Minimum Figures and calculations to submit:*

1. Challenge 1:

Head difference = 10, H confine d= 20, 10 unconfined = 15,5

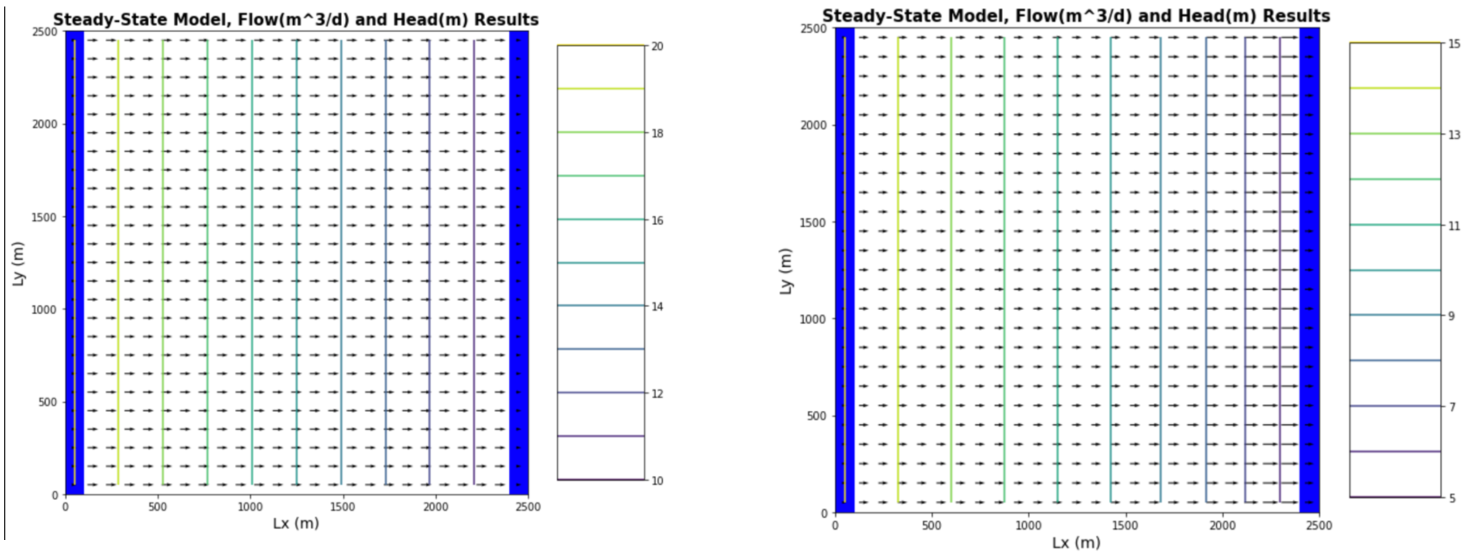

Figure 1: Confined and Unconfined equipotentials. The confined case (left) has equipotentials that are equally spaced, while the unconfined (right) case has equipotentials that bunch towards the right of the model domain

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	Start	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
2	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685924	4.633578	4.581231	4.528886	4.47654	4.424193	4.371847	4.319501	4.26904	4.227716	4.201835	4.193478	4.205243	4.2404475	4.303436	4.4000916	4.538748	4.7319102	5	
3	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685924	4.633578	4.581231	4.528886	4.47654	4.424194	4.371848	4.319502	4.26904	4.227716	4.201835	4.193478	4.205243	4.2404475	4.3034353	4.4000916	4.538748	4.7319102	5	
4	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685924	4.633578	4.581231	4.528886	4.47654	4.424193	4.371848	4.319502	4.269039	4.227716	4.201835	4.193478	4.205243	4.2404475	4.3034353	4.4000916	4.538748	4.73191	5	
5	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633578	4.581231	4.528886	4.47654	4.424193	4.371848	4.319502	4.26904	4.227717	4.201835	4.193478	4.205243	4.2404475	4.3034353	4.4000916	4.538748	4.73191	5	
6	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633578	4.581231	4.528886	4.47654	4.424193	4.371848	4.319502	4.269041	4.227717	4.201835	4.193478	4.205243	4.2404475	4.3034353	4.400091	4.538748	4.7319102	5	
7	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581231	4.528886	4.47654	4.424194	4.371848	4.319502	4.269041	4.227717	4.201835	4.193477	4.205243	4.2404475	4.3034353	4.400091	4.5387473	4.7319102	5	
8	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581231	4.528886	4.47654	4.424194	4.371848	4.319502	4.269041	4.227717	4.201836	4.193477	4.205243	4.2404475	4.3034353	4.400091	4.5387473	4.7319102	5	
9	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581231	4.528886	4.47654	4.424194	4.371848	4.319502	4.269041	4.227717	4.201836	4.193479	4.205243	4.2404475	4.3034343	4.400091	4.5387473	4.73191	5	
10	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581231	4.528886	4.47654	4.424194	4.371848	4.319502	4.26904	4.227717	4.201836	4.193479	4.205243	4.2404475	4.3034353	4.400091	4.5387473	4.73191	5	
11	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581231	4.528886	4.47654	4.424194	4.371848	4.319502	4.26904	4.227717	4.201836	4.193479	4.205244	4.2404475	4.3034353	4.400091	4.5387473	4.73191	5	
12	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581232	4.528886	4.47654	4.424194	4.371848	4.319502	4.26904	4.227717	4.201836	4.193478	4.205244	4.2404475	4.3034353	4.400091	4.5387473	4.73191	5	
13	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581232	4.528886	4.47654	4.424194	4.371848	4.319502	4.26904	4.227717	4.201836	4.193478	4.205244	4.2404475	4.3034353	4.400091	4.5387473	4.73191	5	
14	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581232	4.528887	4.47654	4.424194	4.371848	4.319502	4.26904	4.227717	4.201836	4.193478	4.205244	4.2404475	4.3034353	4.4000916	4.5387473	4.73191	5	
15	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581232	4.528887	4.47654	4.424193	4.371848	4.319502	4.26904	4.227717	4.201836	4.193478	4.205244	4.2404475	4.3034353	4.4000916	4.538748	4.7319102	5	
16	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581232	4.528887	4.476541	4.424193	4.371848	4.319502	4.26904	4.227717	4.201836	4.193479	4.205244	4.2404475	4.3034353	4.4000916	4.538748	4.7319102	5	
17	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581232	4.528887	4.476541	4.424194	4.371848	4.319502	4.269041	4.227717	4.201836	4.193479	4.205244	4.2404475	4.3034353	4.4000916	4.538748	4.7319102	5	
18	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581232	4.528887	4.476541	4.424194	4.371849	4.319502	4.269041	4.227717	4.201836	4.193479	4.205244	4.2404475	4.3034353	4.400091	4.5387473	4.7319102	5	
19	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581232	4.528887	4.476541	4.424194	4.371849	4.319503	4.269041	4.227717	4.201836	4.193479	4.205244	4.2404475	4.3034353	4.400091	4.5387473	4.73191	5	
20	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581232	4.528887	4.476541	4.424195	4.371849	4.319503	4.269041	4.227718	4.201836	4.193479	4.205244	4.2404475	4.3034353	4.400091	4.5387473	4.73191	5	
21	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581232	4.528887	4.476541	4.424195	4.371849	4.319503	4.269041	4.227718	4.201836	4.193479	4.205244	4.2404475	4.3034353	4.400091	4.5387473	4.73191	5	
22	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581232	4.528887	4.476541	4.424195	4.371849	4.319503	4.269041	4.227718	4.201836	4.193479	4.205244	4.2404475	4.3034353	4.400091	4.5387473	4.73191	5	
23	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581232	4.528887	4.476541	4.424195	4.371849	4.319503	4.269041	4.227718	4.201836	4.193479	4.205244	4.240448	4.3034353	4.400091	4.5387473	4.73191	5	
24	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581232	4.528887	4.476541	4.424195	4.371849	4.319504	4.269041	4.227718	4.201836	4.193479	4.205244	4.2404475	4.3034353	4.400091	4.5387473	4.73191	5	
25	5	4.947655	4.8953075	4.842962	4.790617	4.73827	4.685925	4.633579	4.581232	4.528887	4.476541	4.424195	4.371849	4.319504	4.269041	4.227718	4.201836	4.193479	4.205244	4.2404475	4.303435	4.4000907	4.538747	4.73191	5	
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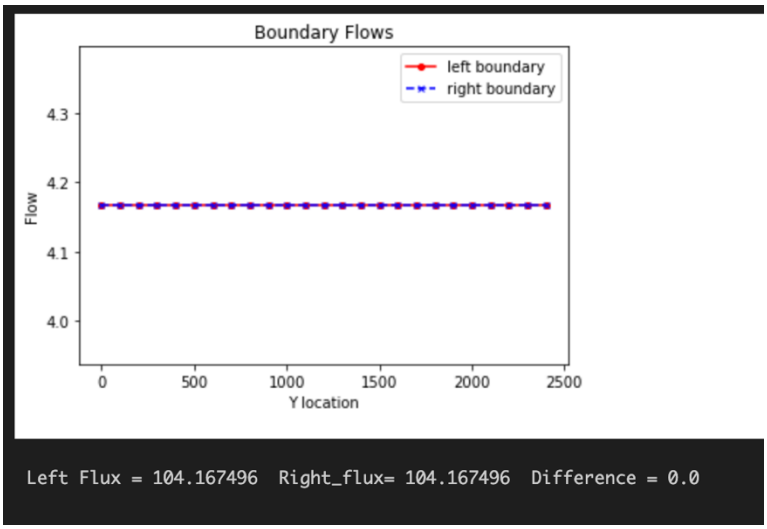
Figure 2 Difference in Head across the whole domain for the Confined case - the unconfined case. The confined case used HL = 20 and Hr =10, while the unconfined used HL = 15 and HR = 5.

2. Challenge 2:



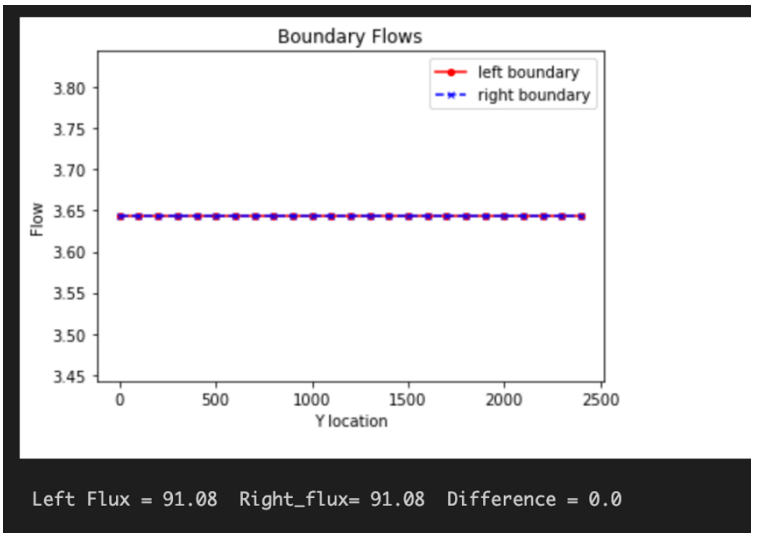


Figure 3; Flow lines for confined (left) and unconfined (right) cases along the left (red) and right (blue boundary).

Challenge 3:

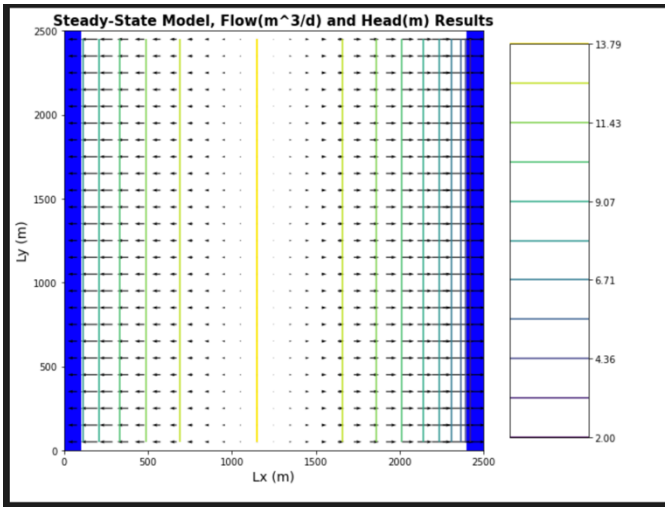


Figure 4 Equipotential and head values for the recharge case where recharge is happening across the whole domain

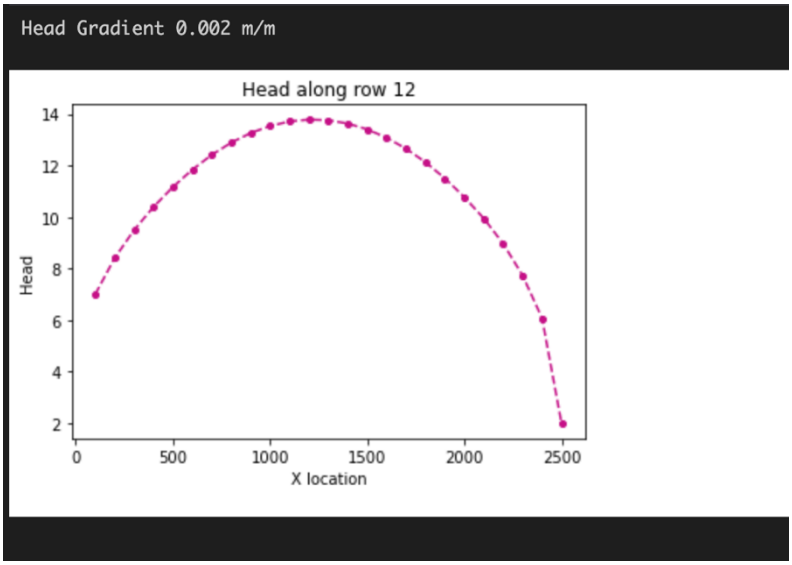


Figure 5: Head values across the middle of the domain for the unconfined case and the given head gradient

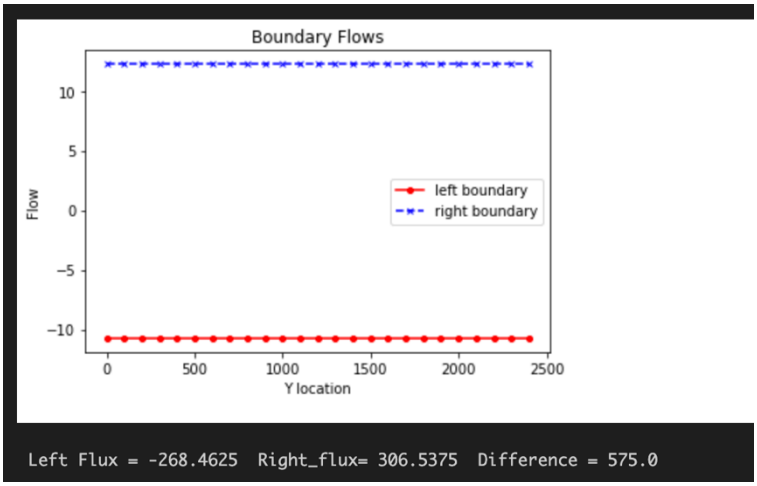


Figure 6: Flux values across the left (red) and right (blue boundary for the unconfined case with recharge across the whole system

4. Challenge 4:

- Report the total excess irrigation applied per year in m

Total calculated excess irrigation 1*e^-4 m/d *365 = 0.0365 m of water per year

- Report the total calculated irrigation per year and your assumed efficiency rate

Based on a quick google search, it looks like most drip irrigation is 70 – 90% efficient. If the excess irrigation per year is 0.0365, we can assume that that is 30% of the total and with algebra we can conclude that the total irrigation is 0.122 m per year.

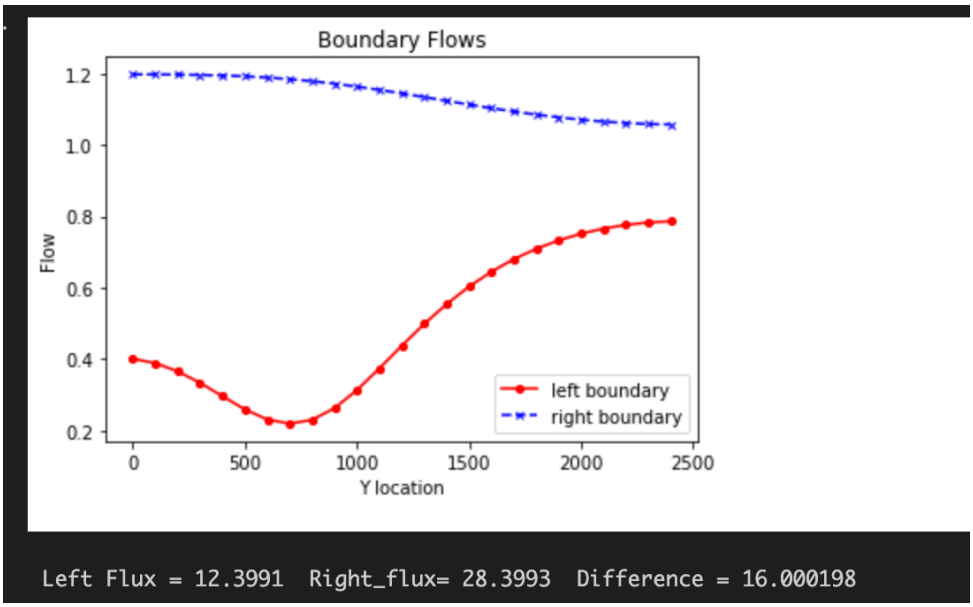


Figure 7: Boundary flux values for the contamination zone with recharge happening at the farm location

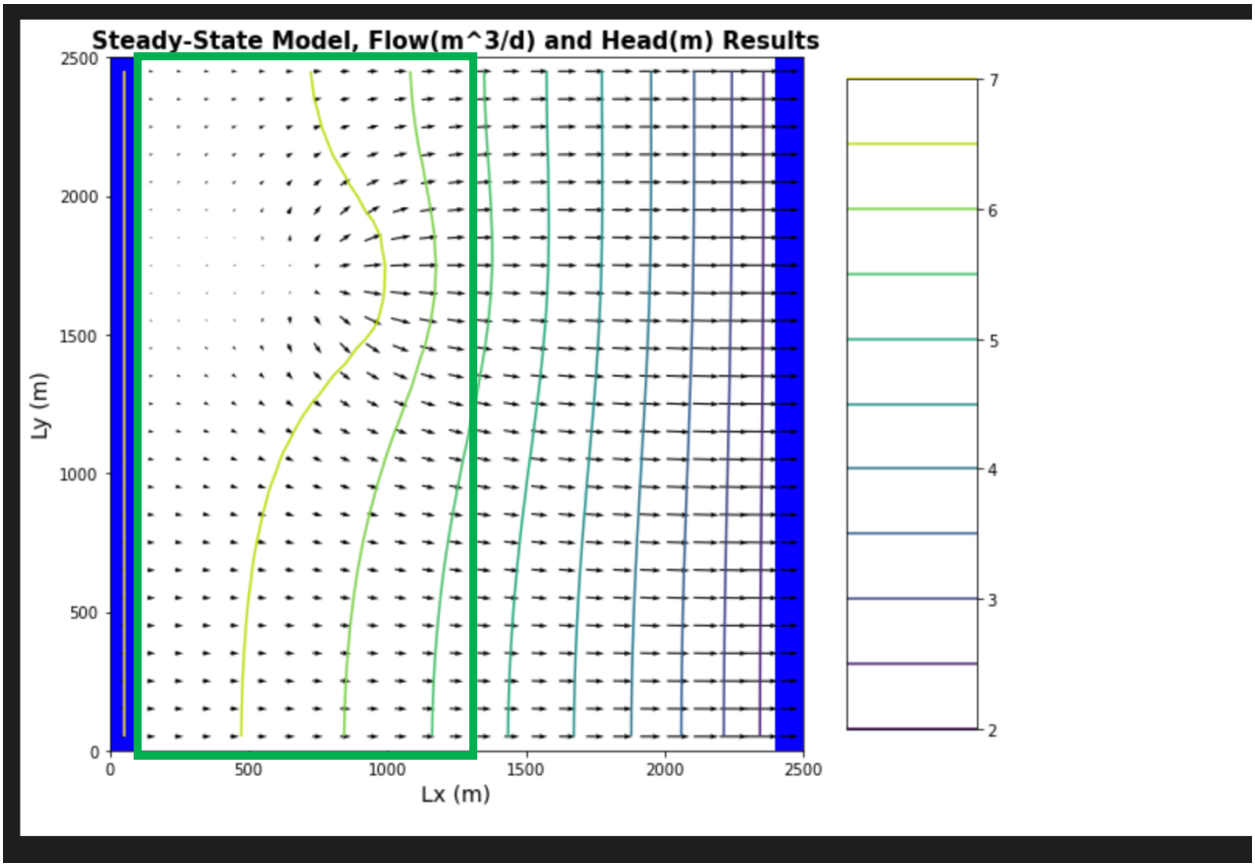


Figure 8 Equipotentials and contamination zone (green) for recharge happening at the farm (top left of model domain)

5. Challenge 5:

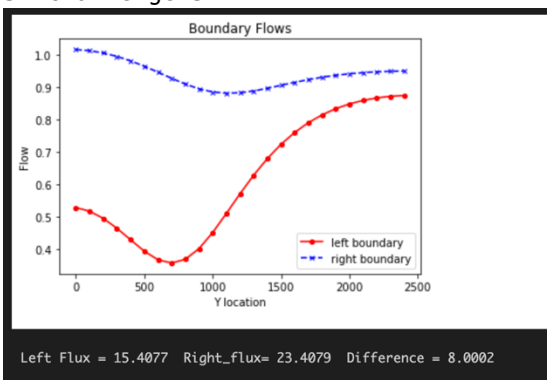


Figure 9: Boundary flows with the excess irrigation from the farm (top left) and the pumping well (middle of the domain)

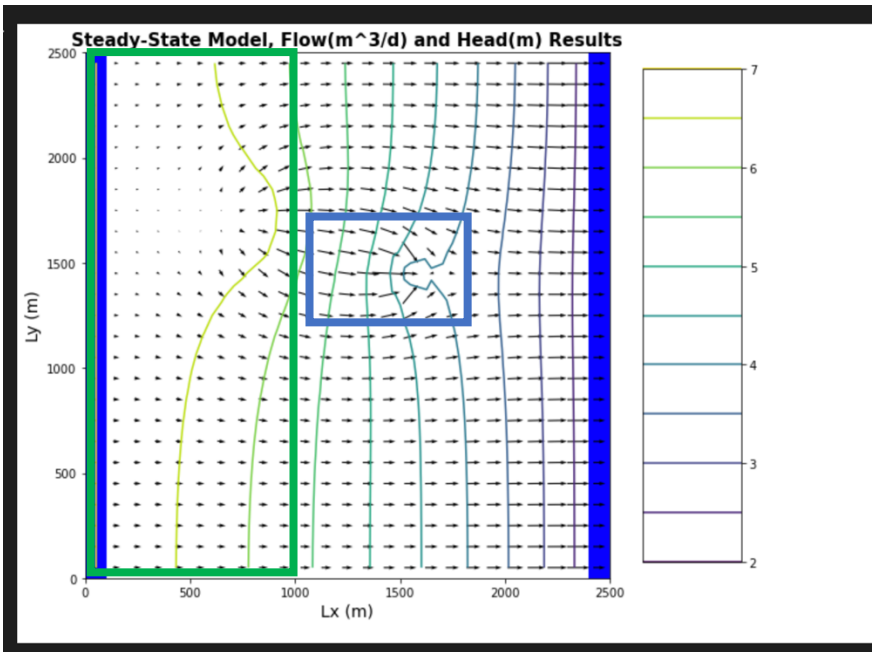


Figure 10: Equipotential lines and head values for excess irrigation from farm, contamination zone (green) with pumping location (blue)