

Project:

Pjelax

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Calculated:

27.8.2014 11:29/2.9.269

SHADOW - Main Result**Calculation:** Böle V126 x 25 x HH137**Assumptions for shadow calculations**

Maximum distance for influence

Calculate only when more than 20 % of sun is covered by the blade

Please look in WTG table

Minimum sun height over horizon for influence

3 °

Day step for calculation

1 days

Time step for calculation

1 minutes

Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

Operational hours are calculated from WTGs in calculation and wind distribution:

Pjelax mätmast 7.11.2012->

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
489	593	538	505	706	379	1 239	1 458	717	638	728	638	8 628

Idle start wind speed: Cut in wind speed from power curve

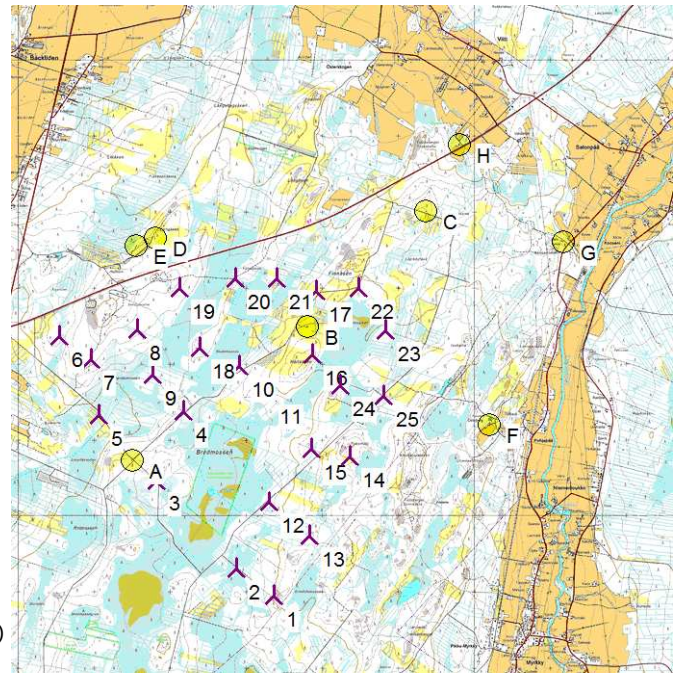
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Height Contours: Tjock_Pjelax_korkeuskäyrät.wpo (1)

Obstacles not used in calculation

Eye height: 1,5 m

Grid resolution: 25,0 m



Scale 1:100 000

New WTG

Shadow receptor

WTGs

ETRS 89 Zone: 35

WTG type

Shadow data

	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]		RPM [RPM]
				[m]									
1	215 364	6 928 951	61,3	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
2	214 868	6 929 311	53,7	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
3	213 812	6 930 466	57,3	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
4	214 167	6 931 384	47,6	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
5	213 057	6 931 331	40,0	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
6	212 534	6 932 364	46,0	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
7	212 950	6 932 071	50,0	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
8	213 565	6 932 463	51,9	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
9	213 762	6 931 864	42,5	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
10	214 911	6 931 981	50,1	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
11	215 266	6 931 617	57,7	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
12	215 294	6 930 177	54,9	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
13	215 824	6 929 738	62,7	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
14	216 360	6 930 783	75,3	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
15	215 853	6 930 889	62,9	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
16	215 871	6 932 133	66,8	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
17	215 919	6 932 966	53,5	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
18	214 386	6 932 218	52,5	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
19	214 116	6 933 007	53,4	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
20	214 853	6 933 123	47,5	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
21	215 403	6 933 128	47,5	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
22	216 470	6 932 998	60,0	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
23	216 828	6 932 444	60,4	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
24	216 236	6 931 720	65,0	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	
25	216 806	6 931 590	67,7	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GridStreame-3 300	3 300	126,0	137,0	1 715	0,0	

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SHADOW - Main Result**Calculation:** Böle V126 x 25 x HH137**Shadow receptor-Input**

No.	Name	ETRS 89 Zone: 35						Degrees from south cw [°]	Slope of window [°]	Direction mode
		East	North	Z	Width	Height	Height a.g.l. [m]			
				[m]	[m]	[m]	[m]			
A	Asuinrakennus (Vikens skogsväg)	213 494	6 930 739	52,7	5,0	5,0	1,0	0,0	90,0	"Green house mode"
B	Lomarakennus (Vikens skogsväg)	215 808	6 932 495	60,3	5,0	5,0	1,0	0,0	90,0	"Green house mode"
C	Lomarakennus (Finnås skogsväg)	217 367	6 934 011	55,0	5,0	5,0	1,0	0,0	90,0	"Green house mode"
D	Lomarakennus (Ljungåsen)	213 798	6 933 662	52,6	5,0	5,0	1,0	0,0	90,0	"Green house mode"
E	Lomarakennus (Ljungåsen)	213 556	6 933 557	49,7	5,0	5,0	1,0	0,0	90,0	"Green house mode"
F	Asuinrakennus (Lähteenmäentie 70)	218 199	6 931 203	60,0	5,0	5,0	1,0	0,0	90,0	"Green house mode"
G	Asuinrakennus (Myrkyntie 467)	219 169	6 933 613	43,6	5,0	5,0	1,0	0,0	90,0	"Green house mode"
H	Asuinrakennus (Kaskistentie 1305)	217 798	6 934 887	31,0	5,0	5,0	1,0	0,0	90,0	"Green house mode"

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values	
		Shadow hours per year [h/year]	
A	Asuinrakennus (Vikens skogsväg)	15:48	
B	Lomarakennus (Vikens skogsväg)	51:01	
C	Lomarakennus (Finnås skogsväg)	4:03	
D	Lomarakennus (Ljungåsen)	14:29	
E	Lomarakennus (Ljungåsen)	17:13	
F	Asuinrakennus (Lähteenmäentie 70)	1:41	
G	Asuinrakennus (Myrkyntie 467)	0:00	
H	Asuinrakennus (Kaskistentie 1305)	0:00	

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1274)	0:00	0:00
2	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1275)	0:00	0:00
3	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1276)	76:32	15:48
4	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1277)	0:00	0:00
5	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1278)	0:00	0:00
6	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1279)	8:18	1:14
7	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1280)	15:45	1:56
8	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1281)	59:08	7:24
9	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1282)	15:51	1:55
10	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1283)	15:05	3:14
11	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1284)	21:36	3:16
12	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1285)	0:00	0:00
13	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1286)	0:00	0:00
14	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1287)	0:00	0:00
15	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1288)	17:37	2:10
16	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1289)	98:27	20:58
17	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1290)	0:00	0:00
18	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1291)	25:56	4:07
19	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1292)	59:25	11:52
20	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1293)	38:41	8:30
21	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1294)	4:34	0:50
22	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1295)	26:58	6:41
23	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1296)	33:02	5:26
24	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1297)	23:53	4:35
25	VESTAS V126-3.3 GridStreame 3300 126.0 !O! hub: 137,0 m (TOT: 200,0 m) (1298)	17:32	3:41

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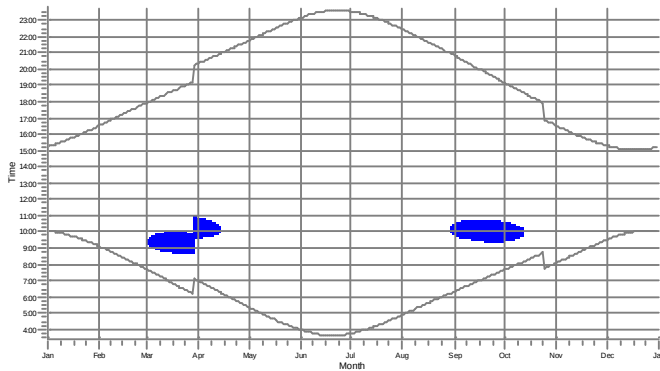
Calculated:

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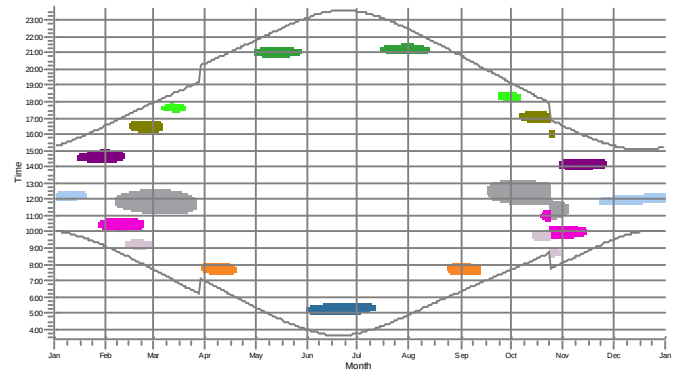
SHADOW - Calendar, graphical

Calculation: Böle V126 x 25 x HH137

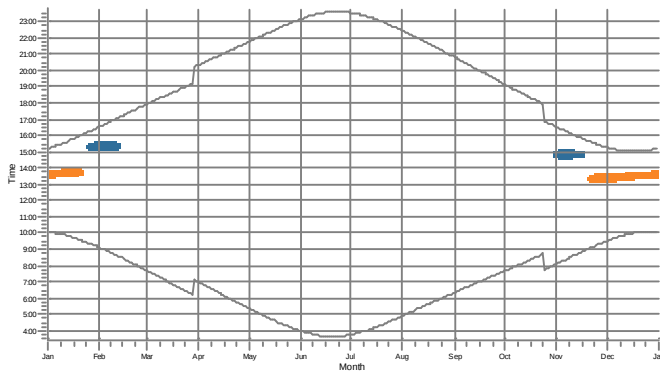
A: Asuinrakennus (Vikens skogsväg)



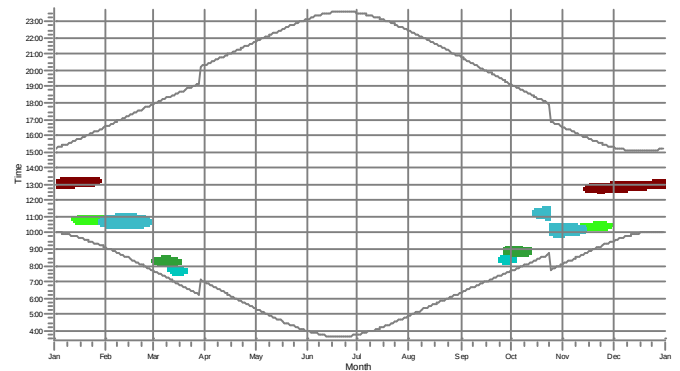
B: Lomarakennus (Vikens skogsväg)



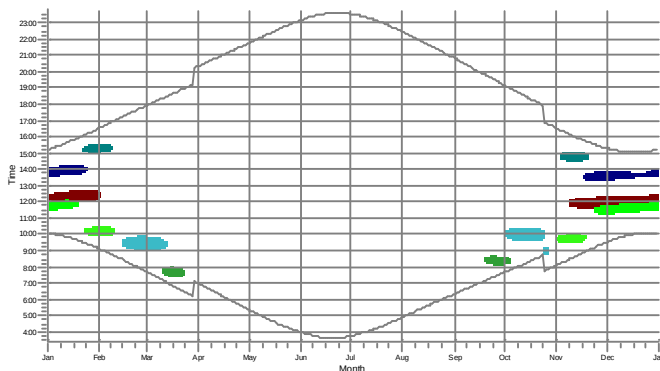
C: Lomarakennus (Finnås skogsväg)



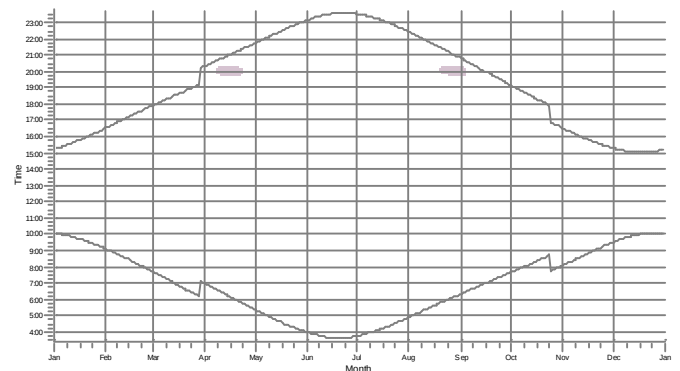
D: Lomarakennus (Ljungåsen)



E: Lomarakennus (Ljungåsen)



F: Asuinrakennus (Lähteenmäentie 70)



WTGs

- 3: VESTAS V126-3.3 GridStream 3300 126.0 IO! hub: 137,0 m (TOT: 200,0 m) (1276)
- 6: VESTAS V126-3.3 GridStream 3300 126.0 IO! hub: 137,0 m (TOT: 200,0 m) (1279)
- 7: VESTAS V126-3.3 GridStream 3300 126.0 IO! hub: 137,0 m (TOT: 200,0 m) (1280)
- 8: VESTAS V126-3.3 GridStream 3300 126.0 IO! hub: 137,0 m (TOT: 200,0 m) (1281)
- 9: VESTAS V126-3.3 GridStream 3300 126.0 IO! hub: 137,0 m (TOT: 200,0 m) (1282)
- 10: VESTAS V126-3.3 GridStream 3300 126.0 IO! hub: 137,0 m (TOT: 200,0 m) (1283)
- 11: VESTAS V126-3.3 GridStream 3300 126.0 IO! hub: 137,0 m (TOT: 200,0 m) (1284)
- 15: VESTAS V126-3.3 GridStream 3300 126.0 IO! hub: 137,0 m (TOT: 200,0 m) (1288)
- 16: VESTAS V126-3.3 GridStream 3300 126.0 IO! hub: 137,0 m (TOT: 200,0 m) (1289)

- 18: VESTAS V126-3.3 GridStream 3300 126.0 IO! hub: 137,0 m (TOT: 200,0 m) (1291)
- 19: VESTAS V126-3.3 GridStream 3300 126.0 IO! hub: 137,0 m (TOT: 200,0 m) (1292)
- 20: VESTAS V126-3.3 GridStream 3300 126.0 IO! hub: 137,0 m (TOT: 200,0 m) (1293)
- 21: VESTAS V126-3.3 GridStream 3300 126.0 IO! hub: 137,0 m (TOT: 200,0 m) (1294)
- 22: VESTAS V126-3.3 GridStream 3300 126.0 IO! hub: 137,0 m (TOT: 200,0 m) (1295)
- 23: VESTAS V126-3.3 GridStream 3300 126.0 IO! hub: 137,0 m (TOT: 200,0 m) (1296)
- 24: VESTAS V126-3.3 GridStream 3300 126.0 IO! hub: 137,0 m (TOT: 200,0 m) (1297)
- 25: VESTAS V126-3.3 GridStream 3300 126.0 IO! hub: 137,0 m (TOT: 200,0 m) (1298)

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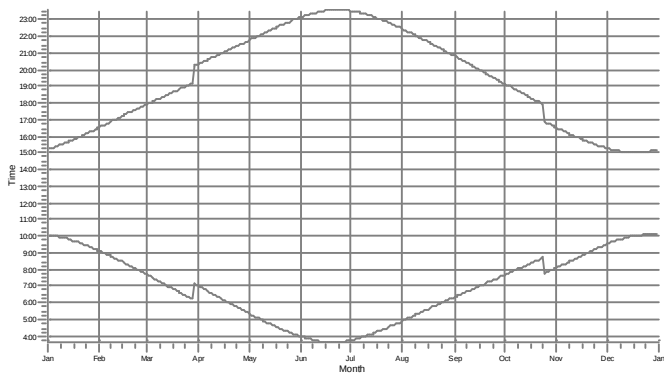
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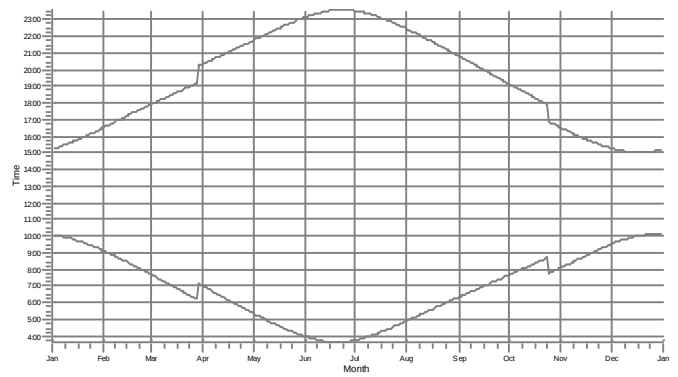
SHADOW - Calendar, graphical

Calculation: Böle V126 x 25 x HH137

G: Asuinrakennus (Myrkyntie 467)



H: Asuinrakennus (Kaskistentie 1305)



WTGs

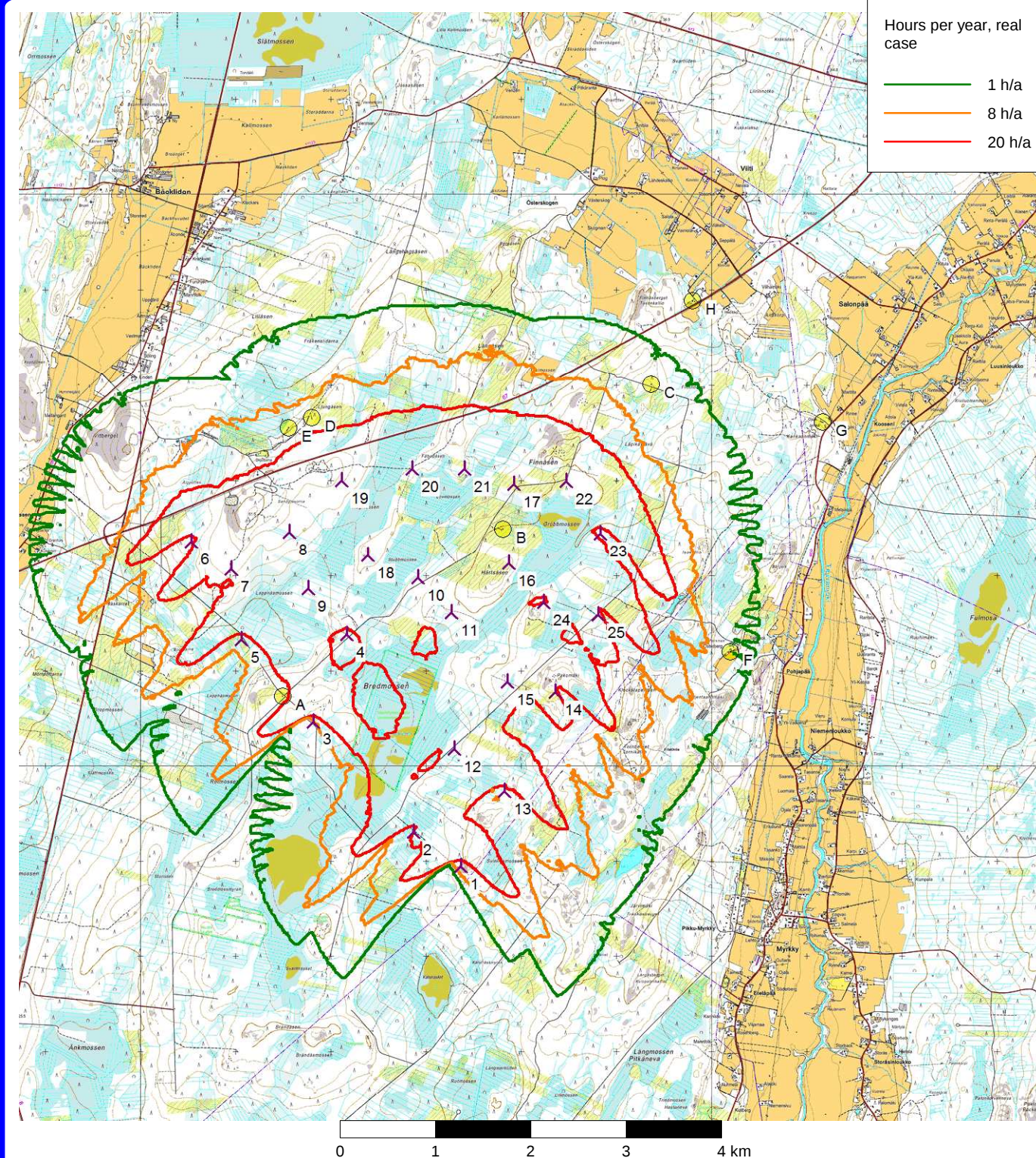
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Calculated:
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SHADOW - Map

Calculation: Böle V126 x 25 x HH137



New WTG

Shadow receptor

Flicker map level: Height Contours: Tjock_Pjelax_korkeuskäyrät.wpo (1)

Böle vindkraftspark
Bölen tuulivoimapuisto

 Kraftverk / Voimalaitos ALT2

 Bostad - Asuinrakennus

 Fritidsbostad/Jaktstuga - Lomarakennus

Skuggning / Varjostus

 1 h/a

 8 h/a

 20 h/a

