DATE: November 20, 1997

TO: Jim Giaque

FROM: John Pryately

RE: 6A Leachate Color Sample

The 6A leachate sample collected 11-19-97, by Jim Giaque, was analyzed for spectrophotometric true color. The sample was run on 11-19-97, at 4:45 pm, by Randy Thomason. The test result from the sample was 1607 mg/l platinum cobalt true color.

Standards analysis results run with this sample were:

Standard	Result
100	106
500	506
1000	1006

If you have any questions about this test please contact me at 6720.

Fac/Perm/Co ID #	Date	Doc ID#
44-06	10/10/2011	DIN 153410

LANDFILL NUMBER 6 - FECAL COLIFORM				
DATE COLLECTED			COL/100MIL	
6/24/96		<	1000	
7/15/96		>	110000	
8/29/96		>	2400	
9/4/96			33000	
9/18/96			520	
10/3/96			80000	
10/10/96			1000	
	GEOMETRIC MEAN		6225.483	

Champion International Corporation
Canton, NC

Dioxin Analysis Results

NPDES TESTING FOR THIRD QUARTER 1997
SAMPLED 7/7/97 - 7/10/97

	SECONDARY EFFLUENT		PRIMARY INFLUENT		LANDFILL LEACHATE		SLUDGE	
Isomer	Analysis #1 - ppq	Analysis #2 - ppq	Analysis #1 - ppq	Analysis #2 - ppq	Analysis #1 - ppq	Analysis #2 - ppq	Analysis #1 - ppt	Analysis #2 - ppt
2,3,7,8-TCDD	ND(1.0)	ND(1.4)	ND(2.0)	ND(2.5)	ND(1.6)	ND(1.0)	ND(0.89)	ND(0.90)
1,2,3,7,8-PeCDD	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.1)	ND(0.17)	ND(0.10)
1,2,3,4,7,8-HxCDD	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.44)	ND(0.31)
1,2,3,6,7,8-HxCDD	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.48)	ND(0.34)
1,2,3,7,8,9-HxCDD	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.33)	ND(0.21)
1,2,3,4,6,7,8-HpCDD	ND(1.7)	ND(1.0)	ND(2.4)	ND(2.2)	ND(1.0)	ND(1.0)	9.0	7.2
2,3,7,8-TCDF	ND(1.0)	ND(1.0)	ND(1.4)	ND(1.9)	ND(1.0)	ND(1.0)	7.2	5.3
1,2,3,7,8-PeCDF	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.13)	0.67
2,3,4,7,8-PeCDF	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.12)	ND(2.0)
1,2,3,4,7,8-HxCDF	ND(1.0)	ND(1.0)	ND(1.0)	1.1	ND(1.0)	ND(1.0)	ND(0.10)	ND(1.0)
1,2,3,6,7,8-HxCDF	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.10)	ND(1.0)
2,3,4,6,7,8-HxCDF	ND(1.0)	ND(1.0)	2.6	3.5	ND(1.0)	ND(1.0)	ND(0.10)	ND(1.0)
1,2,3,7,8,9-HxCDF	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.14)	ND(0.12)
1,2,3,4,6,7,8-HpCDF	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	2.5	2.1
1,2,3,4,7,8,9-HpCDF	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.60)	ND(0.27)

@ - Result is an estimated value that is below the lower calibration limit, butabove the target detection limit.
PPT = parts per trillion or Pg/g
PPQ = parts per quadrillion or Pg/l

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Pace Analytical Services, Inc. - Ashev
54 Ravenscroft Drive
Asheville, NC 28801

May 08, 1997
PACE Project Number: A70425522

Attn: Ms. Robin Blakenbaker

Client Reference: Champion International

Parameter	Units	PRL	PACE Sample Number: 93 0382070 Date Collected: 04/25/97 Date Received: 04/28/97 Client Sample ID: LF6E Leachate	METHOD	DATE ANALYZED
ORGANIC ANALYSIS					
BASE/NEUTRALS AND ACIDS				8270	
bis(2-Chloroethyl)ether	ug/L	10	ND		05/01/97
Phenol	ug/L	10	ND		05/01/97
2-Chlorophenol	ug/L	10	ND		05/01/97
1,3-Dichlorobenzene	ug/L	10	ND		05/01/97
1,4-Dichlorobenzene	ug/L	10	ND		05/01/97
1,2-Dichlorobenzene	ug/L	10	ND		05/01/97
Benzyl alcohol	ug/L	20	ND		05/01/97
bis(2-Chloroisopropyl)ether	ug/L	10	ND		05/01/97
2-Methylphenol	ug/L	10	ND		05/01/97
Hexachloroethane	ug/L	10	ND		05/01/97
n-Nitrosodi-n-propylamine	ug/L	10	ND		05/01/97
4-Methylphenol	ug/L	10	ND		05/01/97
Nitrobenzene	ug/L	10	ND		05/01/97
3,5,5-Trimethyl-2-cyclohexanone	ug/L	10	ND		05/01/97
2-Nitrophenol	ug/L	10	ND		05/01/97
2,4-Dimethylphenol	ug/L	10	ND		05/01/97
bis(2-Chloroethoxy)methane	ug/L	10	ND		05/01/97
Benzoic acid	ug/L	50	ND		05/01/97
2,4-Dichlorophenol	ug/L	10	ND		05/01/97
1,2,4-Trichlorobenzene	ug/L	10	ND		05/01/97
Naphthalene	ug/L	10	ND		05/01/97
4-Chloroaniline	ug/L	20	ND		05/01/97
Hexachlorobutadiene	ug/L	10	ND		05/01/97
4-Chloro-3-methylphenol	ug/L	20	ND		05/01/97
2-Methylnaphthalene	ug/L	10	ND		05/01/97
Hexachlorocyclopentadiene	ug/L	10	ND		05/01/97
2,4,6-Trichlorophenol	ug/L	10	ND		05/01/97
2,4,5-Trichlorophenol	ug/L	10	ND		05/01/97
2-Chloronaphthalene	ug/L	10	ND		05/01/97

REPORT OF LABORATORY ANALYSIS

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Ms. Robin Blakenbaker
Page 2

May 08, 1997
PACE Project Number: A70425522

Client Reference: Champion International

PACE Sample Number:			93 0382070		
Date Collected:			04/25/97		
Date Received:			04/28/97		
Client Sample ID:			LF6E		
Parameter	Units	PRL	Leachate	METHOD	DATE ANALYZED
ORGANIC ANALYSIS					
BASE/NEUTRALS AND ACIDS				8270	
2-Nitroaniline	ug/L	50	ND		05/01/97
Acenaphthylene	ug/L	10	ND		05/01/97
Dimethyl phthalate	ug/L	10	ND		05/01/97
2,6-Dinitrotoluene	ug/L	10	ND		05/01/97
Acenaphthene	ug/L	10	ND		05/01/97
3-Nitroaniline	ug/L	50	ND		05/01/97
2,4-Dinitrophenol	ug/L	50	ND		05/01/97
Dibenzofuran	ug/L	10	ND		05/01/97
2,4-Dinitrotoluene	ug/L	10	ND		05/01/97
4-Nitrophenol	ug/L	50	ND		05/01/97
Fluorene	ug/L	10	ND		05/01/97
4-Chlorophenyl phenyl ether	ug/L	10	ND		05/01/97
Diethyl phthalate	ug/L	10	ND		05/01/97
4-Nitroaniline	ug/L	50	ND		05/01/97
2-Methyl-4,6-dinitrophenol	ug/L	50	ND		05/01/97
N-Nitrosodiphenylamine	ug/L	10	ND		05/01/97
4-Bromophenyl phenyl ether	ug/L	10	ND		05/01/97
Hexachlorobenzene	ug/L	10	ND		05/01/97
Pentachlorophenol	ug/L	50	ND		05/01/97
Phenanthrene	ug/L	10	ND		05/01/97
Anthracene	ug/L	10	ND		05/01/97
Di-n-butyl phthalate	ug/L	10	ND		05/01/97
Fluoranthene	ug/L	10	ND		05/01/97
Pyrene	ug/L	10	ND		05/01/97
Benzyl butyl phthalate	ug/L	10	ND		05/01/97
3,3-Dichlorobenzidine	ug/L	20	ND		05/01/97
Benz[a]anthracene	ug/L	10	ND		05/01/97
Chrysene	ug/L	10	ND		05/01/97
bis(2-Ethylhexyl)phthalate	ug/L	10	ND		05/01/97
Di-n-octylphthalate	ug/L	10	ND		05/01/97
Benzo[b]fluoranthene	ug/L	10	ND		05/01/97

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Ms. Robin Blakenbaker
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May 08, 1997
PACE Project Number: A70425522

Client Reference: Champion International

Parameter	Units	PRL	PACE Sample Number: 93 0382070 Date Collected: 04/25/97 Date Received: 04/28/97 Client Sample ID: LF6E Leachate	METHOD	DATE ANALYZED
ORGANIC ANALYSIS					
BASE/NEUTRALS AND ACIDS				8270	
Benzo[k]fluoranthene	ug/L	10	ND		05/01/97
Benzo[a]pyrene	ug/L	10	ND		05/01/97
Indeno[1,2,3-cd]pyrene	ug/L	10	ND		05/01/97
Dibenz[a,h]anthracene	ug/L	10	ND		05/01/97
Benzo[g,h,i]perylene	ug/L	10	ND		05/01/97
Surrogate - 2-Fluorophenol	%		39		05/01/97
Surrogate - Phenol-d6	%		27		05/01/97
Surrogate - Nitrobenzene-d5	%		56		05/01/97
Surrogate - 2-Fluorobiphenyl	%		63		05/01/97
Surrogate - 2,4,6-Tribromophenol	%		68		05/01/97
Surrogate - Terphenyl-d14	%		90		05/01/97
Date Extracted	Date		043097		04/30/97
PESTICIDES AND PCBS				8080	
alpha-BHC	ug/L	0.05	ND		05/02/97
beta-BHC	ug/L	0.05	ND		05/02/97
gamma-BHC (Lindane)	ug/L	0.05	ND		05/02/97
delta-BHC	ug/L	0.1	ND		05/02/97
Heptachlor	ug/L	0.05	ND		05/02/97
Aldrin	ug/L	0.05	ND		05/02/97
Heptachlor epoxide	ug/L	0.8	ND		05/02/97
Endosulfan I	ug/L	0.1	ND		05/02/97
Dieldrin	ug/L	0.02	0.06 CO		05/02/97
Endrin	ug/L	0.06	ND		05/02/97
4,4-DDD	ug/L	0.1	ND		05/02/97
Endosulfan II	ug/L	0.1	ND		05/02/97
4,4-DDT	ug/L	0.1	ND		05/02/97
4,4-DDE	ug/L	0.1	ND		05/02/97
Endrin aldehyde	ug/L	0.2	ND		05/02/97
Endosulfan sulfate	ug/L	0.7	ND		05/02/97
Methoxychlor	ug/L	0.5	ND		05/02/97
Toxaphene	ug/L	2.4	ND		05/02/97
Chlordane (tech)	ug/L	0.2	ND		05/02/97

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Ms. Robin Blakenbaker
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May 08, 1997
PACE Project Number: A70425822

Client Reference: Champion International

PACE Sample Number:			93 0382070		
Date Collected:			04/25/97		
Date Received:			04/28/97		
Client Sample ID:			LF6E		
Parameter	Units	PRL	Leachate	METHOD	DATE ANALYZED
ORGANIC ANALYSIS					
PESTICIDES AND PCBS				8080	
Aroclor-1016	ug/L	1.0	ND		05/02/97
Aroclor-1221	ug/L	1.0	ND		05/02/97
Aroclor-1232	ug/L	1.0	ND		05/02/97
Aroclor-1242	ug/L	1.0	ND		05/02/97
Aroclor-1248	ug/L	1.0	ND		05/02/97
Aroclor-1254	ug/L	1.0	ND		05/02/97
Aroclor-1260	ug/L	1.0	ND		05/02/97
Date Extracted, Pesticides & PCBs	Date		043097		04/30/97
VOLATILE ORGANICS			SF	8260	
Dichlorodifluoromethane	ug/L	50	ND		05/02/97
Chloromethane	ug/L	100	ND		05/02/97
Vinyl Chloride	ug/L	100	ND		05/02/97
Bromomethane	ug/L	100	ND		05/02/97
Chloroethane	ug/L	100	ND		05/02/97
Trichlorofluoromethane	ug/L	50	ND		05/02/97
1,1-Dichloroethene	ug/L	50	ND		05/02/97
Methylene chloride	ug/L	50	ND		05/02/97
trans-1,2-Dichloroethene	ug/L	50	ND		05/02/97
1,1-Dichloroethane	ug/L	50	ND		05/02/97
2,2-Dichloropropane	ug/L	100	ND		05/02/97
cis-1,2-Dichloroethene	ug/L	50	ND		05/02/97
Chloroform	ug/L	50	ND		05/02/97
Bromochloromethane	ug/L	50	ND		05/02/97
1,1,1-Trichloroethane	ug/L	50	ND		05/02/97
Carbon Tetrachloride	ug/L	50	ND		05/02/97
1,1-Dichloropropene	ug/L	50	ND		05/02/97
Benzene	ug/L	50	ND		05/02/97
1,2-Dichloroethane	ug/L	50	ND		05/02/97
Trichloroethene	ug/L	50	ND		05/02/97
1,2-Dichloropropane	ug/L	50	ND		05/02/97
Bromodichloromethane	ug/L	50	ND		05/02/97

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Ms. Robin Blakenbaker
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May 08, 1997
PACE Project Number: A70425522

Client Reference: Champion International

Parameter	Units	PRL	PACE Sample Number: 93 0382070 Date Collected: 04/25/97 Date Received: 04/28/97 Client Sample ID: LF6E Leachate	METHOD	DATE ANALYZED
ORGANIC ANALYSIS					
VOLATILE ORGANICS			SF	8260	
Dibromomethane	ug/L	50	ND		05/02/97
Toluene	ug/L	50	ND		05/02/97
1,1,2-Trichloroethane	ug/L	50	ND		05/02/97
Tetrachloroethene	ug/L	50	ND		05/02/97
1,3-Dichloropropane	ug/L	50	ND		05/02/97
Chlorodibromomethane	ug/L	50	ND		05/02/97
1,2-Dibromoethane	ug/L	50	ND		05/02/97
Chlorobenzene	ug/L	50	ND		05/02/97
1,1,1,2-Tetrachloroethane	ug/L	50	ND		05/02/97
Ethylbenzene	ug/L	50	ND		05/02/97
m-Xylene and p-Xylene	ug/L	50	ND		05/02/97
o-Xylene	ug/L	50	ND		05/02/97
Styrene	ug/L	50	ND		05/02/97
Bromoform	ug/L	50	ND		05/02/97
Isopropylbenzene	ug/L	50	ND		05/02/97
1,1,2,2-Tetrachloroethane	ug/L	50	ND		05/02/97
n-Propylbenzene	ug/L	50	ND		05/02/97
Bromobenzene	ug/L	50	ND		05/02/97
1,2,3-Trichloropropane	ug/L	50	ND		05/02/97
2-Chlorotoluene	ug/L	50	ND		05/02/97
1,3,5-Trimethylbenzene	ug/L	50	ND		05/02/97
4-Chlorotoluene	ug/L	50	ND		05/02/97
tert-Butylbenzene	ug/L	50	ND		05/02/97
1,2,4-Trimethylbenzene	ug/L	50	ND		05/02/97
sec-Butylbenzene	ug/L	50	ND		05/02/97
1,3-Dichlorobenzene	ug/L	50	ND		05/02/97
p-Isopropyltoluene	ug/L	50	ND		05/02/97
1,4-Dichlorobenzene	ug/L	50	ND		05/02/97
n-Butylbenzene	ug/L	50	ND		05/02/97
1,2-Dichlorobenzene	ug/L	50	ND		05/02/97
1,2-Dibromo-3-chloropropane	ug/L	50	ND		05/02/97

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Ms. Robin Blakenbaker
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May 08, 1997
PACE Project Number: A70425522

Client Reference: Champion International

Parameter	Units	PRL		METHOD	DATE ANALYZED
PACE Sample Number:			93 0382070		
Date Collected:			04/25/97		
Date Received:			04/28/97		
Client Sample ID:			LF6E		
			Leachate		
ORGANIC ANALYSIS					
VOLATILE ORGANICS			SF	8260	
1,2,4-Trichlorobenzene	ug/L	100	ND		05/02/97
Hexachlorobutadiene	ug/L	100	ND		05/02/97
Naphthalene	ug/L	100	ND		05/02/97
1,2,3-Trichlorobenzene	ug/L	50	ND		05/02/97
Surrogate - Dibromofluoromethane	%		103		05/02/97
Surrogate - Toluene-d8	%		100		05/02/97
Surrogate - 4-Bromofluorobenzene	%		104		05/02/97

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Page 7

May 08, 1997
PACE Project Number: A70425522

Client Reference: Champion International

PACE Sample Number:			93 0382088		
Date Collected:			04/25/97		
Date Received:			04/28/97		
Client Sample ID:			LF6E		
Parameter	Units	PRL	Leachate	METHOD	DATE ANALYZED
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Mercury	mg/L	0.002	ND EQ	245.1	05/02/97
Metal Digestion, Mercury			050297		05/02/97

PACE Sample Number:			93 0382096		
Date Collected:			04/25/97		
Date Received:			04/28/97		
Client Sample ID:			Blank		
Parameter	Units	PRL		METHOD	DATE ANALYZED
ORGANIC ANALYSIS					
VOLATILE ORGANICS				8260	
Dichlorodifluoromethane	ug/L	5.0	ND		05/05/97
Chloromethane	ug/L	10	ND		05/05/97
Vinyl Chloride	ug/L	10	ND		05/05/97
Bromomethane	ug/L	10	ND		05/05/97
Chloroethane	ug/L	10	ND		05/05/97
Trichlorofluoromethane	ug/L	5.0	ND		05/05/97
1,1-Dichloroethene	ug/L	5.0	ND		05/05/97
Methylene chloride	ug/L	5.0	ND		05/05/97
trans-1,2-Dichloroethene	ug/L	5.0	ND		05/05/97
1,1-Dichloroethane	ug/L	5.0	ND		05/05/97
2,2-Dichloropropane	ug/L	10	ND		05/05/97
cis-1,2-Dichloroethene	ug/L	5.0	ND		05/05/97
Chloroform	ug/L	5.0	ND		05/05/97
Bromochloromethane	ug/L	5.0	ND		05/05/97
1,1,1-Trichloroethane	ug/L	5.0	ND		05/05/97
Carbon Tetrachloride	ug/L	5.0	ND		05/05/97
1,1-Dichloropropene	ug/L	5.0	ND		05/05/97
Benzene	ug/L	5.0	ND		05/05/97
1,2-Dichloroethane	ug/L	5.0	ND		05/05/97
Trichloroethene	ug/L	5.0	ND		05/05/97

REPORT OF LABORATORY ANALYSIS

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APPENDIX B

HELP MODEL
B-1 LEAKAGE THROUGH LINER (6A-West)
B-2 LEAKAGE THROUGH CAP (6A-East)
B-3 GROUNDWATER RECHARGE

B-1 LEAKAGE THROUGH LINER

```
**********************************************************************
**********************************************************************
**                                                                  **
**                                                                  **
**          HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE            **
**               HELP MODEL VERSION 3.05a  (5 JUNE 1996)             **
**               DEVELOPED BY ENVIRONMENTAL LABORATORY              **
**                 USAE WATERWAYS EXPERIMENT STATION                **
**           FOR USEPA RISK REDUCTION ENGINEERING LABORATORY         **
**                                                                  **
**                                                                  **
**********************************************************************
**********************************************************************
```

PRECIPITATION DATA FILE: C:\HELP3\CANTON.D4
TEMPERATURE DATA FILE: C:\HELP3\CANTON.D7
SOLAR RADIATION DATA FILE: C:\HELP3\CANTON.D13
EVAPOTRANSPIRATION DATA: C:\HELP3\CANTON.D11
SOIL AND DESIGN DATA FILE: C:\HELP3\6AW-GWM.D10
OUTPUT DATA FILE: C:\HELP3\6AW-GWM.OUT

TIME: 14:57 DATE: 9/18/1997

****

TITLE: CHAMPION - LANDFILL 6A WEST - LEAKAGE THROUGH LINER

****

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	960.00	INCHES
POROSITY	=	0.4000	VOL/VOL
FIELD CAPACITY	=	0.3600	VOL/VOL
WILTING POINT	=	0.2800	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3655	VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.139999997000E-05 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 21

THICKNESS	=	15.00	INCHES
POROSITY	=	0.3970	VOL/VOL
FIELD CAPACITY	=	0.0320	VOL/VOL
WILTING POINT	=	0.0130	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0320	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000012000	CM/SEC
SLOPE	=	5.00	PERCENT
DRAINAGE LENGTH	=	100.0	FEET

LAYER 3

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 4

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	48.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4710	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.499999987000E-04	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	90.00	
FRACTION OF AREA ALLOWING RUNOFF	=	0.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	8.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	3.166	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	3.200	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.240	INCHES
INITIAL SNOW WATER	=	2.623	INCHES
INITIAL WATER IN LAYER MATERIALS	=	373.934	INCHES
TOTAL INITIAL WATER	=	376.557	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
ASHEVILLE NORTH CAROLINA

STATION LATITUDE	=	35.26	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00	
START OF GROWING SEASON (JULIAN DATE)	=	96	
END OF GROWING SEASON (JULIAN DATE)	=	298	
EVAPORATIVE ZONE DEPTH	=	8.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	7.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	84.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	77.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	3.52	4.27	3.34	3.52	3.28
4.48	4.23	3.00	2.65	2.69	3.05

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
36.80	39.10	46.40	55.70	63.30	69.80
73.20	72.60	66.90	56.00	46.40	39.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA
AND STATION LATITUDE = 35.26 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.08	3.43	3.81	3.13	4.04	3.51
	4.03	3.94	2.52	2.24	2.86	3.14
STD. DEVIATIONS	1.33	1.85	2.32	1.66	1.36	1.47
	1.52	1.79	1.45	1.26	2.00	1.73
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	0.780	1.028	1.656	2.174	2.836	3.071
	2.916	2.482	1.640	1.100	1.212	0.565
STD. DEVIATIONS	0.394	0.555	1.306	2.108	2.821	3.049
	2.920	2.473	1.760	1.179	0.781	0.339

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS	0.7054	0.5879	0.5946	0.5893	0.6572	0.6536
	0.6775	0.7621	0.8537	0.8644	0.8637	0.7611
STD. DEVIATIONS	0.4938	0.4721	0.5142	0.4997	0.5552	0.5166
	0.5204	0.4709	0.3605	0.3535	0.3420	0.4888

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
STD. DEVIATIONS	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0000	0.0000	0.0000	0.0001

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	0.0268	0.0246	0.0226	0.0232	0.0250	0.0257
	0.0258	0.0290	0.0335	0.0329	0.0339	0.0289
STD. DEVIATIONS	0.0188	0.0198	0.0196	0.0196	0.0211	0.0203
	0.0198	0.0179	0.0142	0.0134	0.0134	0.0186

AVERAGE ANNUAL TOTALS & STD. DEVIATIONS) FOR YEARS 1 THROUGH 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	39.73 (4.479)	144205.4	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000
EVAPOTRANSPIRATION	21.459 (17.8486)	77896.57	54.018
LATERAL DRAINAGE COLLECTED FROM LAYER 2	8.57059 (4.93081)	31111.246	21.57426
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00129 (0.00070)	4.678	0.00324
AVERAGE HEAD ON TOP	0.028 (0.016)		

OF LAYER 3

CHANGE IN WATER STORAGE	9.520	(17.6218)	34557.60	23.964

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 15

	(INCHES)	(CU. FT.)
PRECIPITATION	2.99	10853.700
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	0.04761	172.84032
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000007	0.02494
AVERAGE HEAD ON TOP OF LAYER 3	0.056	
MAXIMUM HEAD ON TOP OF LAYER 3	0.111	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	0.9 FEET	
SNOW WATER	122.47	444571.0310

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3958
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2800

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 15

LAYER	(INCHES)	(VOL/VOL)
1	373.3469	0.3889
2	0.4878	0.0325
3	0.0000	0.0000
4	22.6080	0.4710
SNOW WATER	122.914	

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MONTHLY PRECIPITATION STATS FOR CANTON, N.C. (d:\cpc\nc\stats2.txt)
DATE: 01/13/97

SOURCE: RAINFALL DATA FROM NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION.
MONTHLY AVERAGES BASED ON 63 YEARS OF RECORD (1931-1993).
MISSING MONTHLY DATA WAS NOT INCLUDED IN MONTHLY AVERAGES.

JAN	NUMBER OF YEARS OF DATA	=	61
	MONTHLY AVERAGE (inches)	=	3.3
FEB	NUMBER OF YEARS OF DATA	=	62
	MONTHLY AVERAGE (inches)	=	3.5
MAR	NUMBER OF YEARS OF DATA	=	63
	MONTHLY AVERAGE (inches)	=	4.3
APR	NUMBER OF YEARS OF DATA	=	63
	MONTHLY AVERAGE (inches)	=	3.3
MAY	NUMBER OF YEARS OF DATA	=	61
	MONTHLY AVERAGE (inches)	=	3.5
JUN	NUMBER OF YEARS OF DATA	=	62
	MONTHLY AVERAGE (inches)	=	3.3
JUL	NUMBER OF YEARS OF DATA	=	62
	MONTHLY AVERAGE (inches)	=	4.5
AUG	NUMBER OF YEARS OF DATA	=	61
	MONTHLY AVERAGE (inches)	=	4.2
SEP	NUMBER OF YEARS OF DATA	=	62
	MONTHLY AVERAGE (inches)	=	3.0
OCT	NUMBER OF YEARS OF DATA	=	62
	MONTHLY AVERAGE (inches)	=	2.6
NOV	NUMBER OF YEARS OF DATA	=	62
	MONTHLY AVERAGE (inches)	=	2.7
DEC	NUMBER OF YEARS OF DATA	=	62
	MONTHLY AVERAGE (inches)	=	3.0

TABLE 1. DEFAULT LOW DENSITY SOIL CHARACTERISTICS

Soil Texture Class			Total Porosity vol/vol	Field Capacity vol/vol	Wilting Point vol/vol	Saturated Hydraulic Conductivity cm/sec
HELP	USDA	USCS				
1	CoS	SP	0.417	0.045	0.018	1.0×10^{-2}
2	S	SW	0.437	0.062	0.024	5.8×10^{-3}
3	FS	SW	0.457	0.083	0.033	3.1×10^{-3}
4	LS	SM	0.437	0.105	0.047	1.7×10^{-3}
5	LFS	SM	0.457	0.131	0.058	1.0×10^{-3}
6	SL	SM	0.453	0.190	0.085	7.2×10^{-4}
7	FSL	SM	0.473	0.222	0.104	5.2×10^{-4}
8	L	ML	0.463	0.232	0.116	3.7×10^{-4}
9	SiL	ML	0.501	0.284	0.135	1.9×10^{-4}
10	SCL	SC	0.398	0.244	0.136	1.2×10^{-4}
11	CL	CL	0.464	0.310	0.187	6.4×10^{-5}
12	SiCL	CL	0.471	0.342	0.210	4.2×10^{-5}
13	SC	SC	0.430	0.321	0.221	3.3×10^{-5}
14	SiC	CH	0.479	0.371	0.251	2.5×10^{-5}
15	C	CH	0.475	0.378	0.251	2.5×10^{-5}
21	G	GP	0.397	0.032	0.013	3.0×10^{-1}

a = constant representing the effects of various fluid constants and gravity, 21 cm^3/sec

ϕ = total porosity, vol/vol

θ_r = residual volumetric water content, vol/vol

ψ_b = bubbling pressure, cm

λ = pore-size distribution index, dimensionless

A more detailed explanation of Equation 11 can be found in Appendix A of the HELP program Version 3 User's Guide and the cited references.

TABLE 2. MODERATE AND HIGH DENSITY DEFAULT SOILS

Soil Texture Class			Total Porosity vol/vol	Field Capacity vol/vol	Wilting Point vol/vol	Saturated Hydraulic Conductivity cm/sec
HELP	USDA	USCS				
22	L (Moderate)	ML	0.419	0.307	0.180	1.9×10^{-5}
23	SiL (Moderate)	ML	0.461	0.360	0.203	9.0×10^{-6}
24	SCL (Moderate)	SC	0.365	0.305	0.202	2.7×10^{-6}
25	CL (Moderate)	CL	0.437	0.373	0.266	3.6×10^{-6}
26	SiCL (Moderate)	CL	0.445	0.393	0.277	1.9×10^{-6}
27	SC (Moderate)	SC	0.400	0.366	0.288	7.8×10^{-7}
28	SiC (Moderate)	CH	0.452	0.411	0.311	1.2×10^{-6}
29	C (Moderate)	CH	0.451	0.419	0.332	6.8×10^{-7}
16	Liner Soil (High)		0.427	0.418	0.367	1.0×10^{-7}
17	Bentonite (High)		0.750	0.747	0.400	3.0×10^{-9}

3.5.2 Default Waste Characteristics

Table 4 provides a summary of default moisture retention values for various waste layers. Municipal waste properties provided in Tchobanoglous et al. (1977) and Equations 6 and 7 were used to determine the total porosity, field capacity, and wilting point of a well compacted municipal waste. The field capacity and wilting point were calculated using Tchobanoglous et al.'s high and low water content values, respectively. Oweis et al. (1990) provided information on the in-situ saturated hydraulic conductivity of municipal waste. Zeiss and Major (1993) described the moisture flow through

The saturated hydraulic conductivities of the ash and slag wastes were taken directly from the references. The saturated hydraulic conductivities of the coal burning electric plant ashes at maximum dry density were determined in-situ and the maximum dry density municipal solid waste incinerator ash and fine copper slag values were determined by laboratory methods. The saturated hydraulic conductivities of various other waste materials are provided in Table 5. Similar to default soils, the HELP program uses Equation 8 to adjust the saturated hydraulic conductivities of the default wastes in the top half of the evaporative zone to account for root penetration.

A more detailed explanation of the calculation procedure used for the ash and slag wastes can be found in Appendix A of the HELP program Version 3 User's Guide. Like the soil properties, the default waste properties were determined using empirical equations developed from soil data. Therefore, these values should not be used in place of a detailed laboratory and field testing program.

TABLE 5. SATURATED HYDRAULIC CONDUCTIVITY OF WASTES

Waste Material	Saturated Hydraulic Conductivity cm/sec*	Reference
Stabilized Incinerator Fly Ash	8.8×10^{-5}	Poran and Ahtchi-Ali (1989)
High-Density Pulverized Fly Ash	2.5×10^{-5}	Swain (1979)
Solidified Waste	4.0×10^{-2}	Rushbrook et al. (1989)
Electroplating Sludge	1.6×10^{-5}	Bartos and Palermo (1977)
Nickel/Cadmium Battery Sludge	3.5×10^{-6}	"
Inorganic Pigment Sludge	5.0×10^{-6}	"
Brine Sludge - Chlorine Production	8.2×10^{-5}	"
Calcium Fluoride Sludge	3.2×10^{-5}	"
High Ash Papermill Sludge	1.4×10^{-6}	Perry and Schultz (1977)

Waste Product →

* - Determined by laboratory methods.

3.5.3 Default Geosynthetic Material Characteristics

Table 6 provides a summary of default properties for various geosynthetic materials. The values were extracted from Geotechnical Fabrics Report--1992 Specifiers Guide (Industrial Fabrics Association International, 1991) and Giroud and Bonaparte (1985).

3.6 SOIL MOISTURE INITIALIZATION

The soil moisture of the layers may be initialized by the user or the program. If initialized by the program, the soil moisture is initialized near steady-state using a three step procedure. The first step sets the soil moisture of all liners to porosity or saturation and the moisture of all other layers to field capacity.

In the second step the program computes a soil moisture for each layer below the top liner system. These soil moistures are computed to yield an unsaturated hydraulic conductivity equal to 85% of the lowest effective saturated hydraulic conductivity of all

TABLE 6. DEFAULT GEOSYNTHETIC MATERIAL CHARACTERISTICS

Geosynthetic Material Description		Saturated Hydraulic Conductivity cm/sec
HELP	Geosynthetic Material	
20	Drainage Net (0.5 cm)	$1.0 \times 10^{+1}$
34	Drainage Net (0.6 cm)	$3.3 \times 10^{+1}$
35	High Density Polyethylene (HDPE) Membrane	2.0×10^{-13}
36	Low Density Polyethylene (LDPE) Membrane	4.0×10^{-13}
37	Polyvinyl Chloride (PVC) Membrane	2.0×10^{-11}
38	Butyl Rubber Membrane	1.0×10^{-12}
39	Chlorinated Polyethylene (CPE) Membrane	4.0×10^{-12}
40	Hypalon or Chlorosulfonated Polyethylene (CSPE) Membrane	3.0×10^{-12}
41	Ethylene-Propylene Diene Monomer (EPDM) Membrane	2.0×10^{-12}
42	Neoprene Membrane	3.0×10^{-12}

B-2 LEAKAGE THROUGH CAP (6A-East)

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**                                                                  **
**                                                                  **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE        **
**                   HELP MODEL VERSION 3.05a  (5 JUNE 1996)         **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY          **
**                     USAE WATERWAYS EXPERIMENT STATION            **
**                FOR USEPA RISK REDUCTION ENGINEERING LABORATORY    **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE: h:\CHP\nc\6a-west\HELP\CANTON2.D4
TEMPERATURE DATA FILE: h:\CHP\nc\6a-west\HELP\CANTON2.D7
SOLAR RADIATION DATA FILE: h:\CHP\nc\6a-west\HELP\CANTON2.D13
EVAPOTRANSPIRATION DATA: h:\CHP\nc\6a-west\HELP\CANTON2.D11
SOIL AND DESIGN DATA FILE: h:\CHP\nc\6a-west\HELP\covered.D10
OUTPUT DATA FILE: h:\CHP\nc\6a-west\HELP\covered.OUT

TIME: 11:11 DATE: 3/ 5/1998

****

TITLE: CHAMPION - LANDFILL 6A WEST - LEAKAGE THROUGH LINER

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 12

THICKNESS	=	6.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3308	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.419999997000E-04	CM/SEC

NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 4.20
FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 21

THICKNESS	=	12.00	INCHES
POROSITY	=	0.3970	VOL/VOL
FIELD CAPACITY	=	0.0320	VOL/VOL
WILTING POINT	=	0.0130	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0482	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000012000	CM/SEC
SLOPE	=	5.00	PERCENT
DRAINAGE LENGTH	=	250.0	FEET

LAYER 3

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.04	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	0.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	0.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 4

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	36.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	960.00	INCHES
POROSITY	=	0.4000	VOL/VOL
FIELD CAPACITY	=	0.3600	VOL/VOL
WILTING POINT	=	0.2800	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3600	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.139999997000E-05	CM/SEC

LAYER 6

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 21

THICKNESS	=	15.00	INCHES

POROSITY	=	0.3970	VOL/VOL
FIELD CAPACITY	=	0.0320	VOL/VOL
WILTING POINT	=	0.0130	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0320	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000012000	CM/SEC
SLOPE	=	5.00	PERCENT
DRAINAGE LENGTH	=	100.0	FEET

LAYER 7

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 8

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	48.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4710	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.499999987000E-04	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #12 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 5.% AND A SLOPE LENGTH OF 250. FEET.

SCS RUNOFF CURVE NUMBER	=	83.70	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	3.203	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	7.590	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.416	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	386.623	INCHES
TOTAL INITIAL WATER	=	386.623	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
ASHEVILLE NORTH CAROLINA

STATION LATITUDE	=	35.26 DEGREES
MAXIMUM LEAF AREA INDEX	=	3.00
START OF GROWING SEASON (JULIAN DATE)	=	96
END OF GROWING SEASON (JULIAN DATE)	=	298
EVAPORATIVE ZONE DEPTH	=	18.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	7.60 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	75.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	84.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	77.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	3.52	4.27	3.34	3.52	3.28
4.48	4.23	3.00	2.65	2.69	3.05

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
36.80	39.10	46.40	55.70	63.30	69.80
73.20	72.60	66.90	56.00	46.40	39.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA
AND STATION LATITUDE = 35.26 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.08	3.43	3.81	3.13	4.04	3.51
	4.03	3.94	2.52	2.24	2.86	3.14

STD. DEVIATIONS	1.33	1.85	2.32	1.66	1.36	1.47
	1.52	1.79	1.45	1.26	2.00	1.73

RUNOFF

TOTALS	0.227	0.294	0.074	0.015	0.062	0.028
	0.022	0.073	0.041	0.017	0.122	0.042
STD. DEVIATIONS	0.358	0.764	0.107	0.028	0.104	0.071
	0.033	0.192	0.098	0.034	0.218	0.062

EVAPOTRANSPIRATION

TOTALS	1.150	1.508	2.381	2.517	3.198	3.296
	3.365	2.864	2.058	1.388	1.078	0.798
STD. DEVIATIONS	0.262	0.343	0.524	1.005	1.045	0.940
	1.123	0.750	0.771	0.612	0.329	0.185

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS	2.0862	1.7546	1.5550	0.9975	0.7827	0.3370
	0.4928	0.8346	0.4348	0.6773	1.4361	1.7421
STD. DEVIATIONS	1.2978	1.4915	1.7504	0.9259	0.7995	0.4278
	0.6859	0.9262	0.6289	0.9425	1.5437	1.1100

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

LATERAL DRAINAGE COLLECTED FROM LAYER 6

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 8

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	0.1983	0.1838	0.1479	0.0981	0.0745	0.0332
	0.0469	0.0794	0.0427	0.0644	0.1411	0.1656
STD. DEVIATIONS	0.1234	0.1573	0.1664	0.0910	0.0760	0.0421
	0.0652	0.0881	0.0618	0.0896	0.1517	0.1055

DAILY AVERAGE HEAD ON TOP OF LAYER 7

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 15

	INCHES		CU. FEET	PERCENT
PRECIPITATION	39.73	(4.479)	144205.4	100.00
RUNOFF	1.015	(1.0295)	3684.59	2.555
EVAPOTRANSPIRATION	25.600	(2.7254)	92928.22	64.442
LATERAL DRAINAGE COLLECTED FROM LAYER 2	13.13061	(3.63342)	47664.113	33.05294
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00001	(0.00000)	0.025	0.00002
AVERAGE HEAD ON TOP OF LAYER 3	0.106	(0.030)		
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.00001	(0.00000)	0.021	0.00001
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.00000	(0.00000)	0.004	0.00000
AVERAGE HEAD ON TOP OF LAYER 7	0.000	(0.000)		
CHANGE IN WATER STORAGE	-0.020	(1.4797)	-71.55	-0.050

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 15

	(INCHES)	(CU. FT.)
PRECIPITATION	2.99	10853.700
RUNOFF	1.157	4201.1709
DRAINAGE COLLECTED FROM LAYER 2	1.11788	4057.90308
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000001	0.00203
AVERAGE HEAD ON TOP OF LAYER 3	3.295	
MAXIMUM HEAD ON TOP OF LAYER 3	5.923	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	24.7 FEET	
DRAINAGE COLLECTED FROM LAYER 6	0.00000	0.00157
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.000000	0.00003
AVERAGE HEAD ON TOP OF LAYER 7	0.000	
MAXIMUM HEAD ON TOP OF LAYER 7	0.005	
LOCATION OF MAXIMUM HEAD IN LAYER 6 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	5.37	19489.3320

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2560
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0787

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 15

LAYER	(INCHES)	(VOL/VOL)
1	2.0750	0.3458
2	0.8325	0.0694
3	0.0000	0.0000
4	15.3720	0.4270
5	345.6000	0.3600
6	0.4800	0.0320
7	0.0000	0.0000
8	22.6080	0.4710
SNOW WATER	0.000	

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B-3 GROUNDWATER RECHARGE

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**
** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **
** HELP MODEL VERSION 3.05a (5 JUNE 1996) **
** DEVELOPED BY ENVIRONMENTAL LABORATORY **
** USAE WATERWAYS EXPERIMENT STATION **
** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **
**
**
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****

PRECIPITATION DATA FILE: D:\CHP\NC\HELP\CANTON2.D4
TEMPERATURE DATA FILE: D:\CHP\NC\HELP\CANTON2.D7
SOLAR RADIATION DATA FILE: D:\CHP\NC\HELP\CANTON2.D13
EVAPOTRANSPIRATION DATA: D:\CHP\NC\HELP\CANTON2.D11
SOIL AND DESIGN DATA FILE: D:\CHP\NC\HELP\6AW-GWR.D10
OUTPUT DATA FILE: D:\CHP\NC\HELP\6AW-GWR.OUT

TIME: 9:57 DATE: 10/ 3/1997

****

TITLE: CHAMPION - LANDFILL 6A WEST - RECHARGE TO GW

****

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 12

THICKNESS	=	240.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3619	VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.419999997000E-04 CM/SEC
NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 4.20
FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #12 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 50.% AND A SLOPE LENGTH OF 300. FEET.

SCS RUNOFF CURVE NUMBER	=	88.70	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	6.742	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	8.478	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	3.780	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	86.850	INCHES
TOTAL INITIAL WATER	=	86.850	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
ASHEVILLE NORTH CAROLINA

STATION LATITUDE	=	35.26	DEGREES
MAXIMUM LEAF AREA INDEX	=	3.00	
START OF GROWING SEASON (JULIAN DATE)	=	96	
END OF GROWING SEASON (JULIAN DATE)	=	298	
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	7.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	84.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	77.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	3.52	4.27	3.34	3.52	3.28
4.48	4.23	3.00	2.65	2.69	3.05

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
36.80	39.10	46.40	55.70	63.30	69.80
73.20	72.60	66.90	56.00	46.40	39.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA
AND STATION LATITUDE = 35.26 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.08	3.43	3.81	3.13	4.04	3.51
	4.03	3.94	2.52	2.24	2.86	3.14
STD. DEVIATIONS	1.33	1.85	2.32	1.66	1.36	1.47
	1.52	1.79	1.45	1.26	2.00	1.73
RUNOFF						
TOTALS	0.387	0.453	0.270	0.095	0.216	0.085
	0.122	0.217	0.108	0.062	0.304	0.173
STD. DEVIATIONS	0.413	0.818	0.348	0.088	0.284	0.154
	0.141	0.368	0.192	0.090	0.457	0.189

EVAPOTRANSPIRATION

TOTALS	1.085	1.467	2.545	3.040	4.233	3.613
	3.657	2.939	2.528	1.614	0.958	0.725
STD. DEVIATIONS	0.254	0.352	0.285	0.806	0.954	1.041
	1.256	0.767	0.909	0.753	0.258	0.165

PERCOLATION/LEAKAGE THROUGH LAYER 1

TOTALS	0.2621	0.4363	0.8399	1.2481	1.3451	1.2090
	0.9847	0.7822	0.5818	0.5449	0.4859	0.3139
STD. DEVIATIONS	0.1396	0.3813	0.5749	0.8213	0.5869	0.4660
	0.2818	0.2183	0.1916	0.2401	0.1999	0.1794

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 15

	INCHES		CU. FEET	PERCENT
PRECIPITATION	39.73	(4.479)	144205.4	100.00
RUNOFF	2.492	(1.2987)	9045.12	6.272
EVAPOTRANSPIRATION	28.404	(3.0914)	103105.91	71.499
PERCOLATION/LEAKAGE THROUGH LAYER 1	9.03387	(2.83991)	32792.961	22.74046
CHANGE IN WATER STORAGE	-0.203	(2.7721)	-738.61	-0.512

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 15

	(INCHES)	(CU. FT.)
PRECIPITATION	2.99	10853.700
RUNOFF	1.195	4338.7646
PERCOLATION/LEAKAGE THROUGH LAYER 1	0.184828	670.92499
SNOW WATER	5.37	19489.3320

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4000
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2100

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FINAL WATER STORAGE AT END OF YEAR 15

LAYER	(INCHES)	(VOL/VOL)
1	83.7976	0.3492
SNOW WATER	0.000	

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APPENDIX C

MASS BALANCE ANALYSIS CALCULATION

Champion International Corporation
Area 6A West
Mass Balance Calculation for 2L Standard

GIVEN:

Watershed Area (Acres)	38	
Landfill Area- Open (Acres)	15	
Landfill Area- Closed (Acres)	14	
Precipitation Recharge (in/yr)	9	HELP Model
Landfill Leakage Rate-open (cf/ac/yr)	4.67	HELP Model
Landfill Leakage Rate-closed (cf/ac/yr)	0.004	HELP Model

Groundwater Recharge throughout watershed less landfill area (cf/yr) 294030

Leakage from landfill (cf/yr) 70

Determine concentration at Bowen Branch:

Concentration(Bowen Branch)=((Concentration(Lab)*Leakage Rate)/(GW Recharge + Leakage Rate))

Chemical	Standard (mg/l)	Laboratory Result (mg/l)		Estimated Concentration at Bowen Branch (mg/l)	Standard Met
Acetone	0.7	ND	1	1.2E-04	ok
Acrylamide (propenamide)	0.00001	ND	1	1.2E-04	Exceeded
Arsenic	0.05		1.71	4.1E-04	ok
Barium	2		0.112	Below Standard	ok
Benzene	0.001	ND	0.05	6.0E-06	ok
Boron	0.32	ND	0.2	Below Standard	ok
Bromoform (tribromomethane)	0.00019	ND	0.05	6.0E-06	ok
Butylbenzyl phthalate	0.1	ND	0.01	Below Standard	ok
Cadmium	0.005		0.04	9.5E-06	ok
Carbofuran	0.036		NT		
Carbon tetrachloride	0.0003	ND	0.05	6.0E-06	ok
Chlordane	2.70E-05	ND	0.004	4.8E-07	ok
Chloride	250		490	1.2E-01	ok
Chlorobenzene	0.05	ND	0.05	6.0E-06	ok
Chloroform (trichloromethane)	0.00019	ND	0.05	6.0E-06	ok
2-Chlorophenol	0.0001	ND	0.01	1.2E-06	ok
Chromium	0.05	ND	0.05	6.0E-06	ok
Cis-1,2-dichloroethene	0.07	ND	0.05	Below Standard	ok
Coliform organisms (total)	1		6225	1	ok
Color (Color Units)	15		1607	3.8E-01	ok
Copper	1	ND	0.01	Below Standard	ok
Cyanide	0.154		0.004	Below Standard	ok
2,4-D (2,4-dichlorophenoxy acetic acid)	0.07	ND	0.012	Below Standard	ok
1,2-Dibromo-3-chloropropane	2.50E-05	ND	0.05	6.0E-06	ok
Dichlorodifluoromethane (Freon-12; Halon)	1.4	ND	0.05	Below Standard	ok
1,1-Dichloroethane	0.7	ND	0.05	Below Standard	ok
1,2-Dichloroethane (ethylene dichloride)	0.00038	ND	0.05	6.0E-06	ok
1,1-Dichloroethylene (vinylidene chloride)	0.007	ND	0.05	6.0E-06	ok
1,2-Dichloropropane	0.00056	ND	0.05	6.0E-06	ok
Di-n-butyl (or dibutyl) phthalate (DBP)	0.7	ND	0.01	Below Standard	ok
Diethylphthalate (DEP)	5	ND	0.01	Below Standard	ok
Di(2-ethylhexyl) phthalate (DEHP)	0.003	ND	0.01	1.2E-06	ok
Di-n-octyl phthalate	0.14	ND	0.01	Below Standard	ok
P-dioxane (1,4-diethylene dioxide)	0.007		NT		
Dioxin	2.2E-10	ND	1.00E-09	1.2E-13	ok
Dissolved solids (total)	500		1,100	2.6E-01	ok
Diundecyl phthalate (Santicizer 711)	0.14		NT		
Endrin	0.002	ND	0.0012	Below Standard	ok
Epichlorohydrin (1-chloro-2,3-epoxypropane)	0.00354	ND	0.025	3.0E-06	ok
Ethylbenzene	0.029	ND	0.05	6.0E-06	ok
Ethylene dibromide (EDB; 1,2-dibromoethane)	4.00E-07	ND	0.00001	1.2E-09	ok

NOTES:
1. ND - Not Detected above indicated reporting limit
2. Initial concentration for "Not Detected" compounds set at one-half of the reporting limit.

Chemical	Standard (mg/l)	Laboratory Result (mg/l)		Estimated Concentration at Bowen Branch (mg/l)	Standard Met
Ethylene glycol	7	ND	10	1.2E-03	ok
Fluorene	0.28	ND	0.01	Below Standard	ok
Fluoride	2		1.6	Below Standard	ok
Foaming agents	0.5		NT		
Gross alpha (adjusted) particle activity (excluding radium-226 and uranium)	15 pCi/l		NT		
Heptachlor	8.00E-06	ND	0.001	1.2E-07	ok
Heptachlor epoxide	4.00E-06	ND	0.016	1.9E-06	ok
Heptane	2.1	ND	0.025	Below Standard	ok
Hexachlorobenzene (perchlorobenzene)	2.00E-05	ND	0.01	1.2E-06	ok
N-hexane	0.42	ND	0.025	Below Standard	ok
Iron	0.3		0.47	1.1E-04	ok
Lead	0.015		0.009	Below Standard	ok
Lindane	0.0002	ND	0.001	1.2E-07	ok
Manganese	0.05		7.1	1.7E-03	ok
Mercury	0.0011	ND	0.0005	Below Standard	ok
Metadichlorobenzene (1,3-dichlorobenzene)	0.62	ND	0.01	Below Standard	ok
Methoxychlor	0.035	ND	0.01	Below Standard	ok
Methylene chloride (dichloromethane)	0.005	ND	0.1	1.2E-05	ok
Methyl ethyl ketone (MEK; 2-butanone)	0.17	ND	1	1.2E-04	ok
Methyl tert-butyl ether (MTBE)	0.2	ND	0.025	Below Standard	ok
Naphthalene	0.021	ND	0.01	Below Standard	ok
Nickel	0.1		0.12	2.9E-05	ok
Nitrate	10	ND	0.2	Below Standard	ok
Nitrite	1		0.05	Below Standard	ok
Orthodichlorobenzene (1,2-dichlorobenzene)	0.62	ND	0.05	Below Standard	ok
Oxamyl	0.175		NT		
Paradichlorobenzene	0.075	ND	0.05	Below Standard	ok
Pentachlorophenol	0.0003	ND	0.05	6.0E-06	ok
pH	6.5 - 8.5		7.7		ok
Phenanthrene	0.21	ND	0.01	Below Standard	ok
Phenol	0.3		0.026	Below Standard	ok
Radium-226 and radium-228 (combined)	5 pCi/l		NT		
Selenium	0.05	ND	0.005	Below Standard	ok
Silver	0.018		0.1	2.4E-05	ok
Styrene (ethenylbenzene)	0.1	ND	0.05	Below Standard	ok
Sulfate	250		660	1.6E-01	ok
Tetrachloroethylene (perchloroethylene; PCE)	0.0007	ND	0.05	6.0E-06	ok
Toluene (methylbenzene)	1		0.054	Below Standard	ok
Toxaphene	3.10E-05	ND	0.0024	2.9E-07	ok
2,4,5-TP (Silvex)	0.05	ND	0.002	Below Standard	ok
Trans-1,2-dichloroethene	0.07	ND	0.05	Below Standard	ok
1,1,1-Trichloroethane (methyl chloroform)	0.2	ND	0.05	Below Standard	ok
Trichloroethylene (TCE)	0.0028	ND	0.05	6.0E-06	ok
Trichlorofluoromethane	2.1	ND	0.05	Below Standard	ok
Vinyl chloride (chloroethylene)	1.50E-05	ND	0.1	1.2E-05	ok
Xylenes (o-, m-, and p-)	0.53	ND	0.05	Below Standard	ok
Zinc	2.1		0.04	Below Standard	ok

NOTES:
1. ND - Not Detected above indicated reporting limit
2. Initial concentration for "Not Detected" compounds set at one-half of the reporting limit.

EPA *US Environmental Protection Agency • Office of Research and Development • NCEA*

THE US EPA TEF VALUES

The polychlorinated dibenzodioxins (CDDs) include 75 individual compounds, and the polychlorinated dibenzofurans (CDFs) include 135 individual compounds. These individual compounds are technically referred to as congeners. Only 7 of the 75 congeners of CDDs are thought to have dioxin-like toxicity; these are ones with chlorine substitutions in, at least, the 2,3,7,and 8 positions. Only 10 of the 135 possible congeners of CDFs are thought to have dioxin-like toxicity; these also are ones with substitutions in the 2,3,7, and 8 positions. There are 209 PCB congeners, of which only 13 are thought to have dioxin-like toxicity. These are PCBs with 4 or more chlorines with just 1 or no substitution in the ortho position. These compounds are sometimes referred to as coplanar, meaning that they can assume a flat configuration with rings in the same plane. These 30 dioxin-like compounds are often found in complex mixtures. For risk assessment purposes, a toxicity equivalency procedure was developed to describe the cumulative toxicity of these mixtures. This procedure involves assigning individual toxicity equivalency factors (TEFs) to the CDD, CDF, and PCB congeners. These TEF values have had international endorsement (U.S. EPA, 1989; Ahlborg, et.al., 1994). 2,3,7,8-TCDD is assigned a TEF of 1.0. All other congeners have lower TEF values ranging from 0.5 to 0.00001. Generally accepted TEF values for CDD/Fs and PCBs are shown in Table 1. Calculating the toxic equivalency (TEQ) of a mixture involves multiplying the concentration of individual congeners by their respective TEF. The sum of the TEQ concentrations for the individual congeners is the TEQ concentration for the mixture.

Of the 419 dioxin, furan, and PCB congeners, only these 30 are considered to have dioxin like toxicity. The following table lists the Toxic Equivalency Factors, or TEFs, of these congeners.

I. DIOXINs	
2,3,7,8-TCDD	1.0
1,2,3,7,8-PeCDD	0.5
1,2,3,4,7,8-HxCDD	0.1
1,2,3,6,7,8-HxCDD	0.1
1,2,3,7,8,9-HxCDD	0.1
1,2,3,4,6,7,8-HpCDD	0.01
1,2,3,4,6,7,8,9-OCDD	0.001
II. FURANs	
2,3,7,8-TCDF	0.1
1,2,3,7,8-PeCDF	0.05
2,3,4,7,8-PeCDF	0.5
1,2,3,4,7,8-HxCDF	0.1
1,2,3,6,7,8-HxCDF	0.1
1,2,3,7,8,9-HxCDF	0.1
2,3,4,6,7,8-HxCDF	0.1
1,2,3,4,6,7,8-HpCDF	0.01
1,2,3,4,7,8,9-HpCDF	0.01
1,2,3,4,6,7,8,9-OCDF	0.001
III. PCBs	
3,3',4,4'-TeCB (PCB 77)	0.0005
2,3,3',4,4'-PeCB (PCB 105)	0.0001
2,3,4,4',5-PeCB (PCB 114)	0.0005
2,3',4,4',5-PeCB (PCB 118)	0.0001
2',3,4,4',5-PeCB (PCB 123)	0.0001
3,3',4,4',5-PeCB (PCB 126)	0.1
2,3,3',4,4',5-HxCB (PCB 156)	0.0005
2,3,3',4,4',5'-HxCB (PCB 157)	0.0005
2,3',4,4',5,5'-HxCB (PCB 167)	0.00001
3,3',4,4',5,5'-HxCB (PCB 169)	0.01
2,2',3,3',4,4',5-HpCB (PCB 170)	0.0001
2,2',3,4,4',5,5'-HpCB (PCB 180)	0.00001
2,3,3',4,4',5,5'-HpCB (PCB 189)	0.0001

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