APPENDIX G

HELP MODELING RESULTS

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE (HELP)

The Hydrologic Evaluation of Landfill Performance (HELP) model was used to evaluate alternative cap designs proposed for use on repositories to be constructed in the UBMC Engineering Evaluation/Cost Analysis. The HELP model provides estimates of the effectiveness of various cap designs for minimizing infiltration to underlying repository fill (mine waste/soils) from incident annual precipitation, and thus minimizing generation of leachate.

Two simulations were conducted using the HELP model: one to analyze a 12-inch soil cap, and a second to evaluate an engineered composite cap consisting of a 60 mil HDPE liner, overlaying by a 200 mil drainage net, overlain by a 24-inch soil cover. Model parameters are summarized in the attached model output files. Key input parameters for the model included:

1. Average Annual Total Precipitation = 17.98 inches;
2. Hydraulic conductivity (K) of cover soil layer = 10^{-4} cm/sec;
3. K of the 60-mil LPDE liner = 0.4×10^{-12} cm/sec;
4. K of the geonet layer = 10 cm/sec;
5. Evaporative zone depth = 14 inches;
6. Runoff curve number CN (estimated from soil type, vegetative cover, slope, and slope length) = 82.90; and
7. Assumed slope length of 300 ft and an area of 10 acres.

The HELP model simulation was set to the maximum simulation period of 20 years. Output files from the modeling analysis are attached. Results for the soil cap option show that the 12-inch soil cap would reduce annual infiltration to the underlying mine waste to 4.9% of incident precipitation on an annual average basis over a 20-year period, and model results for the lined scenario indicated that the annual infiltration to the underlying mine waste would be reduced to 0.0002% of incident precipitation on an annual average basis over a 20-year period (Appendix A).

Results of the HELP model analysis are preliminary and are for comparison purposes only. The model will be refined for final design once the location and size of the repository are determined.

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**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**               HELP MODEL VERSION 3.01   (14 OCTOBER 1994)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:     U:\HELP\UBMC4.D4
TEMPERATURE DATA FILE:       U:\HELP\UBMC7.D7
SOLAR RADIATION DATA FILE:   U:\HELP\UBMC13.D13
EVAPOTRANSPIRATION DATA:     U:\HELP\UBMC11.D11
SOIL AND DESIGN DATA FILE:   U:\HELP\DATA10.D10
OUTPUT DATA FILE:            U:\HELP\UBMCLINE.OUT


TIME:   7:49     DATE:   6/ 8/2006


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     TITLE:  UBMC REPOSITORY - 60MIL HDPE LINER WITH GEONET & 24" SOIL COVER

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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
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                     TYPE 1 - VERTICAL PERCOLATION LAYER
                        MATERIAL TEXTURE NUMBER   9
        THICKNESS                    =     24.00   INCHES
        POROSITY                     =      0.5010 VOL/VOL
        FIELD CAPACITY               =      0.2840 VOL/VOL
        WILTING POINT                =      0.1350 VOL/VOL
        INITIAL SOIL WATER CONTENT   =      0.2102 VOL/VOL
        EFFECTIVE SAT. HYD. COND.    =  0.190000006000E-03 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  20
        THICKNESS                    =      0.06   INCHES
        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                        =     28.60   PERCENT
        DRAINAGE LENGTH              =    300.0    FEET


                                LAYER  3
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                     TYPE 3 - BARRIER SOIL LINER
                        MATERIAL TEXTURE NUMBER  37
        THICKNESS                    =      0.03   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.    =  0.199999999000E-10 CM/SEC
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LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 43

THICKNESS	=	120.00	INCHES
POROSITY	=	0.4190	VOL/VOL
FIELD CAPACITY	=	0.3200	VOL/VOL
WILTING POINT	=	0.1800	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3007	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.189999992000E-04	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 9 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 28.% AND A SLOPE LENGTH OF 300. FEET.

SCS RUNOFF CURVE NUMBER	=	82.90	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	10.000	ACRES
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	2.204	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	7.014	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.890	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	41.125	INCHES
TOTAL INITIAL WATER	=	41.125	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM HELENA MONTANA

MAXIMUM LEAF AREA INDEX	=	2.00
START OF GROWING SEASON (JULIAN DATE)	=	169
END OF GROWING SEASON (JULIAN DATE)	=	244
AVERAGE ANNUAL WIND SPEED	=	7.80 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	63.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	54.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	49.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	63.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR HELENA MONTANA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.86	0.65	1.22	1.75	2.93	3.10
1.36	1.69	1.68	1.12	0.70	0.92

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR HELENA MONTANA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
19.10	25.00	30.40	39.40	48.10	55.30
61.30	60.10	50.80	41.40	28.90	21.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR HELENA MONTANA

STATION LATITUDE = 46.36 DEGREES

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	17.07	619641.250	100.00
RUNOFF	1.165	42291.004	6.83
EVAPOTRANSPIRATION	15.613	566738.125	91.46
DRAINAGE COLLECTED FROM LAYER 2	0.2991	10856.757	1.75
PERC./LEAKAGE THROUGH LAYER 3	0.000035	1.264	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	1.121733	40718.914	6.57
CHANGE IN WATER STORAGE	-1.128	-40964.066	-6.61
SOIL WATER AT START OF YEAR	41.125	1492840.370	
SOIL WATER AT END OF YEAR	39.997	1451876.370	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.502	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	22.85	829455.062	100.00
RUNOFF	1.254	45508.734	5.49
EVAPOTRANSPIRATION	19.606	711706.750	85.80
DRAINAGE COLLECTED FROM LAYER 2	1.5257	55382.273	6.68
PERC./LEAKAGE THROUGH LAYER 3	0.000058	2.090	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0001		
PERC./LEAKAGE THROUGH LAYER 4	0.734347	26656.787	3.21
CHANGE IN WATER STORAGE	-0.270	-9799.370	-1.18
SOIL WATER AT START OF YEAR	39.997	1451876.370	
SOIL WATER AT END OF YEAR	39.144	1420920.120	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.583	21156.801	2.55
ANNUAL WATER BUDGET BALANCE	0.0000	-0.106	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	17.95	651584.937	100.00
RUNOFF	2.441	88615.008	13.60
EVAPOTRANSPIRATION	14.314	519605.031	79.74
DRAINAGE COLLECTED FROM LAYER 2	1.0261	37246.867	5.72
PERC./LEAKAGE THROUGH LAYER 3	0.000046	1.676	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0001		
PERC./LEAKAGE THROUGH LAYER 4	0.543330	19722.875	3.03
CHANGE IN WATER STORAGE	-0.375	-13604.715	-2.09
SOIL WATER AT START OF YEAR	39.144	1420920.120	

SOIL WATER AT END OF YEAR	38.777	1407618.500	
SNOW WATER AT START OF YEAR	0.583	21156.801	3.25
SNOW WATER AT END OF YEAR	0.574	20853.715	3.20
ANNUAL WATER BUDGET BALANCE	0.0000	-0.102	0.00

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	17.30	627990.062	100.00
RUNOFF	1.157	41990.711	6.69
EVAPOTRANSPIRATION	15.631	567390.000	90.35
DRAINAGE COLLECTED FROM LAYER 2	0.6453	23424.453	3.73
PERC./LEAKAGE THROUGH LAYER 3	0.000045	1.618	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.430578	15629.978	2.49
CHANGE IN WATER STORAGE	-0.563	-20445.355	-3.26
SOIL WATER AT START OF YEAR	38.777	1407618.500	
SOIL WATER AT END OF YEAR	38.789	1408026.870	
SNOW WATER AT START OF YEAR	0.574	20853.715	3.32
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.272	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	14.68	532884.000	100.00
RUNOFF	1.843	66895.055	12.55
EVAPOTRANSPIRATION	12.376	449264.312	84.31
DRAINAGE COLLECTED FROM LAYER 2	0.2569	9326.394	1.75
PERC./LEAKAGE THROUGH LAYER 3	0.000030	1.078	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.353919	12847.247	2.41
CHANGE IN WATER STORAGE	-0.150	-5449.071	-1.02
SOIL WATER AT START OF YEAR	38.789	1408026.870	
SOIL WATER AT END OF YEAR	38.639	1402577.870	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.063	0.00

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ANNUAL TOTALS FOR YEAR 6

	INCHES	CU. FEET	PERCENT

PRECIPITATION	15.06	546678.000	100.00
RUNOFF	0.816	29625.600	5.42
EVAPOTRANSPIRATION	14.393	522460.406	95.57
DRAINAGE COLLECTED FROM LAYER 2	0.6925	25137.668	4.60
PERC./LEAKAGE THROUGH LAYER 3	0.000046	1.683	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.300819	10919.715	2.00
CHANGE IN WATER STORAGE	-1.142	-41465.617	-7.59
SOIL WATER AT START OF YEAR	38.639	1402577.870	
SOIL WATER AT END OF YEAR	37.496	1361112.250	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.230	0.00

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ANNUAL TOTALS FOR YEAR 7

	INCHES	CU. FEET	PERCENT
PRECIPITATION	18.61	675542.937	100.00
RUNOFF	1.521	55194.598	8.17
EVAPOTRANSPIRATION	15.229	552829.937	81.83
DRAINAGE COLLECTED FROM LAYER 2	1.1242	40808.191	6.04
PERC./LEAKAGE THROUGH LAYER 3	0.000061	2.200	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0001		
PERC./LEAKAGE THROUGH LAYER 4	0.261182	9480.919	1.40
CHANGE IN WATER STORAGE	0.475	17229.283	2.55
SOIL WATER AT START OF YEAR	37.496	1361112.250	
SOIL WATER AT END OF YEAR	37.940	1377211.370	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.031	1130.075	0.17
ANNUAL WATER BUDGET BALANCE	0.0000	0.053	0.00

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ANNUAL TOTALS FOR YEAR 8

	INCHES	CU. FEET	PERCENT
PRECIPITATION	16.17	586970.937	100.00
RUNOFF	1.689	61302.918	10.44
EVAPOTRANSPIRATION	13.752	499209.406	85.05
DRAINAGE COLLECTED FROM LAYER 2	1.2511	45415.215	7.74
PERC./LEAKAGE THROUGH LAYER 3	0.000071	2.570	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0001		
PERC./LEAKAGE THROUGH LAYER 4	0.230785	8377.481	1.43
CHANGE IN WATER STORAGE	-0.753	-27334.111	-4.66
SOIL WATER AT START OF YEAR	37.940	1377211.370	

SOIL WATER AT END OF YEAR	37.218	1351007.370	
SNOW WATER AT START OF YEAR	0.031	1130.075	0.19
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.029	0.00

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ANNUAL TOTALS FOR YEAR 9

	INCHES	CU. FEET	PERCENT
PRECIPITATION	14.99	544137.125	100.00
RUNOFF	0.689	25019.676	4.60
EVAPOTRANSPIRATION	12.884	467692.375	85.95
DRAINAGE COLLECTED FROM LAYER 2	0.8115	29458.627	5.41
PERC./LEAKAGE THROUGH LAYER 3	0.000034	1.231	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.205690	7466.544	1.37
CHANGE IN WATER STORAGE	0.399	14500.013	2.66
SOIL WATER AT START OF YEAR	37.218	1351007.370	
SOIL WATER AT END OF YEAR	37.360	1356150.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.258	9357.383	1.72
ANNUAL WATER BUDGET BALANCE	0.0000	-0.108	0.00

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ANNUAL TOTALS FOR YEAR 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	18.60	675180.125	100.00
RUNOFF	0.739	26820.715	3.97
EVAPOTRANSPIRATION	17.065	619467.250	91.75
DRAINAGE COLLECTED FROM LAYER 2	1.4857	53932.543	7.99
PERC./LEAKAGE THROUGH LAYER 3	0.000067	2.434	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0001		
PERC./LEAKAGE THROUGH LAYER 4	0.185791	6744.217	1.00
CHANGE IN WATER STORAGE	-0.876	-31784.709	-4.71
SOIL WATER AT START OF YEAR	37.360	1356150.000	
SOIL WATER AT END OF YEAR	36.678	1331427.870	
SNOW WATER AT START OF YEAR	0.258	9357.383	1.39
SNOW WATER AT END OF YEAR	0.063	2294.765	0.34
ANNUAL WATER BUDGET BALANCE	0.0000	0.113	0.00

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ANNUAL TOTALS FOR YEAR 11

	INCHES	CU. FEET	PERCENT

PRECIPITATION	15.59	565917.062	100.00
RUNOFF	0.946	34355.359	6.07
EVAPOTRANSPIRATION	13.044	473510.719	83.67
DRAINAGE COLLECTED FROM LAYER 2	0.7819	28384.383	5.02
PERC./LEAKAGE THROUGH LAYER 3	0.000039	1.402	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.169326	6146.551	1.09
CHANGE IN WATER STORAGE	0.648	23520.215	4.16
SOIL WATER AT START OF YEAR	36.678	1331427.870	
SOIL WATER AT END OF YEAR	36.865	1338205.620	
SNOW WATER AT START OF YEAR	0.063	2294.765	0.41
SNOW WATER AT END OF YEAR	0.524	19037.256	3.36
ANNUAL WATER BUDGET BALANCE	0.0000	-0.193	0.00

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ANNUAL TOTALS FOR YEAR 12

	INCHES	CU. FEET	PERCENT
PRECIPITATION	18.03	654489.125	100.00
RUNOFF	1.326	48135.187	7.35
EVAPOTRANSPIRATION	16.076	583566.000	89.16
DRAINAGE COLLECTED FROM LAYER 2	1.1661	42328.363	6.47
PERC./LEAKAGE THROUGH LAYER 3	0.000045	1.636	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0001		
PERC./LEAKAGE THROUGH LAYER 4	0.155845	5657.176	0.86
CHANGE IN WATER STORAGE	-0.694	-25197.666	-3.85
SOIL WATER AT START OF YEAR	36.865	1338205.620	
SOIL WATER AT END OF YEAR	36.695	1332045.250	
SNOW WATER AT START OF YEAR	0.524	19037.256	2.91
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.025	0.00

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ANNUAL TOTALS FOR YEAR 13

	INCHES	CU. FEET	PERCENT
PRECIPITATION	19.34	702042.062	100.00
RUNOFF	0.220	7985.276	1.14
EVAPOTRANSPIRATION	16.797	609735.812	86.85
DRAINAGE COLLECTED FROM LAYER 2	1.9634	71272.047	10.15
PERC./LEAKAGE THROUGH LAYER 3	0.000055	1.999	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0001		
PERC./LEAKAGE THROUGH LAYER 4	0.143546	5210.726	0.74
CHANGE IN WATER STORAGE	0.216	7837.724	1.12
SOIL WATER AT START OF YEAR	36.695	1332045.250	
SOIL WATER AT END OF YEAR	36.340	1319140.620	

SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.571	20742.348	2.95
ANNUAL WATER BUDGET BALANCE	0.0000	0.460	0.00

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ANNUAL TOTALS FOR YEAR 14

	INCHES	CU. FEET	PERCENT
PRECIPITATION	17.45	633435.187	100.00
RUNOFF	0.407	14757.484	2.33
EVAPOTRANSPIRATION	17.372	630607.875	99.55
DRAINAGE COLLECTED FROM LAYER 2	0.6142	22293.914	3.52
PERC./LEAKAGE THROUGH LAYER 3	0.000045	1.634	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.133251	4837.005	0.76
CHANGE IN WATER STORAGE	-1.076	-39061.145	-6.17
SOIL WATER AT START OF YEAR	36.340	1319140.620	
SOIL WATER AT END OF YEAR	35.835	1300821.870	
SNOW WATER AT START OF YEAR	0.571	20742.348	3.27
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.025	0.00

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ANNUAL TOTALS FOR YEAR 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	17.64	640332.125	100.00
RUNOFF	1.023	37149.379	5.80
EVAPOTRANSPIRATION	14.880	540126.812	84.35
DRAINAGE COLLECTED FROM LAYER 2	1.0738	38978.523	6.09
PERC./LEAKAGE THROUGH LAYER 3	0.000055	2.004	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0001		
PERC./LEAKAGE THROUGH LAYER 4	0.124404	4515.860	0.71
CHANGE IN WATER STORAGE	0.539	19561.381	3.05
SOIL WATER AT START OF YEAR	35.835	1300821.870	
SOIL WATER AT END OF YEAR	36.263	1316363.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.111	4019.667	0.63
ANNUAL WATER BUDGET BALANCE	0.0000	0.140	0.00

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ANNUAL TOTALS FOR YEAR 16

	INCHES	CU. FEET	PERCENT
PRECIPITATION	15.11	548493.062	100.00

RUNOFF	0.711	25823.264	4.71
EVAPOTRANSPIRATION	13.983	507572.312	92.54
DRAINAGE COLLECTED FROM LAYER 2	0.8348	30303.229	5.52
PERC./LEAKAGE THROUGH LAYER 3	0.000052	1.897	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.116991	4246.768	0.77
CHANGE IN WATER STORAGE	-0.536	-19452.680	-3.55
SOIL WATER AT START OF YEAR	36.263	1316363.500	
SOIL WATER AT END OF YEAR	35.838	1300930.500	
SNOW WATER AT START OF YEAR	0.111	4019.667	0.73
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.175	0.00

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ANNUAL TOTALS FOR YEAR 17

	INCHES	CU. FEET	PERCENT
PRECIPITATION	19.43	705309.000	100.00
RUNOFF	0.695	25246.203	3.58
EVAPOTRANSPIRATION	16.752	608082.875	86.22
DRAINAGE COLLECTED FROM LAYER 2	1.6412	59574.109	8.45
PERC./LEAKAGE THROUGH LAYER 3	0.000074	2.681	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0001		
PERC./LEAKAGE THROUGH LAYER 4	0.109504	3975.007	0.56
CHANGE IN WATER STORAGE	0.232	8430.909	1.20
SOIL WATER AT START OF YEAR	35.838	1300930.500	
SOIL WATER AT END OF YEAR	35.779	1298790.120	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.291	10571.294	1.50
ANNUAL WATER BUDGET BALANCE	0.0000	-0.098	0.00

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ANNUAL TOTALS FOR YEAR 18

	INCHES	CU. FEET	PERCENT
PRECIPITATION	15.60	566280.062	100.00
RUNOFF	1.426	51758.336	9.14
EVAPOTRANSPIRATION	13.704	497457.187	87.85
DRAINAGE COLLECTED FROM LAYER 2	0.6552	23784.973	4.20
PERC./LEAKAGE THROUGH LAYER 3	0.000032	1.179	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.103549	3758.837	0.66
CHANGE IN WATER STORAGE	-0.289	-10479.429	-1.85
SOIL WATER AT START OF YEAR	35.779	1298790.120	
SOIL WATER AT END OF YEAR	35.383	1284415.120	

SNOW WATER AT START OF YEAR	0.291	10571.294	1.87
SNOW WATER AT END OF YEAR	0.399	14466.938	2.55
ANNUAL WATER BUDGET BALANCE	0.0000	0.144	0.00

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ANNUAL TOTALS FOR YEAR 19

	INCHES	CU. FEET	PERCENT
PRECIPITATION	17.04	618552.250	100.00
RUNOFF	2.828	102658.547	16.60
EVAPOTRANSPIRATION	12.661	459609.469	74.30
DRAINAGE COLLECTED FROM LAYER 2	1.0621	38554.305	6.23
PERC./LEAKAGE THROUGH LAYER 3	0.000043	1.569	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0001		
PERC./LEAKAGE THROUGH LAYER 4	0.097879	3552.991	0.57
CHANGE IN WATER STORAGE	0.391	14176.723	2.29
SOIL WATER AT START OF YEAR	35.383	1284415.120	
SOIL WATER AT END OF YEAR	36.172	1313058.750	
SNOW WATER AT START OF YEAR	0.399	14466.938	2.34
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.201	0.00

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ANNUAL TOTALS FOR YEAR 20

	INCHES	CU. FEET	PERCENT
PRECIPITATION	21.85	793155.375	100.00
RUNOFF	3.287	119302.828	15.04
EVAPOTRANSPIRATION	16.876	612590.125	77.23
DRAINAGE COLLECTED FROM LAYER 2	1.7929	65081.086	8.21
PERC./LEAKAGE THROUGH LAYER 3	0.000048	1.755	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0001		
PERC./LEAKAGE THROUGH LAYER 4	0.093134	3380.751	0.43
CHANGE IN WATER STORAGE	-0.198	-7199.749	-0.91
SOIL WATER AT START OF YEAR	36.172	1313058.750	
SOIL WATER AT END OF YEAR	35.879	1302421.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.095	3437.233	0.43
ANNUAL WATER BUDGET BALANCE	0.0000	0.313	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC

PRECIPITATION						
TOTALS	0.82	0.56	1.07	1.92	3.06	2.76
	1.35	1.39	1.96	1.28	0.60	0.73
STD. DEVIATIONS	0.47	0.34	0.58	1.02	1.46	1.00
	0.75	0.57	1.05	0.55	0.41	0.43
RUNOFF						
TOTALS	0.181	0.088	0.299	0.510	0.093	0.003
	0.000	0.000	0.012	0.000	0.038	0.084
STD. DEVIATIONS	0.289	0.122	0.387	0.638	0.220	0.006
	0.000	0.000	0.028	0.000	0.093	0.127
EVAPOTRANSPIRATION						
TOTALS	0.520	0.547	0.610	1.063	2.536	2.846
	1.797	1.373	1.563	1.120	0.691	0.483
STD. DEVIATIONS	0.158	0.178	0.219	0.441	1.008	0.819
	0.937	0.529	0.848	0.434	0.190	0.135
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	0.0000	0.0000	0.0000	0.0275	0.3026	0.3260
	0.1622	0.0294	0.0584	0.0989	0.0295	0.0007
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0421	0.2590	0.3300
	0.1362	0.0509	0.0782	0.1200	0.0535	0.0030
PERCOLATION/LEAKAGE THROUGH LAYER 3						
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 4						
TOTALS	0.0269	0.0235	0.0255	0.0241	0.0245	0.0231
	0.0235	0.0230	0.0219	0.0221	0.0211	0.0215
STD. DEVIATIONS	0.0278	0.0239	0.0252	0.0232	0.0233	0.0213
	0.0212	0.0204	0.0190	0.0188	0.0178	0.0177

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ACROSS LAYER 3						
AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0002	0.0002
	0.0001	0.0000	0.0000	0.0001	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0002	0.0002
	0.0001	0.0000	0.0001	0.0001	0.0000	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 20

	INCHES		CU. FEET	PERCENT
PRECIPITATION	17.52	(2.212)	635903.4	100.00
RUNOFF	1.309	(0.7925)	47521.80	7.473
EVAPOTRANSPIRATION	15.150	(1.8951)	549961.12	86.485
LATERAL DRAINAGE COLLECTED FROM LAYER 2	1.03518	(0.47091)	37577.191	5.90926
PERCOLATION/LEAKAGE THROUGH FROM LAYER 3	0.00005	(0.00001)	1.780	0.00028
AVERAGE HEAD ACROSS TOP OF LAYER 3	0.000	(0.000)		
PERCOLATION/LEAKAGE THROUGH FROM LAYER 4	0.28078	(0.25924)	10192.316	1.60281
CHANGE IN WATER STORAGE	-0.258	(0.5865)	-9349.07	-1.470

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 20

	(INCHES)	(CU. FT.)
PRECIPITATION	1.73	62799.000
RUNOFF	1.645	59722.4648
DRAINAGE COLLECTED FROM LAYER 2	0.12359	4486.44727
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.000001	0.02673
AVERAGE HEAD ACROSS LAYER 3	0.002	
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.005245	190.40048
SNOW WATER	2.36	85578.8750

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3644
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1242

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FINAL WATER STORAGE AT END OF YEAR 20

LAYER	(INCHES)	(VOL/VOL)
1	5.4133	0.2256
2	0.0006	0.0100
3	0.0000	0.0000
4	30.4655	0.2539
SNOW WATER	0.000	

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**               HELP MODEL VERSION 3.01   (14 OCTOBER 1994)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:     U:\HELP\UBMC4.D4
TEMPERATURE DATA FILE:       U:\HELP\UBMC7.D7
SOLAR RADIATION DATA FILE:   U:\HELP\UBMC13.D13
EVAPOTRANSPIRATION DATA:     U:\HELP\UBMC11.D11
SOIL AND DESIGN DATA FILE:   U:\HELP\DATA11.D10
OUTPUT DATA FILE:            U:\HELP\UBMC12IN.OUT


TIME:   9:43     DATE:   6/ 5/2006


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     TITLE:  UBMC REPOSITORY - 12" SOIL COVER CAP

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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   9
        THICKNESS                    =     12.00   INCHES
        POROSITY                     =      0.5010 VOL/VOL
        FIELD CAPACITY               =      0.2840 VOL/VOL
        WILTING POINT                =      0.1350 VOL/VOL
        INITIAL SOIL WATER CONTENT   =      0.1621 VOL/VOL
        EFFECTIVE SAT. HYD. COND.    =  0.190000006000E-03 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  43
        THICKNESS                    =    120.00   INCHES
        POROSITY                     =      0.4190 VOL/VOL
        FIELD CAPACITY               =      0.3200 VOL/VOL
        WILTING POINT                =      0.1800 VOL/VOL
        INITIAL SOIL WATER CONTENT   =      0.2987 VOL/VOL
        EFFECTIVE SAT. HYD. COND.    =  0.189999992000E-04 CM/SEC


                 GENERAL DESIGN AND EVAPORATIVE ZONE DATA
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      NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
               SOIL DATA BASE USING SOIL TEXTURE # 9 WITH A
               FAIR STAND OF GRASS, A SURFACE SLOPE OF 28.%
               AND A SLOPE LENGTH OF  300. FEET.

      SCS RUNOFF CURVE NUMBER              =     82.90
      FRACTION OF AREA ALLOWING RUNOFF     =    100.0    PERCENT
      AREA PROJECTED ON HORIZONTAL PLANE   =     10.000  ACRES
      EVAPORATIVE ZONE DEPTH               =     14.0    INCHES
      INITIAL WATER IN EVAPORATIVE ZONE    =      2.292  INCHES
      UPPER LIMIT OF EVAPORATIVE STORAGE   =      6.850  INCHES
      LOWER LIMIT OF EVAPORATIVE STORAGE   =      1.980  INCHES
      INITIAL SNOW WATER                   =      0.000  INCHES
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INITIAL WATER IN LAYER MATERIALS	=	37.788	INCHES
TOTAL INITIAL WATER	=	37.788	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
HELENA MONTANA

MAXIMUM LEAF AREA INDEX	=	2.00
START OF GROWING SEASON (JULIAN DATE)	=	169
END OF GROWING SEASON (JULIAN DATE)	=	244
AVERAGE ANNUAL WIND SPEED	=	7.80 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	63.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	54.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	49.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	63.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR HELENA MONTANA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.86	0.65	1.22	1.75	2.93	3.10
1.36	1.69	1.68	1.12	0.70	0.92

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR HELENA MONTANA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
19.10	25.00	30.40	39.40	48.10	55.30
61.30	60.10	50.80	41.40	28.90	21.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR HELENA MONTANA

STATION LATITUDE = 46.36 DEGREES

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	17.07	619641.250	100.00
RUNOFF	1.165	42302.719	6.83
EVAPOTRANSPIRATION	15.790	573190.375	92.50
PERC./LEAKAGE THROUGH LAYER 2	1.133260	41137.328	6.64
CHANGE IN WATER STORAGE	-1.019	-36989.184	-5.97
SOIL WATER AT START OF YEAR	37.788	1371686.620	
SOIL WATER AT END OF YEAR	36.769	1334697.370	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.039	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT

PRECIPITATION	22.85	829455.062	100.00
RUNOFF	1.257	45645.109	5.50
EVAPOTRANSPIRATION	19.482	707201.187	85.26
PERC./LEAKAGE THROUGH LAYER 2	0.962167	34926.664	4.21
CHANGE IN WATER STORAGE	1.148	41682.586	5.03
SOIL WATER AT START OF YEAR	36.769	1334697.370	
SOIL WATER AT END OF YEAR	37.334	1355223.250	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.583	21156.801	2.55
ANNUAL WATER BUDGET BALANCE	0.0000	-0.463	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	17.95	651584.937	100.00
RUNOFF	2.430	88207.648	13.54
EVAPOTRANSPIRATION	14.139	513238.000	78.77
PERC./LEAKAGE THROUGH LAYER 2	1.111405	40344.008	6.19
CHANGE IN WATER STORAGE	0.270	9795.508	1.50
SOIL WATER AT START OF YEAR	37.334	1355223.250	
SOIL WATER AT END OF YEAR	37.612	1365321.870	
SNOW WATER AT START OF YEAR	0.583	21156.801	3.25
SNOW WATER AT END OF YEAR	0.574	20853.715	3.20
ANNUAL WATER BUDGET BALANCE	0.0000	-0.221	0.00

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	17.30	627990.062	100.00
RUNOFF	1.132	41108.484	6.55
EVAPOTRANSPIRATION	16.373	594354.250	94.64
PERC./LEAKAGE THROUGH LAYER 2	0.965665	35053.621	5.58
CHANGE IN WATER STORAGE	-1.172	-42526.480	-6.77
SOIL WATER AT START OF YEAR	37.612	1365321.870	
SOIL WATER AT END OF YEAR	37.015	1343649.000	
SNOW WATER AT START OF YEAR	0.574	20853.715	3.32
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.145	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT

PRECIPITATION	14.68	532884.000	100.00
RUNOFF	1.834	66561.125	12.49
EVAPOTRANSPIRATION	12.448	451864.937	84.80
PERC./LEAKAGE THROUGH LAYER 2	0.679940	24681.836	4.63
CHANGE IN WATER STORAGE	-0.282	-10223.915	-1.92
SOIL WATER AT START OF YEAR	37.015	1343649.000	
SOIL WATER AT END OF YEAR	36.733	1333425.120	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.041	0.00

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ANNUAL TOTALS FOR YEAR 6

	INCHES	CU. FEET	PERCENT
PRECIPITATION	15.06	546678.000	100.00
RUNOFF	0.824	29921.859	5.47
EVAPOTRANSPIRATION	14.316	519666.937	95.06
PERC./LEAKAGE THROUGH LAYER 2	0.558065	20257.768	3.71
CHANGE IN WATER STORAGE	-0.638	-23168.418	-4.24
SOIL WATER AT START OF YEAR	36.733	1333425.120	
SOIL WATER AT END OF YEAR	36.095	1310256.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.117	0.00

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ANNUAL TOTALS FOR YEAR 7

	INCHES	CU. FEET	PERCENT
PRECIPITATION	18.61	675542.937	100.00
RUNOFF	1.488	54030.273	8.00
EVAPOTRANSPIRATION	15.832	574697.312	85.07
PERC./LEAKAGE THROUGH LAYER 2	0.621328	22554.221	3.34
CHANGE IN WATER STORAGE	0.668	24261.244	3.59
SOIL WATER AT START OF YEAR	36.095	1310256.750	
SOIL WATER AT END OF YEAR	36.732	1333387.870	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.031	1130.075	0.17
ANNUAL WATER BUDGET BALANCE	0.0000	-0.121	0.00

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ANNUAL TOTALS FOR YEAR 8

	INCHES	CU. FEET	PERCENT

PRECIPITATION	16.17	586970.937	100.00
RUNOFF	1.676	60832.316	10.36
EVAPOTRANSPIRATION	13.789	500540.625	85.28
PERC./LEAKAGE THROUGH LAYER 2	0.606718	22023.867	3.75
CHANGE IN WATER STORAGE	0.098	3574.008	0.61
SOIL WATER AT START OF YEAR	36.732	1333387.870	
SOIL WATER AT END OF YEAR	36.862	1338092.000	
SNOW WATER AT START OF YEAR	0.031	1130.075	0.19
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.125	0.00

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ANNUAL TOTALS FOR YEAR 9

	INCHES	CU. FEET	PERCENT
PRECIPITATION	14.99	544137.125	100.00
RUNOFF	0.696	25265.750	4.64
EVAPOTRANSPIRATION	12.570	456284.969	83.85
PERC./LEAKAGE THROUGH LAYER 2	0.862176	31296.984	5.75
CHANGE IN WATER STORAGE	0.862	31289.371	5.75
SOIL WATER AT START OF YEAR	36.862	1338092.000	
SOIL WATER AT END OF YEAR	37.466	1360024.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.258	9357.383	1.72
ANNUAL WATER BUDGET BALANCE	0.0000	0.058	0.00

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ANNUAL TOTALS FOR YEAR 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	18.60	675180.125	100.00
RUNOFF	0.706	25610.992	3.79
EVAPOTRANSPIRATION	17.519	635926.562	94.19
PERC./LEAKAGE THROUGH LAYER 2	0.836084	30349.846	4.50
CHANGE IN WATER STORAGE	-0.460	-16707.576	-2.47
SOIL WATER AT START OF YEAR	37.466	1360024.000	
SOIL WATER AT END OF YEAR	37.201	1350379.000	
SNOW WATER AT START OF YEAR	0.258	9357.383	1.39
SNOW WATER AT END OF YEAR	0.063	2294.765	0.34
ANNUAL WATER BUDGET BALANCE	0.0000	0.309	0.00

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ANNUAL TOTALS FOR YEAR 11

	INCHES	CU. FEET	PERCENT

PRECIPITATION	15.59	565917.062	100.00
RUNOFF	0.876	31808.771	5.62
EVAPOTRANSPIRATION	12.797	464541.281	82.09
PERC./LEAKAGE THROUGH LAYER 2	0.963145	34962.168	6.18
CHANGE IN WATER STORAGE	0.953	34604.879	6.11
SOIL WATER AT START OF YEAR	37.201	1350379.000	
SOIL WATER AT END OF YEAR	37.693	1368241.370	
SNOW WATER AT START OF YEAR	0.063	2294.765	0.41
SNOW WATER AT END OF YEAR	0.524	19037.256	3.36
ANNUAL WATER BUDGET BALANCE	0.0000	-0.054	0.00

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ANNUAL TOTALS FOR YEAR 12

	INCHES	CU. FEET	PERCENT
PRECIPITATION	18.03	654489.125	100.00
RUNOFF	1.342	48730.738	7.45
EVAPOTRANSPIRATION	16.740	607672.625	92.85
PERC./LEAKAGE THROUGH LAYER 2	0.974630	35379.078	5.41
CHANGE IN WATER STORAGE	-1.027	-37293.187	-5.70
SOIL WATER AT START OF YEAR	37.693	1368241.370	
SOIL WATER AT END OF YEAR	37.190	1349985.500	
SNOW WATER AT START OF YEAR	0.524	19037.256	2.91
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.186	0.00

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ANNUAL TOTALS FOR YEAR 13

	INCHES	CU. FEET	PERCENT
PRECIPITATION	19.34	702042.062	100.00
RUNOFF	0.208	7534.646	1.07
EVAPOTRANSPIRATION	16.696	606080.125	86.33
PERC./LEAKAGE THROUGH LAYER 2	1.246441	45245.797	6.44
CHANGE IN WATER STORAGE	1.190	43181.699	6.15
SOIL WATER AT START OF YEAR	37.190	1349985.500	
SOIL WATER AT END OF YEAR	37.808	1372424.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.571	20742.348	2.95
ANNUAL WATER BUDGET BALANCE	0.0000	-0.208	0.00

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ANNUAL TOTALS FOR YEAR 14

	INCHES	CU. FEET	PERCENT

PRECIPITATION	17.45	633435.187	100.00
RUNOFF	0.407	14790.723	2.34
EVAPOTRANSPIRATION	17.375	630705.312	99.57
PERC./LEAKAGE THROUGH LAYER 2	1.184093	42982.570	6.79
CHANGE IN WATER STORAGE	-1.516	-55043.758	-8.69
SOIL WATER AT START OF YEAR	37.808	1372424.750	
SOIL WATER AT END OF YEAR	36.863	1338123.370	
SNOW WATER AT START OF YEAR	0.571	20742.348	3.27
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.333	0.00

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ANNUAL TOTALS FOR YEAR 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	17.64	640332.125	100.00
RUNOFF	1.014	36814.332	5.75
EVAPOTRANSPIRATION	14.955	542855.812	84.78
PERC./LEAKAGE THROUGH LAYER 2	0.996226	36163.016	5.65
CHANGE IN WATER STORAGE	0.675	24498.654	3.83
SOIL WATER AT START OF YEAR	36.863	1338123.370	
SOIL WATER AT END OF YEAR	37.427	1358602.370	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.111	4019.667	0.63
ANNUAL WATER BUDGET BALANCE	0.0000	0.312	0.00

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ANNUAL TOTALS FOR YEAR 16

	INCHES	CU. FEET	PERCENT
PRECIPITATION	15.11	548493.062	100.00
RUNOFF	0.710	25775.822	4.70
EVAPOTRANSPIRATION	14.450	524548.625	95.63
PERC./LEAKAGE THROUGH LAYER 2	0.896277	32534.848	5.93
CHANGE IN WATER STORAGE	-0.947	-34366.277	-6.27
SOIL WATER AT START OF YEAR	37.427	1358602.370	
SOIL WATER AT END OF YEAR	36.591	1328255.750	
SNOW WATER AT START OF YEAR	0.111	4019.667	0.73
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.065	0.00

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ANNUAL TOTALS FOR YEAR 17

	INCHES	CU. FEET	PERCENT

PRECIPITATION	19.43	705309.000	100.00
RUNOFF	0.695	25214.539	3.57
EVAPOTRANSPIRATION	17.594	638675.437	90.55
PERC./LEAKAGE THROUGH LAYER 2	0.719143	26104.877	3.70
CHANGE IN WATER STORAGE	0.422	15314.012	2.17
SOIL WATER AT START OF YEAR	36.591	1328255.750	
SOIL WATER AT END OF YEAR	36.722	1332998.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.291	10571.294	1.50
ANNUAL WATER BUDGET BALANCE	0.0000	0.162	0.00

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ANNUAL TOTALS FOR YEAR 18

	INCHES	CU. FEET	PERCENT
PRECIPITATION	15.60	566280.062	100.00
RUNOFF	1.414	51322.785	9.06
EVAPOTRANSPIRATION	14.390	522361.656	92.24
PERC./LEAKAGE THROUGH LAYER 2	0.681550	24740.250	4.37
CHANGE IN WATER STORAGE	-0.886	-32144.855	-5.68
SOIL WATER AT START OF YEAR	36.722	1332998.500	
SOIL WATER AT END OF YEAR	35.729	1296958.000	
SNOW WATER AT START OF YEAR	0.291	10571.294	1.87
SNOW WATER AT END OF YEAR	0.399	14466.938	2.55
ANNUAL WATER BUDGET BALANCE	0.0000	0.219	0.00

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ANNUAL TOTALS FOR YEAR 19

	INCHES	CU. FEET	PERCENT
PRECIPITATION	17.04	618552.250	100.00
RUNOFF	2.818	102286.789	16.54
EVAPOTRANSPIRATION	12.941	469766.062	75.95
PERC./LEAKAGE THROUGH LAYER 2	0.595666	21622.664	3.50
CHANGE IN WATER STORAGE	0.685	24876.848	4.02
SOIL WATER AT START OF YEAR	35.729	1296958.000	
SOIL WATER AT END OF YEAR	36.813	1336301.750	
SNOW WATER AT START OF YEAR	0.399	14466.938	2.34
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.117	0.00

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ANNUAL TOTALS FOR YEAR 20

	INCHES	CU. FEET	PERCENT

PRECIPITATION	21.85	793155.375	100.00
RUNOFF	3.244	117755.828	14.85
EVAPOTRANSPIRATION	16.820	610553.312	76.98
PERC./LEAKAGE THROUGH LAYER 2	0.830865	30160.406	3.80
CHANGE IN WATER STORAGE	0.956	34685.441	4.37
SOIL WATER AT START OF YEAR	36.813	1336301.750	
SOIL WATER AT END OF YEAR	37.674	1367550.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.095	3437.233	0.43
ANNUAL WATER BUDGET BALANCE	0.0000	0.361	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.82	0.56	1.07	1.92	3.06	2.76
	1.35	1.39	1.96	1.28	0.60	0.73
STD. DEVIATIONS	0.47	0.34	0.58	1.02	1.46	1.00
	0.75	0.57	1.05	0.55	0.41	0.43
RUNOFF						
TOTALS	0.181	0.089	0.297	0.505	0.090	0.002
	0.000	0.000	0.011	0.000	0.039	0.084
STD. DEVIATIONS	0.289	0.124	0.387	0.635	0.219	0.005
	0.000	0.000	0.026	0.000	0.093	0.126
EVAPOTRANSPIRATION						
TOTALS	0.523	0.560	0.695	1.027	2.544	2.792
	1.930	1.472	1.510	1.121	0.695	0.481
STD. DEVIATIONS	0.170	0.191	0.284	0.429	0.977	0.899
	0.898	0.549	0.772	0.515	0.192	0.122
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	0.0793	0.0698	0.0747	0.0704	0.0762	0.0737
	0.0521	0.0606	0.0720	0.0893	0.0745	0.0785
STD. DEVIATIONS	0.0236	0.0182	0.0190	0.0171	0.0162	0.0194
	0.0329	0.0388	0.0393	0.0275	0.0252	0.0245

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 20

	INCHES		CU. FEET	PERCENT
PRECIPITATION	17.52	(2.212)	635903.4	100.00
RUNOFF	1.297	(0.7879)	47076.07	7.403
EVAPOTRANSPIRATION	15.351	(1.9685)	557236.31	87.629
PERCOLATION/LEAKAGE THROUGH FROM LAYER 2	0.87124	(0.20808)	31626.094	4.97341
CHANGE IN WATER STORAGE	-0.001	(0.8908)	-34.97	-0.005

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 20

	(INCHES)	(CU. FT.)
PRECIPITATION	1.73	62799.000
RUNOFF	1.646	59736.0586
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.007527	273.22345
SNOW WATER	2.36	85578.8750

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3428
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1307

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FINAL WATER STORAGE AT END OF YEAR 20

LAYER	(INCHES)	(VOL/VOL)
1	2.4586	0.2049
2	35.2149	0.2935
SNOW WATER	0.000	

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