
ANNEXE B – Simulations HELP

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**
**          HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
**          HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)
**          DEVELOPED BY ENVIRONMENTAL LABORATORY
**          USAE WATERWAYS EXPERIMENT STATION
**          FOR USEPA RISK REDUCTION ENGINEERING LABORATORY
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PRECIPITATION DATA FILE: C:\HELP3\MAGOG-P.D4
TEMPERATURE DATA FILE: C:\HELP3\MAGOG-T.D7
SOLAR RADIATION DATA FILE: C:\HELP3\MAGOG-S.D13
EVAPOTRANSPIRATION DATA: C:\HELP3\MAGOG-E.D11
SOIL AND DESIGN DATA FILE: c:\HELP3\MAG-EXPA.D10
OUTPUT DATA FILE: C:\HELP3\MAGEXPOA.OUT

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TIME: 10:17 DATE: 9/21/2005

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TITLE: LET MAGOG - CET EXPLOITATION - 3,0 DE MR
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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 5

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THICKNESS = 20.00 CM
POROSITY = 0.4570 VOL/VOL
FIELD CAPACITY = 0.1310 VOL/VOL
WILTING POINT = 0.0580 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.1250 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC
NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 3.00
FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

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THICKNESS = 300.00 CM
POROSITY = 0.6710 VOL/VOL
FIELD CAPACITY = 0.2920 VOL/VOL
WILTING POINT = 0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2000 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC

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LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

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THICKNESS = 50.00 CM
POROSITY = 0.3970 VOL/VOL
FIELD CAPACITY = 0.0320 VOL/VOL

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WILTING POINT = 0.0130 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.0320 VOL/VOL
 EFFECTIVE SAT. HYD. COND. = 0.500000000000 CM/SEC
 SLOPE = 2.00 PERCENT
 DRAINAGE LENGTH = 50.0 METERS

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
 MATERIAL TEXTURE NUMBER 35
 THICKNESS = 0.15 CM
 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/HECTARE
 FML INSTALLATION DEFECTS = 0.00 HOLES/HECTARE
 FML PLACEMENT QUALITY = 3 - GOOD

LAYER 5

TYPE 2 - LATERAL DRAINAGE LAYER
 MATERIAL TEXTURE NUMBER 20
 THICKNESS = 0.50 CM
 POROSITY = 0.8500 VOL/VOL
 FIELD CAPACITY = 0.0100 VOL/VOL
 WILTING POINT = 0.0050 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL
 EFFECTIVE SAT. HYD. COND. = 10.0000000000 CM/SEC
 SLOPE = 2.00 PERCENT
 DRAINAGE LENGTH = 50.0 METERS

LAYER 6

TYPE 4 - FLEXIBLE MEMBRANE LINER
 MATERIAL TEXTURE NUMBER 35
 THICKNESS = 0.15 CM
 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/HECTARE
 FML INSTALLATION DEFECTS = 0.00 HOLES/HECTARE
 FML PLACEMENT QUALITY = 4 - POOR

LAYER 7

TYPE 3 - BARRIER SOIL LINER
 MATERIAL TEXTURE NUMBER 17
 THICKNESS = 0.60 CM
 POROSITY = 0.7500 VOL/VOL
 FIELD CAPACITY = 0.7470 VOL/VOL
 WILTING POINT = 0.4000 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.7500 VOL/VOL
 EFFECTIVE SAT. HYD. COND. = 0.300000003000E-08 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
 SOIL DATA BASE USING SOIL TEXTURE # 5 WITH BARE

GROUND CONDITIONS, A SURFACE SLOPE OF 5. % AND
A SLOPE LENGTH OF 100. METERS.

SCS RUNOFF CURVE NUMBER = 83.80
 FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT
 AREA PROJECTED ON HORIZONTAL PLANE = 1.0000 HECTARES
 EVAPORATIVE ZONE DEPTH = 20.0 CM
 INITIAL WATER IN EVAPORATIVE ZONE = 2.500 CM
 UPPER LIMIT OF EVAPORATIVE STORAGE = 9.140 CM
 LOWER LIMIT OF EVAPORATIVE STORAGE = 1.160 CM
 INITIAL SNOW WATER = 0.230 CM
 INITIAL WATER IN LAYER MATERIALS = 64.555 CM
 TOTAL INITIAL WATER = 64.785 CM
 TOTAL SUBSURFACE INFLOW = 0.00 MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
BURLINGTON VERMONT

STATION LATITUDE = 45.25 DEGREES
 MAXIMUM LEAF AREA INDEX = 2.00
 START OF GROWING SEASON (JULIAN DATE) = 130
 END OF GROWING SEASON (JULIAN DATE) = 275
 EVAPORATIVE ZONE DEPTH = 20.0 CM
 AVERAGE ANNUAL WIND SPEED = 14.00 KPH
 AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 67.00 %
 AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 67.00 %
 AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 73.00 %
 AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 73.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CARIBOU MAINE

NORMAL MEAN MONTHLY PRECIPITATION (MM)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
85.3	62.3	80.2	79.1	98.5	109.6
118.6	119.7	99.0	93.5	90.7	90.5

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR BURLINGTON VERMONT

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES CELSIUS)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
-10.6	-8.8	-2.9	4.6	12.0	16.9
19.4	18.2	13.3	7.2	0.6	-6.9

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR BURLINGTON VERMONT
AND STATION LATITUDE = 45.25 DEGREES

AVERAGE MONTHLY VALUES (MM) FOR YEARS 1 THROUGH 2

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	96.55 120.70	82.80 99.20	114.45 134.25	56.65 84.35	71.30 109.20	101.85 114.05
STD. DEVIATIONS	29.49	22.49	68.24	20.86	2.12	7.14

RUNOFF 20.36 63.36 118.44 61.16 5.94 33.02

TOTALS 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

EVAPOTRANSPIRATION 0.000 0.000 0.000 0.000 0.000 0.000 0.000

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS 11.741 10.831 10.165 33.756 66.406 85.668

STD. DEVIATIONS 1.078 1.552 2.155 33.194 3.880 5.052

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 2.1343 0.4931 2.3431 165.8370 56.5263 14.4226

STD. DEVIATIONS 2.9266 0.8644 29.3763 52.6491 42.0911 77.4341

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 3.0183 0.6973 3.3136 234.5289 79.9402 20.3966

STD. DEVIATIONS 4.1392 1.2225 17.9618 66.8310 20.6756 19.4857

PERCOLATION/LEAKAGE THROUGH LAYER 6

TOTALS 0.0000 0.0000 0.0000 0.0001 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

LATERAL DRAINAGE COLLECTED FROM LAYER 7

TOTALS 0.0000 0.0000 0.0000 0.0001 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0001 0.0000 0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (CM)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES 0.0199 0.0051 0.0219 1.6003 0.5279 0.1392

STD. DEVIATIONS 0.0273 0.0081 0.2835 0.4917 0.4062 0.7231

DAILY AVERAGE HEAD ON TOP OF LAYER 6

AVERAGES 0.0282 0.0072 0.0309 2.2631 0.7465 0.1968

STD. DEVIATIONS 0.0387 0.0114 0.1733 0.6241 0.1995 0.1820

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 2

PRECIPITATION 1185.35 (136.685) 11853.5 100.00

MM CU. METERS PERCENT

1185.35 (136.685) 11853.5 100.00

RUNOFF	0.000	(0.0000)	0.00	0.000
EVAPOTRANSPIRATION	532.084	(19.0859)	5320.84	44.888
LATERAL DRAINAGE COLLECTED FROM LAYER 3	447.09824	(391.88837)	4470.982	37.71867
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00017	(0.00014)	0.002	0.00001
AVERAGE HEAD ON TOP OF LAYER 4	3.545	(3.116)		
LATERAL DRAINAGE COLLECTED FROM LAYER 5	0.00014	(0.00013)	0.001	0.00001
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.00003	(0.00002)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 6	0.000	(0.000)		
CHANGE IN WATER STORAGE	206.168	(9.2960)	2061.68	17.393

PEAK DAILY VALUES FOR YEARS	1 THROUGH 2	
	(MM)	(CU. METERS)
PRECIPITATION	45.20	452.000
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 3	24.32697	243.26968
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000008	0.00008
AVERAGE HEAD ON TOP OF LAYER 4	70.423	
MAXIMUM HEAD ON TOP OF LAYER 4	112.826	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	9.9 METERS	
DRAINAGE COLLECTED FROM LAYER 5	0.00001	0.00008
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 6	0.000	
MAXIMUM HEAD ON TOP OF LAYER 6	0.333	
LOCATION OF MAXIMUM HEAD IN LAYER 5 (DISTANCE FROM DRAIN)	0.0 METERS	
SNOW WATER	319.63	3196.3071
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.4570
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.0580

*** 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.

FINAL WATER STORAGE AT END OF YEAR 2

LAYER	(CM)	(VOL/VOL)
1	3.6011	0.1801
2	87.5999	0.2920
3	2.2344	0.0447
4	0.0000	0.0000
5	0.0050	0.0100
6	0.0000	0.0000
7	0.4500	0.7500
SNOW WATER	12.128	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **
** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **
** DEVELOPED BY ENVIRONMENTAL LABORATORY **
** USAE WATERWAYS EXPERIMENT STATION **
** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **
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PRECIPITATION DATA FILE: C:\HELP3\MAGOG-P.D4
TEMPERATURE DATA FILE: C:\HELP3\MAGOG-T.D7
SOLAR RADIATION DATA FILE: C:\HELP3\MAGOG-S.D13
EVAPOTRANSPIRATION DATA: C:\HELP3\MAGOG-E.D11
SOIL AND DESIGN DATA FILE: C:\HELP3\MAG-EXPB.D10
OUTPUT DATA FILE: C:\HELP3\MAGEXPOB.OUT

TIME: 10:22 DATE: 9/21/2005

TITLE: LET MAGOG - CET EXPLOITATION MOYENNE - 15 M DE MR

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 5
THICKNESS = 20.00 CM
POROSITY = 0.4570 VOL/VOL
FIELD CAPACITY = 0.1310 VOL/VOL
WILTING POINT = 0.0580 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.1250 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC
NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 3.00
FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0
THICKNESS = 1500.00 CM
POROSITY = 0.6710 VOL/VOL
FIELD CAPACITY = 0.2920 VOL/VOL
WILTING POINT = 0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2250 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.600000028000E-03 CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0
THICKNESS = 50.00 CM
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. = 0.500000000000 CM/SEC
 SLOPE = 2.00 PERCENT
 DRAINAGE LENGTH = 50.0 METERS

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.15 CM
 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/HECTARE
 FML INSTALLATION DEFECTS = 0.00 HOLES/HECTARE
 FML PLACEMENT QUALITY = 3 - GOOD

LAYER 5

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS = 0.50 CM
 POROSITY = 0.8500 VOL/VOL
 FIELD CAPACITY = 0.0100 VOL/VOL
 WILTING POINT = 0.0050 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL
 EFFECTIVE SAT. HYD. COND. = 10.0000000000 CM/SEC
 SLOPE = 2.00 PERCENT
 DRAINAGE LENGTH = 50.0 METERS

LAYER 6

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.15 CM
 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/HECTARE
 FML INSTALLATION DEFECTS = 0.00 HOLES/HECTARE
 FML PLACEMENT QUALITY = 4 - POOR

LAYER 7

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 17

THICKNESS = 0.60 CM
 POROSITY = 0.7500 VOL/VOL
 FIELD CAPACITY = 0.7470 VOL/VOL
 WILTING POINT = 0.4000 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.7500 VOL/VOL
 EFFECTIVE SAT. HYD. COND. = 0.300000003000E-08 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 5 WITH BARE

GROUND CONDITIONS, A SURFACE SLOPE OF 5. % AND
A SLOPE LENGTH OF 100. METERS.

SCS RUNOFF CURVE NUMBER = 83.80
 FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT
 AREA PROJECTED ON HORIZONTAL PLANE = 1.0000 HECTARES
 EVAPORATIVE ZONE DEPTH = 20.0 CM
 INITIAL WATER IN EVAPORATIVE ZONE = 2.500 CM
 UPPER LIMIT OF EVAPORATIVE STORAGE = 9.140 CM
 LOWER LIMIT OF EVAPORATIVE STORAGE = 1.160 CM
 INITIAL SNOW WATER = 0.230 CM
 INITIAL WATER IN LAYER MATERIALS = 342.055 CM
 TOTAL INITIAL WATER = 342.285 CM
 TOTAL SUBSURFACE INFLOW = 0.00 MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
BURLINGTON VERMONT

STATION LATITUDE = 45.25 DEGREES
 MAXIMUM LEAF AREA INDEX = 2.00
 START OF GROWING SEASON (JULIAN DATE) = 130
 END OF GROWING SEASON (JULIAN DATE) = 275
 EVAPORATIVE ZONE DEPTH = 20.0 CM
 AVERAGE ANNUAL WIND SPEED = 14.00 KPH
 AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 67.00 %
 AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 67.00 %
 AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 73.00 %
 AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 73.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CARIBOU MAINE

NORMAL MEAN MONTHLY PRECIPITATION (MM)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
85.3	62.3	80.2	79.1	98.5	109.6
118.6	119.7	99.0	93.5	90.7	90.5

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR BURLINGTON VERMONT

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES CELSIUS)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
-10.6	-8.8	-2.9	4.6	12.0	16.9
19.4	18.2	13.3	7.2	0.6	-6.9

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR BURLINGTON VERMONT
AND STATION LATITUDE = 45.25 DEGREES

AVERAGE MONTHLY VALUES (MM) FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	92.00	89.62	89.42	64.52	57.72	116.34
	123.52	127.84	114.24	88.86	90.80	93.64
STD. DEVIATIONS	31.07	19.57	46.79	26.00	13.42	28.77

	24.54	49.74	62.26	35.30	24.64	30.18
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	11.979	11.142	11.696	25.365	58.393	81.967
	111.512	80.943	66.222	34.182	25.045	10.890
STD. DEVIATIONS	1.096	1.565	3.118	18.880	10.808	13.622
	20.175	36.079	7.292	9.537	2.788	1.499
LATERAL DRAINAGE COLLECTED FROM LAYER 3						

TOTALS	36.0864	29.7918	18.4397	18.4315	25.2370	37.9201
	31.7741	34.1064	21.7277	35.9185	22.3068	34.0388
STD. DEVIATIONS	33.3877	27.6002	24.4997	27.1155	26.6105	35.5476
	33.4850	33.5924	21.5079	27.2437	13.3079	20.9560
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 5						

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 7						

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 (CM)

DAILY AVERAGE HEAD ON TOP OF LAYER 4						

AVERAGES	0.3370	0.3040	0.1722	0.1779	0.2357	0.3659
	0.2967	0.3185	0.2097	0.3354	0.2153	0.3179
STD. DEVIATIONS	0.3118	0.2808	0.2288	0.2617	0.2485	0.3430
	0.3127	0.3137	0.2075	0.2544	0.1284	0.1957
DAILY AVERAGE HEAD ON TOP OF LAYER 6						

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

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5						

	MM		CU. METERS		PERCENT	
PRECIPITATION	1148.52	(85.814)	11485.2		100.00	

RUNOFF	0.000	(0.0000)	0.00	0.000
EVAPOTRANSPIRATION	529.336	(10.1892)	5293.36	46.088
LATERAL DRAINAGE COLLECTED FROM LAYER 3	345.77875	(285.15002)	3457.788	30.10646
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00012	(0.00010)	0.001	0.00001
AVERAGE HEAD ON TOP OF LAYER 4	2.738	(2.259)		
LATERAL DRAINAGE COLLECTED FROM LAYER 5	0.00009	(0.00007)	0.001	0.00001
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.00004	(0.00003)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 6	0.000	(0.000)		
CHANGE IN WATER STORAGE	273.406	(12.6498)	2734.06	23.805

PEAK DAILY VALUES FOR YEARS	1 THROUGH 5	
	(MM)	(CU. METERS)
PRECIPITATION	50.30	503.000
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 3	4.01018	40.10183
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000001	0.00001
AVERAGE HEAD ON TOP OF LAYER 4	11.609	
MAXIMUM HEAD ON TOP OF LAYER 4	21.677	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	3.3 METERS	
DRAINAGE COLLECTED FROM LAYER 5	0.00000	0.00001
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 6	0.000	
MAXIMUM HEAD ON TOP OF LAYER 6	0.127	
LOCATION OF MAXIMUM HEAD IN LAYER 5 (DISTANCE FROM DRAIN)	0.0 METERS	
SNOW WATER	454.53	4545.2852
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.4570
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.0580

*** 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.

FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(CM)	(VOL/VOL)
1	4.1151	0.2058
2	468.8779	0.3126
3	2.9732	0.0595
4	0.0000	0.0000
5	0.0050	0.0100
6	0.0000	0.0000
7	0.4500	0.7500
SNOW WATER	2.566	

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**
** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **
** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **
** DEVELOPED BY ENVIRONMENTAL LABORATORY **
** USAE WATERWAYS EXPERIMENT STATION **
** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **
**
**

PRECIPITATION DATA FILE: C:\HELP3\MAGOG-P.D4
TEMPERATURE DATA FILE: C:\HELP3\MAGOG-T.D7
SOLAR RADIATION DATA FILE: C:\HELP3\MAGOG-S.D13
EVAPOTRANSPIRATION DATA: C:\HELP3\MAGOG-E.D11
SOIL AND DESIGN DATA FILE: c:\HELP3\MAG-FER1.D10
OUTPUT DATA FILE: C:\HELP3\MAGOFER1.OUT

TIME: 9:31 DATE: 9/21/2005

TITLE: LET MAGOG - CET POSTFERMETURE - 15 M DE MR

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 5

THICKNESS = 15.00 CM
POROSITY = 0.4570 VOL/VOL
FIELD CAPACITY = 0.1310 VOL/VOL
WILTING POINT = 0.0580 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.1310 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.10000005000E-02 CM/SEC
NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 3.00
FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 1

THICKNESS = 45.00 CM
POROSITY = 0.4170 VOL/VOL
FIELD CAPACITY = 0.0450 VOL/VOL
WILTING POINT = 0.0180 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0450 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.999999978000E-02 CM/SEC
SLOPE = 5.00 PERCENT
DRAINAGE LENGTH = 200.0 METERS

LAYER 3

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.10 CM
 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/HECTARE
 FML INSTALLATION DEFECTS = 0.00 HOLES/HECTARE
 FML PLACEMENT QUALITY = 4 - POOR

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 5

THICKNESS = 30.00 CM
 POROSITY = 0.4570 VOL/VOL
 FIELD CAPACITY = 0.1310 VOL/VOL
 WILTING POINT = 0.0580 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.2058 VOL/VOL
 EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS = 1500.00 CM
 POROSITY = 0.6710 VOL/VOL
 FIELD CAPACITY = 0.2920 VOL/VOL
 WILTING POINT = 0.0770 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.3123 VOL/VOL
 EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC

LAYER 6

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS = 50.00 CM
 POROSITY = 0.3970 VOL/VOL
 FIELD CAPACITY = 0.0320 VOL/VOL
 WILTING POINT = 0.0130 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.0593 VOL/VOL
 EFFECTIVE SAT. HYD. COND. = 0.500000000000 CM/SEC
 SLOPE = 2.00 PERCENT
 DRAINAGE LENGTH = 50.0 METERS

LAYER 7

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.15 CM
 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/HECTARE
 FML INSTALLATION DEFECTS = 0.00 HOLES/HECTARE
 FML PLACEMENT QUALITY = 3 - GOOD

LAYER 8

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.50	CM
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	10.0000000000	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	50.0	METERS

LAYER 9

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.15	CM
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/HECTARE
FML INSTALLATION DEFECTS	=	0.00	HOLES/HECTARE
FML PLACEMENT QUALITY	=	4	- POOR

LAYER 10

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.60	CM
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7500	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000003000E-08	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 5 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 5.% AND A SLOPE LENGTH OF 200. METERS.

SCS RUNOFF CURVE NUMBER	=	83.20	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.0000	HECTARES
EVAPORATIVE ZONE DEPTH	=	20.0	CM
INITIAL WATER IN EVAPORATIVE ZONE	=	2.190	CM
UPPER LIMIT OF EVAPORATIVE STORAGE	=	8.940	CM
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.960	CM
INITIAL SNOW WATER	=	0.230	CM
INITIAL WATER IN LAYER MATERIALS	=	482.034	CM
TOTAL INITIAL WATER	=	482.264	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM BURLINGTON VERMONT

STATION LATITUDE	=	45.25	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	130	
END OF GROWING SEASON (JULIAN DATE)	=	275	
EVAPORATIVE ZONE DEPTH	=	20.0	CM
AVERAGE ANNUAL WIND SPEED	=	14.00	KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	67.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	67.00	%

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 73.00 %
 AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 73.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
 COEFFICIENTS FOR CARIBOU MAINE

NORMAL MEAN MONTHLY PRECIPITATION (MM)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
85.3	62.3	80.2	79.1	98.5	109.6
118.6	119.7	99.0	93.5	90.7	90.5

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
 COEFFICIENTS FOR BURLINGTON VERMONT

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES CELSIUS)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
-10.6	-8.8	-2.9	4.6	12.0	16.9
19.4	18.2	13.3	7.2	0.6	-6.9

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
 COEFFICIENTS FOR BURLINGTON VERMONT
 AND STATION LATITUDE = 45.25 DEGREES

AVERAGE MONTHLY VALUES (MM) FOR YEARS 1 THROUGH 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	99.55 121.28	81.99 103.10	73.25 99.40	53.67 84.08	80.77 93.25	107.07 88.36
STD. DEVIATIONS	27.70 38.71	22.39 43.80	43.75 43.11	22.34 32.39	34.55 30.75	32.61 34.65
RUNOFF						
TOTALS	1.167 2.230	3.711 0.819	129.967 0.866	162.286 1.127	2.054 10.742	2.017 1.619
STD. DEVIATIONS	4.520 5.922	13.835 1.194	86.450 1.595	121.609 2.498	4.487 21.520	2.557 3.300
EVAPOTRANSPIRATION						
TOTALS	11.287 94.706	10.405 75.941	13.377 57.945	24.260 35.711	62.022 20.248	80.120 10.659
STD. DEVIATIONS	1.640 20.798	1.839 24.272	3.187 13.456	12.322 7.280	17.697 6.077	18.651 1.792
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	20.9071 22.4220	13.4735 22.6402	10.5222 24.9595	10.7264 28.1601	20.6857 34.6000	20.8861 32.0304
STD. DEVIATIONS	10.6540 7.4686	6.8233 11.5988	5.3757 9.6594	4.9017 11.2885	4.6681 13.4919	5.9867 12.5597
PERCOLATION/LEAKAGE THROUGH LAYER 3						
TOTALS	0.0008 0.0009	0.0005 0.0009	0.0004 0.0010	0.0004 0.0011	0.0008 0.0014	0.0008 0.0013
STD. DEVIATIONS	0.0004	0.0003	0.0002	0.0002	0.0002	0.0002

	0.0003	0.0005	0.0004	0.0005	0.0006	0.0005
LATERAL DRAINAGE COLLECTED FROM LAYER 6						
TOTALS	6.5360	6.1634	5.8714	3.3359	0.2054	0.1225
	0.1038	0.0906	0.0827	0.0788	0.0651	0.0609
STD. DEVIATIONS	25.0844	23.6782	22.5431	12.7418	0.6291	0.3277
	0.2613	0.2193	0.1876	0.1735	0.1514	0.1418
PERCOLATION/LEAKAGE THROUGH LAYER 7						
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 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
PERCOLATION/LEAKAGE THROUGH LAYER 10						
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 (CM)

DAILY AVERAGE HEAD ON TOP OF LAYER 3						
AVERAGES	15.6516	11.0933	7.8773	8.2978	15.4859	16.1571
	16.7858	16.9492	19.3083	21.0815	27.0359	23.9830
STD. DEVIATIONS	7.9759	5.6598	4.0244	3.7919	3.4947	4.6312
	5.5912	8.6832	7.4723	8.4509	10.9669	9.4084
DAILY AVERAGE HEAD ON TOP OF LAYER 7						
AVERAGES	0.0610	0.0637	0.0548	0.0322	0.0019	0.0012
	0.0010	0.0008	0.0008	0.0007	0.0006	0.0006
STD. DEVIATIONS	0.2342	0.2448	0.2105	0.1230	0.0059	0.0032
	0.0024	0.0020	0.0018	0.0016	0.0015	0.0013
DAILY AVERAGE HEAD ON TOP OF LAYER 9						
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

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 15				
	MM		CU. METERS	PERCENT
PRECIPITATION	1085.76	(130.778)	10857.6	100.00
RUNOFF	318.606	(88.5758)	3186.06	29.344
EVAPOTRANSPIRATION	496.680	(45.4903)	4966.80	45.745
LATERAL DRAINAGE COLLECTED FROM LAYER 2	262.01324	(64.14925)	2620.132	24.13178

PERCOLATION/LEAKAGE THROUGH LAYER 3	0.01052 (0.00259)	0.105	0.00097
AVERAGE HEAD ON TOP OF LAYER 3	166.422 (40.921)		
LATERAL DRAINAGE COLLECTED FROM LAYER 6	22.71646 (86.01807)	227.165	2.09222
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.00007 (0.00002)	0.001	0.00001
AVERAGE HEAD ON TOP OF LAYER 7	0.183 (0.693)		
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.00005 (0.00002)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.00002 (0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 9	0.000 (0.000)		
CHANGE IN WATER STORAGE	-14.256 (2.6179)	-142.56	-1.313

PEAK DAILY VALUES FOR YEARS	1 THROUGH	15
	(MM)	(CU. METERS)
PRECIPITATION	72.00	720.000
RUNOFF	131.156	1311.5623
DRAINAGE COLLECTED FROM LAYER 2	2.05436	20.54357
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.000099	0.00099
AVERAGE HEAD ON TOP OF LAYER 3	572.646	
MAXIMUM HEAD ON TOP OF LAYER 3	941.429	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	35.2 METERS	
DRAINAGE COLLECTED FROM LAYER 6	3.76259	37.62592
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000001	0.00001
AVERAGE HEAD ON TOP OF LAYER 7	10.892	
MAXIMUM HEAD ON TOP OF LAYER 7	20.400	
LOCATION OF MAXIMUM HEAD IN LAYER 6 (DISTANCE FROM DRAIN)	3.2 METERS	
DRAINAGE COLLECTED FROM LAYER 8	0.00000	0.00001
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 9	0.000	
MAXIMUM HEAD ON TOP OF LAYER 9	0.129	
LOCATION OF MAXIMUM HEAD IN LAYER 8 (DISTANCE FROM DRAIN)	0.0 METERS	
SNOW WATER	454.53	4545.2852
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.4109
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.0480

*** 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.

FINAL WATER STORAGE AT END OF YEAR 15

LAYER	(CM)	(VOL/VOL)
1	2.5284	0.1686
2	10.9515	0.2434
3	0.0000	0.0000
4	3.9300	0.1310
5	438.0000	0.2920
6	1.6000	0.0320
7	0.0000	0.0000
8	0.0050	0.0100
9	0.0000	0.0000
10	0.4500	0.7500
SNOW WATER	3.415	

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**
**          HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE          **
**          HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)              **
**          DEVELOPED BY ENVIRONMENTAL LABORATORY                  **
**          USAE WATERWAYS, EXPERIMENT STATION                    **
**          FOR USEPA RISK REDUCTION ENGINEERING LABORATORY        **
**
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PRECIPITATION DATA FILE: C:\HELP3\MAGOG-P.D4
TEMPERATURE DATA FILE:  C:\HELP3\MAGOG-T.D7
SOLAR RADIATION DATA FILE: C:\HELP3\MAGOG-S.D13
EVAPOTRANSPIRATION DATA: C:\HELP3\MAGOG-E.D11
SOIL AND DESIGN DATA FILE: c:\HELP3\MAG-IPN.D10
OUTPUT DATA FILE:       C:\HELP3\MAG-OPN.OUT

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TIME: 9:46 DATE: 9/21/2005

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*****
TITLE: LET MAGOG - COUCHE DRAINANTE EXPOSEE - 50 CM
*****

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE SPECIFIED BY THE USER.

LAYER 1

```

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 1
THICKNESS = 1.00 CM
POROSITY = 0.4170 VOL/VOL
FIELD CAPACITY = 0.0450 VOL/VOL
WILTING POINT = 0.0180 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0320 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.999999978000E-02 CM/SEC
NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 3.00
FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

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LAYER 2

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TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0
THICKNESS = 50.00 CM
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. = 0.500000000000 CM/SEC
SLOPE = 2.00 PERCENT
DRAINAGE LENGTH = 50.0 METERS

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LAYER 3

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TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

```


THICKNESS	=	0.15	CM
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/HECTARE
FML INSTALLATION DEFECTS	=	0.00	HOLES/HECTARE
FML PLACEMENT QUALITY	=	3	- GOOD

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.50	CM
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	10.0000000000	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	50.0	METERS

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.15	CM
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/HECTARE
FML INSTALLATION DEFECTS	=	0.00	HOLES/HECTARE
FML PLACEMENT QUALITY	=	4	- POOR

LAYER 6

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.60	CM
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7500	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000003000E-08	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 1 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 5.% AND A SLOPE LENGTH OF 100. METERS.

SCS RUNOFF CURVE NUMBER	=	73.50	
FRACTION OF AREA ALLOWING RUNOFF	=	0.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.0000	HECTARES
EVAPORATIVE ZONE DEPTH	=	20.0	CM
INITIAL WATER IN EVAPORATIVE ZONE	=	0.640	CM
UPPER LIMIT OF EVAPORATIVE STORAGE	=	7.960	CM
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.265	CM
INITIAL SNOW WATER	=	0.230	CM
INITIAL WATER IN LAYER MATERIALS	=	2.087	CM
TOTAL INITIAL WATER	=	2.317	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
BURLINGTON VERMONT

STATION LATITUDE = 45.25 DEGREES
 MAXIMUM LEAF AREA INDEX = 2.00
 START OF GROWING SEASON (JULIAN DATE) = 130
 END OF GROWING SEASON (JULIAN DATE) = 275
 EVAPORATIVE ZONE DEPTH = 20.0 CM
 AVERAGE ANNUAL WIND SPEED = 14.00 KPH
 AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 67.00 %
 AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 67.00 %
 AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 73.00 %
 AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 73.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CARIBOU MAINE

NORMAL MEAN MONTHLY PRECIPITATION (MM)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
85.3	62.3	80.2	79.1	98.5	109.6
118.6	119.7	99.0	93.5	90.7	90.5

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR BURLINGTON VERMONT

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES CELSIUS)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
-10.6	-8.8	-2.9	4.6	12.0	16.9
19.4	18.2	13.3	7.2	0.6	-6.9

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR BURLINGTON VERMONT
AND STATION LATITUDE = 45.25 DEGREES

AVERAGE MONTHLY VALUES (MM) FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	92.00	89.62	89.42	64.52	57.72	116.34
	123.52	127.84	114.24	88.86	90.80	93.64
STD. DEVIATIONS	31.07	19.57	46.79	26.00	13.42	28.77
	24.54	49.74	62.26	35.30	24.64	30.18
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	11.979	11.142	11.683	16.640	33.313	55.628
	70.844	56.566	52.780	28.459	26.276	10.939

STD. DEVIATIONS	1.096	1.565	3.118	11.126	8.533	14.020
	9.297	21.999	13.931	11.960	3.407	1.489

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS	0.0000	0.0000	116.0105	224.2286	42.5401	50.7090
	58.1542	55.7839	76.9071	53.9301	67.5737	10.5169
STD. DEVIATIONS	0.0000	0.0000	122.3314	177.3008	33.2053	21.6036
	27.4057	39.7172	53.0164	26.3210	24.6492	11.6467

PERCOLATION/LEAKAGE THROUGH LAYER 3

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

LATERAL DRAINAGE COLLECTED FROM LAYER 4

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

PERCOLATION/LEAKAGE THROUGH 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

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (CM)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	0.0000	0.0000	1.0827	2.1632	0.3972	0.4893
	0.5431	0.5209	0.7421	0.5036	0.6521	0.0982
STD. DEVIATIONS	0.0000	0.0000	1.1414	1.7100	0.3101	0.2085
	0.2559	0.3709	0.5116	0.2458	0.2379	0.1088

DAILY AVERAGE HEAD ON TOP OF LAYER 5

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

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	MM		CU. METERS	PERCENT
PRECIPITATION	1148.52	(85.814)	11485.2	100.00
RUNOFF	0.000	(0.0000)	0.00	0.000
EVAPOTRANSPIRATION	386.249	(15.4497)	3862.49	33.630
LATERAL DRAINAGE COLLECTED FROM LAYER 2	756.35413	(107.49107)	7563.541	65.85468
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.00027	(0.00004)	0.003	0.00002
AVERAGE HEAD ON TOP OF LAYER 3	5.994	(0.856)		

LATERAL DRAINAGE COLLECTED FROM LAYER 4	0.00024 (0.00004)	0.002	0.00002
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.00003 (0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	0.000 (0.000)		
CHANGE IN WATER STORAGE	5.916 (2.5933)	59.16	0.515

PEAK DAILY VALUES FOR YEARS 1 THROUGH 5		
	(MM)	(CU. METERS)
PRECIPITATION	50.30	503.000
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	75.50713	755.07129
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.000025	0.00025
AVERAGE HEAD ON TOP OF LAYER 3	218.164	
MAXIMUM HEAD ON TOP OF LAYER 3	289.968	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	16.8 METERS	
DRAINAGE COLLECTED FROM LAYER 4	0.00002	0.00024
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	0.000	
MAXIMUM HEAD ON TOP OF LAYER 5	0.589	
LOCATION OF MAXIMUM HEAD IN LAYER 4 (DISTANCE FROM DRAIN)	0.0 METERS	
SNOW WATER	454.53	4545.2852
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.3980
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.0132

*** 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.

FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(CM)	(VOL/VOL)
1	0.0726	0.0726
2	2.1811	0.0436
3	0.0000	0.0000
4	0.0050	0.0100
5	0.0000	0.0000
6	0.4500	0.7500
SNOW WATER	2.566	
