) (Task Manager)
Scott Heim (SH)
CSHSC
EPA Personnel: Susan Svenski (SS) (EPA SEAT)

11:20 Mack Co. Plastic Molding located in Pownal, upstream of site

11:23 On site Check in w/ EPA OSC

Calibrate HNu PI Model HW-101
Span Setting 980 EPA ID: 774974
Reading: 55 ppm Bkg Oppm
Cal Gas 98.9 ppm Isobutylene 55 ppm

also using Matheson PM Rad Meter
No Calibration EPA ID 683649

Met w/ Lisa Daniels, EPA ESD OSC for the Removal Action
OHM is the removal contractor

5/3/93 Joseph Schmidl (7)

appears to be a leaching system in basement which leads to the sewer. Sewer lines most likely pumped to lagoon #1

EPA has searched and removed some drums from the site, and may have identified drums of sulphuric acid.

They have collected shallow soil samples from the surface of lagoons 2, 4, 5.
Land fill Leachate is collected in a 6000-gal steel UST. The State of Vermont collects leachate in tank from the land fill and disposes of it to Lagoon #5. State will sample monitoring and residential wells in late May.

There are questions as to whether the leachate collection system is operating properly - it is not maintained.

Sediment has been deposited outside of Lagoon #1 beyond the breach. They have collected a soil sample there.

(8) Photo Log 5/3/93 Joseph Schmidt

Number	Time	Dir. Facing	Description
			NONE TAKEN

Photo Log 5/3/9 Joseph Schmidt (9)

Number	Time	Dir. Facing	Description
			NONE TAKEN

(10) 5/3/93 Joseph Schmidl

11:55 We've asked to read and sign off on the HASP for the site before we access the site.

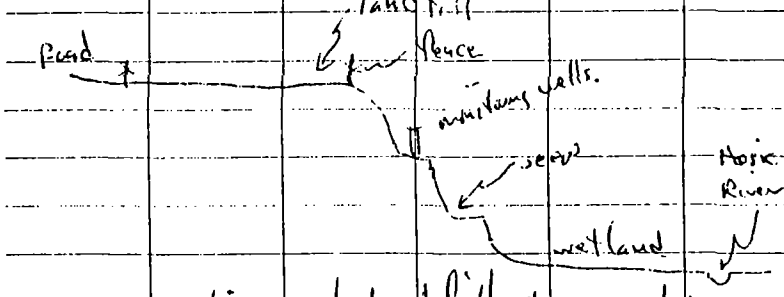
12:24 at Landfill - located a monitoring well capped and locked SE of landfill
Camera will not work - no photos taken

12:27 at NE side of landfill
Slope falls in two steps - middle step is an impassable road. Below the step is a wetland.

Because of the steps here we will need to collect an upgradient sample here.

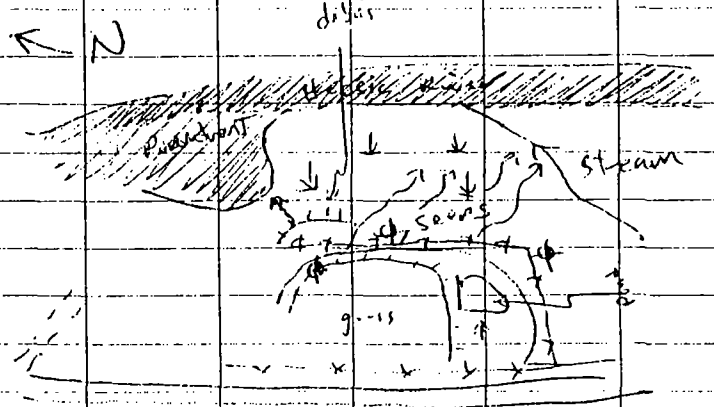
MWell NorthEast Landfill is not locked, now capped when notified screened - no readings.

5/3/93 Joseph Schmidl (c)



X section of landfill topography

Sketch of Landfill vicinity



(12) 5/3/93 Joseph Schmidl

a great deal of tires, and automotive debris, as well as at least 3 55-gallon drums, are noted on the north side of the land fill.

Water is ponded in the unclosed cell. Plug vines, typ. overgrowing at edges. The rest of the cell is covered w/ grass.

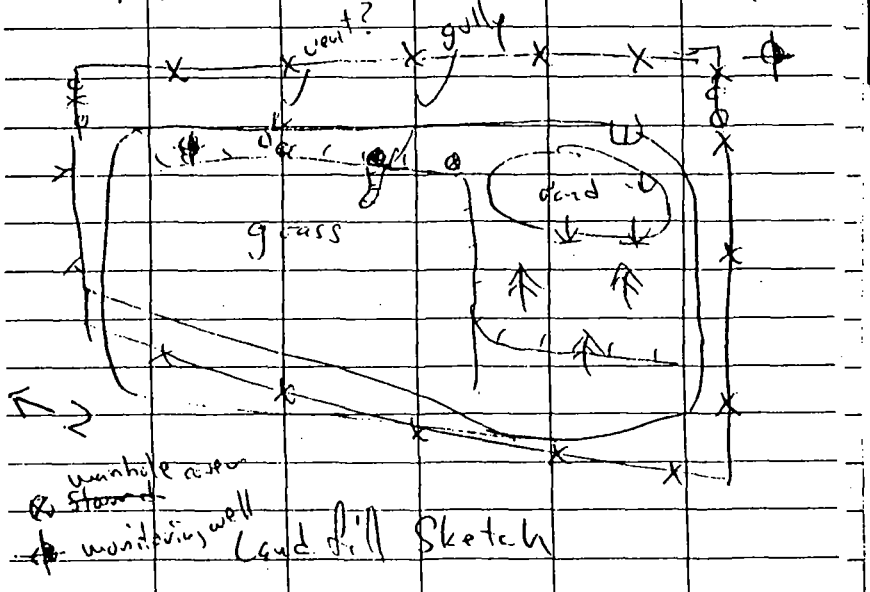
Onto closed cells, there is no water ponded.
Some liner is exposed, north of the liner

a piece of 4" PVC Stickup is located below the middle drain. it is full of water above ground level, with no water proof cap.

a monitoring well is located further west it is capped, but the lock is not locked.

13:05 Back at van - proceed to Lagoons

(13) 5/3/93 Joseph Schmidl



Land fill Sketch

Notes Regarding Land Fill Sampling:
Plan to collect a sample along leachate stream from wetland to document release.

We will also want to collect background Sediment samples, at least one.

Lagoon Area:
noted well L-1 capped, not locked.

an in flow stream is noted at the mid way point between L-1 and L-2.

on the south side of the river. will need to sample this stream.

13:17 at junction of Lagoons #1 and 3, on south side Lagoon #5 is full of water. Lagoon #1 is capped and has a depression on top - Typha and Phragmites are growing in the depression.

L-2, is area previous landfill appears to be wetted shit.

at the junction between Lagoons #1 and #3, at the river there is a bend which is a point bar with good sedimentation. Sample Location SD-03-07 is flagged.

SS notes a leachate seep between Lagoon #1 and #5. No reading on HNu

foundation of Press Building is in place. Building is gone.

Bluegill sunfish noted in Lagoon #5

white flag placed at leachate seep from Lagoon #1 to #5

This sample may be leachate City is flowing today) or may be Sediment, if dry when we return. GW/SD-03-08.

the west end of Lagoon #4 is dry and vegetated with grass. From this vantage point we can see water at the north end. The inlet/outlet berm is apparent but subtle. Fencing is intact along with Lagoons #1 and #3.

1400 at south end of Lagoon #5 pit sample flag at Location SD-03-04 SD-03-04/05 - at beginning of weir which releases to the river the weir does not seem to run at this time. Logs are piled up in the channel indicating periodic (Spring high water) flow.

(16) 5/3/93 Joseph Schmidl

Locate pin flag outside of Lagoon #5 at off fall to Housic River, centered below lagoon's riser.

Berm located on south bank of Housic River, alongside Lagoon #6.

Isolated rectangular pools noted in Lagoon #4 No leachate seeps from Lagoon #4 to river noted.

Deer tracks noted in sediment of Lagoon 4

Island noted in river near northern end of lagoon 4 - N 100' long vegetated w/ grasses, which are bent downstream, suggesting inundation periodically

the southern end in Lagoon #4 is flowing to west the northern end.

soil in lagoon is fine grained, and brown to grey-brown in color.

(17) 5/3/93 Joseph Schmidl

a distinct cut in the inside of the bank is noted along Lagoon 4, apparently anthropomorphic.

Animal track / slide is noted north of the cut.

at breach at northern end of Lagoon 4 water is not flowing at present. EPA OSC indicated that it did flow this spring.

We noted scoppula location at the north end of Lagoon #4 about 20 feet from the River.

Not much wetland noted to the limit of canal property.

walked back alongside edge of Lagoon #4 - noted green-grey material mixed in with brown soil in Lagoon #4

14:50 at L-3 not locked - appears L-4 not found

14:55 at L-15 not locked, protective stickup loose - pump tubing in well.

(18) 5/3/93 Joseph Schmidl

we locate L-13 - capped, not locked. Plastic can is hard to view-use, so we don't.

well L-11 possibly noted

well L-12 not noted

Lagoon #3A and #3B are completely vegetated with grass and small trees. Cannot see Lagoon #4A

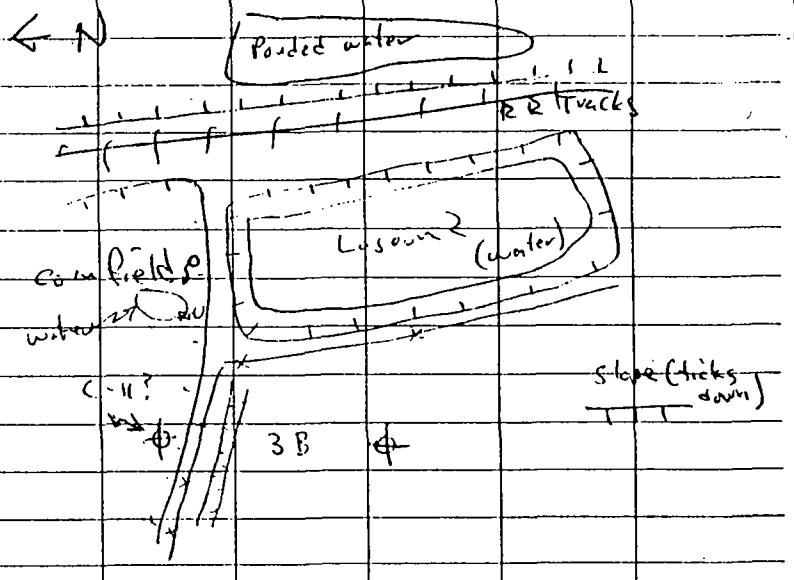
Lagoon #2 is wet, and contains Phragmites and Typha

at L-5 capped & locked

exit Lagoon area -
15:15 secured gate behind us.

Lagoon #2 is full of water, clear, stained brown, apparently deep. Some wetland vegetation has established

(19) 5/3/93 Joseph Schmidl



It is apparent while looking at Lagoon #2 from the south ~~west~~ that water level in Lagoon #2 is w the same height as the corn field to the north perhaps higher. The corner of the corn field adjacent to the Lagoon is very wet. From inside the fence, we cannot inspect the slope for springs. The ponded water north of Lagoon #2 comes from seeps at the base of Lagoon #2.

(20) 5/3/93 Joseph Schmidl

13:25 met w/ Lisa Dunek following our recon

indicated that an old lagoon may be seen on an old land fill

also - there is a possible sewage seepage vs outfall to the river even within the confines of the mine haven toilet paper is visible in the effluent.

16:00 Upgrade to level C - OHM

Led by Pat Ball around the Mill

In to Main Room where obviously infiltrates the building. Floor is wood, wet, and boards are rotting and loosening.

Floor sumps water leads to a trench on the river side of the building = this would discharge without basic R.

5/3/93 Joseph Schmidl (21)

Salt holding tank in basement is still 1/2 full

Ground Water JS 5/4/93

a seep is located in the basement in the center and flows into the collection system

fisherman noted access the water from the site.

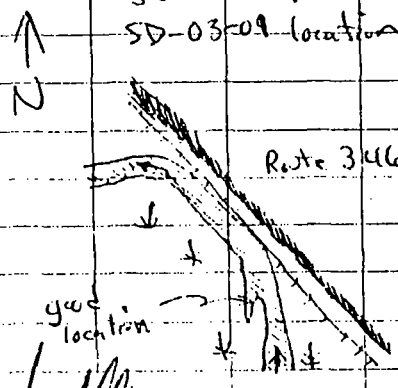
Basement floor is Brick, with trenches along both sides the first floor is used to store hazardous Materials which have sorted out are collected at the back east of the first floor. Containers from all over the building are collected here. Traces of Mercury hydrofluoric have been recovered - it is stored in the "bomb room" because it is shock sensitive

16:45 out of level C - checked out w/ Lisa Dunek clean in & out again.

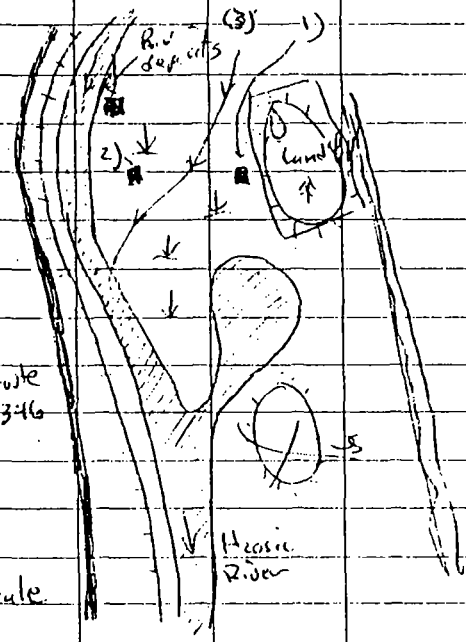
(22) 5/3/93 Joseph Schmidl

16:55 Drove downstream of site to attempt to locate downstream sample location. Noted a stream (located on Quad) which flows into the river from the north. This will have to be accounted for in sampling strategy. A possible good location is identified for sediment sample, but is located ½ mile downstream, perhaps too far. Significant wetlands are noted upstream from this spot, but will be accessible only by boat. We should check on whether we can use the ARCS boat, as the river flows pretty rapidly here. A canoe would be more useful.

Sketch of potential SD-03-09 location



(23) 5/3/93 Joseph Schmidl



17:10 Drove to ~~south~~ upstream of site on route 346, looked across river to landfill. noted that I have it mislocated on the site sketch. the only place to collect an upstream river sample is from the landfill side of the river, across wetlands down gradient of the landfill. These wetlands are wooded, and may be difficult to cross.

(24) 5/3/93 Joseph Schmidl

Two, possibly 3 sediment samples should be collected.

1) leachate sample from landfill. collect >200' inside wetland to confirm Level II target.
2) sediment sample upstream from all sources, to use for comparison with downstream data.
3) downstream river sediment sample from point bar on inside bend of river

17:20 Offsite for day

No readings on HNO_3 above background

Follow-up notes:

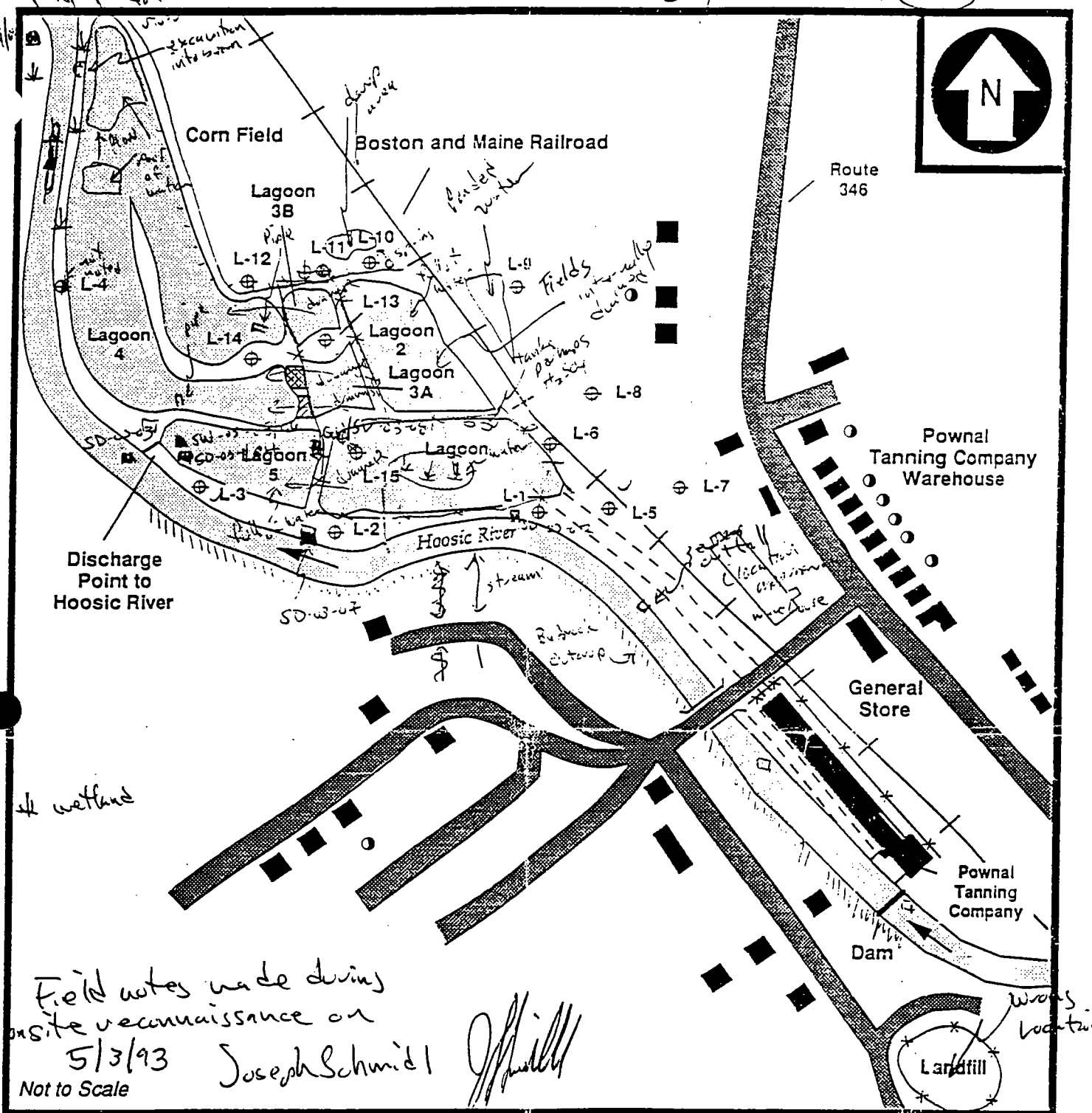
the fields located ~~north~~ NE of the railroad tracks located adjacent to Lagoon #2 are flooded adjacent to the RR tracks. This is possibly tied to + high water, blockage in the stream to the south, or possible GW discharge from Lagoon #2

J. Schmidl

5/3/93 Joseph Schmidl (25)

Check w/ Diane Stallings, regarding the necessity of submitting a release memo regarding the apparent release from Lagoon #2 to the corn field. She indicates no.

Logbook Page 26



Field notes made during onsite reconnaissance on 5/3/93 Joseph Schmidl

Monitoring Well (screened in overburden)
Monitoring Well (screened interval unknown)
Drinking Water Well (screened interval unknown-location approximate)
Bridge
Fence
Fence Gate
Clarifier Building
Press Building
Railroad Tracks
Residence
Unpaved Road
Paved Road

LOCATION MAP

POWNAL TANNERY LAGOONS
POWNAL, VERMONT

TRC

Figure 2.

MS63/20

(26) 5/3/93 Joseph Schmidl

Attached Site Sketch
WR notes made on
5/3/93 by
Joseph Schmidl

5/9/93 Joseph Schmidl (7)

0640 Depart Lowell TRC Offices
Field Team Joseph Schmidl (JS)
Andrew Hagens (AH)
Scott James (SJ)
John Nelson (JN)
Cathy Gabis (CG)

We became separated from
each other at Queen Pk NM

1040 All TRC personnel on site.

Calibrate MNOS
#2 S/N A79329
CPA ID 43 4974
calibrates to 55 ppm
Span set at 562

#4 A S/N
CPA ID
Calibrates to
Span set at

(28) 6/9/93 Joseph Schmidt

11:05 JN/SJ on location S. Jones departed to collect Sample SD-03-01 and SD-03-02

11:10 at Location SD-03-03 we began wagon train to proceed for sampling

11:15 JN/SJ are visible on bank opposite SD-03-03

Photos #1-5A taken earlier

#1 view of north side of Tannery Bldg. facing SE. JS

#2 View along Hoosic River - facing SE

note lack of tilling to river

#3 View along Hoosic R. of Tannery - facing NE

#4 Views along tannery bldg. - SE end - facing SE

#5 View of building beyond tannery to SE of #4

#5A View of SE end of tannery - facing NW

11:25 Photo #6 facing SE to sample location SD-03-01

(24) 6/9/93 Joseph Schmidt

11:30 proceed to north end of Lagoon #4

Photo #7 11:46 facing E looking upstream along Hoosic River

Photo #8 facing E Note wetland along South bank

Photo #9 facing SE at South end of lagoon 4 where OHM collected it's sample

Photo 11:50 #10 facing NW toward NW end of Lagoon 4

Photo 11:56 #11-12 at NW corner of Lagoon 2 JS

Photo #13 JS

Sample SD-03-01/02 collected at 11:50 by JN and SJ. 0-2' deep

12:00 Photo #14 facing west from east end of lagoon #4

12:02 back at vehicle 0-3" deep

12:05 collect sample SD-03-03 (AH)

photo #15 looking west from around to SD-03-03

photo #16 facing E toward Lagoon 5 to SD 03-03

82

(30)

6/9/93 Joseph Schmidt

12:12 Sample # SD-03-04 collected by CG - 0'-8" deep.

12:14 Photo # 17 looking West of Location #5 to SD-03-04

12:27 at location SD-03-07 collected by Westera and of little bank at base of road. Collected by AH. 0-2" deep Photo # 18 SD-03-07

12:29 Photo # 19 Photo of MD on S side of location #5, mid way along its length, note no cap, no lock, and no concrete footings.

12:40 Return to Command Post - JN(SJ) have returned from sampling

Tailgate on samples for floats

13:10 onsite at land fill

AH/SJ move out to collect SD-03-05

(31)

6/9/93 Joseph Schmidt

13:20 AH calls in to notify us that additional leachate streams flow into the embankment on the river.

13:30 Rinsate Blank RB-03-10.

Sample Descriptions

SD-03-01/02 Medium to course sand, little fine sand and silt, brown, wet.

SD-03-03 Brown fine sand and silt, little clay, wet

SD-03-04 Medium to fine Brown sand, little silt - wet

SD-03-05 Grey-brown silt, little fine sand, wet trace organics

SD-03-06 Grey Brown Silt, trace clay, some roots, wet

SD-03-07 Medium to course Brown sand, little fine sand and silt wet

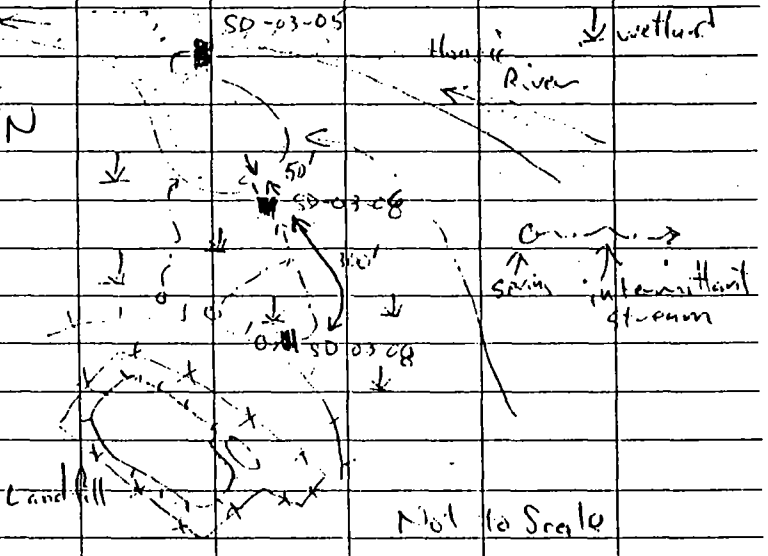
SD-03-08 Brown, med to course sand little fine sand and silt wet

SD-03-09 Not collected

13:40 Sample SD-03-05 collected. by AH, SJ collected 0-8" deep.

13:50 move out to location SD-03-06 based on location of SD-03-05, there is no need for sample SD-03-09

(32) 6/9/93 Joseph Schmidl



Not to Scale

JS

Sample SD-03-06 collected at 14:30 by JS. 0-3" deep.

JS

Sample SD-03-05 collected at 14:40 by C.G. - 0-3" deep

(33) 6/9/93 Joseph Schmidl

11:30 Using a tape measure, the distance along the drainage route from sample location SD-05-08 was measured. At 300 feet, sample SD-03-06 was collected. Then Sample SD-03-08 was collected. 0-3" deep

15:00 Return to vehicles - establish decon line and decon equipment. Pack samples - do paperwork.

All is shrouded by ants and is stung several times on the arms. The stings swell and then go down. The stings are washed w/ soap and water, and Aquaphor pats ice on it.

No Readings above background on HNu all day.

16:15 Keys returned to OX and Field team - Cecles out.

Travel to Bennington, VT to drop samples at Ramada Inn,

(34)

6/9/93	Joseph Schmidl	
Above a regular pick up occurs at 1645.		
Arrive at Ramada at 1635.		

(35)

10/10/93	Joseph Schmidl	
09:50	Contacted Nina Smith (Region 7 SMO) to transmit shipping Info.	
	Case No.: 20136	
	Organic Lab Campbell Chem Lab	
	Inorganic Lab Chemtech Consulting	
	8 soil/sed 1 aq.	
	FULL TCL and TAL + CN analyses	
	Fed Ex Airbill	
	Organic: 6969 4194 35	
	Inorganic: 6969 4194 46	
	shipment for case complete.	

(36) 9/10/93 Joseph Schmidt

13:55 I called Shawn Hayes, EPA to find out who Jane Downing, EPA is, and how to reach her. Both Jane Downing and Nancy Barmakian, EPA are now Section Chiefs in other areas. The EPA contact for Pownal Tannery Lagoons is now Michael Jezinski (sp?) at 573-5786 (617). I left a message with him to obtain a copy of the M&E report.

14:17 contacted Mary Dever (EPA). she indicated Ann Lisa Danek is at Pownal Today, but not regularly anymore. (The removal activities must be done). She will attempt to contact Lisa regarding getting us the type, quantity, and containment characteristics of the former tannery building contents. She will call back in 1-2 days.

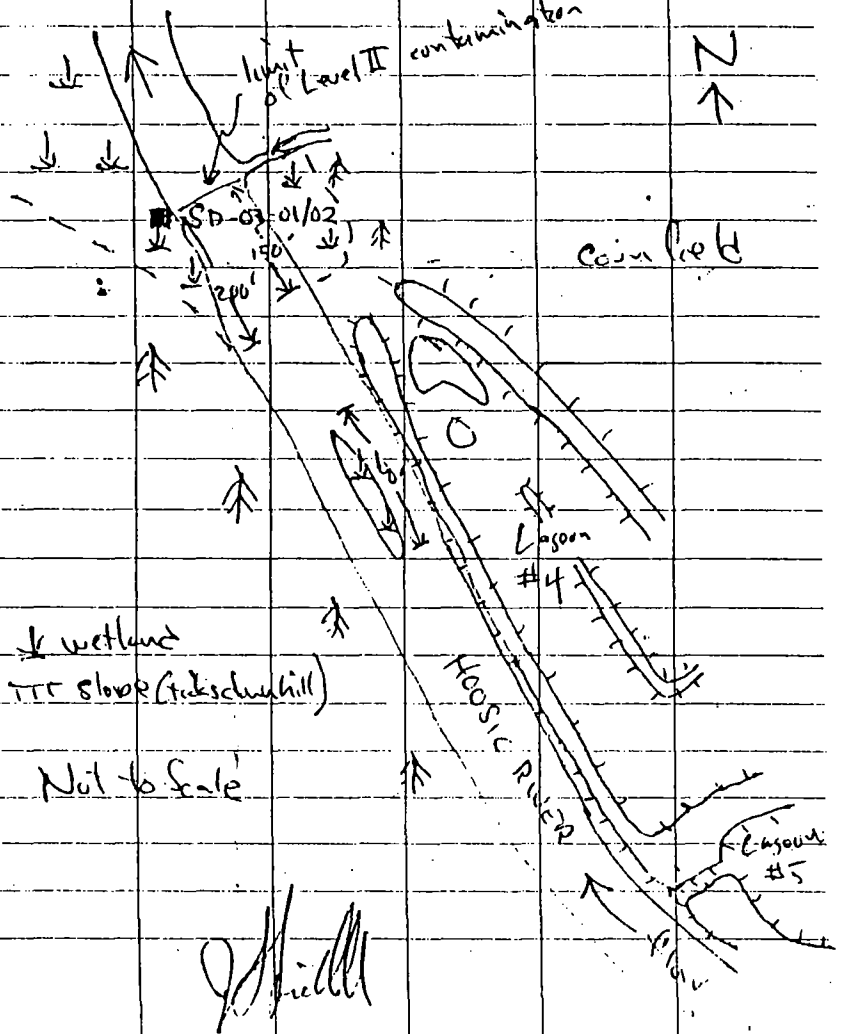
9/8/93 Joseph Schmidt (-7)

using the USGS North Pownal Quadrangle Map, the distances to sample location SD-03-01 and SD-03-02 were measured from both the outfall from Lagoon #5 and the outfall/breach from Lagoon #4.

Approximately the outfall from Lagoon #5 is approximately 3000 feet (0.57 miles) upstream of sample locations SD-03-01/02. The outfall/breach from Lagoon #4 is approximately 350-325 feet upstream of sample locations SD-03-01/02.

(38) 9/8/93 Joseph Schmidl

Based on Field Notes from pp. 16-17 and p. 26, the following areas of wetland were defined adjacent to the site along the Hoosic River



9/8/93 Joseph Schmidl (39)

Small riparian wetlands consisting of ash-leaved maple, red osier, fern were identified by Scott Heim (TRCC) during site reconnaissance.

The sketch on page 38 summarizes distances of wetland frontage to the Hoosic River. These include:

- 200 feet along the SW bank of the Hoosic River
- 150' feet along the NE bank of the Hoosic River
- both sides of the ~100' island in the Hoosic River (200')

total wetland frontage between outfall from Lagoon #5 and sample location SD-03-01/02 is 200 + 150 + 200 feet = 550 feet.

550 ft ÷ 5280 ft/mile = 0.10 miles

The following transcription of field logbook pages was performed by Joseph Schmidl (the author) on May 20, 1994. These pages have been transcribed from the hand written field logbook since some copied logbook pages are illegible. Field notes have been transcribed from logbook verbatim. All information appears on the same line and page in both the original and the transcribed versions.

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Name Joseph Schmidl, Task Mgr.
TRC Environmental Corp.
Address Boott Mills So., Foot of John St.
Lowell, MA 01852-1124
Phone 508/970-5600

Project Pownal Tannery Lagoons
Site Inspection Prioritization
1-636-013-0-1J03-4
TDD No. 9209-27-ATX

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While reviewing files in Bennington, Vermont Assessor's Office on another project, I noted an 1845 Bennington County Map. At the location of the Pownal Tannery Lagoons site is a building identified as a "woolen mill". The building is located approximately where the present Tannery Building is.

on Friday, April 23, Access
Agreement was returned, signed,
by Michael J. Flynn, the past
president of the owner of
record, Pownal Tanning Company.

4/27/93 Joseph Schmidl
contacted Susan Sverski
(EPA SEAT) regarding accompanying
us on our recon. She indicated
that her first available day
would be Monday, May 3. I
said that we'd do it that day.
I suggested that we depart TRC
at 06:00, but she insisted
that she could not possibly leave
earlier than 08:00. She indicated
that she preferred to ride with
us, due to the difficulty of
arranging a government vehicle.
I indicated that this was
acceptable, but that we would have
a very late return because of
it.

09:10 I received a return message
from Mary Dever (EPA ESD) indicating
that the EPA was still mobilized
at the Pownal Tannery, conducting
emergency removal.
The site phone no. is:
802/823-0131

12:00 call was returned by Lisa Danek
(EPA ESD) who is the OSC at
Pownal Tannery. She gave
me the following information:

we do not have to contact the
man who is the "caretaker" at
the site.

A breach in the wall of Lagoon 4
was noted this spring at the
northernmost end. A release
to the river definitely occurred
this spring. We may need to revise
sampling strategy to compensate.

In order to enter the former Tannery Building, we will have to be in Full Level C, due to asbestos contamination, which is extensive.

Apparently, the river flow/level continues to fluctuate greatly on a daily basis. The area of the riverbank which Lisa is familiar with is located near the former tannery building. In this area, the banks of the river are steep, and access for sampling may be difficult. She indicated it may be wise to rig up a lifeline for access to the river. I hope that further downstream, where the river is less modified, we will have easier access.

- Check w/Naida on any special precautions re: decon for asbestos.

Amendment to work plan drafted after consultation w/ Naida Gavrelis, regarding:

- Level C in former Tannery Building
- Safety lines needed on riverbanks.

08:00 Depart TRC Office in Lowell, MA

TRC Personnel: Joseph Schmidl (JS)
(Task Manager)
Scott Heim (SH)
OSHSC

EPA Personnel: Susan Sverski (SS)
(EPA SEAT)

11:20 Mack Co. Plastic Molding
located in Pownal, upstream of
site

11:23 [arrive] Onsite. Check in with EPA OSC

Calibrate HNu PI Model HW-101
Span Setting 980 EPA ID: 734974
Reading: 55 ppm Bkg: 0 ppm
Cal Gas 98.9 ppm Isobutylene 55 ppm

also using Monitor IV Rad Meter
No Calibration EPA ID: 683649

met with Lisa Danek, EPA ESD
OSC for the Removal Action
OHM is the removal contractor

appears to be a trenching system in
basement which leads to the screen house.
screen house most likely pumped to
Lagoon #1

EPA has searched and recovered some drums
from the site, and may have identified
drums of sulfuric acid.

they have collected shallow soil samples
from the surface of lagoons 2, 4, 5.
Landfill Leachate is collected in a 6000-gal steel UST.
The State of Vermont collects leachate in a truck
from the landfill and disposes of it
to Lagoon #5. State will sample monitoring
and residential wells in late May

There are questions as to whether the
leachate collection system is
operating properly - it is not maintained.

Sediment has been deposited outside of
Lagoon #4 beyond the breach. They have
collected a soil sample there.

Number	Time	Dir. Facing	Description

NONE
TAKEN

Number	Time	Dir. Facing	Description

NONE
TAKEN

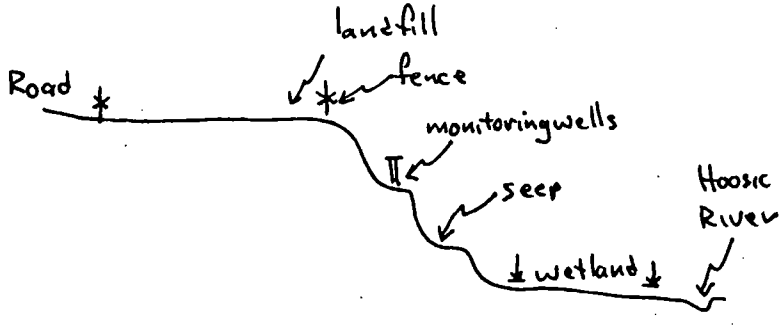
11:55 we are aske[d] to read and sign off on the HASP for the site before we access the site.

12:24 at Landfill - located a monitoring well capped and locked SE of landfill
Camera will not work - no photos taken

12:27 at NE side of landfill
slope falls in two steps - middle step is an impassable road. Below the step is a wetland.

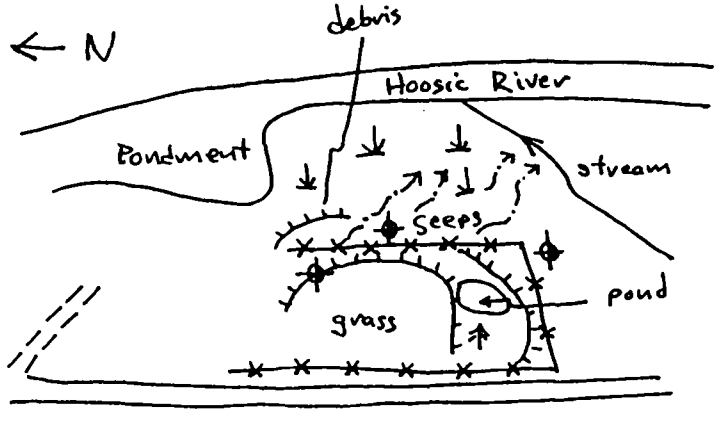
Because of the seeps here we will need to collect an upgradient sample here.

M well North of landfill is not locked, nor capped when screened - no readings



X-section of landfill topography

Sketch of Landfill Vicinity



a great deal of tires, and automotive debris, as well as at least 3 55-gallon drums, are noted on the north side of the landfill.

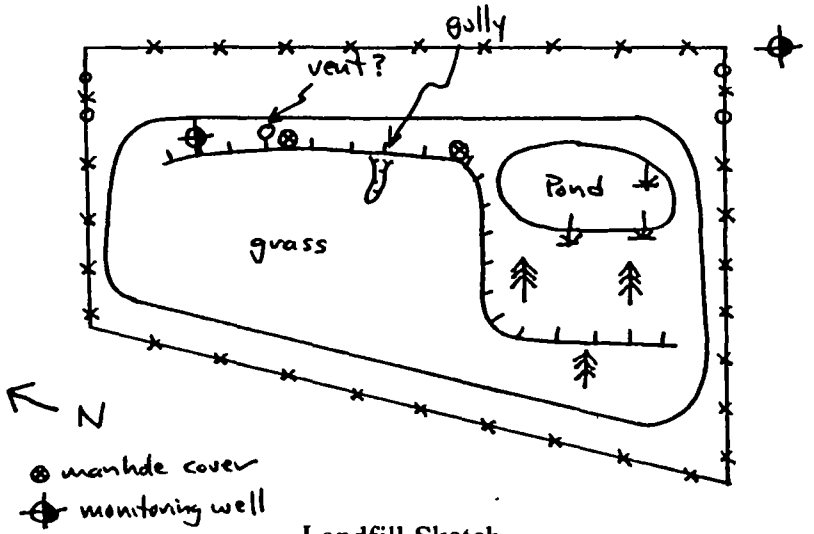
Water is ponded in the unclosed cell Phragmites, Typha are growing at the edges. the rest of the cell is covered with grass.

On the closed cells, there is no water ponded.
some liner is exposed, north of the liner [landfill].

a piece of 4" PVC Stickup is located below the middle drain. it is full of water above ground level, with out a waterproof cap.

a monitoring well is located farther west it is capped, but the lock is not locked.

13:05 Back at van - proceed to Lagoons



Landfill Sketch

Notes Regarding Landfill Sampling:
Plan to collect a sample along leachate stream from wetland to document release.

We will also want to collect background sediment samples, at least one.
Lagoon Recon:
noted well L-1 capped, not locked.

an inflow stream is noted at the midway point between L-2 and L-2,

on the south side of the river -
will need to sample this stream.

13:17 at junction of Lagoons #1 and 5, on
south side Lagoon #5 is full of
water. Lagoon #1 is capped and
has a depression on top - Typha
and Phragmites are growing in the
depression.
L-2, is a red pipe with a handle -
appears to be rusted shut.

at the junction between Lagoons #1 and #5
at the river there is a bend which
is a point bar with good sediment-
ation. Sample Location SD-03-07
is flagged.

SS notes a leachate seep between
Lagoon #1 and #5. No reading on HNu.

foundation of Press Building is in place -
building is gone.

Bluegill sunfish noted in Lagoon #5

White flag placed at leachate seep
from Lagoon #1 to #5
this sample may be leachate
(it is flowing today) or may be
sediment, if dry when we return.
SW/SD-03-08.

The near end of Lagoon #4 is dry and
vegetated with grass. From this vantage
point, we can see water at the north end -
the raised center berm is apparent,
but subtle. Fencing intact along south
lagoons #1 and #3.

14:00 at south end of Lagoon #5
put sample flag at location SW-03-04
SD-03-04/05 - at beginning of
weir which releases to the river
the weir does not seem to run
at this time. Logs are
piled in the channel, indicating
periodic (Spring high water) flow.

Locate pin flag outside of
Lagoon #5 at outfall to
Hoosic River, centered betw. lagoon & river.

Bedrock noted on south bank of
Hoosic River, alongside Lagoon #4.

Isolated rectangular pools noted in
Lagoon #4 no leachate seeps
from Lagoon #4 to the river noted.

Deer tracks noted in sediment of
Lagoon #4

Island noted in river near north end
of lagoon #4 - ~ 100' long. vegetated
with grasses, which are bent downstream,
suggesting inundation, periodically.

The southern pool in Lagoon #4 is flowing
toward the northern end

soil in lagoon is fine sand, and
brown to grey-green in color.

a distinct cut in the inside bank
is noted along Lagoon 4, apparently
anthropomorphic.
Animal track/slide is noted north of the cut.

at breach at northern end of Lagoon 4
water is not flowing at present. EPA OSC
indicated that it did flow this spring.
we noted scoopula location at the north end of Lagoon #4 about 20 feet from the river.

Not much wetland noted to the
limit of the Pownal property.

Walked back along the inside edge of Lagoon #4 -
noted grey-green material mixed in
with brown silt in Lagoon #4.
14:50 at L-3 not locked - [or] capped
L-4 not found

14:55 at L-15 not locked, protective
stickup loose - pump tubing
in well.

we locate L-13 - capped, not locked. Plastic cap is hard to remove, so we don't.

well L-11 possibly noted

well L-12 not noted

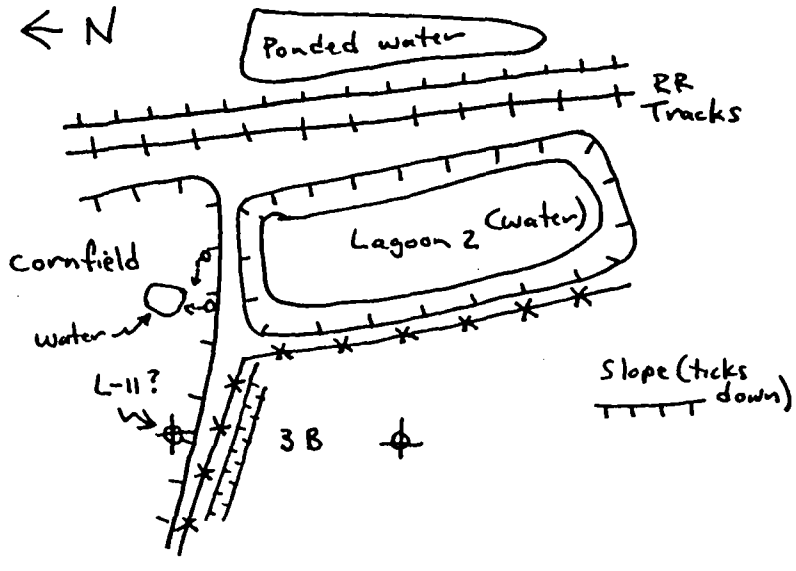
Lagoons #3A and #3B are completely vegetated with grass and small trees. Cannot see Lagoon #4A.

Lagoon #2 is wet and contains Phragmites and Typha

at L-5 capped & locked

exit Lagoon area -
15:15 secured gate behind us.

Lagoon #2 is full of water, clear, stained brown, apparently deep. Some wetlands vegetation has established.



It is apparent while looking at Lagoon #2 from the southwest, that water level in Lagoon #2 is ~ the same height as the cornfield to the north, perhaps higher. The corner of the cornfield adjacent to the Lagoon is very wet. From inside the fence, we cannot inspect the slope for springs. The ponded water north of Lagoon #2 comes from seeps at the base of Lagoon #2.

15:25 met with Lisa Danek following our recon

indicated that an old lagoon may
have been an old landfill

also - there is a possible sewage
outfall to the river even with the
north end of the warehouse
toilet paper is visible in the
effluent.

16:00 Upgrade to Level C -
Led by Pat Ball (OHM) around the Mill

Into the Main Room weather obviously
infiltrates the building.
Floor is wood, wet, and boards
are rotting and loosening.

Floor sumps noted
lead to a trench on the
river side of the building. This
trench discharges to the Hoosic R.

salt holding tank in basement
is still 1/2 full

a ground water seep is located in the basement
in ~ the center and
flows into the collection
system.

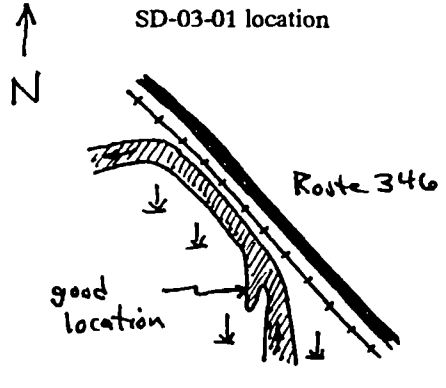
fisherman is noted across
the river from the site.

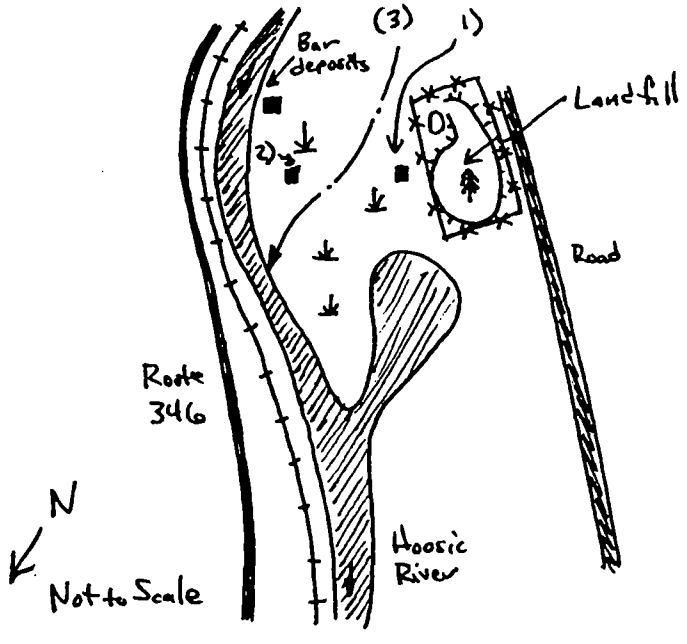
Basement floor is Brick, with
trenches along both sides.
The first floor is used to store hazardous
materials which are sorted out
are collected at the north end
of the first floor. Containers from
all over the building are collected here.
4 cans of tetrahydrofuran have
been recovered - it is stored in
the "bomb room" because it is shock sensitive.

16:45 Out of Level C - check out with Lisa Danek
decon in OHM area

16:55 Drove downstream of the site to attempt to locate downstream sample location Noted a stream (located on Quad) which flows into the river from the north. This will have to be accounted for in sampling strategy. A possible good location is identified for the sediment sample, but is located ~ 1/2 mile downstream, perhaps too far. Significant wetlands are noted upstream from this spot, but will be accessible only by boat. We should check on whether we can use the ARCS boat, as the river flows pretty rapidly here. A canoe would be more useful.

sketch of potential SD-03-01 location





17:10 Drove to upstream of site on route 346. looked across river to landfill. noted that I have it mislocated on the site sketch. the only place to collect an upstream river sample is from the landfill side of the river, across wetlands downgradient of the landfill. these wetlands are wooded, and may be difficult to cross.

Two, possibly 3 sediment samples should be collected.

1) leachate sample from landfill. collect >200' inside wetland to confirm Level II target.
2) sediment sample upstream from all sources, to use for comparison with downstream data.
3) upstream river sediment sample from a point bar on the inside bend of river

17:20 Offsite for day

No readings on HNu above background

Follow-up notes:

the fields located NE of the railroad tracks located adjacent to Lagoon #2 are flooded adjacent to the RR tracks. This is possibly tied to high water, blockage in the stream to the north, or possible GW discharge from Lagoon #2

Check w/ Diane Stallings, regarding the necessity of submitting a release memo regarding the apparent release from Lagoon 2 to the cornfield. She indicates no.

Attached Site Sketch
with notes made on
5/3/93 by
Joseph Schmidl

06:40 Depart Lowell, TRC Offices
Field Team Joseph Schmidl (JS)
Andrew Hargens (AH)
Scott James (SJ)
John Nelson (JN)
Cathy Gabis (CG)

we become separated from
each other at Greenfield, MA

10:40 All TRC Personnel onsite.

Calibrate HNus
#2 S/N A70329
EPA ID 434974
calibrates to 55 ppm
span set at 862

#4A S/N
EPA ID
Calibrates to
Span set at

11:00 J. Nelson S James depart to collect sample SD-03-01 and SD-03-02.

11:10 at Location SD-03-03 we begin recon in the area to prep for sampling

11:25 JS/SJ are visible on the bank opposite SD-03-03

Photos #1-5A taken earlier

#1 view of north side of Tannery Bldg. facing SE.

#2 View along Hoosic river - facing E note lack of diking to river

#3 View along Hoosic R. of Tannery - facing NE

#4 View along tannery bldg. - SE end - facing SE

#5 View of SE end of tannery - facing NW

11:45 Photo #6 facing SE to sample location SD-03-01

11:30 proceed to north end of Lagoon #4

Photo #7 facing E looking upstream along
11:46 Hoosic River

Photo #8 facing E Note: wetland along South bank

Photo #9 facing SE at south end of Lagoon 4 where OHM collected its sample

11:50 Photo #10 facing NW toward NW end of Lagoon 4

11:56 Photo #11-12 at NW corner of Lagoon 2

Sample SD-03-01/02 collected at 11:50 by JN and SJ. 0"-2" deep

12:00 Photo # 13 + 14 facing west from east end of Lagoon #4

12:02 back at vehicle

12:05 collect sample SD-03-03 0"-3" deep (AH)

Photo #15 looking west from road to SD-03-03

Photo #16 facing E toward lagoon 5 to SD-03-03

12:12 Sample SD-03-04 collected by CG - 0"-3" deep.

12:14 Photo #17 looking W end of Lagoon #5 to SD-03-04

12:27 at location SD-03-07 collected at upstream end of little bar at base of road. collected by AH. 0"-2" deep. Photo #18 SD-03-07

12:29 Photo #19 Photo of MW on S side of lagoon #5, midway along its length. note no cap, no lock, and no concrete footing.

12:40 return to Command Post - JN/SJ have returned from sampling

field team breaks for fluids

13:10 onsite at Landfill

AH/SJ move out to collect SD-03-05

13:20 AH calls in to notify us that additional leachate streams flow into the embayment on the river.

13:30 Rinsate Blank RB-03-10.

Sample Descriptions

SD-03-01/02 Medium to coarse sand, little fine sand and silt, brown, wet.

SD-03-03 Brown fine sand and silt, little clay, wet.

SD-03-04 Medium to fine Brown sand, little silt - wet

SD-03-05 Grey-brown Silt, little fine sand, wet trace organics

SD-03-06 Grey-brown Silt, trace clay, some roots, wet

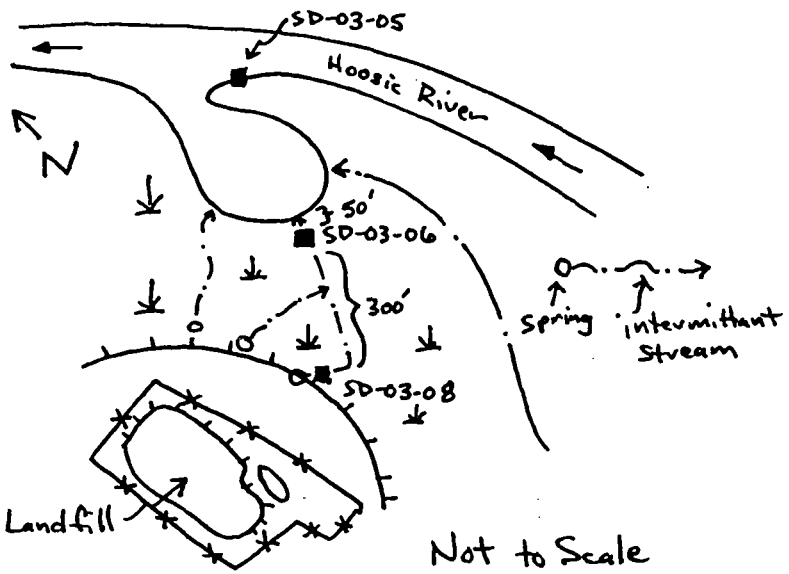
SD-03-07 Medium to coarse Brown sand, little fine sand and silt, wet

SD-03-08 Brown, med[ium] to coarse Sand, little fine sand and silt, wet

SD-03-09 Not collected

13:40 sample SD-03-05 collected by AH, SJ. collected 0"-3" deep.

13:50 move out to location SD-03-06 based on the location of SD-03-05, there is no need for sample SD-03-09



Sample SD-03-06 collected at 14:30
by JS. 0"-3" deep.

Sample SD-03-08 collected at 14:40
by CG. 0"-3" deep.

14:30 Using a tape measure, the distance along the drainage route from sample location SD-03-08 was measured. At 300 feet, sample SD-03-06 was collected. Then Sample SD-03-08 was collected, 0"-3" deep.

15:00 Return to vehicles - establish decon line and decon equipment. Pack samples - do paperwork.

AH is attacked by ants and is stung several times on the arm. The stings swell and then go down. The stings are washed with soap and water, and Andrew puts Ice on it.

No readings above background on HNu all day.

16:15 Keys returned to OSC and Field Team Checks out.

travel to Bennington, VT to drop samples at the Ramada Inn,

where a regular pickup occurs at
16:45.
Arrive at Ramada at 16:35.

09:50 Contacted Nina Smith
(Region I SMO)
to transmit shipping Info.

Case No.: 20136
Organic Lab CompuChem Lab.
Inorganic Lab Chemtech Consulting

8 soil/sed 1 aq.

Full TCL and TAL + CN
analyses

Fed Ex Airbill
Organic: 6969419435
Inorganic: 6969419446

shipment for case complete.

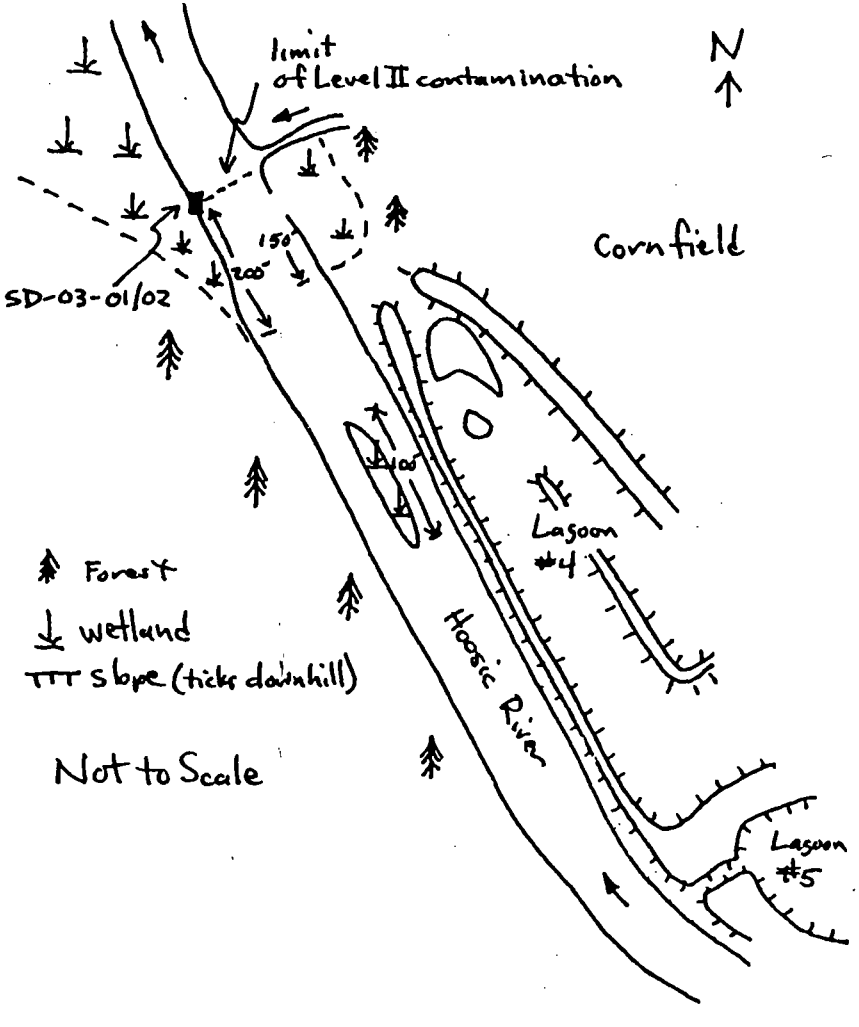
13:55 I called Sharon Hayes, EPA to find out who Jane Downing, EPA is and how to reach her. Both Jane Downing and Nancy Barmakian, EPA are now Section Chiefs in other areas. The EPA contact for Pownal Tannery Lagoons is now Michael Jezinski (sp?) at 573-5786 (617). I left a message with him to obtain a copy of the M&E report.

14:17 contacted Mary Dever (EPA). she indicated that Lisa Danek is at Pownal Today, but not regularly anymore. (The removal activities must be done). She will attempt to contact Lisa regarding getting us the type, quantity, and containment characteristics of the former tannery building contents. She will call back in 1-2 days.

using the USGS North Pownal Quadrangle Map, the distances to Sample location SD-03-01 and SD-03-02 were measured from both the outfall from Lagoon #5 and the outfall/breach from Lagoon #4.

The outfall from Lagoon #5 is approximately 3000 feet (0.57 miles) upstream of sample locations SD-03-01/02. The outfall/breach from Lagoon #4 is approximately 350-325 feet upstream of sample locations SD-03-01/02.

Based on Field Notes from pp. 16-17
and p. 26, the following areas
of wetland were defined adjacent
to the site along the Hoosic River



Small riparian wetlands consisting of
ash-leaved maple and sensitive fern were
identified by Scott Heim (TRCC)
during site reconnaissance.

The sketch on page 38 summarizes
distances of wetland frontage to
the Hoosic River. These include:

- 200 feet along the SW bank of the Hoosic River
- 150′ feet along the NE bank of the Hoosic River
- both sides of the ~ 100′ island in the Hoosic River (200′)

total wetland frontage between
outfall from Lagoon #5 and
sample location SD-03-01/02 is
200 + 150 + 200 feet = 550 feet.
550 feet ÷ 5280 ft/mile = 0.10 miles

REFERENCE 9

LAIDLAW ENVIRONMENTAL SERVICES

NORTH CAROLINA HAZARDOUS WASTE MANIFEST

Form Approved OMB No. 2050-0039.

FORM HAZARDOUS WASTE MANIFEST | 1. Generator's US EPA ID No. V T D 0 0 2 0 7 4 8 3 9 | Manifest Document No. 1 9 6 3 3 9 | 2. Page 1 of 1 | Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
US EPA Region I Laboratory Attn: Lisa Danek
60 Westview Ave. Lexington, MA 02173
4. Generator's Phone (617) 223-7265

A. State Manifest Document Number

B. State Generator's ID Pownal Tannery Site, Rte 346 and Depot Rd Pownal, VT 05260

5. Transporter 1 Company Name: Price Trucking Corp.
6. US EPA ID Number: N Y D 0 4 6 7 6 5 5 7 4
C. State Transporter's ID 9710 W N.Y.
D. Transporter's Phone 716/822-1414

7. Transporter 2 Company Name
8. US EPA ID Number
E. State Transporter's ID
F. Transporter's Phone

9. Designated Facility Name and Site Address
LAIDLAW ENV. SVCS. (TS), INC.
208 Watlington Ind. Drive
Reidsville, NC 27320
10. US EPA ID Number: N C D 0 0 0 6 4 8 4 5 1
G. State Facility's ID
H. Facility's Phone 919/342-6106

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. RQ Hazardous Waste Solid, n.o.s. (sulfide compounds) 9 UN3077 PGIII (D003)	02	DM	800	P	D003
b. RQ Hazardous Waste Liquid, n.o.s. (sulfide compounds) 9 UN3082 PGIII (D003)	01	DF	500	P	D003
c.					

J. Additional Description for Materials Listed Above
11a. RVUFD-101
11b. RVUFD-102

K. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information
P.O. 48540
In case of emergency, contact John Tobin, (800) 242-4644

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations, and all applicable state laws and regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name: LISA A. DANEK | Signature: Lisa A. Danek (Agent for US EPA) | Month 10 | Day 12 | Year 93

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: John Rosenbaum | Signature: John Rosenbaum | Month 10 | Day 12 | Year 93

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name | Signature | Month | Day | Year

Discrepancy Indication Space
Item 11a. is RVUFD-102, 11b is RVUFD-101

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19
Printed/Typed Name | Signature | Month | Day | Year

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE
One Winter Street Boston, Massachusetts 02108

REFERENCE 10 314-

DEP

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. VTD002074839
Manifest Document No. 78251
2. Page 1 of 1
Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
US EPA REGION I LABORATRY Attn: Lisa Danek
60 WESTVIEW AVENUE
LEXINGTON MA 02173

4. Generator's Phone (802) 823-0107

A. State Manifest Document Number MA H 314048
B. State Gen. ID RTE 346 & DEPOT ROAD POWNAL VT

5. Transporter 1 Company Name LAIDLAW ENV. SVCS. (NORTH EAST), INC.
6. US EPA ID Number MAD000604447
C. State Trans. ID A60053 Ma.
D. Transporter's Phone (508 683-1002

7. Transporter 2 Company Name
8. US EPA ID Number
E. State Trans. ID
F. Transporter's Phone ( )

9. Designated Facility Name and Site Address
LAIDLAW ENVIRONMENTAL SERVICES (NORTH EAST), INC.
300 CANAL STREET
LAWRENCE MA
10. US EPA ID Number MAD000604447
G. State Facility's ID NOT REQUIRED
H. Facility's Phone (508 683-1002

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. RQ, Waste Oxidizing Substances Liquid, Corrosive, n.o.s. (Hydrogen Peroxide, Silver nitrate) 5.1 UN3098 PG II (D001, D011)	1	DF	80	P	D001, D002 D011
b. Waste Oxidizing Substances, Liquid, Corrosive, n.o.s. (Sodium hypochlorite, Sodium Peroxide) 5.1 UN3098 PG II	1	DF	20	P	D001 D002
c. Waste Corrosive Liquids, Poisonous, n.o.s. (Sodium Azide, Sodium Hydroxide) 8 UN2922 PG II	1	DF	15	P	D002
d. RQ, Waste Cyanides, Inorganic, n.o.s. (Cyanide Salt) 6.1 UN1588 PG I (P030)	1	DF	15	P	P030

J. Additional Descriptions for Materials Listed Above (include physical state and hazard code.)
a. L7825-05 Lab Pack
b. L7825-06 Lab Pack
c. L7825-07 Lab Pack
d. L7825-08 Lab Pack

K. Handling Codes for Wastes Listed Above
a. S01
b. S01
c. S01
d. S01

15. Special Handling Instructions and Additional Information
Ia (cont.) DOTE10161 Ib (cont.) ~~DOTE10161~~ (LA) Ic (cont.) Id (cont.) ~~DOTE~~ 1923
For additional information on lab packs, see attached container contents sheets.

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.
If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.
IN EMERGENCY SITUATION CONTACT LAIDLAW (NORTH EAST) 508-683-1002

Printed/Typed Name: LISA A. DANEK | Signature: [signature] Agent for USEPA | Date: Month Day Year 06 24 93

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: Marc A. Giavis | Signature: [signature] | Date: Month Day Year 06 24 93

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name | Signature | Date: Month Day Year

19. Discrepancy Indication Space
845 am
1A 11d add (Drum) 15 d change 8 to 7 (1923) 1 K Per 3 [illegible]

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.
Printed/Typed Name: [illegible] | Signature: [signature] | Date: Month Day Year [illegible]

In case of emergency or spill, immediately call the National Response Center (800) 424-8802.

MA H 314048 COPY 3: FACILITY MAILS TO GENERATOR

Form Approved OMB No. 2050-0039. Expires 9-30-94
EPA Form 8700-22 (Rev. 9-88) Previous editions are obsolete.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE
One Winter Street Boston, Massachusetts 02108

316

REFERENCE 11

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator's US EPA ID No. VTL002074839	Manifest Document No. 78250	2. Page 1 of 1 — Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
US EPA REGION I LABORATRY Attn: Lisa Danek
60 WESTVIEW AVENUE
LEXINGTON MA 02173
4. Generator's Phone (803) 823-0107

A. State Manifest Document Number: MA H 314047
B. State Gen. ID: RTE 346 & DEPOT ROAD EGYPT VT
C. State Trans. ID: A60053
D. Transporter's Phone (508 683 1002
E. State Trans. ID
F. Transporter's Phone ( )
G. State Facility's ID: NOT REQUIRED
H. Facility's Phone (508 683-1002

5. Transporter 1 Company Name: LAIDLAW ENV. SVCS. (NORTH EAST), INC. 6. US EPA ID Number: MAD000604447
7. Transporter 2 Company Name 8. US EPA ID Number

9. Designated Facility Name and Site Address
LAIDLAW ENVIRONMENTAL SERVICES (NORTH EAST), INC.
300 CANAL STREET
LAWRENCE MA
10. US EPA ID Number: MAD000604447

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. Waste Caustic Alkali Liquids, n.o.s. (Sodium Hydroxide) 8 UN1719 PG II	1	DF	60	P	D002
b. RQ, Waste Poisonous Liquids, n.o.s. (Phenol, 1,1,1-Trichloroethane) 6.1 UN2810 PG II (D003, U144)	1	DF	125	P	D038, U188 F002, U144
c. Waste Flammable Liquids, n.o.s. (Ethanol, Petroleum Distillates) 3 UN1993 PG II	1	DF	20	P	D001
State Regulated Oil Waste	1	DF	90	P	MA01 VT02

J. Additional Descriptions for Materials Listed Above (include physical state and hazard code.)
a. L7825-01 (I) Lab Pack
b. L7825-03 (I) Lab Pack
c. L7825-04 (I) Lab Pack
d. L7825-02 (I) Lab Pack

K. Handling Codes for Wastes Listed Above
a. S 0 1 c. S 0 1
b. S 0 1 d. S 0 1

15. Special Handling Instructions and Additional Information
Ia (cont.) DOTE10161 Ib (cont.) DOTE10161 Ic (cont.) Corrosive Flammable DOTE10161 Id (cont.)
For additional information on lab packs see attached container contents sheets

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.
If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.
IN EMERGENCY SITUATION CONTACT LAIDLAW (NORTH EAST) 508-683-1002

Printed/Typed Name	Signature	Date (Month Day Year)
LISA A DANEK	Lisa A. Danek	06 21 93

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)
Marc A. Giavis	Marc A. Giavis	06 21 93

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)

19. Discrepancy Indication Space

J. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Date (Month Day Year)
SHAWN D. DAVIS	Shawn D. Davis	6 21 93

Form Approved OMB No. 2050-0039 Expires 9-30-94
EPA Form 8700-22 (Rev. 9-88) Previous editions are obsolete.

IIA H 314047 COPY 3: FACILITY MAILS TO GENERATOR

In case of emergency or spill, immediately call the National Response Center (800) 424-8802.

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE
One Winter Street Boston, Massachusetts 02108

REFERENCE 12 3/8

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of 1	Information in the shaded areas is not required by Federal law.
VTD002074839	78252		

3. Generator's Name and Mailing Address
US EPA REGION I LABORATRY Attn: Lisa Danek
60 WESTVIEW AVENUE
LEXINGTON MA 02173

4. Generator's Phone (802) 823-0107

A. State Manifest Document Number: MA H 314032
B. State Gen. ID: RTE 346 & DEPOT ROAD PONDIAL VT
C. State Trans. ID: A60053 Ma.
D. Transporter's Phone (508 683-1002
E. State Trans. ID:
F. Transporter's Phone ( )
G. State Facility's ID: NOT REQUIRED
H. Facility's Phone (508 683-1002

5. Transporter 1 Company Name: LAIDLAW ENV. SVCS. (NORTH EAST), INC.
6. US EPA ID Number: MAD000604447
7. Transporter 2 Company Name
8. US EPA ID Number
9. Designated Facility Name and Site Address: LAIDLAW ENVIRONMENTAL SERVICES (NORTH EAST), INC.
300 CANAL STREET
LAWRENCE MA
10. US EPA ID Number: MAD000604447

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. RQ, Waste Corrosive Liquids, N.O.S. (Sulfuric Acid, Hydrochloric Acid) 8 UN1760 PG II (D002, D009)	1	DF	100	P	D002 D009
b. RQ, Waste Corrosive Liquids, N.O.S. (Sulfuric acid, mercuric sulfate) 8 UN1760 II (D002, D009)	1	DF	25	P	D009 D002
c. RQ, Waste Poisonous Solids, N.O.S. (Mercuric Iodide) 6.1 UN2811 II D009	1	DH	15	P	D009
d.					

J. Additional Descriptions for Materials Listed Above (include physical state and hazard code.)
a. L7825-09 (P) Lab Pack
L7825-11 (P) Lab Pack
b. L7825-10 (91) Lab Pack
d.

K. Handling Codes for Wastes Listed Above
a. S 0 1
c. S 0 1
b. S 0 1
d.

15. Special Handling Instructions and Additional Information
Ia (cont.) DOT7016 Ib (cont.) Ic (cont.) Id (cont.)
For additional information on lab packs, see attached container contents sheets.

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.
If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.
IN EMERGENCY SITUATION CONTACT LAIDLAW (NORTH EAST) 508-683-1002

Printed/Typed Name	Signature	Date (Month Day Year)
LISA A DANEK	Lisa A. Danek	06 24 93

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)
Marc A. Giavis	Marc A. Giavis	06 24 93

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.

Printed/Typed Name	Signature	Date (Month Day Year)
Silvana D. Dias	Silvana D. Dias	06 24 93

Form Approved OMB No. 2050-0039. Expires 9-30-94
EPA Form 8700-22 (Rev. 9-88) Previous editions are obsolete.

GENERATOR

TRANSPORTER

FAC

In case of emergency or spill, immediately call the National Response Center (800) 424-8802.

MA H 314032 COPY>3: FACILITY MAILS TO GENERATOR

COPY>3: FACILITY MAILS TO GENERATOR

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE
One Winter Street Boston, Massachusetts 02108

REFERENCE 13

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.: MED020748339 | Manifest Document No.: 7825 | 2. Page 1 of 1 | Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
US EPA REGION I LABORATORY Attn: Lisa Danek
60 WESTVIEW AVENUE
LEXINGTON MA 02173

4. Generator's Phone (803) 822-0107

A. State Manifest Document Number: MA H 314033
B. State Gen. ID: RTE 346 & DEPOT ROAD
C. State Trans. ID: MA 24139 VT
D. Transporter's Phone (508 683-1002
E. State Trans. ID:
F. Transporter's Phone ( )
G. State Facility's ID: NOT REQUIRED
H. Facility's Phone (508 683-1002

5. Transporter 1 Company Name: LAIDLAW ENV. SVES. (NORTH EAST), INC. | 6. US EPA ID Number: MAD000604447

7. Transporter 2 Company Name | 8. US EPA ID Number

9. Designated Facility Name and Site Address
LAIDLAW ENVIRONMENTAL SERVICES (NORTH EAST), INC.
300 CANAL STREET
LAWRENCE MA

10. US EPA ID Number: MAD000604447

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. RQ, Waste Oxidizing Substances Solid, Corrosive, n.o.s. (hydrochloric acid, hydrogen peroxide) 5.1 UN3085 II (D001)	3	DM	1200	P	D001
b. RQ Waste Potassium Nitrate, mixture 5.1 UN1486 III (D001)	1	DM	400	P	D001
c. RQ, Waste Ammonium Persulfate, mixture 5.1 UN1444 III D001	1	DF	400	P	D001
d. RQ, White Asbestos, chrysotile, mixture (MA99) 9 UN2590 III	1	DM	400	P	MA99

J. Additional Descriptions for Materials Listed Above (include physical state and hazard code)
a. L7826-LES-62,63,64 (D) Solid Oxidizer/debris (E)
b. L7826-LES-59
c. L7826-LES-60, (F) Solid Oxidizer/debris (A)
d. L7826-LES-18 (B) Contains w/ Asbestos

K. Handling Codes for Wastes Listed Above
a. S 0 1 1 b. S 0 1 1 c. S 1 9 1 d. S 0 1 1

15. Special Handling Instructions and Additional Information
15a (cont.) 15b (cont.) 15c (cont.) 15d (cont.)
Combined Amount

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.
If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.
IN EMERGENCY SITUATION CONTACT LAIDLAW (NORTH EAST) 508-683-1002

Printed/Typed Name: X LISA A. DANEK | Signature: Lisa A. Danek / REGION I EPA | Date: Month 06 Day 24 Year 93

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: [illegible] | Signature: [signature] | Date: Month 06 Day 24 Year 93

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name | Signature | Date: Month Day Year

FACILITY

19. Discrepancy Indication Space
In IId add (MA99) OK per Bill Tollman 6/28/93 9:05 AM

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.
Printed/Typed Name: SHARON T. DAVIS | Signature: [signature] | Date: Month 06 Day 28 Year 93

Form Approved OMB No. 2050-0039. Expires 9-30-94
EPA Form 8700-22 (Rev. 9-88) Previous editions are obsolete.

In case of emergency or spill, immediately c... National Response Center (800) 424-8802.

GENERATOR

COPY > 3: FACILITY MAILS TO GENERATOR

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE
One Winter Street Boston, Massachusetts 02108

REFERENCE 14

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of 1	Information in the shaded areas is not required by Federal law.
VTD002074839	78266		

3. Generator's Name and Mailing Address
US EPA REGION I LABORATRY Attn: Lisa Danek
60 WESTVIEW AVENUE
LEXINGTON MA 02173

4. Generator's Phone (802) 823-0107

A. State Manifest Document Number: MA H 314034
B. State Gen. ID: RTE 346 & DEPOT ROAD PONNAL VT
C. State Trans. ID: MA24139
D. Transporter's Phone (508 683 1002
E. State Trans. ID:
F. Transporter's Phone ( )
G. State Facility's ID: NOT REQUIRED
H. Facility's Phone (508 683-1002

5. Transporter 1 Company Name: LAIDLAW ENV. SVCS. (NORTH EAST), INC.
6. US EPA ID Number: MAD000604447
7. Transporter 2 Company Name
8. US EPA ID Number
9. Designated Facility Name and Site Address: LAIDLAW ENVIRONMENTAL SERVICES (NORTH EAST), INC.
300 CANAL STREET
LAWRENCE MA
10. US EPA ID Number: MAD000604447

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. RQ, Waste Oxidizing Substances Solid, n.o.s. (magnesium persulfate, Potassium nitrate) 5.1 UN1479 II D001	1	DM	400	P	D001
b. RQ, Waste Ammonium Persulfate, mixture 5.1 UN 1444 III D001	1	DM	400	P	D001
c. RQ, Waste Ammonium Persulfate, mixture 5.1 UN1444 III D001	1	DM	400	P	D001
d.					

J. Additional Descriptions for Materials Listed Above (Include physical state and hazard code)
a. L7826-LES-57 (G1) Oxidizer contaminated debris
b. L7826-LES-58 (C1) debris w/ oxidizer, dirt
c. L7826-LES-61 (F1)
d.

K. Handling Codes for Wastes Listed Above
a. S01 c. S01
b. S01 d.

15. Special Handling Instructions and Additional Information
Ia (cont.) Ib (cont.) Ic (cont.) Id (cont.

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.
If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.
IN EMERGENCY SITUATION CONTACT LAIDLAW (NORTH EAST) 508-683-1002

Printed/Typed Name	Signature	Date (Month Day Year)
LISA A DANEK		10 22 93

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)
Gene A Vitt		10 22 93

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.

Printed/Typed Name	Signature	Date (Month Day Year)
Miriam D. Dias		10 24 93

Form Approved OMB No. 2050-0039 Expires 9-30-94
EPA Form 3700-22 (Rev. 9-88) Previous editions are obsolete

GENERATOR

TRANSPORTER

FACILITY

In case of emergency or spill, immediately call National Response Center (800) 424-8802.

MA H 314034 COPY>3: FACILITY MAILS TO GENERATOR

COPY>3: FACILITY MAILS TO GENERATOR

324

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE
One Winter Street Boston, Massachusetts 02108

REFERENCE 15

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. VTD002074839 — Manifest Document No. 78264
2. Page 1 of 1 — Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
US EPA REGION I LABORATRY LISA DANEK
60 WESTVIEW AVENUE
LEXINGTON MA 02173
4. Generator's Phone (802) 823-0107

A. State Manifest Document Number: MA H 314043
B. State Gen. ID: RTE 346 & DEPOT ROAD
C. State Trans. ID: MA 24139
D. Transporter's Phone (508) 683-1002
E. State Trans. ID
F. Transporter's Phone ( )
G. State Facility's ID: NOT REQUIRED
H. Facility's Phone (508) 683-1002

5. Transporter 1 Company Name: LAIDLAW ENV. SVCS. (NORTH EAST), INC. 6. US EPA ID Number: MAD000604447
7. Transporter 2 Company Name 8. US EPA ID Number
9. Designated Facility Name and Site Address: LAIDLAW ENVIRONMENTAL SERVICES (NORTH EAST), INC. 300 CANAL STREET LAWRENCE MA — 10. US EPA ID Number: MAD000604447

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. STATE REGULATED OIL WASTE	5	DM	1500	P	MA01 VT02
b. STATE REGULATED OIL WASTE	7	CF	2100	P	MA01 VT02
c. STATE Regulated oil waste	1	DM	400	P	MA01 VT02
d. NON Regulated material	1	DM	100	P	MA99

J. Additional Descriptions for Materials Listed Above (include physical state and hazard code)
a. L7806-LES-34, 42, 56, 53, 50 (E) — c. pigment, PPE, oil L7826-LES-26 (F)
b. PPE w/ oil (U) L7826-LES-85, 86, 87, 88, 89, 90, 91 — d. art pigment Surfactant L7826-LES-67 (J)

K. Handling Codes for Wastes Listed Above: a. S01 b. S01 c. S01 d. S01

15. Special Handling Instructions and Additional Information
Ia (cont.) Ib (cont.) Ic (cont.) Id (cont.)

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.
If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.
IN EMERGENCY SITUATION CONTACT LAIDLAW (NORTH EAST) 508-683-1002

Printed/Typed Name: LISA A DANEK — Signature: [signature] (Agent for USEPA) — Date: 06 24 93
17. Transporter 1 Acknowledgement of Receipt of Materials — Printed/Typed Name: Charles A. [signature] — Signature: [signature] — Date: 06 24 93
18. Transporter 2 Acknowledgement of Receipt of Materials — Printed/Typed Name — Signature — Date: Month Day Year
19. Discrepancy Indication Space
Section J (b) add 89, 90, 91 per Bill Tallman 6/25/93
20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.
Printed/Typed Name — Signature — Date: Month Day Year

Form Approved OMB No 2050-0039. Expires 9-30-94
EPA Form 8700-22 (Rev. 9-88) Previous editions are obsolete

In case of emergency or spill, immediately call National Response Center (800) 424-8802.

MA H 314043 COPY 3: FACILITY MAILS TO GENERATOR

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE
One Winter Street Boston, Massachusetts 02108

3.26

REFERENCE 16 76657
MAH 314044

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. VTD002074839 | Manifest Document No. 78263 | 2. Page 1 of 1 | Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
US EPA REGION 1 LABORATRY
60 WESTVIEW AVENUE
LEXINGTON MA 02173

4. Generator's Phone (802) 823-0107

A. State Manifest Document Number MA H 314044
B. State Gen. ID RTE 346 & DEPOT ROAD
UNIONAL VT
C. State Trans. ID MA24139 508 683-1002
D. Transporter's Phone ( )
E. State Trans. ID
F. Transporter's Phone ( )
G. State Facility's ID NOT REQUIRED
H. Facility's Phone (508 683 1002)

5. Transporter 1 Company Name (NORTH EAST), INC. | 6. US EPA ID Number MAD000604447

7. Transporter 2 Company Name | 8. US EPA ID Number

9. Designated Facility Name and Site Address
LAIDLAW ENVIRONMENTAL SERVICES (NORTH EAST), INC.
300 CANAL STREET
LAWRENCE MA

10. US EPA ID Number MAD000604447

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. STATE REGULATED OIL WASTE	1 (LA)	DF	350	P	MA01 VT02
b. STATE REGULATED OIL WASTE	1	DM	350	P	MA01 VT02
c. STATE REGULATED OIL WASTE	25 (LA)	DM	7650	P	MA01 VT02
STATE REGULATED OIL WASTE	3	DF	1050 (LA)	P	MA01 VT02

J. Additional Descriptions for Materials Listed Above (include physical state and hazard code.)
a. L7826-LCS-37,38 (M) (E) | c. L7826-LCS-
Tar debris
b. L7826-LCS-40 (M) | d. L7826-LCS-54,36 (E)

K. Handling Codes for Wastes Listed Above
a. S 2 1 | c. S 0 1
b. S 0 1 | d. S 0 1

15. Special Handling Instructions and Additional Information
1a (cont.) 1b (cont.) 1c (cont.) 1d (cont.)
Sect J(c) 02-04, 12, 27, 29-33, 35, 38, 39, 41, 43-49, 55 (LQ)

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.
If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.
IN EMERGENCY SITUATION CONTACT LAIDLAW (NORTH EAST) 508-683-1002

Printed/Typed Name	Signature	Date (Month Day Year)
LISA A DANEK	Lisa A. Danek (Agent for US EPA)	06 24 93

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)
Charles A Vitt		06 24 93

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.

Printed/Typed Name	Signature	Date (Month Day Year)

GENERATOR
TRANSPORTER
F
TY

In case of emergency or spill, immediately call the National Response Center (800) 424-8802.

MA H 314044 COPY > 8: GENERATOR RETAINS

Form Approved OMB No. 2050-0039. Expires 9-30-94
EPA Form 8700-22 (Rev. 9-88) Previous editions are obsolete.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE
One Winter Street Boston, Massachusetts 02108

REFERENCE 17

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. [illegible]0020?4839
Manifest Document No. 78262
2. Page 1 of 1
Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
US EPA REGION I LABORATRY
60 WESTVIEW AVENUE
LEXINGTON MA 02173
4. Generator's Phone (802) 923-0107

A. State Manifest Document Number: MA H 314045
B. State Gen. ID: RTE 346 & DEPOT ROAD POWNAL VT
C. State Trans. ID: MA24139
D. Transporter's Phone (508 683-1002)
E. State Trans. ID
F. Transporter's Phone ( )
G. State Facility's ID: NOT REQUIRED
H. Facility's Phone (508 683-1002)

5. Transporter 1 Company Name: LAIDLAW ENV. SVCS. (NORTH EAST), INC.
6. US EPA ID Number: MAD000604447
7. Transporter 2 Company Name
8. US EPA ID Number

9. Designated Facility Name and Site Address
LAIDLAW ENVIRONMENTAL SERVICES (NORTH EAST), INC.
300 CANAL STREET
LAWRENCE MA
10. US EPA ID Number: MAD000604447

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. RQ, Waste Caustic Alkali liquids, n.o.s. (sodium hypochlorite) 8 UN1719 II D002	3	DF	1550	P	D002
b. STATE Regulated oil waste	1	DM	200	P	MA01 VT02
c. STATE Regulated oil waste	3	DM	1250	P	MA01 VT02
d. State Regulated oil waste	2	DF	450	P	MA01 VT02

J. Additional Descriptions for Materials Listed Above (include physical state and hazard code)
a. (sodium hypochlorite) L7826-LES-84, 78, 77 (D)
b. oil debris L7826-LES-13 (C)
c. oil water L7826-LES-65, 22, 23 (B)
d. oil water L7826-LES-24, 08 (B)

K. Handling Codes for Wastes Listed Above
a. S01 b. S01 c. S01 d. S01

15. Special Handling Instructions and Additional Information
15 (cont.) 15 (cont.) 12c. L7826-LES #05 = 85 1c (cont.) 1d (cont.)
L7826-LES-22, 23 = 55

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

IN EMERGENCY SITUATION CONTACT LAIDLAW (NORTH EAST) 508-683-1002

Printed/Typed Name: LISA A. DANEK — Signature: [signature] AGENT FOR US EPA — Date: Month Day Year 06 24 93

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: Charles H. [illegible] — Signature: [signature] — Date: Month Day Year 06 24 93

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name — Signature — Date: Month Day Year

19. Discrepancy Indication Space
6/25/93
[illegible] (Sodium hypochlorite) OK per Bill [illegible]

Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.
Printed/Typed Name: [illegible] — Signature: [signature] — Date: Month Day Year 06 25 93

Form Approved OMB No. 2050-0039. Expires 9-30-94
EPA Form 8700-22 (Rev. 9-88) Previous editions are obsolete.

MA H 314045 COPY 3: FACILITY MAILS TO GENERATOR

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE
One Winter Street Boston, Massachusetts 02108

REFERENCE 18

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. VTD002074839 — Manifest Document No. 78261
2. Page 1 of 1 — Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
US EPA REGION I LABORATRY
60 WESTVIEW AVENUE
LEXINGTON MA 02173

4. Generator's Phone (802) 823-0107

A. State Manifest Document Number: MA H 314046
B. State Gen. ID: RTE 346 & DEPOT ROAD POWNAL VT

5. Transporter 1 Company Name: LAIDLAW ENV. SVCS. (NORTH EAST), INC.
6. US EPA ID Number: MAD000604447
C. State Trans. ID: MA 24139
D. Transporter's Phone 508 683-1002

7. Transporter 2 Company Name
8. US EPA ID Number
E. State Trans. ID
F. Transporter's Phone ( )

9. Designated Facility Name and Site Address
LAIDLAW ENVIRONMENTAL SERVICES (NORTH EAST), INC.
300 CANAL STREET
LAWRENCE MA
10. US EPA ID Number: MAD000604447
G. State Facility's ID: NOT REQUIRED
H. Facility's Phone 508 683-1002

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. Waste Phosphoric Acid Solution 8 UN1805 III (D002)	1	DF	150	P	D002
b. Waste Corrosive liquids, n.o.s. 8 (muriatic acid/hydrogen peroxide) (D002)	1	DF	250	P	D002
c. Waste Sodium Hydroxide, Solution 8 UN1824 (LA) II (D002)	2	DM	850	P	D002
d. Sodium Hydroxide, Solid, mixture 8 UN1823 II (LA)	1	DM	500	P	MA99

J. Additional Descriptions for Materials Listed Above (include physical state and hazard code)
a. aqueous acid liquid L7826-LES-82 (S)
b. (muriatic acid/hydrogen peroxide) L7826-LES-69 (Q)
c. lye solution (sodium hydroxide) L7826-LES-79, 73 (A)
d. Sodium hydroxide dirt L7826-LES-68 (G)

K. Handling Codes for Wastes Listed Above
a. S01 b. S01 c. S01 d. S01

15. Special Handling Instructions and Additional Information
Ia (cont.) Ib (cont.) 12 Ic (cont.) L7826-LES-79 = 850 m lb cont. dbl. pack
L7826-LES-73 = 550 m

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

IN EMERGENCY SITUATION CONTACT LAIDLAW (NORTH EAST) 508-683-1002.

Printed/Typed Name: LISA A DANEK — Signature: [signature] Agent ... — Date: 06 24 93

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: Charles A. ... — Signature: [signature] — Date: 06 24 93

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name — Signature — Date Month Day Year

19. Discrepancy Indication Space
... muriatic acid ... ok per Bill Tollman 6/25/93 ...

20. Facility Owner or Operator Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.
Printed/Typed Name: [illegible] — Signature: [signature] — Date: [illegible]

Form Approved OMB No. 2050-0039 Expires 9-30-94
EPA Form 8700-22 (Rev. 9-88) Previous editions are obsolete.

IN CASE OF EMERGENCY OR SPILL, IMMEDIATELY CALL THE NATIONAL RESPONSE CENTER (800) 424-8802.

COPY 3: FACILITY MAILS TO GENERATOR — MA H 314046

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE
One Winter Street Boston, Massachusetts 02108

REFERENCE 19 76659
MAH 314031

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.: VTD020074839
Manifest Document No.: 78254
2. Page 1 of 1
Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
US EPA REGION I LABORATORY
60 WESTVIEW AVENUE
LEXINGTON MA 02173
4. Generator's Phone (802) 823-0107

A. State Manifest Document Number: MA H 314031
B. State Gen. ID: RTE 346 & DEPOT ROAD POMFRET VT
C. State Trans. ID: A60053 MA. 508 683 1002
D. Transporter's Phone ( )
E. State Trans. ID
F. Transporter's Phone ( )
G. State Facility's ID: NOT REQUIRED
H. Facility's Phone (508 683 1002)

5. Transporter 1 Company Name: LAIDLAW ENVIRONMENTAL SERVICES (NORTH EAST), INC.
6. US EPA ID Number: MAD000604447
7. Transporter 2 Company Name
8. US EPA ID Number
9. Designated Facility Name and Site Address: LAIDLAW ENVIRONMENTAL SERVICES (NORTH EAST), INC.
300 CANAL STREET
LAWRENCE MA
10. US EPA ID Number: MAD000604447

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
GENERATOR a. Waste 1,1,1-Trichloroethane, Solution 6.1 UN2831 PG III	2	DF	950	P	F002
b. State Regulated Oil Waste	1	DM	450	P	MA01 VT02
c. State Regulated Oil Waste	2	DF	800	P	MA01 VT02
d. State Regulated Oil Waste	1	DF	450	P	MA01 VT02

J. Additional Descriptions for Materials Listed Above (include physical state and hazard code)
a. 6.1 UN2831 1,1,1-Trichloroethane "Z" — c. L7826-LES-11506 "P" — Water/Oil
b. L7826-LES-01707 "N" — Debris w/oil
d. L7826-LES-07 "A" — Water/oil

K. Handling Codes for Wastes Listed Above
a. S01 c. S01
b. S02 d. S01

15a. Special Handling Instructions and Additional Information (cont.) 15b (cont.) 15c (cont.) 15d (cont.)
Sec. 12a.) L7826-LES-07 is an overpacked drum.

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.
If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.
IN EMERGENCY SITUATION CONTACT LAIDLAW (NORTH EAST) 508-683-1002

Printed/Typed Name	Signature	Date (Month Day Year)
LISA A DANEK	Lisa A. Danek (FACILITY EPA)	01 24 93

TRANSPORTER
17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)
Marc A. Gavis	Marc A. Gavis	01 24 93

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)

FACILITY
19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.

Printed/Typed Name	Signature	Date (Month Day Year)

Form Approved OMB No. 2050-0039. Expires 9-30-94
EPA Form 8700-22 (Rev. 9-88) Previous editions are obsolete.

COPY A: GENERATOR RETAINS

In case of emergency or spill, immediately call the National Response Center (800) 424-8802.

MA H 314031 COPY A: GENERATOR RETAINS

334

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE
One Winter Street Boston, Massachusetts 02108

REFERENCE 20

Please print or type. (Form designed for use on elite (12-pitch) typewriter

UNIFORM HAZARDOUS WASTE MANIFEST	Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of 1	Information in the shaded areas is not required by Federal law.
	VTD002074839	78253		

3. Generator's Name and Mailing Address
US EPA REGION I LABORATRY Attn. Lisa Danek
60 WESTVIEW AVENUE
LEXINGTON MA 02173

4. Generator's Phone (802) 823-0107

5. Transporter 1 Company Name: LAIDLAW ENV. SVCS. (NORTH EAST), INC. 6. US EPA ID Number: MAD000604447

7. Transporter 2 Company Name 8. US EPA ID Numoer

9. Designated Facility Name and Site Address
LAIDLAW ENVIRONMENTAL SERVICES (NORTH EAST), INC.
300 CANAL STREET
LAWRENCE MA

10. US EPA ID Numoer: MAD000604447

A. State Manifest Document Number: MA H 314023
B. State Gen. ID: RTE 346 & DEPOT ROAD DCNNAL VT
C. State Trans. ID: A60053 Ma. 508 683-1002
D. Transporter's Phone (508 683-1002
E. State Trans. ID
F. Transporter's Phone ( )
G. State Facility's ID: NOT REQUIRED
H. Facility's Phone (508 683-1002

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. RQ, Waste Petroleum Distillates, n.o.s. (Petroleum Distillates) 3 UN1268 PG III (D001)	2	DM	650	P	D001
b. Waste 1,1,1-Trichloroethane, Mixture 6.1 UN2831 PG III	1	DM	400	P	F002
c. Hazardous Waste Liquid, n.o.s. (1,1,1-Trichloroethane) 9 NA3082 PG III	1	DM	400	P	F002
d. Waste 1,1,1-Trichloroethane, Mixture 6.1 UN2831 PG III	1	DM	400	P	F002

J. Additional Descriptions for Materials Listed Above (include physical state and hazard code)
a. 6.1 Petroleum Distillates L7826-LES-17,25 "K"
c. 6.1, 1,1,1-Trichloroethane L7826-LES-16 "V"
b. Debris w/1,1,1-Trichloroethane L7826-LES-14 "Y"
d. oil, water, 1,1,1-Trichloroethane L7826-LES-06 "O"

K. Handling Codes for Wastes Listed Above
a. S 0 1 c. S 0 1
b. S 0 1 d. S 0 1

15. Special Handling Instructions and Additional Information
Ia (cont.) Sec. 12 a.) L7826-LES-17 is a Fal, drum/55gal. 12d.) Overpacked 55gallon drum into 55gallon drum.
Ib (cont.)
Ic (cont.)
Id (cont.)

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.
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IN EMERGENCY SITUATION CONTACT LAIDLAW (NORTH EAST) 508-683-1002

Printed/Typed Name	Signature	Date (Month Day Year)
LISA A DANEK	Lisa A Danek AGENT	01 24 91

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)
Marc A. Giavis	Marc A. Giavis	01 24 91

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19

Printed/Typed Name	Signature	Date (Month Day Year)
SUMITA D. DAS	Sumita D. Das	1/31/91

Form Approved OMB No. 2050-0039, Expires 9-30-94
EPA Form 8700-22 (Rev. 9-88) Previous editions are obsolete

COPY 3: FACILITY MAILED TO GENERATOR

GENERATOR

TRANSPORTER

FACILITY

In case of emergency or spill, immediately c

National Response Center (800) 424-8802.

336

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE
One Winter Street Boston, Massachusetts 02108

REFERENCE 21

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. VTD002074839 | Manifest Document No. 78255 | 2. Page 1 of 1 | Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
US EPA REGION I LABORATRY Attn: Lisa Danek
60 WESTVIEW AVENUE
LEXINGTON MA 02173

4. Generator's Phone (802) 823-0107

A. State Manifest Document Number: MA H 314030
B. State Gen. ID: RTE 346 & DEPOT ROAD POMFRET VT
C. State Trans. ID: A60053 Ma. 508 683-1002
D. Transporter's Phone ( )
E. State Trans. ID
F. Transporter's Phone ( )
G. State Facility's ID: NOT REQUIRED
H. Facility's Phone (508 683-1002

5. Transporter 1 Company Name: LAIDLAW ENV. SVCS. (NORTH EAST), INC. | 6. US EPA ID Number: MAD000604447
7. Transporter 2 Company Name | 8. US EPA ID Number
9. Designated Facility Name and Site Address: LAIDLAW ENVIRONMENTAL SERVICES (NORTH EAST), INC.
300 CANAL STREET
LAWRENCE MA | 10. US EPA ID Number: MAD000604447

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. State Regulated Oil Waste	2	DM	500	P	MA01 VT02
b. State Regulated Oil Waste	1	DM	500	P	MA01 VT02
c. State Regulated Oil Waste	1	DM	500	P	MA01 VT02
d. State Regulated Oil Waste	3	DF	1500	P	MA01 VT02

J. Additional Descriptions for Materials Listed Above (include physical state and hazard code)
a. oil, grease L7826-LES-21,19 "H"
b. oil, tannic acid L7826-LES-20 "W"
c. Water, oil sludge L7826-LES-72 "X"
d. Water, oil sludge L7826-LES-80,71,70 "X"

K. Handling Codes for Wastes Listed Above
a. S 0 1 | c. S 0 1 | b. S 0 1 | d. S 0 1

15. Special Handling Instructions and Additional Information
Ia (cont.) Sec. 12a.) L7826-LES-19 is an overpacked drum.
Ib (cont.)
Ic (cont.) 12d) L7826-LES-80 is an overpacked drum.
Id (cont.)
Contains PCBs

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.
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IN EMERGENCY SITUATION CONTACT LAIDLAW (NORTH EAST) 508-683-1002

Printed/Typed Name: LISA A. DANEK | Signature: Lisa A Danek (Agent for USEPA) | Date: Month 06 Day 24 Year 93

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: Marc A. Giavis | Signature: Marc A. Giavis | Date: Month 06 Day 24 Year 93

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name | Signature | Date: Month Day Year

FACILITY

19. Discrepancy Indication Space

Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.
Printed/Typed Name: William D. Davis | Signature: Laurence H. Marco | Date: Month 06 Day 24 Year 93

Form Approved OMB No. 2050-0039. Expires 9-30-94
EPA Form 8700-22 (Rev. 9-88) Previous editions are obsolete.

GENERATOR

In case of emergency or spill, immediately call the National Response Center (800) 424-8802.

MA H 314030 COPY>3: FACILITY MAILS TO GENERATOR

COPY>3: FACILITY MAILS TO GENERATOR

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE
One Winter Street Boston, Massachusetts 02108

REFERENCE 22

338

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.: VTL0020748[illegible]
Manifest Document No.: 78256
2. Page 1 of 1 — Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
US EPA REGION I LABORATRY Attn: Lisa Danek
60 WESTVIEW AVENUE
LEXINGTON MA 02173
4. Generator's Phone (802) 823-0107

A. State Manifest Document Number: MA H 314029
B. State Gen. ID: RTE 346 & DEPOT ROAD DOWNS VT
C. State Trans. ID: A60053 Ma.
D. Transporter's Phone (508 683-1002
E. State Trans. ID
F. Transporter's Phone ( )
G. State Facility's ID: NOT REQUIRED
H. Facility's Phone (508 683-1002

5. Transporter 1 Company Name: LAIDLAW ENV. SVCS. (NORTH EAST), INC.
6. US EPA ID Number: MAD000604447
7. Transporter 2 Company Name
8. US EPA ID Number
9. Designated Facility Name and Site Address
LAIDLAW ENVIRONMENTAL SERVICES (NORTH EAST), INC.
300 CANAL STREET
LAWRENCE MA
10. US EPA ID Number: MAD000604447

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. RQ White Asbestos, Chrysotile, Mixture 9 UN2590 PG III	2	DM	900	P	MA99
b. Non Regulated Material	2	DM	800	P	MA99
c. Non Regulated Material	1	DM	450	P	MA99
Non Regulated Material	1	DM	450	P	MA99

J. Additional Descriptions for Materials Listed Above (include physical state and hazard code)
a. Debris w/ Asbestos C7826-LES-10,11 "T"
c. Water, dye, leather C7826-LES-81 "R"
b. Debris w/ tannic acid, sodium acetate C7826-LES-15,83 "I"
d. Dirt, Pigments, Surfactants C7826-LES-66 "L"

K. Handling Codes for Wastes Listed Above
a. 5 0 1 | c. 5 0 1
b. 5 0 1 | d. 5 0 1

15. Special Handling Instructions and Additional Information
1a (cont.) 1b (cont.) 1c (cont.) 1d (cont.)

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.
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IN EMERGENCY SITUATION CONTACT LAIDLAW (NORTH EAST) 508-683-1002

Printed/Typed Name: LISA A. DANEK
Signature: [signature]
Date: Month 06 Day 14 Year 93

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: Marc A. Giavis
Signature: [signature]
Date: Month 06 Day 24 Year 93

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name
Signature
Date: Month Day Year

19. Discrepancy Indication Space

FACILITY

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name: JULIANA D. PAIAS
Signature: [signature]
Date: Month 06 Day 24 Year 93

Form Approved OMB No. 2050-0039 Expires 9-30-94
EPA Form 8700-22 (Rev. 9-86) Previous editions are obsolete

GENERATOR

In case of emergency or spill, immediately call the National Response Center (800) 424-8802.

MA H 314029 COPY 3: FACILITY MAILS TO GENERATOR

340

State of New Jersey
Department of Environmental Protection and Energy
Hazardous Waste Regulation Program
Manifest Section
CN 028, Trenton, NJ 08625-0028

REFERENCE 23

Please type or print in block letters. (Form designed for use on elite (12-pitch) typewriter.) Form Approved. OMB No. 2050-0039. Expires 9-30-94

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. VTD002074839 Manifest Document No. 93002
2. Page 1 of 1
Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address: US EPA REGION ONE-POMNAL TANNERY SITE
ROUTE 346 & DEPOT ROAD
NORTH POMNAL, VT 05260
4. Generator's Phone (802) 823-0107

A. State Manifest Document Number: NJA 1670701
B. State Generator's ID: 60 WESTVIEW STREET, LEXINGTON, MA 02173
C. State Trans. ID: NJDEP S50060
D. Transporter's Phone (315) 471-0503
E. State Trans. ID:

5. Transporter 1 Company Name: ENVIRONMENTAL PRODUCTS & SERVICES, INC
6. US EPA ID Number: NYD980761191
7. Transporter 2 Company Name:
8. US EPA ID Number:

9. Designated Facility Name and Site Address:
CYCLE CHEM, INC.
217 SOUTH FIRST STREET
ELIZABETH, NJ 07206
10. US EPA ID Number: NJD010220046
F. Transporter's Phone ( )
G. State Facility's ID:
H. Facility's Phone (908) 355-5800

	11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number) HM	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a.	X RQ WASTE FLAMMABLE LIQUIDS, N.O.S. (CONTAINS METHYL ETHYL KETONE, MINERAL SPIRITS), 3, UN1993, PGII (D001, D035)	001	DM	00173	P	D001
b.	X WASTE CORROSIVE SOLIDS, N.O.S. (CONTAINS SODIUM HYDROXIDE, AMMONIUM HYDROXIDE), 8, UN1759, PGII (D002)	001	DM	00074	P	D002
c.	X RQ, WASTE BATTERIES, WET, FILLED WITH ACID, 8, UN2794, PG III (D002)(D008) 07	001	DM	00050	P	D002
d.		(m3)	DM	00056	P	D002

J. Additional Descriptions for Materials Listed Above
a. SEE PACKING SLIP L,I,E (JS11) (D035)
c. SEE PACKING SLIP S,L,C,E (JS17) (D008) 91
b. SEE PACKING SLIP S,C (JS16)
d.

K. Handling Codes for Wastes Listed Above
a. c.
b. d.

15. Special Handling Instructions and Additional Information: CERCLA APPROVED DISPOSAL SITES ONLY C,XC6049
JOB# 09BA1230 11a) 346097-UIM ERG#27
PO# 22763 11b) 346097-AA/R ERG#60
NJ DECAL# 11c) 346097-EXCEL ERG#60
CERTIFICATES OF DISPOSAL REQUIRED
EMERGENCY PHONE# 315-471-0503
EMERGENCY CONTACT: MICHAEL T. SCHUBERT

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.
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Printed/Typed Name: LISA A. DANEK
Signature: Lisa A. Danek (Agent for USEPA)
Month Day Year: 9-13-93

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: ANTONIO VEGA
Signature:
Month Day Year: 09 23 93

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name:
Signature:
Month Day Year:

19. Discrepancy Indication Space
waste code D008 added to 11c., Jc. original.

FACILITY

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name:
Signature:
Month Day Year:

SIGNATURE AND INFORMATION MUST BE LEGIBLE ON ALL COPIES

NJA 1670701

342

State of New Jersey
Department of Environmental Protection and Energy
Hazardous Waste Regulation Program
Manifest Section
CN 028, Trenton, NJ 08625-0028

REFERENCE 24

se type or print in block letters. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039. Expires 9-30-94

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. NYD980761191 — Manifest Document No. 75007

2. Page 1 of 1 — Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
US EPA REGION ONE-PCANAL TANNERY SITE
ROUTE 346 & DEPOT ROAD
NORTH PCANAL, VT 05250

A. State Manifest Document Number NJA 1670702

B. State Generator's ID
60 WESTVIEW ST.,
LEXINGTON, MA 02173

4. Generator's Phone (802) 823-0107

5. Transporter 1 Company Name — 6. US EPA ID Number
ENVIRONMENTAL PRODUCTS & SERVICES, INC — NYD980761191

C. State Trans. ID MDEP 55000

7. Transporter 2 Company Name — 8. US EPA ID Numoer

D. Transporter's Phone (315) 471-0503

E. State Trans. ID

9. Designated Facility Name and Site Address
CYCLE CHEM, INC.
217 SOUTH FIRST STREET
ELIZABETH, NJ 07206

10. US EPA ID Numoer — NJD000220046

F. Transporter's Phone ( )

G. State Facility's ID

H. Facility's Phone (908) 355-5800

	11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number) HM		12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a.	X	WASTE COMPRESSED GASES, FLAMMABLE, N.O.S. (CONTAINS TOLUENE, XYLENE), 2.1, UN1954 (D001)	001	CF	00020	P	D001
b.	X	RQ, WASTE OXIDIZING SUBSTANCES, LIQUID, N.O.S. (CONTAINS SILVER NITRATE, HYDROGEN PEROXIDE), 5.1, UN3139, PGII, (D001, D011)	001	CF	00012	P	D001
c.	X	RQ, WASTE CORROSIVE LIQUIDS, N.O.S. (CONTAINS SULFURIC ACID, NITRIC ACID), 8, UN1760, PGII (D002, ~~D004~~ D005) (NJ) SG	001	CF	00022	P	D002
d.	X	WASTE FLAMMABLE LIQUIDS, N.O.S. (CONTAINS PETROLEUM DISTILLATES, MINERAL SPIRITS), 3, UN1993, PGII (D001)	001	DM	00104	P	D001

J. Additional Descriptions for Materials Listed Above

a. SEE PACKING SLIP G, I (JS14)
b. SEE PACKING SLIP L,I,E (JS15) (D011)
c. SEE PACKING SLIP L,C,E (JS13) (NJ) (D004) (D005)
d. SEE PACKING SLIP L,I (JS12)

K. Handling Codes for Wastes Listed Above

a. c.

15. Special Handling Instructions and Additional Information
JOB#098A1230
PO#22763
NJ DECAL#
11a) 346097-F043 ERG#22
11b) 346097-DOK ERG#35
11c) 346097-UDM ERG#60
11d) 346097-UIM ERG#27
EMERGENCY PHONE # 315-471-0503
CERCLA APPROVED SITES ONLY
CERTIFICATES OF DISPOSAL REQUIRED NY PLATE # C.X.C604A

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

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Printed/Typed Name: LISA A. DANEK — Signature: [signature] (for USEPA) — Month/Day/Year: 11 20 95

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name: ANTONIO VEGA — Signature: [signature] — Month/Day/Year: 11 20 95

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name — Signature — Month/Day/Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name — Signature — Month/Day/Year

NJA 1670702

REFERENCE 25

SUBSURFACE HAZARDOUS WASTE INVESTIGATIONS AT

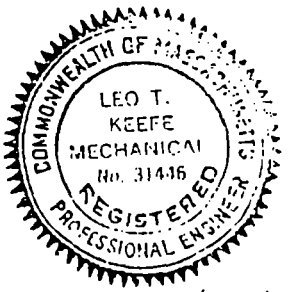
Pownal Tanning
Route 346
N. Pownal, Vermont 02561

Prepared by:

Bruce M. Poole
Leo T, Keefe, P.E.

SP, Inc.
29 Congress Street
Salem, Massachusetts 01970
(617)745-4569

January 1988



Leo T Keefe

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TABLE OF CONTENTS
(cont.)

I. Introduction

Pownal Tanning Co., Inc. is located on Route 346 in North Pownal, Vermont. The company is involved in the processing of cow and sheep raw hides into finished leather. The manufacturing activities require many chemical baths to remove the hair, tan the hides and color the leather.

Wastewater is generated from several distinct process operations and the associated rinses: hidewash, beaming, bate, pickle, tan, blue soak, retanning, fat liquoring, coloring and finishing. Analyses are conducted continuously to characterize daily wastewater, sludge and process wastes. The treatment system operation has allowed compliance with NPDES effluent discharge limits since 1980.

The wastewater is prescreened, chemically coagulated and settled in a primary clarifier. Biological oxidation then occurs in an extended aeration lagoon followed by an algae stabilization lagoon and final aerated polishing lagoon. The final effluent is discharged to the Hoosic River. Primary sludge is dewatered by filter press and disposed of in the on-site landfill. Sludge generated in the lagoons is pumped by portable pontoon sludge removal pumps to the clarifier for settling.

II. Site History

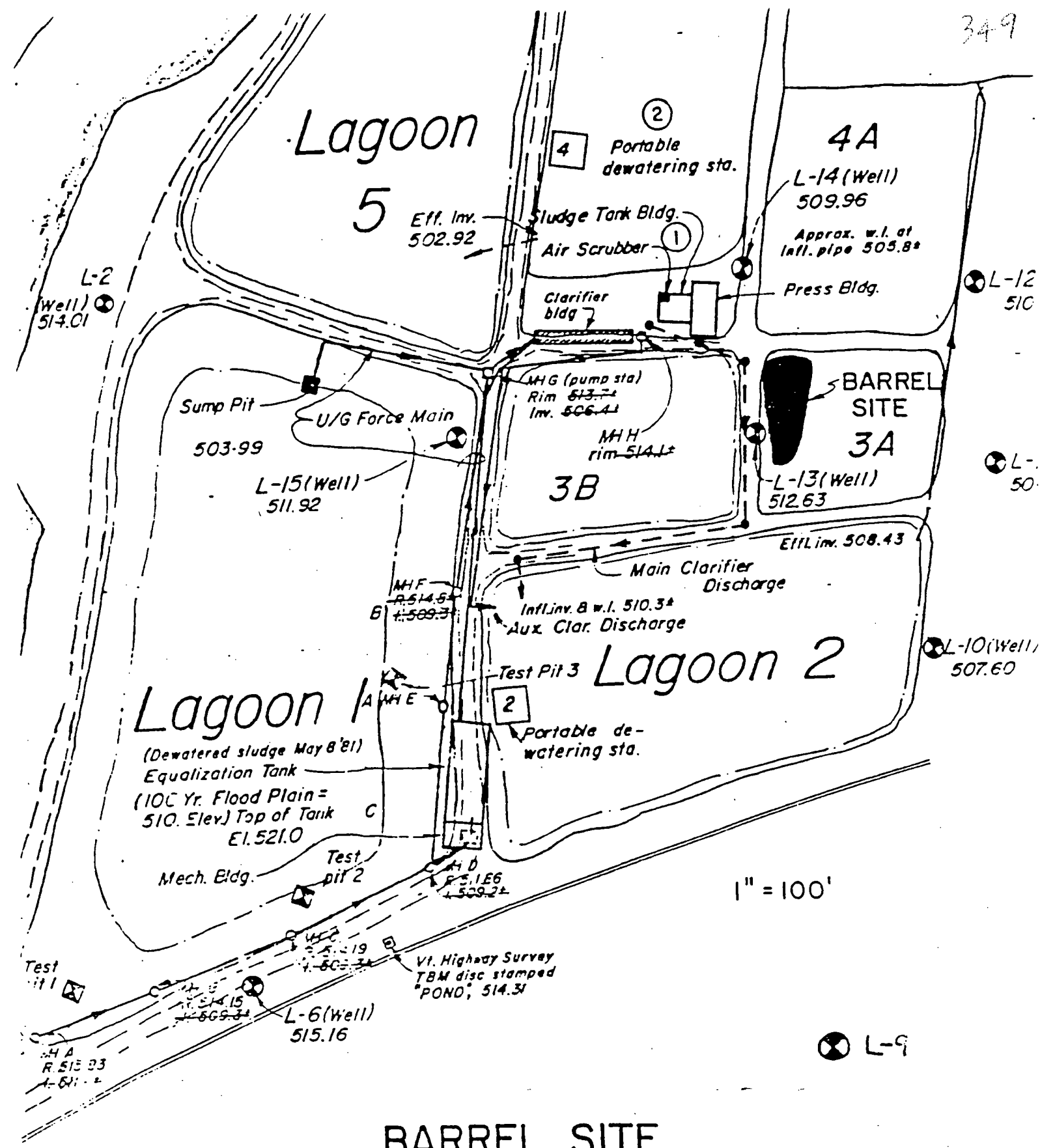
The factory building was built in 1901 as a textile mill to be idealy situated between a river and a railroad. The railroad had unloading tracks by the lagoons and the existing warehouse. The townspeople (Pownal and N. Pownal) used the lagoon area for a

dump, over 30 to 40 years, until the 1940's. Large appliance disposal and trash burning were the primary activities. In the late 1940's, the mill was purchased by John Flynn and Sons for use as a tannery. The wastewater lagoons were constructed in the late 1960's and modified by the addition of a concrete clarifier in 1977. Lagoon No. 1 was drained and closed between 1978 and 1980, covered with lime and brought to grade. A 12-inch clay cap was spread over the surface.

The edges of Lagoon No. 1 have been used as burning areas for tannery trash over the last four years. Some crushed empty barrels were also disposed of at the lagoon. Of the seventeen acres between the railroad and the river, approximately 9 acres are active lagoons, and 7 acres are former sludge storage cells. Most of the site is well vegetated.

III. Site Conditions

The entire lagoon treatment area encompasses over 17 acres with several former tannery sludge lagoons and three active lagoons. The clarifier, sludge storage tanks and filter press building are located in the center of the site (See Figure 1). The lagoons are bordered on the south and west by the Hoosic River, on the North by a cornfield and on the east by several residences (Figure 2). The eight houses are upgradient (275 feet to 350 feet) from the property line. The house closest to the area of barrel discovery is 525 feet away. Several homeowners maintain shallow wells.

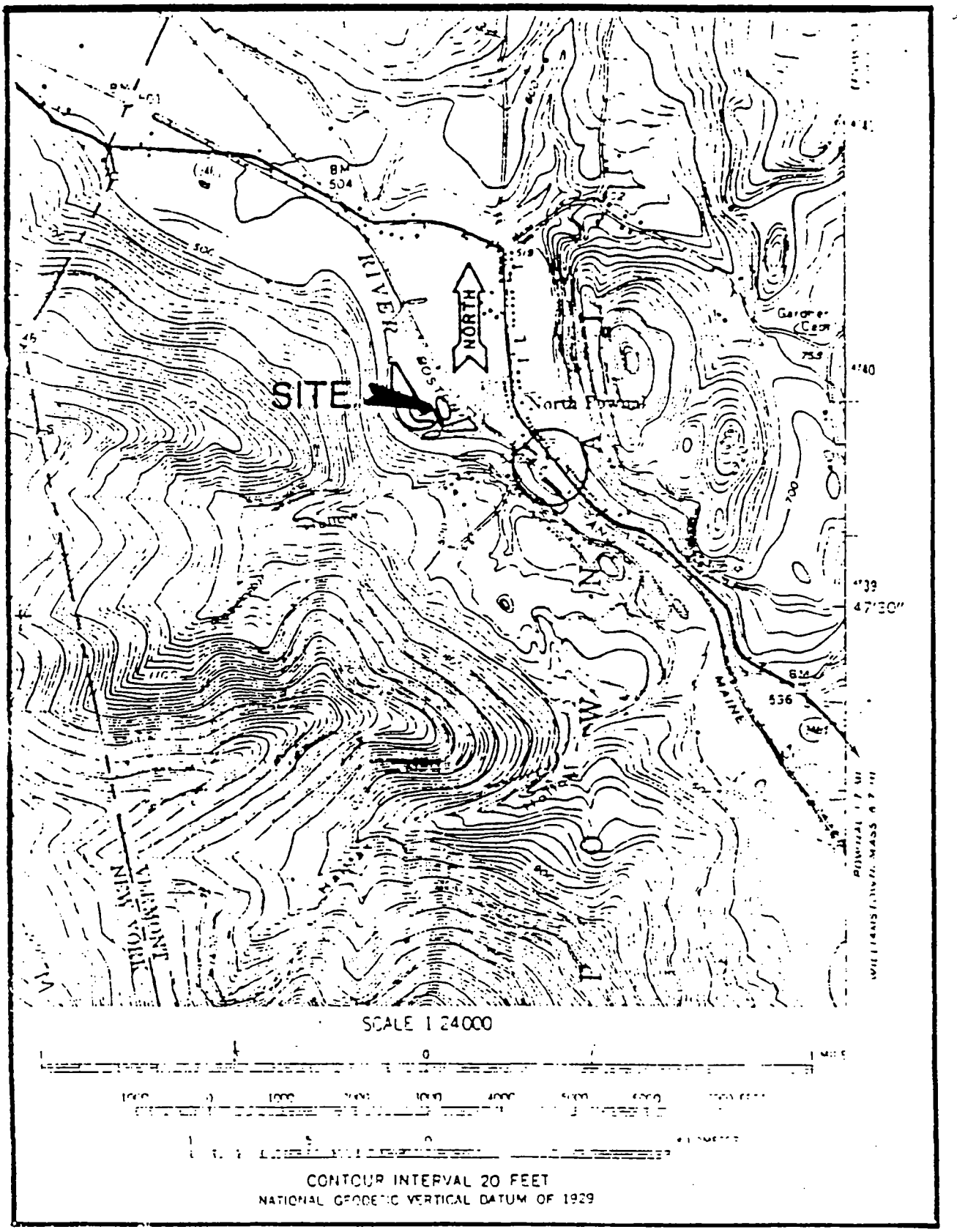


BARREL SITE

Pownal Tanning Company
North Pownal, VT

FIGURE 1

SP, INC.



SITE LOCUS

Pownal Tanning Company
North Pownal, VT

FIGURE 2

SP, INC.

IV. Remedial Action

The plant manager was informed on March 19, 1987 that a worker has seen barrels buried in one of the abandoned sludge lagoons (3A) in the fall of 1982. The lagoons (3A, 3B and 4A) had been filled with sludge over the past ten years and were dewatered and closed in 1981. A minimum 12-inch clay cap had been placed over all three lagoons. The boring logs (Appendix A) indicate the lagoons contained from 6 to 10 feet of tannery sludge. After 1981, all sludge was filter pressed and disposed in a secure licensed disposal facility at another location.

The Vermont Agency of Environmental Conservation was notified by letter (Appendix B) and telephone call that drums were present and that excavation was scheduled for April 14, 1987. Ken and Peter, state inspectors, were present on-site for the barrel removal and repackaging. The description of site activities is included in the Remedial Action section of this report. Barrel, soil and air sampling was conducted by both SP, Inc. and the State inspectors.

The barrels had been placed at the top of the sludge layer and covered with 2 to 5 feet of clay fill. Four different types of waste was observed;

1. Zone A contained three large 55 gallon barrels, (one leaking) that contained #6 oil, sawdust and rags. The staff identified the barrels as the remaining clean-up residues from a Thanksgiving (1982) boiler fire which spilled oil in the factory. 30 drums of waste oil had been properly manifested and disposed of by Solvent Recovery Systems of Connecticut (EPA ID# CTD009717604). These three barrels were the leftovers.

2. Five partially crushed orange barrels were found in Zone B. There was spilled approximately 1/3 barrel of a tan grainy material with an animal oil smell. The plant manager identified the material as a lignosulfonate filler, used in the finishing process. The barrels were unopened but dented so all material was transfered to new barrels. The filler substance was confirmed as Levelin C, made by L.H. Lincoln and Sons, Inc. The company confirmed a purchase by Pownal on May 11, 1977. The MSDS sheet is enclosed and the substance is characterized as non-hazardous, although is contains a small amount of cresolic acid as a preservative.

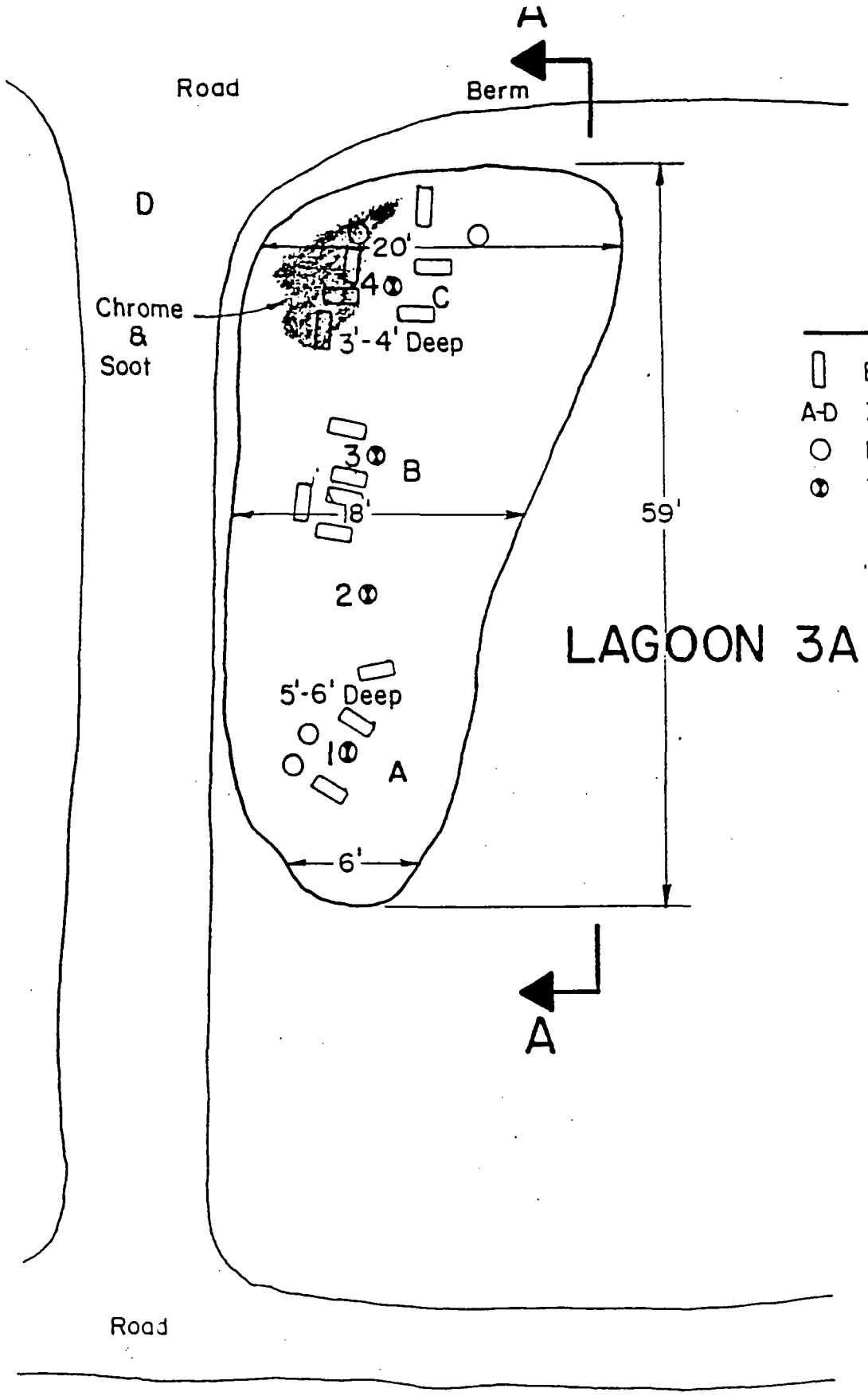
3. A group of 20 gallon paper barrels (6) were found in Zone C. The contents were apparently new finishes; white, tan and blue. Many of the barrels were broken and the area smelled of solvents. Lacquer finishes are typically 10 to 30 percent solvent (Xylene, Toluene). Soil, finish and barrels were redrummed.

4. The area Zone D surrounding and partially over Zone C also contained burned wood, soot and chromium crystals. The granular material was black and green. Laboratory tests indicate it was trivalent chrome as chromium oxide Cr_2O_3. When the chromium (15% soln) used in tanneries becomes overheated (fire) or evaporates, it crystallizes. The crystal material, soot, wood and soil were placed in three drums.

A crew of 5 men with suits and respirators and a backhoe operator dug up the barrels on April 14, 1987. Whole barrels were lifted onto a 40 foot by 40 foot Hypalon liner for repackaging (A 10-inch sand berm surrounded the liner). Trash and spillage was

handpicked and contaminated soil was shoveled directly into new barrels. Cross contamination was minimized because the barrel areas were separated. Figure 3 illustrates the barrel placement and excavation site. Contents were photographed, sampled and labeled in new barrels. The results of analyses have been forwarded to the State agency (6/87) and are included in this report. The finish and oil barrels (10) have been disposed of. The chromium wastes are awaiting a schedule for pick-up by Solvent Recovery Systems, Inc. The final barrel inventory after repacking and clean-up was 15; an itemization is included in Table 1. Ambient air sampling results are reported in Table 2. All waste barrels were wiped clean, then cut-up and steam cleaned before disposal as scrap. The site was backfilled with existing soil and covered with 12 inches of new clay.

At a later date (11/87), monitoring wells were installed around the barrel site and soil cores were taken in the excavation zone. These analyses do not indicate any migration of material off-site. The cores in the barrel area still show small amounts of oil chrome and solvents. A thorough geophysical and hydrological study has also been conducted to determine the direction of groundwater flow. The report, prepared by Craig Saunders, Saunders Associates will be submitted separately.



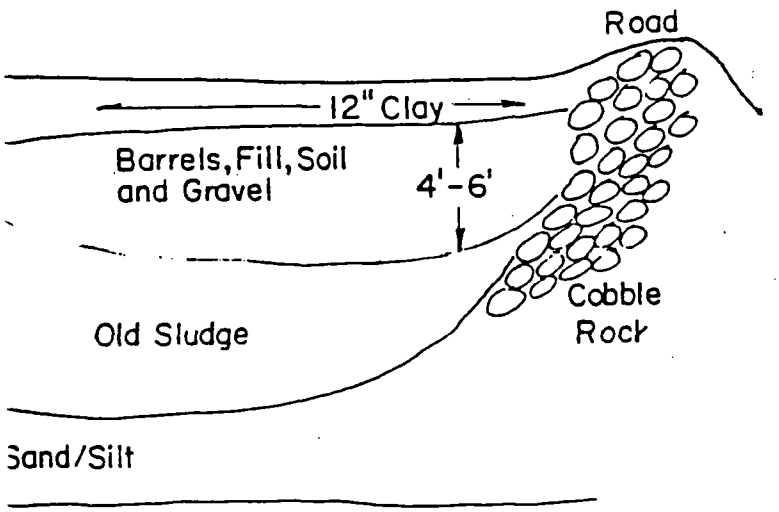
KEY

- Barrels
- A-D Zones / Waste Types
- Empty Crushed $KMnO_4$
- Test Cores (1-4): 11-18-

PLAN

Pownal Tanning Company
North Pownal, VT

els



SECTION X-X

CAVATED AREA

BARREL EXCAVATION AREA

Not to Scale

FIGURE 3

TABLE 1

Pownal Tanning EPA ID# VTD002074839
Barrel Inventory
4/15/87

Waste Type/Zone	ID Number	Contents
A	1	#6 oil and sawdust
A	2	#6 oil and clay
A	3	#6 oil, clay, sand and soil 2/3 full
C	4	White and tan finish and soil
C	5	White and tan finish and soil
D	6	Trivalent chromium, soot and soil 2/3 full
B	7	Filler, sand and oil
B	8	Filler, sand and oil
B	9	Filler and soil
D&B	10	Trivalent chromium and finish
D	11	Chromium and soil
D	12	Chromium and soil
B	13	Filler - clean
B	14	Filler - clean
B&C	15	Filler, finish, soil and oil 1/2 full

TABLE 2

Air VOC Analysis
Photo-Vac
Photoionizer
4/14/87

Area	Substance	VOC ppm
Zone A In Pit	#6 Oil	20-40
Zone B In Pit	Filler	10-20
Zone C In Pit	Finish (White)	400-1000
Zone C	Blue Finish	40
Zone C	Tan Plastic Finish	90-100
Zone D	Pile Soot/Chrome	10-46
Under Pit	In old sludge (background)	50-70
Beside Pit (15' away)	On road	70-80

V. Assessment Rationale

The building and surrounding property has been subjected to a comprehensive investigation to determine whether hazardous waste materials and/or oils have been released or are contained or located; on the site or in the soil or groundwater. This report summarizes the conditions encountered on the existing buildings, grounds and subsurface soils, and groundwater. The certification of materials and soils sampled involves the Resources Conservation and Recovery Act (RCRA) regulations for analysis of reactivity, corrosivity, ignitability and extraction procedure toxicity. The hazardous material investigations required tests for eight heavy metals in the soil and volatile organics (VOA), pH and conductivity in groundwater.

Since many sites have been developed only to discover that wastes stored below the ground continue to leach heavy metals or carcinogenic solvent fumes that affect human health, the importance of complete site studies is a financial necessity. Many construction techniques and treatment programs can eliminate the risk in industrial site development, but the problems have to be discovered by chemical analysis. Documentation of the size, character and constituents of any previous landfill activity is essential to the determination of future impacts. The combination of test cores, soil characterization, soil EP toxicity tests, and surface and groundwater chemical analysis (if groundwater is encountered) reveals the extent of site contamination, if any. The enclosed discussion and engineering report presents the results of previous industrial activity on the site and how it relates to future development potential.

All applicable sites must be certified free of hazardous wastes and contaminated groundwater in order to obtain title insurance for the sale, remortgages or building addition to the property. This site survey is conducted by a professional engineer who has had extensive experience handling the hazardous materials from tanneries, electroplaters, and other industries as well as the design of wastewater treatment systems, sludge disposal facilities and landfills. This experience includes a variety of remedial site clean-up actions.

All soils and groundwater are sampled according to EPA protocol and analyzed at SP, Inc.'s in-house chemistry laboratory in Salem, Massachusetts. All sites are subjected to corings and grounds survey to determine natural conditions and any areas of man-made fill or disposal.

A material is considered hazardous if it shows:

1. Ignitability - Having a flashpoint of less than 140°F; a nonliquid liable to cause fires through friction, absorption of moisture, spontaneous chemical change or retained heat from manufacturing or liable when ignited to burn so vigorously and persistently as to create a hazard; ignitable compressed gases; oxidizers.

2. Corrosivity - Aqueous wastes exhibiting a pH of less than or equal to 2 or greater than or equal to 12.5 and liquid wastes capable of corroding steel at a rate of greater than 0.25 inches per year.

3. Reactivity - Readily undergo violent chemical change; react violently or form potentially explosive mixtures with water; generate toxic fumes when mixed with water (or when exposed to mild acidic or basic conditions for sulfide or cyanide bearing wastes), explode when subjected to a strong initiating force; explode at normal temperatures and pressures; or classified as Class A or B explosives.

4. Fail the EP Toxicity Tests - The Extraction Procedure (EP) Toxicity Test is designed to simulate the physical processes which would occur in a landfill. To simulate the acidic leaching medium which occur in actively decomposing landfills, EPA chose to employ acetic acid. To simulate the leaching process, EPA specified a procedure requiring the mixing of the solid component of the wastes (soil in this instance) with the acidic leaching medium for a period of 24 hours. To duplicate the attenuation in concentration expected to occur between the point of leachate generation and the point of human or environmental exposure, EPA applied a dilution factor of 100 to the concentration of toxic constituents observed in the test extract.

5. Identified as a Priority Pollutant - The RCRA legislation has classified a minimum of 126 organic and metallic compounds as acutely hazardous to human health. As such, only extremely low levels are tolerated in the environment and non-existence required for drinking water sources. These compounds are detected by gas chromatograph and regulated according to their level, mode of toxicity (i.e. oral, dermal, inhalation) and health effect (carcinogen, irritant, or mutagen,). In all cases, there are

chronic (long-term) concerns as well as acute (single-exposure) toxicities that have to be evaluated.

VI. Methods

A four-inch diameter hollow core auger device with split spoon sampler was used to penetrate asphalt or soil to refusal or several feet below the groundwater table or the limits of the auger. A minimum of four cores per acre is used when the area appears natural. An engineer on site during excavation characterizes soil strata type, depth, unnatural material quantities and groundwater levels. This data is presented in the Soil Logs (Appendix). Any organic material, colored soil or landfill refuse is sampled as a worst case and subjected to the EP Toxicity Test. All analyses are performed according to Standard Methods 15th edition 1980, RCRA Regulations E.P. Toxicity Extraction Procedures 1978, or the EPA Method 602 for gas chromatographic analysis of petroleum hydrocarbons. Quality assurance and sample identification protocols are in accordance with federal requirements of the National Pollution Discharge Elimination System (NPDES), and Clean Water Act of 1976.

At all times, hazardous materials must be stored on sealed and bermed bituminous or concrete pads with no conditions that would endanger human health or contaminate the environment. The results of sampling and locations of potentially hazardous materials are identified in this report to facilitate proper disposal and strict adherance to the Hazardous Waste Regulations.

VII. Surficial Geology

As shown in the Figure 2 Site Locus, the Pownal Tanning lagoons are situated in the Hoosic River floodplain between two mountain ranges. The topographical gradient rises rapidly on the east and west of the site. The primary soils in the area are river outwash deposits of very fine sand, inorganic silt and some clay. The soils upgradient of the site (east) by the residences, have layers of fine sand and silt and occassional clay and coarse gravel lenses. Water level was encountered 6 to 20 feet below grade in this area.

The area of drum excavation was a man-made lagoon with large stone berms and roadways on all four sides. The interior of the lagoon berms had been lined with silt and clay. After five or more years as a sludge drying lagoon (3A, 3B and 4A received sludge from the clarifier and Lagoon No. 2) all the lagoons were coated with lime, covered with fill to grade and sealed with 12 to 18 inches of clay in 1981 - 82. The site is 1 to 2 feet above the 100 year floodline. The soils found adjacent to the barrel area in L-11 and L-12, north side, are very dense fine to medium sand and soft wet clay. Downgradient of the site are a sludge lagoon (4A) and active Lagoon (4). Wells L-13 and L-14 uncovered very fine sand and some inorganic silt with a trace of coarse gravel.

The general groundwater flow was towards the river. Well Nos. L-12, L-13, L-14 and L-15 were installed primarily for water level determination since the proximity to old sludge or active lagoons influences the water quality. The wells were all sampled even though the wells (L-13, L-14 and L-15) yielded black anerobic

water. Some groundwater mounding could be attributed to Lagoon No. 2. Groundwater flow would be west to northwest from the barrel site. The river is 300 to 500 feet from the site in the westerly direction.

Monitoring wells were installed upgradient (3) and around the site (6) according to the protocol shown in Figure 4. Details of the Boring Logs are in the Appendix.

The wells were pumped for 10 minutes or until they ran out of water two days in a row before sampling. A separate VOA flask was filled for organic analysis. Well water depths were recorded each day. The samples were refrigerated during transport and before analysis at the SP, Inc. laboratory. The results of analysis are presented in the following reports.

VII. Summary of Results

The initial analyses were conducted on the materials placed in barrels 1 through 15, these results are shown in Tables 3 to 9. Both the Zone A and B barrels, #6 oil and filler, were high in oil and grease (6.75 and 8.43 percent) respectively. Only Barrel No. 11 (chromium and soil) failed the EP Toxicity Test with 7.56 mg/l (the limit is 5.0 mg/l). Large amounts of bulk chrome was found in Barrel Nos. 1, 11 and 12. This is expected since the tannery sludge surrounding the barrels averages 40,000 to 60,000 mg/kg bulk chromium. Volatile organic analysis on selected drums (EPA 601 and 602) revealed the presence of toluene (Barrels 4 and 5), xylenes, ethylbenzene (+ possible cresolic acid compounds - in barrels 7, 8, 9, 10, 13, 14 and 15). The analysis of the brown

oily liquid supernate of Barrel No. 13 (called Test 13A) was very high in toluene or cresolic acid at 21,500 mg/kg. Most of the barrels contained solvents in the range of 500 to 3000 mg/kg with compounds like ethylbenzene, toluene and xylene.

Subsequent November 18, 1987 sampling of the excavated area, with 8 foot cores, (1 1/2-inch diameter) were composited as samples 1 to 4 (See Figure 3). The results of metal, oil and organic analyses are presented in Tables 10, 11 and 12. The soil remaining in the excavated area does still contain small amounts of bulk trivalent chromium (4660 mg/kg), oil (3.1% max.) and trace solvents (<2.5 mg/kg toluene and xylene). The oil value represents animal fats in the sludge and petroleum hydrocarbons.

The monitoring wells that were installed in 1983 (L-1 to L-6) have been tested a minimum of twice per year, with the only elevated values being the lead in L-5 and L-6 in 1985 and 1986. The present test results (Tables 13 and 14) are similar to background levels with the exception of L-1, which contains a lead value of 0.09 mg/l. The drinking water standard is 0.05 mg/l. Well L-1 is directly adjacent (17 feet) from Lagoon No. 1 which contains 4 to 10 feet of covered tannery sludge.

The wells installed in November 1987, upgradient and beside the lagoon site, were purged several times and sampled for metals and organics. Several of these wells (L-7, L-8 and L-9) are next to residences. The test results for these wells are shown in Table 15 and 16. The analysis results are within drinking water guidelines for all parameters.

The wells installed to the north of the barrel site (L-10 to L-12) were tested and the results are presented in Tables 16 and 17. Again no organic constituents were found, although elevated BOD, TOC and TDS was found in well L-10, which is directly beside (20 feet) active Lagoon No. 2. The infiltration from the lagoon may influence the groundwater in this area. Directly beside the barrel disposal site and sludge lagoons, three wells (L-13, L-14 and L-15) were placed to observe downgradient conditions. These wells contained leachate from the stored sludge (i.e. high TDS, chlorides, sulfides and BOD, but no hazardous metals or organics. See Tables 18 and 19 for the test results.

Other analyses of the clarifier well, which is underneath the clarifier building and the filter press sludge as produced are included for reference in Tables 20, 21 and 22.

VII. Conclusion

In summary, the barrels and spilled wastes have been cleaned-up and repackaged for disposal at a licensed facility. The potential for migration is limited by the sludge and clay present at the barrel site. The adjacent soils, fine sand and silt, also have low permeability and restrict the movement of contaminants off the site. The general direction of groundwater flow has been determined to be towards the Hoosic River, a Class C waterbody not used for drinking water or recreation. No movement of contaminants has been detected 100 feet off-site or upgradient towards the residences.

Based upon this site investigation and chemical analyses, we believe that the conditions do not constitute an imminent hazard to the public health, safety, welfare or the environment. Coupled with the previous history of dumping and sludge storage, the remaining chemical constituents will not further degrade the groundwater on-site. The following recommendations are made to further minimize migration potential and provide site monitoring.

1. The barrel excavation area should be covered with an additonal 12 inches of clay overlaping the perimeter by 20 feet. The site should be sloped toward the west at a greater than 2 percent slope.

2. The other areas of high magnetometry readings should be trenched in the spring to check for more barrels. The areas next to Lagoon No. 1 have been used for scrap disposal for years, but will also be trenched.

3. All trenching, sampling and remedial action will be performed at the direction of an experienced environmental consultant who oversees and documents all activity. The handling and disposal of oil or hazardous materials will be accomplished in conformity with all applicable Federal, State and Local Statutes and Regulations.

4. The monitoring wells surrounding the lagoons and barrel site will be sampled and tested quarterly for metals and organics. The test protocol and specific parameters tested will be the same as has been conducted on wells L-1 to L-6 for four years. These tests are pH, total dissolved solids, conductivity, sulfide, total chromium, hexavalent chromium, lead, biochemical oxygen demand,

and total organic carbon. Volatile organic analyses, EPA Method 601 and 602 will also be conducted on the wells closest to the barrel site (L-9, L-10, L-11, L-12, L-13 and L-14) for a minimum of one year.

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SOIL EXPLORATION CORPORATION

Geotechnical Drilling and Groundwater Monitor Wells

23 Ingalls St.
Nashua, NH 03060
(603) 882-3601

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Client POWNAL TANNING COMPANY; S.P. ENGINEERING Date 12/02/87 Job No. 87-927

Location ROUTE 367, POWAL, VERMONT

ING L-7 Ground Elev. Date Start 11/17/87 Date Complete 11/17/87 Drilling Foreman M.M. Eng./Hydrol. Geologist B.P.

WELL L-7 Sample Data

DEPTH	Sample No.	Sample Depth (ft.)	Blows 6" Penetration	Rec. Inches	Casing Blows Per ft.	Strata Change Depth	Soil and/or bedrock strata descriptions: Visual Identification of Soil and/or Rock Strata
	1	0'0"- 2'0"	1-2-2-1				Very loose to loose, damp, very fine SAND, some inorganic silt, trace root matter.
5	2	4'0"- 6'0"	4-4-3-3				
						8'0"	Dense, dry, very fine to fine SAND, trace medium to coarse sand, and fine to coarse gravel, lenses, trace inorganic silt.
10	3	9'0"- 11'0"	23-24-22-20				
						13'0"	Very loose, wet, fine to medium SAND, trace coarse sand, and inorganic silt.
15	4	14'0"- 16'0"	2-1-1-1				
						18'0"	Medium stiff, wet, inorganic silt, trace clay.
	5	19'0"- 21'0"	3-4-5-5				
						23'0"	Soft, wet, inorganic SILT.
25	6	24'0"- 26'0"	2-3-3-1				
						26'0"	End of boring at 26'0" Set well point at 23'0" Water level at 16'0" upon completion Well Materials; 1 - 2" PVC end plug 1 - 10' x 2" PVC screen 1 - 10' x 2" PVC riser 1 - 5' x 2" PVC riser ½ bag - sakrete sand 1 bag - silica sand ½ pail - bentonite pellets
30							
35							
40							

Type of Boring Casing Size: Hollow Stem Auger Size: 3¼

Proportion Percentages
Trace 0 to 10%
Some 10 to 40%
And 40 to 50%

Granular Soils (blows per ft.)
0 to 4 Very Loose
4 to 10 Loose
10 to 30 Medium Dense
30 to 50 Dense
Over 50 Very Dense

Cohesive Soils (blows per ft.)
0 to 2 Very Soft
2 to 4 Soft
4 to 8 Medium Stiff
8 to 15 Stiff
15 to 30 Very Stiff
Over 30 Hard

Standard penetration test (SPT) = 140# hammer falling 30"
Blows are per 6" taken with an 18" long x 2" O.D. x 1 3/8" I.D. split spoon sampler unless otherwise noted.

The terms and percentages used to describe soil and or rock are based on visual identification of the retrieved samples. ■ Moisture content indicated may be affected by time of year and water added during the drilling process. ■ Water levels indicated may vary with seasonal fluctuation and the degree of soil saturation when the boring was taken. ■ The stratification lines represent the approximate boundaries between soil types, the actual transitions may be gradual. ■

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Client: POWNAL TANNING COMPANY; S.P. ENGINEERING — Date: 12/02/87 — Job No.: 87-927

Location: ROUTE 367, POWAL, VERMONT

BORING NO.: L-8 — Ground Elev.: — Date Start: 11/17/87 — Date Complete: 11/17/87 — Drilling Foreman: M.M. — Eng./Hydrol. Geologist: B.P.

WELL L-8 Sample Data

DEPTH	Sample No.	Sample Depth (ft.)	Blows 6" Penetration	Rec. Inches	Casing Blows Per ft.	Strata Change Depth	Soil and/or bedrock strata descriptions: Visual Identification of Soil and/or Rock Strata
	1	0'0" - 2'0"	1-2-2-1				Very loose, dry, very fine SAND, some inorganic silt, trace fine sand, and root matter.
						3'0"	Loose, wet, very fine SAND, some inorganic silt, trace fine sand lenses.
5	2	4'0" - 6'0"	3-4-4-3				
						7'0"	Soft, wet CLAY, trace very fine to medium sand, and inorganic silt.
10	3	9'0" - 11'0"	3-1-1-2				
						12'0"	Loose, wet, very fine SAND, and inorganic silt, trace clay.
15	4	14'0" - 16'0"	3-4-5-4				
20	5	19'0" - 21'0"	3-2-2-3				
						21'0"	No samples required from 21'0" to 41'0" by request of client.
25							
30							
35							
40							

Type of Boring: — Casing Size: — Hollow Stem Auger Size: 3¼

Proportion Percentages
Trace 0 to 10%
Some 10 to 40%
And 10 to 50%

Granular Soils (blows per ft.)
0 to 4 Very Loose
4 to 10 Loose
10 to 30 Medium Dense
30 to 50 Dense
Over 50 Very Dense

Cohesive Soils (blows per ft.)
0 to 2 Very Soft
2 to 4 Soft
4 to 8 Medium Stiff
8 to 15 Stiff
15 to 30 Very Stiff
Over 30 Hard

Standard penetration test (SPT) = 140# hammer falling 30"
Blows are per 6" taken with an 18" long x 2" O.D. x 1 3/8" I.D. split spoon sampler unless otherwise noted.

The terms and percentages used to describe soil and or rock are based on visual identification of the retrieved samples. ■ Moisture content indicated may be affected by time of year and water added during the drilling process. ■ Water levels indicated may vary with seasonal fluctuation and the degree of soil saturation when the boring was taken. ■ The stratification lines represent the approximate boundaries between soil types, the actual transitions may be gradual. ■

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Client POWNAL TANNING COMPANY; S.P. ENGINEERING Date 12/02/87 Job No. 87-927

Location ROUTE 367, POWAL, VERMONT

RING L-8 Continued | Ground Elev. | Date Start 11/17/87 | Date Complete 11/17/87 | Drilling Foreman M.M. | Eng./Hydrol. Geologist B.P.

DEPTH	Sample Data: Sample No.	Sample Data: Sample Depth (ft.)	Sample Data: Blows 6" Penetration	Sample Data: Rec. Inches	Sample Data: Casing Blows Per ft.	Soil and/or bedrock strata descriptions: Strata Change Depth	Soil and/or bedrock strata descriptions: Visual Identification of Soil and/or Rock Strata
						41'0"	End of boring at 41'0" Set well point at 41'0" Water level at 35'0" upon completion Well Materials; 1 - 2" PVC end plug 1 - 10' x 2" PVC screen 1 - 5' x 2" PVC screen 3 - 10' x 2" PVC riser 2 bags - silica sand ½ pail - bentonite pellets
45							
50							
55							
65							
70							
80							

Type of Boring Casing Size: Hollow Stem Auger Size: 3½

Proportion Percentages	Granular Soils (blows per ft.)		Cohesive Soils (blows per ft.)	
Trace 0 to 10%	0 to 4 Very Loose	30 to 50 Dense	0 to 2 Very Soft	8 to 15 Stiff
Some 10 to 40%	4 to 10 Loose	Over 50 Very Dense	2 to 4 Soft	15 to 30 Very Stiff
And 40 to 50%	10 to 30 Medium Dense		4 to 8 Medium Stiff	Over 30 Hard

Standard penetration test (SPT) = 140# hammer falling 30"
Blows are per 6" taken with an 18" long x 2" O.D. x 1 3/8" I.D. split spoon sampler unless otherwise noted.

The terms and percentages used to describe soil and or rock are based on visual identification of the retrieved samples. ■ Moisture content indicated may be affected by time of year and water added during the drilling process. ■ Water levels indicated may vary with seasonal fluctuation and the degree of soil saturation when the boring was taken. ■ The stratification lines represent the approximate boundaries between soil types, the actual transitions may be gradual. ■

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Client POWNAL TANNING COMPANY; S.P. ENGINEERING Date 12/02/87 Job No. 87-927

Location ROUTE 367, POWAL, VERMONT

RING I.D. L-19 Ground Elev. Date Start 11/18/87 Date Complete 11/18/87 Drilling Foreman M.M. Eng./Hydrol. Geologist B.P.

WELL L-9 Sample Data

DEPTH	Sample No.	Sample Depth (ft.)	Blows 6" Penetration	Rec. Inches	Casing Blows Per ft.	Strata Change Depth	Soil and/or bedrock strata descriptions: Visual Identification of Soil and/or Rock Strata
	1	0'0"- 2'0"	3-3-4-5				Loose, dry, very fine SAND, trace to some organic silt, and inorganic silt, and root matter.
						3'0"	
5	2	5'0"- 7'0"	6-12-13-15				Stiff, damp, inorganic SILT.
						8'0"	
10	3	10'0"- 12'0"	4-14-26-30				Very dense, wet, fine to coarse SAND, some inorganic silt, trace fine to medium gravel.
15	4	15'0"- 17'0"	12-10-29-30				
						17'0"	End of boring at 17'0" Set well point at 14'6" Water level at 10'0" upon completion
							Well Materials; 1 - 2" PVC end plug 1 - 10' x 2" PVC screen 1 - 5' x 2" PVC riser 1 bag - silica sand ½ pail - bentonite pellets
25							
30							
35							
40							

Type of Boring Casing Size: Hollow Stem Auger Size:

Proportion Percentages	Granular Soils (blows per ft.)		Cohesive Soils (blows per ft.)	
Trace 0 to 10%	0 to 4 Very Loose	30 to 50 Dense	0 to 2 Very Soft	8 to 15 Stiff
Some 10 to 40%	4 to 10 Loose	Over 50 Very Dense	2 to 4 Soft	15 to 30 Very Stiff
And 40 to 50%	10 to 30 Medium Dense		4 to 8 Medium Stiff	Over 30 Hard

Standard penetration test (SPT) = 140# hammer falling 30"
Blows are per 6" taken with an 18" long x 2" O.D. x 1 3/8" I.D. split spoon sampler unless otherwise noted.

The terms and percentages used to describe soil and or rock are based on visual identification of the retrieved samples. ■ Moisture content indicated may be affected by time of year and water added during the drilling process. ■ Water levels indicated may vary with seasonal fluctuation and the degree of soil saturation when the boring was taken. ■ The stratification lines represent the approximate boundaries between soil types, the actual transitions may be gradual. ■

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Client POWNAL TANNING COMPANY; S.P. ENGINEERING Date 12/02/87 Job No. 87-927

Location ROUTE 367, POWAL, VERMONT

RING L-9 Ground Elev. Date Start 11/18/87 Date Complete 11/18/87 Drilling Foreman M.M. Eng./Hydrol. Geologist B.P.

WELL L-10

DEPTH	Sample No.	Sample Depth (ft.)	Blows 6" Penetration	Rec. Inches	Casing Blows Per ft.	Strata Change Depth	Visual Identification of Soil and/or Rock Strata
	1	0'0"- 2'0"	7-6-5-5				Medium dense, dry, fine to medium SAND, trace fine gravel, and root matter, coal, ash, (fill).
5	2	4'0"- 6'0"	2-2-2-3			3'0"	Loose, wet, very fine SAND, trace inorganic silt.
10	3	9'0"- 11'0"	9-10-11-14			7'0"	Medium dense, wet, fine to coarse SAND, trace inorganic silt.
15	4	14'0"- 16'0"	5-7-8-6			13'0"	Medium dense, wet, very fine SAND, some clay, trace to some inorganic silt.
						16'0"	End of boring at 16'0" Set well point at 15'0" Water level at 8'0" upon completion Well Materials; 1 - 2" PVC end plug 1 - 10' x 2" PVC screen 2 - 5' x 2" PVC riser 1 - 2" PVC slip cap 1 bag - silica sand ½ pail - bentonite pellets

Type of Boring Casing Size: Hollow Stem Auger Size: 3¼

Proportion Percentages	Granular Soils (blows per ft.)		Cohesive Soils (blows per ft.)	
Trace 0 to 10%	0 to 4 Very Loose	30 to 50 Dense	0 to 2 Very Soft	8 to 15 Stiff
Some 10 to 40%	4 to 10 Loose	Over 50 Very Dense	2 to 4 Soft	15 to 30 Very Stiff
And 40 to 50%	10 to 30 Medium Dense		4 to 8 Medium Stiff	Over 30 Hard

Standard penetration test (SPT) = 140# hammer falling 30"
Blows are per 6" taken with an 18" long x 2" O.D. x 1 3/8" I.D. split spoon sampler unless otherwise noted.

The terms and percentages used to describe soil and or rock are based on visual identification of the retrieved samples. ■ Moisture content indicated may be affected by time of year and water added during the drilling process. ■ Water levels indicated may vary with seasonal fluctuation and the degree of soil saturation when the boring was taken. ■ The stratification lines represent the approximate boundaries between soil types, the actual transitions may be gradual. ■

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Client: POWNAL TANNING COMPANY; S.P. ENGINEERING | Date: 12/02/87 | Job No.: 87-927

Location: ROUTE 367, POWAL, VERMONT

BORING NO.: L-10 | Ground Elev.: | Date Start: 11/18/87 | Date Complete: 11/18/87 | Drilling Foreman: M.M. | Eng./Hydrol. Geologist: B.P.

WELL L-11 Sample Data

DEPTH	Sample No	Sample Depth (ft.)	Blows 6" Penetration	Rec. Inches	Casing Blows Per ft.	Strata Change Depth	Soil and/or bedrock strata descriptions: Visual Identification of Soil and/or Rock Strata
	1	0'0"- 2'0"	2-2-3-2				Loose, damp, very fine to fine SAND, trace coarse sand, organic silt, and root matter.
						3'0"	
5	2	5'0"- 7'0"	1-1-1-1				Very loose, wet, very fine to fine SAND, trace inorganic silt.
						8'0"	
10	3	10'0"- 12'0"	25-30-26-24				Very dense, wet, fine to medium SAND, trace fine to coarse gravel, and inorganic silt.
						13'0"	
15	4	15'0"- 17'0"	3-2-2-1				Soft, wet CLAY, some very fine sand, and inorganic silt, lenses.
						17'0"	End of boring at 17'0" Set well point at 13'0" Water level at 6'0" upon completion Well Materials; 1 - 2" PVC end plug 1 - 10' x 2" PVC screen 1 - 5' x 2" PVC riser ½ bag - silica sand ½ pail - bentonite pellets
20							
25							
30							
35							
40							

Type of Boring: Casing Size: | Hollow Stem Auger Size: 7¼

Proportion Percentages
Trace 0 to 10%
Some 10 to 40%
And 40 to 50%

Granular Soils (blows per ft.)
0 to 4 Very Loose
4 to 10 Loose
10 to 30 Medium Dense
30 to 50 Dense
Over 50 Very Dense

Cohesive Soils (blows per ft.)
0 to 2 Very Soft
2 to 4 Soft
4 to 8 Medium Stiff
8 to 15 Stiff
15 to 30 Very Stiff
Over 30 Hard

Standard penetration test (SPT) = 140# hammer falling 30"
Blows are per 6" taken with an 18" long x 2" OD x 1 3/8" I.D. split spoon sampler unless otherwise noted.

The terms and percentages used to describe soil and or rock are based on visual identification of the retrieved samples. ■ Moisture content indicated may be affected by time of year and water added during the drilling process. ■ Water levels indicated may vary with seasonal fluctuation and the degree of soil saturation when the boring was taken. ■ The stratification lines represent the approximate boundaries between soil types, the actual transitions may be gradual. ■

148 Pioneer Dr.
Leominster, MA 01453
(617) 840-0391

SOIL EXPLORATION CORPORATION

Geotechnical Drilling and Groundwater Monitor Wells

23 Ingalls St.
Nashua, NH 03060
(603) 882-3601

37

Client POWNAL TANNING COMPANY; S.P. ENGINEERING Date 12/02/87 Job No. 87-927

Location ROUTE 367, POWAL, VERMONT

BORING NO. L-11 Ground Elev. Date Start 11/17/87 Date Complete 11/17/87 Drilling Foreman M.M. Eng./Hydrol. Geologist B.P.

WELL L-12 Sample Data

DEPTH	Sample No.	Sample Depth (ft.)	Blows 6" Penetration	Rec. Inches	Casing Blows Per ft.	Strata Change Depth	Soil and/or bedrock strata descriptions: Visual Identification of Soil and/or Rock Strata
	1	0'0"- 2'0"	3-4-5-6				
5	2	4'0"- 6'0"	2-2-3-2				Very loose to medium dense, dry to damp, very fine SAND, trace inorganic silt, and organic silt, and root matter.
10	3	9'0"- 11'0"	2-2-1-1				
						13'0"	Very dense, wet, fine to coarse SAND, trace fine to coarse gravel, and inorganic silt.
15	4	14'0"- 16'0"	20-20-25-30				
						17'0"	End of boring at 17'0" Set well point at 17'0" Water level at 14'0" upon completion Well Materials; 1 - 2" PVC end plug 1 - 10' x 2" PVC screen 2 - 5' x 2" PVC riser 1 bag - silica sand ½ pail - bentonite pellets
20							
25							
30							
35							
40							

Type of Boring Casing Size: Hollow Stem Auger Size: 3¼

Proportion Percentages
Trace 0 to 10%
Some 10 to 40%
And 40 to 50%

Granular Soils (blows per ft.)
0 to 4 Very Loose
4 to 10 Loose
10 to 30 Medium Dense
30 to 50 Dense
Over 50 Very Dense

Cohesive Soils (blows per ft.)
0 to 2 Very Soft
2 to 4 Soft
4 to 8 Medium Stiff
8 to 15 Stiff
15 to 30 Very Stiff
Over 30 Hard

Standard penetration test (SPT) = 140# hammer falling 30"
Blows are per 6" taken with an 18" long x 2" O.D. x 1 3/8" I.D. split spoon sampler unless otherwise noted.

The terms and percentages used to describe soil and or rock are based on visual identification of the retrieved samples. ■ Moisture content indicated may be affected by time of year and water added during the drilling process. ■ Water levels indicated may vary with seasonal fluctuation and the degree of soil saturation when the boring was taken. ■ The stratification lines represent the approximate boundaries between soil types, the actual transitions may be gradual. ■

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37

Client	POWNAL TANNING COMPANY; S.P. ENGINEERING	Date	12/02/87	Job No.	87-927
Location	ROUTE 367, POWAL, VERMONT				

BORING NO.	L-12	Ground Elev.		Date Start	11/16/87	Date Complete	11/16/87	Drilling Foreman	M.M.	Eng./Hydrol. Geologist	B.P.

WELL L-13 Sample Data

DEPTH	Sample No.	Sample Depth (ft.)	Blows 6" Penetration	Rec. Inches	Casing Blows Per ft.	Strata Change Depth	Visual Identification of Soil and/or Rock Strata
	1	0'0"- 2'0"	4-3-3-3				Medium stiff, damp CLAY, some inorganic silt, and very fine sand, trace fine gravel, and organic, root matter.
5	2	4'0"- 6'0"	1-1-4-3			4'0"	Loose to medium stiff, wet, organic SILT, trace fine to medium gravel, and sand.
10	3	9'0"- 11'0"	5-5-4-5			8'0"	Loose to very loose, damp, very fine SAND, some organic silt, lenses, trace to some inorganic silt.
15	4	14'0"- 14'6"	3-			14'6"	Medium dense, wet, very fine to fine SAND, some medium to coarse sand, and organic silt, lenses, trace fine to medium gravel.
	5	14'6"- 16'0"	5-10-12			17'0"	Refusal at 17'0" with hollow stem auger Set well point at 17'0" Water level at 10'0" upon completion Well Materials; 1 - 2" PVC end plug 1 - 10' x 2" PVC screen 2 - 5' x 2" PVC riser 1 bag - silica sand ½ pail - bentonite pellets
20							
25							
30							
35							
40							

Type of Boring Casing Size: Hollow Stem Auger Size: 3¼

Proportion Percentages	Granular Soils (blows per ft.)		Cohesive Soils (blows per ft.)	
Trace 0 to 10%	0 to 4 Very Loose	30 to 50 Dense	0 to 2 Very Soft	8 to 15 Stiff
Some 10 to 40%	4 to 10 Loose	Over 50 Very Dense	2 to 4 Soft	15 to 30 Very Stiff
And 40 to 50%	10 to 30 Medium Dense		4 to 8 Medium Stiff	Over 30 Hard

Standard penetration test (SPT) = 140# hammer falling 30"
Blows are per 6" taken with an 18" long x 2" O.D. x 1 3/8" I.D. split spoon sampler unless otherwise noted.

The terms and percentages used to describe soil and or rock are based on visual identification of the retrieved samples. ■ Moisture content indicated may be affected by time of year and water added during the drilling process. ■ Water levels indicated may vary with seasonal fluctuation and the degree of soil saturation when the boring was taken. ■ The stratification lines represent the approximate boundaries between soil types, the actual transitions may be gradual. ■

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Geotechnical Drilling and Groundwater Monitor Wells

23 Ingalls St.
Nashua, NH 03060
(603) 882-3601

Client POWNAL TANNING COMPANY; S.P. ENGINEERING Date 12/02/87 Job No. 87-927

Location ROUTE 367, POWAL, VERMONT

BORING NO. L-13 Ground Elev. Date Start 11/18/87 Date Complete 11/18/87 Drilling Foreman M.M. Eng./Hydrol. Geologist B.P.

WELL L-14 Sample Data

DEPTH	Sample No.	Sample Depth (ft.)	Blows 6" Penetration	Rec. Inches	Casing Blows Per ft.	Strata Change Depth	Soil and/or bedrock strata descriptions: Visual Identification of Soil and/or Rock Strata
	1	0'0"- 2'0"	5-6-5-7				Loose to medium dense, dry to wet, very fine SAND, some inorganic silt.
5	2	4'0"- 6'0"	3-4-3-3				
10	3	9'0"- 11'0"	3-4-5-3				
15							
						18'0"	End of boring at 18'0" Set well point at 18'0" Water level at 15'0" upon completion Well Materials; 1 - 2" PVC end plug 1 - 10' x 2" PVC screen 2 - 5' x 2" PVC riser 1 bag - silica sand ½ pail - bentonite pellets
20							
25							
30							
35							
40							

Type of Boring Casing Size. Hollow Stem Auger Size: 3¼

Proportion Percentages
Trace 0 to 10%
Some 10 to 40%
And 40 to 50%

Granular Soils (blows per ft.)
0 to 4 Very Loose
4 to 10 Loose
10 to 30 Medium Dense
30 to 50 Dense
Over 50 Very Dense

Cohesive Soils (blows per ft.)
0 to 2 Very Soft
2 to 4 Soft
4 to 8 Medium Stiff
8 to 15 Stiff
15 to 30 Very Stiff
Over 30 Hard

Standard penetration test (SPT) = 140# hammer falling 30"
Blows are per 6" taken with an 18" long x 2" O.D. x 1 3/8" I.D. split spoon sampler unless otherwise noted.

The terms and percentages used to describe soil and or rock are based on visual identification of the retrieved samples. ■ Moisture content indicated may be affected by time of year and water added during the drilling process. ■ Water levels indicated may vary with seasonal fluctuation and the degree of soil saturation when the boring was taken. ■ The stratification lines represent the approximate boundaries between soil types, the actual transitions may be gradual. ■

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37

Client POWNAL TANNING COMPANY; S.P. ENGINEERING Date 12/02/87 Job No. 87-927

Location ROUTE 367, POWAL, VERMONT

BORING NO. L-14 Ground Elev. Date Start 11/17/87 Date Complete 11/17/87 Drilling Foreman M.M. Eng./Hydrol. Geologist B.P.

WELL L-15 Sample Data

DEPTH	Sample No.	Sample Depth (ft.)	Blows 6" Penetration	Rec. Inches	Casing Blows Per ft.	Strata Change Depth	Soil and/or bedrock strata descriptions: Visual Identification of Soil and/or Rock Strata
	1	0'0"- 2'0"	3-4-4-3				Loose, dry, very fine SAND, trace to some inorganic silt, and organic silt, trace medium to coarse sand, and root matter.
5	2	4'0"- 6'0"	3-3-3-4				
						7'0"	Dense, dry, very fine SAND, some organic silt, trace medium to coarse sand.
10	3	9'0"- 11'0"	13-64-26-24				
15	4	14'0"- 15'6"	3-25-20-				
	4A	15'6"- 16'0"	20			15'6"	Medium dense to dense, wet, fine to coarse SAND, trace fine to coarse gravel, and organic silt.
20	5	19'0"- 21'0"	20-18-15-14				
						21'0"	End of boring at 21'0" Set well point at 19'0" Water level at 14'6" upon completion Well Materials; 1 - 2" PVC end plug 1 - 10' x 2" PVC screen 1 - 10' x 2" PVC riser 1 bag - silica sand ½ pail - bentonite pellets
25							
30							
35							
40							

Type of Boring Casing Size: Hollow Stem Auger Size: 3¼

Proportion Percentages
Trace 0 to 10%
Some 10 to 40%
And 40 to 50%

Granular Soils (blows per ft.)
0 to 4 Very Loose
4 to 10 Loose
10 to 30 Medium Dense
30 to 50 Dense
Over 50 Very Dense

Cohesive Soils (blows per ft.)
0 to 2 Very Soft
2 to 4 Soft
4 to 8 Medium Stiff
8 to 15 Stiff
15 to 30 Very Stiff
Over 30 Hard

Standard penetration test (SPT) = 140# hammer falling 30"
Blows are per 6" taken with an 18" long x 2" O.D. x 1 3/8" I.D. split spoon sampler unless otherwise noted.

The terms and percentages used to describe soil and or rock are based on visual identification of the retrieved samples. ■ Moisture content indicated may be affected by time of year and water added during the drilling process. ■ Water levels indicated may vary with seasonal fluctuation and the degree of soil saturation when the boring was taken. ■ The stratification lines represent the approximate boundaries between soil types, the actual transitions may be gradual. ■

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SOIL EXPLORATION CORPORATION

Geotechnical Drilling and Groundwater Monitor Wells

23 Ingalls St.
Nashua, NH 03060
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Client: POWNAL TANNING COMPANY; S.P. ENGINEERING — Date: 12/02/87 — Job No.: 87-927

Location: ROUTE 367, POWAL, VERMONT

BORING NO.: L-16 — Ground Elev.: LAG 4A — Date Start: 11/16/87 — Date Complete: 11/16/87 — Drilling Foreman: M.M. — Eng./Hydrol. Geologist: B.P.

DISCARD

DEPTH	Sample No.	Sample Depth (ft.)	Blows 6" Penetration	Rec. Inches	Casing Blows Per ft.	Strata Change Depth	Visual Identification of Soil and/or Rock Strata
	1	0'0"- 2'0"	2-1-weight of hammer				Very soft, damp, some CLAY, fine sand, trace organic silt, fine gravel, and wood, (fill).
5	2	4'0"- 6'0"	weight of hammer				
						9'0"	
10	3	9'0"- 10'0"	2-2-				Soft, wet, inorganic SILT, some very fine sand.
	3A	10'0"- 11'0"	8-8			10'0"	Medium dense to dense, wet, fine to coarse SAND, trace fine to medium gravel, trace organic silt, and inorganic silt.
15	4	14'0"- 16'0"	45-45-26-23				
	5	18'0"- 20'0"	4-4-5-5			18'0"	Stiff, moist CLAY.
20						20'0"	End of boring at 20'0" Set well point at 17'0" Water level at 11'0" upon completion Well Materials; 1 - 2" PVC end plug 1 - 10' x 2" PVC screen 2 - 5' x 2" PVC riser
25							
30							
35							
40							

Soil and/or bedrock strata descriptions

Type of Boring: Casing Size: Hollow Stem Auger Size: 3¼

Proportion Percentages
Trace 0 to 10%
Some 10 to 40%
And 40 to 50%

Granular Soils (blows per ft.)
0 to 4 Very Loose
4 to 10 Loose
10 to 30 Medium Dense
30 to 50 Dense
Over 50 Very Dense

Cohesive Soils (blows per ft.)
0 to 2 Very Soft
2 to 4 Soft
4 to 8 Medium Stiff
8 to 15 Stiff
15 to 30 Very Stiff
Over 30 Hard

Standard penetration test (SPT) = 140# hammer falling 30"
Blows are per 6" taken with an 18" long x 2" O.D. x 1 3/8" I.D. split spoon sampler unless otherwise noted.

The terms and percentages used to describe soil and or rock are based on visual identification of the retrieved samples. ■ Moisture content indicated may be affected by time of year and water added during the drilling process. ■ Water levels indicated may vary with seasonal fluctuation and the degree of soil saturation when the boring was taken. ■ The stratification lines represent the approximate boundaries between soil types, the actual transitions may be gradual. ■

REFERENCE 26

Pownal Case Report

I. Regulatory History Relating to Lagoon #1

Pownal Tanning Company, located on Route 346 in North Pownal, Vermont, was constructed in the 1920's. The facility is owned by John Flynn and Sons, Inc., 80 Boston Street, Salem, Massachusetts 01970, and is operated by Pownal Tanning Company.

The company tans and finishes cow and sheep hides. Plant operation consists of various cutting and finishing processes. The "beam house" is where hair, grease, and other residues are removed from raw hide. Hides are then further processed in the "color tanning room" using water and various chemicals, including retanning agents, various dyes and pigments containing lead and chrome and softening oils. Wastewater is discharged on an as needed basis from both operations. Waste streams associated with these processes include lubricating oils, paint and solvent sludges, and tanning sludge consisting of animal fat and hair, leather trimmings and shavings and wastewater treatment sludges. At this point in time, paint and solvent sludges and lubricating oils are stored on site in a hazardous waste storage facility and shipped before the 90 day limit.

Before 1963, waste streams were discharged directly to the Hoosic River. With the construction of a lagoon system in early 1963, wastewater sludges went through a series of lagoons where solids settled out before ultimately discharging into the Hoosic. Air photos dated May 12, 1962, show the area where the lagoons would eventually be constructed. The original lagoon system consisted of two lagoons covering ten acres. In 1971, with the construction of dividing berms and conversion of more land surface into lagoon, the two lagoons were divided into five lagoons covering 22½ acres. An air photo taken on April 27, 1974, shows the lagoon system in full operation. Lagoon #1 received waste directly from the plant and acted as an initial settling basin for large solids and sludge. Wastewater then passed from lagoon #1 consecutively to the other lagoons and finally to the Hoosic.

In 1978 a clarifier unit was built to aid in handling sludge. Wastewater then went from lagoon #1 into the clarifier and then into the lagoon series. Solids from the clarifier were placed in lagoons 1 and 2, while the effluent went into 3, 4, 5, and then the Hoosic. By 1980, lagoon #1 was full and complaints about odor from the lagoon increased. A Consent Order issued on August 1, 1980, addressed odor abatement of lagoon #1. It required removal of surface water, lining the surface with a ½ inch thick layer of lime, and stated that the measures required did not constitute final disposal of sludge in #1. By October, 1980, lagoon #1 was mostly inactive, covered with 150 tons of lime, and contained 50,000 yards^3 of sludge up to 12 feet deep.

A letter form the Agency to Pownal Tanning dated August 26, 1980 stated that the sludge in all lagoons was to be considered hazardous by virtue of 6-602 (2)(a)(10) and 6-602 (2)(a)(12), and required toxicity testing of sludges in lagoons #1 and 3. Testing was subsequently done on sludges from lagoons 1, 2, and 3. E. P. Toxicity analysis of sludges submitted by Dubois and King on

October 10, 1980 revealed that sludges in lagoons #2 and #3 were non-hazardous. Sludge in lagoon #1 failed E. P. Toxicity testing for lead, rendering it by definition hazardous under 40 CFR 261.24 (a) (see Hazardous Waste Delisting dated 1/21/82).

In September, 1981, Pownal submitted a petition to delist their wastewater treatment sludge from lagoons #2, 3a, 3b, 4, 4a, and 5 and the currently produced sludge. The delisting was accomplished on January 21, 1982 and did not include lagoon #1 because of its lead content. Chrome content was not considered since the lagoon contained trivalent chrome as opposed to hexavalent chrome.

Lagoon #1 continued to receive waste until April of 1981. Pownal's consultant was using the area as an experimental sludge drying bed (see memos dated 4/10/81 and 4/27/81), an act not approved by the Agency. A letter dated April 1, 1981 was sent to Mr. William Fuller of John Flynn and Sons, owner of Pownal Tanning, informing him that due to the hazardous nature of sludge in lagoons 1 - 5, closure of the lagoons required a hydrologic study and monitoring data to show that the lagoons "present no threat to the environment," and a closure plan should be filed which provided for "long term monitoring and maintenance and ..... financial responsibility."

A letter from the Agency dated May 12, 1982, to Pownal required "prompt disposition of sludge in lagoon #1," and required submission by July 1, 1983 of a plan for either removal of the sludge or final closure of the lagoon.

A response was submitted by Sea Plantations, Pownal's consultant, dated June 29, 1982, addressing closure of lagoons #1, 3a, 3b and 4a. Suggested closure of the lagoons would include installing a cover consisting of 6 inches of impermeable material sloped to divert surface water. A grain size analysis of the proposed cover material was included, which gave no units, but listed percentages as 5% sand, 36% silt, and 59% clay. A very rough estimate of hydraulic conductivity taken from these percentages falls at about 1.5 x 10 cm/sec or about .3 feet/day. Current guidelines for capping material for hazardous waste landfills requires a conductivity of 1 x 10 cm/sec (.003 feet/day) or less.

Two Agency memos, dated July 15, 1982 and July 26, 1982, pertaining to how the lagoons should be closed are included in the file. A letter to Sea Plantations followed, dated August 12, 1982, delineating Agency policy toward closure of lagoon #1. A two foot thick impermeable soil cap was required, sloped to promote surface drainage, and seeded to minimize erosion. In addition, a quarterly groundwater monitoring program was proposed, which required installation of three new downgradient wells. Sea Plantations then proposed on August 17, 1982, a one foot cover for lagoon #1, one new monitoring well and stated that, to date, no water quality problems existed for lagoon #1. On September 1, 1982, the Agency accepted one foot of cover, and required the installation of two new monitoring wells. On October 7, 1982, the Agency accepted as cover material dredged silt from the forebay area of the company's hydroelectric dam.

Two new monitoring wells were installed on October 13, 1982. A letter from Pownal dated May 18, 1983 stated that "during the spring this year, the large lagoon #1 was covered in compliance with the directions of the AEC."

From 1983 to 1988, the only activity concerning lagoon #1 involved groundwater monitoring. Wells were monitored twice in 1982, once in 1983, once in 1984, and three times in 1986. The required quarterly groundwater monitoring program was never undertaken. A file memo dated September 5, 1985 stated the need to properly close lagoon #1 as a hazardous waste disposal unit under permit. A letter was sent to owner William Fuller on April 30, 1986 stating that the facility must submit a closure/post closure plan for lagoon #1 in compliance with federal regulations which should address closure of the lagoon, as well as post closure monitoring and maintenance.

An inspection by AEC staff of lagoon #1 on May 22, 1986, revealed that the surface of lagoon #1 had subsided approximately seven feet at its center. Ponding and surface cracking of the cover, as well as an absence of vegetative cover, was noted and photographed at that time. Pownal was again on that day informed by Agency staff that proper closure was never achieved and maintained and that additional groundwater monitoring points were necessary.

To that end, an order was issued to Pownal on August 20, 1986, requiring them to undertake a hydrogeological assessment of the site and submit a closure plan consistent with 40 CFR 265, subparts F, G, and H.

Since that time Pownal has installed two presumed "upgradient" monitor wells, and retested sludge cores from lagoon #1 for E P Toxicity characteristic. Listed below are results from this testing and results from tests done in 1980.

	E P Toxicity Limit	1980	1986 Averages	
			Aquatec	S.P. Eng.
Lead	5.0	5.35	1.0	0.18
Chromium	5.0	11.0	5.0	1.74

Of note is that values for lead and chrome have decreased since the 1980 sampling. In all probability, levels have dropped due to leaching of lead and chrome to groundwater.

Pownal has, in addition, submitted a hydrogeological assessment, conducted by Bruce Poole of S.P. Engineering. The report was found by Agency staff to be largely inadequate and did not supply even the basic necessary information regarding flow directions or water table contours. Many, if not all, of the conclusions and decisions reached regarding closure are based on assumed values rather than actual field conditions. The Agency has concerns that Pownal's consultant is not qualified to perform such an assessment.

POWELL TANNERY
POWELL, VERMONT

WATER QUALITY TEST RESULTS
from SURFACE WATER SAMPLING ON THE HOOSIC RIVER

DATE OF SAMPLING: 5/20/81

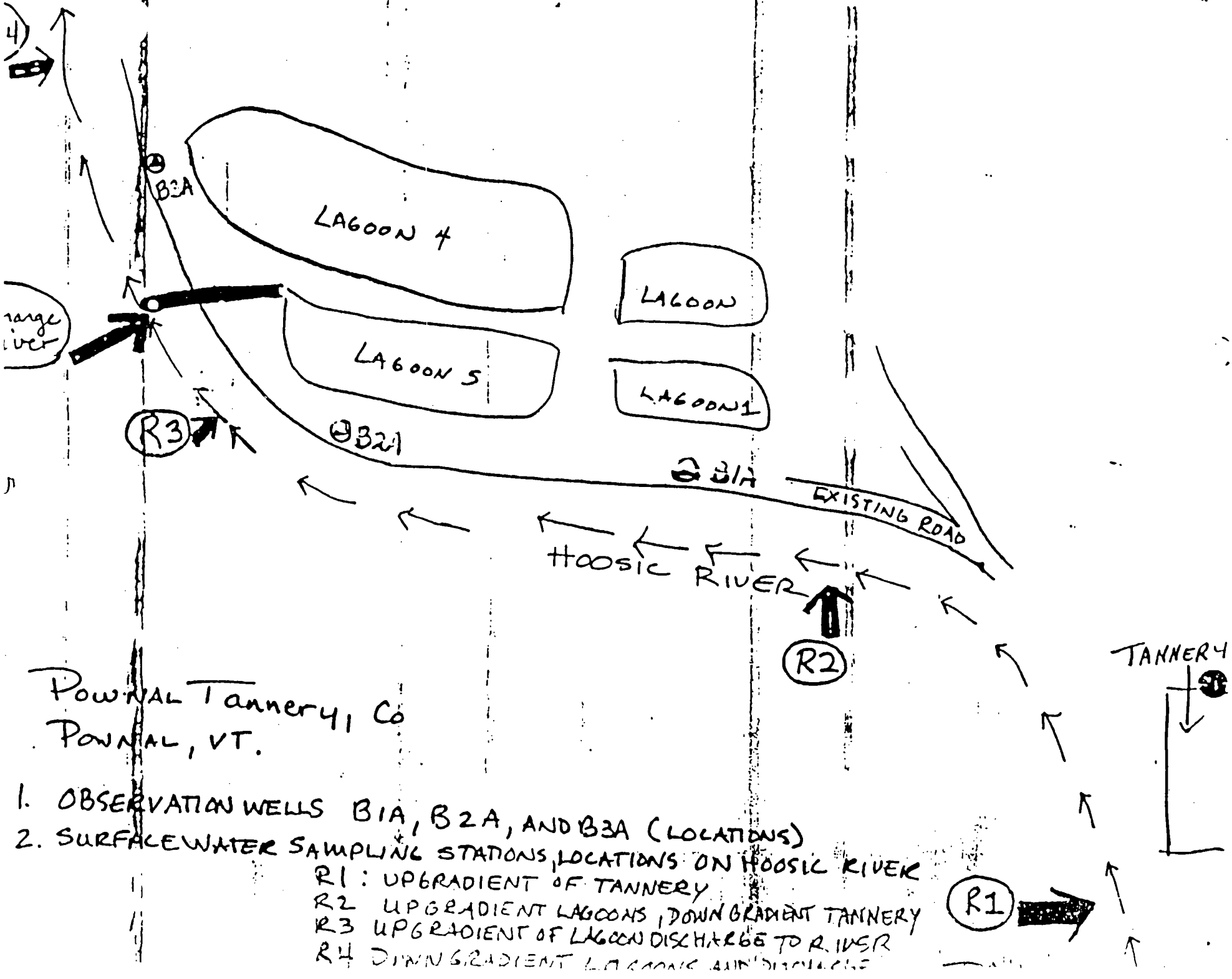
LOCATION	R1	R2	R3	R4
pH(FS)	7.7	7.7	7.6	7.6
COND.(FS)	190	200	200	290
LEAD TOT.(WR)	0.003	0.005	(0.003	0.007
LEAD TOT.(SP)				
CHLORIDE(WR)	9.29	10.1	9.51	28.3
CHROMIUM TOT. (WR)	0.004	0.004	0.004	0.014
" "(SP)	0.32	0.09	1.18	1.15
CHROMIUM 6+(SP)	(0.01	(0.01	(0.01	(0.01
TSS(SP)	4	(4	4	(4
BOD(SP)	195	180	165	135

310 PRINT

UNITS: (COND.) CONDUCTIVITY, UMHOS/CM.; DEPTH TO GROUNDWATER (GW); FEET; ALL OTHERS mg/l.
*TSS TOTAL SUSPENDED SOLIDS; BOD BIOCHEMICAL OXYGEN DEMAND

CODE DEFINITIONS:
(FS) FIELD MEASUREMENT, STATE OF VERMONT
(WR) ANALYSIS VERMONT STATE WATER QUALITY LAB
(SP) ANALYSIS SEA PLANTATIONS LABORATORY
(AQ) ANALYSIS AQUATEC LABORATORY

SAMPLING LOCATIONS:
R1: UPGRADIENT OF TANNERY AND LAGOONS.
R2: DOWNGRADIENT OF TANNERY, UPGRADIENT OF LAGOONS.
R3: UPGRADIENT OF LAGOON DISCHARGE TO RIVER.
R4: DOWNGRADIENT OF DISCHARGE AND LAGOONS.



POWNAL TANNERY, CO
POWNAL, VT.

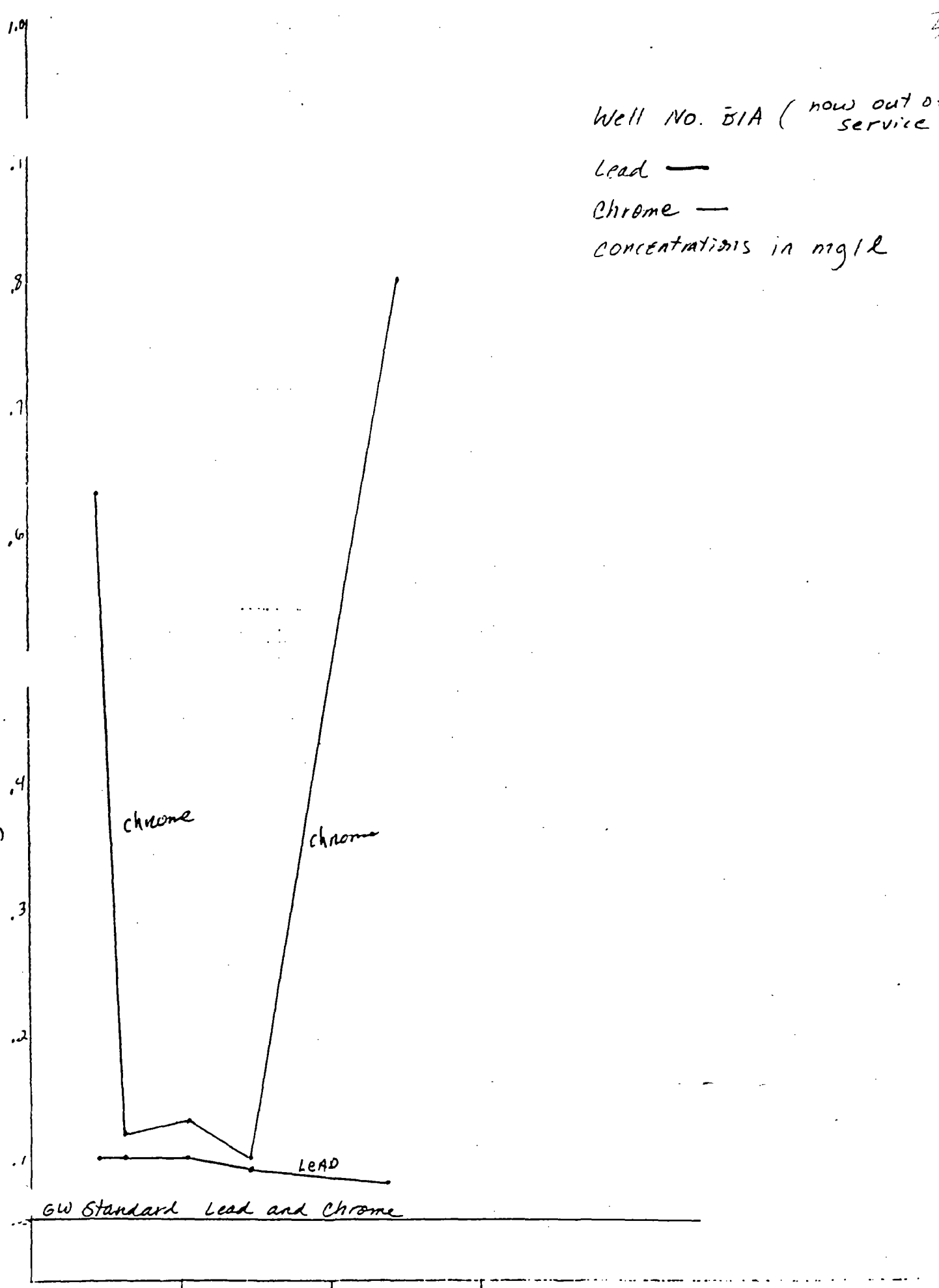
1. OBSERVATION WELLS B1A, B2A, AND B3A (LOCATIONS)
2. SURFACEWATER SAMPLING STATIONS, LOCATIONS ON HOOSIC RIVER
   - R1: UPGRADIENT OF TANNERY
   - R2 UPGRADIENT LAGOONS, DOWNGRADIENT TANNERY
   - R3 UPGRADIENT OF LAGOON DISCHARGE TO RIVER
   - R4 DOWNGRADIENT LAGOONS AND DISCHARGE

Well No. 61A (now out of service)

Lead —

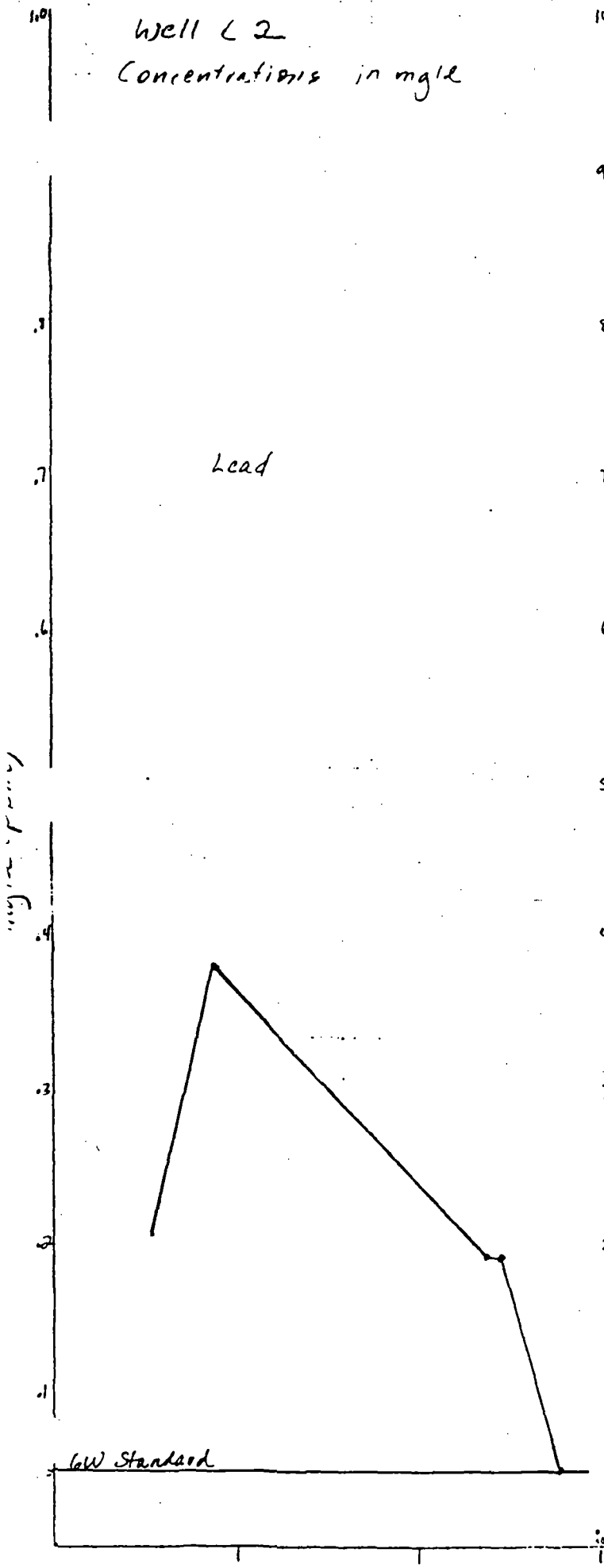
Chrome —

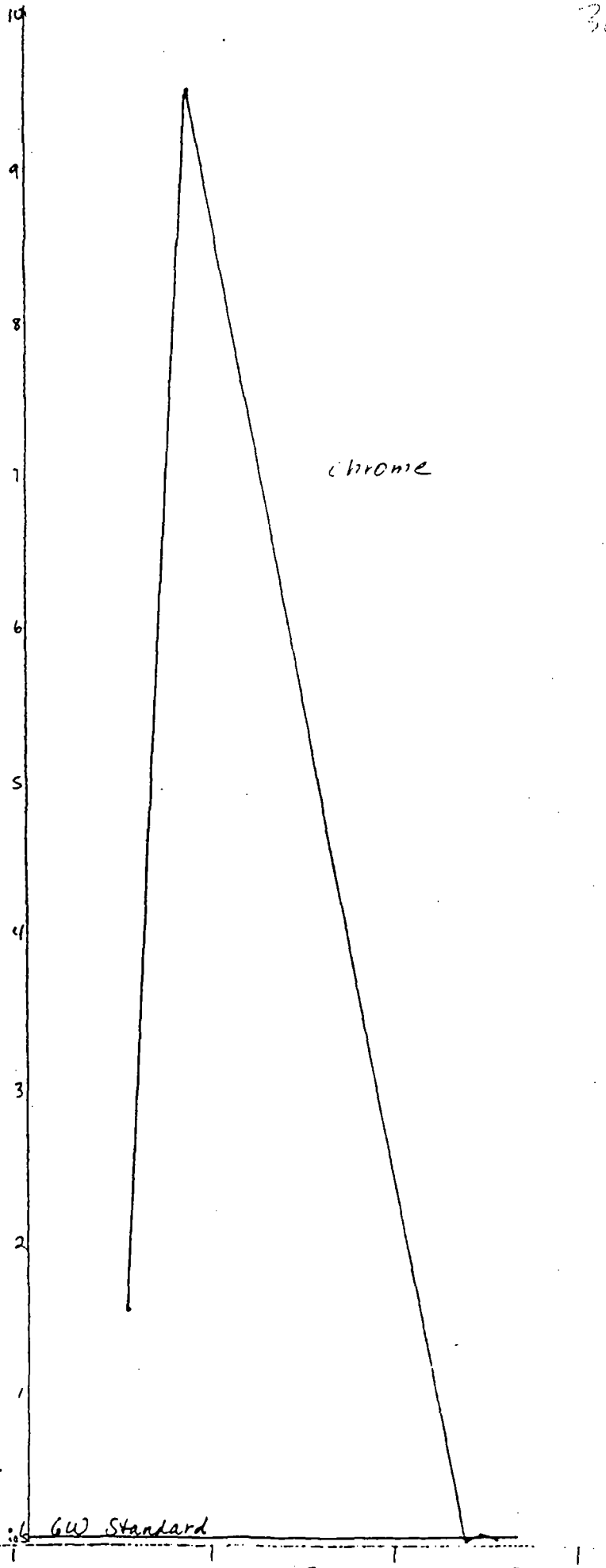
concentrations in mg/l

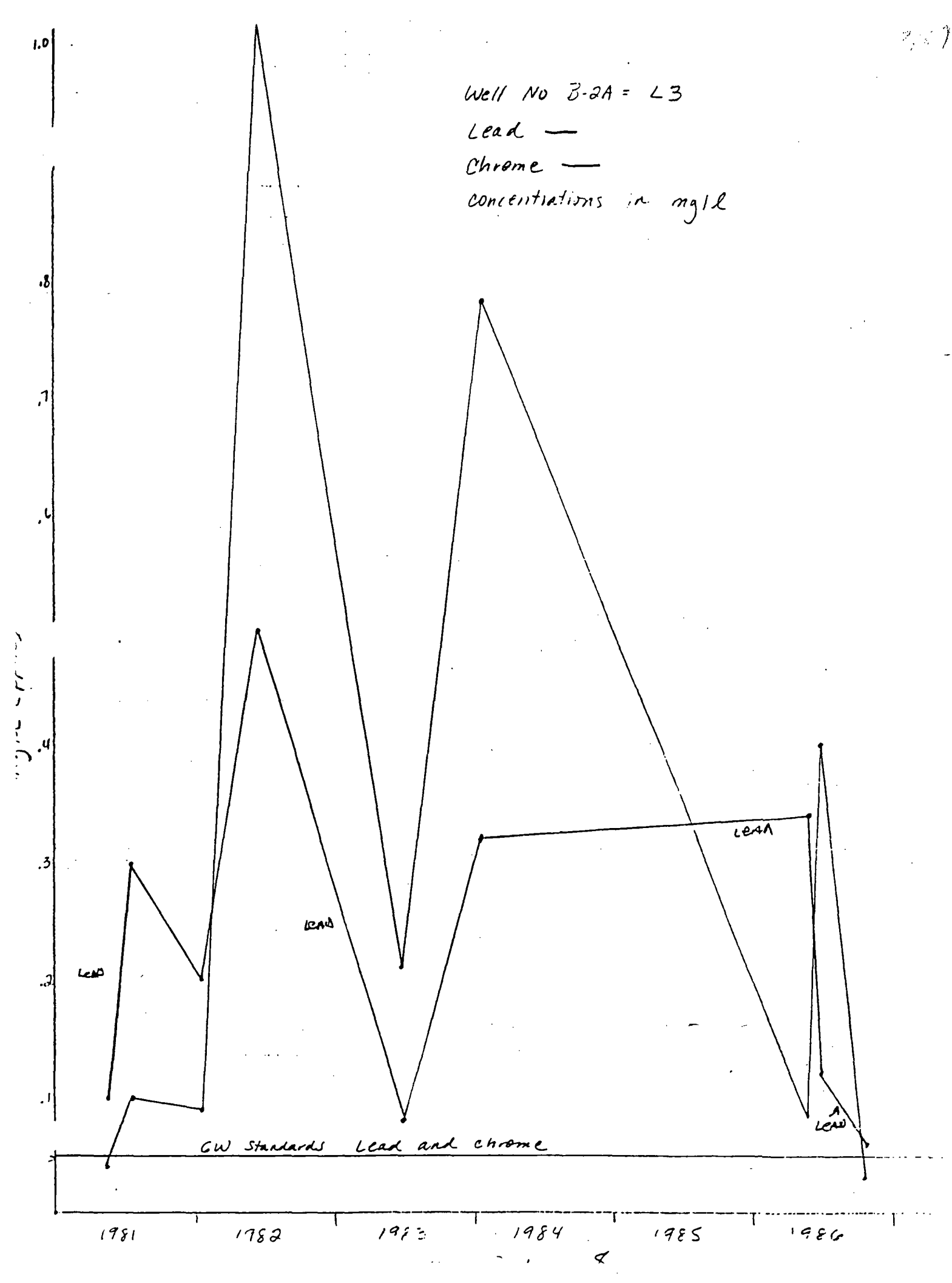


Well C 2

Concentrations in mg/l





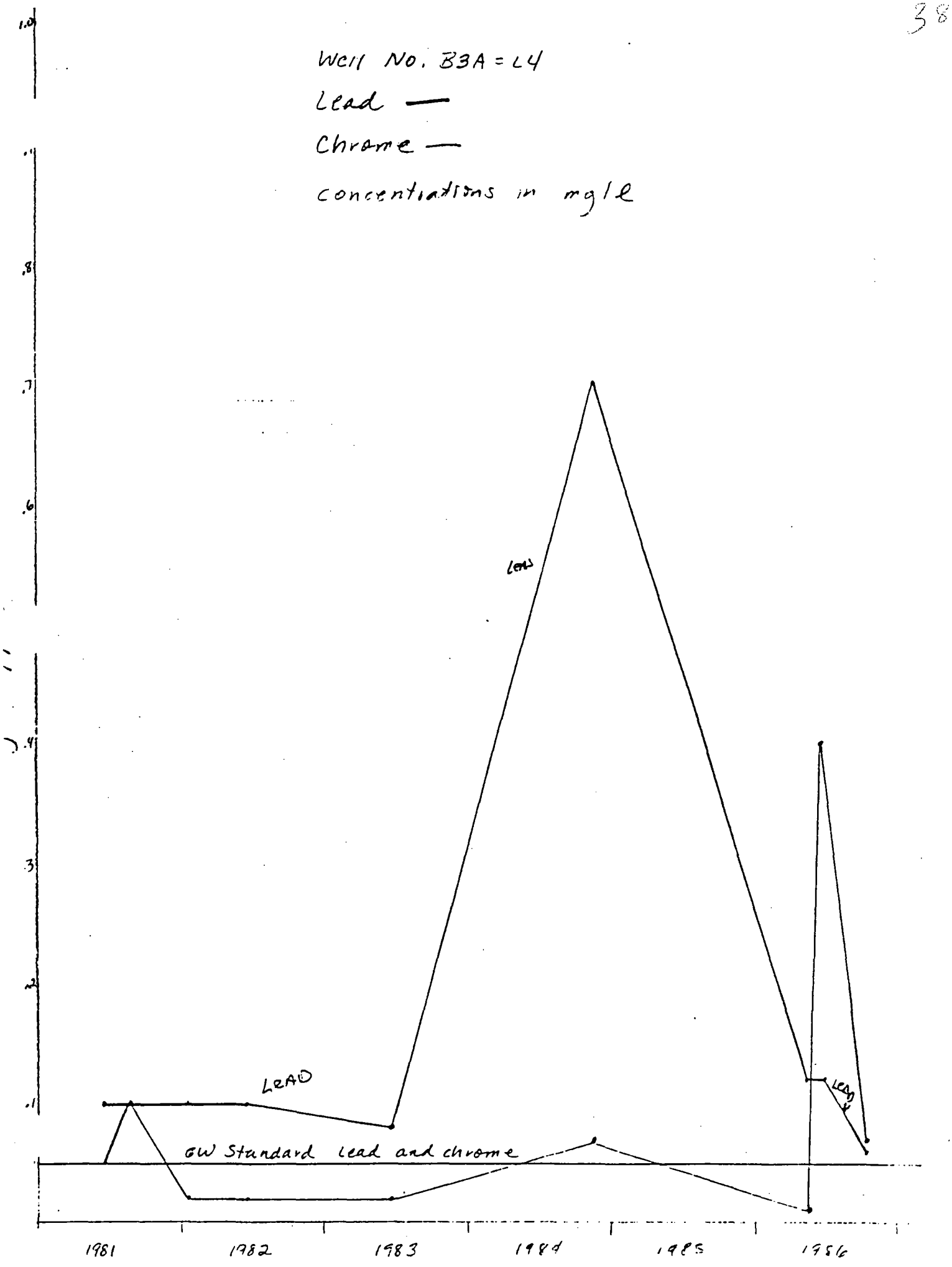

Well No B-2A = L3
Lead —
Chrome —
concentrations in mg/l
1.0
.8
.7
.6
.4
.3
.2
.1
LEAD
LEAD
LEAD
LEAD
GW Standards Lead and chrome
1981
1982
1984
1985
1986

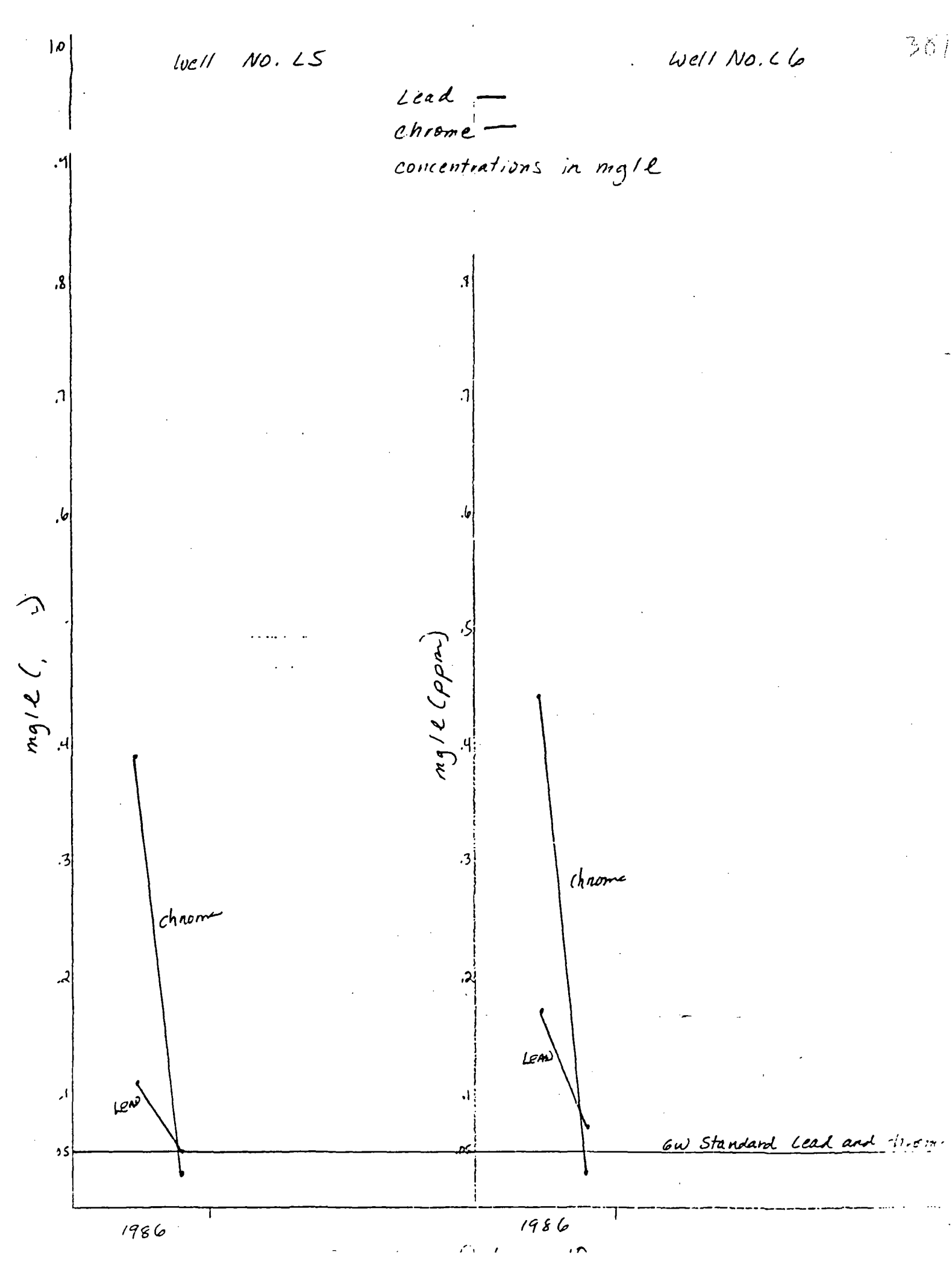
Well No. B3A = L4

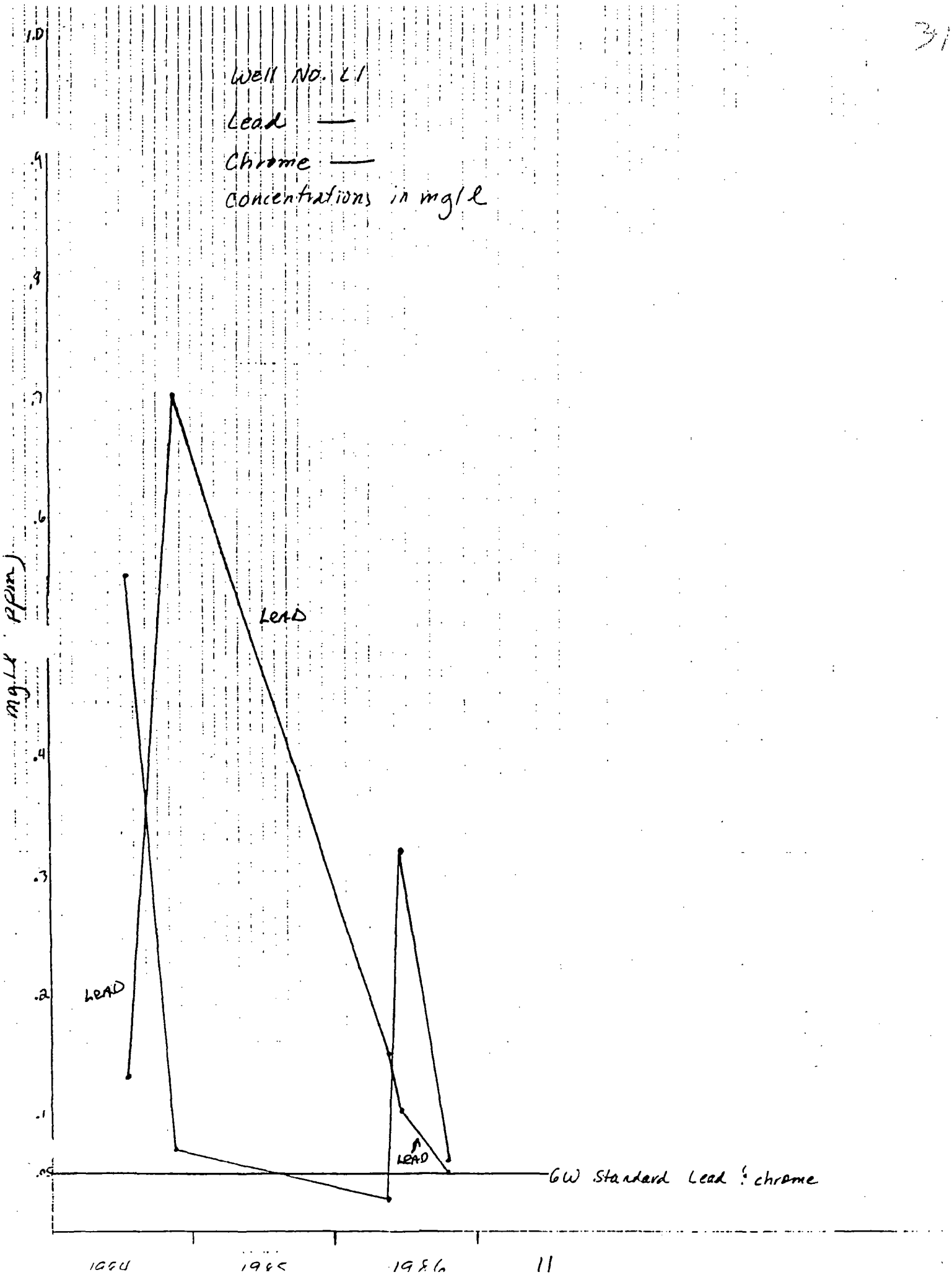
Lead —

Chrome —

concentrations in mg/l




Well NO. L5
Well No. C6
Lead —
chrome —
concentrations in mg/l
mg/l (ppm)
chrome
LEAD
chrome
LEAD
GW Standard Lead and
1986
1986


Well No. L1
Lead
Chrome
Concentrations in mg/l
1.0
.9
.8
.7
.6
.4
.3
.2
.1
.05
mg/l (ppm)
LEAD
LEAD
LEAD
GW Standard Lead & chrome
1985
1986
11

IV Environmental Degradation and Receptors

Ongoing degradation of groundwater quality has been observed in wells surrounding the lagoon system perimeter. Three monitoring wells B1A, B2A and B3A were installed in April or 1981, two more, L1 and L2 in October of 1982, and two more, L5 and L6 in June of 1986. A map of well locations is attached. Monitoring began in 1981 and has continued to the present day, although not at the quarterly schedule required in 1982 as part of the closure plan. Monitoring results are attached, as well as graphs illustrating concentrations that exceed National Interim Drinking Water Standards for chromium and lead.

Wells B1A, B2A, B3A, L1 and L2 were installed between the lagoon's berm system and the river. Wells L5 and L6 were placed in an area assumed to be upgradient of the lagoon system, and were to indicate background water quality.

Results indicate continued and ongoing exceedences of ground water quality standards for total chromium, lead, occasionally chlorides, and variances in pH in all wells tested. A supply well drilled by Pownal in 1980 on a berm in the center of the lagoon system was tested in 1984. This well terminate at 25 feet in gravel and tested with above standard concentrations of chloride, sodium, and iron; and detectable but below standard levels of chrome and lead.

Of note is the fact that the two monitoring wells installed to be hydraulically upgradient show among the highest levels of chrome and lead. Contamination in these presumed upgradient wells indicate two things: the groundwater flow system at Pownal is not understood, and its very possible that a reversal in the local gradient has occurred due to groundwater mounding in the lagoon area. This has significant implications in that residential shallow wells are in the vicinity as discussed below. The lagoon system is located on the floodplain of and immediately adjacent to the Hoosic River. The floodplain area is crisscrossed by numerous meander scars, areas containing gravel with high hydraulic conductivity which serve as excellent conduits for leachate. Several homeowner wells are terminated within the same gravel units.

Since the lagoon system is adjacent to and less than 15 feet from the Hoosic River, surface water samples were taken on 5/20/81 to determine water quality up and downstream of the facility and the lagoons. A map of sample locations is included. A trend of water quality degradation, including increasing conductivity, decreasing pH, and increasing lead and chloride concentrations can be seen going from upgradient above the facility to downgradient below the lagoons.

A potential problem exists, as mentioned above, for three local homeowner wells located between 350 and 500 feet from the lagoon system. The wells are located in a direction that should be upgradient of the lagoon system, and are well points terminated at 15 feet in the shallow aquifer. Analyses of the wells are attached, and as of July 20, 1986, they were clean. It should be stressed here that the direction of groundwater flow is not well understood, and the presumed upgradient monitoring wells are contaminated.

Attachment 2

APPENDIX VIII, APPENDIX IX, SUPERFUND, AND PRIORITY POLLUTANT COMPOUNDS

Common Name	Appendix VIII (IX)	Superfund List	Priority Pollutants
ORGANICS			
acenaphthene	X	X	X
acenaphthylene	X	X	X
acetone	A	X	
acetonitrile	X		X
acetophenone	X		
2-acetylaminofluorene	X		
acrolein	X		X
acrylonitrile	X		X
aldrin	X	X	X
allyl alcohol	X		
4-aminobiphenyl	X		
aniline	X	(removed)	
anthracene	X	X	X
aramite	X		
Aroclor 1016	X	X	X
Aroclor 1221	X	X	X
Aroclor 1232	X	X	X
Aroclor 1242	X	X	X
Aroclor 1248	X	X	X
Aroclor 1254	X	X	X
Aroclor 1260	X	X	X
benzene	X	X	X
benzenethiol	X		
benzidine	X	(removed)	X
benz(a)anthracene	X	X	X
benzo(b)fluoranthene	X	X	X
benzo(k)fluoranthene	X	X	X
benzoic acid	A	X	
benzo(ghi)perylene	X	X	X
benzo(a)pyrene	X	X	X
p-benzoquinone	X		
benzyl alcohol	A	X	
alpha-BHC	X	X	X
beta-BHC	X	X	X
delta-BHC	X	X	X
gamma-BHC	X	X	X
bis(2-chloroethoxy)methane	X	X	X
bis(2-chloroethyl)ether	X	X	X
bis(2-chloroisopropyl)ether	X	X	X
bis(2-ethylhexyl)phthalate	X	X	X
bromodichloromethane	X	X	X
bromomethane	X	X	X
4-bromophenyl phenyl ether	X	X	X
butyl benzyl phthalate	X	X	X
2-sec-butyl-4,6-dinitrophenol	X		
carbon disulfide	X	X	
carbon tetrachloride	X	X	X
chlordane	X	X	X
p-chloroaniline	X	X	
chlorobenzene	X	X	X
chlorobenzilate	X		
2-chloro-1,3-butadiene	X		
p-chloro-m-cresol	X		X
chlorodibromomethane	X	X	X
chloroethane	X	X	X
2-chloroethyl vinyl ether	X	X	X

Common Name	Appendix VIII (IX)	Superfund List	Priority Pollutants
chloroform	X	X	X
chloromethane	X	X	X
2-chloronaphthalene	X	X	X
2-chlorophenol	X	X	X
4-chlorophenyl phenyl ether	A	X	X
3-chloropropene	X		
3-chloropropionitrile	X		
chrysene	X	X	X
ortho-cresol	X	X	
para-cresol	X	X	
4,4'-DDD	X	X	X
4,4'-DDE	X	X	X
4,4'-DDT	X	X	X
dibenzo(a,h)anthracene	X	X	X
dibenzofuran	A	X	
dibenzo(a,e)pyrene	X		
dibenzo(a,h)pyrene	X		
dibenzo(a,i)pyrene	X		
1,2-dibromo-3-chloropropane	X		
1,2-dibromoethane	X		
dibromomethane	X		
di-n-butyl phthalate	X	X	X
m-dichlorobenzene	X	X	X
o-dichlorobenzene	X	X	X
p-dichlorobenzene	X	X	X
3,3'-dichlorobenzidine	X	X	X
trans-1,4-dichloro-2-butene	X		
dichlorodifluoromethane	X		(removed)
1,1-dichloroethane	X	X	X
1,2-dichloroethane	X	X	X
1,1-dichloroethylene	X	X	X
trans-1,2-dichloroethylene	X	X	X
dichloromethane	X	X	X
2,4-dichlorophenol	X	X	X
2,6-dichlorophenol	X		
2,4-dichlorophenoxyacetic acid	X		
1,2-dichloropropane	X	X	X
cis-1,3-dichloropropene	X	X	X
trans-1,3-dichloropropene	X	X	
dieldrin	X	X	X
diethyl phthalate	X	X	X
0,0-diethyl-0-2-pyrazinyl phosphorothioate	X		
3,3'-dimethoxybenzidine	X		
p-dimethylaminoazobenzene	X		
7,12-dimethylbenz(a)anthracene	X		
3,3'-dimethylbenzidine	X		
alpha, alpha-dimethyl-phenethylamine	X		
2,4-dimethylphenol	X	X	X
dimethyl phthalate	X	X	X
m-dinitrobenzene	X		
4,6-dinitro-o-cresol	X	X	X
2,4-dinitrophenol	X	X	X
2,4-dinitrotoluene	X	X	X
2,6-dinitrotoluene	X	X	X

State of Vermont

REFERENCE 27

Department of Fish and Wildlife
Department of Forests, Parks and Recreation
Department of Environmental Conservation
State Geologist
Natural Resources Conservation Council

AGENCY OF NATURAL RESOURCES
Department of Environmental Conservation
Solid Waste Management Division
103 South Main Street
Waterbury, Vermont 05671-0407

(802) 244-7831
FAX (802) 241-3273

MEMORANDUM

TO: Edward Leonard, Director

THRU: Julie Hackbarth, Chief, Technical Assistance Section

FROM: James Surwilo, Technical Assistance Section

DATE: May 24, 1993

RE: Pownal Tannery Landfill

As you know, I have been asked to formulate options and cost estimates for closure or remediation of the Pownal Tannery Landfill. The tasks involved in developing these options and estimates included a file review, computer modeling, a round of water quality sampling, a site reconnaissance, a literature search, and personal communications.

Attached as Appendices are: (A) - Assumptions for Cost Estimates, (B) - References, (C) - May 19, 1993, Trip Report, and (D) - HELP Model Memorandum.

BACKGROUND:

In the early 1960's the Pownal Tanning Company, Inc., constructed a waste water treatment system adjacent to their tanning facility. Ultimately, a series of five lagoons was constructed, plus a clarifier, with discharge to the Hoosic River. Sludge removal and disposal was not considered in the initial treatment plant design however, and eventually Lagoons #1, #3A, #3B, and #4A were filled with settled sludge, bypassed from the treatment process, and "capped".

In the early 1980's, in an effort to manage sludge from the ongoing tanning operation, Pownal proposed constructing an on-site, lined landfill. The original design was to develop, in phases, a four-cell, three acre landfill with a total capacity of 22,000 cubic yards, over a lifespan of ten years. Solid waste facility certification was obtained in 1982. A recertification application was submitted in 1988 but was denied by the Agency. The company declared bankruptcy in 1988.

SITING:

The Pownal Tanning Landfill is located off Dean Road, North Pownal, Vermont. The facility is located about 1/4 mile south and across the Hoosic River from the tannery itself. The lagoon system is located several hundred yards north of the tannery complex.

The landfill is sited on what has been described as a glaciofluvial terrace just west and above of the floodplain of the Hoosic River. Borings indicate that the original base soils of the site consisted of a 5-10 foot thick layer of coarse sands and gravels overlying a thick fine sand and silt layer. The borings were generally terminated at forty feet, regardless of the apparent ground water table, and bedrock was not encountered. Six of the borings were developed into permanent ground water monitoring wells.

Ground water flow is from west to east, from the Taconic hills towards the Hoosic River. The parcel of land on which the landfill is sited extends eastward to the Hoosic River. Because of the surficial geology, gravels over silts, a shallow perched water table exists above this interface. The perched water table is evidenced by the seeps visible just east of the landfill as the ground surface drops relatively steeply down to the Hoosic floodplain. Due to the shallow water table, base material had to be emplaced under some portions of the lined cells to meet the Agency's then required vertical separation distance to groundwater of ten feet.

There are several residences along Dean Road within 1000 feet of the landfill. These residents are served by individual water supplies, a variety of drilled wells and dug wells. Because of the relationship of the landfill to the Hoosic River and the underlying impeding layer, and the location of the residences themselves, these drinking water supplies are believed to not be in jeopardy from potential discharges from the landfill.

A short access drive off of Dean Road leads to the site. There is a locked, chain link gate controlling vehicular access to the landfill, and a six foot chain link fence surrounds the site.

DESIGN:

The sludge landfill design consisted of four abutting lined cells, developed in a row from north (Cell 1) to south (proposed Cell 4). Cell 1 was constructed in 1982, filled and capped by 1983. Cell 2 was constructed in 1983, filled by 1987, and capped in 1987. Cell 3 was constructed in 1987, and was in use when Pownal filed for bankruptcy in 1988. Subsequent to the bankruptcy, sludge was removed from wastewater treatment plant Lagoons #2 and #4 and disposed of in Cell 3. Cell 4 was never built.

The designs of the three existing cells essentially are comparable. Above the required ten foot base pad each cell's liner system consists of 36-mil chlorosulfonated chlorinated polyethylene (Hypalon) liner, 12 inches of sand cushion, 18 inches of crushed stone through which run 4-inch perforated PVC leachate collection pipes, and a top layer of six inches of gravel to allow for truck and equipment traffic. Above the lining system sludge was placed in a layer of sludge from six to 13 feet thick, depending on the individual cell. The cap design, which was implemented over Cells 1 and 2, consisted of 20-mil PVC, topped with two feet of silty sand, sloped from 2% -5%, west to east.

The leachate collection system consists of 4-inch perforated PVC laterals, on five foot centers in the crushed stone layer, sloped west to east at 0.5%. The laterals in each cell were joined to a 6-inch PVC header, which penetrated the liner in the southeastern corner of each cell then entered a four foot diameter manhole. During their active life, leachate from Cells 1 and Cell 2 flowed by gravity to the manholes from where it was removed by pumping. Leachate storage capacity in these manholes was very limited and frequent need for pumping was problematic. Cell 3 was designed with a with a 7000 gallon leachate storage tank and alarm system for additional storage beyond what was afforded by the manhole. After the construction of Cell 3 and the installation of the storage tank, Cells 1 and 2 were replumbed to bypass the individual manholes. Leachate flowing from cells 1, 2, and 3 is directed to the leachate storage tank.

OPERATIONS:

During operations of the Tanning Company, wastewater treatment plant sludge from the clarifier was pumped to a Clow filter press for dewatering. The 1982 solid waste facility certification required that sludge brought to the landfill have a solid content of greater than 22%, and records indicate that frequently the solids content exceeded 40%. Sludge was trucked from the filter press building to the landfill in either a covered dump truck or roll-off container. Sludge was covered at the landfill with six inches of soil on a daily basis.

During the active operations of landfill Cells 1 and 2 leachate was pumped manually from the individual manholes to a vintage 2500 gallon capacity fire truck, and was then disposed of into the headworks of the Pownal Tanning wastewater treatment plant. Once the leachate storage tank was installed and the piping modification were made, leachate was pumped with an in-tank submersible pump to a specially designed, fully enclosed roll-off container. The container allowed for an extra 2500 gallons of leachate storage, and increased flexibility in transportation scheduling.

The Tanning Company ceased operations in early 1988. Clean-up of the wastewater lagoon system was initiated in the summer of 1988 and continued into 1990. Lagoon #2 was dewatered and all sludge was brought to Cell 3 for disposal. Lagoon #4 was also dewatered, the sludge windrowed for drying, and the vast majority brought to Cell 3 for disposal. Some small piles of sludge currently remain in Lagoon #4. Lagoon #5 was at one point dewatered in anticipation of sludge drying and removal, however this was never accomplished and the lagoon now contains a large volume of water.

As conditioned by the 1982 certification, Pownal set aside $80,000 in an escrow account for closure of the landfill. At the time the fund was transferred to the Agency (October, 1989) the amount contained in the account was $95,199. There have been six disbursements of the fund, totaling $12,277. The Agency has contracted with a local septage hauler to remove leachate from the landfill for placement in Lagoon #5 on five occasions. In June 1990, a leak in a leachate collection system pipe was discovered and the Agency authorized a local excavating contractor to perform the repair. The current balance of the account is $98,834.35.

CURRENT STATUS:

Since the 1988 bankruptcy of the Tanning Company, and particularly since the stoppage of clean-up procedures in 1990, maintenance of the landfill has been virtually non-existent and the condition of the facility is degenerating.

Cell 1 has been capped for ten years. The soil cap remains stable with no areas of erosion or cracking. The top surface has a thick, uniform growth of weeds and grass. The top surface was mowed in 1991 so that woody plants have not established themselves. Some small woody plants are growing on the eastern sideslope as this section has not been mowed since the bankruptcy. A landfill gas-like odor has been noticed in past inspections and this leads to the belief that the tannery sludge is not non-putresible as originally presumed, and gases from anaerobic decomposition of the sludge are escaping through the cap. It was also noted during the May 19, 1993 site reconnaissance that the cap appeared slightly depressed. This also may be due to the sludge undergoing decomposition and settlement.

Cell 2 has been capped for six years. During active operations of Cell 3, trucks were routed up the sideslope of Cell 2 and across its surface. This has caused some erosion of the soil cover and in several small areas the underlying PVC cap is exposed. Vegetation is less dense than on Cell 2, and is comprised primarily of sparse weeds. The surface does not appear to have become depressed, or not to the noticeable extent of Cell 1.

Cell 3 became operational in 1987 and received sludge while the tannery was viable, and from clean-up operations of Lagoon #2 and #4. Sludge has been disposed of in approximately the western two-thirds of the cell. The eastern one-third of the cell is open. The sludge that was brought to the cell was covered with six inches of soil, except for the eastern most edge which was not covered at all. The top surface supports a sparse growth of weeds similar to Cell 2. The last active face, leading down to the unused area, now supports a thick growth of saplings 15-20 feet in height. The unused, open area of the cell has ponded leachate and rainwater above the crushed stone layer. Along the perimeter of the open water typical wetland vegetation has been established, including cattails and reeds. The northern, eastern, and southern cell berms are beginning to support small trees and woody growth. These berms tended to erode and previous site visits had revealed exposed Hypalon liner, but the vegetation has become so thick as to mask any of these exposed areas if they exist.

The **Cell 3** manhole and leachate collection tank are at capacity. Survey work performed on May 19, 1993, confirmed that the leachate in the cell, in the tank and in the manhole is at the same elevation. The leachate tank was equipped with a high water alarm system, now disabled, and a submersible pump, status unknown.

The **chain link fence** around the perimeter of the landfill in good condition on the north, south, and west sides. Several of the fence posts on the eastern side have shifted or slid because of erosion due to surface water flowing off the landfill. The access gate, while functional, is misaligned.

The **access road** is quite rough and rutted, and becoming overgrown due to lack of use.

The ground water **monitoring well network** was evaluated during the sampling event on May 19, 1993. Historically, the wells have been poorly developed, silty, and contained marginal water columns. These same conditions were present during the recent monitoring. Samples were obtained from all of the wells with the exception of B2 which did not contain sufficient water for sample extraction. None of the PVC well caps were in placed, and only one well was locked. The location of the monitoring wells themselves is minimally adequate to be considered a network. Well B10 is upgradient, B8, B7 and B3 are downgradient, and B13 is either cross gradient or downgradient.

AREAS OF CONCERN:

1. The foremost area of concern is the structural integrity of the lined landfill itself and the probability of ongoing leachate leakage into the environment. This concern has been manifested recently for several reasons:

   a. Since obtaining the escrow account for closure in 1989, the Agency has authorized removal of leachate from Cell 3 on an "as-needed" basis. This removal occurred three times in 1989, once in 1990, and once in 1991. The leachate has not been removed since April, 1991, and yet the level visible in the landfill appears to have stabilized. (A benchmark was recently established to more accurately track the level of leachate.)

   b. All of the landfill cells were designed to allow storage of leachate on the liner in the crushed stone and sand layers. In Cell 3 this storage capacity would be approximately (120' X 180' X 2.5' X 7.48 gal/cf X 0.25 porosity) = 101,000 gallons. To estimate current leachate generation rates the Army Corps of Engineers - Hydrological Evaluation of Landfill Performance (HELP) computer model (see attachment) was utilized. The model estimates leachate generation for Cell 3 in its present configuration to be 266,000 gallons per year. If the leachate collection system was drained completely by the last removal event in April, 1991, 570,000 gallons of leachate should have accumulated in the ensuing two years and two months.

   3. Woody vegetation has become firmly established over lined areas of the landfill. Deep rooted vegetation can penetrate synthetic liners, which in turn may cause leachate leakage.

During a November 1986, site visit while the Cell 3 leachate collection system modifications were ongoing, I noted that the difference in elevation of the collection header was only three inches over the distance between Manhole 1 and Manhole 3. Thus, it is conceivable that leachate being produced in Cell 3 is backing up the collection system and being introduced into Cells 1 and 2. However, the storage capacity of these smaller cells is relatively minor, estimated to be 18,000 gallons and 21,000 gallons respectively.

In June 1990, I was present when a repair was made to the leachate collection system outside of Cell 3. The leak was caused when a 90° "elbow" slipped out of place. In order to make the repair it was necessary to expose the leachate header extending from Cells 1 and 2. I observed that only single drops of leachate were flowing from Cells 1 and 2. At the time this was assumed to be a positive sign in that the landfill cap was effectively preventing rainwater infiltration, the sludge had dewatered over time, and leachate production had virtually ceased. Upon reevaluation however, given the present scenario, I believe there exists the possibility of leachate flowing from Cell 3 into Cells 1 and 2, and from there being leaked into the environment.

All indications are that with the open configuration of Cell 3, more leachate is produced than is accountable for, and that there is a strong possibility that the integrity of the lining system has been compromised. However, without validation, such as visible leakage or confirmed ground water impacts it is difficult to make a definitive conclusion.

2. The detection of odors emanating from Cells 1 and 2 indicates that the buried sludge is undergoing biological decomposition and the resulting gases are being permeating the landfill capping system . During the original certification process the Tanning Company purported the sludge to be stable and not subject to biological activity. Thus, this possibility was not a factor in the design of the landfill and a gas venting system was not incorporated into the cap.

   A second indication of decomposition in settlement is the recent observation of the surface of Cell 1 becoming slightly depressed. As the cell was originally capped with a minimally acceptable final grade of 2-5%, any settlement would tend to cause either a horizontal or concave top surface and an accompanying reduction in surface water run off.

3. In correlation to the issue of potential landfill leakage is the ongoing excessive leachate generation due to the open "bathtub" configuration of Cell 3. A computer generated estimate of leachate generation from Cell 3 is 266,000 gallons per year. Leachate generation must be controlled and what leachate is produced must be responsibly managed.

4. Minor areas of concern include: disrepair of the access control fence and gate, unsecured monitoring wells, poor road condition, erosion gullies.

FURTHER INVESTIGATIONS:

Additional investigation is warranted prior to selecting one closure or remedial approach. Firstly, efforts must be undertaken to determine whether landfill has developed serious leaks, what the quantity of the leakage is, and if the leakage could be traced to a particular source(s) or cell(s). The results of the analyses of groundwater and leachate samples collected on May 19, 1993 may aid in this determination, and additional sampling events are likely to be necessary. If inconclusive, the installation of two or three additional monitoring wells should be considered. These wells should be placed proximal to the landfill, in locations where leakage would be undetectable by the existing well network, and where it may be possible to pinpoint any discharge.

COSTS: (See appendix A for assumptions)

Monitor existing locations (8)	$5000
Install two monitoring wells (30')	$3850
Monitor new wells (2X)	$3000

Because there are major discrepancies between the original landfill design plans and narrative, later submittals, actual construction practices, and field observations, a topographic survey of the site is warranted. The survey would eliminate uncertainty regarding the areal extent of the landfill, the volume of waste previously disposed of, the capacity remaining in Cell 3, the extent of settlement of Cells 1 and 2, and the locations and elevations of various appurtenances.

COSTS: (See appendix A for assumptions)

Detailed Topographic Survey	$4500

Along with an upgrade of the monitoring program, leachate levels in Cell 3 should be accurately recorded on a weekly basis for, assume, six months.

COSTS:

Weekly Measurement ($20/wk)	$520

The Cell 1 and Cell 2 cap and the Cell 3 open area should be thoroughly inspected to define areas of substandard soil cover, exposed geomembrane, or tears of defects in the geomembrane. The use of a photoionization meter would aid in locating sources of gas emissions and potential breeches in the cap.

COSTS: (See appendix for assumptions)

Site inspection	$2500

ALTERNATIVES:

Data obtained from the above work program may be used to develop a preferred closure or remedial alternative, and subsequent post-closure or post-remediation plan. At this point in time, without a more complete understanding of the situation, the options are numerous and best presented in matrix form.

Environmental remediation was not considered in any of the alternatives. Costs are far too variable for this exercise.

LANDFILL CELL 1 (8400 SF) - REMEDIAL ALTERNATIVES

OPTION	COST	EFFECTIVENESS AND LIMITATIONS
1. Cut vegetation	$350	Basically, no action. Assumes cell is not leaking, surface water is not ponding, gas venting is not warranted. Inexpensive.
2. Regrade surface, add acceptable final cover material to create 2' at 5% slope. 6" topsoil, seed, mulch.	$10,500	Assumes PVC cap is intact, gas venting not warranted. One foot common fill necessary to obtain 5% grade. Will be an effective barrier to infiltration and consequent leachate generation.
3. Same as 2 above, add gas vents.	$13,000	
4. Remove soil from edges, grade remainder. Add 1' sand, 40 mil geomembrane, 18" cap, topsoil, seed mulch. Install gas vents.	$18,300	Essentially a replacement of the present cap to one of current standards. Eliminates uncertainty regarding present cap. Requires specialized personnel. Very effective barrier against infiltration and consequent leachate production. Cell 2 remediation must be identical.
5. Remove and dispose sludge in a remote location. Reclaim landfill area.	$142,100	Assume cell believed to be beyond repair, or post closure tasks too costly or logistically complex. Likely to be performed in conjunction with Cells 2 and 3. Assume sludge to be a solid waste.

LANDFILL CELL 2 (10,000 SF) - REMEDIAL ALTERNATIVES

OPTION	COST	EFFECTIVENESS AND LIMITATIONS
1. Cut vegetation	$420	Basically, no action. Assumes cell is not leaking, surface water is not ponding, gas venting is not warranted. Inexpensive.
2. Regrade surface, add acceptable final cover material to create 2' at 5% slope. 6" topsoil, seed, mulch.	$12,400	Assumes PVC cap is intact, gas venting not warranted. One foot common fill necessary to obtain 5% grade. Will be effective against infiltration.
3. Same as 2 above, add gas vents.	$14,900	
4. Remove soil from edges, grade remainder. Add 1' sand, 40 mil geomembrane, 18" cap, topsoil, seed mulch. Install gas vents.	$20,700	Essentially a replacement of the present cap to one of current standards. Eliminates uncertainty regarding present cap. Requires specialized installers. Very effective barrier against infiltration. Cell 1 remediation must be identical.
5. Remove and dispose sludge in a remote, secure landfill. Reclaim landfill area.	$224,500	Assume cell believed to be beyond repair, or post closure tasks too costly. Likely to be performed in conjunction with Cells 2 and 3.

LANDFILL CELL 3 (35,700 SF) - REMEDIAL OPTIONS

OPTION	COST	EFFECTIVENESS AND LIMITATIONS
1. Remove vegetation, fill remaining capacity with common fill, regrade, add 1' sand, 40 mil geomembrane, 18" cap, topsoil, seed, mulch. Repair alarm system.	$73,500	Permanently closes cell to design grade. Does not allow for disposal of Lagoon #4 or #5 sludge.
2. Remove vegetation, fill remaining capacity with sludge from Lagoon 4 and 5. Cap same as Option 1.	$80,700	Permanently closes cell to design grade. May allow for clean-up of Lagoons.
3. Remove existing sludge to a remote, secure landfill. Reclaim landfill area.	$357,000	Assumes the cell is not intact or salvageable, or that post-closure care is too costly or logistically complex. Would likely necessitate removal of Cells 1 and 2.

ACCESS ROAD, FENCE, GATE, LEACHATE REMOVAL - REMEDIAL OPTIONS

OPTION	COST	EFFECTIVENESS AND LIMITATIONS
1. Repair fence, gate, regrade access road, improve site drainage. Remove stored leachate.	$20,000	To be performed only in conjunction with Cell Options 1, 2, or 3. Removal of sludge would not merit this work.
2. No repair to structures. Remove stored leachate.	$15,000	Assume sludge is removed. Maintenance or upgrade of these features then is unnecessary.

MONITORING WELLS (5 existing, 2 proposed) - REMEDIAL OPTIONS

OPTION	COST	EFFECTIVENESS AND LIMITATIONS
1. Redevelop existing wells, new caps, new locks.	$1500	Necessary under all scenarios.

Total closure of the site would entail selecting one option for each component of the facility. Obviously some actions for particular landfill cells need to be corroborated with the options selected for the other two cells. For example, the determination that Cell 1 should be recapped would preclude the option of only cutting the vegetation on Cell 2.

POST-CLOSURE CARE:

Once closure or remediation of the site has been accomplished, regularly schedules post-closure care must be initiated. Two scenarios exist for post-closure care dependent on what particular closure actions were performed. If the landfill was capped in place, by what ever method, post-closure care would be considered to be maintenance of the site for some time period until health, safety, or environmental threats from the facility were believed to be minimal. For costing purposes, under Federal municipal solid waste Rules, this time period is 30 years. Under Agency guidelines this period is 20 years. If the sludge was removed, and the landfill essentially is dismantled, the post-closure care period would be substantially shorter due to the immediate risk reduction.

If the landfill is capped, post-closure tasks and costs would be:

CAPPED LANDFILL - POST-CLOSURE - 30 YRS @ 4% PRESENT WORTH

ITEM	YR 1 COST	YR 4 COSTS	30 YR COSTS
Mow grass (2x/yr), repair erosion, snowplowing, general upkeep.	$1200		$20,700
Yearly inspection, report.	$ 800		$13,800
Environmental Monitoring - (8 locations, 2x/yr). Assume 20% discount for long term contract.	$8000		$138,300
Leachate Treatment - (556,386 gal, $0.05/gal removal, $0.07/gal treatment).		$66,800	
TOTAL - Leachate treatment for four years, maintenance for 30 years.			**$239,600**

If the landfill and appurtenances are removed, the potential source of contamination is removed and there would be no leachate to be treated. Thus, unless the groundwater is severely impacted, the post-closure period may be shortened considerably. For cost estimating, assume the time period for continued monitoring is five years, and for maintenance, two years.

REMOVED LANDFILL - POST-CLOSURE COSTS - 5 YEARS @ 4% PRESENT WORTH

ITEM	YR 1 COST	YR 2 COSTS	YR 5 COSTS
Repair erosion.	$500	$900	
Yearly site inspection, report.	$800	$1500	
Environmental monitoring as above.	$8000		$35,600
TOTAL - Inspection and repairs for two years, monitoring for five years.			**$38,000**

SUMMARY:

A number of options exist for closure, remediation, and post-closure care of the Pownal Tannery Landfill. More complete data and information on the integrity of the landfill are crucial to making an informed decision. Further investigations should entail additional water quality monitoring, a detailed site reconnaissance, potentially the installation of several more monitoring wells, and a site survey. The estimated cost of this work is $12,500 to $20,000. Upon completion of the data gathering a closure plan, estimated to cost $15,000 should be formulated.

Based on what I believe to be the range of feasible workscopes, estimated costs range from $90,000 for a simple closure to $740,000 to relocate all existing sludge to a remote, secure disposal facility. Two of the more likely scenarios are: (1) - completely recap Cells 1 and 2, fill Cell 3 with sludge and then cap, and perform 30 years of post closure maintenance, or (2) - remove all sludge and dismantle the landfill.

There are essentially only two post-closure options. If the landfill is capped and closed the 30-year post-closure cost estimate is $240,000. If the sludge is removed, post-closure tasks are simpler, and of shorter duration. The 5-year cost is estimated to be $38,000.

Estimated costs for these two closure and post-closure options are outlined below.

ITEM	CAPPING	REMOVAL
Further Investigation	$ 19,370	$ 16,870*
Closure Plan	$ 15,000	$ 15,000
Cell 1	$ 18,300	$142,100
Cell 2	$ 20,700	$224,500
Cell 3	$ 80,700	$357,000
Appurtenances, one time leachate removal	$ 20,000	$ 15,000
Redevelop wells	$ 1,500	$ 1,500
Post-Closure Maintenance, leachate removal (capping only), monitoring	$239,600 (30 yr)	$ 38,000 (5 yr)
TOTAL	**$415,170**	**$809,970**

* In theory, further investigation is optional if the prior decision to remove the sludge is made.

As indicated by the cost estimates removing the sludge is substantially more expensive than capping the landfill. Also, there is no guarantee that a disposal facility willing to accept the sludge is available. The benefits of removal are that the operation and the ensuing post-closure period is of short duration, and uncertainty of future responsibility and liability are avoided

APPENDIX A - ASSUMPTIONS FOR COST ESTIMATES

FURTHER INVESTIGATIONS

Groundwater Monitoring:

1. Assume parameters to include: COD, Hexavalent Chromium, Chromium, Lead, EPA Method 8240, EPA Method 8270, pH, Conductivity. Cost: $500 per single sample, $50/hr for personnel including per diem, $100/day equipment charge.

2. Two days (16 hr) to perform sampling on all locations.

Monitoring Well Installation:

1. Assume: mobilization and demobilization - $400 lump sum, boring - $18/ft, hydrogeologist supervision - $60/hr, materials - $15/ft, per diem - $120/day, decontamination - $100.

2. Assume 30' depth, one day (8 hr) per well.

Detailed Topographic Survey:

1. Assume five acres @ $900/acre.

Site Inspection:

1. Assume: personnel - $50/hr; per diem, equipment, report, miscellaneous - $900.

2. 32 hours labor (two days field, two days office).

CLOSURE AND REMEDIATION ALTERNATIVES

Cut Vegetation:

1. Assume $42/1000 sf.

Regrading:

1. Assume: light grading - $0.15/sf; common fill hauled, spread, compacted - $5.00/cy; 2' soil cap hauled, spread, compacted, tested - $0.87/sf; 6" topsoil layer - $0.178/sf; hydroseeding - $0.030/sf.

Gas Vents:

1. Assume $15/lf for two foot deep trench, filled with stone, perforated PVC laterals, solid risers.

2. Assume additional $10/lf for repair of geomembrane cap on Cells 1 and 2.

Utilize Lagoon #4 and #5 Sludge:

1. Assume sludge is dewatered in lagoons.

2. Scrape sludge from lagoon - $3.18/cy, load trucks - $1.38/cy, haul to landfill - 2.56/cy, spread and compact - $1.00/cy.

Facilities Improvements:

1. Regrade access road, repair fence, repair gate - $5000 lump sum.

2. For leachate removal assume presently 125,000 gallons on-site, $0.05/gal pump and haul to Bennington WWTP, $0.07/gallon for treatment.

Geomembrane Cap:

1. Assume for Cells 1 and 2: remove 6' wide swath of soil from top edges of existing PVC cap by hand - $6.47/lf.

2. Installation, QA/QC of 40 mil PVC or VLDPE geomembrane - $0.60/sf.

3. Other assumptions as above.

Sludge Removal:

1. Assume sludge is defined as a solid waste.

2. Disposal is in a lined, in-state landfill (Newbury Waste Management, Palisades, or CV).

3. Sludge/soil density is 2000 lb/cy.

4. Excavate sludge, load trucks - $1.39/cy.

5. $65/hr hauling charge, utilize 20-ton capacity dump trailers, seven hour round trip to disposal facility.

6. Tipping fee - $50/ton.

7. Grade, topsoil, seed, mulch former landfill area - $358/1000 sf.

Remove Vegetation:

1. Remove woody vegetation from Cell 3 - $2000 lump sum.

Repair Alarm:

1. Repair and improve leachate alarm system - $1500 lump sum.

POST-CLOSURE CARE

Yearly Maintenance:

1. Mow and trim grass - $2.00/1000 sf.

2. Snowplow access road as needed, erosion repair, general maintenance - $1000/yr.

3. Site inspection and report, 16 hr @ $50/hr.

Leachate Removal:

1. See assumptions on page 15. $0.12/gal trucking and treatment.

Monitoring:

1. See assumptions on page 14. 20% discount for long term contract.

APPENDIX B - REFERENCES:

Means Site Work & Landscape Cost Data, 1993.

Guidelines for Municipal Solid Waste Landfills, State of Vermont - Solid Waste Management Division, 1991.

Application for Disposal Facility Certification for Pownal Tanning Co., Inc., SP, Inc., 1988.

R.L. Barlow, Inc., Pownal, Vermont. Personal communication.

Aquatec, Inc., Colchester, Vermont. Personal communication.

Scitest Laboratory Services, Randolph, Vermont. Price guide.

All Terrain Drilling, Greenland, NH. Personal communication.

Environmental Drilling, Inc., Pelham, NH. Personal communication.

Con-Tect, Inc., Concord, NH, Personal communication.

East Mountain Transport, Arlington, Vermont. Personal communication.

Casella Waste Management, Inc., Rutland, Vermont. Personal communication.

The Palisades Group, Moretown, Vermont. Personal communication.

Munson Earthmoving Corporation, South Burlington, Vermont. Personal communication.

GENERAL NOTES

1) Base liner shall be 36 mil. reinforced Hypalon installed as shown on detail sheet.
2) Finish grade across top of landfill shall not exceed 5%. A minimum slope of 2% shall be maintained to prevent ponding. Working face slopes shall not exceed 2:1.
3) Existing water supply well shall be abandoned and all appurtenances, including well tiles, shall be removed. The hole shall be backfilled with a silty clay, (such as daily cover material), having a permeability coefficient less than 1×10^{-6} cm/sec.

Spot elevation represents water level of a small distributary stream in hummocky sedge/alder floodplain swamp. US. Dept HUD/FIA report of Oct. 1979 indicates Q10 elevation of 524-525', Q100 - 530-531'. (North Pownal comm'ly N° 500016)

- 39.2 (+300) Spot elevations (leveling of 15 Oct. 81)
- ---570--- Interpolated topography
- B4 Boring/sampling well locations
- S2 Surface water sampling locations
- 560 Revised topography
- Inferred direction of groundwater flow
- Approx. floodplain fringe (elev. 531'±)
- (+500) Approx. groundwater elevations (as of date of boring - see inset)
- Approx. limit of zone of influence
- Leachate collection manholes

Notes
1. Proximity of water table to surface at existing well indicates presence of an impervious layer, possibly clay or cemented gravel. Core shall be taken at locations B3-6 to determine the depth and nature of this layer.
2. Locations B2, 7, 8, 10, 11 & 13 shall be permanent groundwater monitoring wells, in accordance with Vermont Regulations governing the disposal of solid wastes, septage & liquid sludge (see section I, this sheet.)
3. Assumed seasonal high water table 558.0'.

REFERENCE 28

REV.	DATE	DESCRIPTION	BY
4	4-8-87	Leach. Storage Tank Location Revised	ea
3	9-9-85	Cell 3 Leachate Collection System Added	ea
2	10 Mr 82	Design revised, new borings added	jd
1	18 No 81	Borings located in field	jd

Pownal Tanning Company
Route 346
North Pownal, Vermont

Proposed Sludge Disposal Site
Moore property

SPESL Sea Plantations Environmental Services, Ltd.
Engineering and Environmental Consultants
29 Congress Street, Salem, Massachusetts

Drawn By J. Dick | Checked By
Date October 1981 | Project No. 0054
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