Appendix B

Sample Reports From Tier 1 and Tier 2

Tier 1 Evaluation Results

Recommendation : **Composite Liner**

Facility Type	Landfill
Facility name	Southern Industries Landfill
Street address	122 Industrial Ave
City	Raleigh
State	NC
Zip	27611
Date of sample analysis	October 31, 1998
Name of user	
Additional information	

List of Constituents Selected by the User

CAS Number	Constituent Name	Leachate Conc. (mg/L)
71-43-2	Benzene	0.01
7440-36-0	Antimony	0.03
75-09-2	Methylene Chloride (Dichloromethane)	0.02

Minimum Liner Recommendation Based on MCL

CAS Number	Constituent Name	Minimum Liner Recommendation
71-43-2	Benzene	No Liner
7440-36-0	Antimony	Single Liner
75-09-2	Methylene Chloride (Dichloromethane)	Single Liner

Minimum Liner Recommendation Based on HBN

CAS Number	Constituent Name	Minimum Liner Recommendation
71-43-2	Benzene	Composite Liner
7440-36-0	Antimony	Single Liner
75-09-2	Methylene Chloride (Dichloromethane)	No Liner

In the following tables, the LCTV is generally calculated as LCTV = DAF * RGC. However, in some instances, the DAF is denoted here with an asterisk (*). This occurs when the ground-water concentration is either exceedingly low, thus capping the LCTV, or the LCTV is capped by some other constraint. In instances where the toxic daughter cap is applied, the RGC is either absent or denoted by an asterisk. Please refer to Section 7.2 of the IWEM User's Guide (Limits on the Leachate Concentration Threshold Value) for more details. A brief explanation of LCTV caps is given in this report after the detailed HBN results.

Detailed Results Based on MCL - No Liner

CAS Number	Constituent Name	MCL (mg/L)	DAF	LCTV (mg/L)	Leachate Conc. (mg/L)	Protective ?
71-43-2	Benzene	0.005	2.2	0.011	0.01	Yes
7440-36-0	Antimony	0.006		0.014	0.03	No
75-09-2	Methylene Chloride (Dichloromethane)	0.005	2.2	0.011	0.02	No

Detailed Results Based on MCL - Single Liner

CAS Number	Constituent Name	MCL (mg/L)	DAF	LCTV (mg/L)	Leachate Conc. (mg/L)	Protective ?
71-43-2	Benzene	0.005	6.1	0.031	0.01	Yes
7440-36-0	Antimony	0.006		0.04	0.03	Yes
75-09-2	Methylene Chloride (Dichloromethane)	0.005	6.2	0.031	0.02	Yes

Detailed Results Based on MCL - Composite Liner

CAS Number	Constituent Name	MCL (mg/L)	DAF	LCTV (mg/L)	Leachate Conc. (mg/L)	Protective?
71-43-2	Benzene	0.005	1.90E+04	0.5 (A)	0.01	Yes
7440-36-0	Antimony	0.006		1000 (B)	0.03	Yes
75-09-2	Methylene Chloride (Dichloromethane)	0.005	6.20E+05	1000 (B)	0.02	Yes

Detailed Results Based on HBN - No Liner

CAS Number	Constituent Name	HBN (mg/L)	Exposure Pathway & Effect	DAF	LCTV (mg/L)	Leachate Conc . (mg/L)	Protective?
71-43-2	Benzene	0.0016	Inhalation Cancer	2.2	0.0036	0.01	No
7440-36-0	Antimony	0.0098	Ingestion Non-cancer		0.023	0.03	No
75-09-2	Methylene Chloride (Dichloromethane)	0.013	Ingestion Cancer	2.2	0.029	0.02	Yes

Detailed Results Based on HBN - Single Liner

CAS Number	Constituent Name	HBN (mg/L)	Exposure Pathway & Effect	DAF	LCTV (mg/L)	Leachate Conc. (mg/L)	Protective ?
71-43-2	Benzene	0.0016	Inhalation Cancer	6.1	0.0097	0.01	No
7440-36-0	Antimony	0.0098	Ingestion Non-cancer		0.068	0.03	Yes
75-09-2	Methylene Chloride (Dichloromethane)	0.013	Ingestion Cancer	6.2	0.081	0.02	Yes

Detailed Results Based on HBN - Composite Liner

CAS Number	Constituent Name	HBN (mg/L)	Exposure Pathway & Effect	DAF	LCTV (mg/L)	Leachate Conc. (mg/L)	Protective?
71-43-2	Benzene	0.0016	Inhalation Cancer	1.90E+04	0.5 (A)	0.01	Yes
7440-36-0	Antimony	0.0098	Ingestion Non-cancer		1000 (B)	0.03	Yes
75-09-2	Methylene Chloride (Dichloromethane)	0.013	Ingestion Cancer	6.30E+05	1000 (B)	0.02	Yes

CAPS & WARNINGS

A - The LCTV is capped by the Toxicity Characteristic Rule Exit Level (TC LEVEL) of the constituent.

B - The LCTV is capped by 1000 mg/L (EPA Policy).

C - The LCTV exceeds the cited solubility for this constituent.

D - The parent constituent LCTV is derived from the LCTV of a more conservative toxic daughter product(s).

E - The parent constituent does not have a RGC for this exposure pathway and effect, but the toxic daughter product(s) does. The LCTV of the parent is derived from the LCTV of the toxic daughter product.

Constituent Name	CAS ID
Benzene	71-43-2

Physical Properties

Property	Value	Data Source
Constituent Type	Organic	
Molecule Weight (g/mol)	78.1134	
Log Koc (distribution coefficient for organic carbon) (mL/g)	1.8	USEPA, 1993a
Ka: acid-catalyzed hydrolysis rate constant (1/mol yr)	0	USEPA, 1993a
Kn: neutral hydrolysis rate constant (1/yr)	0	USEPA, 1993a
Kb: base-catalyzed hydrolysis rate constant (1/mol yr)	0	USEPA, 1993a
Solubility (mg/L)	1750	USEPA, 1997c
Diffusivity in air (cm^2/sec)	282	Calc., based on USEPA, 2001a
Diffusivity in water (m^2/yr)	0.0325	Calc., based on USEPA, 2001a
Henry's law constant (atm-m^3/mol)	0.0056	USEPA, 1997c

Reference Ground-water Concentration Values

Property	Value	Data Source
Maximum Contamination Level (mg/L)	0.005	USEPA, 2000h
HBN-Ingestion, Non-Cancer (mg/L)		
HBN-Ingestion, Cancer (mg/L)	0.0018	USEPA, 2001b
HBN-Inhalation, Non-Cancer (mg/L)	0.19	CALEPA, 1999b
HBN-Inhalation, Cancer (mg/L)	0.0016	USEPA, 2001b
Reference Dose (mg/kg-day)		
Reference Concentration (mg/m^3)	0.06	CALEPA, 2000
Carcinogenic Slope Factor-Oral (1/mg/kg-day)	0.055	USEPA, 2001b
Carcinogenic Slope Factor-Inhalation (1/mg/kg-day)	0.027	Calc, based on USEPA, 2001b

Constituent Name	CAS ID
Antimony	7440-36-0

Physical Properties

Property	Value	Data Source
Constituent Type	Metal	
Molecule Weight (g/mol)	121.76	
Log Koc (distribution coefficient for organic carbon) (mL/g)		
Ka: acid-catalyzed hydrolysis rate constant (1/mol yr)		
Kn: neutral hydrolysis rate constant (1/yr)		
Kb: base-catalyzed hydrolysis rate constant (1/mol yr)		
Solubility (mg/L)	1.00E+06	CambridgeSoft Corporation, 2001
Diffusivity in air (cm^2/sec)		
Diffusivity in water (m^2/yr)		
Henry's law constant (atm-m^3/mol)		

Reference Ground-water Concentration Values

Property	Value	Data Source
Maximum Contamination Level (mg/L)	0.006	USEPA, 2000h
HBN-Ingestion, Non-Cancer (mg/L)	0.0098	USEPA, 2001b
HBN-Ingestion, Cancer (mg/L)		
HBN-Inhalation, Non-Cancer (mg/L)		
HBN-Inhalation, Cancer (mg/L)		
Reference Dose (mg/kg-day)	0.0004	USEPA, 2001b
Reference Concentration (mg/m^3)		
Carcinogenic Slope Factor-Oral (1/mg/kg-day)		
Carcinogenic Slope Factor-Inhalation (1/mg/kg-day)		

Constituent Name	CAS ID
Methylene Chloride (Dichloromethane)	75-09-2

Physical Properties

Property	Value	Data Source
Constituent Type	Organic	
Molecule Weight (g/mol)	84.9328	
Log Koc (distribution coefficient for organic carbon) (mL/g)	0.93	USEPA, 1993a
Ka: acid-catalyzed hydrolysis rate constant (1/mol yr)	0	USEPA, 1993a
Kn: neutral hydrolysis rate constant (1/yr)	0.001	USEPA, 1993a
Kb: base-catalyzed hydrolysis rate constant (1/mol yr)	0.6	USEPA, 1993a
Solubility (mg/L)	1.30E+04	USEPA, 1997c
Diffusivity in air (cm^2/sec)	315	Calc., based on USEPA, 2001a
Diffusivity in water (m^2/yr)	0.0394	Calc., based on USEPA, 2001a
Henry's law constant (atm-m^3/mol)	0.0022	USEPA, 1997c

Reference Ground-water Concentration Values

Property	Value	Data Source
Maximum Contamination Level (mg/L)	0.005	USEPA, 2000h
HBN-Ingestion, Non-Cancer (mg/L)	1.5	USEPA, 2001b
HBN-Ingestion, Cancer (mg/L)	0.013	USEPA, 2001b
HBN-Inhalation, Non-Cancer (mg/L)	10	USEPA, 1997a
HBN-Inhalation, Cancer (mg/L)	0.028	USEPA, 2001b
Reference Dose (mg/kg-day)	0.06	USEPA, 2001b
Reference Concentration (mg/m^3)	3	USEPA, 1997a
Carcinogenic Slope Factor-Oral (1/mg/kg-day)	0.0075	USEPA, 2001b
Carcinogenic Slope Factor-Inhalation (1/mg/kg-day)	0.0016	Calc, based on USEPA, 2001b

References

CalEPA. 1999b. Air Toxics Hot Spots Program Risk Assessment Guidelines: Part III. Technical Support Document for the Determination of Noncancer Chronic Reference Exposure Levels. SRP Draft. Office of Environmental Health Hazard Assessment, Berkeley, CA. http://www.oehha.org/hotspots/RAGSII.html.

CalEPA. 2000. Air Toxics Hot Spots Program Risk Assessment Guidelines: Part III. Technical Support Document for the Determination of Noncancer Chronic Reference Exposure Levels. Office of Environmental Health Hazard Assessment, Berkeley, CA. Available online (in 3 sections) at http://www.oehha.org/air/chronic_rels/22RELS2k.html, http://www.oehha.org/air/chronic_rels/42kChREL.html, http://www.oehha.org/air/chronic_rels/Jan2001ChREL.html.

CambridgeSoft Corporation. 2001. ChemFinder.com database and internet searching. http://chemfinder.cambridgesoft.com. Accessed July 2001.

USEPA. 1993a. Environmental Fate Constants for Orgainic Chemicals Under Consideration for EPA's Hazardous Waste Identification Projects, EPA/600/R-93/132, August 1993.

USEPA. 1997a. Health Effects Assessment Summary Tables (HEAST). EPA-540-R-97-036. FY 1997 Update. Office of Solid Waste and Emergency Response, Washington, DC.

USEPA. 1997c. Superfund Chemical Data Matrix (SCDM). SCDMWIN 1.0 (SCDM Windows User's Version), Version 1. Office of Solid Waste and Emergency Response, Washington DC: GPO. http://www.epa.gov/superfund/resources/scdm/index.htm. Accessed July 2001

USEPA. 2000h. Code of Federal Regulations, National Primary Drinking Water Regulations, CFR 40, Part 141, Section 32. www.epa.gov/safewater/regs/cfr141.pdf.

USEPA. 2001a. WATER9. Office of Air Quality Planning and Standards, Research Triangle Park, NC. http://www.epa.gov/ttn/chief/software/water/index.html. Accessed July 2001.

USEPA. 2001b. Integrated Risk Information System (IRIS). National Center for Environmental Assessment, Office of Research and Development, Washington, DC. http://www.epa.gov/iris/

Calculated from inhalation unit risk factors from USEPA, 2001b.

Tier 2 Evaluation Results

Recommendation: **Composite Liner**

Facility Type	Landfill
Facility name	
Street address	
City	
State	
Zip	
Date of sample analysis	
Name of user	
Additional information	

Landfill Parameters

Parameter	Value	Data Source
Depth of base of the LF below ground surface (m)	0	Default
Distance to well (m)	150	Default
Landfill area (m^2) [requires site specific value]	1.23E+04	132
WMU depth (m) [requires site specific value]	6.5	zxc

Subsurface Parameters

Subsurface Environment **Sand and Gravel**

Parameter	Value	Data Source
Ground-water pH value (metals only)	Distribution	Monte Carlo [See IWEM TBD 4.2.3.1]
Depth to water table (m)	Distribution	Monte Carlo [See IWEM TBD 4.2.3.1]
Aquifer hydraulic conductivity (m/yr)	Distribution	Monte Carlo [See IWEM TBD 4.2.3.1]
Regional hydraulic gradient	Distribution	Monte Carlo [See IWEM TBD 4.2.3.1]
Aquifer thickness (m)	Distribution	Monte Carlo [See IWEM TBD 4.2.3.1]

Regional Soil and Climate Parameters

Parameter	Value
Soil Type	Medium-grained soil (silt loam)
Climate Center	Greensboro NC
No Liner Infiltration Rate (m/yr)	.3256
Clay Liner Infiltration Rate (m/yr)	.0362
Composite Liner Infiltration Rate (m/yr)	Monte Carlo
Recharge Rate (m/yr)	0.3256

Constituent Reference Ground-water Concentrations and Constituent Properties

Constituent Name	RGC (mg/L)	RGC Based On	Kd* (L/kg)	Decay Coeff* (1/yr)	Leachate Conc. (mg/L)
Acrylonitrile	0.0002	HBN - Ingestion, Cancer			0.1

*If a site-specific value was entered by the user, it will be displayed here; otherwise, the model used the constituent properties listed at the end of the report.

Daughter Constituent Reference Ground-water Concentrations and Constituent Properties

Parent Constituent	Daughter Constituent	RGC (mg/L)	RGC Based On	Kd* (L/kg)	Decay Coeff.* (1/yr)
Acrylonitrile	Acrylamide	2.20E-05	HBN - Ingestion, Cancer		
Acrylonitrile	Acrylic acid [propenoic acid]	12	HBN - Ingestion, NonCancer		

*If a site-specific value was entered by the user, it will be displayed here; otherwise, the model used the constituent properties listed at the end of the report.

Detailed Results for Parent Constituents -- No Liner

Constituent Name	Leachate Conc. (mg/L)	DAF (mg/L)	LCTV (mg/L)	Selected RGC	RGC (mg/L)	90th %tile Exp. Conc. (mg/L)	Protective?
Acrylonitrile	0.1	2.4	4.11E-05 (D)	HBN - Ingestion, Cancer	2.20E-05	0.0413	No

Detailed Results for Parent Constituents -- Clay Liner

Constituent Name	Leachate Conc. (mg/L)	DAF (mg/L)	LCTV (mg/L)	Selected RGC	RGC (mg/L)	90th %tile Exp. Conc. (mg/L)	Protective?
Acrylonitrile	0.1	13	0.0003 (D)	HBN - Ingestion, Cancer	2.20E-05	0.0075	No

Detailed Results for Parent Constituents -- Composite Liner

Constituent Name	Leachate Conc. (mg/L)	DAF (mg/L)	LCTV (mg/L)	Selected RGC	RGC (mg/L)	90th %tile Exp. Conc. (mg/L)	Protective?
Acrylonitrile	0.1	2.40E+04	4.32	HBN - Ingestion, Cancer	2.20E-05	4.10E-06	Yes

Detailed Results for Daughter Constituents -- No Liner

Constituent Name	Leachate Conc. (mg/L)	DAF (mg/L)	LCTV (mg/L)	Selected RGC	RGC (mg/L)	90th %tile Exp. Conc. (mg/L)	Protective?
Acrylamide	0.134	2.5	5.50E-05	HBN - Ingestion, Cancer	2.20E-05	0.0539	No
Acrylic acid [propenoic acid]	0.1358	2.4	28.8	HBN - Ingestion, NonCancer	12	0.0562	Yes

Detailed Results for Daughter Constituents -- Clay Liner

Constituent Name	Leachate Conc. (mg/L)	DAF (mg/L)	LCTV (mg/L)	Selected RGC	RGC (mg/L)	90th %tile Exp. Conc. (mg/L)	Protective?
Acrylamide	0.134	17	0.0004	HBN - Ingestion, Cancer	2.20E-05	0.008	No
Acrylic acid [propenoic acid]	0.1358	NA	NA	All Available		NA	See No Liner

Detailed Results for Daughter Constituents -- Composite Liner

Constituent Name	Leachate Conc. (mg/L)	DAF (mg/L)	LCTV (mg/L)	Selected RGC	RGC (mg/L)	90th %tile Exp. Conc. (mg/L)	Protective?
Acrylamide	0.134	1.00E+30	1000	HBN - Ingestion, Cancer	2.20E-05	0	Yes
Acrylic acid [propenoic acid]	0.1358	NA	NA	All Available		NA	See No Liner

CAPS & WARNINGS

A - The LCTV is capped by the Toxicity Characteristic Rule Exit Level (TC LEVEL) of the constituent.

B - The LCTV is capped by 1000 mg/L (EPA Policy).

C - The LCTV exceeds the cited solubility for this constituent.

D - The parent constituent LCTV is derived from the LCTV of a more conservative toxic daughter product(s).

Constituent Name	CAS ID
Acrylonitrile	107-13-1

Physical Properties

Property	Value	Data Source
ChemicalType	Organic	
Molecule Weight (g/mol)	53.0634	
Log Koc (distribution coefficient for organic carbon) (mL/g)	-0.089	USEPA, 1993a
Ka: acid-catalyzed hydrolysis rate constant (1/mol yr)	500	USEPA, 1993a
Kn: neutral hydrolysis rate constant (1/yr)	0	USEPA, 1993a
Kb: base-catalyzed hydrolysis rate constant (1/mol yr)	5200	USEPA, 1993a
Solubility (mg/L)	7.40E+04	USEPA, 1997c
Diffusivity in air (cm^2/sec)	360	Calc., based on USEPA, 2001a
Diffusivity in water (m^2/yr)	0.0388	Calc., based on USEPA, 2001a
Henry's law constant (atm-m^3/mol)	0.0001	USEPA, 1997c

Reference Ground-water Concentration Values

Property	Value	Data Source
Maximum Contamination Level (mg/L)		
HBN-Ingestion, Non-Cancer (mg/L)	0.025	USEPA, 1997a
Reference Dose (mg/kg-day)	0.001	USEPA, 1997a
HBN-Ingestion, Cancer (mg/L)	0.0002	USEPA, 2001b
Carcinogenic Slope Factor-Oral (1/mg/kg-day)	0.54	USEPA, 2001b
HBN-Inhalation, Non-Cancer (mg/L)	0.038	USEPA, 2001b
Reference Concentration (mg/m^3)	0.002	USEPA, 2001b
HBN-Inhalation, Cancer (mg/L)	0.001	USEPA, 2001b
Carcinogenic Slope Factor-Inhalation (1/mg/kg-day)	0.24	Calc, based on USEPA, 2001b

Constituent Name	CAS ID
Acrylamide	79-06-1

Physical Properties

Property	Value	Data Source
ChemicalType	Organic	
Molecule Weight (g/mol)	71.0786	
Log Koc (distribution coefficient for organic carbon) (mL/g)	-0.989	USEPA, 1993a
Ka: acid-catalyzed hydrolysis rate constant (1/mol yr)	31.5	USEPA, 1993a
Kn: neutral hydrolysis rate constant (1/yr)	0.018	USEPA, 1993a
Kb: base-catalyzed hydrolysis rate constant (1/mol yr)	0	USEPA, 1993a
Solubility (mg/L)	6.40E+05	USEPA, 1997c
Diffusivity in air (cm^2/sec)	337	Calc., based on USEPA, 2001a
Diffusivity in water (m^2/yr)	0.0397	Calc., based on USEPA, 2001a
Henry's law constant (atm-m^3/mol)	1.00E-09	USEPA, 1997c

Reference Ground-water Concentration Values

Property	Value	Data Source
Maximum Contamination Level (mg/L)		
HBN-Ingestion, Non-Cancer (mg/L)	0.0049	USEPA, 2001b
Reference Dose (mg/kg-day)	0.0002	USEPA, 2001b
HBN-Ingestion, Cancer (mg/L)	2.20E-05	USEPA, 2001b
Carcinogenic Slope Factor-Oral (1/mg/kg-day)	4.5	USEPA, 2001b
HBN-Inhalation, Non-Cancer (mg/L)		
Reference Concentration (mg/m^3)		
HBN-Inhalation, Cancer (mg/L)	5.1	USEPA, 2001b
Carcinogenic Slope Factor-Inhalation (1/mg/kg-day)	4.6	Calc, based on USEPA, 2001b

Constituent Name	CAS ID
Acrylic acid [propenoic acid]	79-10-7

Physical Properties

Property	Value	Data Source
ChemicalType	Organic	
Molecule Weight (g/mol)	72.1	
Log Koc (distribution coefficient for organic carbon) (mL/g)	-1.84	USEPA, 1993a
Ka: acid-catalyzed hydrolysis rate constant (1/mol yr)	0	USEPA, 1993a
Kn: neutral hydrolysis rate constant (1/yr)	0	USEPA, 1993a
Kb: base-catalyzed hydrolysis rate constant (1/mol yr)	0	USEPA, 1993a
Solubility (mg/L)	1.00E+06	USEPA, 1997c
Diffusivity in air (cm^2/sec)	325	Calc., based on USEPA, 2001a
Diffusivity in water (m^2/yr)	0.0378	Calc., based on USEPA, 2001a
Henry's law constant (atm-m^3/mol)	1.17E-07	USEPA, 1997c

Reference Ground-water Concentration Values

Property	Value	Data Source
Maximum Contamination Level (mg/L)		
HBN-Ingestion, Non-Cancer (mg/L)	12	USEPA, 2001b
Reference Dose (mg/kg-day)	0.5	USEPA, 2001b
HBN-Ingestion, Cancer (mg/L)		
Carcinogenic Slope Factor-Oral (1/mg/kg-day)		
HBN-Inhalation, Non-Cancer (mg/L)	15	USEPA, 2001b
Reference Concentration (mg/m^3)	0.001	USEPA, 2001b
HBN-Inhalation, Cancer (mg/L)		
Carcinogenic Slope Factor-Inhalation (1/mg/kg-day)		

References

USEPA. 1993a. Environmental Fate Constants for Orgainic Chemicals Under Consideration for EPA's Hazardous Waste Identification Projects, EPA/600/R-93/132, August 1993.
USEPA. 1997a. Health Effects Assessment Summary Tables (HEAST). EPA-540-R-97-036. FY 1997 Update. Office of Solid Waste and Emergency Response, Washington, DC.
USEPA. 1997c. Superfund Chemical Data Matrix (SCDM). SCDMWIN 1.0 (SCDM Windows User's Version), Version 1. Office of Solid Waste and Emergency Response, Washington DC: GPO. http://www.epa.gov/superfund/resources/scdm/index.htm. Accessed July 2001
USEPA. 2001a. WATER9. Office of Air Quality Planning and Standards, Research Triangle Park, NC. http://www.epa.gov/ttn/chief/software/water/index.html. Accessed July 2001.
USEPA. 2001b. Integrated Risk Information System (IRIS). National Center for Environmental Assessment, Office of Research and Development, Washington, DC. http://www.epa.gov/iris/
Calculated from inhalation unit risk factors from USEPA, 2001b.