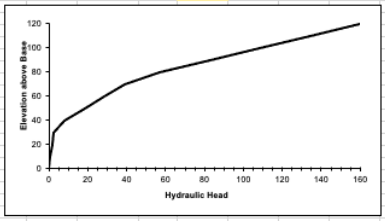
Direct solution for flux

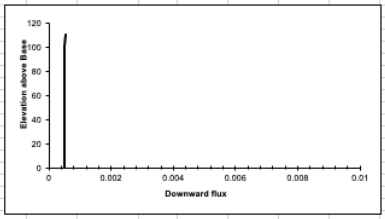
	K	num cells
zone 1	0.0002	4.5
zone 2	0.0005	4
zone 3	0.006	3.5
Keq	0.00038806	
q	0.00051475	

z	K zone cell	K cell	H	q	zone 1	zone 2	zone 3
120	1	0.0002	160		1	0	0
110	1	0.0002	134.25969	0.0005148	1	0	0
100	1	0.0002	108.52011	0.0005148	1	0	0
90	1	0.0002	82.781454	0.0005148	1	0	0
80	1	0.0002	57.043769	0.0005148	1	0	0
70	2	0.0005	39.028284	0.0005147	0	1	0
60	2	0.0005	28.734466	0.0005147	0	1	0
50	2	0.0005	18.441175	0.0005147	0	1	0
40	2	0.0005	8.1481529	0.0005147	0	1	0
30	3	0.006	2.5728811	0.0005146	0	0	1
20	3	0.006	1.7152273	0.0005146	0	0	1
10	3	0.006	0.8576136	0.0005146	0	0	1
0	3	0.006	0	0.0005146	0	0	1

Map of node and cell numbers

	node	cell	
1	-		1
2	-		2
3	-		3
4	-		4
5	-		5
6	-		6
7	-		7
8	-		8
9	-		9
10	-		10
11	-		11
12	-		12
13	-		13





The Challenge:

Create a 1D, vertical steady state model with constant head top and bottom boundaries.

Show, based on the flux with depth, that the model is steady state.
Repeat this for a homogeneous and for a heterogeneous column.

Show that the steady state flux agrees with the direct calculation based on the harmonic mean average K.

Show the steady state head profile for a column with approximately equal-thickness layers with different K values.
Use this profile to explain why the equivalent hydraulic conductivity, Keq, is closer to the lower of the K values.

Heterogeneous

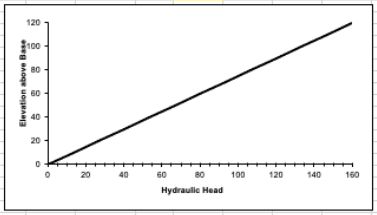
Direct solution for flux

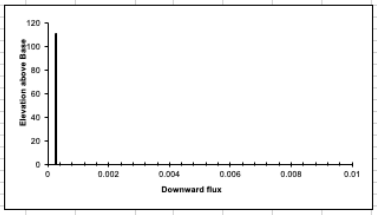
	K	num cells
zone 1	0.0002	12
zone 2	0.0005	0
zone 3	0.006	0
Keq	0.0002	
q	0.00026667	

z	K zone cell	K cell	H	q	zone 1	zone 2	zone 3
120	1	0.0002	160		1	0	0
110	1	0.0002	146.66667	0.0002667	1	0	0
100	1	0.0002	133.33333	0.0002667	1	0	0
90	1	0.0002	120	0.0002667	1	0	0
80	1	0.0002	106.66667	0.0002667	1	0	0
70	1	0.0002	93.333333	0.0002667	1	0	0
60	1	0.0002	80	0.0002667	1	0	0
50	1	0.0002	66.666667	0.0002667	1	0	0
40	1	0.0002	53.333333	0.0002667	1	0	0
30	1	0.0002	40	0.0002667	1	0	0
20	1	0.0002	26.666667	0.0002667	1	0	0
10	1	0.0002	13.333333	0.0002667	1	0	0
0	1	0.0002	0	0.0002667	1	0	0

Map of node and cell numbers

	node	cell	
1	-		1
2	-		2
3	-		3
4	-		4
5	-		5
6	-		6
7	-		7
8	-		8
9	-		9
10	-		10
11	-		11
12	-		12
13	-		13





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Homogeneous