SUB-APPENDIX D6-C

Calculation of Mounding Between Finger Drains

Calculation of Mounding Between Finger Drains – Old Landfill Area Vertical Expansion Ridge Landfill Expansion Environmental Assessment, Blenheim, Ontario		
Job No: 18111331 (2000)	Made by: S. Rimal Updated by: F. Gondim Reviewed by: F. Barone	Date: December 20, 2019

References:

Ref. 1 – Rowe, R.K., Quigley, R.M., Brachman, R.W.I., and Booker, J.R. (2004). Barrier Systems for Waste Disposal Facilities, 2nd Edition, Spon Press, 587p.

Ref. 2 – Oweis, I.S. and Khera, R.P. (1998). Geotechnology for Waste Management, Second Edition, PWS Publishing Company, Boston, 471p.

Ref. 3 – Sharma, H.D. and Reddy, K.R. (2004). Geoenvironmental Engineering, Site Remediation, Waste Containment and Emerging Waste Management Technologies, John Wiley & Sons Inc., New Jersey, 968p.

As shown in the attached cross-sections we have:

q_{INF} = maximum monthly average percolation rate through waste = 35 mm/month = 0.035 m^3/m^2/month

Note: for the operational scenario (i.e., the worst case scenario), we considered that Cell O1, which is the largest cell of the Old Landfill, would have a 50 m x 100 m (i.e., 0.5 hectare) open working face without cover and 15.7 hectares with 0.30 m thick cover, for a total of 16.2 hectares. Using the maximum monthly percolation rates of 57 mm/month for the open working face area and 34 mm/month for the area with 0.30 m thick cover as per attached HELP model outputs, an equivalent maximum monthly percolation rate of 35 mm/year was obtained for the Cell O1 area using the following equation: q_{INF} = (0.5 hectare x 57 mm/month + 15.7 hectares x 34 mm/month)/16.2 hectares = 35 mm/month.

L = horizontal distance between the perimeter drain and central peak of the landfill = 400 m

Q_{INF} = total infiltration per unit width over the horizontal distance L (m^3/month)

= q_{INF} x L x 1 m (unit width)
= 0.035 m^3/m^2/month x 400 m x 1 m
= 14 m^3/month

H = vertical distance between the bottom elevation of the finger drains to the maximum top elevation of finger drains = 6 m

q_{LAT} = lateral flux collected by the finger drains (m/y)

= Q_{INF} / (H x 1 m) = 14 m^3/month / (6 m x 1 m) = 2.3 m/month

The mounding between the finger drains can be calculated as follows (Ref. 1): $H_{MAX} = 0.5\, l \sqrt{\frac{q_{LAT}}{k_W}}$

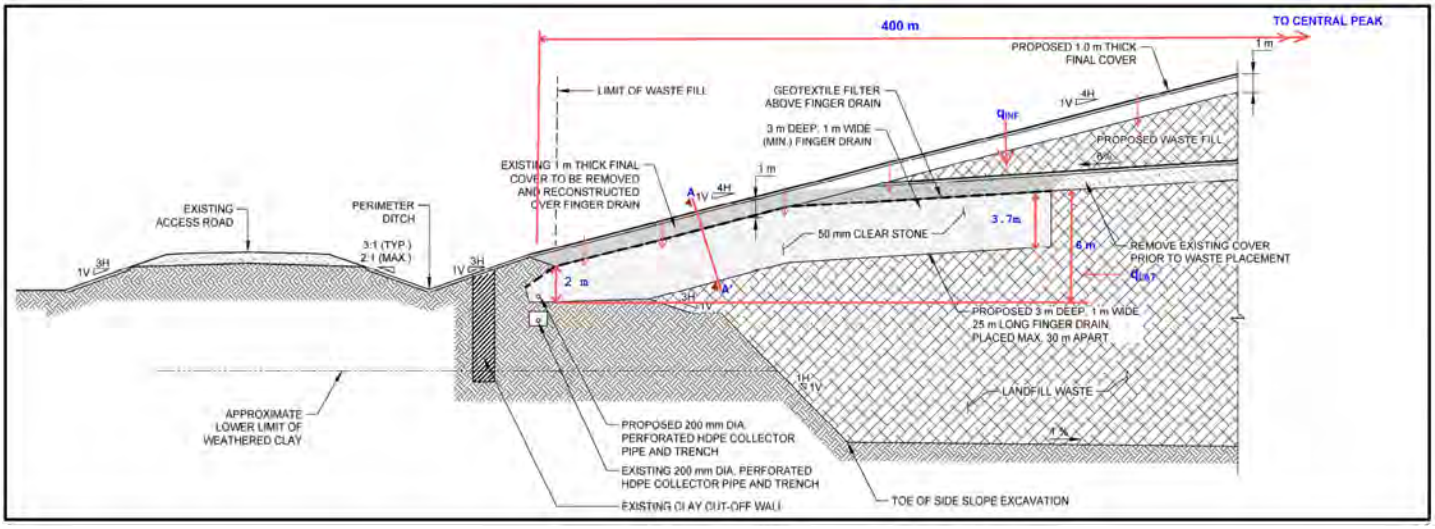
where,

H_{MAX} = maximum height of mounding (m)
l = distance between the finger drains = 25 m
k_W = hydraulic conductivity of waste = 1 x 10^{-3} cm/s = 26.3 m/month (Ref. 2 and 3)

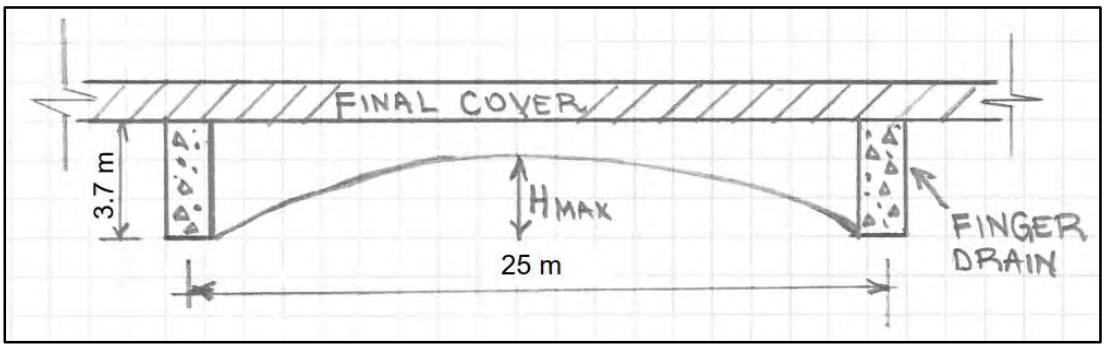
Calculation of Mounding Between Finger Drains – Old Landfill Area Vertical Expansion Ridge Landfill Expansion Environmental Assessment, Blenheim, Ontario		
Job No: 18111331 (2000)	Made by: S. Rimal Updated by: F. Gondim Reviewed by: F. Barone	Date: December 20, 2019

$$H_{MAX} = 0.5 \times 25\ m \sqrt{\frac{2.3\ m/month}{26.3\ m/month}} = 3.7\ m$$

H_{MAX} is equal to 3.7 m depth of the finger drains and therefore the maximum mounding between finger drains is predicted to be at the base of the final cover for the 25 m spacing.



Cross section showing proposed finger drain and vertical expansion.



Cross section A-A' showing mounding between two finger drains.

HELP Model Output File - Open Working Face (No Cover) Scenario

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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:\WHI\VHELP22\data\P2118.VHP\_weather1.dat
TEMPERATURE DATA FILE:        C:\WHI\VHELP22\data\P2118.VHP\_weather2.dat
SOLAR RADIATION DATA FILE:   C:\WHI\VHELP22\data\P2118.VHP\_weather3.dat
EVAPOTRANSPIRATION DATA:      C:\WHI\VHELP22\data\P2118.VHP\_weather4.dat
SOIL AND DESIGN DATA FILE:   C:\WHI\VHELP22\data\P2118.VHP\I_388189.inp
OUTPUT DATA FILE:             C:\WHI\VHELP22\data\P2118.VHP\O_388189.prt


TIME:   14:55       DATE:   12/12/2019


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      TITLE:   Ridge Landfill-Dec19-100m-no-cover

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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   18
          THICKNESS                      =    2000.00     CM
          POROSITY                       =       0.6710 VOL/VOL
          FIELD CAPACITY                 =       0.2920 VOL/VOL
          WILTING POINT                  =       0.0770 VOL/VOL
          INITIAL SOIL WATER CONTENT     =       0.2900 VOL/VOL
          EFFECTIVE SAT. HYD. COND.      =   0.100000224000E-02 CM/SEC
        NOTE:   SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY   4.63
                FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.



                    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 #18 WITH A
                 GOOD STAND OF GRASS, A SURFACE SLOPE OF   0.%
                 AND A SLOPE LENGTH OF   100. METERS.

       SCS RUNOFF CURVE NUMBER                =      41.99
       FRACTION OF AREA ALLOWING RUNOFF       =     100.0      PERCENT
       AREA PROJECTED ON HORIZONTAL PLANE     =     44.0000 HECTARES
       EVAPORATIVE ZONE DEPTH                 =      51.0      CM
       INITIAL WATER IN EVAPORATIVE ZONE      =      14.790    CM
       UPPER LIMIT OF EVAPORATIVE STORAGE     =      34.221    CM
       LOWER LIMIT OF EVAPORATIVE STORAGE     =       3.927    CM
       INITIAL SNOW WATER                     =       0.000    CM
       INITIAL WATER IN LAYER MATERIALS       =     580.000    CM
       TOTAL INITIAL WATER                    =     580.000    CM
       TOTAL SUBSURFACE INFLOW                =       0.00     MM/YR
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EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
WINDSOR CANA

STATION LATITUDE = 42.27 DEGREES
MAXIMUM LEAF AREA INDEX = 3.50
START OF GROWING SEASON (JULIAN DATE) = 123
END OF GROWING SEASON (JULIAN DATE) = 282
EVAPORATIVE ZONE DEPTH = 51.0 CM
AVERAGE ANNUAL WIND SPEED = 17.70 KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 66.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 71.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 74.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR WINDSOR CANA

NORMAL MEAN MONTHLY PRECIPITATION (MM)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
45.4	53.0	69.9	76.6	89.6	92.0
83.8	78.8	101.8	76.6	85.4	76.9

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR WINDSOR CANA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES CELSIUS)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
-4.6	-3.9	1.9	8.4	15.1	20.0
22.7	21.8	17.6	10.7	4.8	-1.5

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR WINDSOR CANA
AND STATION LATITUDE = 42.17 DEGREES

LEAK #1: PERCOLATION OR LEAKAGE THROUGH LAYER 1

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DAILY OUTPUT FOR YEAR 1

DAY	S A I R	O I L	RAIN MM	RUNOFF MM	ET MM	E. ZONE WATER CM/CM	HEAD #1 CM	DRAIN #1 MM	LEAK MM
1	*	*	0.0	0.00	0.00	0.2900	0.0000	0.000	0.000
2	*	*	0.0	0.00	0.00	0.2900	0.0000	0.000	0.000
3	*	*	0.0	0.00	0.00	0.2900	0.0000	0.000	0.000
4	*	*	0.0	0.00	0.00	0.2900	0.0000	0.000	0.000
5	*	*	0.0	0.00	0.00	0.2900	0.0000	0.000	0.000
6	*	*	1.4	0.00	0.85	0.2900	0.0000	0.000	0.000
7	*	*	0.0	0.00	0.55	0.2900	0.0000	0.000	0.000
8	*	*	0.0	0.00	0.00	0.2900	0.0000	0.000	0.000
9	*	*	2.9	0.00	0.75	0.2900	0.0000	0.000	0.000
10	*	*	0.0	0.00	0.58	0.2900	0.0000	0.000	0.000
11	*	*	0.0	0.00	0.69	0.2900	0.0000	0.000	0.000
12	*	*	0.2	0.00	0.57	0.2900	0.0000	0.000	0.000
13	*	*	0.0	0.00	0.51	0.2900	0.0000	0.000	0.000
14	*	*	7.0	0.00	0.46	0.2900	0.0000	0.000	0.000

343		9.3	0.00	1.01	0.3330	0.0000	0.000	0.000
344	*	0.0	0.00	0.22	0.3100	0.0000	0.000	1.165
345		0.0	0.00	0.27	0.2928	0.0000	0.000	.4443
346	*	0.0	0.00	0.27	0.2830	0.0000	0.000	0.000
347		0.0	0.00	0.28	0.2748	0.0000	0.000	0.000
348		0.0	0.00	0.38	0.2683	0.0000	0.000	0.000
349		0.0	0.00	0.31	0.2628	0.0000	0.000	0.000
350		1.2	0.00	1.00	0.2585	0.0000	0.000	0.000
351	*	0.0	0.00	0.26	0.2527	0.0000	0.000	1.019
352		0.0	0.00	0.29	0.2520	0.0000	0.000	0.000
353	*	17.2	0.00	0.63	0.2508	0.0000	0.000	1.142
354		7.7	0.00	0.00	0.2957	0.0000	0.000	.6949
355		0.6	0.00	0.82	0.2946	0.0000	0.000	.6501
356		10.4	0.00	1.13	0.3087	0.0000	0.000	0.000
357		0.0	0.00	0.35	0.2990	0.0000	0.000	.3648
358	*	3.8	0.00	0.86	0.2939	0.0000	0.000	1.476
359	*	0.0	0.00	0.70	0.2859	0.0000	0.000	1.824
360		0.0	0.00	0.84	0.2801	0.0000	0.000	1.413
361	*	12.7	0.00	0.59	0.2740	0.0000	0.000	0.000
362	*	0.0	0.00	0.57	0.2686	0.0000	0.000	0.000
363	*	5.3	0.00	0.56	0.2641	0.0000	0.000	0.000
364		0.0	0.00	0.54	0.2649	0.0000	0.000	1.099
365		0.0	0.00	0.00	0.2846	0.0000	0.000	.5260
366		1.0	0.00	1.06	0.2838	0.0000	0.000	0.000

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MONTHLY TOTALS (MM) FOR YEAR 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	44.1	70.0	28.3	68.4	102.7	141.6
	124.5	123.4	88.8	43.4	47.9	110.4
RUNOFF	0.22	0.18	61.12	37.08	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
EVAPOTRANSPIRATION	14.29	12.28	11.51	50.28	96.16	160.14
	135.38	144.33	48.71	31.85	18.38	16.51
PERCOLATION/LEAKAGE THROUGH	9.690	0.000	0.000	4.555	79.728	32.882
LAYER 1	0.000	0.000	0.000	0.000	0.000	11.819

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ANNUAL TOTALS FOR YEAR 20

	MM	CU. METERS	PERCENT
PRECIPITATION	993.50	437140.000	100.00
RUNOFF	98.604	43385.850	9.92
EVAPOTRANSPIRATION	739.814	325518.220	74.47
PERC./LEAKAGE THROUGH LAYER 1	138.673964	61016.544	13.96
CHANGE IN WATER STORAGE	16.408	7219.393	1.65
SOIL WATER AT START OF YEAR	5862.269	2579398.519	
SOIL WATER AT END OF YEAR	5897.662	2594971.460	
SNOW WATER AT START OF YEAR	18.985	8353.548	1.91
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.007	0.00

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AVERAGE MONTHLY VALUES (MM) FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	50.05	50.34	77.94	71.79	85.41	84.79
	90.68	85.30	110.04	71.04	82.76	69.41
STD. DEVIATIONS	14.27	22.56	36.66	20.91	38.76	53.72
	30.32	41.31	55.36	31.32	27.85	27.88
RUNOFF						
TOTALS	3.410	11.332	49.104	6.961	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.840
STD. DEVIATIONS	5.569	20.877	44.448	17.661	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	1.756
EVAPOTRANSPIRATION						
TOTALS	12.597	12.074	15.758	81.214	88.800	115.632
	102.234	80.862	59.368	36.709	27.072	15.547
STD. DEVIATIONS	1.476	2.045	8.076	12.608	27.865	34.053
	40.482	38.556	16.014	4.855	4.933	2.973
PERCOLATION/LEAKAGE THROUGH LAYER 1						
TOTALS	18.5120	1.4641	3.3511	45.2256	57.1784	15.3197
	2.6116	0.0303	0.6060	11.9732	18.1281	30.7484
STD. DEVIATIONS	27.4073	5.0879	7.4296	17.4954	23.4900	21.1600
	9.8867	0.1356	1.6772	18.2189	19.2963	17.0535

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

	MM		CU. METERS	PERCENT
PRECIPITATION	929.55	(124.995)	408999.8	100.00
RUNOFF	71.646	(55.4910)	31524.05	7.708
EVAPOTRANSPIRATION	647.868	(89.6103)	285061.83	69.697
PERCOLATION/LEAKAGE THROUGH LAYER 1	205.14847	(51.24675)	90265.326	22.06977
CHANGE IN WATER STORAGE	4.883	(2.2238)	2148.61	0.525

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 20 and their dates (DDDYYYY)

	(MM)	(CU. METERS)	
PRECIPITATION	75.00	33000.00000	2610013
RUNOFF	93.836	41287.80331	600013
PERCOLATION/LEAKAGE THROUGH LAYER 1	4.182791	1840.42822	1270003
SNOW WATER	139.13	61215.6276	610003

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.5298

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0770

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FINAL WATER STORAGE AT END OF YEAR 20

LAYER	(CM)	(VOL/VOL)
1	589.7662	0.2949

SNOW WATER 0.000

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HELP Model Output File – 0.3 m Thick Cover Scenario

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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:\WHI\VHELP22\data\P2118.VHP\_weather1.dat
TEMPERATURE DATA FILE:        C:\WHI\VHELP22\data\P2118.VHP\_weather2.dat
SOLAR RADIATION DATA FILE:   C:\WHI\VHELP22\data\P2118.VHP\_weather3.dat
EVAPOTRANSPIRATION DATA:      C:\WHI\VHELP22\data\P2118.VHP\_weather4.dat
SOIL AND DESIGN DATA FILE:   C:\WHI\VHELP22\data\P2118.VHP\I_388335.inp
OUTPUT DATA FILE:             C:\WHI\VHELP22\data\P2118.VHP\O_388335.prt


TIME:   11:53       DATE:   12/18/2019


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     TITLE:   Ridge Landfill-Dec19-400m-0.3cover-eva20

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


                                 LAYER   1
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                  TYPE 1 - VERTICAL PERCOLATION LAYER
                       MATERIAL TEXTURE NUMBER    9
          THICKNESS                     =       30.00     CM
          POROSITY                      =        0.5010 VOL/VOL
          FIELD CAPACITY                =        0.2840 VOL/VOL
          WILTING POINT                 =        0.1350 VOL/VOL
          INITIAL SOIL WATER CONTENT    =        0.2840 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =   0.100000000000E-04 CM/SEC
        NOTE:   SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY   4.63
                FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.



                                 LAYER   2
                                 --------

                  TYPE 1 - VERTICAL PERCOLATION LAYER
                       MATERIAL TEXTURE NUMBER   18
          THICKNESS                     =     2000.00     CM
          POROSITY                      =        0.6710 VOL/VOL
          FIELD CAPACITY                =        0.2920 VOL/VOL
          WILTING POINT                 =        0.0770 VOL/VOL
          INITIAL SOIL WATER CONTENT    =        0.2900 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =   0.100000224000E-02 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
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POOR STAND OF GRASS, A SURFACE SLOPE OF 0.%
AND A SLOPE LENGTH OF 400. METERS.

SCS RUNOFF CURVE NUMBER = 85.76
FRACTION OF AREA ALLOWING RUNOFF = 100.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE = 44.0000 HECTARES
EVAPORATIVE ZONE DEPTH = 20.0 CM
INITIAL WATER IN EVAPORATIVE ZONE = 5.680 CM
UPPER LIMIT OF EVAPORATIVE STORAGE = 10.020 CM
LOWER LIMIT OF EVAPORATIVE STORAGE = 2.700 CM
INITIAL SNOW WATER = 0.000 CM
INITIAL WATER IN LAYER MATERIALS = 588.520 CM
TOTAL INITIAL WATER = 588.520 CM
TOTAL SUBSURFACE INFLOW = 0.00 MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
WINDSOR CANA

STATION LATITUDE = 42.27 DEGREES
MAXIMUM LEAF AREA INDEX = 3.50
START OF GROWING SEASON (JULIAN DATE) = 123
END OF GROWING SEASON (JULIAN DATE) = 282
EVAPORATIVE ZONE DEPTH = 20.0 CM
AVERAGE ANNUAL WIND SPEED = 17.70 KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 66.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 71.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 74.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR WINDSOR CANA

NORMAL MEAN MONTHLY PRECIPITATION (MM)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
45.4	53.0	69.9	76.6	89.6	92.0
83.8	78.8	101.8	76.6	85.4	76.9

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR WINDSOR CANA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES CELSIUS)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
-4.6	-3.9	1.9	8.4	15.1	20.0
22.7	21.8	17.6	10.7	4.8	-1.5

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR WINDSOR CANA
AND STATION LATITUDE = 42.17 DEGREES

LEAK #1: PERCOLATION OR LEAKAGE THROUGH LAYER 2

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DAILY OUTPUT FOR YEAR 1

DAY	S A I I R	O L	RAIN MM	RUNOFF MM	ET MM	E. ZONE WATER CM/CM	HEAD #1 CM	DRAIN #1 MM	LEAK #1 MM
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328		2.5	0.00	1.35	0.2692	0.0000	0.000	.6033
329		8.9	0.00	1.35	0.3068	0.0000	0.000	0.000
330		0.0	0.00	0.63	0.3035	0.0000	0.000	0.000
331	*	0.0	0.00	0.56	0.3004	0.0000	0.000	.6033
332		3.3	0.00	1.09	0.3113	0.0000	0.000	0.000
333		0.0	0.00	0.70	0.3075	0.0000	0.000	0.000
334	*	0.0	0.00	0.55	0.3044	0.0000	0.000	0.000
335		16.5	0.06	1.07	0.3808	0.0000	0.000	0.000
336		0.0	0.00	0.77	0.3765	0.0000	0.000	0.000
337		0.0	0.00	0.72	0.3729	0.0000	0.000	0.000
338		0.0	0.00	0.60	0.3662	0.0000	0.000	0.000
339	*	0.0	0.00	0.57	0.3566	0.0000	0.000	0.000
340		0.0	0.00	0.77	0.3477	0.0000	0.000	0.000
341		20.8	0.46	1.19	0.4394	0.0000	0.000	0.000
342		20.4	6.76	1.13	0.4409	0.0000	0.000	.7256
343		9.3	0.30	1.01	0.4302	0.0000	0.000	0.000
344	*	0.0	0.00	0.56	0.4044	0.0000	0.000	.5808
345		0.0	0.00	0.64	0.3817	0.0000	0.000	.5371
346	*	0.0	0.00	0.62	0.3688	0.0000	0.000	0.000
347		0.0	0.00	0.69	0.3580	0.0000	0.000	0.000
348		0.0	0.00	0.86	0.3482	0.0000	0.000	0.000
349		0.0	0.00	0.71	0.3402	0.0000	0.000	0.000
350		1.2	0.00	1.11	0.3370	0.0000	0.000	0.000
351	*	0.0	0.00	0.56	0.3311	0.0000	0.000	.5740
352		0.0	0.00	0.63	0.3253	0.0000	0.000	1.944
353	*	17.2	0.00	0.63	0.3250	0.0000	0.000	1.437
354		7.7	0.61	0.00	0.4384	0.0000	0.000	1.024
355		0.6	0.00	1.05	0.3971	0.0000	0.000	.1400
356		10.4	0.00	1.10	0.4327	0.0000	0.000	.3653E-01
357		0.0	0.00	0.70	0.4042	0.0000	0.000	1.031
358	*	3.8	0.00	0.86	0.3904	0.0000	0.000	2.303
359	*	0.0	0.00	0.70	0.3818	0.0000	0.000	1.545
360		0.0	0.00	0.84	0.3758	0.0000	0.000	0.000
361	*	12.7	0.00	0.59	0.3717	0.0000	0.000	0.000
362	*	0.0	0.00	0.57	0.3687	0.0000	0.000	0.000
363	*	5.3	0.00	0.56	0.3669	0.0000	0.000	.5073
364		0.0	0.00	0.54	0.3789	0.0000	0.000	.8347
365		0.0	0.02	0.00	0.4318	0.0000	0.000	1.251
366		1.0	0.00	1.20	0.4026	0.0000	0.000	.2559

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MONTHLY TOTALS (MM) FOR YEAR 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	44.1	70.0	28.3	68.4	102.7	141.6
	124.5	123.4	88.8	43.4	47.9	110.4
RUNOFF	6.57	5.62	102.30	57.04	5.01	2.94
	1.46	7.11	3.98	0.00	0.06	8.16
EVAPOTRANSPIRATION	14.29	12.28	11.48	25.53	83.19	125.45
	136.05	124.95	50.45	38.37	26.76	22.47
PERCOLATION/LEAKAGE THROUGH	22.004	0.619	1.207	11.641	18.947	12.609
LAYER 2	2.972	2.210	3.558	4.597	6.777	14.728

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ANNUAL TOTALS FOR YEAR 20

	MM	CU. METERS	PERCENT
PRECIPITATION	993.50	437140.000	100.00
RUNOFF	200.258	88113.478	20.16
EVAPOTRANSPIRATION	671.268	295357.865	67.57
PERC./LEAKAGE THROUGH LAYER 2	101.869461	44822.563	10.25

CHANGE IN WATER STORAGE	20.105	8846.101	2.02
SOIL WATER AT START OF YEAR	5975.708	2629311.549	
SOIL WATER AT END OF YEAR	6014.798	2646511.198	
SNOW WATER AT START OF YEAR	18.985	8353.548	1.91
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.007	0.00

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AVERAGE MONTHLY VALUES (MM) FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	50.05	50.34	77.94	71.79	85.41	84.79
	90.68	85.30	110.04	71.04	82.76	69.41
STD. DEVIATIONS	14.27	22.56	36.66	20.91	38.76	53.72
	30.32	41.31	55.36	31.32	27.85	27.88
RUNOFF						
TOTALS	15.926	28.699	91.690	10.502	3.337	6.619
	3.575	2.442	10.173	2.646	3.595	6.730
STD. DEVIATIONS	14.710	31.016	59.900	22.643	5.775	14.768
	6.397	4.652	15.364	4.460	5.955	7.781
EVAPOTRANSPIRATION						
TOTALS	12.582	12.028	15.992	65.145	76.716	84.769
	91.548	78.041	60.047	39.732	30.412	16.419
STD. DEVIATIONS	1.501	2.091	8.935	14.838	22.270	31.834
	28.187	33.570	17.160	5.740	4.411	3.565
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	21.7904	3.8164	3.8498	19.1249	14.9696	7.7964
	5.1063	2.3266	4.8598	15.6241	20.0477	34.3865
STD. DEVIATIONS	22.8534	8.8103	4.6386	8.9841	13.6465	7.5417
	6.2880	4.2292	5.1510	15.8745	15.6445	14.7664

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

	MM		CU. METERS	PERCENT
PRECIPITATION	929.55	(124.995)	408999.8	100.00
RUNOFF	185.934	(81.9580)	81810.96	20.003
EVAPOTRANSPIRATION	583.432	(73.9345)	256710.27	62.765
PERCOLATION/LEAKAGE THROUGH LAYER 2	153.69860	(41.98282)	67627.384	16.53482
CHANGE IN WATER STORAGE	6.480	(2.3583)	2851.19	0.697

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 20 and their dates (DDDYYYY)

	(MM)	(CU. METERS)	
PRECIPITATION	75.00	33000.00000	2610013
RUNOFF	116.541	51278.06560	600013
PERCOLATION/LEAKAGE THROUGH LAYER 2	3.852366	1695.04086	440016
SNOW WATER	139.13	61215.6276	610003
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.5010		
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1350		

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FINAL WATER STORAGE AT END OF YEAR 20

LAYER	(CM)	(VOL/VOL)
1	12.5801	0.4193
2	588.8997	0.2944
SNOW WATER	0.000	

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