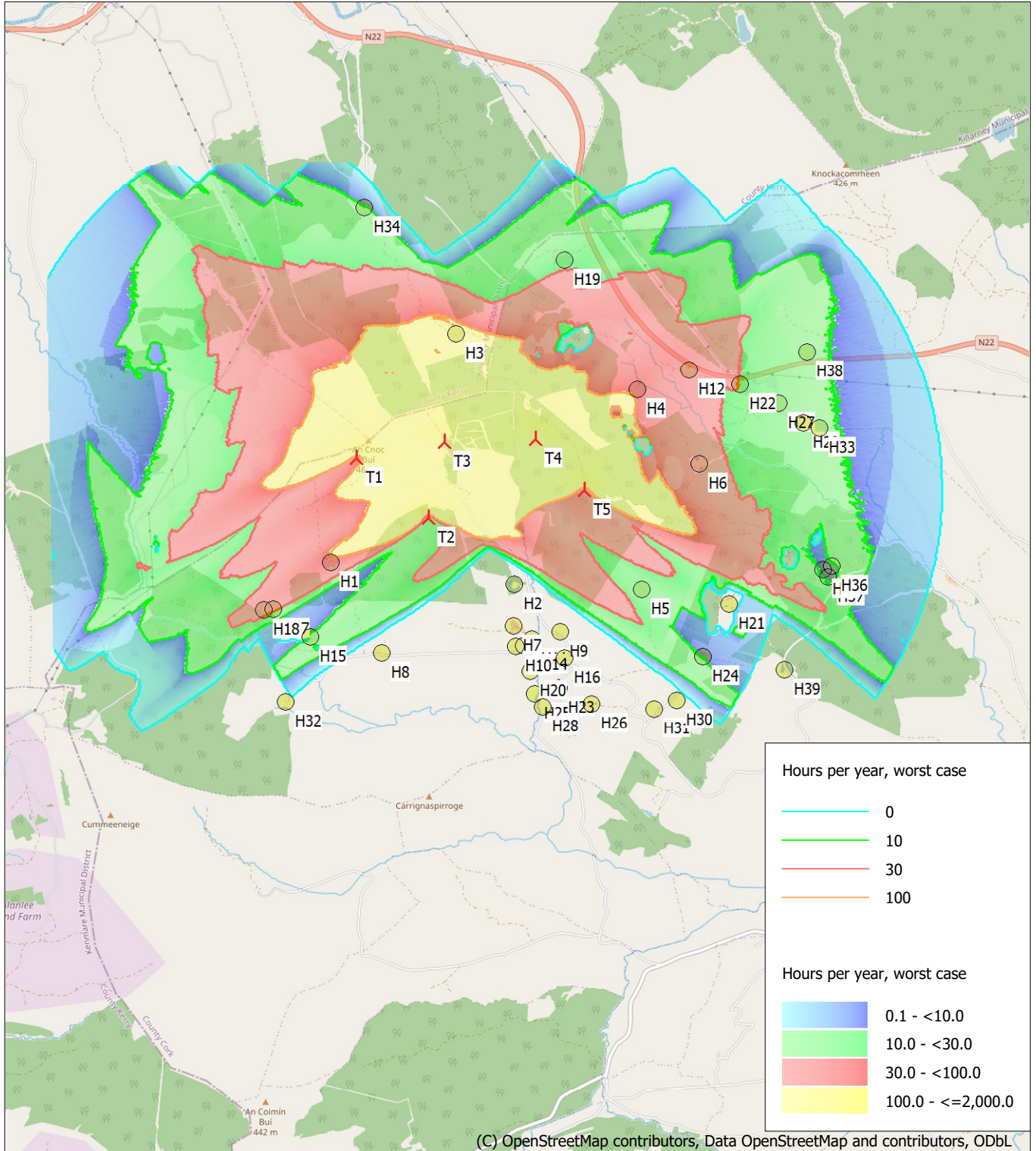


SHADOW - Map

Calculation: Alternative Scenario 2 Worst Case



0 500 1000 1500 2000 m

Map: EMD OpenStreetMap , Print scale 1:40,000, Map center Irish ITM-IRENET95 (IE), geocentric, GRS80 East: 513,470 North: 578,100

▲ New WTG

● Shadow receptor

Flicker map level: Elevation Grid Data Object: Inchamore_EMDGrid_3.wpg (3)

Time step: 2 minutes, Day step: 3 days, Map resolution: 10 m, Visibility resolution: 5 m, Eye height: 1.5 m

SHADOW - Main Result

Calculation: Alternative Scenario 2

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) [VALENTIA OBS.]
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 1.30 2.04 2.89 4.92 5.79 4.99 4.32 4.35 3.60 2.54 1.64 1.06

Operational time
 N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
 357 232 194 296 505 722 799 1,057 875 1,557 847 1,319 8,760

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: Elevation Grid Data Object: Inchamore_EMDGrid_3.wpg
 Receptor grid resolution: 1.0 m

All coordinates are in
 Irish ITM-IRENET95 (IE), geocentric, GRS80

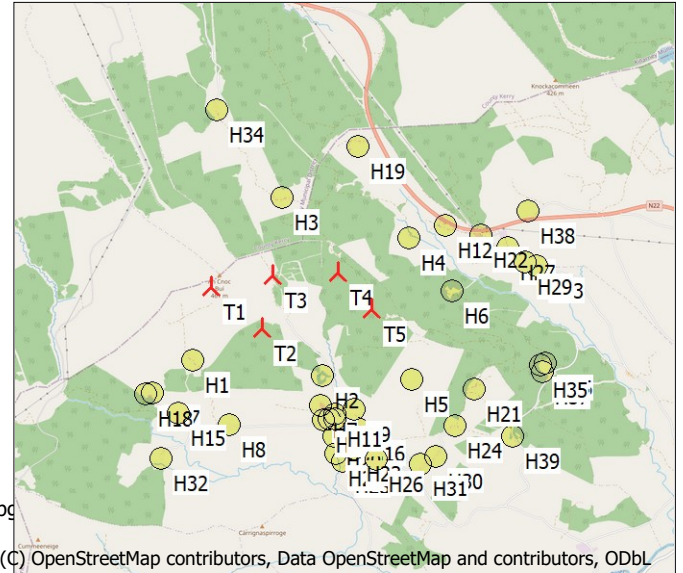
WTGs

	Easting	Northing	Z	Row data/Description	WTG type				Shadow data			
					Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM [RPM]
1	512,358	578,940	448.5	T1	No	Siemens Gamesa	GS 6.0-6,600	6,600	149.0	110.5	2,500	0.0
2	513,947	578,689	369.0	T5	No	Siemens Gamesa	GS 6.0-6,600	6,600	149.0	110.5	2,500	0.0
3	513,613	579,050	374.1	T4	No	Siemens Gamesa	GS 6.0-6,600	6,600	149.0	110.5	2,500	0.0
4	512,852	578,514	369.6	T2	No	Siemens Gamesa	GS 6.0-6,600	6,600	149.0	110.5	2,500	0.0
5	512,972	579,041	400.0	T3	No	Siemens Gamesa	GS 6.0-6,600	6,600	149.0	110.5	2,500	0.0

Shadow receptor-Input

No.	Name	Easting	Northing	Z	Width [m]	Height [m]	Elevation a.g.l. [m]	Slope of window [°]	Direction mode	Eye height (ZVI) a.g.l. [m]
A	H1	512,160	578,211	346.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
B	H2	513,445	578,031	285.9	2.0	2.0	0.5	90.0	"Green house mode"	2.5
C	H3	513,072	579,801	338.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
D	H4	514,329	579,384	289.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
E	H5	514,339	577,982	318.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
F	H6	514,756	578,856	262.2	2.0	2.0	0.5	90.0	"Green house mode"	2.5
G	H7	513,435	577,744	264.0	2.0	2.0	0.5	90.0	"Green house mode"	2.5
H	H8	512,511	577,570	263.5	2.0	2.0	0.5	90.0	"Green house mode"	2.5
I	H9	513,762	577,696	259.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
J	H10	513,449	577,603	249.4	2.0	2.0	0.5	90.0	"Green house mode"	2.5
K	H11	513,566	577,655	253.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
L	H12	514,700	579,510	276.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
M	H13	513,505	577,609	248.6	2.0	2.0	0.5	90.0	"Green house mode"	2.5
N	H14	513,565	577,612	248.9	2.0	2.0	0.5	90.0	"Green house mode"	2.5
O	H15	512,009	577,691	278.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
P	H16	513,794	577,514	246.6	2.0	2.0	0.5	90.0	"Green house mode"	2.5
Q	H17	511,756	577,894	314.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
R	H18	511,689	577,885	311.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
S	H19	513,838	580,300	300.4	2.0	2.0	0.5	90.0	"Green house mode"	2.5
T	H20	513,548	577,431	232.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
U	H21	514,950	577,873	283.9	2.0	2.0	0.5	90.0	"Green house mode"	2.5
V	H22	515,053	579,406	282.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
W	H23	513,747	577,308	221.7	2.0	2.0	0.5	90.0	"Green house mode"	2.5
X	H24	514,759	577,513	272.4	2.0	2.0	0.5	90.0	"Green house mode"	2.5
Y	H25	513,572	577,269	216.5	2.0	2.0	0.5	90.0	"Green house mode"	2.5
Z	H26	513,974	577,197	219.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5

To be continued on next page...



SHADOW - Main Result

Calculation: Alternative Scenario 2

...continued from previous page

No.	Name	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
AA	H27	515,322	579,275	275.0	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AB	H28	513,631	577,179	207.2	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AC	H29	515,488	579,130	260.2	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AD	H30	514,568	577,209	245.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AE	H31	514,413	577,149	233.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AF	H32	511,831	577,246	253.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AG	H33	515,603	579,094	254.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AH	H34	512,444	580,689	261.7	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AI	H35	515,614	578,103	249.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AJ	H36	515,672	578,122	245.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AK	H37	515,646	578,046	243.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AL	H38	515,525	579,630	278.7	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AM	H39	515,332	577,403	242.0	2.0	2.0	0.5	90.0	"Green house mode"	2.5

Calculation Results

Shadow receptor

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]
A	H1	88:32	115	1:12	17:08
B	H2	0:00	0	0:00	0:00
C	H3	114:36	98	1:37	11:14
D	H4	92:49	150	0:46	10:42
E	H5	19:54	72	0:23	4:24
F	H6	45:52	98	0:41	9:13
G	H7	0:00	0	0:00	0:00
H	H8	0:00	0	0:00	0:00
I	H9	0:00	0	0:00	0:00
J	H10	0:00	0	0:00	0:00
K	H11	0:00	0	0:00	0:00
L	H12	47:39	107	0:48	5:57
M	H13	0:00	0	0:00	0:00
N	H14	0:00	0	0:00	0:00
O	H15	11:39	55	0:17	2:15
P	H16	0:00	0	0:00	0:00
Q	H17	34:23	80	0:40	6:29
R	H18	38:32	87	0:40	7:18
S	H19	25:43	84	0:25	2:19
T	H20	0:00	0	0:00	0:00
U	H21	0:00	0	0:00	0:00
V	H22	30:12	77	0:36	4:27
W	H23	0:00	0	0:00	0:00
X	H24	9:51	45	0:17	2:07
Y	H25	0:00	0	0:00	0:00
Z	H26	0:00	0	0:00	0:00
AA	H27	17:43	57	0:26	2:49
AB	H28	0:00	0	0:00	0:00
AC	H29	13:26	51	0:21	2:16
AD	H30	0:00	0	0:00	0:00
AE	H31	0:00	0	0:00	0:00
AF	H32	0:00	0	0:00	0:00
AG	H33	11:55	48	0:21	2:04
AH	H34	10:14	40	0:19	0:56
AI	H35	9:45	37	0:21	2:10
AJ	H36	8:47	34	0:20	1:57
AK	H37	9:53	38	0:20	2:11
AL	H38	12:16	50	0:19	1:43
AM	H39	0:00	0	0:00	0:00

Project: **Inchamore** Description: 5 Turbine Wind Farm, Inchamore, Coolea, Co. Cork

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/02/2023 15:11/3.6.355

SHADOW - Main Result

Calculation: Alternative Scenario 2

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

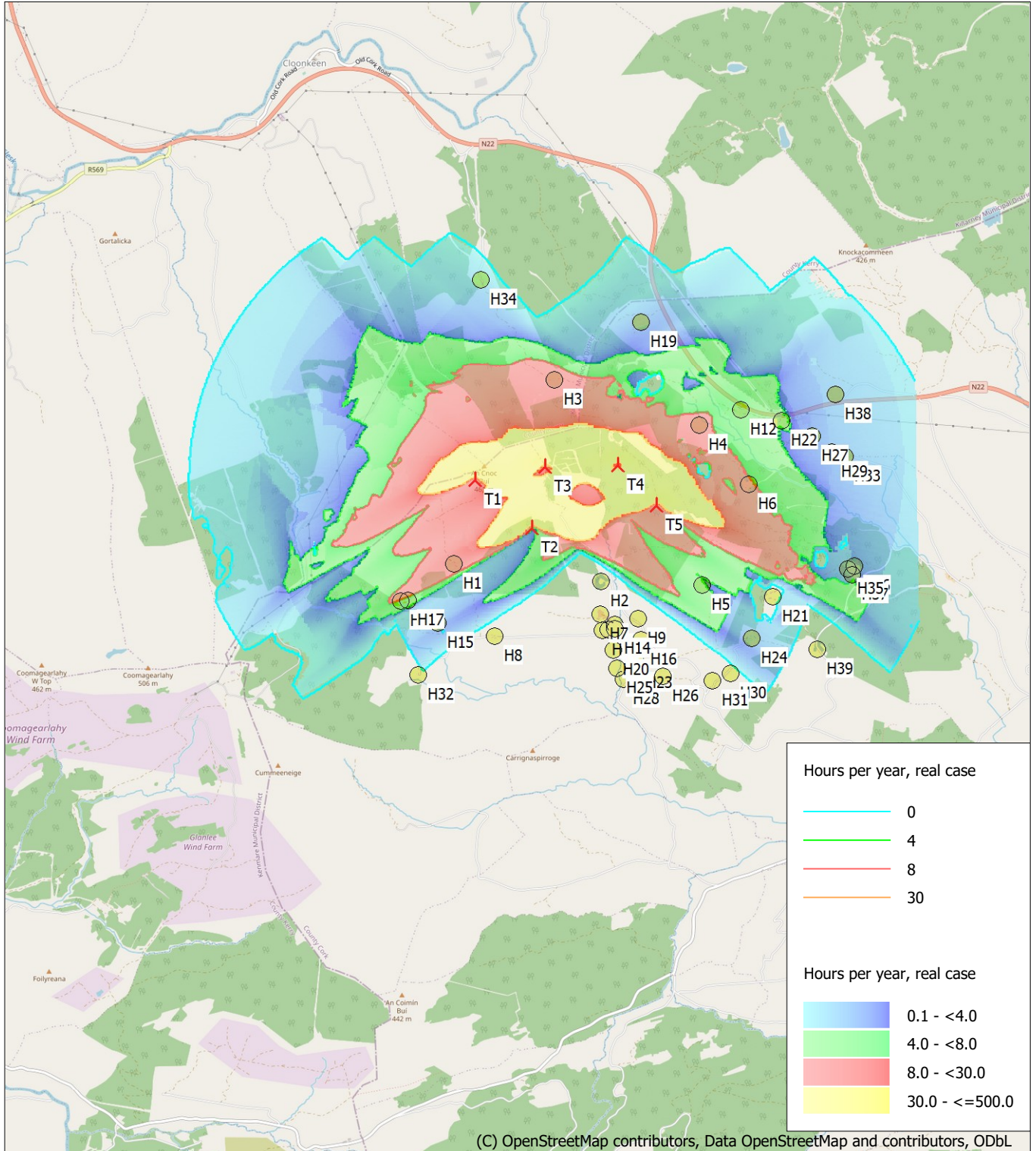
No.	Name	Worst case [h/year]	Expected [h/year]
1	T1	46:59	5:59
2	T5	191:45	27:16
3	T4	153:40	23:36
4	T2	102:10	19:58
5	T3	69:58	7:16

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.

The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

SHADOW - Map

Calculation: Alternative Scenario 2



0 500 1000 1500 2000 m

Map: EMD OpenStreetMap , Print scale 1:50,000, Map center Irish ITM-IRENET95 (IE), geocentric, GRS80 East: 512,720 North: 578,100

🚧 New WTG

🟡 Shadow receptor

Flicker map level: Elevation Grid Data Object: Inchamore_EMDGrid_3.wpg (3)

Time step: 2 minutes, Day step: 3 days, Map resolution: 10 m, Visibility resolution: 5 m, Eye height: 1.5 m