

## Appendix 10-1 - WindPRO Shadow Flicker Modelling Report



## SHADOW - Main Result

Calculation: 10798\_CLOGHERCOR\_200th\_REALISTIC  
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) [MALIN HEAD C.]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1.15 2.00 2.55 4.69 6.02 5.13 4.45 3.83 3.52 2.48 1.46 0.85

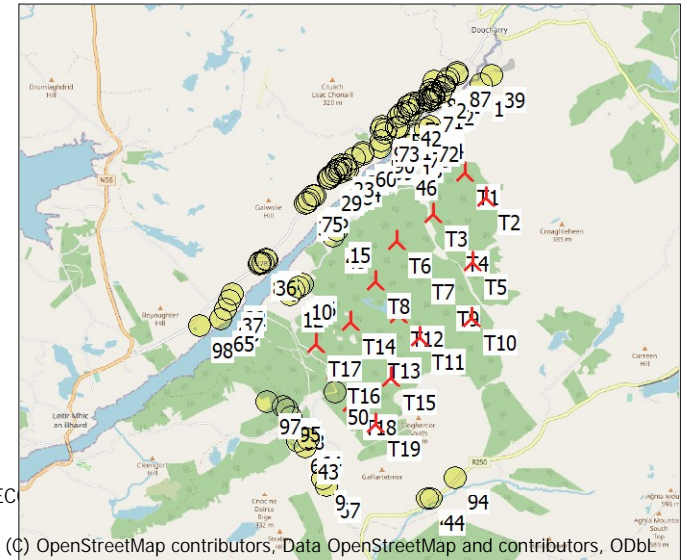
No operational time reduction. It is assumed the WTGs are always running with worst case wind direction.

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: 10798\_Shadow Model\_REC  
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] |
| T1  | 586,252 | 904,152  | 47.6  | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T10 | 586,352 | 901,748  | 163.3 | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T11 | 585,483 | 901,431  | 159.3 | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T12 | 585,145 | 901,821  | 100.5 | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T13 | 584,754 | 901,286  | 126.7 | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T14 | 584,348 | 901,682  | 91.6  | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T15 | 585,010 | 900,769  | 152.7 | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T16 | 584,073 | 900,876  | 96.0  | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T17 | 583,760 | 901,313  | 88.0  | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T18 | 584,353 | 900,350  | 128.4 | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T19 | 584,758 | 899,999  | 155.9 | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T2  | 586,602 | 903,723  | 112.5 | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T3  | 585,726 | 903,472  | 49.5  | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T4  | 586,075 | 903,054  | 96.4  | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T5  | 586,366 | 902,666  | 135.3 | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T6  | 585,117 | 903,032  | 93.8  | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T7  | 585,498 | 902,592  | 96.9  | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T8  | 584,755 | 902,355  | 106.3 | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T9  | 585,921 | 902,139  | 161.8 | VESTAS V162-7.2 7200 162.0 !O! ... | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |



### Shadow receptor-Input

| No. | 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]                     |
| 1   | 586,506 | 905,608  | 5.6   | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 2   | 585,898 | 905,569  | 14.9  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 3   | 585,709 | 905,512  | 34.7  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 4   | 585,675 | 905,461  | 35.5  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 5   | 585,365 | 905,275  | 44.8  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 6   | 585,749 | 905,377  | 19.5  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 7   | 585,678 | 905,361  | 25.7  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 8   | 584,264 | 904,282  | 44.1  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 9   | 583,861 | 899,089  | 165.8 | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 10  | 583,484 | 902,263  | 32.5  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 11  | 583,396 | 902,215  | 27.5  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 12  | 583,342 | 902,142  | 25.9  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |

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## SHADOW - Main Result

Calculation: 10798\_CLOGHERCOR\_200th\_REALISTIC

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| No. | Easting | Northing | Z     | Width | Height | Elevation | Slope of | Direction mode     | Eye height   |
|-----|---------|----------|-------|-------|--------|-----------|----------|--------------------|--------------|
|     |         |          | [m]   | [m]   | [m]    | a.g.l.    | window   |                    | (ZVI) a.g.l. |
|     |         |          |       |       |        | [m]       | [°]      |                    | [m]          |
| 13  | 585,322 | 904,584  | 9.8   | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 14  | 585,676 | 904,919  | 10.2  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 15  | 584,139 | 903,211  | 24.8  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 16  | 585,737 | 905,426  | 24.0  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 17  | 585,295 | 905,236  | 46.8  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 18  | 585,327 | 905,255  | 46.3  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 19  | 585,188 | 905,124  | 40.4  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 20  | 584,892 | 904,928  | 39.3  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 21  | 585,137 | 904,899  | 27.8  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 22  | 584,932 | 904,815  | 32.9  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 23  | 584,208 | 904,274  | 48.3  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 24  | 584,314 | 904,192  | 35.6  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 25  | 584,173 | 904,160  | 44.8  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 26  | 584,124 | 904,187  | 50.5  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 27  | 584,105 | 904,170  | 50.9  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 28  | 584,028 | 904,085  | 51.4  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 29  | 583,983 | 904,057  | 53.1  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 30  | 583,602 | 903,638  | 59.5  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 31  | 582,960 | 902,707  | 30.4  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 32  | 582,381 | 902,159  | 21.2  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 33  | 583,222 | 900,287  | 94.7  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 34  | 582,943 | 900,382  | 104.1 | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 35  | 583,729 | 903,777  | 59.1  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 36  | 582,893 | 902,661  | 32.1  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 37  | 582,340 | 902,051  | 21.9  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 38  | 584,430 | 904,390  | 33.0  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 39  | 586,688 | 905,742  | 7.3   | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 40  | 583,552 | 902,312  | 36.5  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 41  | 585,767 | 905,493  | 24.1  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 42  | 585,307 | 905,115  | 35.2  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 43  | 583,584 | 899,619  | 131.2 | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 44  | 585,684 | 898,760  | 132.1 | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 45  | 584,071 | 903,099  | 28.3  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 46  | 585,243 | 904,307  | 9.1   | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 47  | 585,610 | 898,755  | 137.8 | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 48  | 585,372 | 905,173  | 36.6  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 49  | 585,812 | 905,485  | 17.7  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 50  | 584,077 | 900,530  | 107.6 | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 51  | 585,387 | 905,286  | 43.9  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 52  | 585,943 | 905,656  | 20.3  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 53  | 585,624 | 905,364  | 31.1  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 54  | 585,149 | 905,079  | 37.2  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 55  | 583,616 | 903,661  | 60.5  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 56  | 585,658 | 905,323  | 23.9  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 57  | 585,115 | 904,895  | 28.5  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 58  | 582,932 | 902,738  | 33.3  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 59  | 584,838 | 904,564  | 24.0  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 60  | 584,554 | 904,449  | 30.8  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 61  | 584,553 | 904,488  | 32.0  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 62  | 584,257 | 904,224  | 42.3  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 63  | 584,189 | 904,217  | 47.1  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 64  | 583,624 | 899,746  | 117.8 | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 65  | 582,180 | 901,734  | 16.9  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 66  | 583,459 | 899,703  | 130.1 | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 67  | 583,943 | 898,970  | 153.9 | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 68  | 583,342 | 900,114  | 102.6 | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 69  | 585,993 | 905,698  | 17.9  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 70  | 584,008 | 904,053  | 50.9  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 71  | 582,842 | 902,682  | 34.1  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 72  | 585,579 | 904,881  | 10.1  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 73  | 584,946 | 904,877  | 35.2  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 74  | 584,073 | 904,134  | 51.1  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 75  | 583,662 | 903,717  | 60.9  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 76  | 585,463 | 904,758  | 14.7  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |

To be continued on next page...

## SHADOW - Main Result

Calculation: 10798\_CLOGHERCOR\_200th\_REALISTIC

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| No. | Easting | Northing | Z     | Width | Height | Elevation | Slope of window | Direction mode     | Eye height (ZVI) a.g.l. |
|-----|---------|----------|-------|-------|--------|-----------|-----------------|--------------------|-------------------------|
|     |         |          | [m]   | [m]   | [m]    | [m]       | [°]             |                    | [m]                     |
| 77  | 585,500 | 905,312  | 37.4  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 78  | 585,899 | 905,545  | 12.2  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 79  | 585,928 | 905,577  | 13.1  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 80  | 585,727 | 905,410  | 24.3  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 81  | 585,668 | 905,397  | 30.3  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 82  | 585,862 | 905,460  | 11.3  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 83  | 585,755 | 905,654  | 40.2  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 84  | 582,843 | 902,667  | 33.7  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 85  | 582,817 | 902,649  | 34.0  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 86  | 583,747 | 903,786  | 58.3  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 87  | 586,115 | 905,763  | 12.0  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 88  | 582,264 | 901,902  | 21.2  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 89  | 585,264 | 905,165  | 41.7  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 90  | 584,861 | 904,672  | 28.2  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 91  | 585,757 | 905,433  | 21.7  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 92  | 586,126 | 905,792  | 14.2  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 93  | 584,868 | 904,881  | 37.1  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 94  | 586,086 | 899,112  | 143.7 | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 95  | 583,270 | 900,241  | 96.8  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 96  | 583,551 | 902,312  | 36.4  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 97  | 582,943 | 900,381  | 104.3 | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |
| 98  | 581,838 | 901,625  | 23.2  | 1.0   | 1.0    | 1.0       | 90.0            | "Green house mode" | 2.0                     |

## Calculation Results

Shadow receptor

Shadow, expected values

| No. | Shadow hours per year [h/year] |
|-----|--------------------------------|
| 1   | 0:00                           |
| 2   | 0:00                           |
| 3   | 0:09                           |
| 4   | 0:38                           |
| 5   | 3:43                           |
| 6   | 2:14                           |
| 7   | 2:43                           |
| 8   | 6:02                           |
| 9   | 0:00                           |
| 10  | 23:18                          |
| 11  | 24:06                          |
| 12  | 25:19                          |
| 13  | 11:15                          |
| 14  | 7:43                           |
| 15  | 20:06                          |
| 16  | 1:11                           |
| 17  | 3:17                           |
| 18  | 3:33                           |
| 19  | 3:07                           |
| 20  | 2:23                           |
| 21  | 4:34                           |
| 22  | 5:11                           |
| 23  | 5:02                           |
| 24  | 8:03                           |
| 25  | 5:00                           |
| 26  | 4:35                           |
| 27  | 4:20                           |
| 28  | 3:47                           |
| 29  | 3:34                           |
| 30  | 4:26                           |
| 31  | 5:49                           |
| 32  | 3:31                           |
| 33  | 18:57                          |
| 34  | 12:24                          |

To be continued on next page...

Project:

10798\_Shadow Model

Licensed user:

Tobin Consulting Engineers  
Block 10-4, Blanchardstown, Corporate Park  
IE-DUBLIN 15  
+353 1 80304 01  
Michael Nolan / michael.nolan@tobin.ie  
Calculated:  
02/03/2023 13:22/3.6.361

## SHADOW - Main Result

Calculation: 10798\_CLOGHERCOR\_200th\_REALISTIC

...continued from previous page

Shadow, expected values

No. Shadow hours

per year  
[h/year]

|    |       |
|----|-------|
| 35 | 5:35  |
| 36 | 6:22  |
| 37 | 2:11  |
| 38 | 5:20  |
| 39 | 0:00  |
| 40 | 23:22 |
| 41 | 0:15  |
| 42 | 3:32  |
| 43 | 7:20  |
| 44 | 0:00  |
| 45 | 19:36 |
| 46 | 18:22 |
| 47 | 0:00  |
| 48 | 4:08  |
| 49 | 0:15  |
| 50 | 67:17 |
| 51 | 3:40  |
| 52 | 0:00  |
| 53 | 2:45  |
| 54 | 3:18  |
| 55 | 4:37  |
| 56 | 3:26  |
| 57 | 4:31  |
| 58 | 5:23  |
| 59 | 8:02  |
| 60 | 4:36  |
| 61 | 4:04  |
| 62 | 6:32  |
| 63 | 5:19  |
| 64 | 9:43  |
| 65 | 2:02  |
| 66 | 10:38 |
| 67 | 0:00  |
| 68 | 14:51 |
| 69 | 0:00  |
| 70 | 3:44  |
| 71 | 6:06  |
| 72 | 6:06  |
| 73 | 4:22  |
| 74 | 4:04  |
| 75 | 5:05  |
| 76 | 7:12  |
| 77 | 3:26  |
| 78 | 0:00  |
| 79 | 0:00  |
| 80 | 1:33  |
| 81 | 2:03  |
| 82 | 0:21  |
| 83 | 0:00  |
| 84 | 6:18  |
| 85 | 6:24  |
| 86 | 5:36  |
| 87 | 0:00  |
| 88 | 2:02  |
| 89 | 3:07  |
| 90 | 7:13  |
| 91 | 0:57  |
| 92 | 0:00  |
| 93 | 3:04  |
| 94 | 6:26  |
| 95 | 16:19 |
| 96 | 23:22 |
| 97 | 12:22 |
| 98 | 1:30  |

## SHADOW - Main Result

Calculation: 10798\_CLOGHERCOR\_200th\_REALISTIC

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

| No. | Name  | Expected<br>[h/year] |
|-----|---|----------------------|
| T1  | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (1)  | 45:43                |
| T10 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (10) | 0:00                 |
| T11 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (11) | 6:23                 |
| T12 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (12) | 10:02                |
| T13 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (13) | 16:07                |
| T14 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (14) | 16:59                |
| T15 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (15) | 21:31                |
| T16 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (16) | 20:40                |
| T17 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (17) | 30:26                |
| T18 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (18) | 70:03                |
| T19 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (19) | 32:11                |
| T2  | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (2)  | 24:50                |
| T3  | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (3)  | 29:31                |
| T4  | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (4)  | 11:29                |
| T5  | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (5)  | 2:28                 |
| T6  | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (6)  | 38:41                |
| T7  | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (7)  | 8:37                 |
| T8  | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (8)  | 28:09                |
| T9  | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (9)  | 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.

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 - Main Result

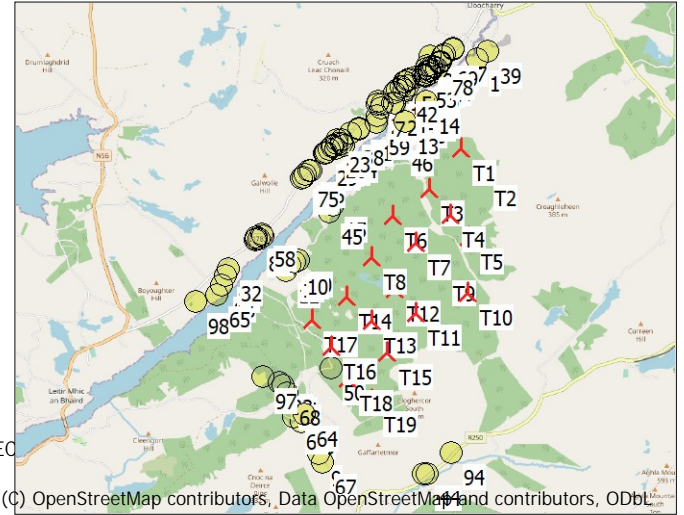
Calculation: 10798\_Cloghercor\_200TH\_Worst Case  
Assumptions for shadow calculations

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: Elevation Grid Data Object: 10798\_Shadow Model\_REC  
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] |
| T1  | 586,252 | 904,152  | 47.6  | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T10 | 586,352 | 901,748  | 163.3 | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T11 | 585,483 | 901,431  | 159.3 | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T12 | 585,145 | 901,821  | 100.5 | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T13 | 584,754 | 901,286  | 126.7 | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T14 | 584,348 | 901,682  | 91.6  | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T15 | 585,010 | 900,769  | 152.7 | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T16 | 584,073 | 900,876  | 96.0  | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T17 | 583,760 | 901,313  | 88.0  | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T18 | 584,353 | 900,350  | 128.4 | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T19 | 584,758 | 899,999  | 155.9 | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T2  | 586,602 | 903,723  | 112.5 | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T3  | 585,726 | 903,472  | 49.5  | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T4  | 586,075 | 903,054  | 96.4  | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T5  | 586,366 | 902,666  | 135.3 | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T6  | 585,117 | 903,032  | 93.8  | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T7  | 585,498 | 902,592  | 96.9  | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T8  | 584,755 | 902,355  | 106.3 | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |
| T9  | 585,921 | 902,139  | 161.8 | VESTAS V162-7.2 7200 162.0 !O! ... Yes | Yes      | VESTAS    | V162-7.2-7,200 | 7,200             | 162.0              | 119.0          | 2,041                    | 9.5       |

### Shadow receptor-Input

| No. | 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]                     |
| 1   | 586,506 | 905,608  | 5.6   | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 2   | 585,898 | 905,569  | 14.9  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 3   | 585,709 | 905,512  | 34.7  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 4   | 585,675 | 905,461  | 35.5  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 5   | 585,365 | 905,275  | 44.8  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 6   | 585,749 | 905,377  | 19.5  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 7   | 585,678 | 905,361  | 25.7  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 8   | 584,264 | 904,282  | 44.1  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 9   | 583,861 | 899,089  | 165.8 | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 10  | 583,484 | 902,263  | 32.5  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 11  | 583,396 | 902,215  | 27.5  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 12  | 583,342 | 902,142  | 25.9  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 13  | 585,322 | 904,584  | 9.8   | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |
| 14  | 585,676 | 904,919  | 10.2  | 1.0   | 1.0    | 1.0              | 90.0            | "Green house mode" | 2.0                     |

To be continued on next page...

## SHADOW - Main Result

Calculation: 10798\_Cloghercor\_200TH\_Worst Case

...continued from previous page

| No. | Easting | Northing | Z     | Width | Height | Elevation | Slope of | Direction mode     | Eye height   |
|-----|---------|----------|-------|-------|--------|-----------|----------|--------------------|--------------|
|     |         |          | [m]   | [m]   | [m]    | a.g.l.    | window   |                    | (ZVI) a.g.l. |
|     |         |          |       |       |        | [m]       | [°]      |                    | [m]          |
| 15  | 584,139 | 903,211  | 24.8  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 16  | 585,737 | 905,426  | 24.0  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 17  | 585,295 | 905,236  | 46.8  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 18  | 585,327 | 905,255  | 46.3  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 19  | 585,188 | 905,124  | 40.4  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 20  | 584,892 | 904,928  | 39.3  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 21  | 585,137 | 904,899  | 27.8  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 22  | 584,932 | 904,815  | 32.9  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 23  | 584,208 | 904,274  | 48.3  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 24  | 584,314 | 904,192  | 35.6  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 25  | 584,173 | 904,160  | 44.8  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 26  | 584,124 | 904,187  | 50.5  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 27  | 584,105 | 904,170  | 50.9  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 28  | 584,028 | 904,085  | 51.4  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 29  | 583,983 | 904,057  | 53.1  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 30  | 583,602 | 903,638  | 59.5  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 31  | 582,960 | 902,707  | 30.4  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 32  | 582,381 | 902,159  | 21.2  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 33  | 583,222 | 900,287  | 94.7  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 34  | 582,943 | 900,382  | 104.1 | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 35  | 583,729 | 903,777  | 59.1  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 36  | 582,893 | 902,661  | 32.1  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 37  | 582,340 | 902,051  | 21.9  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 38  | 584,430 | 904,390  | 33.0  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 39  | 586,688 | 905,742  | 7.3   | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 40  | 583,552 | 902,312  | 36.5  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 41  | 585,767 | 905,493  | 24.1  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 42  | 585,307 | 905,115  | 35.2  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 43  | 583,584 | 899,619  | 131.2 | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 44  | 585,684 | 898,760  | 132.1 | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 45  | 584,071 | 903,099  | 28.3  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 46  | 585,243 | 904,307  | 9.1   | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 47  | 585,610 | 898,755  | 137.8 | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 48  | 585,372 | 905,173  | 36.6  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 49  | 585,812 | 905,485  | 17.7  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 50  | 584,077 | 900,530  | 107.6 | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 51  | 585,387 | 905,286  | 43.9  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 52  | 585,943 | 905,656  | 20.3  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 53  | 585,624 | 905,364  | 31.1  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 54  | 585,149 | 905,079  | 37.2  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 55  | 583,616 | 903,661  | 60.5  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 56  | 585,658 | 905,323  | 23.9  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 57  | 585,115 | 904,895  | 28.5  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 58  | 582,932 | 902,738  | 33.3  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 59  | 584,838 | 904,564  | 24.0  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 60  | 584,554 | 904,449  | 30.8  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 61  | 584,553 | 904,488  | 32.0  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 62  | 584,257 | 904,224  | 42.3  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 63  | 584,189 | 904,217  | 47.1  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 64  | 583,624 | 899,746  | 117.8 | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 65  | 582,180 | 901,734  | 16.9  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 66  | 583,459 | 899,703  | 130.1 | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 67  | 583,943 | 898,970  | 153.9 | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 68  | 583,342 | 900,114  | 102.6 | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 69  | 585,993 | 905,698  | 17.9  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 70  | 584,008 | 904,053  | 50.9  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 71  | 582,842 | 902,682  | 34.1  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 72  | 585,579 | 904,881  | 10.1  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 73  | 584,946 | 904,877  | 35.2  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 74  | 584,073 | 904,134  | 51.1  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 75  | 583,662 | 903,717  | 60.9  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 76  | 585,463 | 904,758  | 14.7  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 77  | 585,500 | 905,312  | 37.4  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |
| 78  | 585,899 | 905,545  | 12.2  | 1.0   | 1.0    | 1.0       | 90.0     | "Green house mode" | 2.0          |

To be continued on next page...



## SHADOW - Main Result

Calculation: 10798\_Cloghercor\_200TH\_Worst Case

...continued from previous page

| No. | Easting | Northing | Z     | Width | Height | Elevation<br>a.g.l. | Slope of<br>window | Direction mode     | Eye height<br>(ZVI) a.g.l. |
|-----|---------|----------|-------|-------|--------|---------------------|--------------------|--------------------|----------------------------|
|     |         |          | [m]   | [m]   | [m]    | [m]                 | [°]                |                    | [m]                        |
| 79  | 585,928 | 905,577  | 13.1  | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 80  | 585,727 | 905,410  | 24.3  | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 81  | 585,668 | 905,397  | 30.3  | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 82  | 585,862 | 905,460  | 11.3  | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 83  | 585,755 | 905,654  | 40.2  | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 84  | 582,843 | 902,667  | 33.7  | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 85  | 582,817 | 902,649  | 34.0  | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 86  | 583,747 | 903,786  | 58.3  | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 87  | 586,115 | 905,763  | 12.0  | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 88  | 582,264 | 901,902  | 21.2  | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 89  | 585,264 | 905,165  | 41.7  | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 90  | 584,861 | 904,672  | 28.2  | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 91  | 585,757 | 905,433  | 21.7  | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 92  | 586,126 | 905,792  | 14.2  | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 93  | 584,868 | 904,881  | 37.1  | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 94  | 586,086 | 899,112  | 143.7 | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 95  | 583,270 | 900,241  | 96.8  | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 96  | 583,551 | 902,312  | 36.4  | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 97  | 582,943 | 900,381  | 104.3 | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |
| 98  | 581,838 | 901,625  | 23.2  | 1.0   | 1.0    | 1.0                 | 90.0               | "Green house mode" | 2.0                        |

## Calculation Results

Shadow receptor

Shadow, worst case

| No. | Shadow hours<br>per year<br>[h/year] | Shadow days<br>per year<br>[days/year] | Max shadow<br>hours per day<br>[h/day] |
|-----|--------------------------------------|--|--|
| 1   | 0:00                                 | 0                                      | 0:00                                   |
| 2   | 0:00                                 | 0                                      | 0:00                                   |
| 3   | 1:26                                 | 14                                     | 0:08                                   |
| 4   | 5:26                                 | 27                                     | 0:15                                   |
| 5   | 27:17                                | 68                                     | 0:28                                   |
| 6   | 18:32                                | 38                                     | 0:41                                   |
| 7   | 22:17                                | 42                                     | 0:40                                   |
| 8   | 37:05                                | 117                                    | 0:27                                   |
| 9   | 0:00                                 | 0                                      | 0:00                                   |
| 10  | 114:10                               | 242                                    | 1:02                                   |
| 11  | 121:53                               | 249                                    | 0:57                                   |
| 12  | 127:51                               | 259                                    | 0:52                                   |
| 13  | 64:13                                | 113                                    | 0:53                                   |
| 14  | 49:40                                | 102                                    | 0:41                                   |
| 15  | 96:44                                | 215                                    | 0:56                                   |
| 16  | 9:59                                 | 31                                     | 0:30                                   |
| 17  | 22:34                                | 76                                     | 0:28                                   |
| 18  | 25:19                                | 72                                     | 0:28                                   |
| 19  | 18:43                                | 48                                     | 0:33                                   |
| 20  | 12:39                                | 53                                     | 0:25                                   |
| 21  | 22:33                                | 50                                     | 0:42                                   |
| 22  | 28:59                                | 87                                     | 0:34                                   |
| 23  | 32:53                                | 96                                     | 0:26                                   |
| 24  | 49:38                                | 129                                    | 0:34                                   |
| 25  | 30:25                                | 102                                    | 0:27                                   |
| 26  | 28:01                                | 96                                     | 0:26                                   |
| 27  | 25:54                                | 87                                     | 0:26                                   |
| 28  | 20:57                                | 73                                     | 0:26                                   |
| 29  | 19:21                                | 69                                     | 0:25                                   |
| 30  | 25:08                                | 90                                     | 0:23                                   |
| 31  | 33:55                                | 111                                    | 0:25                                   |
| 32  | 15:41                                | 55                                     | 0:24                                   |
| 33  | 65:32                                | 163                                    | 0:38                                   |
| 34  | 42:18                                | 120                                    | 0:38                                   |
| 35  | 33:08                                | 111                                    | 0:24                                   |
| 36  | 37:26                                | 116                                    | 0:26                                   |

To be continued on next page...

Project:

10798\_Shadow Model

Licensed user:

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+353 1 80304 01  
Michael Nolan / michael.nolan@tobin.ie  
Calculated:  
02/03/2023 13:20/3.6.361

## SHADOW - Main Result

Calculation: 10798\_Cloghercor\_200TH\_Worst Case

...continued from previous page

Shadow, worst case

| No. | Shadow hours<br>per year<br>[h/year] | Shadow days<br>per year<br>[days/year] | Max shadow<br>hours per day<br>[h/day] |
|-----|--------------------------------------|--|--|
| 37  | 9:53                                 | 32                                     | 0:24                                   |
| 38  | 31:32                                | 106                                    | 0:25                                   |
| 39  | 0:00                                 | 0                                      | 0:00                                   |
| 40  | 105:01                               | 235                                    | 0:51                                   |
| 41  | 2:12                                 | 17                                     | 0:10                                   |
| 42  | 21:58                                | 60                                     | 0:32                                   |
| 43  | 23:52                                | 79                                     | 0:32                                   |
| 44  | 0:00                                 | 0                                      | 0:00                                   |
| 45  | 86:17                                | 201                                    | 0:44                                   |
| 46  | 106:49                               | 167                                    | 1:09                                   |
| 47  | 0:00                                 | 0                                      | 0:00                                   |
| 48  | 28:33                                | 82                                     | 0:30                                   |
| 49  | 2:14                                 | 17                                     | 0:10                                   |
| 50  | 253:37                               | 277                                    | 1:44                                   |
| 51  | 27:25                                | 66                                     | 0:29                                   |
| 52  | 0:00                                 | 0                                      | 0:00                                   |
| 53  | 22:21                                | 44                                     | 0:37                                   |
| 54  | 19:03                                | 48                                     | 0:35                                   |
| 55  | 26:46                                | 99                                     | 0:24                                   |
| 56  | 27:24                                | 48                                     | 0:40                                   |
| 57  | 22:05                                | 49                                     | 0:42                                   |
| 58  | 31:35                                | 106                                    | 0:24                                   |
| 59  | 46:51                                | 131                                    | 0:29                                   |
| 60  | 25:41                                | 96                                     | 0:26                                   |
| 61  | 22:11                                | 89                                     | 0:25                                   |
| 62  | 39:54                                | 122                                    | 0:28                                   |
| 63  | 34:08                                | 104                                    | 0:27                                   |
| 64  | 32:41                                | 95                                     | 0:33                                   |
| 65  | 8:39                                 | 29                                     | 0:23                                   |
| 66  | 36:06                                | 101                                    | 0:31                                   |
| 67  | 0:00                                 | 0                                      | 0:00                                   |
| 68  | 50:13                                | 112                                    | 0:55                                   |
| 69  | 0:00                                 | 0                                      | 0:00                                   |
| 70  | 20:17                                | 68                                     | 0:26                                   |
| 71  | 36:04                                | 114                                    | 0:25                                   |
| 72  | 34:21                                | 70                                     | 0:39                                   |
| 73  | 22:53                                | 73                                     | 0:36                                   |
| 74  | 23:19                                | 79                                     | 0:26                                   |
| 75  | 31:25                                | 99                                     | 0:24                                   |
| 76  | 35:18                                | 64                                     | 0:46                                   |
| 77  | 26:25                                | 56                                     | 0:32                                   |
| 78  | 0:00                                 | 0                                      | 0:00                                   |
| 79  | 0:00                                 | 0                                      | 0:00                                   |
| 80  | 13:03                                | 34                                     | 0:34                                   |
| 81  | 17:04                                | 38                                     | 0:36                                   |
| 82  | 3:03                                 | 20                                     | 0:12                                   |
| 83  | 0:00                                 | 0                                      | 0:00                                   |
| 84  | 37:12                                | 117                                    | 0:25                                   |
| 85  | 37:44                                | 118                                    | 0:25                                   |
| 86  | 33:02                                | 110                                    | 0:24                                   |
| 87  | 0:00                                 | 0                                      | 0:00                                   |
| 88  | 9:06                                 | 30                                     | 0:23                                   |
| 89  | 19:44                                | 60                                     | 0:31                                   |
| 90  | 43:00                                | 114                                    | 0:29                                   |
| 91  | 8:01                                 | 30                                     | 0:25                                   |
| 92  | 0:00                                 | 0                                      | 0:00                                   |
| 93  | 17:59                                | 67                                     | 0:25                                   |
| 94  | 21:46                                | 65                                     | 0:26                                   |
| 95  | 56:48                                | 151                                    | 0:42                                   |
| 96  | 105:14                               | 237                                    | 0:50                                   |
| 97  | 42:10                                | 119                                    | 0:38                                   |
| 98  | 6:07                                 | 24                                     | 0:20                                   |

## SHADOW - Main Result

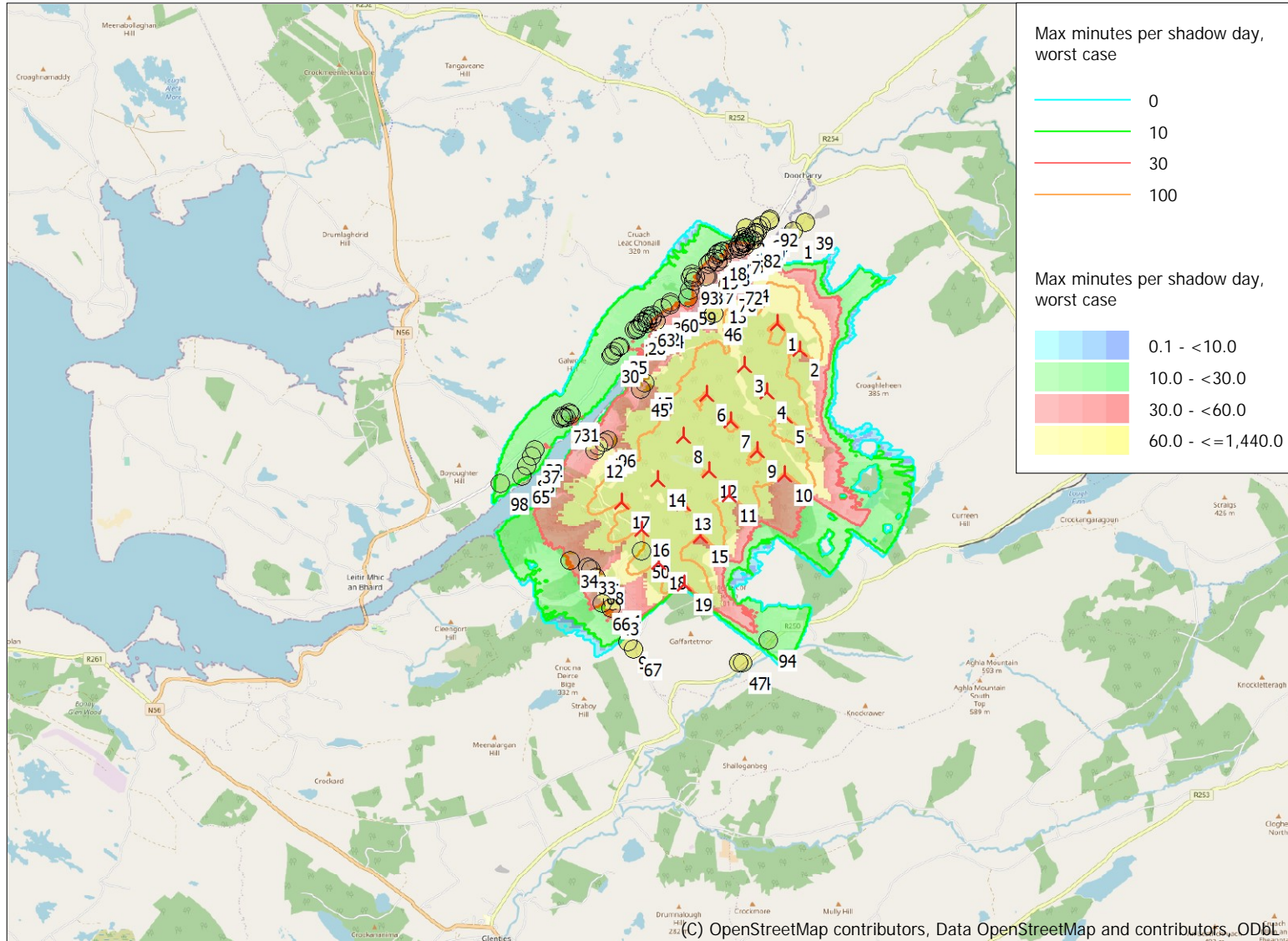
Calculation: 10798\_Cloghercor\_200TH\_Worst Case

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

| No. | Name  | Worst case<br>[h/year] |
|-----|---|------------------------|
| T1  | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (1)  | 245:28                 |
| T10 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (10) | 0:00                   |
| T11 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (11) | 21:34                  |
| T12 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (12) | 57:13                  |
| T13 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (13) | 63:08                  |
| T14 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (14) | 77:50                  |
| T15 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (15) | 70:25                  |
| T16 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (16) | 92:20                  |
| T17 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (17) | 192:38                 |
| T18 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (18) | 259:42                 |
| T19 | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (19) | 120:21                 |
| T2  | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (2)  | 149:11                 |
| T3  | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (3)  | 173:57                 |
| T4  | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (4)  | 75:08                  |
| T5  | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (5)  | 18:06                  |
| T6  | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (6)  | 197:22                 |
| T7  | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (7)  | 43:20                  |
| T8  | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (8)  | 140:41                 |
| T9  | VESTAS V162-7.2 7200 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (9)  | 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.

Project:  
10798\_Shadow Model



**SHADOW - Map**  
Calculation:  
10798\_Cloghercor\_200TH\_Worst Case

Licensed user:  
Tobin Consulting Engineers  
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+353 1 80304 01  
Michael Nolan / michael.nolan@tobin.ie  
Calculated:  
02/03/2023 13:20/3.6.361

Map: EMD OpenStreetMap , Print scale 1:100,000, Map center Irish ITM-IRENET95 (IE), geocentric, GRS80 East: 584,160 North: 901,680  
 ▲ New WTG      ● Shadow receptor  
 Flicker map level: Elevation Grid Data Object: 10798\_Shadow Model\_RECOVER001 04\_10\_2022 15\_59\_53\_EMDGrid\_0.wpg (2)  
 Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1.5 m