

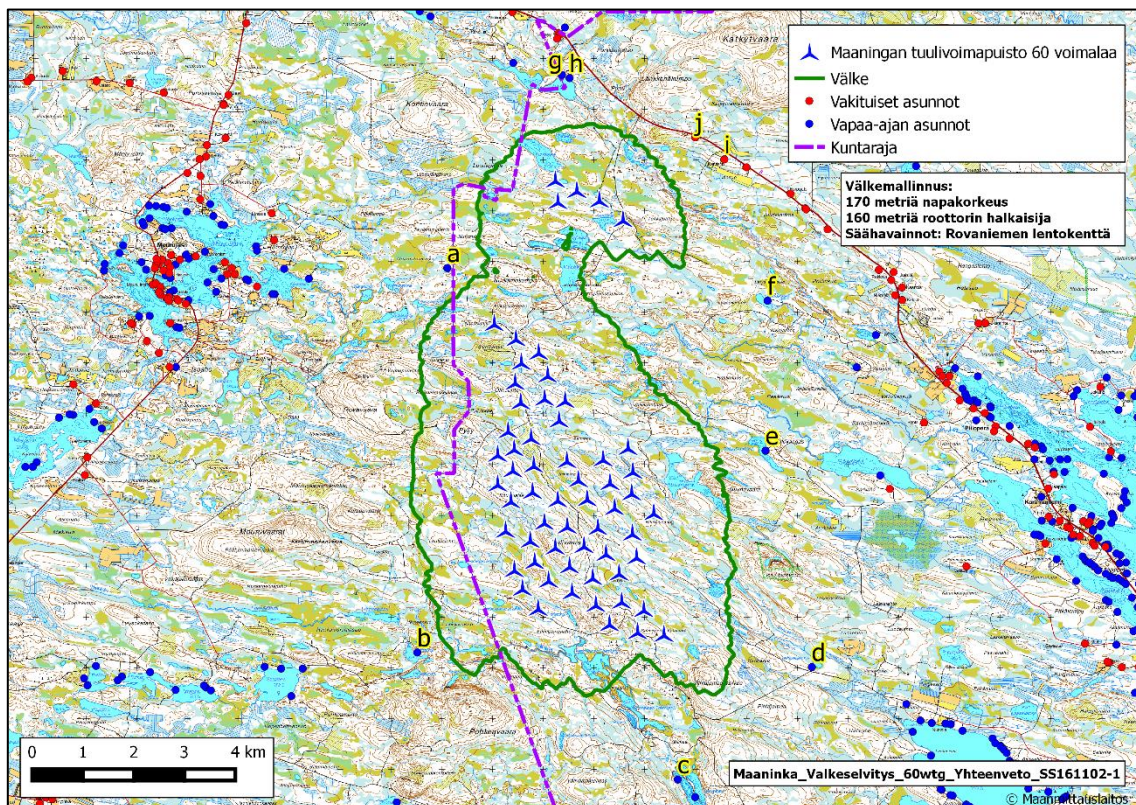
TUULIVOIMAPUISTO MAANINKA

Välkeselvitys

Versio	Päivämäärä	Tekijät	Hyväksytty	Tiivistelmä
01	02.11.2016	SSd	JRd	Tuulivoimapuisto Maaninka, 60 voimalan välkeselvitys.

1 Yhteenveto

- Tehtävä:** Välkeselvityskartta 60 tuulivoimalan maksimivaikutuksesta Maaningan tuulivoimapuiston vaikutusalueella.
- Työmenetelmät:** Välkeselvitys on tehty 60 voimalan sijoitussuunnitelmalla, jossa käytetyt voimalat ovat 5 MW tehoisia ja kokonaiskorkeudeltaan 250 m (napakorkeus 170 m, lavanpituus 80 m). Pääasiallisena laskentatyökaluna on käytetty WindPRO Ver3.1.579 ohjelmiston SHADOW-moduulia. Mallinnuksessa ja raportoinnissa on käytetty koko prosessin ajan ympäristöministeriön vuonna 2012 julkaisemia ohjeita raportista Tuulivoimarakentamisen suunnittelu (Ympäristöministeriö, 2012).
- Tulokset:** Ruotsissa ja Saksassa annettua maksimisuositusta kahdeksan tunnin vuotuisesta varjon väлкеestä asunnoille ei ylitetä 60 tuulivoimalan sijoitussuunnitelmalla (Kuva 1). Myöskään vuosikohtaiset suositukset teoreettisessa maksimitilanteessa (30h/v) eivät ylity. Päiväkohtaiset suositukset teoreettisessa maksimitilanteessa (30 min/pv) ylittävät 11 minuutilla yhdessä kohteessa (kohde a).



Kuva 1. Varjovälkkeen muodostuminen Maaningan alueella. Väkeraja (8 h/v) merkitty vihreällä. Havainnointipisteet on merkitty kuvaan (a-j).

SHADOW - Main Result

Calculation: Maaninka_60_wtg_170m HH_160m rotor

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) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.63	2.38	5.50	8.46	9.88	11.29	10.83	7.58	4.67	2.50	0.75	0.13

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

Tuuliatlas

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
531	356	337	552	706	632	681	883	1 648	967	655	628	8 575

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: Extended 25.8.2016

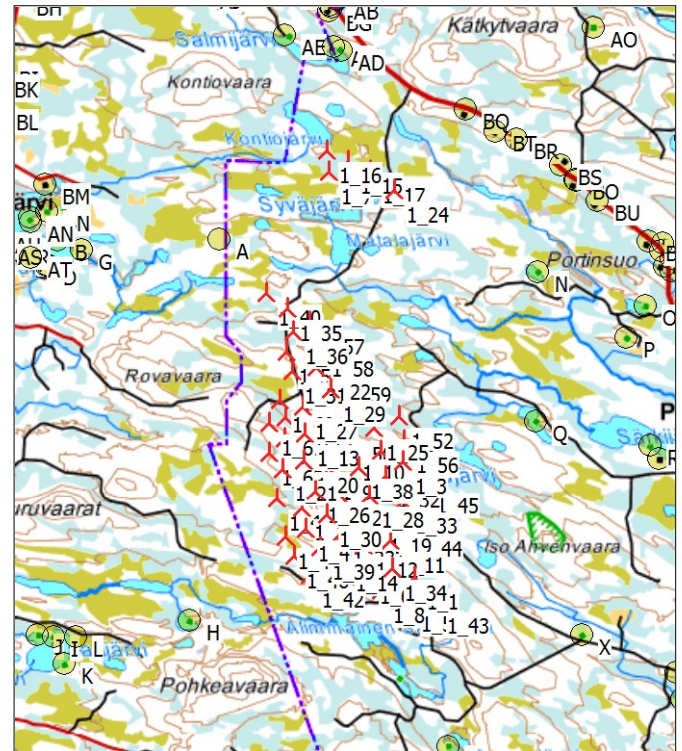
Obstacles not used in calculation

Eye height: 1.5 m

Grid resolution: 10.0 m

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89



▲ New WTG

Scale 1:150 000

● Shadow receptor

WTGs

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
			[m]									
1_1	572 978	7 355 173	318.8	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_10	571 689	7 357 730	309.9	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_11	572 491	7 355 890	315.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_12	571 972	7 355 804	330.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_13	570 811	7 358 017	325.9	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_14	571 564	7 355 519	319.2	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_15	571 659	7 363 424	300.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_16	571 236	7 363 629	301.4	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_17	572 102	7 363 235	296.9	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_18	570 742	7 356 537	325.5	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_19	572 233	7 356 277	318.8	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_2	571 470	7 356 815	351.2	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_20	570 786	7 357 499	346.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_21	570 361	7 357 313	343.1	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_22	571 024	7 359 332	290.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_23	571 515	7 356 031	348.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_24	572 569	7 362 849	285.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_25	572 176	7 358 138	273.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_26	571 021	7 356 890	357.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_27	570 758	7 358 557	305.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_28	572 073	7 356 788	313.4	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_29	571 309	7 358 904	284.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_3	572 739	7 357 469	280.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_30	571 235	7 356 402	370.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_31	570 554	7 359 259	306.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_32	572 403	7 357 180	296.3	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_33	572 753	7 356 675	293.1	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_34	572 542	7 355 335	325.3	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	
1_35	570 460	7 360 507	282.5	WTG Large 160 5000 160.0 !-! h...Yes	WTG	Large 160-5 000	5 000	160.0	170.0	2 000	16.5	

To be continued on next page...

SHADOW - Main Result

Calculation: Maaninka_60_wtg_170m HH_160m rotor

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	East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.					Calculation distance [m]	RPM
			[m]									[RPM]
1_36	570 566	7 360 039	294.3	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_38	571 863	7 357 354	314.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_39	571 102	7 355 750	321.3	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_4	570 829	7 356 117	332.5	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_40	570 034	7 360 804	272.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_41	570 399	7 357 923	347.4	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_42	570 897	7 355 197	301.9	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_43	573 374	7 354 683	318.9	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_44	572 835	7 356 210	300.2	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_45	573 174	7 357 079	286.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_46	570 589	7 355 589	295.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_47	570 429	7 355 958	299.2	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_48	570 256	7 356 732	320.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_49	570 425	7 358 339	320.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_5	571 800	7 356 432	341.7	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_50	571 464	7 358 105	300.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_51	570 444	7 359 646	299.8	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_52	572 667	7 358 362	263.2	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_53	572 312	7 357 673	288.4	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_54	572 855	7 354 737	321.6	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_56	572 762	7 357 897	260.6	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_57	570 907	7 360 237	283.9	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_58	571 085	7 359 788	286.5	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_59	571 429	7 359 290	279.7	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_6	572 034	7 355 273	336.4	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_60	570 305	7 358 692	313.4	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_61	570 100	7 358 228	339.3	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_62	570 100	7 357 644	339.5	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_7	571 286	7 363 205	290.0	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_8	572 302	7 354 893	326.2	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5
1_9	571 283	7 357 334	329.8	WTG Large 160 5000 160.0 !-! h...Yes	WTG		Large 160-5 000	5 000	160.0	170.0	2 000	16.5

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
				[m]	[m]	[m]	[m]	[°]	[°]	
A	Shadow Receptor: Summer Cottage	569 111	7 361 875	275.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
B	Shadow Receptor: Summer Cottage	565 898	7 361 858	260.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
C	Shadow Receptor: Summer Cottage	565 710	7 361 360	261.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
D	Shadow Receptor: Summer Cottage	565 669	7 361 361	263.7	5.0	5.0	1.0	0.0	90.0	"Green house mode"
E	Shadow Receptor: Summer Cottage	565 151	7 361 653	260.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
F	Shadow Receptor: Summer Cottage	565 190	7 361 628	260.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
G	Shadow Receptor: Summer Cottage	566 385	7 361 665	263.2	5.0	5.0	1.0	0.0	90.0	"Green house mode"
H	Shadow Receptor: Summer Cottage	568 519	7 354 304	281.1	5.0	5.0	1.0	0.0	90.0	"Green house mode"
I	Shadow Receptor: Summer Cottage	565 837	7 353 987	270.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
J	Shadow Receptor: Summer Cottage	565 512	7 354 024	270.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
K	Shadow Receptor: Summer Cottage	566 039	7 353 447	280.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
L	Shadow Receptor: Summer Cottage	566 264	7 353 987	270.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
M	Shadow Receptor: Summer Cottage	568 115	7 351 355	285.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
N	Shadow Receptor: Summer Cottage	575 417	7 361 230	264.2	5.0	5.0	1.0	0.0	90.0	"Green house mode"
O	Shadow Receptor: Summer Cottage	577 550	7 360 555	255.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
P	Shadow Receptor: Summer Cottage	577 173	7 359 921	255.5	5.0	5.0	1.0	0.0	90.0	"Green house mode"
Q	Shadow Receptor: Summer Cottage	575 377	7 358 278	255.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
R	Shadow Receptor: Summer Cottage	577 636	7 357 790	245.9	5.0	5.0	1.0	0.0	90.0	"Green house mode"
S	Shadow Receptor: Summer Cottage	573 647	7 351 805	281.4	5.0	5.0	1.0	0.0	90.0	"Green house mode"
T	Shadow Receptor: Summer Cottage	573 457	7 350 756	290.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
U	Shadow Receptor: Summer Cottage	573 186	7 350 711	290.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
V	Shadow Receptor: Summer Cottage	572 914	7 350 743	296.2	5.0	5.0	1.0	0.0	90.0	"Green house mode"
W	Shadow Receptor: Summer Cottage	578 149	7 353 288	265.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
X	Shadow Receptor: Summer Cottage	576 289	7 354 018	267.5	5.0	5.0	1.0	0.0	90.0	"Green house mode"
Y	Shadow Receptor: Summer Cottage	578 427	7 352 965	258.3	5.0	5.0	1.0	0.0	90.0	"Green house mode"
Z	Shadow Receptor: Summer Cottage	578 275	7 352 743	255.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"

To be continued on next page...

SHADOW - Main Result

Calculation: Maaninka_60_wtg_170m HH_160m rotor

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No.	Name	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
				[m]	[m]	[m]	[m]	[°]	[°]	
AA	Shadow Receptor: Summer Cottage	573 991	7 351 456	283.7	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AB	Shadow Receptor: Summer Cottage	571 426	7 366 611	306.7	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AC	Shadow Receptor: Summer Cottage	571 367	7 365 677	281.7	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AD	Shadow Receptor: Summer Cottage	571 518	7 365 614	283.9	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AE	Shadow Receptor: Summer Cottage	570 409	7 365 914	285.3	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AF	Shadow Receptor: Summer Cottage	566 995	7 367 349	260.8	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AG	Shadow Receptor: Summer Cottage	568 217	7 367 119	260.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AH	Shadow Receptor: Summer Cottage	568 397	7 367 025	260.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AI	Shadow Receptor: Summer Cottage	568 567	7 366 930	260.7	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AJ	Shadow Receptor: Summer Cottage	568 779	7 366 828	262.9	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AK	Shadow Receptor: Summer Cottage	565 309	7 367 394	260.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AL	Shadow Receptor: Summer Cottage	565 104	7 367 454	252.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AM	Shadow Receptor: Summer Cottage	565 347	7 362 305	260.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AN	Shadow Receptor: Summer Cottage	565 363	7 362 218	260.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AO	Shadow Receptor: Summer Cottage	576 515	7 366 070	361.1	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AP	Shadow Receptor: Summer Cottage	578 341	7 363 881	290.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AQ	Shadow Receptor: Resident	564 866	7 361 877	265.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AR	Shadow Receptor: Resident	564 923	7 361 751	261.7	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AS	Shadow Receptor: Resident	564 778	7 361 755	262.1	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AT	Shadow Receptor: Resident	565 365	7 361 509	260.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AU	Shadow Receptor: Resident	564 731	7 361 989	263.5	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AV	Shadow Receptor: Resident	577 900	7 361 793	271.4	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AW	Shadow Receptor: Resident	577 852	7 361 637	271.4	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AX	Shadow Receptor: Resident	578 063	7 361 493	270.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AY	Shadow Receptor: Resident	578 068	7 361 246	267.5	5.0	5.0	1.0	0.0	90.0	"Green house mode"
AZ	Shadow Receptor: Resident	577 930	7 361 341	265.5	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BA	Shadow Receptor: Resident	578 500	7 358 834	250.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BB	Shadow Receptor: Resident	577 824	7 357 525	250.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BC	Shadow Receptor: Resident	577 608	7 361 837	275.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BD	Shadow Receptor: Resident	570 391	7 366 911	290.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BE	Shadow Receptor: Resident	571 298	7 366 498	305.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BF	Shadow Receptor: Resident	571 331	7 366 473	305.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BG	Shadow Receptor: Resident	571 272	7 366 390	305.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BH	Shadow Receptor: Resident	565 152	7 366 696	270.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BI	Shadow Receptor: Resident	564 799	7 365 282	280.6	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BJ	Shadow Receptor: Resident	564 701	7 365 109	280.9	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BK	Shadow Receptor: Resident	564 706	7 365 083	280.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BL	Shadow Receptor: Resident	564 744	7 364 432	270.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BM	Shadow Receptor: Resident	565 653	7 362 953	265.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BN	Shadow Receptor: Resident	565 700	7 362 425	275.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BO	Shadow Receptor: Resident	576 158	7 363 051	285.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BP	Shadow Receptor: Resident	576 177	7 363 031	285.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BQ	Shadow Receptor: Resident	573 993	7 364 450	322.2	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BR	Shadow Receptor: Resident	575 004	7 363 857	302.7	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BS	Shadow Receptor: Resident	575 870	7 363 338	285.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BT	Shadow Receptor: Resident	574 567	7 364 014	306.7	5.0	5.0	1.0	0.0	90.0	"Green house mode"
BU	Shadow Receptor: Resident	576 599	7 362 637	285.0	5.0	5.0	1.0	0.0	90.0	"Green house mode"

Calculation Results

Shadow receptor

Shadow receptor		Shadow, worst case		Shadow, expected values	
No.	Name	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
A	Shadow Receptor: Summer Cottage	19:02	38	0:41	2:57
B	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
C	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
D	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
E	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
F	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
G	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
H	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
I	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: Maaninka_60_wtg_170m HH_160m rotor

...continued from previous page

No.	Name	Shadow, worst case		Shadow, expected values	
		Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
J	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
K	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
L	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
M	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
N	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
O	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
P	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
Q	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
R	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
S	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
T	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
U	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
V	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
W	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
X	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
Y	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
Z	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
AA	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
AB	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
AC	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
AD	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
AE	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
AF	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
AG	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
AH	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
AI	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
AJ	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
AK	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
AL	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
AM	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
AN	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
AO	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
AP	Shadow Receptor: Summer Cottage	0:00	0	0:00	0:00
AQ	Shadow Receptor: Resident	0:00	0	0:00	0:00
AR	Shadow Receptor: Resident	0:00	0	0:00	0:00
AS	Shadow Receptor: Resident	0:00	0	0:00	0:00
AT	Shadow Receptor: Resident	0:00	0	0:00	0:00
AU	Shadow Receptor: Resident	0:00	0	0:00	0:00
AV	Shadow Receptor: Resident	0:00	0	0:00	0:00
AW	Shadow Receptor: Resident	0:00	0	0:00	0:00
AX	Shadow Receptor: Resident	0:00	0	0:00	0:00
AY	Shadow Receptor: Resident	0:00	0	0:00	0:00
AZ	Shadow Receptor: Resident	0:00	0	0:00	0:00
BA	Shadow Receptor: Resident	0:00	0	0:00	0:00
BB	Shadow Receptor: Resident	0:00	0	0:00	0:00
BC	Shadow Receptor: Resident	0:00	0	0:00	0:00
BD	Shadow Receptor: Resident	0:00	0	0:00	0:00
BE	Shadow Receptor: Resident	0:00	0	0:00	0:00
BF	Shadow Receptor: Resident	0:00	0	0:00	0:00
BG	Shadow Receptor: Resident	0:00	0	0:00	0:00
BH	Shadow Receptor: Resident	0:00	0	0:00	0:00
BI	Shadow Receptor: Resident	0:00	0	0:00	0:00
BJ	Shadow Receptor: Resident	0:00	0	0:00	0:00
BK	Shadow Receptor: Resident	0:00	0	0:00	0:00
BL	Shadow Receptor: Resident	0:00	0	0:00	0:00
BM	Shadow Receptor: Resident	0:00	0	0:00	0:00
BN	Shadow Receptor: Resident	0:00	0	0:00	0:00
BO	Shadow Receptor: Resident	0:00	0	0:00	0:00
BP	Shadow Receptor: Resident	0:00	0	0:00	0:00
BQ	Shadow Receptor: Resident	0:00	0	0:00	0:00
BR	Shadow Receptor: Resident	0:00	0	0:00	0:00
BS	Shadow Receptor: Resident	0:00	0	0:00	0:00
BT	Shadow Receptor: Resident	0:00	0	0:00	0:00
BU	Shadow Receptor: Resident	0:00	0	0:00	0:00

SHADOW - Main Result

Calculation: Maaninka_60_wtg_170m HH_160m rotor

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

No.	Name	Worst case [h/year]	Expected [h/year]
1_1	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (783)	0:00	0:00
1_10	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (792)	0:00	0:00
1_11	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (793)	0:00	0:00
1_12	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (794)	0:00	0:00
1_13	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (795)	0:00	0:00
1_14	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (796)	0:00	0:00
1_15	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (797)	0:00	0:00
1_16	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (798)	0:00	0:00
1_17	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (799)	0:00	0:00
1_18	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (800)	0:00	0:00
1_19	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (801)	0:00	0:00
1_2	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (784)	0:00	0:00
1_20	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (802)	0:00	0:00
1_21	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (803)	0:00	0:00
1_22	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (804)	0:00	0:00
1_23	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (805)	0:00	0:00
1_24	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (806)	0:00	0:00
1_25	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (807)	0:00	0:00
1_26	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (808)	0:00	0:00
1_27	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (809)	0:00	0:00
1_28	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (810)	0:00	0:00
1_29	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (811)	0:00	0:00
1_3	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (785)	0:00	0:00
1_30	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (812)	0:00	0:00
1_31	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (813)	0:00	0:00
1_32	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (814)	0:00	0:00
1_33	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (815)	0:00	0:00
1_34	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (816)	0:00	0:00
1_35	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (817)	7:17	1:07
1_36	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (818)	0:00	0:00
1_38	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (819)	0:00	0:00
1_39	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (820)	0:00	0:00
1_4	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (786)	0:00	0:00
1_40	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (821)	13:38	2:07
1_41	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (822)	0:00	0:00
1_42	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (823)	0:00	0:00
1_43	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (824)	0:00	0:00
1_44	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (825)	0:00	0:00
1_45	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (826)	0:00	0:00
1_46	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (827)	0:00	0:00
1_47	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (828)	0:00	0:00
1_48	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (829)	0:00	0:00
1_49	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (830)	0:00	0:00
1_5	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (787)	0:00	0:00
1_50	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (831)	0:00	0:00
1_51	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (832)	0:00	0:00
1_52	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (833)	0:00	0:00
1_53	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (834)	0:00	0:00
1_54	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (835)	0:00	0:00
1_56	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (836)	0:00	0:00
1_57	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (837)	0:00	0:00
1_58	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (838)	0:00	0:00
1_59	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (839)	0:00	0:00
1_6	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (788)	0:00	0:00
1_60	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (840)	0:00	0:00
1_61	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (841)	0:00	0:00
1_62	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (842)	0:00	0:00
1_7	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (789)	0:00	0:00
1_8	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (790)	0:00	0:00
1_9	WTG Large 160 5000 160.0 !-! hub: 170.0 m (TOT: 250.0 m) (791)	0:00	0:00

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

SHADOW - Map

Calculation: Maaninka_60_wtg_170m HH_160m rotor

