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# **Risk Assessment Technical Background Document for the Paint and Coatings Hazardous Waste Listing Determination**

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Office of Solid Waste  
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## Table of Contents

| Section  | Page |
|--|------|
| List of Figures .....  | viii |
| List of Tables .....   | ix   |
| 1.0 Introduction .....   | 1-1  |
| 1.1 Background .....   | 1-1  |
| 1.2 Purpose of the Risk Assessment .....                                 | 1-1  |
| 1.3 Overview of Risk Assessment Methodology .....                        | 1-2  |
| 1.4 Document Organization .....  | 1-3  |
| 2.0 Analysis Results .....   | 2-1  |
| 2.1 Human Health Risk Results .....                                      | 2-1  |
| 2.1.1 Risk Results for Landfill Disposal of Combined Solid Wastes .....  | 2-2  |
| 2.1.2 Risk Results for Landfill Disposal of Emission Control Dust .....  | 2-2  |
| 2.1.3 Risk Results for Surface Impoundment Handling of Wastewaters ..... | 2-3  |
| 2.1.4 Risk Results for Treatment Tank Handling of Wastewaters .....      | 2-3  |
| 2.2 Ecological Risk Screening Results .....                              | 2-3  |
| 3.0 Risk Assessment Overview .....                                       | 3-1  |
| 3.1 Human Health Risk Assessment .....                                   | 3-1  |
| 3.1.1 Waste Streams .....  | 3-1  |
| 3.1.2 Waste Management Units .....                                       | 3-2  |
| 3.1.2.1 Landfills .....  | 3-2  |
| 3.1.2.2 Treatment Tanks .....  | 3-3  |
| 3.1.2.3 Surface Impoundments .....                                       | 3-3  |
| 3.1.3 Constituents of Concern .....                                      | 3-3  |
| 3.1.4 Site Configuration and Environmental Setting .....                 | 3-3  |
| 3.1.4.1 Conceptual Site Layout .....                                     | 3-5  |
| 3.1.4.2 Regional Environmental Setting .....                             | 3-5  |
| 3.1.5 Exposure Point Estimates .....                                     | 3-8  |
| 3.1.5.1 Source Partition Modeling .....                                  | 3-8  |
| 3.1.5.2 Fate and Transport Modeling .....                                | 3-9  |
| 3.1.5.3 Farm Food Chain Model .....                                      | 3-10 |
| 3.1.5.4 Aquatic Food Chain Model .....                                   | 3-10 |
| 3.1.6 Assessing Human Exposures .....                                    | 3-10 |
| 3.1.6.1 Human Receptors .....  | 3-11 |
| 3.1.6.2 Exposure Pathways .....  | 3-11 |
| 3.1.7 Toxicity Assessment and Risk Characterization .....                | 3-11 |
| 3.1.7.1 Assessment for Lead and Copper .....                             | 3-14 |
| 3.1.8 Calculating Protective Waste Concentrations .....                  | 3-14 |

## Table of Contents

| Section | Page  |
|---------|---|
| 3.2     | Probabilistic and Deterministic Methods for Determining Exposure                              |
|         | Point Concentrations . . . . . 3-17   |
| 3.2.1   | Probabilistic Analysis . . . . . 3-17   |
| 3.2.1.1 | Parameter Value Distributions . . . . . 3-17  |
| 3.2.2   | Deterministic Analysis . . . . . 3-18   |
| 3.2.2.1 | Selecting Central Tendency and High-End Parameters<br>for Aboveground Pathways . . . . . 3-19 |
| 3.2.2.2 | Selecting Central Tendency and High-End Parameters for<br>Groundwater Pathways . . . . . 3-23 |
| 3.3     | Ecological Assessment . . . . . 3-26  |
| 3.3.1   | Ecological Receptors . . . . . 3-27   |
| 3.3.2   | Ecological Exposure Pathways . . . . . 3-27   |
| 3.3.3   | Ecological Toxicity Assessment and Risk Characterization . . . . . 3-28                       |
| 3.4     | References . . . . . 3-28   |
| 4.0     | Source Characterization . . . . . 4-1   |
| 4.1     | Source Data Development Procedure . . . . . 4-1   |
| 4.2     | Waste Management Scenario Development . . . . . 4-4   |
| 4.2.1   | Characterization of Waste Streams . . . . . 4-5   |
| 4.2.2   | Waste Management Units . . . . . 4-6  |
| 4.2.3   | Constituents . . . . . 4-7  |
| 4.3     | Site Characterization . . . . . 4-7   |
| 4.3.1   | Conceptual Site Layouts . . . . . 4-7   |
| 4.3.1.1 | WMU Boundaries . . . . . 4-7  |
| 4.3.1.2 | Residential Scenarios . . . . . 4-10  |
| 4.3.1.3 | Agricultural Scenario . . . . . 4-11  |
| 4.3.1.4 | Fisher Scenario . . . . . 4-14  |
| 4.3.2   | Regional Environmental Setting . . . . . 4-14   |
| 4.3.2.1 | Meteorological Station Locations . . . . . 4-14   |
| 4.3.2.2 | Climate Data . . . . . 4-18   |
| 4.3.2.3 | Soil Characterization . . . . . 4-18  |
| 4.3.2.4 | Hydrogeologic Environments and Aquifer Properties . . . . . 4-25                              |
| 4.3.2.5 | Estimation of Aquifer Recharge Rates . . . . . 4-30   |
| 4.4     | Characterization of Waste Management Units . . . . . 4-31                                     |
| 4.4.1   | Landfills . . . . . 4-31  |
| 4.4.1.1 | Selecting Representative Landfill Units . . . . . 4-31  |
| 4.4.1.2 | Determining Representative Landfill Surface Areas . . . . . 4-32                              |
| 4.4.1.3 | Landfill Characteristics . . . . . 4-34   |
| 4.4.2   | Aerated and Non-aerated Treatment Tanks . . . . . 4-36  |
| 4.4.2.1 | Sampling Representative Treatment Tank Units . . . . . 4-36                                   |
| 4.4.2.2 | Determining Representative Tank Surface Areas and<br>Heights . . . . . 4-37                   |

## Table of Contents

| Section   | Page |
|---|------|
| 4.4.2.3 Aerated and Nonaerated Treatment Tank Characteristics .                     | 4-39 |
| 4.4.3 Surface Impoundments .....  | 4-47 |
| 4.4.3.1 Sampling Representative Surface Impoundments Units ..                       | 4-47 |
| 4.4.3.2 Determining Representative Surface Areas .....                              | 4-48 |
| 4.4.3.3 Surface Impoundment Characteristics .....                                   | 4-50 |
| 4.5 References .....  | 4-53 |
| 5.0 Estimating Exposure Point Concentrations .....                                  | 5-1  |
| 5.1 Source Partition Modeling of Constituent Releases .....                         | 5-2  |
| 5.1.1 Landfill Partition Model .....  | 5-4  |
| 5.1.1.1 Generic Soil Column Model .....   | 5-6  |
| 5.1.1.2 Hydrology Model .....   | 5-7  |
| 5.1.1.3 Particulate Emissions .....   | 5-7  |
| 5.1.1.4 Model Input Parameters for Landfill Model .....                             | 5-7  |
| 5.1.1.5 Landfill Partition and Model Results .....                                  | 5-11 |
| 5.1.2 Treatment Tanks .....   | 5-11 |
| 5.1.2.1 Model Overview .....  | 5-12 |
| 5.1.2.2 Model Input Parameters for Tanks .....                                      | 5-14 |
| 5.1.2.3 Treatment Tank Partition Model .....  | 5-17 |
| 5.1.3 Surface Impoundments .....  | 5-17 |
| 5.1.3.1 Model Overview .....  | 5-17 |
| 5.1.3.2 Model Input Parameters for Surface Impoundment<br>Source Model .....        | 5-18 |
| 5.1.3.3 Surface Impoundment Partition Model Results .....                           | 5-18 |
| 5.2 Fate and Transport Modeling .....   | 5-21 |
| 5.2.1 Overview .....  | 5-22 |
| 5.2.1.1 Air Pathway Fate and Transport Modeling Overview ....                       | 5-22 |
| 5.2.1.2 Groundwater Pathway Fate and Transport Modeling<br>Overview .....           | 5-24 |
| 5.2.2 Dispersion and Deposition Modeling .....                                      | 5-25 |
| 5.2.2.1 Industrial Source Complex Short Term Dispersion Model                       | 5-26 |
| 5.2.2.2 Configuration of ISCST3 for Air Dispersion and Deposition<br>Modeling ..... | 5-27 |
| 5.2.2.3 Preparing ISCST3 Input Files .....  | 5-30 |
| 5.2.2.4 Source Areas Modeled .....  | 5-31 |
| 5.2.2.5 Spatial Averaging of Air Concentrations and Deposition                      | 5-33 |
| 5.2.3 Estimation of Soil and Water Concentrations .....                             | 5-33 |
| 5.2.3.1 Predicting Soil Concentrations .....  | 5-33 |
| 5.2.3.2 Predicting Surface Water Concentrations .....                               | 5-36 |
| 5.2.3.3 Predicting Media Concentrations for Mercury .....                           | 5-39 |
| 5.2.4 Groundwater Concentrations .....  | 5-40 |
| 5.2.5 Predicting Indoor Air Concentrations .....                                    | 5-46 |

## Table of Contents

| Section | Page  |
|---------|---|
| 5.3     | Calculation of Food Chain Concentrations . . . . . 5-47                   |
| 5.3.1   | Terrestrial Food Chain . . . . . 5-47                                     |
| 5.3.1.1 | Aboveground Vegetation . . . . . 5-48                                     |
| 5.3.1.2 | Belowground Vegetation . . . . . 5-50                                     |
| 5.3.1.3 | Animal Tissue Concentration . . . . . 5-51                                |
| 5.3.2   | Aquatic Food Chain . . . . . 5-51   |
| 5.4     | References . . . . . 5-52   |
| 6.0     | Human Exposure Assessment . . . . . 6-1                                   |
| 6.1     | Receptors and Exposure Pathways . . . . . 6-2                             |
| 6.1.1   | Childhood Exposure . . . . . 6-3  |
| 6.1.2   | Exposure Pathways . . . . . 6-5   |
| 6.1.2.1 | Inhalation of Ambient Air . . . . . 6-5                                   |
| 6.1.2.2 | Ingestion of Soil . . . . . 6-5   |
| 6.1.2.3 | Ingestion of Above- and Belowground Produce . . . . . 6-5                 |
| 6.1.2.4 | Ingestion of Beef and Dairy Products . . . . . 6-5                        |
| 6.1.2.5 | Ingestion of Fish . . . . . 6-5   |
| 6.1.2.6 | Inhalation of Indoor Air . . . . . 6-5                                    |
| 6.1.2.7 | Ingestion of Drinking Water . . . . . 6-5                                 |
| 6.2     | Exposure Factors . . . . . 6-6  |
| 6.2.1   | Intake Factors . . . . . 6-6  |
| 6.2.1.1 | Soil Ingestion . . . . . 6-6  |
| 6.2.1.2 | Fruits and Vegetables Ingestion . . . . . 6-8                             |
| 6.2.1.3 | Beef and Dairy Ingestion . . . . . 6-8                                    |
| 6.2.1.4 | Fish Ingestion . . . . . 6-8  |
| 6.2.1.5 | Drinking Water Ingestion . . . . . 6-8                                    |
| 6.2.1.6 | Inhalation Rates . . . . . 6-8  |
| 6.2.2   | Other Exposure Factors . . . . . 6-9                                      |
| 6.2.2.1 | Body Weights . . . . . 6-9  |
| 6.2.2.2 | Exposure Duration . . . . . 6-9   |
| 6.2.2.3 | Exposure Frequency . . . . . 6-9  |
| 6.2.2.4 | Lifetime and Averaging Time . . . . . 6-9                                 |
| 6.3     | Dose Estimates . . . . . 6-9  |
| 6.3.1   | Average Daily Dose . . . . . 6-10   |
| 6.3.2   | Lifetime Average Daily Dose . . . . . 6-11                                |
| 6.4     | References . . . . . 6-11   |
| 7.0     | Human Health Toxicity Assessments . . . . . 7-1                           |
| 7.1     | Chronic Health Benchmarks Used in This Risk Assessment . . . . . 7-1      |
| 7.2     | Alternative Chronic Health Benchmarks Identified . . . . . 7-9            |
| 7.3     | Chronic Health Benchmarks Derived for This Risk Assessment . . . . . 7-11 |
| 7.4     | References . . . . . 7-12   |

## Table of Contents

| Section | Page  |
|---------|---|
| 8.0     | Generating Results . . . . . 8-1  |
| 8.1     | Human Health Risk Characterization . . . . . 8-1                          |
| 8.1.1   | Lifetime Excess Cancer Risk . . . . . 8-2                                 |
| 8.1.2   | Total Lifetime Excess Cancer Risk . . . . . 8-2                           |
| 8.1.3   | Ingestion Hazard Quotient by Pathway . . . . . 8-2                        |
| 8.1.4   | Ingestion Hazard Quotient . . . . . 8-4                                   |
| 8.1.5   | Inhalation Hazard Quotient . . . . . 8-4                                  |
| 8.2     | Calculating Risk-Based Waste Concentrations . . . . . 8-5                 |
| 8.2.1   | Identify Waste Concentration Scaling Factors . . . . . 8-7                |
| 8.2.1.1 | Aboveground Waste Concentration Scaling Factors . . . . . 8-8             |
| 8.2.1.2 | Groundwater Waste Concentration Scaling Factors . . . . . 8-9             |
| 8.2.2   | Calculate Protective Waste Concentrations for Paint Waste Streams . . 8-9 |
| 8.2.3   | Calculate Protective Leachate Concentrations for Paint Waste Streams 8-9  |
| 8.3     | Evaluate Solubility Limits . . . . . 8-11                                 |
| 9.0     | Ecological Risk Assessment of Paint Wastes . . . . . 9-1                  |
| 9.1     | Technical Approach . . . . . 9-2  |
| 9.2     | Problem Formulation . . . . . 9-2   |
| 9.2.1   | Selection of Assessment Endpoints . . . . . 9-3                           |
| 9.2.2   | Conceptual Model . . . . . 9-5  |
| 9.2.2.1 | Selection of Representative Receptors . . . . . 9-6                       |
| 9.2.2.2 | Identification of Exposure Pathways . . . . . 9-6                         |
| 9.3     | Analysis Phase . . . . . 9-12   |
| 9.3.1   | CSCL Development for Receptor Populations . . . . . 9-13                  |
| 9.3.2   | CSCL Development for Receptor Communities . . . . . 9-18                  |
| 9.3.2.1 | Aquatic Community . . . . . 9-18  |
| 9.3.2.2 | Dissolved Surface Water CSCLs . . . . . 9-19                              |
| 9.3.2.3 | Algae and Aquatic Plants . . . . . 9-19                                   |
| 9.3.2.4 | Benthic Community . . . . . 9-19  |
| 9.3.2.5 | Terrestrial Plant Community . . . . . 9-21                                |
| 9.3.2.6 | Soil Community . . . . . 9-22   |
| 9.3.3   | Tier 2 Analysis . . . . . 9-22  |
| 9.4     | Risk Characterization . . . . . 9-23                                      |
| 9.4.1   | Risk Description . . . . . 9-23   |
| 9.4.2   | Exposure Issues . . . . . 9-25  |
| 9.4.2.1 | Co-occurrence of Receptor and Constituent of Concern . . 9-25             |
| 9.4.2.2 | Conceptual Site Model . . . . . 9-25                                      |
| 9.4.2.3 | Assumptions on Dietary Exposure . . . . . 9-25                            |
| 9.4.2.4 | Bioavailability of Constituents of Concern . . . . . 9-25                 |
| 9.4.2.5 | Multiple Constituent Exposures . . . . . 9-26                             |
| 9.4.3   | CSCL Development Issues . . . . . 9-26                                    |
| 9.5     | References . . . . . 9-26   |



## Table of Contents

| Section  | Page  |
|--|-------|
| 10.0 Analysis of Variability and Uncertainty . . . . .                             | 10-1  |
| 10.1 Variability . . . . .   | 10-1  |
| 10.1.1 Source Characterization and Emissions Modeling . . . . .                    | 10-2  |
| 10.1.2 Fate and Transport Modeling . . . . .                                       | 10-3  |
| 10.1.3 Air Dispersion Modeling . . . . .   | 10-3  |
| 10.1.4 Soil and Water Modeling . . . . .   | 10-4  |
| 10.1.5 Groundwater Modeling . . . . .  | 10-4  |
| 10.1.6 Terrestrial and Aquatic Food Chain . . . . .                                | 10-5  |
| 10.1.7 Exposure Modeling . . . . .   | 10-5  |
| 10.1.8 Summary of Variability Considerations . . . . .                             | 10-5  |
| 10.2 Uncertainty . . . . .   | 10-5  |
| 10.2.1 Scenario Uncertainty . . . . .  | 10-6  |
| 10.2.1.1 Paint Waste Characteristics . . . . .                                     | 10-6  |
| 10.2.1.2 Characteristics and Location of Waterbodies . . . . .                     | 10-6  |
| 10.2.1.3 Receptor Populations Evaluated . . . . .                                  | 10-6  |
| 10.2.1.4 Exposure Uncertainty . . . . .  | 10-7  |
| 10.2.1.5 Natural Background Exposures . . . . .                                    | 10-7  |
| 10.2.2 Model Uncertainty . . . . .   | 10-7  |
| 10.2.2.1 Air Dispersion Modeling . . . . .   | 10-9  |
| 10.2.2.2 Mercury Modeling . . . . .  | 10-9  |
| 10.2.2.3 Groundwater Modeling . . . . .  | 10-10 |
| 10.2.2.4 Assumption of Additivity of Chemicals in<br>Characterizing Risk . . . . . | 10-10 |
| 10.2.2.5 Human Health Benchmarks . . . . .   | 10-11 |
| 10.2.2.6 Lead Risk Characterization . . . . .                                      | 10-12 |
| 10.2.3 Parameter Uncertainty . . . . .   | 10-13 |
| 10.2.3.1 Waste Management Unit Parameters . . . . .                                | 10-13 |
| 10.2.3.2 Distribution Coefficients, $K_d$ . . . . .                                | 10-13 |
| 10.2.3.3 Watershed Universal Soil Loss Equation (USLE)<br>Parameters . . . . .     | 10-14 |
| 10.2.3.4 Biotransfer Factors for Cows . . . . .                                    | 10-14 |
| 10.2.3.5 Exposure Factors . . . . .  | 10-14 |
| 10.3 References . . . . .  | 10-15 |

**List of Appendices**

|   | <b>Page</b> |
|---|-------------|
| Appendix A Human Health Risk Results .....  | A-1         |
| Appendix B Ecological Risk Results .....  | B-1         |
| Appendix C Sensitivity Analysis .....   | C-1         |
| Appendix D Chemical-Specific Parameters for Source Partitioning and Fate and Transport Models ..... | D-1         |
| Appendix E Waste Management Unit Parameters .....   | E-1         |
| Appendix F Variable Summary of Aboveground Fate and Transport Model .....                           | F-1         |
| Appendix G Human Exposure Factors .....   | G-1         |
| Appendix H Distribution Coefficients .....  | H-1         |
| Appendix I Site Data .....  | I-1         |
| Appendix J Statistical Sampling Procedures for Selection of Waste Management Units ..               | J-1         |
| Appendix K Modifications to HWIR Source Partition Model Programs .....                              | K-1         |
| Appendix L Source Data .....  | L-1         |
| Appendix M Direct and Indirect Exposure Equations .....   | M-1         |
| Appendix N Air Dispersion and Deposition Modeling .....   | N-1         |
| Appendix O Groundwater Modeling Parameters .....  | O-1         |
| Appendix P Shower Model .....   | P-1         |
| Appendix Q Human Health Benchmarks .....  | Q-1         |
| Appendix R Screening Ecological Risk Assessment Inputs and Calculations .....                       | R-1         |
| Appendix S Waste Stream Data .....  | S-1         |
| Appendix T Screening Analysis of Groundwater Daughter Products .....                                | T-1         |
| Appendix U Analysis of Groundwater Constituent Time to Impact .....                                 | U-1         |
| Appendix V On-Site Tank Bounding Analysis .....   | V-1         |
| Appendix W Results of Literature Search on Metal Complexes .....                                    | W-1         |

## List of Figures

| Number |  | Page |
|--------|--|------|
| 3-1    | Conceptual site layout   | 3-6  |
| 3-2    | States included in the 1997 census of paint manufacturing facilities and facility locations from the 1997 TRI survey | 3-6  |
| 3-3    | Meteorological stations included in the paints listing risk assessment   | 3-7  |
| 3-4    | Residential scenario   | 3-12 |
| 3-5    | Agricultural scenario  | 3-13 |
| 3-6    | Fisher scenario  | 3-13 |
| 4-1    | Process used to construct source data files used as basis for probabilistic analysis                                 | 4-2  |
| 4-2    | Conceptual site layout for residential aboveground scenario  | 4-8  |
| 4-3    | Conceptual site layout for residential groundwater scenario  | 4-8  |
| 4-4    | Conceptual site layout for agricultural scenario   | 4-9  |
| 4-5    | Conceptual site layout for fisher scenario   | 4-9  |
| 4-6    | Locations of paint manufacturing facilities  | 4-17 |
| 4-7    | Locations of meteorological stations   | 4-18 |
| 4-8    | Soil data flowchart  | 4-24 |
| 4-9    | Correlation of total capacity to area for landfills  | 4-36 |
| 4-10   | Comparison of tank depth regression lines  | 4-45 |
| 4-11   | Correlation of waste quantity to area for surface impoundments   | 4-51 |
| 4-12   | Correlation of total capacity to area for surface impoundments   | 4-52 |
| 5-1    | Illustration of landfill with six cells and three waste layers   | 5-5  |
| 5-2    | Schematic of general model construct for tanks   | 5-14 |
| 5-3    | Conceptual model for SI infiltration algorithm   | 5-18 |
| 5-4    | Air pathway fate and transport processes and exposure points   | 5-23 |
| 5-5    | Groundwater fate and transport processes and exposure points   | 5-25 |
| 5-6    | Air concentration vs. size of area source  | 5-32 |
| 5-7    | Waterbody constituent loading and loss processes   | 5-37 |
| 5-8    | Schematic diagram of groundwater modeling scenario   | 5-41 |
| 5-9    | Schematic plan view showing procedure for determining the downstream location of the receptor well                   | 5-45 |
| 5-10   | Constituent transfer mechanisms for aboveground produce  | 5-49 |
| 6-1    | Human exposure pathways  | 6-1  |
| 7-1    | Approach used to select chronic health benchmark values  | 7-4  |
| 8-1    | Process for calculating protective waste concentrations  | 8-6  |
| 9-1    | General food web model for aquatic and terrestrial systems   | 9-11 |

## List of Tables

| Number |  | Page |
|--------|--|------|
| 2-1    | Summary of 90th Percentile Target Waste Concentrations in Landfill, Combined Solids .....                          | 2-5  |
| 2-2    | Summary of 90th Percentile Target Waste Concentrations in Landfill, Dust .....                                     | 2-7  |
| 2-3    | Summary of 90th Percentile Target Waste Concentrations in Surface Impoundment, Wastewater .....                    | 2-9  |
| 2-4    | Summary of 90th Percentile Target Waste Concentrations in Tanks, Wastewater ...                                    | 2-11 |
| 2-5    | Landfills, Combined Solids Maximum Ecological HQs in Each Medium (90th Percentile Media Concentrations) .....      | 2-12 |
| 2-6    | Landfill, Emission Control Dust—Maximum Ecological HQs in Each Medium (90th Percentile Media Concentrations) ..... | 2-14 |
| 2-7    | Surface Impoundment, Wastewater—Maximum Ecological HQs in Each Medium (90th Percentile Media Concentrations) ..... | 2-16 |
| 2-8    | Treatment Tanks, Wastewater—Maximum Ecological HQs in Each Medium (90th Percentile Media Concentrations) .....     | 2-18 |
| 3-1    | Waste Management Scenarios Modeled .....   | 3-2  |
| 3-2    | Constituents of Concern Evaluated in Paints Listing Risk Assessment .....  | 3-4  |
| 3-3    | WMU and Primary Release Mechanisms .....   | 3-8  |
| 3-4    | WMU and Impacted Environmental Media .....   | 3-9  |
| 3-5    | Environmental Media and Vegetation Considered in the Farm Food Chain Model ..                                      | 3-10 |
| 3-6    | Receptors and Exposure Pathways .....  | 3-12 |
| 3-7    | Human Health Effects Evaluated for Paints Listing Risk Assessment .....  | 3-15 |
| 3-8    | Risk Endpoints for Cancer and Noncancer Effects .....  | 3-16 |
| 3-9    | Parameters Varied in High-End Analysis for Aboveground Pathways .....  | 3-20 |
| 3-10   | Average Ambient Temperatures for Central Tendency and High-End Sites .....   | 3-22 |
| 3-11   | Central Tendency and High-End Partition Coefficient Values Used in Deterministic Analyses .....                    | 3-22 |
| 3-12   | Parameters Varied in High-End Analysis for Groundwater Parameters .....  | 3-24 |
| 4-1    | Waste Management Scenarios Modeled .....   | 4-5  |
| 4-2    | Distributions of Waste Stream Data .....   | 4-6  |
| 4-3    | Distribution of Receptor Well Distance .....   | 4-11 |
| 4-4    | Agricultural Field Sizes by Location .....   | 4-12 |
| 4-5    | Paint Manufacturing Activity by State Based on 1997 Census Data .....  | 4-16 |
| 4-6    | Meteorological Stations for Each State .....   | 4-19 |
| 4-7    | Twelve Hydrogeologic Environments in EPACMTP .....   | 4-26 |
| 4-8    | Summary of Aquifer Types .....   | 4-28 |
| 4-9    | Median Surface Areas for Landfills Strata .....  | 4-33 |
| 4-10   | Summary of Tanks Removed from TSDR Survey Database .....   | 4-38 |
| 4-11   | Range of Heights in Tank Height Bins .....   | 4-38 |
| 4-12   | Median Surface Areas and Heights for Tanks Strata .....  | 4-39 |
| 4-13   | TSDR Survey Wastewater Treatment Codes Used in Identifying Treatment Tanks ..                                      | 4-41 |

## List of Tables

| Number |  | Page |
|--------|--|------|
| 4-14   | Numbers of Tanks by Classification .....   | 4-42 |
| 4-15   | Summary of Tank Size Information Collected in EPA Site Visits for RCRA Air<br>Emission Standards ..... | 4-43 |
| 4-16   | Summary of Depth Imputation Techniques .....   | 4-46 |
| 4-17   | Median Surface Areas for Surface Impoundment Strata .....  | 4-49 |
| 5-1    | WMU and Primary Release Mechanisms .....   | 5-3  |
| 5-2    | Landfill Partition Model Input Parameters .....  | 5-8  |
| 5-3    | Treatment Tank Partition Model Input Parameters .....  | 5-15 |
| 5-4    | Surface Impoundment Partition Model Input Parameters .....   | 5-19 |
| 5-5    | Terrestrial Food Chain Vegetation .....  | 5-48 |
| 6-1    | Receptors and Exposure Pathways .....  | 6-3  |
| 6-2    | Human Exposure Factor Input Parameters and Data Sources .....  | 6-7  |
| 7-1    | Chronic Health Benchmarks Used in Paints Risk Assessment .....   | 7-5  |
| 7-2    | Alternative Chronic Health Benchmarks .....  | 7-10 |
| 7-3    | Chronic Health Benchmarks Derived for This Risk Assessment .....                                       | 7-11 |
| 8-1    | Risk Endpoints Used for Risk Categories .....  | 8-3  |
| 8-2    | Ingestion HQs Summed for Total Ingestion HQ for Each Receptor .....                                    | 8-4  |
| 9-1    | Assessment Endpoints and Measures of Effects .....   | 9-4  |
| 9-2    | Receptor Species for Paint Wastes SERA .....   | 9-7  |
| 9-3    | Conversion Factors for Dissolved Metal .....   | 9-20 |
| 9-4    | Sample Target Waste Calculation .....  | 9-24 |

# 1.0 Introduction

## 1.1 Background

The U.S. Environmental Protection Agency (EPA) is required under the Resource Conservation and Recovery Act (RCRA), Section 3001(e)(2), to make hazardous waste listing determinations on certain wastes generated during the manufacture of paints in the United States. These determinations were to be made within 15 months of enactment of the Hazardous Solid Waste Amendment (HSWA) of 1984. In March 1989, the Environmental Defense Fund (EDF) sued EPA for failing to meet that statutory deadline (EDF vs. Browner; Civ. No. 89-0598 D.D.C.). To resolve most of the issues in the case, EDF and EPA entered into a consent decree in 1991 that added to the scope of the waste streams EPA would evaluate. The 1991 consent decree also set out an extensive series of deadlines. This consent decree has since been modified. Under a new agreement, the Agency must finalize a hazardous waste listing determination on wastes generated during paint manufacture no later than March 30, 2002, and propose these determinations by January 28, 2001.

For listing determinations, three key documents summarize the results of EPA's technical data collection and analysis efforts: a Listing Determination Technical Background Document, an Economics Background Document, and a Risk Assessment Technical Background Document. The Listing Determination Technical Background Document is the "primary" background document and provides a description of the methodologies EPA employed to characterize the industry and wastes that are the subject of the listing determination, a summary of the data and information collected, and supporting data analyses. The Economics Background Document provides estimates of national industry compliance costs for the proposed listing decisions. The Risk Assessment Technical Background Document provides the results of EPA's human health and ecological risk assessments for the wastes that are the subject of the listing determination. This document is the risk assessment technical background document for the Paint and Coatings Listing Determination.

## 1.2 Purpose of the Risk Assessment

This risk assessment was conducted to provide concentrations of individual constituents that can be present in each industry waste stream and remain "protective" (below a specified level of risk) of both human health and the environment. These risk-based concentration limits were generated by evaluating both cancer and noncancer human health risks for individuals (receptors) who may be exposed to releases from commonly used waste management units (treatment tanks, surface impoundments, and landfills). Information provided from the paint and coatings manufacturers on the management of their nonhazardous wastes was used to create the waste management scenarios modeled in this risk assessment. This risk assessment also includes

a screening analysis that provides a general indication of the potential risks to ecological receptors.

There are several reasons for potentially listing the waste streams generated during paint manufacture with a risk-based, protective concentration approach. First, paints and coatings formulations are highly variable because they are used for a wide number of applications, each with different performance requirements. As such, paints and coatings are manufactured using a batch process so that unique characteristics and performance requirements can be met. Batch operations may result in highly variable wastes at the same facility as well as at different facilities. A concentration-based approach allows the variable wastes generated at these facilities to be evaluated individually for hazard so only the truly hazardous wastes are designated as such.

Second, a concentration-based listing approach may provide an incentive for hazardous waste generating facilities to modify their manufacturing process or treat their wastes. For example, if a facility has a listed hazardous waste based on constituent-specific concentration levels established by EPA, the facility may decide to modify its manufacturing process or treat its waste so that it generates a nonhazardous waste.

### 1.3 Overview of Risk Assessment Methodology

This human health risk assessment provides estimates of constituent concentrations that can be present in each of the identified or selected waste streams and remain protective of human health at specified target risk levels. One of two target risk levels was used in this analysis:

- An estimate of the excess lifetime cancer risk for individuals exposed to carcinogenic (cancer-causing) contaminants of 1 chance in 100,000 (1E-5)

or

- A measure of safe intake levels to projected intake levels, a hazard quotient (HQ) of 1, for constituents that can produce noncancer health effects.

The human health risk assessment included seven primary tasks:

1. Establish the characteristics of the waste management units where each waste stream may be managed.
2. Construct the environmental setting where waste management units receiving paint wastes are located.
3. Identify scenarios under which contaminants are released from a waste management unit and transported to a human receptor.
4. Predict the fate and transport of constituents in the environment once they are released from the waste management unit.



5. Quantify an individual's exposure to the contaminant in the environment.
6. Describe the receptor's predicted risk to the exposure and determine concentrations of each constituent that can be safely managed in each waste management unit.
7. Determine if the risk-based protective concentrations for human health are also protective for ecological receptors that may come into contact with contaminated media.

EPA used three analytical approaches to estimate the protective constituent concentrations: deterministic analysis, probabilistic analysis, and bounding analysis. A deterministic risk analysis produces a point estimate of risk or hazard for each receptor based on using a single value for each parameter in the analysis (i.e., any one of a number of input variables required for the fate and transport, exposure, and risk models that EPA uses to assess risk). A probabilistic risk analysis produces a distribution of risks or hazard for each receptor by allowing some of the parameters in the analysis to have more than one value. A probabilistic analysis is ideal for this risk assessment because there are numerous facilities in the contiguous United States that produce paint and coatings. The probabilistic analysis not only captures the variability in waste management practices, it also captures the differences in environmental settings (e.g., hydrology, meteorology) where paint wastes may be managed. A bounding analysis is used as a quick and simple way to "screen out" potential scenarios through the use of very conservative assumptions. For this risk assessment, a bounding analysis was used to evaluate constituents managed in on-site tanks. Similar to the deterministic and probabilistic analyses, the results of the bounding analysis estimated the concentration of a constituent that could be present in an on-site tank and remain protective of human health. In addition, a bounding analysis was used to determine if the transformation products of groundwater contaminants could pose a risk to receptors.

#### 1.4 Document Organization

This background document is organized into the following sections:

- Section 2, Analysis Results, presents a summary of risk assessment results and the risk-based concentration values that are protective of human health. Results are presented for four waste management scenarios: landfill disposal of emission control dust, landfill disposal of combined solids, treatment tank handling of wastewater, and surface impoundment handling of wastewater. Also presented in this section are results from the ecological risk assessment for each of the four waste management scenarios.
- Section 3, Risk Assessment Overview, describes the conceptual framework for the paints risk assessment. It presents the conceptual framework for the human health risk assessment including a description of waste streams and waste management practices, fate and transport modeling, exposure assessment, and calculation of protective waste and leachate concentrations. In addition, it provides a detailed



explanation of the framework for the probabilistic and deterministic analyses and an overview of the ecological risk assessment.

- Section 4, Source Characterization, presents the methodologies used to characterize the environmental setting, including delineation of the site layout and environmental setting (e.g., meteorology, climate, soils, and aquifers). It also describes how we characterized the waste management units including capacities and surface areas.
- Section 5, Estimating Exposure Point Concentrations, describes the models and methods used for source partition modeling, air dispersion and deposition modeling, watershed and waterbody modeling, groundwater modeling, terrestrial food chain modeling, and aquatic food chain modeling.
- Section 6, Human Exposure Assessment, presents an overview of the human receptors, selected exposure pathways, and exposure scenarios considered for this assessment. It also presents particular exposure factors (i.e., values needed to calculate human exposure) used in the analysis and presents methods used to estimate dose, including average daily dose (ADD) and lifetime average daily dose (LADD).
- Section 7, Human Health Toxicity Assessments, presents the noncancer and cancer benchmarks used to evaluate human health effects that may result from exposure to constituents modeled for this risk assessment.
- Section 8, Generating Results, presents the methods used to characterize the risk posed to an individual. It describes the calculation methods used to generate risk-based constituent concentrations that are protective of human health.
- Section 9, Ecological Risk Assessment of Paint Wastes, describes the screening ecological risk assessment (SERA) developed to evaluate the potential ecological risks associated with the management of paint manufacturing wastes.
- Section 10, Analysis of Variability and Uncertainty, discusses the methods that were used in the paints listing risk assessment to account for variability and uncertainty.

The following appendixes, A through W, provide supplemental technical information and supporting data:

- A – Human Health Risk Results
- B – Ecological Risk Results
- C – Sensitivity Analysis

- D – Chemical-Specific Parameters for Source Partitioning and Fate and Transport Models
- E – Waste Management Unit Parameters
- F – Variable Summary of Aboveground Fate and Transport Model
- G – Human Exposure Factors
- H – Distribution Coefficients
- I – Site Data
- J – Statistical Sampling Procedures for Selection of Waste Management Units
- K – Modifications to HWIR Source Partition Model Programs
- L – Source Data
- M – Direct and Indirect Exposure Equations
- N – Air Dispersion and Deposition Modeling
- O – Groundwater Modeling Parameters
- P – Shower Model
- Q – Health Benchmarks
- R – Screening Ecological Risk Assessment Inputs and Calculations
- S – Waste Stream Data
- T – Screening Analysis of Groundwater Daughter Products
- U – Analysis of Groundwater Constituent Time to Impact
- V – Onsite Tank Bounding Analysis
- W – Results of Literature Search on Metal Complexes.



## 2.0 Analysis Results

This section provides summaries of human health and ecological risk assessments for the paints listing risk assessment. The primary analysis conducted for this risk assessment was a probabilistic analysis, the results of which are presented in this section. Additionally, a deterministic analysis was conducted and those results are presented in Appendix A. Results are presented for the probabilistic analyses and are in terms of protective waste concentrations and protective leachate concentrations. These protective concentrations were established to ensure that 90 percent of the time target risk levels of 1 in 100,000 ( $1 \times 10^{-5}$ ) individual lifetime cancer risk or hazard quotient of 1.0 for noncancer health effects are not exceeded for the waste management scenarios evaluated. The screening level ecological risk assessment was conducted to evaluate whether maximum (highest physical limit) waste concentrations are protective of ecological receptors. Constituents for which the screening ecological assessment indicated risks of potential concern were assessed further in a Tier 2 ecological analysis. Results of this analysis are also reported in this section.

An overview of the assessment on which these results are based (e.g., waste management scenarios, analysis framework) is provided in Section 3.0. Other sections of this report provide more details on analysis methodologies, parameter values, assumptions, and uncertainties. In this section, Section 2.1 presents results from the human health risk assessment, and Section 2.2 presents the results from the ecological risk assessment. Tables summarizing these results are presented at the end of this section. Appendixes A and B provide more detailed results for human health and ecological risk, respectively.

### 2.1 Human Health Risk Results

This section presents the protective waste and leachate concentrations that have been determined in the initial human health risk assessment to be protective of human health 90 percent of the time at the target risk levels. Results are presented for four waste management scenarios:

- Landfill disposal of combined solid wastes
- Landfill disposal of emission control dust
- Surface impoundment handling of wastewater
- Treatment tank handling of wastewater.

Probabilistic results are based on a Monte Carlo simulation in which many model input parameter values are varied over 10,000 iterations of the model to yield a statistical distribution of exposures and risks. Results shown in this section are based on the 90<sup>th</sup> percentile level identified from these distributions. The 90<sup>th</sup> percentile level means that the waste concentration

listed in the results tables will be protective of human health at the specified target risk level for 90 percent of the scenarios in the Monte Carlo analysis. Results at other percentile levels and the deterministic analysis are presented in Appendix A.

A summary table format is used to present results for each type of analysis. The table shows results for both the air pathway (aboveground) and the groundwater pathway. For each constituent, the waste concentration reported is the paint waste concentration that corresponds to the target risk levels. That is, it is the maximum paint waste concentration that can be disposed of in the WMU and still be protective of 90 percent of the human receptors evaluated in this risk assessment 90 percent of the time.

For the aboveground and groundwater pathways, protective waste concentrations are reported. In addition, protective leachate concentrations are reported for the groundwater pathway. Similar to the protective waste concentrations, protective leachate concentrations are the leachate concentrations for landfills and surface impoundments that correspond to the target risk levels. As such, they are the maximum leachate concentrations that can be generated by a WMU in which paint waste is disposed of and still be protective of human receptors evaluated in this risk assessment 90 percent of the time.

Additionally, the tables show the receptor and pathway that are the basis for the waste concentrations and leachate concentrations presented. For example, if the 90<sup>th</sup> percentile waste concentration for a given constituent indicates that adult farmer ingestion was the limiting receptor pathway, it means that the adult farmer receptor exposed via the ingestion pathway had the lowest protective concentration for all receptors and pathways evaluated for a given waste management scenario and constituent. It should be noted that the receptor for the inhalation pathway will always be the adult resident because the inhalation noncancer effects are evaluated based on a reference air concentration that is not receptor-specific. Results for other receptors and pathways are presented in Appendix A.

### **2.1.1 Risk Results for Landfill Disposal of Combined Solid Wastes**

Table 2-1 presents the constituent concentration in the waste and leachate that, when used in the Monte Carlo analysis, yielded a distribution of risk levels with a target risk at the 90<sup>th</sup> percentile level. In these tables, landfill combined solid wastes management scenario results are presented for aboveground and groundwater pathways for all constituents.

### **2.1.2 Risk Results for Landfill Disposal of Emission Control Dust**

Table 2-2 presents the constituent concentration in the waste and leachate that, when used in the Monte Carlo analysis, yielded a distribution of risk levels with a target risk at the 90<sup>th</sup> percentile level. In these tables, landfill dust waste management scenario results are presented for aboveground and groundwater pathways for all constituents.

### 2.1.3 Risk Results for Surface Impoundment Handling of Wastewaters

Table 2-3 presents the constituent concentration in the waste and leachate that, when used in the Monte Carlo analysis, yielded a distribution of risk levels with a target risk at the 90<sup>th</sup> percentile level.

In Table 2-3, surface impoundment aqueous waste management scenario results are presented for aboveground and groundwater pathways. For the aboveground pathway, results are reported only for organic constituents and volatile metals (i.e., mercury species) because only volatile constituents are released from a surface impoundment. For the groundwater pathway, results are reported for all constituents.

### 2.1.4 Risk Results for Treatment Tank Handling of Wastewaters

Table 2-4 presents the constituent concentration in the waste and leachate that, when used in the Monte Carlo analysis, yielded a distribution of risk levels with a target risk at the 90<sup>th</sup> percentile level.

In Table 2-4, tank aqueous waste management scenario results are presented only for the aboveground pathway. Because there is no release of constituents to the ground from treatment tanks, there are no groundwater pathway results to report. For the aboveground pathway, results are reported for all organic constituents and volatile metals (i.e., mercury species) because only volatile constituents are released from a tank.

## 2.2 Ecological Risk Screening Results

This section presents the results of a two-tier screening ecological risk assessment (SERA). Ecological risks were initially evaluated for waste concentrations set to 750,000 ppm. Using a hazard quotient approach, the screening assessment evaluated these waste concentrations for all constituents to determine if they were protective of the environment. The ecological assessment considered the modeled media concentrations (soil, surface water, and sediment) associated with the 750,000-ppm waste concentrations. These media concentrations were compared with chemical stressor concentration limits (CSCLs), which are media concentrations that are protective of ecological receptors. HQs were calculated by dividing the media concentrations by the corresponding CSCLs for several receptors in each medium. HQs of 1 or higher indicate that the human health protective waste concentration may not be protective of ecological receptors.

The ecological assessment was based on media concentrations derived from the probabilistic fate and transport modeling (e.g., 90<sup>th</sup> percentile media concentrations). However, the ecological assessment itself was a deterministic analysis: a single CSCL was generated for each receptor in each medium. CSCLs were derived using conservative assumptions (e.g., receptors are assumed to derive all of their food from the contaminated area, diets are assumed to consist predominantly of diet items with the highest contaminant uptake rates). HQs were calculated using 90<sup>th</sup> percentile media concentrations from the probabilistic human health

assessment. Tables 2-5 through 2-8 present the maximum HQs in each medium for the 90th percentile media concentrations for each of the four waste management scenarios.

A second tier analysis was performed for any constituent that had HQs greater than 1 at the 50<sup>th</sup> or 90<sup>th</sup> percentile levels in the initial screening assessment. Only two constituents, lead and mercury, did not screen out at the 750,000-ppm level. For the ecological risk assessment, mercury was modeled assuming that the divalent form of mercury was in the waste. Fate and transport modeling accounted for chemical transformation and concentrations of both divalent and methyl species of mercury in surface waters. It is the predicted methylmercury concentrations in surface water that result in HQs greater than 1. In the Tier 2 assessment, constituent-specific waste concentrations that result in a maximum HQ of 1 at the 50<sup>th</sup> and 90<sup>th</sup> percentile exposure levels were calculated using the same conservative exposure scenarios in the initial ecological screening assessment. The Tier 2 calculated waste concentrations that would result in a maximum HQ of 1 are as follows:

- Lead
  - 90<sup>th</sup> percentile – 2.7E+5 ppm
  - 50<sup>th</sup> percentile – all HQs less than 1
  
- Divalent mercury
  - 90<sup>th</sup> percentile – 7.4E+3 ppm
  - 50<sup>th</sup> percentile – 2.1E+5 ppm.

**Table 2-1. Summary of 90<sup>th</sup> Percentile Target Waste Concentrations in Landfill, Combined Solids**

| Constituent               | CAS No.      | Aboveground                        |       | Groundwater                        |                                      |       |
|---------------------------|--------------|------------------------------------|-------|------------------------------------|--------------------------------------|-------|
|                           |              | Target Waste Concentration (mg/kg) | Basis | Target Waste Concentration (mg/kg) | Target Leachate Concentration (mg/L) | Basis |
| Acrylamide                | 79-06-1      | 1.9E+07 E                          | CF 1  | 4.7E+02                            | 9.7E-01                              | AR 1  |
| Acrylonitrile             | 107-13-1     | 1.7E+05                            | CF 1  | 6.0E+01                            | 1.2E+00                              | NA 3  |
| Antimony                  | 7440-36-0    | 4.4E+06 E                          | CF 2  | 3.2E+03                            | 8.2E+01                              | CR 2  |
| Barium                    | 7440-39-3    | 2.5E+08 E                          | NA 3  | 5.7E+07 E                          | 1.6E+05                              | CR 2  |
| Benzene                   | 71-43-2      | 7.9E+05                            | CF 1  | 4.7E+04                            | 8.3E+01                              | AR 1  |
| Butylbenzylphthalate      | 85-68-7      | 3.5E+11 E                          | CF 2  | L                                  |                                      |       |
| Cadmium                   | 7440-43-9    | 2.8E+06 E                          | CF 2  | 2.8E+05                            | 9.5E+02                              | CR 2  |
| Chloroform                | 67-66-3      | 4.0E+07 E                          | NA 3  | 1.2E+06 E                          | 1.5E+01                              | NA 3  |
| Chromium (III)            | 16065-83-1   | 1.7E+11 E                          | CF 2  | 6.0E+21 E                          | 1.6E+18 E                            | CR 2  |
| Chromium (VI)             | 18540-29-9   | 9.5E+06 E                          | CF 1  | 6.6E+04                            | 1.5E+03                              | CR 2  |
| Cobalt                    | 7440-48-4    | 6.9E+06 E                          | NA 3  | 3.5E+09 E                          | 4.4E+06 E                            | CR 2  |
| Copper                    | 7440-50-8    | 1.2E+07 E                          | NA 3  | 1.1E+08 E                          | 2.5E+05                              | NA 5  |
| Cresol, m-                | 108-39-4     | 2.7E+10 E                          | CF 2  | 3.7E+08 E                          | 3.7E+03                              | CR 2  |
| Cresol, o-                | 95-48-7      | 5.9E+10 E                          | CF 2  | 4.3E+09 E                          | 3.7E+03                              | CR 2  |
| Cresol, p-                | 106-44-5     | 1.2E+10 E                          | CF 2  | 4.3E+08 E                          | 3.7E+02                              | CR 2  |
| Di(2-ethylhexylphthalate) | 117-81-7     | 5.0E+09 E                          | AF 1  | L                                  |                                      |       |
| Dibutylphthalate          | 84-74-2      | 3.2E+11 E                          | CF 2  | L                                  |                                      |       |
| Dichloromethane           | 75-09-2      | 7.9E+06 E                          | CF 1  | 3.3E+05                            | 5.4E+02                              | NA 3  |
| Dimethylphenol, 2,4-      | 105-67-9     | 1.0E+11 E                          | CF 2  | 6.4E+12 E                          | 6.7E+02                              | CR 2  |
| Divalent mercury          | 7439-97-6(d) | 8.7E+05                            | F 2   | 2.4E+07 E                          | 3.6E+04                              | CR 2  |
| Ethylbenzene              | 100-41-4     | 2.1E+09 E                          | NA 3  | L                                  |                                      |       |
| Ethylene glycol           | 107-21-1     | 1.1E+12 E                          | CF 2  | 6.2E+06 E                          | 1.5E+05                              | CR 2  |
| Formaldehyde              | 50-00-0      | 4.0E+07 E                          | CF 1  | 1.4E+06 E                          | 1.5E+04                              | CR 2  |
| Lead                      | 7439-92-1    | 4.3E+08 E                          | NA 4  | 8.3E+11 E                          | 2.9E+08 E                            | NA 5  |
| Mercury                   | 7439-97-6(e) | 2.1E+05                            | NA 3  | 8.9E+08 E                          | 2.9E+05 S                            | NA 3  |
| Methanol                  | 67-56-1      | 3.4E+10 E                          | CF 2  | 3.3E+07 E                          | 3.7E+04                              | CR 2  |
| Methyl ethyl ketone       | 78-93-3      | 1.2E+09 E                          | NA 3  | 2.2E+05                            | 1.4E+03                              | NA 3  |
| Methyl isobutyl ketone    | 108-10-1     | 1.4E+08 E                          | NA 3  | 1.2E+05                            | 6.0E+01                              | NA 3  |
| Methyl methacrylate       | 80-62-6      | 3.8E+08 E                          | NA 3  | 4.1E+04                            | 2.3E+02                              | NA 3  |
| n-Butyl alcohol           | 71-36-3      | 4.1E+09 E                          | CF 2  | 1.5E+06 E                          | 7.4E+03                              | CR 2  |
| Nickel                    | 7440-02-0    | 5.0E+07 E                          | NA 3  | 1.8E+08 E                          | 3.8E+05                              | CR 2  |
| Nickel oxide              | 1313-99-1    | 9.1E+07 E                          | NA 3  | B                                  |                                      |       |
| Pentachlorophenol         | 87-86-5      | 1.7E+08 E                          | CF 1  | 1.6E+05                            | 1.2E+02                              | AR 1  |

(continued)



Table 2-1. (continued)

| Constituent            | CAS No.   | Aboveground                        |  |       | Groundwater                        |                                      |       |
|------------------------|-----------|------------------------------------|--|-------|------------------------------------|--------------------------------------|-------|
|                        |           | Target Waste Concentration (mg/kg) |  | Basis | Target Waste Concentration (mg/kg) | Target Leachate Concentration (mg/L) | Basis |
| Phenol                 | 108-95-2  | 4.7E+11 E                          |  | CF 2  | 5.7E+08 E                          | 4.4E+04                              | CR 2  |
| Selenium               | 7782-49-2 | 6.3E+07 E                          |  | CF 2  | 3.4E+04                            | 8.4E+02                              | CR 2  |
| Silver                 | 7440-22-4 | 5.2E+06 E                          |  | CF 2  | 9.8E+08 E                          | 1.2E+06 E                            | CR 2  |
| Styrene                | 100-42-5  | 3.9E+09 E                          |  | NA 3  | 1.7E+33 E                          | 6.7E+03 S                            | CR 2  |
| Tetrachloroethylene    | 127-18-4  | 2.4E+07 E                          |  | CF 1  | 2.1E+04                            | 3.5E+01                              | NA 3  |
| Tin                    | 7440-31-5 | 9.5E+09 E                          |  | CF 2  | 7.4E+18 E                          | 1.6E+15 E                            | CR 2  |
| Toluene                | 108-88-3  | 2.8E+08 E                          |  | NA 3  | 7.8E+06 E                          | 3.9E+02                              | NA 3  |
| Vinyl acetate          | 108-05-4  | 1.4E+08 E                          |  | NA 3  | G                                  |                                      |       |
| Xylene (mixed isomers) | 1330-20-7 | 1.1E+09 E                          |  | NA 3  | L                                  |                                      |       |
| Zinc                   | 7440-66-6 | 1.3E+08 E                          |  | CF 2  | 4.8E+10 E                          | 4.5E+07 E                            | CR 2  |

AF = Adult farmer.

AR = Adult resident.

B = Screened out of pathway due to no benchmark.

CF = Child farmer.

CR = Child resident.

E = The concentration exceeded 1 million ppm.

F = Fisher.

G = Screened out of pathway due to zero well concentration.

L = Screened out of pathway since there was no constituent concentration in the leachate.

M = Screened out of pathway since chemical is a nonvolatile metal.

NA = Not applicable to a particular receptor group.

S = The concentration exceeded solubility checks.

1 = Risk.

2 = HQ ingestion.

3 = HQ inhalation.

4 = Soil Screening Level.

5 = Drinking water action level.

Table 2-2. Summary of 90<sup>th</sup> Percentile Target Waste Concentrations in Landfill, Dust

| Constituent               | CAS No.      | Aboveground                        |   |       | Groundwater                        |                                      |        |
|---------------------------|--------------|------------------------------------|---|-------|------------------------------------|--------------------------------------|--------|
|                           |              | Target Waste Concentration (mg/kg) |   | Basis | Target Waste Concentration (mg/kg) | Target Leachate Concentration (mg/L) | Basis  |
| Acrylamide                | 79-06-1      | 1.4E+07                            | E | CF 1  | 3.1E+02                            | 7.0E-01                              | AR 1   |
| Acrylonitrile             | 107-13-1     | 1.3E+05                            |   | CF 1  | 4.3E+01                            | 9.1E-01                              | NA 3   |
| Antimony                  | 7440-36-0    | 3.2E+06                            | E | CF 2  | 2.3E+03                            | 5.8E+01                              | CR 2   |
| Barium                    | 7440-39-3    | 1.9E+08                            | E | NA 3  | 2.7E+07                            | 9.2E+04                              | CR 2   |
| Benzene                   | 71-43-2      | 6.3E+05                            |   | CF 1  | 3.1E+04                            | 5.5E+01                              | AR 1   |
| Butylbenzylphthalate      | 85-68-7      | 3.0E+11                            | E | CF 2  | L                                  |                                      |        |
| Cadmium                   | 7440-43-9    | 2.2E+06                            | E | CF 2  | 1.3E+05                            | 5.1E+02                              | CR 2   |
| Chloroform                | 67-66-3      | 3.1E+07                            | E | NA 3  | 6.0E+05                            | 9.4E+00                              | NA 3   |
| Chromium (III)            | 16065-83-1   | 1.6E+11                            | E | CF 2  | 3.1E+21                            | 9.5E+17                              | E CR 2 |
| Chromium (VI)             | 18540-29-9   | 7.5E+06                            | E | CF 1  | 6.8E+04                            | 1.4E+03                              | CR 2   |
| Cobalt                    | 7440-48-4    | 5.7E+06                            | E | NA 3  | 1.7E+09                            | 2.3E+06                              | E CR 2 |
| Copper                    | 7440-50-8    | 9.3E+06                            | E | NA 3  | 5.0E+07                            | 1.3E+05                              | NA 5   |
| Cresol, m-                | 108-39-4     | 2.1E+10                            | E | CF 2  | 1.9E+08                            | 2.6E+03                              | CR 2   |
| Cresol, o-                | 95-48-7      | 3.9E+10                            | E | CF 2  | 2.0E+09                            | 2.6E+03                              | CR 2   |
| Cresol, p-                | 106-44-5     | 8.4E+09                            | E | CF 2  | 2.0E+08                            | 2.6E+02                              | CR 2   |
| Di(2-ethylhexylphthalate) | 117-81-7     | 3.9E+09                            | E | CF 1  | L                                  |                                      |        |
| Dibutylphthalate          | 84-74-2      | 2.8E+11                            | E | CF 2  | L                                  |                                      |        |
| Dichloromethane           | 75-09-2      | 6.3E+06                            | E | CF 1  | 2.4E+05                            | 3.9E+02                              | NA 3   |
| Dimethylphenol, 2,4-      | 105-67-9     | 7.9E+10                            | E | CF 2  | 3.0E+12                            | 4.7E+02                              | CR 2   |
| Divalent mercury          | 7439-97-6(d) | 6.0E+05                            |   | F 2   | 8.9E+06                            | 1.2E+04                              | CR 2   |
| Ethylbenzene              | 100-41-4     | 1.5E+09                            | E | NA 3  | L                                  |                                      |        |
| Ethylene glycol           | 107-21-1     | 1.1E+12                            | E | CF 2  | 4.3E+06                            | 1.1E+05                              | CR 2   |
| Formaldehyde              | 50-00-0      | 2.6E+07                            | E | CF 1  | 9.3E+05                            | 1.1E+04                              | CR 2   |
| Lead                      | 7439-92-1    | 3.6E+08                            | E | NA 4  | 4.0E+11                            | 8.2E+07                              | E NA 5 |
| Mercury                   | 7439-97-6(e) | 1.6E+05                            |   | NA 3  | 3.9E+08                            | 1.1E+05                              | S NA 3 |
| Methanol                  | 67-56-1      | 2.2E+10                            | E | CF 2  | 2.1E+07                            | 2.6E+04                              | CR 2   |
| Methyl ethyl ketone       | 78-93-3      | 8.9E+08                            | E | NA 3  | 1.5E+05                            | 1.0E+03                              | NA 3   |
| Methyl isobutyl ketone    | 108-10-1     | 1.0E+08                            | E | NA 3  | 7.3E+04                            | 4.2E+01                              | NA 3   |
| Methyl methacrylate       | 80-62-6      | 2.8E+08                            | E | NA 3  | 2.8E+04                            | 1.6E+02                              | NA 3   |
| n-Butyl alcohol           | 71-36-3      | 2.7E+09                            | E | CF 2  | 9.7E+05                            | 5.3E+03                              | CR 2   |
| Nickel                    | 7440-02-0    | 3.6E+07                            | E | NA 3  | 1.3E+08                            | 2.2E+05                              | CR 2   |
| Nickel oxide              | 1313-99-1    | 7.3E+07                            | E | NA 3  | B                                  |                                      |        |
| Pentachlorophenol         | 87-86-5      | 1.4E+08                            | E | CF 1  | 9.6E+04                            | 6.6E+01                              | AR 1   |
| Phenol                    | 108-95-2     | 3.2E+11                            | E | CF 2  | 3.2E+08                            | 3.2E+04                              | CR 2   |
| Selenium                  | 7782-49-2    | 5.0E+07                            | E | CF 2  | 2.5E+04                            | 5.9E+02                              | CR 2   |

(continued)

Table 2-2. (continued)

| Constituent            | CAS No.   | Aboveground                        |       | Groundwater                        |                                      |       |
|------------------------|-----------|------------------------------------|-------|------------------------------------|--------------------------------------|-------|
|                        |           | Target Waste Concentration (mg/kg) | Basis | Target Waste Concentration (mg/kg) | Target Leachate Concentration (mg/L) | Basis |
| Silver                 | 7440-22-4 | 4.2E+06 E                          | CF 2  | 4.4E+08 E                          | 5.5E+05                              | CR 2  |
| Styrene                | 100-42-5  | 2.9E+09 E                          | NA 3  | 1.4E+33 E                          | 4.7E+03 S                            | CR 2  |
| Tetrachloroethylene    | 127-18-4  | 1.9E+07 E                          | CF 1  | 1.4E+04                            | 2.4E+01                              | NA 3  |
| Tin                    | 7440-31-5 | 7.8E+09 E                          | CF 2  | 4.1E+18 E                          | 8.9E+14 E                            | CR 2  |
| Toluene                | 108-88-3  | 2.1E+08 E                          | NA 3  | 3.7E+06 E                          | 1.8E+02                              | NA 3  |
| Vinyl acetate          | 108-05-4  | 1.1E+08 E                          | NA 3  | G                                  |                                      |       |
| Xylene (mixed isomers) | 1330-20-7 | 7.6E+08 E                          | NA 3  | L                                  |                                      |       |
| Zinc                   | 7440-66-6 | 1.1E+08 E                          | CF 2  | 1.8E+10 E                          | 1.6E+07 E                            | CR 2  |

AF = Adult farmer.

AR = Adult resident.

B = Screened out of pathway due to no benchmark.

CF = Child farmer.

CR = Child resident.

E = The concentration exceeded 1 million ppm.

F = Fisher.

G = Screened out of pathway due to zero well concentration.

L = Screened out of pathway since there was no constituent concentration in the leachate.

M = Screened out of pathway since chemical is a nonvolatile metal.

NA = Not applicable to a particular receptor group.

S = The concentration exceeded solubility checks.

1 = Risk.

2 = HQ ingestion.

3 = HQ inhalation.

4 = Soil Screening Level.

5 = Drinking water action level.

**Table 2-3. Summary of 90<sup>th</sup> Percentile Target Waste Concentrations in Surface Impoundment, Wastewater**

| Constituent               | CAS No.      | Aboveground                        |       | Groundwater                        |       |
|---------------------------|--------------|------------------------------------|-------|------------------------------------|-------|
|                           |              | Target Waste Concentration (mg/kg) | Basis | Target Waste Concentration (mg/kg) | Basis |
| Acrylamide                | 79-06-1      | 2.3E+05                            | AF 1  | 1.2E+01                            | AR 1  |
| Acrylonitrile             | 107-13-1     | 1.9E+04                            | CF 1  | 9.3E+00                            | NA 3  |
| Antimony                  | 7440-36-0    | M                                  |       | 3.9E+02                            | CR 2  |
| Barium                    | 7440-39-3    | M                                  |       | 7.2E+06 E                          | CR 2  |
| Benzene                   | 71-43-2      | 1.0E+05                            | CF 1  | 5.6E+02                            | AR 1  |
| Butylbenzylphthalate      | 85-68-7      | 5.3E+11 E                          | F 2   | 5.6E+07 E                          | CR 2  |
| Cadmium                   | 7440-43-9    | M                                  |       | 3.9E+04                            | CR 2  |
| Chloroform                | 67-66-3      | 2.0E+06 E                          | NA 3  | 1.5E+02                            | NA 3  |
| Chromium (III)            | 16065-83-1   | M                                  |       | 9.7E+18 E                          | CR 2  |
| Chromium (VI)             | 18540-29-9   | M                                  |       | 8.8E+03                            | CR 2  |
| Cobalt                    | 7440-48-4    | M                                  |       | 2.4E+08 E                          | CR 2  |
| Copper                    | 7440-50-8    | M                                  |       | 1.3E+07 E                          | NA 5  |
| Cresol, m-                | 108-39-4     | 2.0E+07 E                          | CF 2  | 2.2E+04                            | CR 2  |
| Cresol, o-                | 95-48-7      | 2.3E+08 E                          | CF 2  | 2.5E+04                            | CR 2  |
| Cresol, p-                | 106-44-5     | 1.9E+08 E                          | AF 2  | 2.6E+03                            | CR 2  |
| Di(2-ethylhexylphthalate) | 117-81-7     | 6.3E+08 E                          | AF 1  | 1.3E+08 E                          | CR 1  |
| Dibutylphthalate          | 84-74-2      | 4.4E+09 E                          | CF 2  | 5.8E+07 E                          | CR 2  |
| Dichloromethane           | 75-09-2      | 1.1E+06 E                          | CF 1  | 4.5E+03                            | NA 3  |
| Dimethylphenol, 2,4-      | 105-67-9     | 2.9E+08 E                          | CF 2  | 1.7E+04                            | CR 2  |
| Divalent mercury          | 7439-97-6(d) | 2.5E+04                            | F 2   | 6.4E+05                            | CR 2  |
| Ethylbenzene              | 100-41-4     | 4.7E+07 E                          | NA 3  | 1.1E+04                            | NA 3  |
| Ethylene glycol           | 107-21-1     | 8.3E+07 E                          | NA 3  | 7.9E+05                            | CR 2  |
| Formaldehyde              | 50-00-0      | 1.3E+06 E                          | CF 1  | 8.2E+04                            | CR 2  |
| Lead                      | 7439-92-1    | M                                  |       | 1.3E+10 E                          | NA 5  |
| Mercury                   | 7439-97-6(e) | 5.9E+03                            | NA 3  | 1.4E+06 E                          | NA 3  |
| Methanol                  | 67-56-1      | 1.8E+09 E                          | CF 2  | 2.0E+05                            | CR 2  |
| Methyl ethyl ketone       | 78-93-3      | 1.0E+08 E                          | NA 3  | 8.2E+03                            | NA 3  |
| Methyl isobutyl ketone    | 108-10-1     | 6.8E+06 E                          | NA 3  | 3.4E+02                            | NA 3  |
| Methyl methacrylate       | 80-62-6      | 3.0E+07 E                          | NA 3  | 2.1E+03                            | NA 3  |
| n-Butyl alcohol           | 71-36-3      | 2.5E+08 E                          | CF 2  | 4.1E+04                            | CR 2  |
| Nickel                    | 7440-02-0    | M                                  |       | 1.8E+07 E                          | CR 2  |
| Nickel oxide              | 1313-99-1    | M                                  |       | B                                  |       |
| Pentachlorophenol         | 87-86-5      | 1.1E+07 E                          | CF 1  | 1.0E+04                            | AR 1  |
| Phenol                    | 108-95-2     | 4.9E+09 E                          | CF 2  | 2.7E+05                            | CR 2  |
| Selenium                  | 7782-49-2    | M                                  |       | 6.1E+03                            | CR 2  |
| Silver                    | 7440-22-4    | M                                  |       | 4.0E+07 E                          | CR 2  |
| Styrene                   | 100-42-5     | 4.7E+07 E                          | NA 3  | 4.6E+03                            | NA 3  |

(continued)

Table 2-3. (continued)

| Constituent            | CAS No.   | Aboveground                        |   |       | Groundwater                        |       |
|------------------------|-----------|------------------------------------|---|-------|------------------------------------|-------|
|                        |           | Target Waste Concentration (mg/kg) |   | Basis | Target Waste Concentration (mg/kg) | Basis |
| Tetrachloroethylene    | 127-18-4  | 1.9E+06                            | E | CF 1  | 4.8E+02                            | NA 3  |
| Tin                    | 7440-31-5 |                                    | M |       | 9.1E+15 E                          | CR 2  |
| Toluene                | 108-88-3  | 1.2E+07                            | E | NA 3  | 1.2E+03                            | NA 3  |
| Vinyl acetate          | 108-05-4  | 6.6E+06                            | E | NA 3  | G                                  |       |
| Xylene (mixed isomers) | 1330-20-7 | 1.7E+07                            | E | NA 3  | 3.9E+03                            | NA 3  |
| Zinc                   | 7440-66-6 |                                    | M |       | 2.9E+09 E                          | CR 2  |

AF = Adult farmer.

AR = Adult resident.

B = Screened out of pathway due to no benchmark.

CF = Child farmer.

CR = Child resident.

E = The concentration exceeded 1 million ppm.

F = Fisher.

G = Screened out of pathway due to zero well concentration.

L = Screened out of pathway since there was no constituent concentration in the leachate.

M = Screened out of pathway since chemical is a nonvolatile metal.

NA = Not applicable to a particular receptor group.

S = The concentration exceeded solubility checks.

1 = Risk.

2 = HQ ingestion.

3 = HQ inhalation.

4 = Soil Screening Level.

5 = Drinking water action level.

**Table 2-4. Summary of 90<sup>th</sup> Percentile Target Waste Concentrations  
in Tanks, Wastewater**

| Constituent               | CAS No.      | Aboveground                        |   |       |
|---------------------------|--------------|------------------------------------|---|-------|
|                           |              | Target Waste Concentration (mg/kg) |   | Basis |
| Acrylamide                | 79-06-1      | 3.2E+07                            | E | CF 1  |
| Acrylonitrile             | 107-13-1     | 6.9E+04                            |   | CF 1  |
| Benzene                   | 71-43-2      | 1.9E+05                            |   | CF 1  |
| Butylbenzylphthalate      | 85-68-7      | 1.0E+13                            | E | CF 2  |
| Chloroform                | 67-66-3      | 3.3E+06                            | E | NA 3  |
| Cresol, m-                | 108-39-4     | 1.6E+08                            | E | CF 2  |
| Cresol, o-                | 95-48-7      | 3.4E+09                            | E | CF 2  |
| Cresol, p-                | 106-44-5     | 4.0E+09                            | E | CF 2  |
| Di(2-ethylhexylphthalate) | 117-81-7     | 3.5E+09                            | E | AF 1  |
| Dibutylphthalate          | 84-74-2      | 1.6E+10                            | E | CF 2  |
| Dichloromethane           | 75-09-2      | 2.1E+06                            | E | CF 1  |
| Dimethylphenol, 2,4-      | 105-67-9     | 4.9E+09                            | E | CF 2  |
| Divalent mercury          | 7439-97-6(d) | 1.1E+07                            | E | F 2   |
| Ethylbenzene              | 100-41-4     | 1.0E+08                            | E | NA 3  |
| Ethylene glycol           | 107-21-1     | 2.6E+08                            | E | NA 3  |
| Formaldehyde              | 50-00-0      | 2.5E+07                            | E | CF 1  |
| Mercury                   | 7439-97-6(e) | 1.0E+04                            |   | NA 3  |
| Methanol                  | 67-56-1      | 1.7E+10                            | E | CF 2  |
| Methyl ethyl ketone       | 78-93-3      | 5.6E+08                            | E | NA 3  |
| Methyl isobutyl ketone    | 108-10-1     | 3.0E+07                            | E | NA 3  |
| Methyl methacrylate       | 80-62-6      | 8.5E+07                            | E | NA 3  |
| n-Butyl alcohol           | 71-36-3      | 2.4E+09                            | E | CF 2  |
| Pentachlorophenol         | 87-86-5      | 4.4E+08                            | E | CF 1  |
| Phenol                    | 108-95-2     | 1.3E+11                            | E | CF 2  |
| Styrene                   | 100-42-5     | 1.0E+08                            | E | NA 3  |
| Tetrachloroethylene       | 127-18-4     | 3.5E+06                            | E | CF 1  |
| Toluene                   | 108-88-3     | 2.4E+07                            | E | NA 3  |
| Vinyl acetate             | 108-05-4     | 1.6E+07                            | E | NA 3  |
| Xylene (mixed isomers)    | 1330-20-7    | 3.7E+07                            | E | NA 3  |

|   |                                  |
|---|----------------------------------|
| AF = Adult farmer.  | 1 = Risk.                        |
| AR = Adult resident.  | 2 = HQ ingestion.                |
| B = Screened out of pathway due to no benchmark.  | 3 = HQ inhalation.               |
| CF = Child farmer.  | 4 = Soil Screening Level.        |
| CR = Child resident.  | 5 = Drinking water action level. |
| E = The concentration exceeded 1 million ppm.   |                                  |
| F = Fisher.   |                                  |
| G = Screened out of pathway due to zero well concentration.                               |                                  |
| L = Screened out of pathway since there was no constituent concentration in the leachate. |                                  |
| M = Screened out of pathway since chemical is a nonvolatile metal.                        |                                  |
| NA = Not applicable to a particular receptor group.                                       |                                  |
| S = The concentration exceeded solubility checks.   |                                  |

Table 2-5. Landfill, Combined Solids—Maximum Ecological HQs in Each Medium (90<sup>th</sup> Percentile Media Concentrations)

| Constituent               | CAS No.      | Soil  |                         | Water              |                          | Sediment |                      |
|---------------------------|--------------|-------|-------------------------|--------------------|--------------------------|----------|----------------------|
|                           |              | HQ    | Receptor                | HQ                 | Receptor                 | HQ       | Receptor             |
| Acrylamide                | 79-06-1      | ID    |                         | ID                 |                          | ID       |                      |
| Acrylonitrile             | 10713-1      | <1    | Soil Community          | ID                 |                          | ID       |                      |
| Antimony                  | 7440-36-0    | <1    | Mammal (Coyote)         | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Barium                    | 7440-39-3    | <1    | Bird (Cerulean Warbler) | <1                 | Freshwater Community (T) | <1       | Bird (Green Heron)   |
| Benzene                   | 71-43-2      | <1    | Mammal (Mule Deer)      | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Butylbenzylphthalate      | 85-68-7      | <1    | Mammal (Black Bear)     | <1                 | Mammal (River Otter)     | <1       | Benthic Community    |
| Cadmium                   | 7440-43-9    | <1    | Soil Community          | <1                 | Mammal (Muskrat)         | <1       | Benthic Community    |
| Chloroform                | 67-66-3      | <1    | Mammal (Mule Deer)      | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Chromium (III)            | 16065-83-1   | <1    | Bird (Cerulean Warbler) | <1                 | Bird (Belted Kingfisher) | <1       | Bird (Green Heron)   |
| Chromium (VI)             | 18540-29-9   | <1    | Soil Community          | <1                 | Aquatic Plants           | <1       | Mammal (River Otter) |
| Cobalt                    | 7440-48-4    | <1    | Terrestrial Plants      | <1                 | Freshwater Community (T) | ID       |                      |
| Copper                    | 7440-50-8    | <1    | Mammal (Raccoon)        | <1                 | Aquatic Plants           | <1       | Benthic Community    |
| Cresol, m-                | 108-39-4     | ID    |                         | ID                 |                          | ID       |                      |
| Cresol, o-                | 95-48-7      | ID    |                         | ID                 |                          | ID       |                      |
| Cresol, p-                | 106-44-5     | ID    |                         | ID                 |                          | ID       |                      |
| Di(2-ethylhexylphthalate) | 117-81-7     | <1    | Bird (Cerulean Warbler) | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Dibutylphthalate          | 84-74-2      | <1    | Bird (Cerulean Warbler) | <1                 | Bird (Belted Kingfisher) | <1       | Bird (Green Heron)   |
| Dichloromethane           | 75-09-2      | ID    |                         | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Dimethylphenol, 2,4-      | 105-67-9     | ID    |                         | ID                 |                          | ID       |                      |
| Divalent mercury          | 7439-97-6(d) | <1    | Bird (Cerulean Warbler) | 9E+01 <sub>a</sub> | Bird (Osprey)            | <1       | Benthic Community    |
| Ethylbenzene              | 100-41-4     | <1    | Soil Community          | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Ethylene glycol           | 107-21-1     | <1    | Soil Community          | ID                 |                          | ID       |                      |
| Formaldehyde              | 50-00-0      | ID    |                         | ID                 |                          | ID       |                      |
| Lead                      | 7439-92-1    | 2E+00 | Mammal (Mink)           | <1                 | Mammal (River Otter)     | <1       | Mammal (River Otter) |
| Mercury                   | 7439-97-6(e) | <1    | Soil Community          | ID                 |                          | ID       |                      |

(continued)

Table 2-5. (continued)

| Constituent            | CAS No.   | Soil |                         | Water |                          | Sediment |                      |
|------------------------|-----------|------|-------------------------|-------|--------------------------|----------|----------------------|
|                        |           | HQ   | Receptor                | HQ    | Receptor                 | HQ       | Receptor             |
| Methanol               | 67-56-1   | ID   |                         | ID    |                          | ID       |                      |
| Methyl ethyl ketone    | 78-93-3   | <1   | Mammal (Mule Deer)      | <1    | Mammal (River Otter)     | <1       | Mammal (River Otter) |
| Methyl isobutyl ketone | 108-10-1  | ID   |                         | ID    |                          | ID       |                      |
| Methyl methacrylate    | 80-62-6   | ID   |                         | ID    |                          | ID       |                      |
| n-Butyl alcohol        | 71-36-3   | ID   |                         | ID    |                          | ID       |                      |
| Nickel                 | 7440-02-0 | <1   | Terrestrial Plants      | <1    | Aquatic Plants           | <1       | Benthic Community    |
| Pentachlorophenol      | 87-86-5   | <1   | Terrestrial Plants      | <1    | Freshwater Community (T) | <1       | Benthic Community    |
| Phenol                 | 108-95-2  | <1   | Soil Community          | <1    | Freshwater Community (T) | <1       | Benthic Community    |
| Selenium               | 7782-49-2 | <1   | Mammal (Mink)           | <1    | Mammal (River Otter)     | <1       | Mammal (River Otter) |
| Silver                 | 7440-22-4 | <1   | Terrestrial Plants      | <1    | Freshwater Community (T) | <1       | Benthic Community    |
| Styrene                | 100-42-5  | <1   | Terrestrial Plants      | ID    |                          | ID       |                      |
| Tetrachloroethylene    | 127-18-4  | <1   | Soil Community          | <1    | Freshwater Community (T) | <1       | Benthic Community    |
| Tin                    | 7440-31-5 | <1   | Terrestrial Plants      | <1    | Freshwater Community (T) | ID       |                      |
| Toluene                | 108-88-3  | <1   | Soil Community          | <1    | Mammal (Beaver)          | <1       | Benthic Community    |
| Vinyl acetate          | 108-05-4  | ID   |                         | <1    | Freshwater Community (T) | <1       | Benthic Community    |
| Xylene (mixed isomers) | 1330-20-7 | <1   | Soil Community          | <1    | Freshwater Community (T) | <1       | Benthic Community    |
| Zinc                   | 7440-66-6 | <1   | Bird (Cerulean Warbler) | <1    | Aquatic Plants           | <1       | Benthic Community    |

ID = Insufficient data.

T = Total.

<sup>a</sup>Number is based on the transformation of divalent mercury to methylmercury in the waterbody.



Table 2-6. Landfill, Emission Control Dust—Maximum Ecological HQs in Each Medium (90<sup>th</sup> Percentile Media Concentrations)

| Constituent               | CAS          | Soil  |                         | Water              |                          | Sediment |                      |
|---------------------------|--------------|-------|-------------------------|--------------------|--------------------------|----------|----------------------|
|                           |              | HQ    | Receptor                | HQ                 | Receptor                 | HQ       | Receptor             |
| Acrylamide                | 79-06-1      | ID    |                         | ID                 |                          | ID       |                      |
| Acrylonitrile             | 10713-1      | <1    | Soil Community          | ID                 |                          | ID       |                      |
| Antimony                  | 7440-36-0    | <1    | Mammal (Coyote)         | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Barium                    | 7440-39-3    | <1    | Bird (Cerulean Warbler) | <1                 | Freshwater Community (T) | <1       | Bird (Green Heron)   |
| Benzene                   | 71-43-2      | <1    | Mammal (Mule Deer)      | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Butylbenzylphthalate      | 85-68-7      | <1    | Mammal (Black Bear)     | <1                 | Mammal (River Otter)     | <1       | Benthic Community    |
| Cadmium                   | 7440-43-9    | <1    | Soil Community          | <1                 | Mammal (Muskrat)         | <1       | Benthic Community    |
| Chloroform                | 67-66-3      | <1    | Mammal (Mule Deer)      | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Chromium (III)            | 16065-83-1   | <1    | Bird (Cerulean Warbler) | <1                 | Bird (Belted Kingfisher) | <1       | Bird (Green Heron)   |
| Chromium (VI)             | 18540-29-9   | <1    | Soil Community          | <1                 | Aquatic Plants           | <1       | Mammal (River Otter) |
| Cobalt                    | 7440-48-4    | <1    | Terrestrial Plants      | <1                 | Freshwater Community (T) | ID       |                      |
| Copper                    | 7440-50-8    | <1    | Mammal (Raccoon)        | <1                 | Aquatic Plants           | <1       | Benthic Community    |
| Cresol, m-                | 108-39-4     | ID    |                         | ID                 |                          | ID       |                      |
| Cresol, o-                | 95-48-7      | ID    |                         | ID                 |                          | ID       |                      |
| Cresol, p-                | 106-44-5     | ID    |                         | ID                 |                          | ID       |                      |
| Di(2-ethylhexylphthalate) | 117-81-7     | <1    | Bird (Cerulean Warbler) | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Dibutylphthalate          | 84-74-2      | <1    | Bird (Cerulean Warbler) | <1                 | Bird (Belted Kingfisher) | <1       | Bird (Green Heron)   |
| Dichloromethane           | 75-09-2      | ID    |                         | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Dimethylphenol, 2,4-      | 105-67-9     | ID    |                         | ID                 |                          | ID       |                      |
| Divalent mercury          | 7439-97-6(d) | <1    | Bird (Cerulean Warbler) | 1E+02 <sup>a</sup> | Bird (Osprey)            | <1       | Benthic Community    |
| Ethylbenzene              | 100-41-4     | <1    | Soil Community          | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Ethylene glycol           | 107-21-1     | <1    | Soil Community          | ID                 |                          | ID       |                      |
| Formaldehyde              | 50-00-0      | ID    |                         | ID                 |                          | ID       |                      |
| Lead                      | 7439-92-1    | 3E+00 | Mammal (Mink)           | <1                 | Mammal (River Otter)     | <1       | Mammal (River Otter) |
| Mercury                   | 7439-97-6(e) | <1    | Soil Community          | ID                 |                          | ID       |                      |

(continued)

Table 2-6. (continued)

| Constituent            | CAS       | Soil |                         | Water |                          | Sediment |                      |
|------------------------|-----------|------|-------------------------|-------|--------------------------|----------|----------------------|
|                        |           | HQ   | Receptor                | HQ    | Receptor                 | HQ       | Receptor             |
| Methanol               | 67-56-1   | ID   |                         | ID    |                          | ID       |                      |
| Methyl ethyl ketone    | 78-93-3   | <1   | Mammal (Mule Deer)      | <1    | Mammal (River Otter)     | <1       | Mammal (River Otter) |
| Methyl isobutyl ketone | 108-10-1  | ID   |                         | ID    |                          | ID       |                      |
| Methyl methacrylate    | 80-62-6   | ID   |                         | ID    |                          | ID       |                      |
| n-Butyl alcohol        | 71-36-3   | ID   |                         | ID    |                          | ID       |                      |
| Nickel                 | 7440-02-0 | <1   | Terrestrial Plants      | <1    | Aquatic Plants           | <1       | Benthic Community    |
| Pentachlorophenol      | 87-86-5   | <1   | Terrestrial Plants      | <1    | Freshwater Community (T) | <1       | Benthic Community    |
| Phenol                 | 108-95-2  | <1   | Soil Community          | <1    | Freshwater Community (T) | <1       | Benthic Community    |
| Selenium               | 7782-49-2 | <1   | Mammal (Mink)           | <1    | Mammal (River Otter)     | <1       | Mammal (River Otter) |
| Silver                 | 7440-22-4 | <1   | Terrestrial Plants      | <1    | Freshwater Community (T) | <1       | Benthic Community    |
| Styrene                | 100-42-5  | <1   | Terrestrial Plants      | ID    |                          | ID       |                      |
| Tetrachloroethylene    | 127-18-4  | <1   | Soil Community          | <1    | Freshwater Community (T) | <1       | Benthic Community    |
| Tin                    | 7440-31-5 | <1   | Terrestrial Plants      | <1    | Freshwater Community (T) | ID       |                      |
| Toluene                | 108-88-3  | <1   | Soil Community          | <1    | Mammal (Beaver)          | <1       | Benthic Community    |
| Vinyl acetate          | 108-05-4  | ID   |                         | <1    | Freshwater Community (T) | <1       | Benthic Community    |
| Xylene (mixed isomers) | 1330-20-7 | <1   | Soil Community          | <1    | Freshwater Community (T) | <1       | Benthic Community    |
| Zinc                   | 7440-66-6 | <1   | Bird (Cerulean Warbler) | <1    | Aquatic Plants           | <1       | Benthic Community    |

ID = Insufficient data.

T = Total.

<sup>a</sup> Number is based on the transformation of divalent mercury to methylmercury in the waterbody.

**Table 2-7. Surface Impoundment, Wastewater—Maximum Ecological HQs in Each Medium (90<sup>th</sup> Percentile Media Concentrations)**

| Constituent               | CAS          | Soil |                         | Water              |                          | Sediment |                      |
|---------------------------|--------------|------|-------------------------|--------------------|--------------------------|----------|----------------------|
|                           |              | HQ   | Receptor                | HQ                 | Receptor                 | HQ       | Receptor             |
| Acrylamide                | 79-06-1      | ID   |                         | ID                 |                          | ID       |                      |
| Acrylonitrile             | 107-13-1     | <1   | Soil Community          | ID                 |                          | ID       |                      |
| Benzene                   | 71-43-2      | <1   | Mammal (Mule Deer)      | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Butylbenzylphthalate      | 85-68-7      | <1   | Mammal (Black Bear)     | <1                 | Mammal (River Otter)     | <1       | Benthic Community    |
| Chloroform                | 67-66-3      | <1   | Mammal (Mule Deer)      | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Cresol, m-                | 108-39-4     | ID   |                         | ID                 |                          | ID       |                      |
| Cresol, o-                | 95-48-7      | ID   |                         | ID                 |                          | ID       |                      |
| Cresol, p-                | 106-44-5     | ID   |                         | ID                 |                          | ID       |                      |
| Di(2-ethylhexylphthalate) | 117-81-7     | <1   | Bird (Cerulean Warbler) | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Dibutylphthalate          | 84-74-2      | <1   | Bird (Cerulean Warbler) | <1                 | Bird (Belted Kingfisher) | <1       | Bird (Green Heron)   |
| Dichloromethane           | 75-09-2      | ID   |                         | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Dimethylphenol, 2,4-      | 105-67-9     | ID   |                         | ID                 |                          | ID       |                      |
| Divalent mercury          | 7439-97-6(d) | <1   | Bird (Cerulean Warbler) | 2E+00 <sup>b</sup> | Bird (Osprey)            | <1       | Benthic Community    |
| Ethylbenzene              | 100-41-4     | <1   | Soil Community          | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Ethylene glycol           | 10-72-11     | <1   | Soil Community          | ID                 |                          | ID       |                      |
| Formaldehyde              | 50-00-0      | ID   |                         | ID                 |                          | ID       |                      |
| Mercury                   | 7439-97-6(e) | <1   | Soil Community          | ID                 |                          | ID       |                      |
| Methanol                  | 67-56-1      | ID   |                         | ID                 |                          | ID       |                      |
| Methyl ethyl ketone       | 78-93-3      | <1   | Mammal (Mule Deer)      | <1                 | Mammal (River Otter)     | <1       | Mammal (River Otter) |
| Methyl isobutyl ketone    | 108-10-1     | ID   |                         | ID                 |                          | ID       |                      |
| Methyl methacrylate       | 80-62-6      | ID   |                         | ID                 |                          | ID       |                      |
| n-Butyl alcohol           | 71-36-3      | ID   |                         | ID                 |                          | ID       |                      |
| Pentachlorophenol         | 87-86-5      | <1   | Terrestrial Plants      | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Phenol                    | 108-95-2     | <1   | Soil Community          | <1                 | Freshwater Community (T) | <1       | Benthic Community    |
| Styrene                   | 100-42-5     | <1   | Terrestrial Plants      | ID                 |                          | ID       |                      |

(continued)

Table 2-7. (continued)

| Constituent            | CAS       | Soil |                | Water |                          | Sediment |                   |
|------------------------|-----------|------|----------------|-------|--------------------------|----------|-------------------|
|                        |           | HQ   | Receptor       | HQ    | Receptor                 | HQ       | Receptor          |
| Tetrachloroethylene    | 127-18-4  | <1   | Soil Community | <1    | Freshwater Community (T) | <1       | Benthic Community |
| Toluene                | 108-88-3  | <1   | Soil Community | <1    | Mammal (Beaver)          | <1       | Benthic Community |
| Vinyl acetate          | 108-05-4  | ID   |                | <1    | Freshwater Community (T) | <1       | Benthic Community |
| Xylene (mixed isomers) | 1330-20-7 | <1   | Soil Community | <1    | Freshwater Community (T) | <1       | Benthic Community |

ID = Insufficient data.

T = Total.

<sup>a</sup>Number is based on the transformation of divalent mercury to methylmercury in the waterbody.

Table 2-8. Treatment Tanks, Wastewater—Maximum Ecological HQs in Each Medium  
(90<sup>th</sup> Percentile Media Concentrations)

| Constituent               | CAS          | Soil |                         | Water           |                          | Sediment |                      |
|---------------------------|--------------|------|-------------------------|-----------------|--------------------------|----------|----------------------|
|                           |              | HQ   | Receptor                | HQ              | Receptor                 | HQ       | Receptor             |
| Acrylamide                | 79-06-1      | ID   |                         | ID              |                          | ID       |                      |
| Acrylonitrile             | 107-13-1     | <1   | Soil Community          | ID              |                          | ID       |                      |
| Benzene                   | 71-43-2      | <1   | Mammal (Mule Deer)      | <1              | Freshwater Community (T) | <1       | Benthic Community    |
| Butylbenzylphthalate      | 85-68-7      | <1   | Mammal (Black Bear)     | <1              | Mammal (River Otter)     | <1       | Benthic Community    |
| Chloroform                | 67-66-3      | <1   | Mammal (Mule Deer)      | <1              | Freshwater Community (T) | <1       | Benthic Community    |
| Cresol, m-                | 108-39-4     | ID   |                         | ID              |                          | ID       |                      |
| Cresol, o-                | 95-48-7      | ID   |                         | ID              |                          | ID       |                      |
| Cresol, p-                | 106-44-5     | ID   |                         | ID              |                          | ID       |                      |
| Di(2-ethylhexylphthalate) | 117-81-7     | <1   | Bird (Cerulean Warbler) | <1              | Freshwater Community (T) | <1       | Benthic Community    |
| Dibutylphthalate          | 84-74-2      | <1   | Bird (Cerulean Warbler) | <1              | Bird (Belted Kingfisher) | <1       | Bird (Green Heron)   |
| Dichloromethane           | 75-09-2      | ID   |                         | <1              | Freshwater Community (T) | <1       | Benthic Community    |
| Dimethylphenol, 2,4-      | 105-67-9     | ID   |                         | ID              |                          | ID       |                      |
| Divalent mercury          | 7439-97-6(d) | <1   | Bird (Cerulean Warbler) | <1 <sup>a</sup> | Bird (Osprey)            | <1       | Benthic Community    |
| Ethylbenzene              | 100-41-4     | <1   | Soil Community          | <1              | Freshwater Community (T) | <1       | Benthic Community    |
| Ethylene glycol           | 107-21-1     | <1   | Soil Community          | ID              |                          | ID       |                      |
| Formaldehyde              | 50-00-0      | ID   |                         | ID              |                          | ID       |                      |
| Mercury                   | 7439-97-6(e) | <1   | Soil Community          | ID              |                          | ID       |                      |
| Methanol                  | 67-56-1      | ID   |                         | ID              |                          | ID       |                      |
| Methyl ethyl ketone       | 78-93-3      | <1   | Mammal (Mule Deer)      | <1              | Mammal (River Otter)     | <1       | Mammal (River Otter) |
| Methyl isobutyl ketone    | 108-10-1     | ID   |                         | ID              |                          | ID       |                      |
| Methyl mercury            | 22967-92-6   | NA   |                         | <1              | Bird (Osprey)            | NA       |                      |
| Methyl methacrylate       | 80-62-6      | ID   |                         | ID              |                          | ID       |                      |
| n-Butyl alcohol           | 71-36-3      | ID   |                         | ID              |                          | ID       |                      |
| Pentachlorophenol         | 87-86-5      | <1   | Terrestrial Plants      | <1              | Freshwater Community (T) | <1       | Benthic Community    |
| Phenol                    | 108-95-2     | <1   | Soil Community          | <1              | Freshwater Community (T) | <1       | Benthic Community    |

(continued)

Table 2-8. (continued)

| Constituent            | CAS       | Soil |                    | Water |                          | Sediment |                   |
|------------------------|-----------|------|--------------------|-------|--------------------------|----------|-------------------|
|                        |           | HQ   | Receptor           | HQ    | Receptor                 | HQ       | Receptor          |
| Styrene                | 100-42-5  | <1   | Terrestrial Plants | ID    | ID                       | ID       |                   |
| Tetrachloroethylene    | 127-18-4  | <1   | Soil Community     | <1    | Freshwater Community (T) | <1       | Benthic Community |
| Toluene                | 108-88-3  | <1   | Soil Community     | <1    | Mammal (Beaver)          | <1       | Benthic Community |
| Vinyl acetate          | 108-05-4  | ID   |                    | <1    | Freshwater Community (T) | <1       | Benthic Community |
| Xylene (mixed isomers) | 1330-20-7 | <1   | Soil Community     | <1    | Freshwater Community (T) | <1       | Benthic Community |

ID = Insufficient data.

T = Total.

<sup>a</sup>Number is based on the transformation of divalent mercury to methylmercury in the waterbody.

