

Project : Cell 3 Analysis

Johnston's Road Landfill Cell 3

Model : HELP

An US EPA model for predicting landfill hydrologic processes and testing of effectiveness of landfill designs

Author : Project Engineer Rowan Howarth

Client : East Gippsland Shire Council

Location : Bairnsdale

1. Profile. EPA Recommended Profile

Model Settings



















[HELP] Case Settings

Parameter	Value	Units
Runoff Method	Model calculated	(-)
Initial Moisture Settings	Model calculated	(-)

[HELP] Surface Water Settings

Parameter	Value	Units
Runoff Area	100	(%%)
Vegetation Class	Good stand of grass	(-)

Profile Structure

Layer	Top (m)	Bottom (m)	Thickness (m)
 Weekly Cover Material 6	32.5000	32.2000	0.3000
 Municipal Waste (312 kg/cub.m) (Layer 6)	32.2005	30.2005	2.0000
 Weekly Cover Material 5	30.2010	29.9010	0.3000
 Municipal Waste (312 kg/cub.m) (Layer 5)	29.9015	27.9015	2.0000
 Weekly Cover Material 4	27.9020	27.6020	0.3000
 Municipal Waste (312 kg/cub.m) (Layer 4)	27.6025	25.6025	2.0000
 Weekly Cover Material 3	25.6030	25.3030	0.3000
 Municipal Waste (312 kg/cub.m) (Layer 3)	25.3035	23.3035	2.0000
 Weekly Cover Material 2	23.3040	23.0040	0.3000
 Municipal Waste (312 kg/cub.m) (Layer 2)	23.0045	21.0045	2.0000
 Weekly Cover Material 1	21.0045	20.7045	0.3000
 Municipal Waste (312 kg/cub.m) (Layer 1)	20.7050	18.7050	2.0000
 Drainage Aggregate 2	18.7050	18.4050	0.3000
 Drainage Net (0.5cm)	18.4050	18.4000	0.0050
 High Density Polyethylene	18.4000	18.3990	0.0010
 Drainage Aggregate 1	18.3990	17.8990	0.5000
 Butyl Rubber	17.8990	17.8980	0.0010
 Clay	17.8980	16.8980	1.0000

1.1. Layer. Weekly Cover Material 6

Top Slope Length: 0.0000
 Bottom Slope Length: 0.0000
 Top Slope: 0.0000
 Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
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total porosity	0.457	(vol/vol)
field capacity	0.131	(vol/vol)
wilting point	0.058	(vol/vol)
sat.hydr.conductivity	1E-3	(cm/sec)
subsurface inflow	0	(mm/year)

1.2. Layer. Municipal Waste (312 kg/cub.m) (Layer 6)

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.671	(vol/vol)
field capacity	0.292	(vol/vol)
wilting point	0.077	(vol/vol)
sat.hydr.conductivity	0.001	(cm/sec)
subsurface inflow	0	(mm/year)

1.3. Layer. Weekly Cover Material 5

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.457	(vol/vol)
field capacity	0.131	(vol/vol)
wilting point	0.058	(vol/vol)
sat.hydr.conductivity	1E-3	(cm/sec)
subsurface inflow	0	(mm/year)

1.4. Layer. Municipal Waste (312 kg/cub.m) (Layer 5)

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.671	(vol/vol)
field capacity	0.292	(vol/vol)
wilting point	0.077	(vol/vol)
sat.hydr.conductivity	0.001	(cm/sec)
subsurface inflow	0	(mm/year)

1.5. Layer. Weekly Cover Material 4

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.457	(vol/vol)

field capacity	0.131	(vol/vol)
wilting point	0.058	(vol/vol)
sat.hydr.conductivity	1E-3	(cm/sec)
subsurface inflow	0	(mm/year)

1.6. Layer. Municipal Waste (312 kg/cub.m) (Layer 4)

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.671	(vol/vol)
field capacity	0.292	(vol/vol)
wilting point	0.077	(vol/vol)
sat.hydr.conductivity	0.001	(cm/sec)
subsurface inflow	0	(mm/year)

1.7. Layer. Weekly Cover Material 3

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.457	(vol/vol)
field capacity	0.131	(vol/vol)
wilting point	0.058	(vol/vol)
sat.hydr.conductivity	1E-3	(cm/sec)
subsurface inflow	0	(mm/year)

1.8. Layer. Municipal Waste (312 kg/cub.m) (Layer 3)

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.671	(vol/vol)
field capacity	0.292	(vol/vol)
wilting point	0.077	(vol/vol)
sat.hydr.conductivity	0.001	(cm/sec)
subsurface inflow	0	(mm/year)

1.9. Layer. Weekly Cover Material 2

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.457	(vol/vol)
field capacity	0.131	(vol/vol)

wilting point	0.058	(vol/vol)
sat.hydr.conductivity	1E-3	(cm/sec)
subsurface inflow	0	(mm/year)

1.10. Layer. Municipal Waste (312 kg/cub.m) (Layer 2)

Top Slope Length: 30.0000
Bottom Slope Length: 30.0000
Top Slope: 30.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.6710	(vol/vol)
field capacity	0.2920	(vol/vol)
wilting point	0.0770	(vol/vol)
sat.hydr.conductivity	86.40000000000001	(cm/day)
subsurface inflow	0.0000	(cm/day)

1.11. Layer. Weekly Cover Material 1

Top Slope Length: 30.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.457	(vol/vol)
field capacity	0.131	(vol/vol)
wilting point	0.058	(vol/vol)
sat.hydr.conductivity	1E-3	(cm/sec)
subsurface inflow	0	(mm/year)

1.12. Layer. Municipal Waste (312 kg/cub.m) (Layer 1)

Top Slope Length: 30.0000
Bottom Slope Length: 30.0000
Top Slope: 30.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.6710	(vol/vol)
field capacity	0.2920	(vol/vol)
wilting point	0.0770	(vol/vol)
sat.hydr.conductivity	86.40000000000001	(cm/day)
subsurface inflow	0.0000	(cm/day)

1.13. Layer. Drainage Aggregate 2

Top Slope Length: 30.0000
Bottom Slope Length: 30.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Lateral Drainage Layer Parameters

Parameter	Value	Units
total porosity	0.397	(vol/vol)
field capacity	0.032	(vol/vol)
wilting point	0.013	(vol/vol)

sat.hydr.conductivity	8640	(cm/day)
subsurface inflow	0	(mm/year)

1.14. Layer. Drainage Net (0.5cm)

Top Slope Length: 30.0000
Bottom Slope Length: 30.0000
Top Slope: 5.0000
Bottom Slope : 5.0000

[HELP] Geotextiles and Geonets Parameters

Parameter	Value	Units
total porosity	0.8500	(vol/vol)
field capacity	0.01	(vol/vol)
wilting point	0.005	(vol/vol)
sat.hydr.conductivity	864000.0000000000	(cm/day)
subsurface inflow	0	(cm/day)

1.15. Layer. High Density Polyethylene

Top Slope Length: 30.0000
Bottom Slope Length: 30.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Geomembrane Liner Parameters

Parameter	Value	Units
sat.hydr.conductivity	2E-13	(cm/sec)
pinhole density	2	(#/ha)
installation defects	2	(#/ha)
placement quality	4	(-)
geotextile transmissivity	0	(cm ² /sec)

1.16. Layer. Drainage Aggregate 1

Top Slope Length: 30.0000
Bottom Slope Length: 70.0000
Top Slope: 5.0000
Bottom Slope : 4.0000

[HELP] Lateral Drainage Layer Parameters

Parameter	Value	Units
total porosity	0.397	(vol/vol)
field capacity	0.032	(vol/vol)
wilting point	0.013	(vol/vol)
sat.hydr.conductivity	8640	(cm/day)
subsurface inflow	0	(mm/year)

1.17. Layer. Butyl Rubber

Top Slope Length: 70.0000
Bottom Slope Length: 70.0000
Top Slope: 4.0000
Bottom Slope : 4.0000

[HELP] Geomembrane Liner Parameters

Parameter	Value	Units
sat.hydr.conductivity	1.0E-12	(cm/sec)
pinhole density	2	(#/ha)
installation defects	4	(#/ha)
placement quality	4	(-)

geotextile transmissivity	0	(cm ² /sec)
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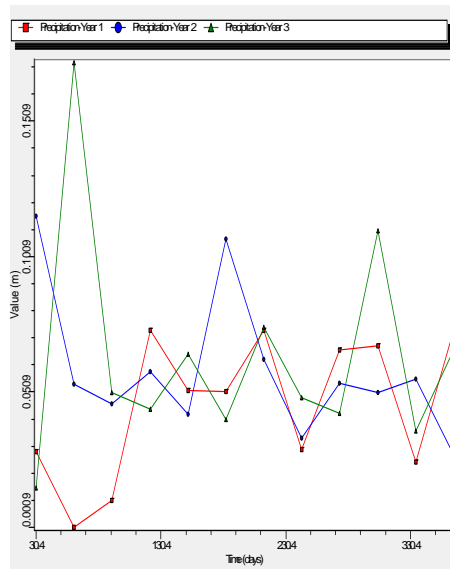
1.18. Layer. Clay

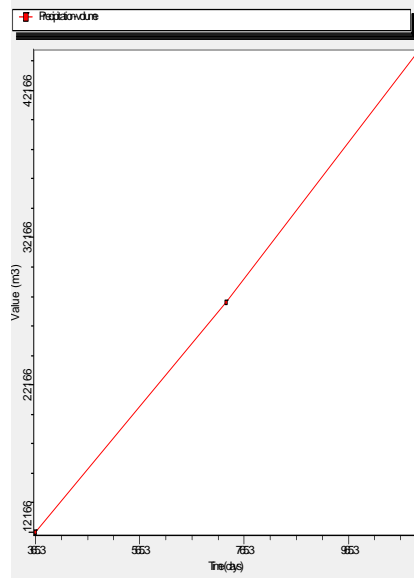
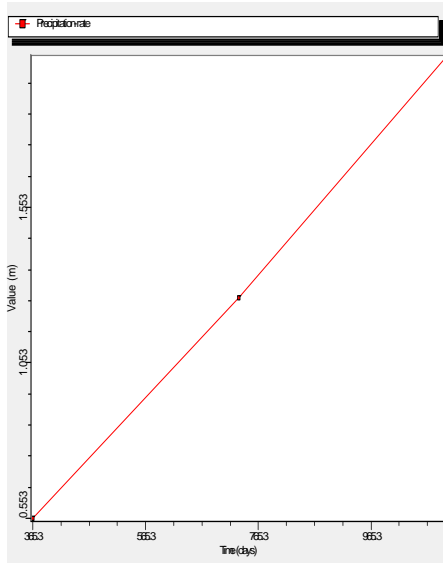
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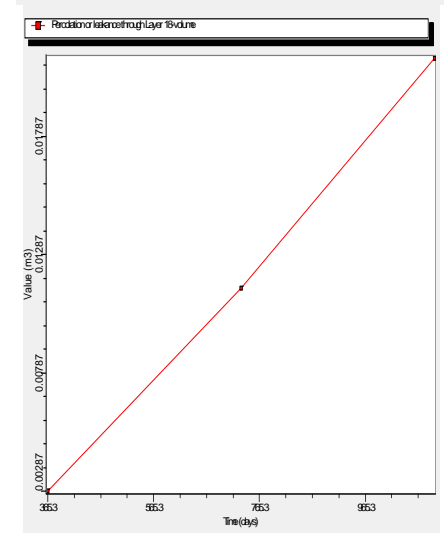
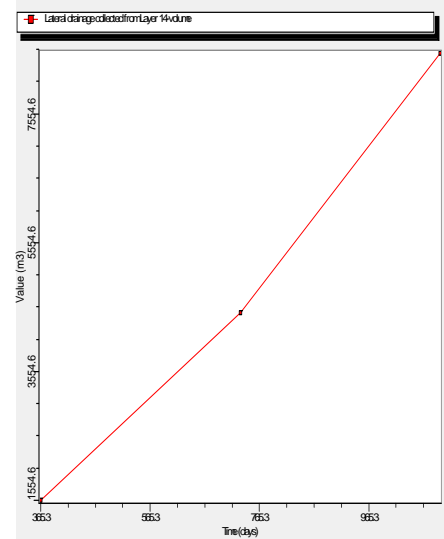
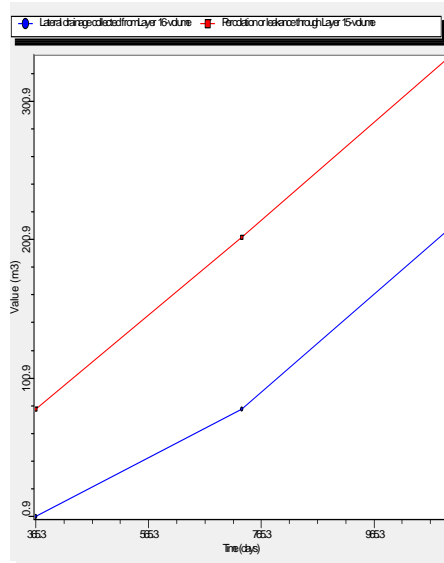
[HELP] Barrier Soil Liner Parameters

Parameter	Value	Units
total porosity	0.475	(vol/vol)
field capacity	0.378	(vol/vol)
wilting point	0.265	(vol/vol)
sat.hydr.conductivity	0.00095	(cm/day)
subsurface inflow	0	(mm/year)

Results:







Annual Totals rate (m)

	Year-1 (m)	Year-2 (m)	Year-3 (m)	Total (m)
Precipitation (m)	5.5300E-01	7.0930E-01	7.6890E-01	2.0312E+00
Runoff (m)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Evapotranspiration (m)	4.4622E-01	5.8591E-01	5.6170E-01	1.5938E+00
Change in water storage (m)	3.6076E-02	-1.2766E-02	1.8432E-02	4.1742E-02
Water budget balance (m)	-8.3052E-09	-1.0653E-08	-1.1548E-08	-3.0506E-08
Soil water (m)	4.3891E+00	4.3764E+00	4.3948E+00	1.3160E+01
Snow water (m)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Lateral drainage collected from Layer 14 (m)	7.0664E-02	1.3263E-01	1.8290E-01	3.8619E-01
Percolation or leakance through Layer 15 (m)	3.5775E-03	5.6164E-03	5.8828E-03	1.5077E-02
Lateral drainage collected from Layer 16 (m)	4.1743E-05	3.5318E-03	5.8724E-03	9.4459E-03
Percolation or leakance through Layer 18 (m)	1.3042E-07	3.9028E-07	4.4157E-07	9.6227E-07
Average head on top of Layer 15 (m)	6.7053E-06	1.2658E-05	1.7346E-05	
Average head on top of Layer 17 (m)	1.1628E-06	9.7719E-05	1.6290E-04	

Annual Totals volume (m3)

	Year-1 (m3)	Year-2 (m3)	Year-3 (m3)	Total (m3)
Precipitation (m3)	1.2166E+04	1.5605E+04	1.6916E+04	4.4686E+04
Runoff (m3)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Evapotranspiration (m3)	9.8168E+03	1.2890E+04	1.2357E+04	3.5064E+04
Change in water storage (m3)	7.9366E+02	-2.8086E+02	4.0551E+02	9.1832E+02
Water budget balance (m3)	-1.8271E-04	-2.3436E-04	-2.5405E-04	-6.7112E-04
Soil water (m3)	9.6561E+04	9.6280E+04	9.6686E+04	2.8953E+05
Snow water (m3)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Lateral drainage collected from Layer 14 (m3)	1.5546E+03	2.9178E+03	4.0238E+03	8.4962E+03
Percolation or leakance through Layer 15 (m3)	7.8705E+01	1.2356E+02	1.2942E+02	3.3169E+02
Lateral drainage collected from Layer 16 (m3)	9.1834E-01	7.7699E+01	1.2919E+02	2.0781E+02
Percolation or leakance through Layer 18 (m3)	2.8692E-03	8.5862E-03	9.7145E-03	2.1170E-02

Accumulated rate (m)

	Year-1 (m)	Year-2 (m)	Year-3 (m)
Precipitation (m)	5.5300E-01	1.2623E+00	2.0312E+00
Runoff (m)	0.0000E+00	0.0000E+00	0.0000E+00
Evapotranspiration (m)	4.4622E-01	1.0321E+00	1.5938E+00
Lateral drainage collected from Layer 14 (m)	7.0664E-02	2.0329E-01	3.8619E-01
Percolation or leakance through Layer 15 (m)	3.5775E-03	9.1939E-03	1.5077E-02
Lateral drainage collected from Layer 16 (m)	4.1743E-05	3.5735E-03	9.4459E-03
Percolation or leakance through Layer 18 (m)	1.3042E-07	5.2070E-07	9.6227E-07

Accumulated volume (m3)

	Year-1 (m3)	Year-2 (m3)	Year-3 (m3)
Precipitation (m3)	1.2166E+04	2.7771E+04	4.4686E+04
Runoff (m3)	0.0000E+00	0.0000E+00	0.0000E+00
Evapotranspiration (m3)	9.8168E+03	2.2707E+04	3.5064E+04
Lateral drainage collected from Layer 14 (m3)	1.5546E+03	4.4724E+03	8.4962E+03
Percolation or leakance through Layer 15 (m3)	7.8705E+01	2.0227E+02	3.3169E+02
Lateral drainage collected from Layer 16 (m3)	9.1834E-01	7.8617E+01	2.0781E+02
Percolation or leakance through Layer 18 (m3)	2.8692E-03	1.1455E-02	2.1170E-02

Peak daily values

	Rate (m)	Volume (m3)	Day	Year
Precipitation	5.4900E-02	1.2078E+03	45	3
Runoff	3.8645E-03	8.5018E+01	205	3
Lateral drainage collected from Layer 14	5.3747E-05	1.1824E+00	205	3
Percolation or leakance through Layer 15	3.8641E-05	8.5009E-01	234	3
Lateral drainage collected from Layer 16	1.6345E-09	3.5960E-05	234	3
Percolation or leakance through Layer 18	0.0000E+00	3.5494E-02	0	1
Snow water	2.3584E-08	5.5023E-05	0	0

2. Profile. Cell 1 Design

Model Settings















[HELP] Case Settings

Parameter	Value	Units
Runoff Method	Model calculated	(-)
Initial Moisture Settings	Model calculated	(-)

[HELP] Surface Water Settings

Parameter	Value	Units
Runoff Area	100	(%%)
Vegetation Class	Good stand of grass	(-)

Profile Structure

Layer	Top (m)	Bottom (m)	Thickness (m)
 Weekly Cover Material 6	32.4935	32.2935	0.2000
 Municipal Waste (312 kg/cub.m) (Layer 6)	32.2940	30.2940	2.0000
 Weekly Cover Material 5	30.2945	29.9945	0.3000
 Municipal Waste (312 kg/cub.m) (Layer 5)	29.9950	27.9950	2.0000
 Weekly Cover Material 4	27.9955	27.6955	0.3000
 Municipal Waste (312 kg/cub.m) (Layer 4)	27.6960	25.6960	2.0000
 Weekly Cover Material 3	25.6965	25.3965	0.3000
 Municipal Waste (312 kg/cub.m) (Layer 3)	25.3970	23.3970	2.0000
 Weekly Cover Material 2	23.3975	23.0975	0.3000
 Municipal Waste (312 kg/cub.m) (Layer 2)	23.0980	21.0980	2.0000
 Weekly Cover Material 1	21.0985	20.7985	0.3000
 Municipal Waste (312 kg/cub.m)	20.7990	18.7990	2.0000
 Drainage Aggregate	18.7995	18.4995	0.3000
 Clay	18.5000	17.5000	1.0000

2.1. Layer. Weekly Cover Material 6

Top Slope Length: 0.0000
 Bottom Slope Length: 0.0000
 Top Slope: 0.0000
 Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.457	(vol/vol)
field capacity	0.131	(vol/vol)
wilting point	0.058	(vol/vol)
sat.hydr.conductivity	1E-3	(cm/sec)
subsurface inflow	0	(mm/year)

2.2. Layer. Municipal Waste (312 kg/cub.m) (Layer 6)

Top Slope Length: 0.0000
 Bottom Slope Length: 0.0000
 Top Slope: 0.0000
 Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.671	(vol/vol)
field capacity	0.292	(vol/vol)
wilting point	0.077	(vol/vol)
sat.hydr.conductivity	0.001	(cm/sec)
subsurface inflow	0	(mm/year)

2.3. Layer. Weekly Cover Material 5

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.457	(vol/vol)
field capacity	0.131	(vol/vol)
wilting point	0.058	(vol/vol)
sat.hydr.conductivity	1E-3	(cm/sec)
subsurface inflow	0	(mm/year)

2.4. Layer. Municipal Waste (312 kg/cub.m) (Layer 5)

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.671	(vol/vol)
field capacity	0.292	(vol/vol)
wilting point	0.077	(vol/vol)
sat.hydr.conductivity	0.001	(cm/sec)
subsurface inflow	0	(mm/year)

2.5. Layer. Weekly Cover Material 4

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.457	(vol/vol)
field capacity	0.131	(vol/vol)
wilting point	0.058	(vol/vol)
sat.hydr.conductivity	1E-3	(cm/sec)
subsurface inflow	0	(mm/year)

2.6. Layer. Municipal Waste (312 kg/cub.m) (Layer 4)

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.671	(vol/vol)
field capacity	0.292	(vol/vol)
wilting point	0.077	(vol/vol)
sat.hydr.conductivity	0.001	(cm/sec)
subsurface inflow	0	(mm/year)

2.7. Layer. Weekly Cover Material 3

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.457	(vol/vol)
field capacity	0.131	(vol/vol)
wilting point	0.058	(vol/vol)
sat.hydr.conductivity	1E-3	(cm/sec)
subsurface inflow	0	(mm/year)

2.8. Layer. Municipal Waste (312 kg/cub.m) (Layer 3)

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.671	(vol/vol)
field capacity	0.292	(vol/vol)
wilting point	0.077	(vol/vol)
sat.hydr.conductivity	0.001	(cm/sec)
subsurface inflow	0	(mm/year)

2.9. Layer. Weekly Cover Material 2

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.457	(vol/vol)
field capacity	0.131	(vol/vol)
wilting point	0.058	(vol/vol)
sat.hydr.conductivity	1E-3	(cm/sec)
subsurface inflow	0	(mm/year)

2.10. Layer. Municipal Waste (312 kg/cub.m) (Layer 2)

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.671	(vol/vol)
field capacity	0.292	(vol/vol)
wilting point	0.077	(vol/vol)
sat.hydr.conductivity	0.001	(cm/sec)
subsurface inflow	0	(mm/year)

2.11. Layer. Weekly Cover Material 1

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.457	(vol/vol)
field capacity	0.131	(vol/vol)
wilting point	0.058	(vol/vol)
sat.hydr.conductivity	1E-3	(cm/sec)
subsurface inflow	0	(mm/year)

2.12. Layer. Municipal Waste (312 kg/cub.m)

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.671	(vol/vol)
field capacity	0.292	(vol/vol)
wilting point	0.077	(vol/vol)
sat.hydr.conductivity	0.001	(cm/sec)
subsurface inflow	0	(mm/year)

2.13. Layer. Drainage Aggregate

Top Slope Length: 0.0000
Bottom Slope Length: 70.0000
Top Slope: 0.0000
Bottom Slope : 4.0000

[HELP] Lateral Drainage Layer Parameters

Parameter	Value	Units
total porosity	0.397	(vol/vol)
field capacity	0.032	(vol/vol)
wilting point	0.013	(vol/vol)
sat.hydr.conductivity	8640	(cm/day)
subsurface inflow	0	(mm/year)

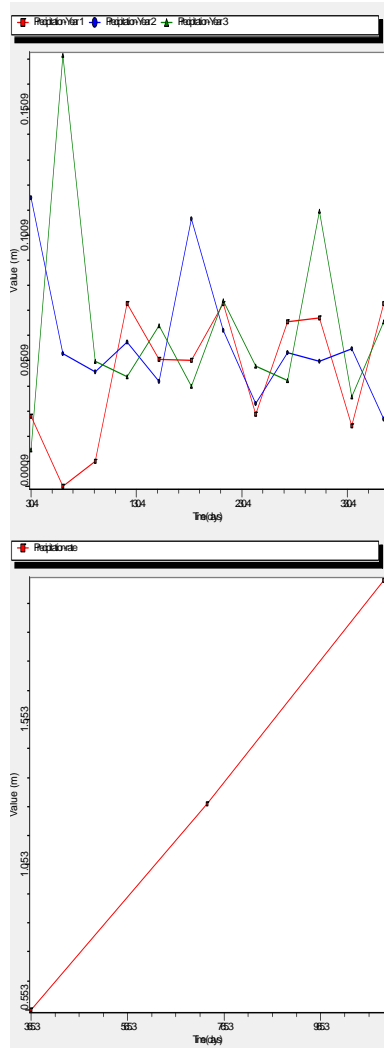
2.14. Layer. Clay

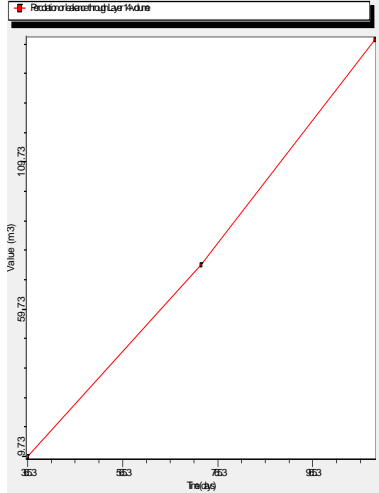
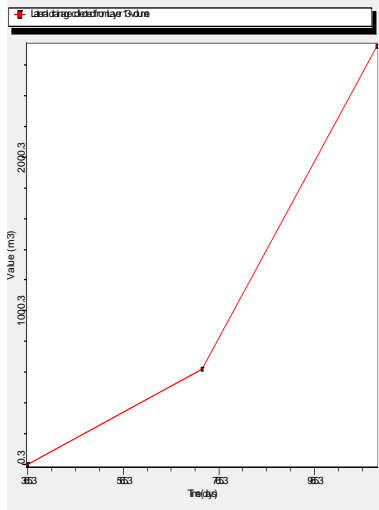
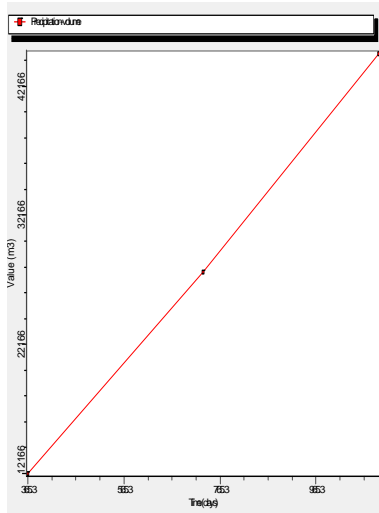
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Bottom Slope Length: 0.0000
Top Slope: 4.0000
Bottom Slope : 0.0000

[HELP] Barrier Soil Liner Parameters

Parameter	Value	Units
total porosity	0.4750	(vol/vol)
field capacity	0.3780	(vol/vol)
wilting point	0.2650	(vol/vol)
sat.hydr.conductivity	0.00095	(cm/day)
subsurface inflow	0.0000	(cm/day)

Results:





Annual Totals rate (m)

	Year-1 (m)	Year-2 (m)	Year-3 (m)	Total (m)
Precipitation (m)	5.5300E-01	7.0930E-01	7.6890E-01	2.0312E+00
Runoff (m)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Evapotranspiration (m)	5.1917E-01	6.7634E-01	6.5636E-01	1.8519E+00
Change in water storage (m)	3.3375E-02	1.7284E-03	1.3644E-02	4.8748E-02
Water budget balance (m)	-8.3052E-09	-1.0653E-08	-1.1548E-08	-3.0506E-08
Soil water (m)	4.2706E+00	4.2723E+00	4.2860E+00	1.2829E+01
Snow water (m)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Lateral drainage collected from Layer 13 (m)	1.2668E-05	2.8275E-02	9.5418E-02	1.2371E-01
Percolation or leakance through Layer 14 (m)	4.4246E-04	2.9553E-03	3.4766E-03	6.8744E-03
Average head on top of Layer 14 (m)	4.2474E-07	7.8149E-04	2.6280E-03	
Average head on top of Layer 17 (m)	1.1628E-06	9.7719E-05	1.6290E-04	

Annual Totals volume (m3)

	Year-1 (m3)	Year-2 (m3)	Year-3 (m3)	Total (m3)
Precipitation (m3)	1.2166E+04	1.5605E+04	1.6916E+04	4.4686E+04
Runoff (m3)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Evapotranspiration (m3)	1.1422E+04	1.4880E+04	1.4440E+04	4.0741E+04
Change in water storage (m3)	7.3426E+02	3.8024E+01	3.0017E+02	1.0724E+03
Water budget balance (m3)	-1.8271E-04	-2.3436E-04	-2.5405E-04	-6.7112E-04
Soil water (m3)	9.3953E+04	9.3991E+04	9.4292E+04	2.8224E+05
Snow water (m3)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Lateral drainage collected from Layer 13 (m3)	2.7869E-01	6.2205E+02	2.0992E+03	2.7215E+03
Percolation or leakance through Layer 14 (m3)	9.7342E+00	6.5017E+01	7.6486E+01	1.5124E+02

Accumulated rate (m)

	Year-1 (m)	Year-2 (m)	Year-3 (m)
Precipitation (m)	5.5300E-01	1.2623E+00	2.0312E+00
Runoff (m)	0.0000E+00	0.0000E+00	0.0000E+00
Evapotranspiration (m)	5.1917E-01	1.1955E+00	1.8519E+00
Lateral drainage collected from Layer 13 (m)	1.2668E-05	2.8288E-02	1.2371E-01
Percolation or leakance through Layer 14 (m)	4.4246E-04	3.3978E-03	6.8744E-03

Accumulated volume (m3)

	Year-1 (m3)	Year-2 (m3)	Year-3 (m3)
Precipitation (m3)	1.2166E+04	2.7771E+04	4.4686E+04
Runoff (m3)	0.0000E+00	0.0000E+00	0.0000E+00
Evapotranspiration (m3)	1.1422E+04	2.6301E+04	4.0741E+04
Lateral drainage collected from Layer 13 (m3)	2.7869E-01	6.2233E+02	2.7215E+03
Percolation or leakance through Layer 14 (m3)	9.7342E+00	7.4751E+01	1.5124E+02

Peak daily values

	Rate (m)	Volume (m3)	Day	Year
Precipitation	5.4900E-02	1.2078E+03	45	3
Runoff	2.8865E-03	6.3503E+01	197	3
Lateral drainage collected from Layer 13	9.7780E-06	2.1512E-01	197	3
Percolation or leakance through Layer 14	0.0000E+00	7.4751E+01	151	236
Snow water	3.9863E-03	1.2410E+01	0	0

3. Profile. Cell 2 Design

Model Settings
















[HELP] Case Settings

Parameter	Value	Units
Runoff Method	Model calculated	(-)
Initial Moisture Settings	Model calculated	(-)

[HELP] Surface Water Settings

Parameter	Value	Units
Runoff Area	100	(%%)
Vegetation Class	Good stand of grass	(-)

Profile Structure

Layer	Top (m)	Bottom (m)	Thickness (m)
 Weekly Cover Material 6	32.5000	32.2000	0.3000
 Municipal Waste (312 kg/cub.m) (Layer 6)	32.2005	30.2005	2.0000
 Weekly Cover Material 5	30.2010	29.9010	0.3000
 Municipal Waste (312 kg/cub.m) (Layer 5)	29.9015	27.9015	2.0000
 Weekly Cover Material 4	27.9020	27.6020	0.3000
 Municipal Waste (312 kg/cub.m) (Layer 4)	27.6025	25.6025	2.0000
 Weekly Cover Material 3	25.6030	25.3030	0.3000
 Municipal Waste (312 kg/cub.m) (Layer 3)	25.3035	23.3035	2.0000
 Weekly Cover Material 2	23.3040	23.0040	0.3000
 Municipal Waste (312 kg/cub.m) (Layer 2)	23.0045	21.0045	2.0000
 Weekly Cover Material 1	21.0050	20.7050	0.3000
 Municipal Waste (312 kg/cub.m) (Layer 1)	20.7055	18.7055	2.0000
 Drainage Aggregate	18.7060	18.4060	0.3000
 High Density Polyethylene (HDPE)	18.4065	18.4055	0.0010
 Clay	18.4060	17.4060	1.0000

3.1. Layer. Weekly Cover Material 6

Top Slope Length: 0.0000
 Bottom Slope Length: 0.0000
 Top Slope: 0.0000
 Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.457	(vol/vol)
field capacity	0.131	(vol/vol)
wilting point	0.058	(vol/vol)
sat.hydr.conductivity	1E-3	(cm/sec)
subsurface inflow	0	(mm/year)

3.2. Layer. Municipal Waste (312 kg/cub.m) (Layer 6)

Top Slope Length: 0.0000
 Bottom Slope Length: 0.0000
 Top Slope: 0.0000
 Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.671	(vol/vol)
field capacity	0.292	(vol/vol)
wilting point	0.077	(vol/vol)
sat.hydr.conductivity	0.001	(cm/sec)
subsurface inflow	0	(mm/year)

3.3. Layer. Weekly Cover Material 5

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.457	(vol/vol)
field capacity	0.131	(vol/vol)
wilting point	0.058	(vol/vol)
sat.hydr.conductivity	1E-3	(cm/sec)
subsurface inflow	0	(mm/year)

3.4. Layer. Municipal Waste (312 kg/cub.m) (Layer 5)

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.671	(vol/vol)
field capacity	0.292	(vol/vol)
wilting point	0.077	(vol/vol)
sat.hydr.conductivity	0.001	(cm/sec)
subsurface inflow	0	(mm/year)

3.5. Layer. Weekly Cover Material 4

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.457	(vol/vol)
field capacity	0.131	(vol/vol)
wilting point	0.058	(vol/vol)
sat.hydr.conductivity	1E-3	(cm/sec)
subsurface inflow	0	(mm/year)

3.6. Layer. Municipal Waste (312 kg/cub.m) (Layer 4)

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.671	(vol/vol)
field capacity	0.292	(vol/vol)
wilting point	0.077	(vol/vol)
sat.hydr.conductivity	0.001	(cm/sec)
subsurface inflow	0	(mm/year)

3.7. Layer. Weekly Cover Material 3

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.457	(vol/vol)
field capacity	0.131	(vol/vol)
wilting point	0.058	(vol/vol)
sat.hydr.conductivity	1E-3	(cm/sec)
subsurface inflow	0	(mm/year)

3.8. Layer. Municipal Waste (312 kg/cub.m) (Layer 3)

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.671	(vol/vol)
field capacity	0.292	(vol/vol)
wilting point	0.077	(vol/vol)
sat.hydr.conductivity	0.001	(cm/sec)
subsurface inflow	0	(mm/year)

3.9. Layer. Weekly Cover Material 2

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.457	(vol/vol)
field capacity	0.131	(vol/vol)
wilting point	0.058	(vol/vol)
sat.hydr.conductivity	1E-3	(cm/sec)
subsurface inflow	0	(mm/year)

3.10. Layer. Municipal Waste (312 kg/cub.m) (Layer 2)

Top Slope Length: 0.0000
Bottom Slope Length: 0.0000
Top Slope: 0.0000
Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.671	(vol/vol)
field capacity	0.292	(vol/vol)
wilting point	0.077	(vol/vol)
sat.hydr.conductivity	0.001	(cm/sec)
subsurface inflow	0	(mm/year)

3.11. Layer. Weekly Cover Material 1

Top Slope Length: 0.0000
 Bottom Slope Length: 0.0000
 Top Slope: 0.0000
 Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.457	(vol/vol)
field capacity	0.131	(vol/vol)
wilting point	0.058	(vol/vol)
sat.hydr.conductivity	1E-3	(cm/sec)
subsurface inflow	0	(mm/year)

3.12. Layer. Municipal Waste (312 kg/cub.m) (Layer 1)

Top Slope Length: 0.0000
 Bottom Slope Length: 0.0000
 Top Slope: 0.0000
 Bottom Slope : 0.0000

[HELP] Vertical Perc. Layer Parameters

Parameter	Value	Units
total porosity	0.671	(vol/vol)
field capacity	0.292	(vol/vol)
wilting point	0.077	(vol/vol)
sat.hydr.conductivity	0.001	(cm/sec)
subsurface inflow	0	(mm/year)

3.13. Layer. Drainage Aggregate

Top Slope Length: 0.0000
 Bottom Slope Length: 70.0000
 Top Slope: 0.0000
 Bottom Slope : 4.0000

[HELP] Lateral Drainage Layer Parameters

Parameter	Value	Units
total porosity	0.397	(vol/vol)
field capacity	0.032	(vol/vol)
wilting point	0.013	(vol/vol)
sat.hydr.conductivity	8640	(cm/day)
subsurface inflow	0	(mm/year)

3.14. Layer. High Density Polyethylene (HDPE)

Top Slope Length: 70.0000
 Bottom Slope Length: 70.0000
 Top Slope: 4.0000
 Bottom Slope : 4.0000

[HELP] Geomembrane Liner Parameters

Parameter	Value	Units
sat.hydr.conductivity	2E-13	(cm/sec)
pinhole density	2	(#/ha)
installation defects	2	(#/ha)
placement quality	3	(-)
geotextile transmissivity	0	(cm ² /sec)

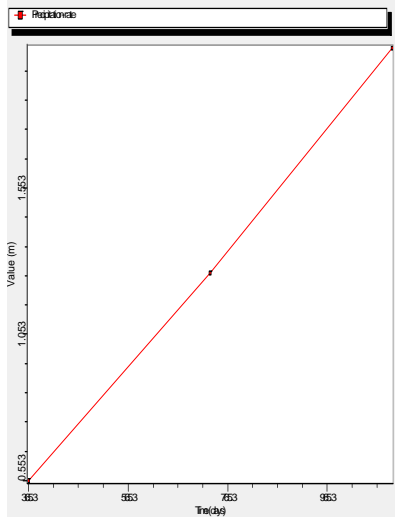
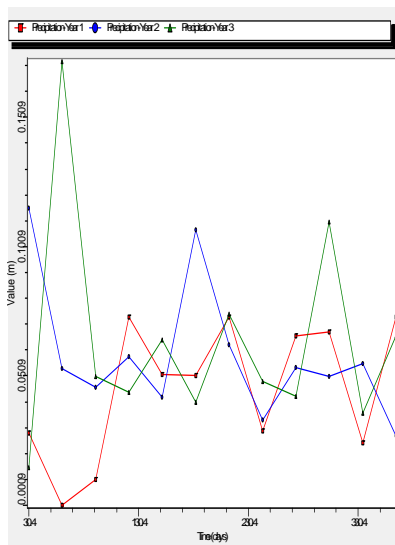
3.15. Layer. Clay

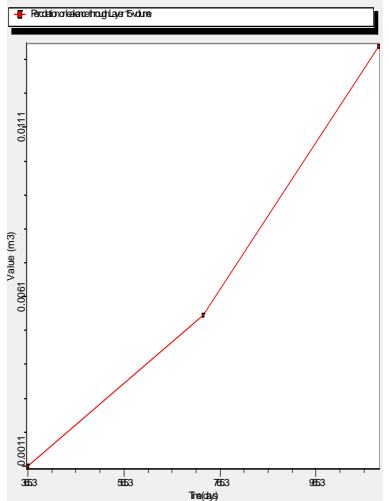
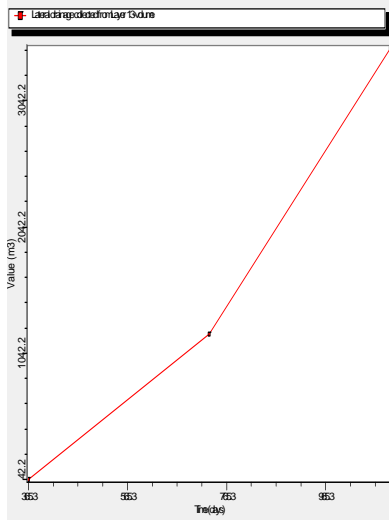
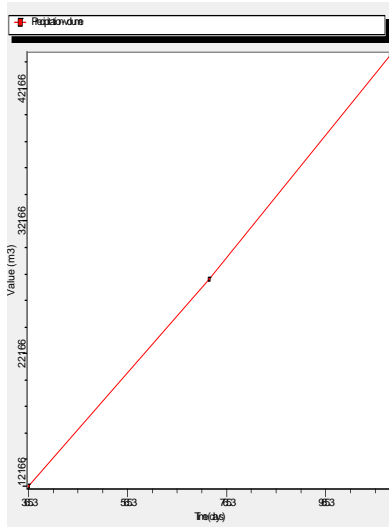
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 Bottom Slope Length: 0.0000
 Top Slope: 4.0000
 Bottom Slope : 0.0000

[HELP] Barrier Soil Liner Parameters

Parameter	Value	Units
total porosity	0.4750	(vol/vol)
field capacity	0.3780	(vol/vol)
wilting point	0.2650	(vol/vol)
sat.hydr.conductivity	0.00095	(cm/day)
subsurface inflow	0.0000	(cm/day)

Results:





Annual Totals rate (m)

	Year-1 (m)	Year-2 (m)	Year-3 (m)	Total (m)
Precipitation (m)	5.5300E-01	7.0930E-01	7.6890E-01	2.0312E+00

Runoff (m)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Evapotranspiration (m)	5.1278E-01	6.6270E-01	6.4910E-01	1.8246E+00
Change in water storage (m)	3.8306E-02	-5.5595E-03	1.6801E-02	4.9547E-02
Water budget balance (m)	-8.3052E-09	-1.0653E-08	-1.1548E-08	-3.0506E-08
Soil water (m)	4.3010E+00	4.2954E+00	4.3122E+00	1.2909E+01
Snow water (m)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Lateral drainage collected from Layer 13 (m)	1.9188E-03	5.2162E-02	1.0300E-01	1.5708E-01
Percolation or leakance through Layer 15 (m)	4.9800E-08	2.0220E-07	3.6111E-07	6.1311E-07
Average head on top of Layer 14 (m)	5.2466E-05	1.4430E-03	2.8360E-03	
Average head on top of Layer 17 (m)	1.1628E-06	9.7719E-05	1.6290E-04	

Annual Totals volume (m3)

	Year-1 (m3)	Year-2 (m3)	Year-3 (m3)	Total (m3)
Precipitation (m3)	1.2166E+04	1.5605E+04	1.6916E+04	4.4686E+04
Runoff (m3)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Evapotranspiration (m3)	1.1281E+04	1.4579E+04	1.4280E+04	4.0141E+04
Change in water storage (m3)	8.4273E+02	-1.2231E+02	3.6961E+02	1.0900E+03
Water budget balance (m3)	-1.8271E-04	-2.3436E-04	-2.5405E-04	-6.7112E-04
Soil water (m3)	9.4621E+04	9.4499E+04	9.4869E+04	2.8399E+05
Snow water (m3)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Lateral drainage collected from Layer 13 (m3)	4.2213E+01	1.1476E+03	2.2660E+03	3.4558E+03
Percolation or leakance through Layer 15 (m3)	1.0956E-03	4.4484E-03	7.9445E-03	1.3489E-02

Accumulated rate (m)

	Year-1 (m)	Year-2 (m)	Year-3 (m)
Precipitation (m)	5.5300E-01	1.2623E+00	2.0312E+00
Runoff (m)	0.0000E+00	0.0000E+00	0.0000E+00
Evapotranspiration (m)	5.1278E-01	1.1755E+00	1.8246E+00
Lateral drainage collected from Layer 13 (m)	1.9188E-03	5.4081E-02	1.5708E-01
Percolation or leakance through Layer 15 (m)	4.9800E-08	2.5200E-07	6.1311E-07

Accumulated volume (m3)

	Year-1 (m3)	Year-2 (m3)	Year-3 (m3)
Precipitation (m3)	1.2166E+04	2.7771E+04	4.4686E+04
Runoff (m3)	0.0000E+00	0.0000E+00	0.0000E+00
Evapotranspiration (m3)	1.1281E+04	2.5860E+04	4.0141E+04
Lateral drainage collected from Layer 13 (m3)	4.2213E+01	1.1898E+03	3.4558E+03
Percolation or leakance through Layer 15 (m3)	1.0956E-03	5.5440E-03	1.3489E-02

Peak daily values

	Rate (m)	Volume (m3)	Day	Year
Precipitation	5.4900E-02	1.2078E+03	45	3
Runoff	2.9364E-03	6.4602E+01	200	3
Lateral drainage collected from Layer 13	9.4313E-09	2.0749E-04	200	3
Percolation or leakance through Layer 15	0.0000E+00	5.5440E-03	0	0
Snow water	7.3540E-03	1.3396E+01	0	0