

LIITE 9

VÄLKEMALLINNUSKUVAT

WindPRO version 2.9.277 Mar 2014

Project:	Printed/Page
Kannus	16.07.2014 14:41 / 1
	Licensed user:
	wpd AG
	Stephanitorsbollwerk 3 (Haus LUV)
	DE-28217 Bremen
	+49 7142 77810
	Calculated:
	14.07.2014 17:42/2.9.277

SHADOW - Main Result

Calculation: Option 1 - 17x V126 - RC

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
0,77 2,46 4,42 6,93 8,81 9,87 9,13 6,84 4,43 2,23 0,93 0,26

Operational hours are calculated from WTGs in calculation and wind distribution:
VTT WindAtlas, 12 Sectors, 75-150m

Operational time
N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
682 418 371 363 521 679 938 1.427 1.248 705 560 618 8.531
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: DEM 2m
Obstacles not used in calculation
Eye height: 1,5 m
Grid resolution: 25,0 m

WTGs

ETRS 89 Zone: 35			WTG type				Shadow data				
East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Calculation distance	RPM
		[m]					[kW]	[m]	[m]	[m]	[RPM]
WTG 01	348.081	7.085.743	63,4 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 02	349.267	7.086.068	67,5 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 03	347.980	7.085.140	68,1 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 04	348.379	7.084.971	72,0 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 05	349.494	7.085.088	75,2 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 06	348.231	7.084.250	72,4 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 07	348.809	7.084.440	78,6 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 08	349.343	7.084.385	77,9 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 09	349.920	7.084.588	78,1 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 10	350.082	7.084.018	80,6 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 11	350.564	7.083.899	80,8 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 12	350.413	7.083.176	83,9 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 13	350.128	7.082.424	90,0 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 14	350.659	7.082.374	90,6 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 15	350.624	7.081.701	92,8 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 16	351.177	7.081.736	93,9 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 17	351.503	7.081.322	96,8 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0

Shadow receptor-Input

ETRS 89 Zone: 35			WTG type		Shadow data				
No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
CH	348.730	7.087.892	51,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 01	352.804	7.083.722	80,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 02	353.308	7.081.675	87,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 03	353.392	7.081.343	90,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 04	349.219	7.081.009	103,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 05	353.085	7.079.703	96,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"

To be continued on next page...

WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg Ø, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

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SHADOW - Main Result

Calculation: Option 1 - 17x V126 - RC

...continued from previous page

ETRS 89 Zone: 35			WTG type		Shadow data				
No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
HH 06	352.136	7.079.279	100,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 07	352.093	7.079.278	101,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 08	349.799	7.079.074	107,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 09	352.463	7.078.966	99,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 01	348.232	7.087.949	51,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 02	348.267	7.087.840	51,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 03	349.121	7.087.807	52,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 04	349.269	7.087.803	52,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 05	349.291	7.087.785	52,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 06	348.960	7.087.777	53,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 07	349.244	7.087.771	53,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 08	349.004	7.087.767	54,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 09	349.263	7.087.756	53,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 10	349.191	7.087.754	53,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 11	349.219	7.087.738	53,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 12	349.182	7.087.697	57,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 13	349.058	7.087.689	54,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 14	349.245	7.087.667	56,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 15	349.229	7.087.645	56,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 16	349.304	7.087.630	59,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 17	349.838	7.087.616	53,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 18	349.339	7.087.593	60,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 19	349.284	7.087.592	59,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 20	349.272	7.087.561	60,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 21	349.393	7.087.553	61,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 22	349.315	7.087.527	61,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 23	349.359	7.087.497	61,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 24	349.398	7.087.467	62,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 25	349.373	7.087.405	63,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 26	346.377	7.083.904	71,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"

Calculation Results

Shadow receptor	
Shadow, expected values	
No.	Shadow hours per year [h/year]
CH	0:00
HH 01	0:00
HH 02	0:00
HH 03	0:00
HH 04	2:35
HH 05	0:00
HH 06	0:00
HH 07	0:00
HH 08	0:00
HH 09	0:00
RH 01	0:00
RH 02	0:00
RH 03	0:00
RH 04	0:00
RH 05	0:00
RH 06	0:00
RH 07	0:52
RH 08	0:00
RH 09	0:53
RH 10	0:52
RH 11	0:54

To be continued on next page...

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WindPRO version 2.9.277 Mar 2014

Project: Kannus	Printed/Page 16.07.2014 14:41 / 3
	Licensed user: wpd AG Stephanitorsbollwerk 3 (Haus LUV) DE-28217 Bremen +49 7142 77810
	Calculated: 14.07.2014 17:42/2.9.277

SHADOW - Main Result

Calculation: Option 1 - 17x V126 - RC

...continued from previous page
Shadow, expected values

No.	Shadow hours per year [h/year]
RH 12	0:55
RH 13	0:52
RH 14	0:57
RH 15	0:59
RH 16	1:00
RH 17	0:50
RH 18	1:03
RH 19	1:02
RH 20	1:04
RH 21	1:05
RH 22	1:08
RH 23	1:10
RH 24	1:13
RH 25	1:20
RH 26	0:00

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

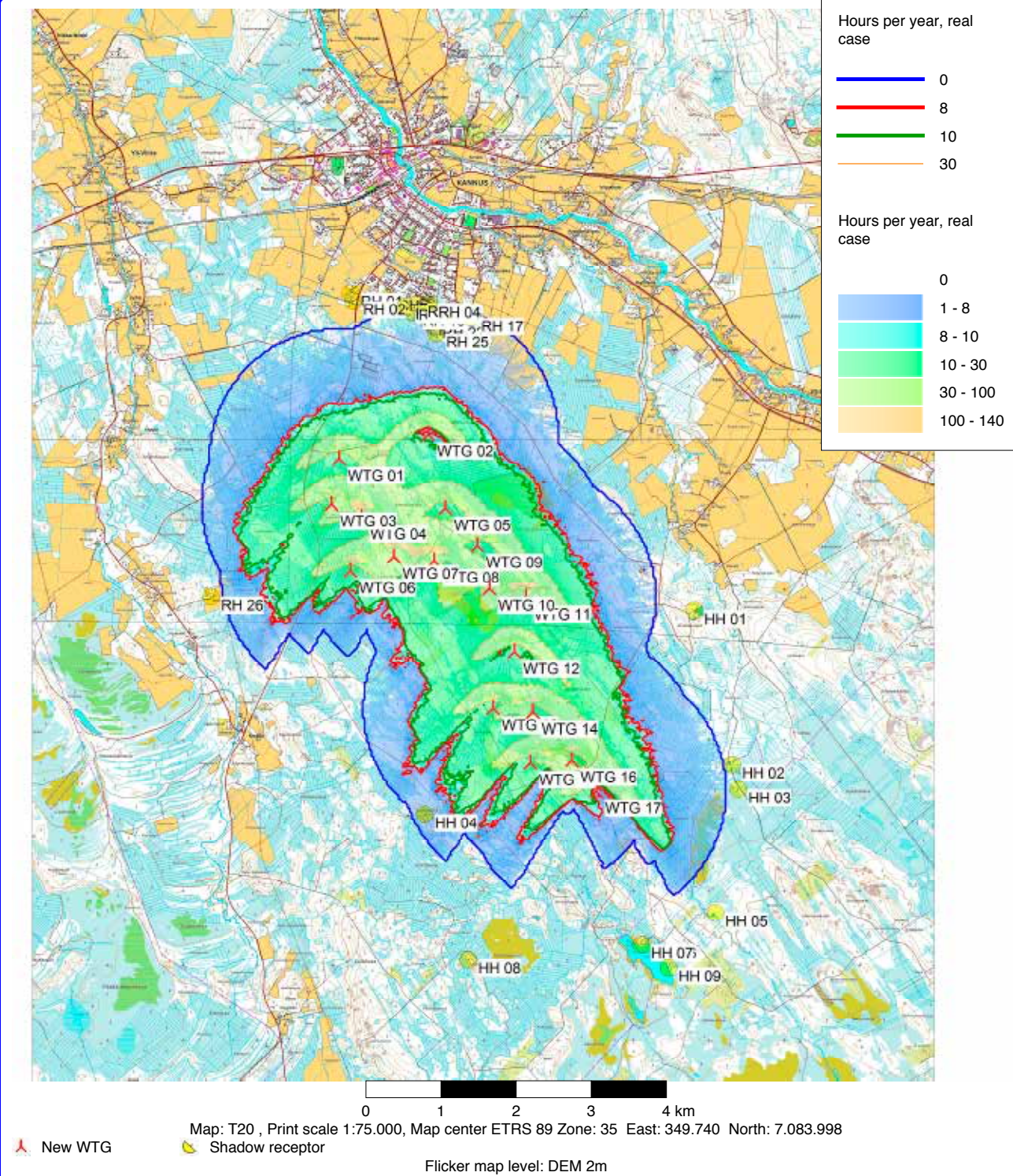
No.	Name	Worst case [h/year]	Expected [h/year]
WTG 01	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (364)	0:00	0:00
WTG 02	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (366)	57:17	5:20
WTG 03	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (365)	0:00	0:00
WTG 04	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (367)	0:00	0:00
WTG 05	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (371)	0:00	0:00
WTG 06	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (368)	0:00	0:00
WTG 07	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (370)	0:00	0:00
WTG 08	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (369)	0:00	0:00
WTG 09	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (372)	0:00	0:00
WTG 10	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (373)	0:00	0:00
WTG 11	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (374)	0:00	0:00
WTG 12	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (375)	0:00	0:00
WTG 13	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (377)	0:00	0:00
WTG 14	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (376)	0:00	0:00
WTG 15	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (378)	9:06	2:35
WTG 16	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (379)	0:00	0:00
WTG 17	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (380)	0:00	0:00

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	Licensed user: wpd AG Stephanitorsbollwerk 3 (Haus LUV) DE-28217 Bremen +49 7142 77810
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SHADOW - Map

Calculation: Option 1 - 17x V126 - RC



WindPRO version 2.9.277 Mar 2014

Project:	Printed/Page
Kannus	16.07.2014 14:44 / 1
	Licensed user:
	wpd AG
	Stephanitorsbollwerk 3 (Haus LUV)
	DE-28217 Bremen
	+49 7142 77810
	Calculated:
	14.07.2014 18:27/2.9.277

SHADOW - Main Result

Calculation: Option 1 - 17x V126 - WC+RC with forest mask (lower heights)

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

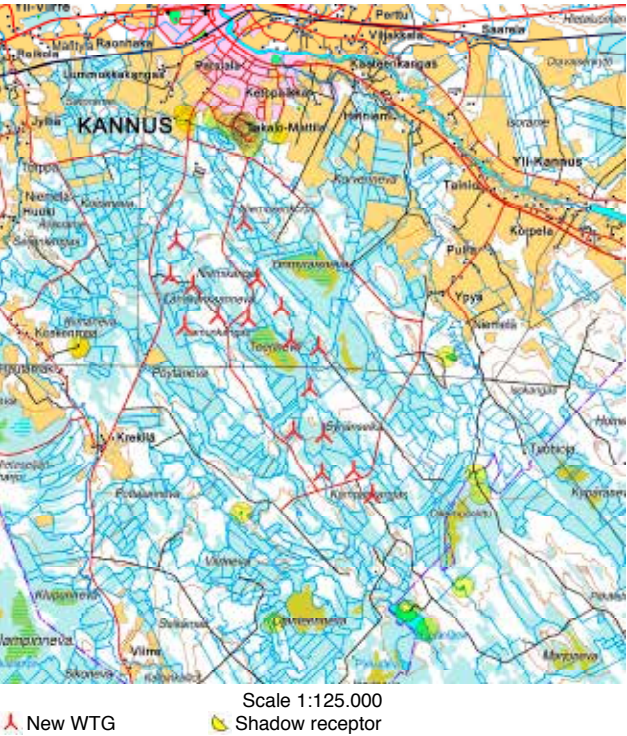
Minimum sun height over horizon for influence 3 °
Day step for calculation 1 days
Time step for calculation 1 minutes

Sunshine probability S (Average daily sunshine hours) []
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0,77 2,46 4,42 6,93 8,81 9,87 9,13 6,84 4,43 2,23 0,93 0,26

Operational hours are calculated from WTGs in calculation and wind distribution:
VTT WindAtlas, 12 Sectors, 75-150m

Operational time
N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
682 418 371 363 521 679 938 1.427 1.248 705 560 618 8.531
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: DEM 2m
Area object(s) used in calculation:
Forest Mask - trees' lower height limits
Obstacles used in calculation
Eye height: 1,5 m
Grid resolution: 25,0 m



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]									
WTG 01	348.081	7.085.743	63,4	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
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Shadow receptor-Input

ETRS 89 Zone: 35									
No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
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HH 01	352.804	7.083.722	80,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 02	353.308	7.081.675	87,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 03	353.392	7.081.343	90,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"

To be continued on next page...

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SHADOW - Main Result

Calculation: Option 1 - 17x V126 - WC+RC with forest mask (lower heights)

...continued from previous page

ETRS 89 Zone: 35											
No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode		
HH 04	349.219	7.081.009	103,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
HH 05	353.085	7.079.703	96,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
HH 06	352.136	7.079.279	100,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
HH 07	352.093	7.079.278	101,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
HH 08	349.799	7.079.074	107,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
HH 09	352.463	7.078.966	99,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 01	348.232	7.087.949	51,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 02	348.267	7.087.840	51,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 03	349.121	7.087.807	52,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 04	349.269	7.087.803	52,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 05	349.291	7.087.785	52,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 06	348.960	7.087.777	53,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 07	349.244	7.087.771	53,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 08	349.004	7.087.767	54,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 09	349.263	7.087.756	53,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 10	349.191	7.087.754	53,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 11	349.219	7.087.738	53,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 12	349.182	7.087.697	57,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 13	349.058	7.087.689	54,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 14	349.245	7.087.667	56,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 15	349.229	7.087.645	56,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 16	349.304	7.087.630	59,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 17	349.838	7.087.616	53,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 18	349.339	7.087.593	60,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 19	349.284	7.087.592	59,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 20	349.272	7.087.561	60,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 21	349.393	7.087.553	61,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 22	349.315	7.087.527	61,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 23	349.359	7.087.497	61,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 24	349.398	7.087.467	62,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 25	349.373	7.087.405	63,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
RH 26	346.377	7.083.904	71,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"		

Calculation Results

Shadow receptor				
No.	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]
CH	0:00	0	0:00	0:00
HH 01	0:00	0	0:00	0:00
HH 02	0:00	0	0:00	0:00
HH 03	0:00	0	0:00	0:00
HH 04	0:00	0	0:00	0:00
HH 05	0:00	0	0:00	0:00
HH 06	0:00	0	0:00	0:00
HH 07	0:00	0	0:00	0:00
HH 08	0:00	0	0:00	0:00
HH 09	0:00	0	0:00	0:00
RH 01	0:00	0	0:00	0:00
RH 02	0:00	0	0:00	0:00
RH 03	0:00	0	0:00	0:00
RH 04	0:00	0	0:00	0:00
RH 05	0:00	0	0:00	0:00
RH 06	0:00	0	0:00	0:00
RH 07	0:00	0	0:00	0:00
RH 08	0:00	0	0:00	0:00
RH 09	0:00	0	0:00	0:00

To be continued on next page...

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WindPRO version 2.9.277 Mar 2014

Project:
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Calculated:
14.07.2014 18:27/2.9.277

SHADOW - Main Result

Calculation: Option 1 - 17x V126 - WC+RC with forest mask (lower heights)

...continued from previous page

No.	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]	
RH 10	0:00	0	0:00	0:00	
RH 11	9:50	40	0:19	0:54	
RH 12	0:00	0	0:00	0:00	
RH 13	0:00	0	0:00	0:00	
RH 14	0:00	0	0:00	0:00	
RH 15	0:00	0	0:00	0:00	
RH 16	0:00	0	0:00	0:00	
RH 17	0:00	0	0:00	0:00	
RH 18	0:00	0	0:00	0:00	
RH 19	0:00	0	0:00	0:00	
RH 20	0:00	0	0:00	0:00	
RH 21	0:00	0	0:00	0:00	
RH 22	0:00	0	0:00	0:00	
RH 23	0:00	0	0:00	0:00	
RH 24	0:00	0	0:00	0:00	
RH 25	0:00	0	0:00	0:00	
RH 26	0:00	0	0:00	0:00	

Total amount of flickering on the shadow receptors caused by each WTG		Worst case [h/year]	Expected [h/year]
No.	Name		
WTG 01	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (364)	0:00	0:00
WTG 02	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (366)	9:50	0:54
WTG 03	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (365)	0:00	0:00
WTG 04	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (367)	0:00	0:00
WTG 05	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (371)	0:00	0:00
WTG 06	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (368)	0:00	0:00
WTG 07	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (370)	0:00	0:00
WTG 08	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (369)	0:00	0:00
WTG 09	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (372)	0:00	0:00
WTG 10	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (373)	0:00	0:00
WTG 11	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (374)	0:00	0:00
WTG 12	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (375)	0:00	0:00
WTG 13	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (377)	0:00	0:00
WTG 14	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (376)	0:00	0:00
WTG 15	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (378)	0:00	0:00
WTG 16	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (379)	0:00	0:00
WTG 17	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (380)	0:00	0:00

WindPRO version 2.9.277 Mar 2014

Project:
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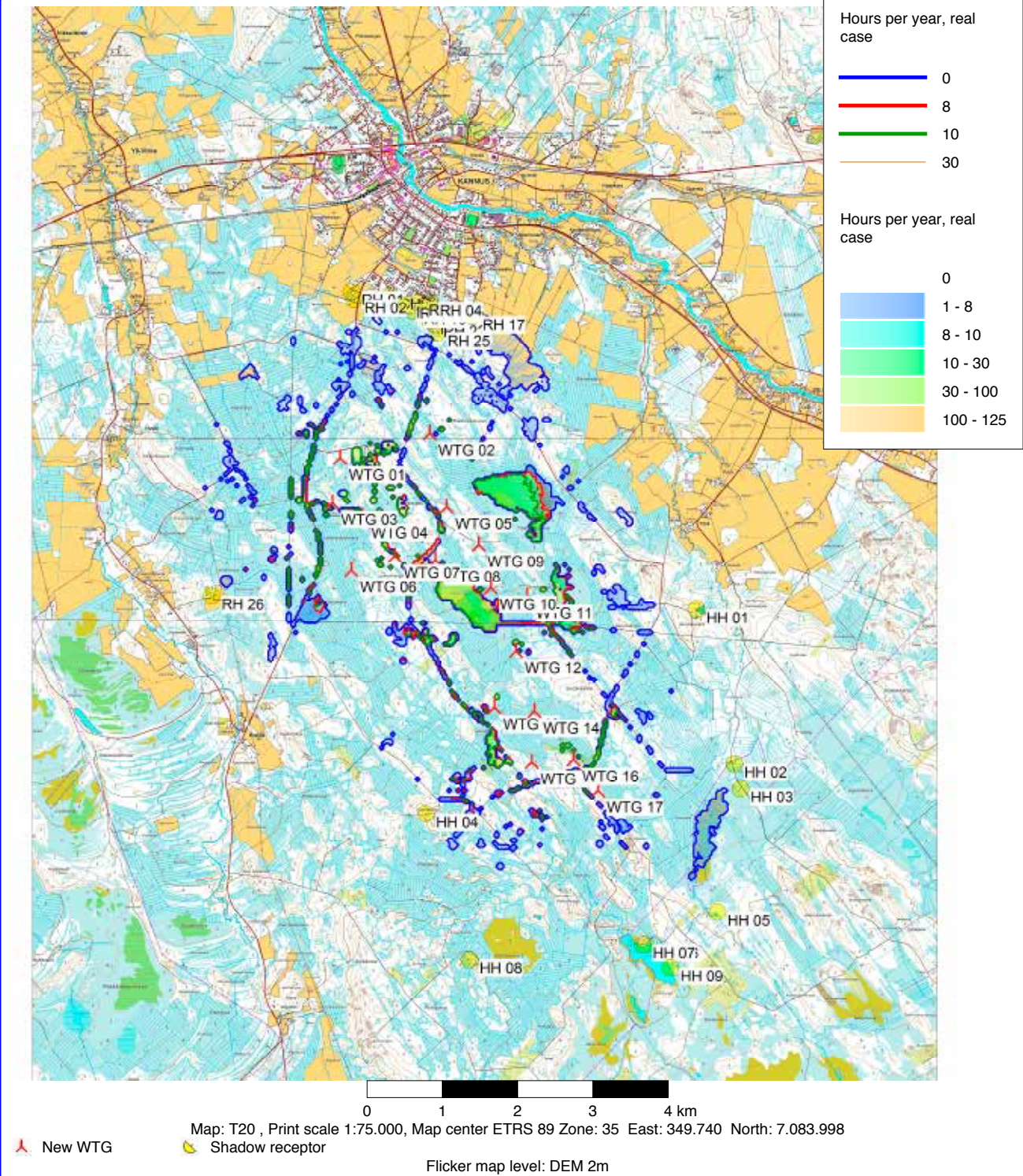
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SHADOW - Map

Calculation: Option 1 - 17x V126 - WC+RC with forest mask (lower heights)



WindPRO version 2.9.277 Mar 2014

Project:	Printed/Page
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	Calculated:
	14.07.2014 16:59/2.9.277

SHADOW - Main Result

Calculation: Option 1 - 17x V126 - WC

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
The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

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: DEM 2m
Obstacles not used in calculation
Eye height: 1,5 m
Grid resolution: 25,0 m



WTGs			ETRS 89 Zone: 35		WTG type				Shadow data			
	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Calculation distance	RPM
								[kW]	[m]	[m]	[m]	[RPM]
WTG 01	348.081	7.085.743	[m]	63,4 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 02	349.267	7.086.068		67,5 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 03	347.980	7.085.140		68,1 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 04	348.379	7.084.971		72,0 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 05	349.494	7.085.088		75,2 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 06	348.231	7.084.250		72,4 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 07	348.809	7.084.440		78,6 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 08	349.343	7.084.385		77,9 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 09	349.920	7.084.588		78,1 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 10	350.082	7.084.018		80,6 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 11	350.564	7.083.899		80,8 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 12	350.413	7.083.176		83,9 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 13	350.128	7.082.424		90,0 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 14	350.659	7.082.374		90,6 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 15	350.624	7.081.701		92,8 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 16	351.177	7.081.736		93,9 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 17	351.503	7.081.322		96,8 VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0

Shadow receptor-Input

ETRS 89 Zone: 35									
No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
CH	348.730	7.087.892	51,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 01	352.804	7.083.722	80,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 02	353.308	7.081.675	87,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 03	353.392	7.081.343	90,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 04	349.219	7.081.009	103,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 05	353.085	7.079.703	96,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 06	352.136	7.079.279	100,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 07	352.093	7.079.278	101,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 08	349.799	7.079.074	107,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 09	352.463	7.078.966	99,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 01	348.232	7.087.949	51,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 02	348.267	7.087.840	51,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 03	349.121	7.087.807	52,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"

To be continued on next page...

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WindPRO version 2.9.277 Mar 2014

Project:	Printed/Page
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	Calculated:
	14.07.2014 16:59/2.9.277

SHADOW - Main Result

Calculation: Option 1 - 17x V126 - WC

...continued from previous page

ETRS 89 Zone: 35									
No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
RH 04	349.269	7.087.803	52,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 05	349.291	7.087.785	52,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 06	348.960	7.087.777	53,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 07	349.244	7.087.771	53,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 08	349.004	7.087.767	54,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 09	349.263	7.087.756	53,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 10	349.191	7.087.754	53,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 11	349.219	7.087.738	53,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 12	349.182	7.087.697	57,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 13	349.058	7.087.689	54,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 14	349.245	7.087.667	56,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 15	349.229	7.087.645	56,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 16	349.304	7.087.630	59,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 17	349.838	7.087.616	53,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 18	349.339	7.087.593	60,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 19	349.284	7.087.592	59,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 20	349.272	7.087.561	60,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 21	349.393	7.087.553	61,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 22	349.315	7.087.527	61,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 23	349.359	7.087.497	61,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 24	349.398	7.087.467	62,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 25	349.373	7.087.405	63,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 26	346.377	7.083.904	71,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"

Calculation Results

Shadow, worst case			
No.	Shadow hours per year	Shadow days per year	Max shadow hours per day
	[h/year]	[days/year]	[h/day]
CH	0:00	0	0:00
HH 01	0:00	0	0:00
HH 02	0:00	0	0:00
HH 03	0:00	0	0:00
HH 04	9:06	36	0:20
HH 05	0:00	0	0:00
HH 06	0:00	0	0:00
HH 07	0:00	0	0:00
HH 08	0:00	0	0:00
HH 09	0:00	0	0:00
RH 01	0:00	0	0:00
RH 02	0:00	0	0:00
RH 03	0:00	0	0:00
RH 04	0:00	0	0:00
RH 05	0:00	0	0:00
RH 06	0:00	0	0:00
RH 07	9:35	41	0:18
RH 08	0:00	0	0:00
RH 09	9:43	42	0:18
RH 10	9:36	40	0:19
RH 11	9:50	40	0:19
RH 12	10:10	42	0:19
RH 13	9:39	40	0:19
RH 14	10:29	42	0:19
RH 15	10:41	42	0:20
RH 16	10:56	42	0:20
RH 17	8:39	36	0:19
RH 18	11:22	44	0:20

To be continued on next page...

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WindPRO version 2.9.277 Mar 2014

Project: Kannus	Printed/Page
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SHADOW - Main Result

Calculation: Option 1 - 17x V126 - WC

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Shadow, worst case			
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
RH 19	11:16	43	0:20
RH 20	11:36	44	0:21
RH 21	11:38	43	0:21
RH 22	12:00	44	0:21
RH 23	12:17	46	0:21
RH 24	12:34	44	0:22
RH 25	13:26	46	0:23
RH 26	0:00	0	0:00

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

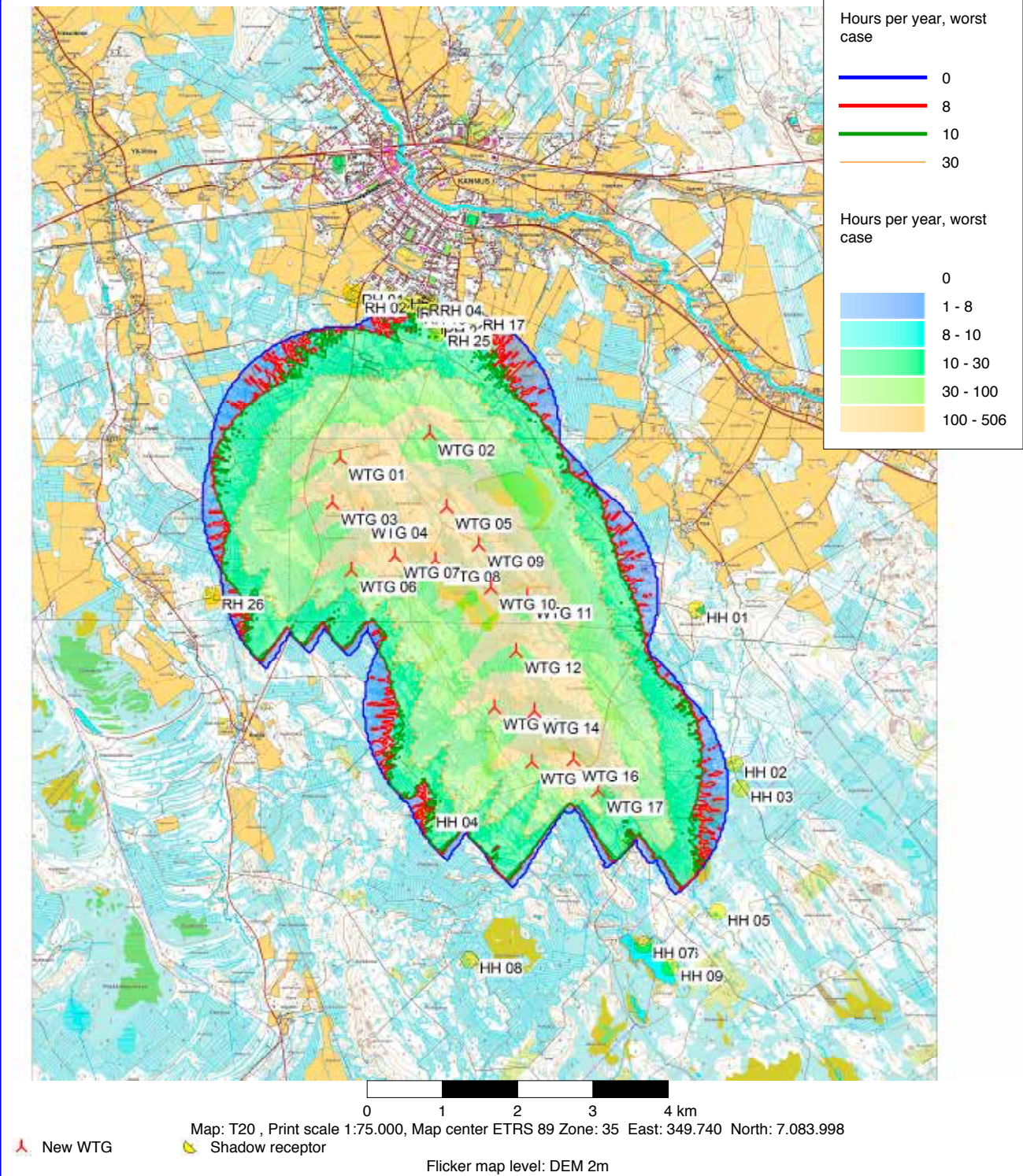
No.	Name	Worst case [h/year]	Expected [h/year]
WTG 01	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (364)	0:00	
WTG 02	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (366)	57:17	
WTG 03	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (365)	0:00	
WTG 04	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (367)	0:00	
WTG 05	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (371)	0:00	
WTG 06	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (368)	0:00	
WTG 07	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (370)	0:00	
WTG 08	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (369)	0:00	
WTG 09	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (372)	0:00	
WTG 10	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (373)	0:00	
WTG 11	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (374)	0:00	
WTG 12	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (375)	0:00	
WTG 13	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (377)	0:00	
WTG 14	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (376)	0:00	
WTG 15	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (378)	9:06	
WTG 16	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (379)	0:00	
WTG 17	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (380)	0:00	

WindPRO version 2.9.277 Mar 2014

Project: Kannus	Printed/Page
	16.07.2014 14:39 / 4
	Licensed user:
	wpd AG Stephanitorsbollwerk 3 (Haus LUV) DE-28217 Bremen +49 7142 77810
Calculated:	
14.07.2014 16:59/2.9.277	

SHADOW - Map

Calculation: Option 1 - 17x V126 - WC



WindPRO version 2.9.277 Mar 2014

Project:	Printed/Page
Kannus	16.07.2014 14:43 / 1
	Licensed user:
	wpd AG
	Stephanitorsbollwerk 3 (Haus LUV)
	DE-28217 Bremen
	+49 7142 77810
	Calculated:
	14.07.2014 17:38/2.9.277

SHADOW - Main Result

Calculation: Option 2 - 14x V126 - RC

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

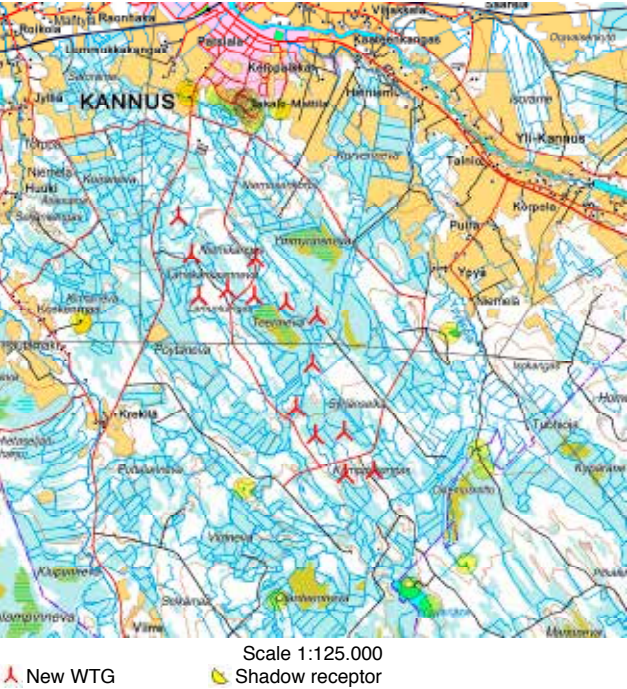
Minimum sun height over horizon for influence 3 °
Day step for calculation 1 days
Time step for calculation 1 minutes

Sunshine probability S (Average daily sunshine hours) []
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
0,77 2,46 4,42 6,93 8,81 9,87 9,13 6,84 4,43 2,23 0,93 0,26

Operational hours are calculated from WTGs in calculation and wind distribution:
VTT WindAtlas, 12 Sectors, 75-150m

Operational time
N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
682 418 371 363 521 679 938 1.427 1.248 705 560 618 8.531
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: DEM 2m
Obstacles not used in calculation
Eye height: 1,5 m
Grid resolution: 25,0 m



WTGs			ETRS 89 Zone: 35		WTG type			Shadow data				
	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
WTG 01	348.081	7.085.743	63,4	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 02	348.310	7.085.092	72,3	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 03	349.423	7.085.018	76,6	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 04	348.437	7.084.363	73,9	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 05	348.935	7.084.474	76,6	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 06	349.396	7.084.366	78,3	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 07	349.954	7.084.243	79,3	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 08	350.495	7.084.010	80,0	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 09	350.412	7.083.176	83,9	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 10	350.128	7.082.424	90,0	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 11	350.461	7.081.938	91,6	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 12	350.963	7.081.999	91,9	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 13	350.985	7.081.249	99,6	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 14	351.483	7.081.320	97,0	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0

Shadow receptor-Input

ETRS 89 Zone: 35									
No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
CH	348.730	7.087.892	51,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 01	352.804	7.083.722	80,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 02	353.308	7.081.675	87,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 03	353.392	7.081.343	90,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 04	349.219	7.081.009	103,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 05	353.085	7.079.703	96,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 06	352.136	7.079.279	100,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 07	352.093	7.079.278	101,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 08	349.799	7.079.074	107,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"

To be continued on next page...

WindPRO version 2.9.277 Mar 2014

Project:	Printed/Page
Kannus	16.07.2014 14:43 / 2
	Licensed user:
	wpd AG
	Stephanitorsbollwerk 3 (Haus LUV)
	DE-28217 Bremen
	+49 7142 77810
	Calculated:
	14.07.2014 17:38/2.9.277

SHADOW - Main Result

Calculation: Option 2 - 14x V126 - RC

...continued from previous page

ETRS 89 Zone: 35									
No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
HH 09	352.463	7.078.966	99,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 01	348.232	7.087.949	51,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 02	348.267	7.087.840	51,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 03	349.121	7.087.807	52,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 04	349.269	7.087.803	52,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 05	349.291	7.087.785	52,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 06	348.960	7.087.777	53,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 07	349.244	7.087.771	53,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 08	349.004	7.087.767	54,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 09	349.263	7.087.756	53,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 10	349.191	7.087.754	53,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 11	349.219	7.087.738	53,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 12	349.182	7.087.697	57,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 13	349.058	7.087.689	54,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 14	349.245	7.087.667	56,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 15	349.229	7.087.645	56,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 16	349.304	7.087.630	59,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 17	349.838	7.087.616	53,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 18	349.339	7.087.593	60,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 19	349.284	7.087.592	59,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 20	349.272	7.087.561	60,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 21	349.393	7.087.553	61,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 22	349.315	7.087.527	61,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 23	349.359	7.087.497	61,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 24	349.398	7.087.467	62,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 25	349.373	7.087.405	63,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 26	346.377	7.083.904	71,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"

Calculation Results

Shadow receptor	
Shadow, expected values	
No.	Shadow hours per year [h/year]
CH	0:00
HH 01	0:00
HH 02	0:00
HH 03	0:00
HH 04	5:45
HH 05	0:00
HH 06	0:00
HH 07	0:00
HH 08	0:00
HH 09	0:00
RH 01	0:00
RH 02	0:00
RH 03	0:00
RH 04	0:00
RH 05	0:00
RH 06	0:00
RH 07	0:00
RH 08	0:00
RH 09	0:00
RH 10	0:00
RH 11	0:00
RH 12	0:00
RH 13	0:00
RH 14	0:00

To be continued on next page...

WindPRO version 2.9.277 Mar 2014

Project:	Printed/Page
Kannus	16.07.2014 14:43 / 3
	Licensed user:
	wpd AG
	Stephanitorsbollwerk 3 (Haus LUV)
	DE-28217 Bremen
	+49 7142 77810
	Calculated:
	14.07.2014 17:38/2.9.277

SHADOW - Main Result

Calculation: Option 2 - 14x V126 - RC

...continued from previous page

Shadow, expected values

No.	Shadow hours per year [h/year]
RH 15	0:00
RH 16	0:00
RH 17	0:00
RH 18	0:00
RH 19	0:00
RH 20	0:00
RH 21	0:00
RH 22	0:00
RH 23	0:00
RH 24	0:00
RH 25	0:00
RH 26	0:00

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

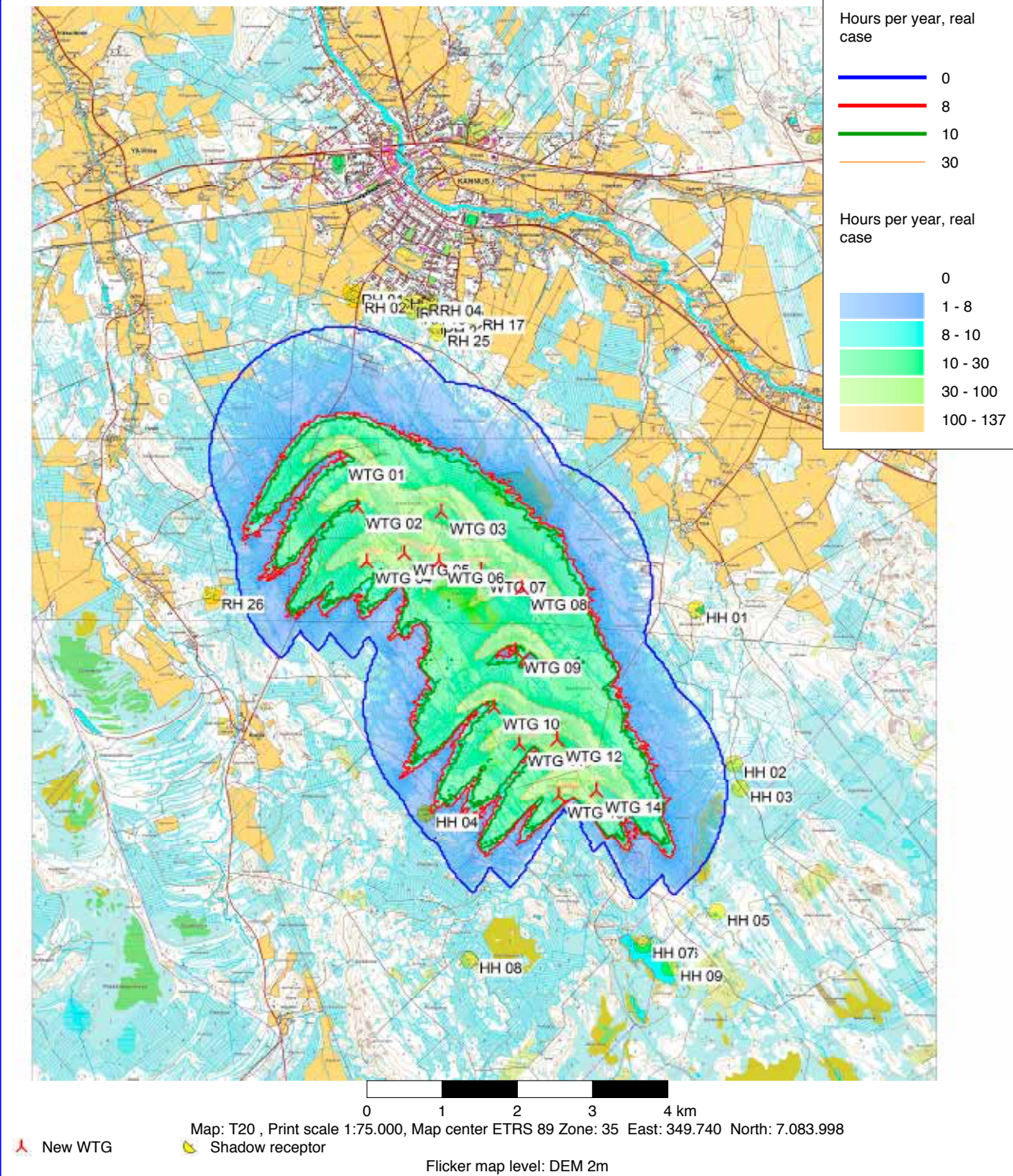
No.	Name	Worst case [h/year]	Expected [h/year]
WTG 01	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (333)	0:00	0:00
WTG 02	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (334)	0:00	0:00
WTG 03	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (339)	0:00	0:00
WTG 04	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (336)	0:00	0:00
WTG 05	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (337)	0:00	0:00
WTG 06	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (340)	0:00	0:00
WTG 07	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (338)	0:00	0:00
WTG 08	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (341)	0:00	0:00
WTG 09	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (335)	0:00	0:00
WTG 10	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (342)	0:00	0:00
WTG 11	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (343)	19:17	5:45
WTG 12	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (344)	0:00	0:00
WTG 13	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (346)	0:00	0:00
WTG 14	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (345)	0:00	0:00

WindPRO version 2.9.277 Mar 2014

Project:	Printed/Page
Kannus	16.07.2014 14:43 / 4
	Licensed user:
	wpd AG
	Stephanitorsbollwerk 3 (Haus LUV)
	DE-28217 Bremen
	+49 7142 77810
	Calculated:
	14.07.2014 17:38/2.9.277

SHADOW - Map

Calculation: Option 2 - 14x V126 - RC



WindPRO version 2.9.277 Mar 2014

Project:	Printed/Page
Kannus	16.07.2014 14:44 / 1
	Licensed user:
	wpd AG
	Stephanitorsbollwerk 3 (Haus LUV)
	DE-28217 Bremen
	+49 7142 77810
	Calculated:
	14.07.2014 19:08/2.9.277

SHADOW - Main Result

Calculation: Option 2 - 14x V126 - WC+RC with forest mask (lower heights)

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

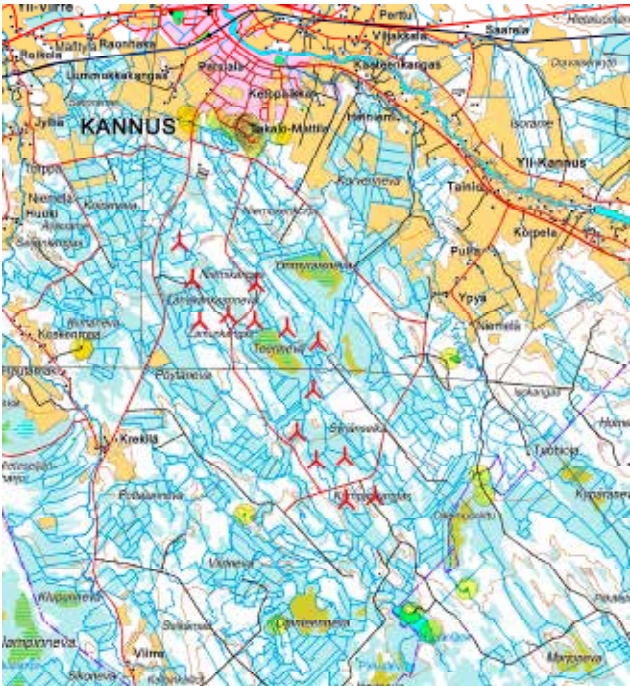
Minimum sun height over horizon for influence 3 °
Day step for calculation 1 days
Time step for calculation 1 minutes

Sunshine probability S (Average daily sunshine hours) []
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
0,77 2,46 4,42 6,93 8,81 9,87 9,13 6,84 4,43 2,23 0,93 0,26

Operational hours are calculated from WTGs in calculation and wind distribution:
VTT WindAtlas, 12 Sectors, 75-150m

Operational time
N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
682 418 371 363 521 679 938 1.427 1.248 705 560 618 8.531
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: DEM 2m
Area object(s) used in calculation:
Forest Mask - trees' lower height limits
Obstacles used in calculation
Eye height: 1,5 m
Grid resolution: 25,0 m



WTGs			ETRS 89 Zone: 35		WTG type				Shadow data				
	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Calculation distance	RPM	
			[m]					[kW]	[m]	[m]	[m]	[RPM]	
WTG 01	348.081	7.085.743	63,4	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0	
WTG 02	348.310	7.085.092	72,3	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0	
WTG 03	349.423	7.085.018	76,6	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0	
WTG 04	348.437	7.084.363	73,9	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0	
WTG 05	348.935	7.084.474	76,6	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0	
WTG 06	349.396	7.084.366	78,3	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0	
WTG 07	349.954	7.084.243	79,3	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0	
WTG 08	350.495	7.084.010	80,0	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0	
WTG 09	350.412	7.083.176	83,9	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0	
WTG 10	350.128	7.082.424	90,0	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0	
WTG 11	350.461	7.081.938	91,6	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0	
WTG 12	350.963	7.081.999	91,9	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0	
WTG 13	350.985	7.081.249	99,6	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0	
WTG 14	351.483	7.081.320	97,0	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0	

Shadow receptor-Input

ETRS 89 Zone: 35									
No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
CH	348.730	7.087.892	51,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 01	352.804	7.083.722	80,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 02	353.308	7.081.675	87,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 03	353.392	7.081.343	90,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 04	349.219	7.081.009	103,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 05	353.085	7.079.703	96,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 06	352.136	7.079.279	100,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"

To be continued on next page...

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WindPRO version 2.9.277 Mar 2014

Project:	Printed/Page
Kannus	16.07.2014 14:44 / 2
	Licensed user:
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	Stephanitorsbollwerk 3 (Haus LUV)
	DE-28217 Bremen
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	Calculated:
	14.07.2014 19:08/2.9.277

SHADOW - Main Result

Calculation: Option 2 - 14x V126 - WC+RC with forest mask (lower heights)

...continued from previous page

ETRS 89 Zone: 35									
No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
HH 07	352.093	7.079.278	101,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 08	349.799	7.079.074	107,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 09	352.463	7.078.966	99,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 01	348.232	7.087.949	51,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 02	348.267	7.087.840	51,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 03	349.121	7.087.807	52,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 04	349.269	7.087.803	52,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 05	349.291	7.087.785	52,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 06	348.960	7.087.777	53,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 07	349.244	7.087.771	53,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 08	349.004	7.087.767	54,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 09	349.263	7.087.756	53,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 10	349.191	7.087.754	53,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 11	349.219	7.087.738	53,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 12	349.182	7.087.697	57,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 13	349.058	7.087.689	54,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 14	349.245	7.087.667	56,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 15	349.229	7.087.645	56,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 16	349.304	7.087.630	59,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 17	349.838	7.087.616	53,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 18	349.339	7.087.593	60,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 19	349.284	7.087.592	59,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 20	349.272	7.087.561	60,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 21	349.393	7.087.553	61,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 22	349.315	7.087.527	61,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 23	349.359	7.087.497	61,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 24	349.398	7.087.467	62,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 25	349.373	7.087.405	63,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 26	346.377	7.083.904	71,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"

Calculation Results

Shadow, worst case				Shadow, expected values	
No.	Shadow hours per year	Shadow days per year	Max shadow hours per day	Shadow hours per year	
				[h/year]	
					[h/year]
CH	0:00	0	0:00	0:00	
HH 01	0:00	0	0:00	0:00	
HH 02	0:00	0	0:00	0:00	
HH 03	0:00	0	0:00	0:00	
HH 04	0:00	0	0:00	0:00	
HH 05	0:00	0	0:00	0:00	
HH 06	0:00	0	0:00	0:00	
HH 07	0:00	0	0:00	0:00	
HH 08	0:00	0	0:00	0:00	
HH 09	0:00	0	0:00	0:00	
RH 01	0:00	0	0:00	0:00	
RH 02	0:00	0	0:00	0:00	
RH 03	0:00	0	0:00	0:00	
RH 04	0:00	0	0:00	0:00	
RH 05	0:00	0	0:00	0:00	
RH 06	0:00	0	0:00	0:00	
RH 07	0:00	0	0:00	0:00	
RH 08	0:00	0	0:00	0:00	
RH 09	0:00	0	0:00	0:00	
RH 10	0:00	0	0:00	0:00	
RH 11	0:00	0	0:00	0:00	
RH 12	0:00	0	0:00	0:00	

To be continued on next page...

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WindPRO version 2.9.277 Mar 2014

Project:	Printed/Page
Kannus	16.07.2014 14:44 / 3
	Licensed user:
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	Calculated:
	14.07.2014 19:08/2.9.277

SHADOW - Main Result

Calculation: Option 2 - 14x V126 - WC+RC with forest mask (lower heights)

...continued from previous page

No.	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]	
RH 13	0:00	0	0:00	0:00	
RH 14	0:00	0	0:00	0:00	
RH 15	0:00	0	0:00	0:00	
RH 16	0:00	0	0:00	0:00	
RH 17	0:00	0	0:00	0:00	
RH 18	0:00	0	0:00	0:00	
RH 19	0:00	0	0:00	0:00	
RH 20	0:00	0	0:00	0:00	
RH 21	0:00	0	0:00	0:00	
RH 22	0:00	0	0:00	0:00	
RH 23	0:00	0	0:00	0:00	
RH 24	0:00	0	0:00	0:00	
RH 25	0:00	0	0:00	0:00	
RH 26	0:00	0	0:00	0:00	

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

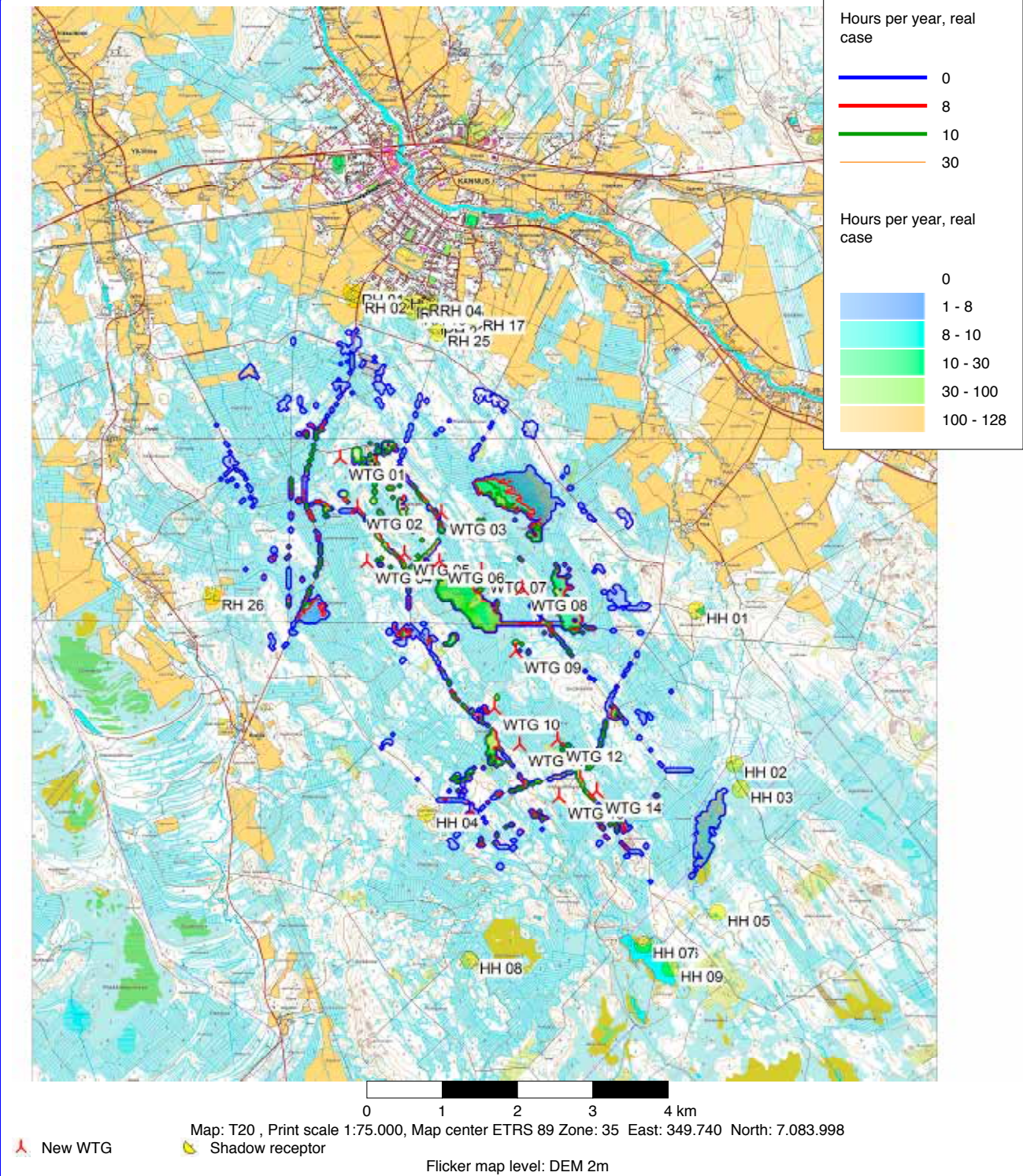
No.	Name	Worst case [h/year]	Expected [h/year]
WTG 01	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (333)	0:00	0:00
WTG 02	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (334)	0:00	0:00
WTG 03	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (339)	0:00	0:00
WTG 04	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (336)	0:00	0:00
WTG 05	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (337)	0:00	0:00
WTG 06	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (340)	0:00	0:00
WTG 07	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (338)	0:00	0:00
WTG 08	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (341)	0:00	0:00
WTG 09	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (335)	0:00	0:00
WTG 10	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (342)	0:00	0:00
WTG 11	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (343)	0:00	0:00
WTG 12	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (344)	0:00	0:00
WTG 13	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (346)	0:00	0:00
WTG 14	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (345)	0:00	0:00

WindPRO version 2.9.277 Mar 2014

Project:	Printed/Page
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	Calculated:
	14.07.2014 19:08/2.9.277

SHADOW - Map

Calculation: Option 2 - 14x V126 - WC+RC with forest mask (lower heights)



WindPRO version 2.9.277 Mar 2014

Project:	Printed/Page
Kannus	16.07.2014 14:40 / 1
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	Calculated:
	14.07.2014 17:01/2.9.277

SHADOW - Main Result

Calculation: Option 2 - 14x V126 - WC

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

The calculated times are "worst case" given by the following assumptions:

- The sun is shining all the day, from sunrise to sunset
- The rotor plane is always perpendicular to the line from the WTG to the sun
- The WTG is always operating

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: DEM 2m
Obstacles not used in calculation
Eye height: 1,5 m
Grid resolution: 25,0 m



Scale 1:200.000
New WTG Shadow receptor

ETRS 89 Zone: 35				WTG type		Shadow data						
No.	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM [RPM]
WTG 01	348.081	7.085.743	63,4	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 02	348.310	7.085.092	72,3	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 03	349.423	7.085.018	76,6	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 04	348.437	7.084.363	73,9	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 05	348.935	7.084.474	76,6	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 06	349.396	7.084.366	78,3	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 07	349.954	7.084.243	79,3	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 08	350.495	7.084.010	80,0	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 09	350.412	7.083.176	83,9	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 10	350.128	7.082.424	90,0	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 11	350.461	7.081.938	91,6	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 12	350.963	7.081.999	91,9	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 13	350.985	7.081.249	99,6	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0
WTG 14	351.483	7.081.320	97,0	VESTAS V126-3.3 Gr...	Yes	VESTAS	V126-3.3 GrStr 3rdOc-3.300	3.300	126,0	167,0	1.712	0,0

Shadow receptor-Input

ETRS 89 Zone: 35									
No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
CH	348.730	7.087.892	51,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 01	352.804	7.083.722	80,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 02	353.308	7.081.675	87,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 03	353.392	7.081.343	90,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 04	349.219	7.081.009	103,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 05	353.085	7.079.703	96,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 06	352.136	7.079.279	100,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 07	352.093	7.079.278	101,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 08	349.799	7.079.074	107,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 09	352.463	7.078.966	99,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 01	348.232	7.087.949	51,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 02	348.267	7.087.840	51,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 03	349.121	7.087.807	52,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 04	349.269	7.087.803	52,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 05	349.291	7.087.785	52,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 06	348.960	7.087.777	53,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"

To be continued on next page...

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WindPRO version 2.9.277 Mar 2014

Project:	Printed/Page
Kannus	16.07.2014 14:40 / 2
	Licensed user:
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	+49 7142 77810
	Calculated:
	14.07.2014 17:01/2.9.277

SHADOW - Main Result

Calculation: Option 2 - 14x V126 - WC

...continued from previous page

ETRS 89 Zone: 35									
No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
RH 07	349.244	7.087.771	53,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 08	349.004	7.087.767	54,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 09	349.263	7.087.756	53,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 10	349.191	7.087.754	53,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 11	349.219	7.087.738	53,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 12	349.182	7.087.697	57,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 13	349.058	7.087.689	54,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 14	349.245	7.087.667	56,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 15	349.229	7.087.645	56,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 16	349.304	7.087.630	59,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 17	349.838	7.087.616	53,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 18	349.339	7.087.593	60,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 19	349.284	7.087.592	59,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 20	349.272	7.087.561	60,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 21	349.393	7.087.553	61,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 22	349.315	7.087.527	61,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 23	349.359	7.087.497	61,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 24	349.398	7.087.467	62,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 25	349.373	7.087.405	63,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 26	346.377	7.083.904	71,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"

Calculation Results

Shadow receptor

Shadow, worst case			
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
CH	0:00	0	0:00
HH 01	0:00	0	0:00
HH 02	0:00	0	0:00
HH 03	0:00	0	0:00
HH 04	19:17	71	0:20
HH 05	0:00	0	0:00
HH 06	0:00	0	0:00
HH 07	0:00	0	0:00
HH 08	0:00	0	0:00
HH 09	0:00	0	0:00
RH 01	0:00	0	0:00
RH 02	0:00	0	0:00
RH 03	0:00	0	0:00
RH 04	0:00	0	0:00
RH 05	0:00	0	0:00
RH 06	0:00	0	0:00
RH 07	0:00	0	0:00
RH 08	0:00	0	0:00
RH 09	0:00	0	0:00
RH 10	0:00	0	0:00
RH 11	0:00	0	0:00
RH 12	0:00	0	0:00
RH 13	0:00	0	0:00
RH 14	0:00	0	0:00
RH 15	0:00	0	0:00
RH 16	0:00	0	0:00
RH 17	0:00	0	0:00
RH 18	0:00	0	0:00
RH 19	0:00	0	0:00
RH 20	0:00	0	0:00
RH 21	0:00	0	0:00

To be continued on next page...

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WindPRO version 2.9.277 Mar 2014

Project:	Printed/Page
Kannus	16.07.2014 14:40 / 3
	Licensed user:
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	Stephanitorsbollwerk 3 (Haus LUV)
	DE-28217 Bremen
	+49 7142 77810
	Calculated:
	14.07.2014 17:01/2.9.277

SHADOW - Main Result

Calculation: Option 2 - 14x V126 - WC

...continued from previous page

Shadow, worst case			
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
RH 22	0:00	0	0:00
RH 23	0:00	0	0:00
RH 24	0:00	0	0:00
RH 25	0:00	0	0:00
RH 26	0:00	0	0:00

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

No.	Name	Worst case [h/year]	Expected [h/year]
WTG 01	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (333)	0:00	
WTG 02	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (334)	0:00	
WTG 03	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (339)	0:00	
WTG 04	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (336)	0:00	
WTG 05	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (337)	0:00	
WTG 06	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (340)	0:00	
WTG 07	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (338)	0:00	
WTG 08	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (341)	0:00	
WTG 09	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (335)	0:00	
WTG 10	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (342)	0:00	
WTG 11	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (343)	19:17	
WTG 12	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (344)	0:00	
WTG 13	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (346)	0:00	
WTG 14	VESTAS V126-3.3 GrStr 3rdOc 3300 126.0 !O! hub: 167,0 m (TOT: 230,0 m) (345)	0:00	

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Project:	Printed/Page
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SHADOW - Map

Calculation: Option 2 - 14x V126 - WC

